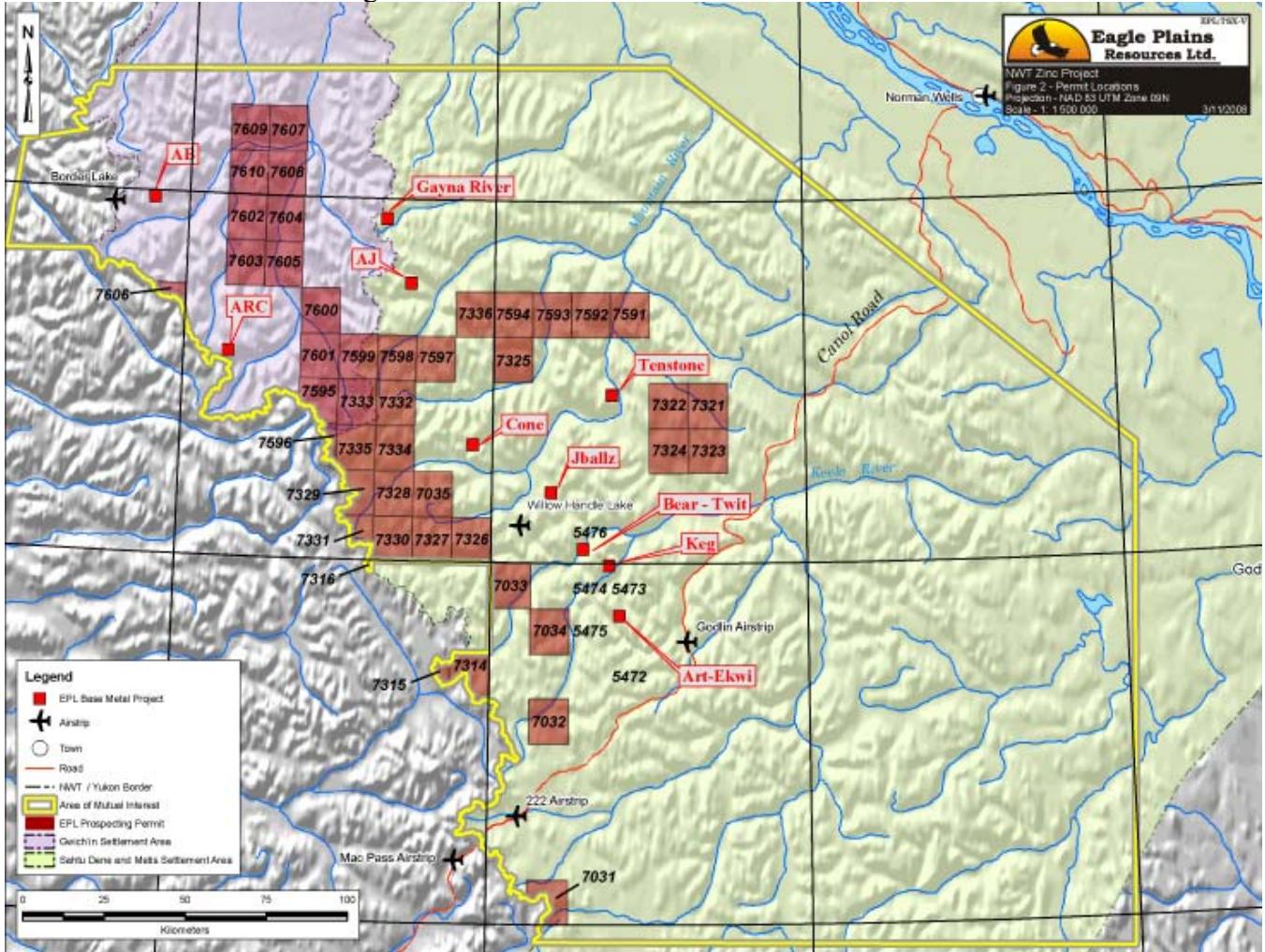


# Mackenzie Valley Zinc Project (Pb, Zn, Cu, Ag)

The Mackenzie Valley Zinc Project includes Prospecting Permit numbers 7593, 7594, 7600, and 7602-7610, for a total of 12 covered in this report under exploration by Eagle Plains Resources Ltd. in 2008, all lie in the Backbone Ranges of the Mackenzie Mountains in the western Northwest Territories.



**Eagle Plains Resources Mackenzie Valley Zinc Project - Permit Locations**

Exploration work in this area first began in the 1970's but was very sporadic after 1980 due to falling metal prices and the remoteness of the area. Potential mineral deposit types found in this region include: shale hosted sedimentary exhalative type and carbonate-hosted, which include Mississippi Valley type and sedimentary hosted copper deposit type. Carbonate and shale-hosted mineralization is widespread throughout the Mackenzie Platform and Selwyn Basin. Over 300 mineral showings are listed in the NWT NORMIN and the Yukon MINFILE databases. These include the past producers around Faro, Yukon, as well as the deposits at Howard's Pass, Tom, Jason, and Gayna River. At least three mineralizing events are known: Middle Cambrian (Faro); Early Silurian (Howard's Pass); and Late Devonian (Tom, Jason), as well as mineralization related to Cretaceous intrusions (Mactung), Dewing et al (2006).

Since 2005, Eagle Plains Resources Ltd. has been acquiring and evaluating permits in the area along with compiling all available historic data. The 2008 exploration program took place between June 10th and August 25th. This program consisted of a crew of up to 25 people which included staff of Bootleg

## Willowhandle Lake - Camp Location



Exploration Inc., a wholly owned subsidiary of Eagle Plains Resources Ltd., as well as many contractors including geophysical, helicopter and general exploration companies. Environmental and academic consultants were also employed during the field season. The exploration program was based out of the Willow Handle Lake camp in the south and the Border Lake camp in the north. Both camps were supplied by float equipped fixed wing

aircraft from Norman Wells, NWT.

The favourable Coates Lake Group stratigraphy exists on and around Permit 7593 and is weakly mineralized with copper locally. The mineralized interval is thin and low grade. Due to the geometry of the half-graben basins collecting the red-bed stratigraphy, the basins east of the Plateau Thrust contain little or none of the copper source rocks. Permit 7593 is east of the Plateau Thrust, making it a less attractive exploration target. The Plateau Thrust scarp exposes slices of weakly mineralized Coates Lake Group on Permit 7594. Although the favourable strata are present west of the Plateau Thrust on this permit, exploration is hampered by topography. Very steep cliffs limit access and make geologic mapping and evaluation very difficult. The shallow dip of units and the significant thickness of barren cap rock reduce the effectiveness of geophysical and geochemical exploration techniques and makes diamond drill testing very expensive. The anomalous lead silt geochemistry from the Sekwi Formation stratigraphy on Permit 7602 show this area has potential for significant carbonate hosted Zn-Pb mineralization and warrants further work. Permit 7603 contains minor iron geochemical anomalies but is considered to have low exploration potential. Although veins host high copper grades on Permit 7604, veining is patchy and erratic and lacks any economic potential. The showings' location atop a steep, rugged peak limits the potential size of the showing. The weak geochemical anomalies do not warrant further work. Zn-Pb mineralization was not found in place on Permit 7605, but enough significant grade mineralization was found in float to warrant further work. The in situ source of mineralization needs to be located on the permit to evaluate its economic potential. Silt geochemistry anomalies on Permit 7608 are underlain by the Proterozoic Little Dal Group. The style of mineralization may be similar to the Gayna River Zn-Pb deposit. The exploration potential on this permit is considered to be weak to moderate within the carbonate rocks of the Little Dal Group and is worthy of further exploration. Permit 7610 contains the HAB Zn-Pb-Ba mineralized float occurrences thought to be hosted in the Arnica or Hume Formations. Mineralization occurs in calcite veins cutting cherty rocks and dolomitic limestones.

The low grade and small size of the HAB showing, in combination with the lack of anomalous silt samples, indicates it is not of economic interest.

## **INTRODUCTION**

The Mackenzie Mountain region, west of Norman Wells, has been explored for zinc, lead, silver, copper and diamonds by both junior and major companies since the early 1970's. The majority of known base metal mineral showings were discovered during the 1970 period when helicopters and silt geochemistry were first used in regional exploration. In the late 1970's, numerous mafic diatremes found in the district were explored for their diamond potential. The remoteness of the area and low metal prices led to a period of inactivity in the late 1970's until 1999 when Eagle Plains Resources Ltd. staked claims in the area of the historic Gayna River Zn-Pb deposit. From 2005 to 2008, Eagle Plains Resources acquired numerous prospecting permits in the district and has subsequently carried out regional exploration, focusing on zinc, lead and copper targets.

### **Location and Access**

Prospecting Permit numbers 7322, 7330, 7335, 7593, 7594, 7596, 7600, and 7602-7610, under exploration by Eagle Plains Resources Ltd. in 2008, all lie in the northern Mackenzie Mountains near the Northwest Territories-Yukon border. The prospecting permits lie 175 km west of Norman Wells and approximately 300 km south of Tsiigehtchic. The center point for this group of permits lies at 64° 45' N latitude and 131° 00' W longitude. Permits 7330, 7335, 7593, 7594 and 7596 lie in the Mountain River drainage and Permit 7322 lies on the Abandoned Creek drainage while the other ones all lie in the Arctic Red River drainage basin.

Access into the area is principally by air from Norman Wells which is the best logistical centre for the project area. An all weather jet airport, barge access along the Mackenzie River, stores and air charter companies are all found at Norman Wells. Several suitable lakes for floatplanes and airstrips for wheeled aircraft are found in the district but a helicopter is required to transport exploration crews to the prospecting permits.

Fireweed Helicopters, based in Whitehorse, provided a Bell 207L Long Ranger for the duration of the field program. The field crews stayed at the base camp at Willow Handle Lake as well as a second base camp at Border Lake. Both camps were serviced by Northwright Air, based in Norman Wells, who provided Twin Otter and Air Porter float equipped aircraft for routine supply flights during the project. The jet airport at Norman Wells was the transportation hub for all camp personnel during the project.

### **Tenure**

Prospecting Permit numbers 7332, 7330, 7593 and 7594 lie on Crown land within the Sahtu Land Settlement area. Prospecting Permit numbers 7600, 7602, 7603, 7604, 7605, 7606, 7607, 7608, 7609 and 7610 lie within the Gwich'in Land Settlement area. Prospecting Permits 7335 and 7596 lie on the boarder between the Sahtu Land Settlement area and the Gwich'in Land Settlement area. Prospecting Permits 7607 and 7608 cover Gwich'in Tribal Council Land parcel 33 (Arctic Red River – Headwaters) and Eagle Plains Resources Ltd. is authorized to carry out exploration work on this ground under the Land Use Research Permit GTC0805, issued by the Gwich'in Tribal Council. These 16 prospecting permits, which are the subject of this assessment report, are 100% owned by Eagle Plains Resources Ltd. which carries no encumbrances on them. Assessment work was carried out by Eagle Plains Resources Ltd. staff and contractors during the period of February 1, 2008 to November 30, 2008.

## **History**

**1966** – Geological Survey of Canada examines part of NTS 105 P map area during Operation Selwyn.

**1971** – S.L. Blusson of the Geological Survey of Canada publishes Map 1333A, and Paper 71-22, Sekwi Mountain Map-Area, Yukon Territory and District of Mackenzie, NWT.

