

Appendix 2. Geochemistry of Bedrock Samples

Appendix 2 consists of sample descriptions in the following section, a table organizing the samples by analytical package (File on CD-ROM: *Table A-2. I-i.xls*), and two work sheets listing analytical results, including original published analytical values for standards from Lynch (1990) (*Table A-2. I-ii.xls*).

A-2.1. Sample Descriptions

This section provides full descriptions for 100 representative “Nahanni” rock samples collected by C.W. Jefferson, listed in chronologic order. The first two digits = year (1985, 1986, 1987); JP = GSC code for C.W. Jefferson; following digits = station number. The main purpose for these analyses was to confirm the nature of the showings as described in assessment reports and to check for any additional elements of potential economic value that might not have been assessed earlier. In particular rare metals such as Germanium were thought to have some potential. Analyses confirmed all previous descriptions, and did not reveal any new strategic elements, however they are reported here for archiving purposes and to provide access to explorationists who might have other new ideas for mineral potential.

Table A-2.1(i) regroups these samples into four assortments according to analytical methods and elements analyzed.

Lithogeochemical analyses for those samples which are in bold face are listed in Table A-2.1(i) which is on the accompanying CD-ROM as an Excel© spreadsheet, filename:
Appdx 2.1 Tb(ii) Lithogeochem87 anal results grpd pat3.xls.

85JP136-1: Prairie Creek massive sulphide & carbonate; showing Cadillac # 8: sheared brecciated galena vein

85JP136-2: Prairie Creek massive sulphide & carbonate; showing Cadillac # 8; 2 annal; reported in 88-1A: botryoidal silica/anglesite(?); surrounding galena clots in a weathered vein.

85JP136-3: Prairie Creek massive sulphide & carbonate; showing Cadillac # 8: botryoidal silica/anglesite(?); surrounding galena clots in a weathered vein.

UTM: 403700E 6820570N

Additional Field notes for station 85JP136 (field book 85-2, p. 39):

Trenches (Showings # 6 & 7); little ground disturbance; host rock is a grey dolostone; main vein in a fault zone; black crackle brecciated gangue; sulphides are sheared; botryoidal silica

85JP145: Prairie Creek massive sulphide & carbonate; Cadillac Showing # 2: massive galena in dolomite-hosted vein exposed in road slash in steep creek.

UTM: 404940E 6826550N

Additional Field notes for Station 85JP145: (field book 85-2, p. 41): Massive galena in vein, hosted in dolostone; exposed in road slash in steep creek

85JP152: Prairie Creek massive sulphide & carbonate; Showing # 2

UTM: 404700E 6825900N

Additional Field notes for Station 85JP152 (field book 85-2, p. 43):

Adit is in birds-eye limestone near entrance; sample from vein on Level 1.

From 1985 Sample List: ore sample from stope first level.

85JP164-1: Lened calc-silicate skarn: rusty talc-?diopside marble

85JP164-2: Lened calc-silicate skarn: cross-cutting diopside-garnet veins

85JP164-3: Lened calc-silicate skarn: radiating beige crystals, ?tourmaline

UTM: 519100E 6914600N

Additional Field notes for Station 85JP164: (field book 85-2, p. 46)

Grey-brown, partly altered limestone samples from Lened - shear zonation from grey-brown altered limestone (85JP164-1) into rusty marble with some diopside and talc (85JP164-2) to white marble with cross-cutting diopside-garnet veins (85JP164-3), in turn cross-cut by tension-like gash veins in diopside veins with sparry calcite, spodumene, garnet, scheelite and radiating prismatic crystals (85JP164-4)

85JP173-2: Vulcan: black siliceous pyritic shale

85JP173-3: Vulcan: coarsely to finely crystalline barite-galena-fluorite-pyrite-sphalerite

85JP173-6: Vulcan: fine grained dolomite cut by barite-fluorite-sulphide veins

UTM: 543100E 6907100N

Additional Field notes for Station 85JP173 (field book 85-2, p. 50 backside):

