GEOLOGICAL SURVEY OF CANADA
OPEN FILE 7138

Diagenetic Study of Tertiary Sequences Beaufort-Mackenzie Basin – Phase 1

CMH Petrology Consultant Inc.

2012

Natural Resources Canada   Ressources naturelles Canada

Canada

GEOLOGICAL SURVEY OF CANADA
OPEN FILE 7138

Diagenetic Study of Tertiary Sequences Beaufort-Mackenzie Basin – Phase 1

CMH Petrology Consultant Inc.
7 Laneham Place SW
Calgary, Alberta T3E 5C6

2012

doi:10.4095/291406

This publication is available from the Geological Survey of Canada Bookstore (http://gsc.nrcan.gc.ca/bookstore_e.php).
It can also be downloaded free of charge from GeoPub (http://geopub.nrcan.gc.ca/).

Recommended citation:
CMH Petrology Consultant Inc., 2012. Diagenetic Study of Tertiary Sequences, Beaufort-Mackenzie Basin – Phase 1; Geological Survey of Canada, Open File 7138, 1014 p. doi:10.4095/291406

PREFACE

The Geological Survey of Canada (GSC) is involved with a multi-disciplinary study of petroleum systems of the Beaufort-Mackenzie region of Arctic Canada under the Earth Sciences Sector Geo-Mapping for Energy and Minerals (GEM) Program. As part of this research, a contracted petrological study of petroleum reservoir quality was undertaken to investigate the post-depositional controls on porosity and permeability of the Tertiary (Paleogene age; 62 – 24 Ma) sedimentary sequences (Aklak, Taglu, Richards and Kugmallit sequences) that host petroleum discoveries in the area. Porosity is important for calculating the volume of petroleum within a reservoir and permeability affects that rate at which petroleum can be produced. Both parameters are critical for evaluating the economic viability of individual petroleum prospects and for assessing the petroleum resource potential of the area. Generally, porosity and permeability are high at the time of sediment deposition but both are reduced by mechanical compaction with increasing sediment burial. As temperature and burial depth increase, diagenetic processes such as mineral dissolution or precipitation (cementation) can further enhance or reduce porosity and permeability. This study focuses on how cementation processes affect reservoir quality and it builds on the previous work of Dr. Volkmar Schmidt which is summarized in GSC Open File 1534. The report is rich in petrographic descriptions and contains many photographic images of rock cores and thin sections used for microscopic examination. These results provide a firm foundation for future studies of the diagenetic evolution of sedimentary successions of the Beaufort-Mackenzie Basin. This study was funded by the former Beaufort-Mackenzie consortium of companies (BP Canada Energy Company, Chevron Canada Limited, ConocoPhillips Canada Resources Corporation, Imperial Oil Resources Ventures Limited, MGM Energy Corporation, and Shell Exploration and Production Company).

Diagenetic Study of Tertiary Sequences
Beaufort Mackenzie Basin - Phase 1

(Based on Core, Sidewall Core and Drill Cuttings)

Geological Survey of Canada

CMH Petrology Consultant Inc.
7 Laneham Place SW
Calgary, Alberta T3E 5C6
Ph: (403) 243-0917 Cell: (403) 813-9961
E-mail: cmhpetrology@shaw.ca

2009-2010

Table of Contents

Summary of Findings

A cursory petrographic diagenetic overview of twelve wells across the Beaufort Mackenzie Basin has shown the following generalities:

1. Aklak Sequence is represented by a variety of rock types and depositional settings. Reindeer D-27 shales and silty shales are non-reservoir quality rocks with compaction as the main pore occluding mechanism. Ikattok J-17 sandstones are thought to have been deposited in a crevasse splay environment whereby the wedge morphology limits the lateral extent. Effective macroporosity is best preserved in the upper portion of this sandstone interval with lower sandstones lacking primary porosity due to early mechanical compaction. Adlartok P-09 sandstones are excellent reservoir quality sandstones with some intervals containing abundant organic material. During shallow burial, primary pores were preserved by early methanogensis processes created by biogenic activity. The methane gas and pore water mixture increased pore pressure, preserved primary pores and prevented mechanical compaction.