**1972** – Arrow InterAmerica begins exploring Pb-Zn occurrences previously discovered by Pete Risby and Art John in the Godlin Lakes area

**1973** – Welcome North Mines Limited options the Goldlin Lake properties. Other companies begin exploring the region.

**1973** – Welcome North Mines Limited options Keg Zn-Pb property to Dynasty Exploration.

**1974-1977** - Welcome North Mines Limited organizes Arctic Red Joint Venture regional exploration program.

**1974-1977** - Welcome North Mines Limited options Bear-Twit Zn-Pb claims to Cominco Ltd.

**1974** – S.L. Blusson of the Geological Survey of Canada publishes GSC Open File 205 as a draft of five 1:250,000 scale geologic maps from Operation Stewart, northern Selwyn Basin, Yukon and NWT (NTS 105O Nidderly Lake, NTS 106A Mt. Eduni, NTS 106B Bonnet PlumeLake, NTS 106C Nadaleen River, NTS 105N Lansing Range).

**1974** – Welcome North Mines Limited and other companies continue large scale regional helicopter supported exploration programs.

**1975** – Rio Tinto discovers significant Zn-Pb mineralization on their Gayna River property. Welcome North Mines Limited options the Goldlin Lake properties. Other companies begin exploring the region.

**1976** – Welcome North discovers Zn-Pb mineralization at the AB showing.

**1978** – Welcome North Mines Limited options Bear Twit Zn-Pb claims to Bethlehem copper.

**1980-1983** - Inco conducts regional exploration program in headwaters of Mackenzie Mountains.

**1993** - Archer Cathro conducts regional exploration program for NDU resources exploring for diatremes.

**1999** – Eagle Plains Resources acquires claims in the area of the historic Gayna river deposit.

**2005** – Eagle Plains Resources Ltd acquires 8 prospecting permits in the district. A limited field program is conducted to verify target types and area potential.

**2006** – Eagle Plains Resources Ltd acquires 6 new prospecting permits (total holdings of 14) in the district. EPL obtains all the original sample material collected by Rio Tinto during their RGS sampling program in the Mackenzie Mountains in the 1970's. Rio Tinto samples are analyzed by ICP for 32 element suite. A helicopter supported field program with a 6 person crew is conducted to prospect areas of anomalous silt geochemistry and examine old showings. Bronco, Mustang and Golfball Zn-Pb-Ag showings are discovered by field crews.

**2007** – Eagle Plains Resources Ltd acquires 23 new prospecting permits (total holdings of 37) in the district. A helicopter supported field program with a 15 person crew is conducted to follow-up RGS silt anomalies and to map and prospect areas of favourable geology. Bronco, Mustang and Golfball Zn-Pb-Ag showings are followed up and Bronco showings are drilled.

**2008** – Eagle Plains Resources Ltd. acquires additional new prospecting permits in the district. A helicopter supported field program with a 16 person crew is conducted to follow-up RGS silt anomalies in basinal rocks looking for SEDEX targets. Detailed exploration work is conducted on carbonate-hosted lead-zinc targets on the Keg and AB Claims in order to define future drill targets. An IP survey is carried out over both Keg and AB claims. Regional evaluation of the potential of sediment hosted copper deposits is continued on the area underlain by Proterozoic red bed sequences.

## **GEOLOGY**

### **Regional Geology**

The regional geology in the Mackenzie Mountains was compiled by Eagle Plains Resources Ltd geologists into a digital database for use with ArcGIS version 9 geographic information systems (GIS). The Yukon digital geology published in 2003, overlaps into the NWT and this was used in addition to digitized geological contacts from existing 1:250,000 scale mapping published by the Geological Survey of Canada for the region.

The principal geologic features underlying the prospecting permits discussed in this report are the Mackenzie Carbonate Platform and the Selwyn Basin. The Howard's Pass, Tom and Jason plus the Anvil camp (Faro, Vangorda, Grum, Swim) Zn-Pb deposits are also shown. Exploration on the Mackenzie Carbonate Platform is focused mainly on carbonate-hosted Zn-Pb-Ag deposits as well as Proterozoic red bed copper deposits whilst sedimentary exhalative Zn-Pb-Ag are the main exploration targets in the shales of the Selwyn Basin and Misty Creek Embayment.

The prospecting permits belonging to Eagle Plains Resources Ltd and the Normin database mineral occurrences are overlain onto the digital geology. Sources for the geological information are mainly from GSC memoirs, bulletins, papers, current research reports, "A" series 1:250,000 geological maps and open file maps plus summaries from the current versions of "the Geology of Canada" series published by N.R. Canada. The principal references for this geological overview and stratigraphy in this section of the report are: Aitken et al 1973, 1982, Aitken and Cook, 1974, Blusson 1971, 1974, Cecile 1982, 2000, Cecil et al 1997, Dewing et al 2006, Fritz et al 1991, Gabrielse et al 1973, Gordey and Anderson 1993, Morrow 1991, 1999. In June 2007, Dr. E.C. Turner of Laurentian University compiled a report giving a brief description of stratigraphic units in order of age for the field mapping crews of Eagle Plains Resources Ltd. All of the regional geology, structure and stratigraphy used in this report is based on the work and ideas of the aforementioned geologists.

The regional geology is subdivided into Phanerozoic basinal and platformal domains dominating the western portion of the area and Proterozoic basinal to platformal domains in the northeast part of the region. A basinal facies belonging to the Cambrian-Silurian rocks of the Misty Creek Embayment is a major feature to the south west of the permits. The Misty Creek Embayment is surrounded by time-equivalent platformal to transitional carbonate rocks.

The structural geology of the Mackenzie Mountain Backbone Ranges between the Canol Road in the south and the Snake River in the north is dominated by a northwesterly striking fold and thrust belt. The less competent Paleozoic clastic strata tends to be the most easily deformed as seen in the area south and west of the permits where it has been extensively folded and thrust. The area in the central and northeast portion of the region is underlain by upper Proterozoic and lower Paleozoic strata characterized by thicker, more competent beds of limestone, dolomite and quartzite which display more moderate broad folds and thrust faults that have moderate to shallow south westerly dips and northwest trending fold axes. Normal and reverse faults have been identified within the Proterozoic sequences in the district and are believed to have formed during the Racklan Orogeny. These faults have roughly north-south and east-west strikes with some showing displacement up to 300 m. Some minor folding occurred during the Helikian as indicated by small scale folds truncated by the Franklin Mountain unconformity. After the deposition of the Cambrian through to Devonian strata a second period of

faulting took place, likely the Laramide Orogeny. The strike for the faults is easterly to northwesterly. The present day structural grain of the region is dominated by Laramide folds.

### **Regional Stratigraphy**

The main stratigraphic units in the Mackenzie Mountains were defined by Geological Survey of Canada geologists during the 1960-2000 period with ongoing revisions and refinements made during the same period. The NWT Geoscience Office is currently working on the Sekwi Project to further refine and correlate stratigraphic units across 1:250,000 map sheets in portions of the area covered by the prospecting permits owned by Eagle Plains Resources Ltd.

Fritz et al. (1991), proposed that there are five main stratigraphic packages exposed in the Mackenzie Mountains:

- 1) The Mesoproterozoic Mackenzie Mountain Supergroup consists of four units (H1, Tsezotene Formation, Katherine Group and Little Dal Group). These formed in an intracratonic basin culminating in the carbonatereefal-evaporitic Little Dal Group.
- 2) The Neoproterozoic Windermere Supergroup (Coates Lake Group, Rapitan Group, Twitya, Keele, Sheepbed, Gametrail, Blueflower and Risky Formations). These record rifting to passive margin settings.
- 3) The latest Precambrian to Cambrian succession consists of the Ingta, Backbone Ranges, Vampire, and Sekwi formations. These were deposited in shelf, ramp, and deep water settings along a passive margin.
- 4) The Upper Cambrian to Lower Silurian succession consists of the units that form the Mackenzie Platform: the Franklin Mountain, Sunblood, Whittaker, and Mount Kindle formations; and the deepwater Hess Formation and the Road River Formation or its equivalents which are the Rabbitkettle and Duo Lake Formations.
- 5) The Devonian succession includes shallow water carbonate and evaporite units of the Camsell, Delorme, Sombre, Arnica, Landry, and Nahanni-Headless formations. These units are overlain by the Horn River, Besa River, Canol and Imperial Formation shales and siltstones of upper middle to upper Devonian age. The deep-water equivalents of the Mackenzie Platform occur in the Selwyn Basin in the western part of the study area. This region of deep-water sedimentation persisted from late Precambrian to Middle Devonian time. It contains the Rabbitkettle and Road River formations that are the deep-water equivalents to the Ordovician and Devonian platformal strata. These are overlain by late Devonian rift clastics.

### **Stratigraphy of the Mackenzie Mountains, NWT**

#### ***PROTEROZOIC***

Proterozoic strata in the Mackenzie Mountains were mapped by the Geological Survey of Canada mainly during the 1970 to 1990 period with the main work being reported in a series of publications by Dr. J. Aitken and others from the GSC. Currently there are a number of confusing overlaps of map units in the published literature and in the digital database of the region and accompanying legend derived from 1:250,000 GSC "A" series and "Open File" maps for the region. The digital map unit legend is listed in brackets after the relevant unit. Where no digital map unit legend is listed, the formation, group or unit name is not present on any of the digital geology maps referred to in the assessment report for prospecting permits.

### *Mackenzie Mountains Supergroup (Early Neoproterozoic; 1083 Ma to~778 Ma)*

This is the lowest stratigraphic package in the Mackenzie Mountains. The supergroup is in excess of 5-6 km thick and consists of four units. Its base is not exposed, and its upper contact is everywhere unconformable, being overlain by units of late Neoproterozoic to early Paleozoic age.

#### H1 Unit

The basal unit of the Mackenzie Mountains Supergroup is carbonate-dominated and in excess of 400 m thick. It represents several intervals of shoaling within shallow-marine environments. It is exposed in the cores of anticlines on two map-sheets: south-central 106H and central 96D. Carbonates consist of pale, buff-weathering fenestral and tepee dolostone with scattered stromatolites and local chert. Siltstone and shale units have been reported from the Ramparts River map-sheet where the exposed succession is thickest. It has recently been suggested that the H1 unit correlates with unit D of the (former) Pinguicula Group (now Mackenzie Mountains Supergroup) in the Wernecke Mountains, although this hypothesis remains to be demonstrated. No mineralization has been reported from this unit in the Mackenzie Mountains.

#### Tsezotene Formation

The Tsezotene Formation (Gabrielse et al. 1973) consists of 600 to 1563 m of dark-weathering terrigenous mudstone, with subordinate sandstone and carbonate rock, and records shallowing-upward of a muddy shelf into a slowly subsiding basin with environments from basinal to peritidal. The formation is crudely divisible into two parts, a lower "grey member" and an upper "red member". The sharp basal contact with map-unit H1 represents a major flooding surface; it is commonly disrupted by sills associated with the Franklin intrusive event. No known mineralization has been reported from this unit.