Vulcan showing below; contact between fossiliferous limestone breccia (85JP173-1) and black siliceous pyritic shales (85JP173-2) with pyrite nodules; barite and sulphides are interbedded; coarsely to finely crystalline barite, galena and fluorite, with veins and laminations of sphalerite and pyrite (85JP173-3) and lenticular pods of mainly coarsely crystalline barite, galena with pyrite (85JP173-4); also white sulphate-barite (BaSO₄) (85JP173-5 sample missing); dolomite cut by fluorite veins; contact is folded and contains layers of fine pyrite; limestone contact (85JP173-6)

85JP184 = Standard: 597, std-2 submitted as 86JP139d

85JP185 = Standard: 718, std-2 submitted as-is

85JP186 = Standard: 812, std-1 submitted as 87JP031b

85JP188 = Standard: 1361, std-3 submitted as-is

85JP192 = Standard: 824, lksd-4 submitted as 86JP136b

85JP195 = Standard: 1463, lksd-1 submitted as 87JPW008r

85JP197 = Standard: 1561, lksd-4 submitted as-is

1986 Samples

86JP128c: Pyramid Mountain showing; pyrrhotite and molybdenum in rusty rock, galena-pyrrhotite-pyrite skarn;

86JP128d: Pyramid Mountain showing; pyroxene skarn

86JP128e: Pyramid Mountain showing; pyroxene skarn +?chlorite

Additional Field notes for Station 86JP128 (field book 86-2, p. 1):

Unit 8 Cambrian (?Sekwi); limestone - granite contact; garnet vein in marble

Additional samples not analyzed include, from 1986 Sample List: 86JP128-a diopside skarn; 86JP128-b galena-pyroxene skarn, rusty pyrrhotite and pyrite

86JP129a: MB Showing; molybdenum-pyroxene-garnet-diopside skarn;

86JP129b: MB Main Showing; molybdenum-pyroxene-garnet-diopside skarn;

86JP129c: MB showing; pyrrhotite-molybdenum-pyroxene-garnet-diopside skarn;

86JP129d: MB showing; axinite

86JP129e: MB Showing; molybdenum-quartz vein cutting skarn (check for gold);

86JP129f: MB Showing; pyroxene skarn

86JP129g: MB Showing North; chalcopyrite-pyrrhotite-?pyroxene-carbonate (check for gold)

Additional Field notes for Station 86JP129 at MB Prospect (field book 86-2, front page backside & p. 1):

Contact Rabbitkettle Formation and Pyramid Batholith on Pyramid Mountain; scheelite in garnet skarn; skarns all diopside, epidote and garnet, actinolite, minor pyrite, pyrrhotite, chalcopyrite, rare molybdenum, bismuthenite and bismuth; wolframite in quartz veins; cassiterite in gressenized garnet; scheelite overlain by massive white crystalline limestone; dark green diopside; in and around calcite nodules in skarn.

86JP131: Tungsten Mine area; lamprophyre dyke;

Additional Field notes for Station 86JP131 (field book 86-2, p. 7):

Late cross-cutting lamprophyre dyke in brecciated fracture zone, cuts all rocks; entered mine via upper ventilation decline, driven through "ore limestone" – wavy laminated limestone; lower argillite\Swiss Cheese limestone\Ore limestone\upper argillite; note some minor nodules

86JP132a: Tungsten mine; high-grade massive sulphide skarn; chalcopyrite – pyrrhotite – scheelite;

86JP132d: Tungsten mine; high-grade skarn from old area of mine, massive sulphide skarn; chalcopyrite-pyrrhotite-scheelite- pyroxene-garnet;

86JP132e: Tungsten mine; sheared altered chloritic rock from old area of mine;

Additional Field notes for Stations 86JP132 A-E (field book 86-2, p. 7 backside):

Collection of high-grade tungsten skarn samples from old area of mine; much pyrrhotite present in pyroxene skarn; Note islands of vein-altered ore limestone in middle skarn; note concentration of tungsten at front of skarn zone.