2. Richards Sequence sediments show that diagenetic cements change vertically and laterally. Marine non-ferroan calcite cement is recognized at Amerk O-09 whereas ankerite is the main carbonate in the southern wells. Vertical changes are also observed whereby “dead oil” is encased within the ferroan dolomite cement crystal lattice. Furthermore, slightly ferroan calcite cement engulfs the ferroan dolomite cement suggesting significant tectonic uplift and meteoric recharge.

3. Some of the Taglu Sequence sediments recovered at Taglu C-42 consist of a stacked complex of channel successions which are dominated by medium to coarse grained chert arenites. Eogenetic analcime cement predates ferroan calcite cementation. Analcime is thought to be sourced from Na-enriched supersaturated pore waters which have migrated into the subsurface.

4. Pullen E-17 Richards Sequence sandstones have been partially to completely occluded by ferroan dolomite cement. The ferroan dolomite has encapsulated dead oil within the carbonate crystal lattice indicating hydrocarbon migration occurred contemporaneous with carbonate precipitation.

5. Intervals with high organic material content, such as those encountered at Adlartok P-09, should undergo early burial mechanical compaction. However, it is suggested that early biogenic activity created a methane gas by-product shortly after initial burial. This free gas is thought to have propped up the pore pressure preventing early burial mechanical compaction.

6. The lower portion of the Richards Sequence at Ivik J-26 is commonly microfractured and occluded by barite cement indicative of tectonic stressors and fault introduced pore fluids.

7. Kugmallit Sequence sandstones show a significant decrease in grain size from east to west, as shown on the schematic cross section. The zeolite, clinoptilolite, is found in abundance partially occluding macropores in the Mallik A-06 litharenites. In contrast, poikilotopic ferroan dolomite occludes macroporosity in the Pullen E-17 Kugmallit Sequence clastics.

8. Porous and permeable Kugmallit litharenites, recognized at Issungnak 2O-61 appear to be a fining upwards sequence. Amerk O-09 Kugmallit sandstones appear to be texturally and compositionally similar to the Issungnak 2O-61 clastics.

9. Microfractured grains, carbonate, silica and sulphate filled microfractures suggest brittle deformation associated with basin development faulting. The overpressure zone may partially be explained by cement dissolution and contemporaneous grain compaction resulting in a seal.

10. X-ray diffraction data generally yielded significantly higher feldspar content than qualitative petrographic analysis. Carbonate staining on some thin section slides

suggests that some of the plagioclase is calcic or intermediate (An30-80) in composition. Reservoir quality is affected by the dissolution of unstable framework grains and calcic plagioclase would have a greater disposition to dissolution in acidic waters. Preliminary experimental electron microprobe analysis indicates plagioclase compositional variation. Further investigation is required to validate this hypothesis.

Introduction

Background

The Geological Survey of Canada is conducting a study of petroleum resource potential in the Beaufort-Mackenzie Basin for the Earth Sciences Sector – Natural Resources Canada (ESS-NRCan) GEM Energy Program under the project entitled, “Mackenzie Delta and Corridor: mapping for energy (MADACOR)).” Reservoir quality is an important variable in determining economically recoverable petroleum for the area. Dr. Volkmar Schmidt published preliminary results, in GSC Open file 1534, for a petrological and diagenetic study of Upper Cretacous and Tertiary sediments of the region. Although this study is rich in observations and descriptions, these results were not integrated with log, seismic and other data into a process-oriented, basin-scale framework.

Objectives

This report is a preliminary study in understanding basin-scale diagenesis. It involves building on the previous work compiled by Dr. V. Schmidt with the goal of further understanding the basin processes controlling the quality of Beaufort-Mackenzie Basin Tertiary reservoirs. Emphasis is placed on the cementation processes that would directly affect reservoir quality.