#### *Katherine Group (muPK)*

The Katherine Group consists of seven informal formation-scale units (K1 to K7) deposited in fluvial, deltaic and marine environments. The unit generally consists of monolithic, distinctively blue-mauve or white- to faintly pink-weathering quartzites interlayered with thinner, more heterogeneous terrigenous siltstone and mudstone; the succession is arranged in three shoaling-upward successions. K1, K3, K5 and K7 are fine- to medium-grained, cross-bedded quartz arenite, whereas K2 and K4 are siltstone/mudstone with dolostone interbeds; K6 is characterized by two distinctive orange-weathering stromatolite units. The basal contact is conformable. Total thicknesses of the group (300-1716 m) and its constituent subunits are exceedingly laterally variable. The exposure area of the Tsezotene Fm and Katherine Group extends from NTS 106F in the northwest to 95L in the southeast. Probable equivalents in the Wernecke Mountains include the "Corn Creek Quartzite" of the former Pinguicula Group. No known mineralisation has been reported from this group.

#### *Little Dal Group (uPL)*

The Little Dal Group consists of seven informally-named formation-scale units that record six depositional increments. It is exposed on NTS sheets 106F in the northwest to 95L in the southeast, and its preserved thickness is 2-3 km. It likely correlates to "unit F" of the former Pinguicula Group in the Wernecke Mountains. The unit's base is effectively conformable on the Katherine Group, and its top is always unconformable. The group is crudely divided into lower and upper parts for practical purposes related to their spatial distribution: lower formations are exposed predominantly east of the Plateau

Thrust and upper formations west of it. These informal groupings were used as map-units (H5 and HLD) in the 1970s, but these units were superseded by the seven formation-scale units described below.

#### Lower Little Dal (H5)

The lower formations of the Little Dal Group are exposed predominantly east of the Plateau Thrust. Mudcracked Formation Dark grey shallow-marine siltstone and shale interbedded with white quartz arenite. Hummocky cross stratification, gutter casts, synaeresis cracks and halite casts common in northwest; desiccation cracks common in southeast. Orange-weathering quartz-sandy ooid-intraclast grainstone marker (to 10 m) at top. Basal contact conformable in northwest; minor unconformity in southeast. Thickness 9-65 m.

#### Basinal and Platformal assemblages (laterally equivalent)

The Basinal assemblage is exposed from NTS 106F southeast to approximately the junction of 95M, 105P, 106A and 96D. Southeast of there, it passes laterally to the temporally equivalent Platformal assemblage, present on 95M and 95L.

#### Basinal assemblage (formerly 'dead-end shale')

The Basinal assemblage consists of grey, black and red shale and interbedded ribbon, nodular and parted lime mudstone, with giant calcimicrobial stromatolite reefs in the extreme northwest. Shale to carbonate packages define four subtle hectometre-scale members. Carbonate of first member forms a distinctive stromatolite biostrome. Carbonate of second member is medium grey-weathering lime mudstone with thin shaly interlayers. Carbonate of third member is quartz-silty lime mudstone. Carbonate of fourth member is lime mudstone with molar-tooth cracks. Thickness of constituent members and colour of their shales varies laterally. Total thickness 425-631 m. Basinal member four carbonate and uppermost reefs locally host base-metal mineralisation at Gayna River.

#### Platformal assemblage

Buff-weathering dolomitic to limestone ooid and molar-tooth crack-fill intraclast grainstone, molar-tooth carbonate and parted limestone, with a range of stromatolitic patch reefs. These were deposited in a high-energy ramp environment. Thickness 395-770m.

#### Grainstone Formation

Dolomitic ooid-intraclast grainstone and minor interlayered argillaceous dolostone deposited in laterally persistent, high-energy carbonate platform setting. Calcareous quartz arenite and sandy argillaceous dolostone common near the top of the formation. Conformable basal contact is gradational over several metres. Present on NTS sheets 106F (northwest) to 95L (southeast). Approximate thickness ~425 m. At Gayna River, the Grainstone Formation was informally divided into several units including the lower and upper host units that contain Zn-Pb mineralisation.

#### Upper Little Dal (H5c, H5g)

##### Gypsum Formation

Banded and intermittently multidirectionally current-rippled white to grey gypsum with minor red, grey or green gypsiferous siltstone and dolostone, particularly near the base. A regional subtidal marker unit with nodular and molar-tooth carbonate is present near the top of the formation (~10 m). Nodular and enterolithic gypsum fabrics common in some sections. Local red terrigenous mudstone, especially near base. Evaporites predominantly lagoonal and related to an inferred barrier. Thickness up to ~500 m.

### Rusty Shale Formation

Shallow marine to peritidal; recessive, desiccation-cracked, ripple-marked, black to rusty grey shaly mudstone, siltstone and very fine-grained pyritic or dolomitic quartz arenite. Five regional members: basal dolostone (~40m), lower varicoloured shale (<80 m), middle sandstone (50 m), upper shale (<50m) and upper dolostone (<50m). Abrupt but conformable basal contact. Thickness 115 to 260 m.

### Upper Carbonate Formation

Informally subdivided into 12-13 members. Lower six members (UC 1-6) composed of grey and tan stromatolitic to oolitic dolostone and limestone. Upper six members (UC 7-12) are discontinuous stromatolitic carbonate units separated by grey to brown nodular mudstone. Gradational basal contact with the Rusty Shale formation is placed above the uppermost of the shales present in the upper carbonate member. Records deposition in shallow, energetic carbonate platform. Thickness up to ~700m. Upper contact unconformably overlain by a variety of late Neoproterozoic to Paleozoic units.

### *Windermere Supergroup (Late Neoproterozoic)*

#### *Coates Lake Group*

##### Thundercloud Formation

Locally, at base, the "Little Dal Lavas", which signal the first rifting phase of the Windermere, unconformably overlie the Little Dal Group. Overlying volcanic-derived sandstone and conglomerate pass upward into recessive mudstone, quartz sandstone and minor carbonate rocks. Thickness up to 300m.

##### Redstone River Formation

White and red gypsum of playa (rift-valley) origin; conglomerates at base. Red terrigenous mudstone more common near top. Thickness >1000 m.

##### Coppercap Formation

Shallow-marine to sub-storm-wave-base carbonates that are commonly thinly bedded. Thickness to 300m. Transition zone with Redstone River Formation. is host to Cu mineralisation.

### *Rapitan Group (Hru, Hrm, Hrl, uPR3)*

The Rapitan Group rests conformable upon Coates Lake Group, or unconformable upon Little Dal Group. It has a restricted areal distribution. The type locality for the Rapitan Group lies 10 to 12 km (6 to 9 mi) west of Hayhook Lake, 63 deg 30'N, 127 deg W. This area includes the type sections of the Shezal and Sayunei formations.

The Rapitan Group is over 1,500 m (4,920+ ft) and is found in the Mackenzie, Wernecke and Ogilvie mountains. The Rapitan Group in ascending order consists of: 1) Snake River Tillite - reddish-brown weathering mixtite with minor orthoconglomerate, sandstone and iron formation; 2) Sayunei Fm (=homotaxial equivalent of the Snake River Tillite) - reddish-brown weathering siltstone with minor mixtite, conglomerate, sandstone and iron formation; and 3) Shezal Fm - reddish-brown, greenish-grey and buff weathering mixtites with minor mudstone, sandstone and orthoconglomerate. It overlies units of the Mackenzie Mountains Supergroup with regional unconformity. It is overlain by the Twitya Formation with a possible angular unconformity.

The name of this unit was taken from Rapitan Creek to describe tillitic rocks in the Snake River area which are probably correlative with the Shezal and Sayunei formations. It was later expanded to include the Twitya Formation and again later expanded it to include the overlying Keele Formation. In order to avoid the introduction of subgroup names to distinguish the glaciogene Sayunei and Shezal formations from the nonglaciogene Twitya-Keele sequence, Yeo et al. (1978) and Yeo (1978) proposed restriction of the Rapitan Group to the glaciogene units, reverting to the original usage.

#### Sayunei Formation

Dark red terrigenous mudstone, sandy turbidites, and conglomeratic debrites deposited in slope and deep-water environments of the evolving rift margin. Local dropstones record coeval glaciation of landmass near the basin margin. Iron formation common near the top. Thickness ~600 m.

#### Shezal Formation

Green to red tillite, up to 800 m thick.

#### Post-Rapitan, pre-Cambrian formations

##### *Keele Formation (uPK)*

The Keele Formation consists of orange to brown weathering, silty and sandy dolostone. The base of the formation is marked by local minor brown weathering diamictite while the top of the formation is marked by a distinct white dolostone unit.

##### *Sheepbed Formation (uPS)*

Strata assigned to the Sheepbed Formation consist of shale, calcareous shale and minor argillaceous limestone. They are grey weathering, grey to black and thin bedded. Locally, pisolites are present in the limestone horizons.

##### *Risky Formation (uPRI)*

The Risky Formation consists of buff grey to yellow weathering, poorly bedded dolostone. Included to a minor extent are beds of varicoloured quartzite, siltstone and shale.

### **PALEOZOIC-MESOZOIC**

#### ***Lower to Middle Cambrian***

##### Pre-trilobite Lower Cambrian Units

##### *Backbone Ranges Formation (PCBI)*

The Backbone Ranges Formation ranges between Late Proterozoic unconformably overlies Proterozoic stratigraphic units such as the Sheepbed Formation. The type section of the Backbone Ranges Formation is approximately 1400m thick but the lower contact of this formation is rarely exposed in the Bronco area so only a minimum thickness of 200 m can be calculated in this area. The majority of the Backbone Ranges Formation consists of a fine to medium-grained, dark purple to brown quartzite with occasional green to brown siltstone. These sediments are thick to thin bedded and rarely feature fossilized burrows. These well-sorted quartzites were likely deposited in a shallow water environment.

##### *Vampire Formation (uPCV)*

The Vampire Formation consists of dark brown weathering, thin-bedded, argillaceous fine-grained sandstone and siltstone. Also present are minor clastic orthoquartzite beds. Post-trilobite Lower Cambrian units

### *Sekwi Formation (ICS)*

The Sekwi Formation conformably overlies the Vampire or Backbone Ranges Formation and is characterized by distinctively coloured limestone and dolostone that weather orange, red, yellow, and grey. It is divided into lower and upper units, and has a strong inboard-outboard differentiation in facies and paleobathymetry, particularly in the lower part. The lower Sekwi Formation is characterised by outer ramp facies and slope deposits: thinbedded, variably argillaceous lime mudstones, locally with slump folds, conglomerates of lime mudstone intraclasts, interlayered shale, and local olistoliths (giant, contorted slide masses). The upper part of the slope contains resedimented shallow-water material derived from the upper ramp, such as oolitic or skeletal material and small archeocyathan-calcimicrobial mounds that originally grew on the upper slope and outer ramp. The lower and upper Sekwi are divided by a quartz sandstone unit, except in most distal locations. The upper Sekwi has considerably less lateral variability, and consists of fenestral, rippled, burrowed and intraclastic carbonates with local oolitic and oncolitic units, all deposited in peritidal and quiescent, shallow lagoonal areas. The formation thickens markedly southwestward to a maximum thickness of >1 km. It is conformably overlain by the Hess River Fm in outboard locations, and unconformably overlain by the Mount Kindle Fm. in inboard locations.