Additional notes from 1986 Sample List; samples not analyzed:

86JP132-B high-grade skarn from old area of mine (missing?);
86JP132-C high-grade skarn from old area of mine, old drill core;
86JP132-F from old area of mine, sheared altered chloritic rock

86JP133: Tungsten Mine, “Swiss Cheese” nodular calc-silicate hornfels
Additional Field and Sample List notes for Station 86JP133 (field book 86-2, p. 7 backside):
“chert” unit; calc-silicate hornfels of Swiss Cheese unit; nodules, texture lenticular

86JP134a: Tungsten mine; high grade massive sulphide skarn; pyrrhotite-chalcopyrite-scheelite-bismuth;
86JP134b: Tungsten mine; massive sulphide skarn; chalcopyrite-pyrrhotite-scheelite;
86JP134c: Tungsten mine; pale green/white rock, pyroxene, minor pyrrhotite;
Additional Field notes for Station 86JP134 (field book 86-2, p. 7 backside and P. 8):
Collection of high-grade scheelite samples (86JP134A,B,C) from mine office; surface showing staked and drilled by Kennecott in 1956; approximately 1.5 million tonnes of 1.24% W with about 4 years mine life/mining reserves left.

86JP135a: Sunblood dolostone near Mawer Showing; stromatolite/thrombolite
86JP135b: Sunblood dolostone; typical non-strom-----
86JP135c: Mawer Showing: low-grade sphalerite in Sunblood “zebra” dolostone
86JP135d: Mawer Showing: low-grade sphalerite in Sunblood “zebra” dolostone
Additional Field notes for Station 86JP135 (field book 86-2, p. 8 backside):
Main Mawer showing; zebra texture noted in places; main breccia is shown by photo #6, grey dolostone with rounded diffuse boundaries transected by white sparry dolomite; ZnS in sparry dolomite (about 1% Zn?); 86JP135A,B ?stromatolite?, some Sunblood rock types; 86JP135C,D some samples of ?ore formation

86JP136a: “burrowed” (bio-tubed) mottled dolostone
86JP136b: “burrowed” (bio-tubed) mottled dolostone
From Field notes for Station 86JP136 (field book 86-2, p. 8 backside): Sunblood Formation

86JP137: “rusty” sandstone
Additional Field notes for Station 86JP137 (field book 86-2, p. 8 backside): rusty sandstone from ?Earn Group; float at fuel cache (86JP137-1, -2 combined) Note: in an earlier list was mistakenly duplicated as 85JP137 - does not exist.

86JP138aa: Little Nahanni Pegmatite Group; aplitic margin of dyke
86JP138ac: Little Nahanni Pegmatite Group; coarse pegmatitic centre
86JP138b: Little Nahanni Pegmatite Group pegmatite with black and white mineral in core;
86JP138c: Little Nahanni Pegmatite Group pegmatite; comb-like quartz layering
86JP138d: Little Nahanni Pegmatite Group; host hornfelsed dolomitic pelite, “metagrit”
86JP138e: Little Nahanni Pegmatite Group; host hornfelsed dolomitic pelite, “metagrit”
Additional Field notes for Station 86JP138 (field book 86-2, p. 9):
“Cali” lithium pegmatite swarm cutting Upper Grit Unit; swarm exposed for at least 6 miles (approximately 10 kilometres) on east side of the ridge; dykes are <10 cm to >2 m wide; quartz, feldspar and acicular pink/green/white spodumene, lepidolite and purple fluorite; spodumene is up to 10 cm or more in length, 1-5 mm in width; dykes are anastomosing, dip sub-vertically, strike 320; samples for analyses contain glassy, black, hard (H= 5-6) minerals, ?niobium–tantalum; marginal phasae, massive grading to acicular; core phase with pink spodumene and white lepidolite; fluorite concentrated in areas of coarse pegmatite veins (86JP138A); blue mineral in core of pegmatite; note sweetish, fetid odour on breaking (86JP138B); comb quartz layering, 2 pieces (86JP138C); hornfels ?meta-seds (86JP138D,E).