Scope of Work

(i) Review GSC Open File 1534 “Petrographic/Diagenetic Study of Upper Cretaceous and Tertiary Strata, Beaufort-Mackenzie Basin” by Dr. Volkmar Schmidt with emphasis placed on the petroleum bearing Aklak, Taglu, Richards and Kugmallit sequences.

(ii) Compilation and creation of an inventory of existing curated thin sections for the Beaufort-Mackenzie wells in the National Energy Board collection at the G.S.C. Calgary Core and Sample Repository.

(iii) Petrographic analysis of thin sections for prioritized wells that were chosen to complement existing and on-going G.S.C. studies.

(iv) Interpret regional and reservoir scale diagenetic history by integration of petrographic observations with relevant GSC data.

(v) Recommendations for further work.

The quality and staining of core and drill cutting thin sections for the Beaufort-Mackenzie wells stored at the G.S.C. Calgary Core and Sample Repository and loaned from industry are variable. Some were prepared with clear epoxy whereas others were impregnated with blue epoxy to identify porosity. Staining of thin sections is also variable with non-stained, others one-third stained with Alizarin Red (to distinguish calcite – pink, from dolomite) and one-third stained with sodium ferricyanide (to distinguish ferroan carbonate – dark blue, from non-ferroan carbonate). Petrographic differentiation of ankerite and dolomite is based on the intensity of staining. Since these carbonates precipitate along a solid solution series, petrographic differentiation is somewhat subjective. X-ray diffraction methodology may be a more accurate method to differentiate these carbonates. Some of the samples were also stained with sodium cobaltinitrate to identify alkali feldspar (yellow stain on orthoclase and microcline).

Existing point count data and qualitative point count data, generated from Dr. V. Schmidt's study, were compiled without editing. No additional point count data were generated for this study. A compilation of the estimated mineral content and the point count data is presented in the Appendix.

Overviews and thin section photomicrographs of salient features are also provided in the Appendix.

Documentation

Petrographic results, detailing mineralogical data are summarized in the following tables, figures and photomicrographs:

- Figure 1: Well Locations for the Beaufort Mackenzie Basin
- Figure A : Schematic Cross Section illustrating Aklak Sequence with Overviews
- Figure B : Schematic Cross Section - Aklak Sequence
- Figure C : Schematic Cross Section – Taglu Sequence
- Figure D : Schematic Cross Section – Richards Sequence
- Figure E : Schematic Cross Section – Kugmallit Sequence
- Tables 1a to 1g : Point Count Data and Mineralogy
- Appendix – Thin Section Overviews, Thin Section Photomicrographs and Descriptions

Petrographic Results

The diagenetic processes that have occurred in the Beaufort Mackenzie basin reflect a complex evolutionary process between the depositional environment, source rock mineralogy, burial history and tectonic events. The interrelationship between several factors including sand body geometries, sand/shale ratios, detrital mineralogy, sedimentary textures, biogenetic influences, fluid composition and fluid flux plus time, temperature and pressure all have a direct influence on the primary controls of diagenesis. Diagenetic cements and their occurrence within the basin is the focus of this preliminary diagenetic study.

Aklak Sequence

The Aklak Sequence is represented by five wells located in the western portion of the Beaufort Mackenzie Basin (Figure 1). The wells include Reindeer D-27 in the south to Adlartok P-09 to the northeast. This Late Paleocene to Early Eocene sedimentary package illustrates depositional environment variability within a fluvio-deltaic setting. The clay dominant lithology encountered at Reindeer D-27 indicates non-reservoir quality prodelta deposits whereas the oil bearing Adlartok P-09 multicycle of sandstones, siltstones and shales represents rapidly buried deltaic sediments.