This unit has an approximate thickness of 900 m in the Bronco permit area. This Sekwi Formation is laterally extensive and features a wide range of characteristics and facies changes. The Bronco area is dominated by distal slope facies with thinly bedded limestone, rare intraclast breccias, and soft sediment deformation. The Sekwi Formation can be split into three units: the basal unit consisting of thinly bedded limestone interbedded with siltstone and intraclast breccias, the middle section is dominated by light brown to grey siltstone and shale while the upper Sekwi Formation is formed by massive to thickly bedded limestone and dolostone that formed in a shallow water environment.

### *Hess River Formation (mCH)*

This recessive formation consists of dark shale and siltstone with minor chert and carbonate layers. In many places it can be divided into a lower black shale and overlying limestone and shale. Its basal contact is conformable with Sekwi Fm. carbonates. In northwestern Misty Creek embayment, the formation has a thick middle unit (1500m) of quartz sandstone – shale turbidites. The formation is laterally equivalent to a hiatus to the east. Barite occurrences have been reported. Distribution: Misty Creek embayment. Thickness from 100 (east) to 2500 m (central Misty Creek embayment)

The Hess River Formation has a distinct but conformable contact with the underlying Sekwi Formation. Contact is placed where shale is more abundant than limestone (within one metre). In the Bronco Property area the Hess River Formation is between 38 and 115 m thick, one tenth of its thickness in the Misty Creek Embayment. This variation in thickness may be caused by a diachronous relationship with the Sekwi Formation or differences in basin depth during deposition. The Hess Formation consists of deep water facies and is dominated by black shale with thin beds of limestone. Lower Hess Formation is characterized by black shale overlain by interbedded calcareous shale and argillaceous limestone. A distinct lack of graptolites in the Hess Formation distinguishes it from other shale-dominated units in the region.

### *Rockslide Formation (mCR)*

The Rockslide Formation consists of a sequence of recessive, weathering, laminated limestone. It also contains nodular siltstone, oolitic and silty limestone

### ***Cambrian-Ordovician***

#### ***Rabbitkettle Formation (COR1, COR2)***

Thin-bedded, yellow- and grey-weathering argillaceous limestone deposited below storm wave-base, with local intraclastic units and slump folds as evidence of slopes. Ripple cross-lamination and trace fossils abundant.

The Rabbitkettle Formation has a conformable but clear contact with the underlying Hess River Formation and its boundary is defined by the dominance of limestone over shale. Thickness 65 to >700m. The Rabbitkettle Formation thickness ranges from 65 m to a maximum of approximately 1200 m. This formation is defined by a distinctive basal section of carbonate breccia with thick yellow weathering beds of limestone which grades upward into shale. These sediments are identified as deep-water facies due to the lack of shallow-water features and its fine grained sediments. Laterally equivalent to Franklin Mountain Fm. Distribution: Misty Creek embayment.

### ***Upper Cambrian to Lower Ordovician***

#### ***Franklin Mountain Formation (Ronning Group) (COF1)***

Predominantly marine dolostone, with stromatolites, intraclasts, and chert. Distinctive red, quartz sandy to shaly basal member with trilobite trace fossils unconformably overlies various other units. The Franklin Mountain Formation is the platform equivalent of the Duo Lakes and Rabbitkettle Formations. It consists of a monotonous succession of light grey weathering, vuggy, thick-bedded, fine to coarse crystalline dolostone and ranges in thickness from 0 to 530 metres. This unit exhibits a number of shallow water features. Locally a basal unit, that weathers a distinctive red colour, is present. It is comprised of white, pink and mauve quartz sandstone, red and green shale and siltstone and an arenaceous yellow dolostone. The age of the Franklin Mountain Formation is restricted to between Cambrian to Early Ordovician from conodont fossil evidence. This unit is unconformably overlain by the Mt. Kindle Formation.

### ***Ordovician-Silurian***

#### ***Sunblood Formation (OS)***

The Sunblood Formation occurs in the southern Mackenzie Mountains between Whittaker Range, Natla River, and Mary Range. It is a transitional unit between the basal Duo Lakes Formation and the platform Mount Kindle Formation. The Sunblood Formation has a maximum thickness of 1,040 m (3,412 ft) in Thundercloud Range but thins towards the north to 500 m (1,640 ft) at Grizzly Bear Lake, 300 m (984 ft) at Whittaker Range, and 230 m (755 ft) near Natla River.

At the type locality, the Sunblood consists of generally micritic, grey, thin- to thick-bedded limestones that weather in shades of grey, orange, pink and buff due to silt content. Limestones are commonly finely laminated and mud cracks are common. Sparites and finely crystalline dolostones are uncommon. An arenaceous unit forms the top of the Sunblood formation in Sunblood, Whittaker, and Thundercloud ranges. Towards the north, the formation changes to grey, finely to medium crystalline dolostones. The Sunblood is generally resistant and in the survey area this unit is dominated by light to dark grey dolomite that has mottled weathering. The dolomites of the Sunblood Formation are often thinly laminated and flaggy with irregular interbedded black graptolitic argillite.

It conformably overlies the Broken Skull Formation, Franklin Mountain and Rabbitkettle Formations. It is conformably overlain by Esbataottine Fm and disconformably overlain by Whittaker Fm. To the west, Sunblood passes into dark shales of the Duo Lake Fm of the Road River Group but details of this facies change are unknown. It unconformably overlies the Nonda Fm in parts of the southern Yukon. The

formation is sparsely fossiliferous, containing trilobites, brachiopods ostra-codes, bryozoans, bivalves, cephalopods and conodonts.

#### *Duo Lakes Formation (ODR1)*

The Duo Lakes Formation is recessive deep water black graptolitic shale and yellow weathering argillaceous limestone with minor chert. It is up to 415 m thick and is conformably underlain by the Rabbitkettle Formation. To the east it is laterally equivalent to a hiatus. The transition from Rabbitkettle Fm is defined by a distinct change from limestone to shale-dominated strata. Graptolite fauna (at least 8 graptolite zones) are present in these shales which makes a clear distinction between this formation and the Hess River Formation which has a similar appearance but lacks graptolite fossils. This unit is found throughout the Misty Creek Embayment and can be divided into two units. The lower part of the Duo Lakes Formation is approximately 240 m of thin bedded limestone and graptolitic shale. The upper unit is 76 m thick and is dominated by graptolitic siliceous shale with minor chert. The Upper Duo Lakes Formation is the lateral equivalent of the Cloudy Formation which is a basinal limestone and the Elmer Creek and Steel Formations as well as the platformal Sunblood Fm to the SE. Thick tongues of Marmot Formation volcanics occur within the Duo Lakes Formation in the central part of the embayment. This formation is the product of a deep basin environment. Further south this unit hosts the Howard's Pass deposit.

#### *Kindle Group (Equiv to Ronning Gp)*

The Kindle Group includes the Mt. Kindle and Whittaker Formations and is aged from Late Ordovician to Early Silurian from fauna fossils that include corals, brachiopods and bryozoans.

#### *Mount Kindle Formation (OSK1 and OSK4)*

The Mt. Kindle Formation is comprised of up to 570 metres of thick bedded, massive, dark brownish grey siliceous, fossiliferous (corals, nautiloids) dolostone and minor limestone that locally contains chert nodules and beds. It unconformably overlies the Franklin Mountain Formation and is unconformably overlain by Siluro-Devonian carbonate strata. It has a total thickness is 262 m (859 ft) at the type section. The formation is widespread in the northern Franklin and eastern Mackenzie mountains, except where removed by pre-Devonian and later erosion.

The Mount Kindle Fm is subdivided into three informal members at the type section. The basal member, 21m (68ft) thick is recessive. It consists of argillaceous grey-weathering dolomite which weathers flaggy, nodular and rubbly. Weathering colours are light grey, light olive-grey, and yellowish-grey. Corals, brachiopods, gastropods and echinoderm debris are present. The middle, resistant member of the Mount Kindle is 65m (212ft) thick at the type section, and consists of thin- to thick-bedded, brownish-grey weathering dolomite. The dolomite is generally fine to medium crystalline, in part sucrosic, and shows fair to good inter-crystalline and vuggy porosity. Colonial and solitary corals are common in the lower part. The upper, recessive member is 187m (615ft) thick and consists of yellowish-brown weathering, micro to medium crystalline dolomite. The upper member is less thickly bedded and lacks the abundance of biostromal material that is present in the middle, resistant member. In many of the coarser dolomite units, granular textures indicate derivation from original limegrainstone or lime-packstone. Local small vugs lined with drusy calcite may represent leached fossils. Colonial and solitary corals, stromatoporoids and pentamerid brachiopods are found in the lower part of this unit, but most fossils are poorly preserved.

The Mount Kindle Fm is underlain by a regional unconformity separating basal Mount Kindle beds from

underlying Ordovician or older rocks. The top of the formation is overlain by an unconformity beneath the Delorme Fm, Bear Rock (Gossage) Formation and/or Cretaceous strata. In the Mackenzie Mountains, the formation is in part equivalent to the Whittaker Formation Whittaker Formation (OSK2). This formation is characterized by massive poorly bedded cliff-forming, dark, coarsely crystalline, vuggy, fossiliferous coarse-grained dolostone with interbedded medium to light grey laminated limestone to dolomite that weathers orange to brown. Distinctive nodules and lenses of black chert separate the Whittaker Formation from the underlying Sunblood Formation. The Whittaker Fm is known host to base metal mineralisation and phosphorite is locally present within this unit.

It is 1,240 m (4,070 ft) in the Whittaker Range and reflecting the thick Whittaker development in the Root River Basin. The Whittaker thins northward and westward (e.g. 457 m; 1500 ft) thick near North Nahanni River; 335 m (1,100 ft) near lat. 63 deg 30'N, and 417 m (1369 ft) at the northern end of the Thundercloud Range. The formation extends throughout the Mackenzie Mountains and southeastern Yukon (east flank of the Selwyn Basin). Limestones, dolomites and shales. In the type section the formation is divisible into three units listed in ascending order: 1) 402 m (1,320 ft) dark grey, fine- to medium-grained, thinly bedded, grey weathering limestone; 2) 262 m (860 ft) mainly fine-grained, dark grey, medium- to thick-bedded dark grey to light grey weathering, sparsely cherty, in part fossiliferous dolomite; and 3) 576 m (1,890 ft) dark grey to greyish-black, fine-grained and platy to thinly bedded limestone with alternating thin interbeds of dark grey and black siltstone in the basal part. These divisions are essentially the same on Pastel Creek, Delorme Range.

The Whittaker Formation is directly correlative in the south to the Mt. Kindle Formation and so is included in the Kindle Group. This formation conformably overlies the Sunblood and Esbataottine Fms in the Root Basin and in the Selwyn Basin. It unconformably overlies older strata over the Redstone arch. It is conformably overlain by the Delorme Fm in all areas. West of the Natla River near 128 deg 50'W, it passes laterally to black graptolitic shales and shaly limestones of the Road River Group. It contains brachiopods, ostracodes, corals, trilobites and graptolites including the *Strophomena ceraurus*, the *Bighornia thaerodonta* and *Hesparorthis oepikirna* faunas.