86JP139a: Tungsten Mine area - argillite stratigraphically below “Swiss Cheese” unit
86JP139b: Tungsten Mine area - “Swiss Cheese” unit
86JP139c: Tungsten Mine area - “Swiss Cheese” unit
Additional Field notes for Station 86JP139 (field book 86-2, p. 16): samples taken from Sardine Creek, Tungsten area.

86JP144: Roy showing - massive sulphide; lead–zinc–silver skarn/replacement; collected by Ken Dawson

86JPH045a: Nahanni Butte weakly mineralized dolomite breccia

86JPH045b: Nahanni Butte dolomite breccia with <1% galena
86JPH045c: Nahanni Butte dolostone cut by quartz-calcite-tetrahedrite veins (comb. c1&c2)

86JPH046a: Nahanni Butte dolomite cut by qtz+calc+tetrah. veins (comb. c1&c2)
86JPH046c: Nahanni Butte weakly mineralized dolomite breccia
86JPH046d: Nahanni Butte dolomite breccia with <1 % galena
86JPH046e: Nahanni Butte unmineralized(?) zebra dolomite
86JPH046f: Nahanni Butte coarsely crystalline limestone with minor tetrahedrite
86JPH046g: Nahanni Butte as 045a,b; 046f
86JPH046h: Nahanni Butte as 045a,b; 046f

86JP132b = 85JP190 = Standard: 0058, lkstd-2

86JP136b submitted as such, also = 85JP192 = 87JP028C = Standard: 824, lkstd-4

86JP139d = 85JP184 = Standard: 0597, stsd-2

86JPH046b = 85JP189 = Standard: 1512, stsd-1

87JP012d: Earn Group ribbon porcellanite

Additional Field notes for Station 87JP012 (field book 1987-1, p. 3, frontside and backside):

Orange band is rusty pyritic rock; pale grey (fresh), finely laminated, disseminated and nodular pyrite, ?exhalite; samples A & B are of rusty rock on this ridge; sample C is aplite dyke; beneath “?exhalite”, have gun-blue weathering siliceous shales of porcellanite (sample D); still dipping 45SW

87JP013d: Ordovician(?) calcareous volcanic

Additional Field notes for Station 87JP13 (field book 1987-1, p. 3 backside):

Soft, platy, laminated shales (87JP12A,B); pod of hornfels / hornfelsed concretion? (87JP12C); and sub-horizontal tan weathering calcareous ?tuff? (87JP12D) then soft, platy, phyllitic grey shales as above exhalite and chert; dipping NE

87JP015a: Pab Showing, Earn Group; blebby siliceous pyritic barite

Additional Field notes for Station 87JP015 (field book 1987-1, p. 4):

Beds dipping 80° SW in Earn Group; soft, black to grey, platy to lenticular shales; with local blebby barite and pyrite (87JP15A,B);

87JP017: Earn Group - pyritic, laminated barite

Additional Field notes for Station 87JP17 (field book 1987-1, p. 4):

Bag of representative chip samples of pyritic barite exhalite outcrop.

87JP018A-E: Pab showing, Earn Group; blebby siliceous pyritic barite?

87JP018F: Pab showing, Earn Group; 2 pieces of black slates beneath 18A-E

Additional Field notes for Station 87JP018 (field book 1987-1, p. 4):

Pyritic shales with lamellae of coarsely crystalline pyrite into ribbon-bedded chert with large calcite concretions; representative chips from baritic zone (87JP18A-E); and platy slate on footwall (87JP18F); large diffuse pyritic nodules in hanging wall

87JP020a: Earn Group rusty pyritic hornfelsed porcellanite

Additional Field notes for Station 87JP020 (field book 1987-1, p. 4 backside):

Rusty weathering pyritic shales and porcellanites; dipping 45° SW, fine hornfels (87JP020A,B); limestone concretion (87JP020C);

87JP022a: Road River Group shale - calcareous, graptolitic with hydrozincite.