During the early burial stages, mechanical compaction of ductile grains is the first process to affect the sedimentary pore system. In some Unipkat I-22 sandstone intervals, grain rimming microcrystalline siderite rims framework grains and replaces some of the clay-rich lithoclasts. Compactional processes are limited by this grain rimming cement. Organic rich sandstones from the Adlartok P-09 well have a very porous system with minimal mechanical compaction and primary porosity preserved. The high abundance of organic material may have promoted microbially-induced methanogenesis that released gas into pore waters. This could have increased the pore water pressure which in turn impeded mechanical compaction.

Kaolinite clay precipitation is rare and caused by the dissolution of feldspathic grains from acidic pore waters.

Minor chemical compaction processes started during deeper burial (mesogenetic), with the precipitation of quartz overgrowths on host monocrystalline quartz grains, resulting in a further decrease in primary porosity. This is evident in particular at Unipkat I-22, whereby siderite outlines the host grain from the syntaxial quartz cement overgrowths.

Cementation by carbonate cements further arrested mechanical compaction. Leaching of unstable feldpathic grains and volcanic lithoclasts has enhanced the pore system.

The lower portion of the Aklak Sequence at Ellice O-14 is characterized by mechanical failure exhibited by apparent conjugate discontinuous silica and carbonate filled fractures that cross cut framework grains and matrix.

An increase in grain size is observed from clay dominated clastics in the south to sandstones recovered from core at the Adlartok P-09 well. A significant increase in sandstone content and grain size occurs from the Reindeer D-27 to Adlartok P-09. The main mechanisms that decrease porosity and permeability in the Aklak sandstones are initially mechanical compaction. These are the physical forces that increase the sediment packing. Firstly, grain slippage and slight rotation of framework constituents occurs usually to depths <1500 meters. Ductile deformation or the squeezing of labile constituents between rigid grains due to overburden pressure occurs between 500 to 4000 meters. And thirdly, brittle grain deformation occurs when framework cement is subsequently leached.

Qualitative petrographic analysis data for the Reindeer D-27, Unipkat I-22, Ikattok J-17 and Adlartok P-09 is not available. However, the average mineralogy of the Aklak sandstones recovered from Ellice O-14, as determined by qualitative thin section analysis (Open file 1534) include monocrystalline quartz (28.3%), chert (22.7%), clay-rock fragments (28.9%), undifferentiated feldspars (3.9%), sideritized rock fragments (1.6%), micas (2.3%) plus organic material (1%). Brown matrix clays comprise up to 10% of the rock volume. Authigenic cements and clays are comprised of silica (2%), siderite (2%), kaolinite (1.4%), calcite (1.8%), traces of dolomite, leucoxene and pyrite. Effective secondary porosity varies from nil to 15%, averaging 6.5%.

Overall, average whole rock X-ray diffraction analysis from Aklak Sequence samples taken from Ellice O-14, has generated quartz (43.9%), plagioclase (13%), alkali feldspar (5.5%), micas (9.6%), siderite (7.2%), clays [kaolinite/chlorite 5.6%, kaolinite 2.3%, chlorite 3%, mixed/expandable (7.2%)], pyrite, ankerite and halite.

There is a significant difference between estimated thin section analysis and whole rock X-ray diffraction analysis data. In particular, petrographic data appear to significantly underestimate the feldspar content. This is important since feldspars are considered chemically unstable and are susceptible to dissolution and creation of an enhanced secondary pore system.

B.A. Shell I.O.E. Reindeer D-27

Primary intergranular effective porosity is lacking in these prodelta shales, silty shales and siltstones. Parallel laminae, rare diminutive burrows, starved ripples (10856 ft), pyritic nodules (10342 ft), microfractured sideritic laminae plus sideritic nodules (11894 ft), and intraformational clasts are some of the physical structures observed in thin section. Authigenic cements consist mainly of siderite, zoned sideritic nodules and pyritic nodules. Small scale faults are illustrated in Overview 11894 feet. Diagenetic processes involve the compaction and dewatering of clays.