#### *Marmot Formation (CSM4)*

The Marmot Formation occurs as lenses and tongues of volcanic rocks within the Duo Lakes Formation. In most parts of the basin the Marmot Formation has a variable thickness from one to tens of metres ranging up to 500m in the central Misty Creek Embayment. This volcanism is contemporaneous with the deposition of the Duo Lakes and Cloudy Formations. A wide range of lithologies are present from volcanoclastic and epiclastic units to intrusive and extrusive mafic rocks. Lapilli tuff, fine-grained breccia, sandstone, siltstone, argillite, amygdaloidal flow rock, conglomerate, sills, and minor coarse breccia have all been reported for the Marmot Formation. The matrix of these mafic volcanics often contains carbonate, chalcedony, or chlorite. Diatremes associated with the Marmot volcanics have been mapped in the headwaters of the Mountain River.

#### *Cloudy Formation (ODR4)*

The Cloudy Formation is a succession of thin bedded sooty grey limestone with crinoids and local chert and yellow weathering limestone intercalated with local chert, shale and Marmot volcanics. The limestone is black on a fresh surface and fine to medium crystalline. Olistostromes indicate deposition on a slope. It has a gradational contact with underlying Duo Lakes Fm. The Cloudy Formation conformably overlies the Duo Lakes Formation and its contact is marked by the contrast between the sooty-grey, yellow weathering limestone and cherty shale beds of the Duo Lakes Formation. The Cloudy Formation is unconformably overlain by carbonates of the Delorme Group. This contact is marked by a

distinct unconformity. It is laterally equivalent to platformal Mount Kindle and Whittaker Fms, north and south of 64° respectively. In the main Misty Creek embayment, the Cloudy Formation is only a thin layer and is grouped as a member in the Duo Lakes Formation. Thicknesses range up to 470 m.

### ***Ordovician to Devonian***

#### ***Road River Formation (ODR)***

The term Road River Formation was a term originally applied by Gabrielse et al (1973) to argillaceous, graptolitic strata similar in composition, biostratigraphy and thickness to what is now recognized as Rabbitkettle, Duo Lake and Steel formations. Recent changes in terminology now restrict the name to basinal facies strata of primarily Ordovician to Silurian age which occur in the Selwyn Basin. In much of our study area the name Road River Formation was retained.

Road River Formation strata consist of thin-bedded, pyritic black and grey shale, calcareous shale, argillaceous limestone, dolostone and siltstone. Locally, genera of graptolites and tentaculites are abundant in shale horizons; genera of crinoids and brachiopods are present in calcareous horizons. This formation is structurally complex and often exhibits styles of folding not apparent in both the overlying and underlying units. To the south of the study area and within the Selwyn Basin, the Road River Formation host the Howard's Pass stratiform zinclead deposits.

### ***Devonian-Mississippian***

Stratigraphic units comprised of platformal and transitional facies carbonate strata include the Delorme Group which includes the Tsetso and Camsell Formations, the Arnica-Bear Rock Group, which includes the Arnica, Sombre and Bear Rock Formations, the Landry Formation and the Hume Group. More basinal clastic facies are represented by Earn Group, which includes the Canol and Imperial Formations.

#### ***Delorme Group (SDD)***

The Delorme group is of Early Devonian age and separated from the Mt. Kindle Formation by the sub-Devonian unconformity. It is comprised of the Tsetso and Camsell Formations.

#### ***Tsetso Formation***

The Tsetso Formation averages 150 m in thickness but ranges from a feather to a maximum of 337.5 m. The age of this formation is deemed to be late Silurian to early Devonian, diagnosed from a collection of conodont fossils.

The Formation has been described as light yellow weathering, argillaceous and silty, thin to medium planar bedded dolostone. At some localities, these dolostone beds can be sandwiched between recessive orange silty-sandy beds. Some sedimentary features include finely laminated and stromatolitic beds as well as small scale ripples and mudcracks in more platy intervals. The Tsetso Formation overlies the Mt. Kindle Formation with a sharp, unconformable contact and is conformable with overlying units.

#### ***Camsell Formation (IDC)***

The Camsell Formation can be up to 1.5 km in thickness and is thought to be of early Devonian in age inferred from its stratigraphic position. The Camsell Formation can be divided into a silty carbonate facies and an evaporate facies.

The carbonate facies is colour banded and well bedded. It is co-extensive in the Formation and described as dark grey lime mudstone or dark grey-brown dolostone, grading upward to light grey laminated dolostones and very thin bedded, platy, silty-argillaceous dolostone. This facies does not exhibit any significant features. The evaporate facies, on the other hand, is much less extensive than the carbonate

facies. It is found in the Godlin Salient and Camsell sub-basin (Morrow, 1991), and consists of an anhydrite-bearing subsurface with intensely brecciated strata in outcrop sections. The upper contact is sharp and conformable while the lower contact, although less defined, also seems to be conformable.

#### *Arnica-Bear Rock Group*

The Arnica-Bear Rock Group is an informal assemblage and is dated from early Devonian to middle Devonian in age. It is comprised of the Arnica, Sombre, and Bear Rock Formations. The Landry Formation has been sometimes included as well but will be described as a separate unit in this report.

**Arnica Formation (DA)** The Arnica is one of the most geographically widespread formations in the Mackenzie Mountains and can reach a maximum thickness of 390.5 m where it passes laterally westward to the Sombre Formation (Morrow, 1991). The unit is faintly colour banded, moderately resistant and poorly exposed. The most dominant rock type has been described as dark brown-grey, bitumen-bearing fine to medium crystalline dolostone. Near the upper contact with the Landry Formation, it is more common to find limestone interbeds. There isn't any fauna data available but the unit has an early Devonian age from its stratigraphic position.

#### **Sombre Formation (IDS)**

The Sombre Formation ranges in thickness from 700 m to 1 km and is laterally contiguous with strata of the Arnica Formation. It is described as a grey dolostone similar to the Arnica Formation. Both have alternations of thick bedded dark brown-grey stromatoporoid and amphioporoid bearing dolostones with light grey stromatolite bearing laminated dolostone. As in the Arnica Formation, no fauna.

#### **Bear Rock Formation (Db)**

The historic definition of the Bear Rock Formation is: brecciated, non-bedded dolomite and limestone lying below Middle Devonian strata and above a sharp disconformity with well-bedded Silurian limestones below. The more revised definition has come to include all strata between the bedded limestone of the Hume Formation, and the Ronning Formation, which includes an interval of thin to medium planar bedded pelletal lime mudstone.

#### **Landry Formation (DL)**

The Landry Formation has a thickness range of 20 m to a maximum of 505 m near the shelf edge. It caps the Arnica-Bear Rock Group and has been dated as Middle Devonian from conodont fossils. The Formation has been described as very resistant blue-grey weathering limestone that displays a pronounced ribbed appearance in outcrop smooth bed partings. The thin resistant beds consist of thin bedded dark grey weathering, brown. This appearance is due to alternating thick resistant beds with thin recessive ones. The thick resistant beds consist of tan pelletal lime wackestone or lime mudstone with lime mudstone and pelletal mudstone with planar to wavy bedding. This thick vs. thin relationship is thought to be due to individual regressive episodes of deposition (Morrow, 1991). The upper contact with the Hume Formation is abrupt and conformable as is the lower contact with the Bear Rock, Arnica and Sombre assemblage.

#### *Hume Group (DH1, DH2, DH3)*

The Hume assemblage has an average thickness of 150 m, ranging from 90-350 m. It includes the Hume (DH3), Headless (DH1) and Nahanni (DH2) Formations. The group is used to cap Silurian-Devonian sequence ages with its tight age restrictions of Early to Late Eifelian. The characteristic Hume Formation consists of dark grey argillaceous and fossiliferous limestone with minor shale interbeds. In

outcrop it can be divided into 2 distinct units that can be correlated with the Nahanni and Headless Formations in the southern Mackenzie Mountains. The lower unit (Headless) consists of recessive dark grey-brown weathering, thin to medium bedded argillaceous limestone with shale interbeds that are irregular to nodular bedding. The upper unit (Nahanni), meanwhile, consists of resistant grey weathering thick bedded cliff forming limestone. The lower unit seems to pass gradationally upward into the upper resistant unit with a gradual increase in bed thickness and reduction of argillaceous content. The upper contact with the Canol Formation is sharp but not very well exposed and could be interbedded. The lower contact with the Landry Formation is abrupt and conformable.

#### *Hailstone (Natla) (DN)*

The Hailstone Formation (formerly known as the Natla Formation) is a shale dominated recessive unit that unconformably overlies the Duo Lakes Formation. It ranges in age from Early to Middle Devonian from graptolite fossil evidence. The entire Hailstone Formation is approximately 190 m thick; the lower 70 m of the unit is dominated by black shale and thinly bedded bioclastic limestone. This is overlain by 50 m of thinly bedded limestone followed by another 70 m of black shales with medium thick beds of bioclastic limestone. In general, this is a recessive unit with outcrop dominated by the more resistant beds of limestone. This formation is the lateral equivalent of the Grizzly Bear Formation, a platform carbonate unit. The bioclastic debris in the Hailstone Formation is derived from fan deposits that are sourced from the Grizzly Bear Formation.

#### *Grizzly Bear (DB)*

The Grizzly Bear Formation represents a transitional facies between basinal Earn Group rocks to the west and platformal strata of the Sombre, Arnica and Hailstone Formations to the east. It consists of a series of resistant grey weathering, bioclastic limestone with a maximum thickness of the 256 m. A wide variety of fossils are found within the Grizzly Bear Formation that include corals, bryozoans and stromatoporoids, as well as abundant crinoidal bioclastic debris (twin axial canal ossicles). It is dated to be Early to early Middle Devonian from fossil evidence. The carbonates of this Formation were deposited in a shallow-water platform environment based on the thickly bedded nature, fossil content and bioclastic debris. This unit outcrops over much of Permit 7033.

#### *Earn Group (DME, DME1, DME2)*

The Earn Group is Late Devonian in age and includes the Canol, Imperial, Misfortune and Thor Hills Formations. The Earn Group was previously divided into an upper and lower unit by Abbott (1982) that are now referred to as the Prevost Formation and the Portrait Lake Formation. These Formations correlate to the Thor Hills and Misfortune Formation, respectively. This Prevost Formation is host to the Tom and Jason deposits as well as numerous bedded barite occurrences in the MacMillan Pass area.

#### *Canol Formation*

The Canol Formation is dated to be Late Devonian, most likely Frasnian in age and ranges between 23-120 m in thickness. It is described as dark grey-black with rusty brown weathering, siliceous thin bedded, fissile and noncalcareous shale. In some localities, there are minor limestone nodules and rare thin limestone beds included within the shale unit. It has been correlated by Blusson to the Besa River Formation and by Cecile to the Misfortune Formation. The environment of deposition is thought to be deep water; organic rich shales deposited during early stage of fore deep basin development. The Canol Formation lies unconformably on top of the Devonian carbonate strata, whether it be Grizzly Bear or Hume Formations and has a sharp conformable contact with the overlying Imperial Formation.