87JP022d: Road River Group porcellanite with hydrozincite.

87JP022e: Aplitic dyke with visible molybdenite cutting Road River Group

Additional Field notes for Station 87JP022 (field book 1987-1, p. 4 backside):

Graptolitic, calcareous black shales with white coating of zinc (87JP022A,B); concretions in ribbon porcellanite, 2 pieces (87JP022C); ribbon porcellanite (87JP022D); cut by aplite dyke with molybdenum and galena (87JP022E, 2 pieces); ribbon cherts extend right down to top of Devonian limestone (87JP022F) with which they are conformable and interbedded

87JP023: Early Showing, dolomitic fault breccia

Additional Field notes for Station 87JP023 (field book 1987-1, p. 5):

High-angle fault between steeply SW dipping pale grey limestone on west and gently SW dipping dolostone; fault breccia (87JP023)

87JP024: Quartz Showing, quartz vein with tetrahedrite

Additional Field notes for Station 87JP024 (field book 1987-1, p. 5):

Quartz carbonate vein trending at 180/40 in carbonate beneath Thundercloud Fault; veins up to 5 metres in thickness

87JP025: Snobird Butrenchuck dolomitic fault breccia

Additional Field notes for Station 87JP025 (field book 1987-1, p. 5):

Crackle tectonic breccia; Sunblood Formation; very weak zinc zap response; grab samples (87JP025A,B,C)

87JP026ab: hematite, upper trench, McBean claims 2&3

87JP026c: McBean 2&3 solid hematite from deep in trench / lower trench

87JP026de: McBean 2&3 solid hematite from deep in trench / lower trench

Additional Field notes for Station 87JP026 (field book 1987-1, p. 5 backside):

Well developed specular hematite; minor high angle fault zone from aerial photograph; from top part of gossan trench (87JP026A,B); more solid hematite from deep in trench (87JP026C,D,E);

87JP028a: Pab shale with densely disseminated pyrite nodules

87JP028b: Pab Shale with clustered nodules of pyrite and ?barite

Additional Field notes for Station 87JP028 (field book 1987-1, p. 6): contact between ribbon chert (basal Earn Group) on west, and tan weathering Road River shales on east; note pyrite concretions comprising (a) densely disseminated pyrite or (b) clustered nodules of pyrite and ?barite; (87JP028c) note weathering crust, non-calcareous

87JP029: Pab: gun-blue weathering ribbon porcellanite

Additional Field notes for Station 87JP029 (field book 1987-1, p. 6): gun-blue weathering porcellanite

87JP030a: vertical sequence of ribbon porcellanite & background Road River Group shales

87JP030b: Pab limestone concretion from background Road River Group shales

87JP030c: gun-blue weathering ribbon porcellanite, with hydrozincite

87JP030d: limestone concretion in zinc zone

Additional Field notes for Station 87JP030 (field book 1987-1, p. 6): vertical sequence of ribbon p porcellanite

(sampleA), ?Road River; near drill platform on eastern part of outcrop; series of random chip samples randomly across 20 metres; (B) pieces of limestone concretions for conodont; (C) chip sample, not complete, but representative across 5 metres of section; note strong development of hydrozincite; D is sample of concretion within zinc zone; note these may be Silurian cherts; check back lower in section for zinc; no zap response

87JP031a: Pab: gun-blue weathering ribbon porcellanite

87JP031c: Pab qtz veins with minor tetrahedrite

87JP031e: Pab porcellanite representative grab bag

Additional Field notes for Station 87JP031 (field book 1987-1, p. 6 backside): Road River “looking” graptolitic calcareous shales; graptolitic shales including some porcellanites (A); and some concretions in shale (B); cut by thin quartz veins up to 5 centimetres, with tetrahedrite (C); above graptolitic calcareous shales, note ribbon porcellanite (D); random grab “select” representatives of porcellanites (E), includes some dark calcite concretions (F)

87JP032a: Lower Earn Group from reconnaissance: rusty shales.