Shell Unipkat I-22

Drill cuttings recovered from the Aklak Sequence at Unipkat I-22 consist mainly of very fine to fine grained litharenites. Depositional environment, outlined by Dixon (1992), consists of interdistributary bay coals, siltstones, silty shales and shales. Framework grains are comprised mainly of monocrystalline quartz, organic material, sideritized clay-rich sedimentary grains, chert and polycrystalline quartz. Subordinate framework grains include quartz-rich sedimentary grains (reworked silt/sandstone), polycrystalline quartz, schistose metamorphic rock fragments, micas (muscovite), K-feldspar, plagioclase, glauconite and phosphate (fish debris). Pseudo-matrix is common, created from the compaction of labile lithoclasts. Early mechanical compaction has mostly destroyed primary porosity in these sandstones and secondary porosity (dissolution of unstable framework grains) is rare. Ductile grains are commonly squeezed between the more competent grains. Grain squeezing alone can reduce porosity to nearly zero in lithic sandstones. Effective porosity is generally lacking in most of the sandstone intervals with the exception of sandstones recovered at 7030 to 7050 meters. Early eogenetic microcrystalline grain rimming siderite is commonly succeeded by the uneven precipitation of silica cement on host monocrystalline quartz grains. Partial dissolution of feldspar grains has resulted in the precipitation of loosely packed kaolinite clays within open macropores.

Trace to minor authigenic phases consist of cements and clays. The cements include microcrystalline grain rimming siderite, rare very poorly developed quartz overgrowths (Plate 07, View B, D:5-6), and rare pyrite. The latter has replaced organic material and has precipitated within chert micropores. Trace amounts of tightly packed kaolinite clays have precipitated within open macropores. Carbonate cement (?non-stained rendering carbonate identification difficult) is found in minor volumes. Dissolution of this carbonate cement and unstable feldspathic framework grains has enhanced the porosity in some of these Aklak intervals.

These rapidly buried organic-rich silty sands are generally considered to be susceptible to eogenetic mechanical compaction. However, the preservation of primary porosity in some intervals is thought to be a result of overpressuring related to early biogenic methane production.

Porous fine to medium grained, litharenites were encountered at 10236 feet. Authigenic cements are minor consisting of unevenly distributed quartz overgrowths and pore filling carbonate cement (not stained for carbonate identification). Framework grains include monocrystalline quartz, chert, polycrystalline quartz plus argillic sedimentary clasts.

IMP Ikattok J-17

Tertiary sediments encountered at Ikattok J-17 consist mainly of shales, silty shales, coals and minor incursions of sandstones. The coarsening upwards sandstones recovered from core between 7212 to 7260.6 feet are represented by four petrographic samples.

Mechanical compaction is the main diagenetic process which has significantly reduced to obliterated primary porosity in these lithic sandstones. Grain contacts are mainly concavo-convex with ductile framework constituents compacted between the more competent grains. Dissolution of calcic plagioclase (stained pink in the thin sections) has created isolated macropores. Massive well sorted, fine grained sandstones are recognized at the base. Unevenly distributed elongate organic material intraformational clasts are concentrated along parallel laminae. Authigenic cements are not preserved in these sandstones.

I.O.E. Ellice O-14

Framework grains are dominated by monocrystalline quartz (28.4%), chert (22.8%) and clay-rich sedimentary grains (28.9%). Subordinate framework constituents include sideritized clay clasts, micas and organic material. The sandstones are generally lacking matrix clays with the exception of bioturbated silty sandstones at 7915.5 feet.

An overall gradually fining upwards sequence is recognized from core recovered at Ellice O-14. Qualitative petrographic data show a decrease in chert content towards the top and a significant increase of clay-rich sedimentary grains.

Massive gravel lag deposits within a fluvial channel represent the sandstones recovered from core at 9470 and 9527 feet. The predominance of massive sandstones and pebbly polymictic sandstones, recognized as fluvial channel gravel lag, lacking in matrix clays suggests channelized flow. The dispersal of polymictic coarse to pebble sized grains within both the laminated and massive sandstones may be a product of short-lived violent flood events (bank scour). The top of the Aklak encountered by core is mainly represented by non-bioturbated massive shales.