### Imperial Formation

The Imperial Formation is of Late Devonian (Early to Middle Famennian) in age from conodont fossil evidence. It has been described as 468 m of green sandstone and green sandy shale with minor limestone, and 138 m of dark coloured shale interbedded with sandy grey-brown, fossiliferous limestone beds (Morrow, 1991). This Formation is rhythmically bedded with graded beds and flute clasts. These features indicate a distal turbidite succession, with a shallower water environment for sediment deposition in the northern and eastern part of the Mackenzie Mountains, and a deeper water environment in the southern part. To the southwest it correlates with the Thor Hills Formation of the Earn Group. The upper contact with the Hawthorne Creek Formation of the Tsichu Group is subtle but distinguished by an appearance of well sorted quartz sandstone and quartzite, while the lower contact with the Canol Formation is sharp and conformable.

### Misfortune Formation

This Formation is continuous and similar to the Canol Formation, its lateral boundary defined by the nature of the overlying clastic succession: the appearance of more beds of lithic sandstone and chert pebble conglomerate. The Misfortune Formation can be divided into upper and lower members; the lower member consisting of black shale with limonitic weathering and minor siltstone, and the upper member consisting of resistant, whitish weathering black siliceous shale with minor lithic sandstone and chert pebble conglomerate. The lower contact with the Hailstone Formation is sharp and conformable.

### Thor Hills Formation

The Thor Hills Formation is correlative in time and is homotaxial with the Imperial Formation. It can be divided up into three distinct sections: the lowest consisting of brown weathering dark grey shale, the middle section consisting of blue-grey weathering black shale with thin beds of grey limestone, and the upper section consisting of thick, recessive brown weathering, dark grey shale and siltstone. The lower contact is marked where the whitish siliceous shale of the Misfortune Formation meets the dark brown shale, conglomerate and sandstone of the Thor Hills Formation.

### *Keno Hill Formation (MK)*

The Keno Hill Formation consists of a sequence of resistant, grey, massive to thick-bedded quartz arenite and orthoquartzite. These rocks are interbedded with black shale and calcareous phyllite. This unit is present only in Permit 7032.

### ***Carboniferous to Cretaceous***

#### *Tsichu Group (CPT)*

The Tsichu was upgraded to group from Formation in the Cecile bulletin due to the distinct Lithological difference between the Earn and Tsichu units. The group is Late Carboniferous to Early Permian in age and includes the Hawthorne Creek, Keele Creek, Caribou Pass and Fourway Formations. The Tsichu group is interpreted as being a complex paleogeography with both shallow water limestone and clastics (Heritage, Fourway and Caribou Formations), and deeper water facies on the peripheries of the shallow water environments (Hawthorne and Keele Creek Formations).

### Hawthorne Creek Formation

This unit is divided into two parts: the lower part consisting of thick black shale with minor quartzite and sandstone and the upper part consisting of thick black calcareous shale with medium thick beds of yellow limestone. This Formation rests conformably on the Thor Hills Formation and is distinguished by

the difference in sandstone composition. The quartz sandstone of the Hawthorne Creek Formation contrasts with the chert pebble conglomerate and dark sandstone of the Thor Hills Formation.

#### Heritage Trail Formation

The Heritage Trail Formation consists of massive to blocky, buff grey-white quartzite with a dark coloured shale matrix base. It has a sharp conformable contact with the Hawthorne Creek Formation.

#### Keele Creek Formation

The Keele Creek Formation consists of 70% dark grey to black shale interstratified with 30% of thin-thick beds of crinoidal grey limestone. Near the top of the Formation there is an appearance of minor thin beds and nodules of chert. The Keele Creek Formation forms a sharp and conformable contact with the Heritage Trail Formation.

#### Caribou Pass Formation

The Caribou Pass Formation consists of grey-white weathering fine grained bioclastic limestone with chert nodules and shale in the basal and upper parts of the Formation. It also has a sharp, conformable contact with the Heritage Trail Formation and is a facies correlative with the Keele Creek Formation.

#### Fourway Formation

The Fourway Formation has very little extent and is comprised of siliceous and white buff calcarenite and calcisiltite with minor quartz.

### **Mineralization**

Carbonate and shale-hosted mineralization is widespread throughout the Mackenzie Platform and Selwyn Basin. Over 300 mineral showings are listed in the NWT NORMIN and the Yukon MINFILE databases. These include the past producers around Faro, Yukon, as well as the deposits at Howard's Pass, Tom, Jason, and Gayna River. At least three mineralizing events are known: Middle Cambrian (Faro); Early Silurian (Howard's Pass); and Late Devonian (Tom, Jason), as well as mineralization related to Cretaceous intrusions (Mactung), Dewing et al (2006).

During the field work in 2005, 2006, 2007 and 2008, numerous Zn-Pb showings in the district were visited, as well as new ones discovered, by geologists working for Eagle Plains Resources Ltd. Most Zn-Pb showings fall into the carbonate-hosted class with only a few in the sedimentary exhalative class. Showings in the carbonate-hosted class range from dissolution and breccia-hosted (Bronco, Gayna River, Bear-Twit), Mississippi Valley Type (AB-ABC, Keg, Justice), and vein type to fracture permeability-controlled (Cone, AJ, Ris, Rio Main Golf Ball). Sedimentary exhalative targets in the Misty Creek Embayment district, north-east of the Selwyn Basin hosted Tom and Jason Pb-Zn deposits at MacMillan Pass are mainly barite-rich with only weak zinc geochemical enrichments (Wise, Anita). Regional lead and zinc silt anomalies associated with the Earn Group shales are positive indicators of potential SEDEX mineralization in the Misty Creek Embayment and are the focus of ongoing exploration work.

Work on the three northeastern permits (7322, 7594 and 7493) focused on exploration for sedimentary copper mineralization. Minor amounts of copper was found but low grade and erratic distribution of copper produced discouraging results. Mineralization on permits 7600 and 7602 through to 7610 is mainly vein to hosted in carbonate rocks. Only scattered low grade Zn, Pb or Cu was found, mainly in float, on these permits. No mineralization was found on permits 7330 or 7335.

## **2008 EXPLORATION PROGRAM**

### **Objectives**

The 2008 field season was the fourth year of exploration in the northern Mackenzie Mountains, carried out by Eagle Plains Resources Limited. The style of exploration was a continuation of the highly successful 2007 program. The principal objectives of the 2008 exploration work were to look for carbonate-hosted and sedimentary exhalative Zn-Pb-Ag mineralization as well as sedimentary copper mineralization. The 2008 objectives of the work on the sedimentary copper target was to investigate the possibility that a northward extension of favourable stratigraphy and copper mineralization associated with red beds in Proterozoic strata correlating with the Coates Lake showing south of the Keele River.

### **Personnel**

Field crews employed by Bootleg Exploration Inc., a wholly owned subsidiary of Eagle Plains Resources Ltd, conducted the work on the permits. Soil and silt sampling were performed by trained geotechnicians under the supervision of a geologist. Geological mapping and rock sampling was carried out by graduate geologists and geological summer students. Crews worked in pairs with up to 10 people working on geology and sampling at one time. The base camp consisted of a project manager, camp manager, a data and sampling manager, a cook/first aid attendant and bull cook plus a maintenance person. A Wildlife Monitor was employed by Eagle Plains Resources but reported to the Territorial Government, Department of Renewable Resources. Typically only one helicopter pilot was based in the exploration camp.

### **Logistics**

A land use permits were obtained for the base camps at Willow Handle and Border Lakes. A base camp was set up in agreement with a local guide and outfitter who owns a surface lease at Willow Handle Lake, at the headwaters of the Mountain River. This camp was used to access the two permits in the eastern part of the project area. A second base camp was established at Border Lake to provide access to the western and northern group of prospecting permits. Fixed wing access into the camps was by float equipped aircraft from Norman Wells but a short, rough airstrip at Willow Handle Lake can accommodate small aircraft on wheels. All fuel was flown in from Norman Wells and an inventory was kept listing quantity and location of all barrels which was reported weekly to the Territorial Environmental Officer based in Norman Wells and Inuvik. A gasoline fired Honda generator supplied electricity to the camp during working hours and powered a small satellite telephone/internet system. Back-up telephone communications were provided by Iridium satellite phone systems which were also used by field crews. Rock, silt and soil samples, empty fuel barrels and non-burnable garbage were back hauled by Twin Otter to Norman Wells.

### **Exploration**

Exploration methods focused mainly on showing examination, preliminary geological mapping and follow-up of existing silt anomalies. Additional silt sampling was also carried out over some of the permits. The potential for the eastern belt of Proterozoic rocks to host sedimentary copper deposits was investigated by Dr. E. Turner.

### **Geochemical Analysis**

In a large, relatively unexplored area such as the Mackenzie Mountains, the target area must be narrowed down in order to create effective exploration strategies. Regional analysis of silt, soil and rock

geochemistry allowed for the definition of more local targets for geologic mapping, silt and soil sampling. The regional analysis included samples from both the Yukon and Northwest Territories regional silt sampling programs in addition to a proprietary Rio Tinto dataset and Eagle Plains Resources own sample collection. In total the analysis included over 10,000 silt samples, over 10,000 soil samples and over 1,100 rock samples.

In order to define what an anomalous value is, statistics were run on the entire geochemical database. Samples were then separated into tectonic environment and reanalyzed. Weakly anomalous samples were defined using the 95th percentile while highly anomalous samples were defined using the 99th percentile. In the final analysis of 2008 samples the statistics for the entire population (the "All" category) were used. Analysis concentrated on lead, silver, zinc, copper, iron and arsenic; elements likely to be found in close proximity to an economic deposit.

## **2008 EXPLORATION WORK - PERMIT EVALUATION**

### **Permit 7322**

Permit 7322 was acquired by Eagle Plains Resources Ltd. in January 2007. It is located in the northwest corner of the NTS map sheet 106A07, directly west of Permit 7321. It was acquired due to the perspective geologic units for sediment hosted copper mineralization and included anomalous copper values from historic silt samples.

The middle of this permit area is underlain by northwest-southeast trending rocks that are pertinent to sediment hosted copper mineralization. These units include the dolostone of the Little Dal Formation, the siltstone and sandstone of the Rapitan (uPR3) Formation and the dolostone-gypsum of the Bear Rock Formation. There are also carbonate strata present that include the Devonian Arnica and Hume (DH3) Formations as well as the Proterozoic Keele Formation. On either side of this sequence of rocks are broad successions of shales and siltstones of the Imperial Formation (uDI). The Plateau Thrust cuts through the southwest corner of Permit 7322.

A succession of easterly dipping thrust faults follow the same directional trend as the rocks in the middle of the permit. Work on this permit concentrated on evaluating the sediment hosted copper potential including locating and assessing the prospective Coates Lake Group stratigraphy. Liz Turner visited this permit with her assistant over several days to evaluate its stratigraphy and regional structure rather than focussing on geochemical surveys. The Coates Lake Group hosts the Redstone Copper deposit 100 km to the southeast of Permit 7322. The permit was found to contain the Coppercap Formation and a thin sequence of Thundercloud Formation up to 80 meters thick which appears and disappears along strike. The Thundercloud Formation provides a potential copper source while the Coppercap Formation provides a reductive unit to precipitate copper.