87JP032b: Lower Earn Group; densely disseminated pyrite nodules

87JP032e: Pab pyritic parts of barite; equal parts of 32e1,2,3

87JP032f: Lower Earn Group – gun-blue porcellanite

Additional Field notes for Station 87JP032 (field book 1987-1, p. 7):

Dark rusty hornfels, upper Earn (A); light rusty hornfels, rusty lower Earn, no porcellanite (B); limestone, ?Devonian (C); barite layer, laminated with limestone nodules, 2 pieces (D); includes rusty zones, pyritic barite (E1-3); ribbon porcellanite tan light grey weathering in ?Road River, 3 pieces (F); limestone concretions in porcellanite (G);

87JP033b: GSC “Pb” showing, Sunblood Fm; fenestral dolostone with minor sphalerite

87JP033c: GSC “Pb” showing, Sunblood Fm; brecciated fenestral dolostone with minor sphalerite

Additional Field notes for Station 87JP033 (field book 1987-1, p. 7):

In Sunblood Formation; “Pb” showing on South Nahanni Anticline; (A) from thin breccia horizon above main showing; (B) fenestral dolostone with minor zinc zap response, 2 pieces from section across, 50 cm block; (C) breccia near (B);

87JP035: Cay BC; sphalerite and galena from massive Pb-Zn sulphide skarn/replacement/MVT

Additional Field notes for Station 87JP035 (field book 1987-1, p. 7): sample from Cay Showing.

87JP036: Nahanni Butte Mountain; tetrahedrite + malachite + azurite in vuggy quartz in dolomite breccia

Additional Field notes for Station 87JP036 (field book 1987-1, p. 7 backside):

tetrahedrite, malachite and azurite in vuggy druzy quartz in dolomite breccia

87JP037a: Nahanni Butte dolostone breccia with good zinc zap response

Additional Field notes for Station 87JP037 (field book 1987-1, p. 7 backside):

Pale rusty grey weathering stratabound massive unit within/?between variegated grey bedded unit; “zebra” texture; (A) large piece of dolomite breccia with sphalerite, good zinc zap; (B) quartz-tetrahedrite vein at Nahanni Butte

87JP039c: Funeral Formation argillaceous limestone

87JP039d: Headless Formation ribbon porcellanite

87JP039f: ?Funeral Formation limestone near Aster Spring

Additional Field notes for Station 87JP039 (field book 1987-1, p. 9):

Meilleur River; 39A- Arnica Formation crystalline dolostone; 39B- Funeral Formation crinoidal limestone; 39C- Funeral Formation argillaceous limestone, fossiliferous, mainly crinoids and coral; 39D- ?Headless Formation ribbon porcellanites, siliceous shales; 39E- 30-40 cm limestone concretions; 39F- Funeral Formation limestone, approximately mid-way between 87JP39E and hot spring;

87JPW001r1: porphyritic quartz monzonite

UTM: 564250E 6893000N

87JPW004rb: disseminated pyrite in argillaceous shale; pyritic shale; - two pieces packaged - combine

UTM: 564200E 6895800N

87JPW058d: ferricrete in alluvium in slumped bank

87JPW058r: shale+porcellanite in ferricrete -Horn R / Ft Simpson?; from limestone-shale interbeds located at big Tributary to Sundog Creek

UTM: 442750E 6839750N

87JPW059r: shales (Horn River) exposed in Wretched Creek

UTM: 442500E 6839750N

87JPW065r: shales (Horn River) exposed in Wretched Creek

87JP008r = 85JP195 = Standard: 1463, lksd-1

87JP028c = 85JP192 = Standard: 824, lksd-4

87JP031b = 85JP186 = Standard: 0812, stsd-1