Further work on this permit should focus on mapping of the Coates Lake Group for known copper bearing and basal red bed members in the central portion of the permit near geochemically anomalous silt samples. Further statistical analysis of the RGS database is also recommended to analyze for the potential existence of Little Dal basalts which are a likely contributor of copper to the system.

### **Permit 7330**

Permit 7330 was acquired by Eagle Plains Resources Ltd. in January 2007. It is located in the northeast corner of the NTS map sheet 106B02, directly west of Permit 7327. It was acquired due to its SEDEX potential and includes historic silt samples that are anomalous in zinc.

Almost this entire permit is underlain by shales and siltstones of the Road River (ODR) Group and the Earn Group (DME2). In the very southwest of the permit there is a small succession of Cambrian carbonates of the Sekwi Formation.

Work on Permit 7330 consisted of soil sampling in the vicinity of the historic Road River showing to evaluate the potential of the Road River Group. Prospecting and rock sampling was also conducted in the Road River Group to look for mineralization. The Road River Group is recessive and outcrop is confined to the sides of river cuts. No anomalous values were returned from sampling on Permit 7330. Further prospecting and sampling of the Earn Group (DME2) in the northeast portion of the permit is recommended to evaluate the SEDEX potential of the permit. Geologic mapping to better define the nature and location of the Earn Group and Road River Group contact is recommended.

### **Permit 7335**

Permit 7335 was acquired by Eagle Plains Resources Ltd. in January 2007. It is located in the northwest corner of the NTS map sheet 106B07, directly west of Permit 7334. It was acquired due to its SEDEX potential and the presence of historic silt samples anomalous in zinc. There was also an Aster anomaly located in the western part of the permit.

The northeast half of Permit 7335 is underlain by shales and siltstones of the Earn Group (DME2), while the southwest half of the permit area is underlain by shales and siltstone of the Road River (ODR) Formation as well as some thin sequences of Marmot Formation volcanics.

Silt, rock, and soil sampling was conducted on Permit 7335 to evaluate the Earn Group (DME2) for SEDEX mineralization potential. A detailed silt line (contains AHSRS048 to 054) returned anomalous values in iron and arsenic, indicating a pyrite source for the anomaly, and silver. The soil line, SRL074, returned iron and arsenic anomalies in addition to weak silver and copper anomalies. One rock sample returned anomalous iron values (EVSRR063).

Initial results for Permit 7335 are promising as the pyrite indicates the presence of an anoxic basin, although no anomalous lead or zinc values were returned. Mapping of the permit is recommended in the Earn Group (DME2) along with further sampling and prospecting to locate the source of the copper and silver anomalies.

### **Permit 7593**

Permit 7593 was acquired by Eagle Plains Resources in January 2008. It is located in the northeast corner of the NTS map sheet 106A12, directly northeast of Permit 7325. It was acquired because of the prospective geologic units for sediment hosted copper mineralization and covers anomalous copper values from historic silt samples. Stratigraphy in Permit 7593 youngs to the southwest with the sequence interrupted by two major thrust faults imposing the unnamed H5 gypsum unit onto Devonian Imperial Formation clastics. The southwest younging sequence consists of a series of facies changes as the area experienced a transgression in the upper Proterozoic and a subsequent regression though to the Devonian.

The Coates Lake Group hosts the Redstone Copper deposit 125 km to the southeast of Permit 7593. Running in a narrow band from northwest to southeast through the center of Permit 7593, the Coates Lake Group has a maximum thickness of 300 meters. It has unconformable contacts with the Proterozoic Rapitan Formation above and the Proterozoic Little Dal Group below. The Coates Lake Group is a transitional unit containing the Thundercloud and Redstone River Formations composed of volcanoclastics, mudstones, carbonates and evaporites; and the host Coppercap Formation composed of transitional carbonates.

Work on this permit concentrated on evaluating the sediment hosted copper potential including locating and assessing the prospective Coates Lake stratigraphy. The permit was found to contain the Coppercap Formation and a thin sequence of Thundercloud Formation. The Thundercloud Formation provides a potential copper source while the Coppercap Formation provides a reductive unit to precipitate copper. One sample containing disseminated chalcopyrite hosted in limestone assayed 110 ppm Cu (BSSRR021). Geochemical and geological evaluation indicates that sedimentary hosted copper is a possibility in this permit. The Coates Lake Group was deposited in half-grabens which shallowed slowly to the east. On the east side of the Plateau Thrust, the halfgrabens were shallow and the Coates Lake Group is thinner than to the west of the Plateau Thrust.

No further work is recommended on Permit 7593 due to limited geochemical results and the permits position on the east side of the Plateau Thrust.

#### **Permit 7594**

Permit 7594 was acquired by Eagle Plains Resources in January 2008. It is located in the northwest corner of the NTS map sheet 106A12, directly west of Permit 7593. It was acquired due to the prospective geologic units for sediment hosted copper mineralization and included anomalous copper values from historic silt samples.

The permit is composed of southwest younging sedimentary units structurally repeated by thrust faults consistently using the unnamed H5 gypsum layer to slide. The repeated packages are an extension of the regressive sequence seen in Permit 7593 to the east. The Coates Lake Group is structurally repeated by the Plateau Thrust and runs in two narrow bands from northwest to southeast with a maximum thickness of 300 meters. It has unconformable contacts with the Proterozoic Rapitan Formation above and the Proterozoic Little Dal Group below. The Coates Lake Group is a transitional unit containing the Thundercloud and Redstone River Formations composed of volcanoclastics, mudstones, carbonates and evaporites, and the host Coppercap Formation composed of transitional carbonates.

Work on this permit concentrated on evaluating the sediment hosted copper potential including locating and assessing the prospective Coates Lake stratigraphy. Appropriate host strata was found to be present and it contained trace amounts of copper mineralization, indicating that sedimentary hosted copper is possible in this permit.

Further work recommend for Permit 7594 includes silt sampling drainages at and just below where they intersect Little Dal stratigraphy, in addition to limited prospecting and sampling of Coates Lake stratigraphy. Further statistical analysis of the RGS database is also recommended to analyze for the potential existence of Little Dal basalts which are a likely contributor of copper to the system.

#### **Permit 7596**

Permit 7596 was acquired by Eagle Plains Resources in January 2008. It is located in the southeast corner of the NTS map sheet 106B06, directly west of Permit 7335.

The stratigraphy of Permit 7596 is dominated by lower Cambrian Sekwi Formation (ICS) overlain by Ordovician Road River Group (ODR). Marmot Volcanics (CSM4) cover portions of the permit in two thin northwest trending bands.

Work on this permit concentrated on evaluating the Road River Group for SEDEX mineralization potential. One day was spent on the eastern limit of the permit conducting preliminary assessment and prospecting. No geochemical samples were acquired.

A limited amount of work was completed on Permit 7596 during the 2008 field season and further prospecting and mapping of the Road River Group is recommended.

### **Permit 7600**

Permit 7600 was acquired by Eagle Plains Resources in January 2008. It is located in the northeast corner of the NTS map sheet 106B11, 70 km west of Permit 7593. It was acquired due to analysis of a proprietary regional silt database which identified the permits potential for SEDEX and carbonate hosted Zn-Pb mineralization.

The majority of this permit is underlain by lower Cambrian Sekwi Formation carbonates and Proterozoic Backbone Ranges Formation quartzites. Cambrian to Devonian Road River Group shales and Ordovician to Silurian Kindle Formation (OSK4) carbonates also underly a portion of the permit. Two faults interrupt the stratigraphic sequence in the permit, transposing the Backbone Ranges Formation on top of younger carbonates. prospective geology in this permit includes the Sekwi Formation, which is known for carbonate hosted Zn-Pb elsewhere in the region, and the Road River Formation which has potential to host SEDEX style mineralization.

Because of its limited geochemical anomalies and remote location no work was completed on this permit in 2008 and no further work is recommended.

### **Permit 7602**

Permit 7602 was acquired by Eagle Plains Resources in January 2008. It is located in the northeast corner of the NTS map sheet 106B13, northwest of permit 7600. It was acquired due to Eagle Plains Resources analysis of regional silt geochemical data which identifying the area as having high potential for containing carbonate hosted Zn-Pb mineralization.

The majority of Permit 7602 is underlain by Cambrian to Devonian Road River Formation shales and lower Cambrian Sekwi Formation carbonates. The complex structural geometry of the permit arises from multiple northwest to southeast trending thrust faults displacing much of the strata. Bands of Proterozoic Backbone Ranges Formation quartzites and Sheepbed Formation shales compose a small portion of the geology in the northeast and southwest corners of the permit.

One day was spent by the field crew working on this permit. Low density follow up silt sampling was completed to test the Sekwi Formation for carbonate hosted Zn-Pb potential in prospective areas identified from the regional geochemical data. One drainage returned five anomalous lead values in the north-central part of the permit (JLSRS287 & 288, EVSRS081 & 082, GHSRS287 – see geochemical results in Appendix V). A second drainage in the east-central portion of the permit also returned anomalous lead values from two samples near the head of the drainage (JLSRS285, GHSRS285). All anomalous samples fall within Sekwi stratigraphy.

Anomalous silt samples derived from the Sekwi Formation in this area indicates that this permit has good potential for carbonate hosted Zn-Pb mineralization.

Further work recommended for this permit includes 1:20,000 scale geological mapping and prospecting of the north-central and east-central areas focused on locating the source of geochem anomalies and to search for carbonate hosted Zn-Pb mineralization in the Sekwi Formation.

### **Permit 7603**

Permit 7603 was acquired by Eagle Plains Resources in January 2008. It is located in the southeast corner of the NTS map sheet 106B13, directly south of Permit 7602. It was acquired following analysis of geochemical silt database information flagging this permits potential as a candidate to contain carbonate hosted Zn-Pb mineralization.

The majority of the permit is underlain by lower Cambrian Sekwi Formation carbonates and Proterozoic Backbone Ranges Formation quartzites. Cambrian to Devonian Road River Group shales occupy a portion of the northeast corner. Faults truncate the Backbone Ranges Formation to the north and south of the unit while a thrust fault emplaces the Sekwi Formation on top of the Road River Group.

One day was spent by the field crew working on this permit during the 2008 exploration season. Work included low density silt sampling to test the Sekwi Formation for carbonate hosted Zn-Pb mineralization prior to more detailed geologic mapping. The Sekwi Formation was identified as a prospective unit by regional analysis. One drainage, located in Sekwi stratigraphy near the center of the permit, returned anomalous values of iron and arsenic indicating the presence of pyrite (JLSRS294: Fe, EVSRS086: As). Pyrite is often associated Zn-Pb mineralization as a marcasite cap such as those located above the AB and Keg showings. Work to date indicates low potential for this permit to host an economic deposit.

No further work is recommended for this permit.

#### **Permit 7604**

Permit 7604 was acquired by Eagle Plains Resources in January 2008. It is located in the northwest corner of the NTS map sheet 106B14, directly east of Permit 7602. It was acquired for its SEDEX and carbonate hosted Zn-Pb potential and the presence of the historic Kooke Group copper showing.

This permit is underlain by bands of carbonate and clastics younging to the southwest. Thrust faults bisect the permit, trending northwest to southeast, transposing the Proterozoic Rapitan Formation onto the Ordovician to Devonian Road River Group and the lower Cambrian Sekwi Formation carbonates onto the Devonian Arnica Formation carbonates. The permit also contains Proterozoic Keele, Sheepbed and Backbone Ranges Formations and Palaeozoic Kindle (OSK1), Delorme, Landry, and Arnica Formations.

One day was spent by the field crew working on this permit in 2008. Low density silt sampling was completed to test the Sekwi Formation for its carbonate hosted Zn-Pb potential. The historic Kooke Group showing was evaluated. The drainage in the Sekwi Formation in the southwest corner of permit contains weakly anomalous lead values (contains sample EVSRS074). The Kooke Group showing was found to contain chalcopyrite in 10 cm thick quartz veins in subcrop. Mineralization consisted of finely crystalline quartz with blebs of medium crystalline chalcopyrite. Two grab samples taken from the Kooke Group showing returned 5.59% Cu.

The Kooke Group showing occurs on an inaccessible, high, rugged peak. The small surface area together with poor regional silt results indicates that this permit has a low potential to host an economic deposit.

No further work is recommended for this permit.

#### **Permit 7605**

Permit 7605 was acquired by Eagle Plains Resources in January 2008. It is located in the southwest corner of the NTS map sheet 106B14, directly east of Permit 7603. It was acquired following a regional analysis identifying the area as having a good potential for SEDEX and carbonate hosted Zn-Pb mineralization.

The majority of this permit is composed of fault repeated sequences of lower Cambrian Sekwi Formation and Cambrian to Devonian Road River Group. Small segments of Proterozoic Backbone Ranges Formation quartzites, Ordovician to Silurian Kindle Formation (OSK4) carbonates and Proterozoic Sheepbed Formation occur locally. Thrust faults trend northwest to southeasterly and units young to the southwest. The Sekwi Formation is a favourable host for carbonate hosted Zn-Pb and the Road River Group has the potential to host SEDEX style Zn-Pb mineralization.

One day was spent by the field crew working on the permit in 2008. Silt sampling was completed on the permit to test the lower Cambrian Sekwi Formation for carbonate hosted Zn-Pb potential. Only two historic silt samples contained anomalous geochemical values and no new samples collected in 2008 were anomalous. The unnamed showing across from Grizzly Bear Pass was not located, but galena and

sphalerite were found in float downstream of the historic showing location. Samples of dolostone host with dolomite veins containing sphalerite and galena were found. Two grab samples returned 1.57% Pb and 6.18% Zn and 0.60% Zn.

Out crop is limited near the base the of the creek where the mineralized float was found, but prospecting of the creek and mapping of outcrop in the upper reaches of creek is recommended to locate the source of the Zn-Pb mineralized float. As only a portion of the Sekwi Formation was sampled in 2008, sampling of the rest of the Sekwi Formation is recommended for this permit.

#### **Permit 7606**

Permit 7606 was acquired by Eagle Plains Resources in January 2008. It is located in the northeast corner of NTS map sheet 106C09, and lies 25 km to the southwest of permit 7603. This permit was acquired to cover an area with good potential for containing carbonate hosted Zn-Pb mineralization.

The bedrock underlying Permit 7606 is composed of Proterozoic Risky and Backbone Ranges Formations and lower Cambrian Sekwi Formation. A broad, open anticline hinge runs along the southwest border of the permit, exposing the oldest rocks at the anticline core and the youngest rocks to the northeast. The Sekwi Formation is the most prospective stratigraphy, known to contain carbonate hosted Zn-Pb style mineralization.

No field work was completed on this permit in 2008. No further work is recommended for this permit.

#### **Permit 7607**

Permit 7607 was acquired by Eagle Plains Resources in January 2008. It is located in the northwest corner of the NTS map sheet 106G03, north of permit 7604.

The north and east of Permit 7607 is dominated by the Proterozoic Katherine Group quartzites and the unnamed Helikian H5 unit. The south and west of the permit is dominated by a syncline exposing Devonian carbonates in the core and Cambrian to Ordovician carbonates of the Kindle (OSK1) and Franklin Mountain Formations on the limbs.

No field work was completed on this permit in 2008. No further work is recommended for this permit.

#### **Permit 7608**

Permit 7608 was acquired by Eagle Plains Resources in January 2008. It is located in the southwest corner of the NTS map sheet 106G03, directly south of Permit 7607. It was acquired following a regional analysis by Eagle Plains Resources identifying this permit as having favourable potential for containing carbonate hosted Zn-Pb mineralization.

Bedrock geology underlying Permit 7608 is composed of several thrust panels which truncate the Devonian carbonates with the unnamed H5 gypsum unit. Proterozoic Katherine quartzites, unnamed H5, and Cambrian to Ordovician Franklin Mountain Formations dominate the northeast portion of the permit. The southeast portion of the permit is composed of thin bands of Silurian to Devonian carbonates in addition to all of the units mentioned above.

One day was spent by the field crew working on Permit 7608 during 2008. Low density silt sampling of creeks was completed over the Proterozoic Little Dal Group in addition to detailed silt sampling in the vicinity of an historic lead silt anomaly. Mapping of the Little Dal contact with the underlying unnamed H5 unit was carried out.

The Little Dal Group is composed of cliff forming, grey, crystalline dolomite with occasional ferroan carbonate veinlets. This unit grades downward into H5 consisting of recessive, green shales interbedded with carbonates.

No anomalous rock values were returned for this permit. The drainage in which detailed silting was completed returned weakly anomalous lead values, with values increasing downstream across the

contact with H5 (AUSRS028 to 051). This could be the result of a changing pH causing lead to become less mobile and precipitate in the silt. The favourable geology and anomalous silt values indicate this permit has a moderate potential to contain carbonate hosted Zn-Pb. Further prospecting and silt sampling of the Little Dal Group is recommended on this permit.

Further work on Permit 7608 should include silt sampling of all drainages crossing the Little Dal Group as well as mapping and prospecting to follow up any anomalies.

### **Permit 7609**

Permit 7609 was acquired by Eagle Plains Resources in January 2008. It is located in the northeast corner of the NTS map sheet 106G04, directly west of Permit 7607.

The northern portion of the permit is dominated by Proterozoic Katharine Group quartzites and the unnamed H5 unit. The southern portion is dominated by relatively flat lying Cambrian to Devonian carbonates.

No work was completed on this permit in 2008. No further work is recommended for this permit.

### **Permit 7610**

Permit 7610 was acquired by Eagle Plains Resources in January 2008. It is located in the southeast corner of the NTS map sheet 106G04, directly west of Permit 7608. It was acquired to cover any extensions of mineralization related to the historic HAB Zn-Pb showings.

Permit 7610 is dominated by thrust repeated panels of Proterozoic Little Dal Group and Rapitan Formation, Cambrian to Ordovician Franklin Mountain Formation, Ordovician to Silurian Kindle Formation (OSK1), Silurian to Devonian Sunblood Formation, and Devonian Arnica, Landry and Hume Formations. The southwest corner of the permit is composed of Proterozoic marine carbonates and clastics. The HAB Zn-Pb showing is occurs on Permit 7610 and is composed of barite, smithsonite and galena. The showing is located within the Devonian Arnica and Hume Formations. Mineralization occurs in calcite veins within cherty or siliceous host rocks.

Mineralization is confined to float trains with none visible in outcrop.

One day was spent by field crews working on Permit 7610 during the 2008 season. Work focused on evaluating the historic HAB showings and carrying out low density silt sampling of nearby creeks. No anomalous values were returned from silt samples. Smithsonite was found in talus at the base of an outcrop near the HAB Zone A showing. Hosted in dolomitic limestone, the sample contained smithsonite in highly fractured chert with carbonate filling the fractures. The low grade and small size of the HAB showing, in combination with the lack of anomalous silt samples, indicates that it is not an economic deposit and as such does not warrant further work at this time.

No further work is recommended for Permit 7610.

## **CONCLUSIONS**

Permit 7330 returned no anomalous values from the Road River Group; however, the Earn Group (DME2) on the permit remains unexplored and mapping and prospecting of the DME2 Formation is recommended.

Permit 7335 returned some promising soil geochemistry from the DME2 Formation and further mapping, prospecting, and sampling is recommended to locate the source of the anomalous values.

The favourable Coates Lake Group stratigraphy exists on and around Permit 7593 and is weakly mineralized with copper locally. The mineralized interval is thin and low grade. Due to the geometry of

the half-graben basins collecting the red-bed stratigraphy, the basins east of the Plateau Thrust contain little or none of the copper source rocks. Permit 7593 is east of the Plateau Thrust, making it a less attractive exploration target.

The Plateau Thrust scarp exposes slices of weakly mineralized Coates Lake Group on Permits 7594 and 7322. Although the favourable strata are present west of the Plateau Thrust on this permit, exploration is hampered by topography. Very steep cliffs limit access and make geologic mapping and evaluation very difficult. The shallow dip of units and the significant thickness of barren cap rock reduce the effectiveness of geophysical and geochemical exploration techniques and makes diamond drill testing very expensive.

Permit 7596 returned no anomalous values, but work to date is insufficient to determine the mineral potential of the permit.

The anomalous lead silt geochemistry from the Sekwi Formation stratigraphy on Permit 7602 show this area has potential for significant carbonate hosted Zn-Pb mineralization and warrants further work.

Permit 7603 contains minor iron geochemical anomalies but is considered to have low exploration potential.

Although veins host high copper grades on Permit 7604, veining is patchy and erratic and lacks any economic potential. The showings' location atop a steep, rugged peak limits the potential size of the showing. The weak geochemical anomalies do not warrant further work.

Zn-Pb mineralization was not found in place on Permit 7605, but enough significant grade mineralization was found in float to warrant further work. The in situ source of mineralization needs to be located on the permit to evaluate its economic potential.

Silt geochemistry anomalies on Permit 7608 are underlain by the Proterozoic Little Dal Group. The style of mineralization may be similar to the Gayna River Zn-Pb deposit. The exploration potential on this permit is considered to be weak to moderate within the carbonate rocks of the Little Dal Group and is worthy of further exploration.

Permit 7610 contains the HAB Zn-Pb-Ba mineralized float occurrences thought to be hosted in the Arnica or Hume Formations. Mineralization occurs in calcite veins cutting cherty rocks and dolomitic limestones. The low grade and small size of the HAB showing, in combination with the lack of anomalous silt samples, indicates it is not of economic interest.

## **RECOMMENDATIONS**

- Further work recommended for Permits 7593 and 7954 should focus on mapping the Coates Lake Group and silt sampling to define geochemical targets. Statistical analysis of the RGS database is recommended to analyze for the potential existence of Little Dal basalts.
- Further work recommended for Permit 7602 includes 1:20,000 scale geological mapping and prospecting to locate the source of Zn-Pb geochem anomalies in the Sekwi Formation.
- Further work recommended for Permit 7605 includes prospecting and mapping of the creek containing Zn-Pb mineralized float and completion of silt sampling in the Sekwi Formation stratigraphy within this

permit.

- Further work on Permit 7608 should include silt sampling of all drainages crossing the Little Dal Group as well as mapping and prospecting to follow up any silt geochemistry anomalies.

Eagle Plains Resources is currently seeking joint venture partners to assist with the exploration of these permit areas and individual properties located within them.

Updated August 24, 2009