The lower portion of the Aklak Sequence at Ellice O-14 is characterized by mechanical failure exhibited by apparent conjugate discontinuous silica and carbonate filled fractures that cross cut framework grains and matrix. Pore fluids within the clays provide the solute to precipitate out calcite cement. This mechanical failure may be related to the re-activation of underlying growth faults.

Many shear zones with en-echelon vein system show evidence of pressure solution where the more soluble components of the rock (calcite) are taken out of the rock to be deposited nearby as vein filling.

Tectonic stylolites form under tectonic stress situations and are probably initiated perpendicular to the maximum compressive tectonic stress (Laramide Compression). As a result they usually cross cut the bedding surface and intersect and displace tectonic features of the rock.

Dome et al. Adlartok P-09

Early mechancial compaction is slight in these porous and permeable sandstones. Anomalously high macroporosity is preserved in the Aklak Sequence, considering the high content of ductile organic grains. It is suggested that primary porosity was preserved initially by early biogenic activity (methanogensis), whereby pores are preserved by overpressures. Subsequent early mesogenetic ankerite precipitation preserved the intergranular pores. Leaching of the pore preserving cement has resulted in further mechanical compaction and fracturing of brittle grains. Volcanic rock fragments and calcic plagioclase are considered the most susceptible to grain dissolution.

Taglu Sequence

An overall coarsening upwards trend is observed in the Taglu Sequence recovered from Mallik A-06, Niglintgak M-19 and Taglu C-42. Laterally from Ellice O-14 to the west to Mallik A-06 the main pore filling cement is patchily distributed ferroan calcite (ankerite). Minor analcime cement has precipitated within some of the Taglu C-42 channel fill sandstone intervals.

Eogenetic mechanical compaction slightly reduced primary porosity in the Taglu Sequence sediments. Authigenic minerals are not volumetrically significant in most of the well locations except at Ellice O-14 whereby ferroan carbonate cementation totally occludes the pore system. The most commonly observed authigenic phases include analcime, calcite, leucoxene and clays. The latter, as determined by previous X-ray diffraction analysis includes kaolinite/chlorite, kaolinite, chlorite and mixed/expandable clays.

Analcime is observed within the pore system of some of the Taglu C-42 sandstone intervals, between 9673.6 to 9742.8 feet, occurring as patchy cement filling intergranular pore spaces. Analcime belongs to the zeolite group of tectosilicates and is a hydrated sodium aluminum silicate. It is noticeably absent from secondary dissolution pores and hence may have formed relatively early in the diagenetic sequence. Significantly, some of the analcime cement patches show ragged corroded edges suggestive of diagenetic leaching. Brittle mechanical compaction, shown by microfractures that crosscut the framework grains and analcime cement (9715.2 feet) also suggest an early precipitation. Analcime most commonly forms as a by-product of the alteration of feldspars and feldspathic rock fragments by Na-rich pore fluids in near-surface environments. An alkaline environment (?inland playa lakes) may have provided the fluids necessary to alter the feldspar-rich sandstones.

Poikilotopic, twinned slightly ferroan calcite occurs as a minor to common component, filling intergranular and intragranular pore spaces in both the sandstone and conglomerate lithologies. Rare ferroan dolomite remnants are observed locally in the Taglu C-42 (9481, 9476.2 , 10497 feet) engulfed by poikilotopic ferroan calcite cements. Mesogenetic precipitated ferroan dolomite is a precursor to the ferroan calcite cement suggesting a significant tectonic uplift event occurred.

Taglu C-42

Early mechanical compaction has slightly reduced primary porosity in these sandstones. Precipitation of pore preserving analcime, in some sections, and ferroan carbonate has preserved much of the pore system. Subsequent dissolution of the carbonate cement and unstable framework lithoclasts has enhanced the intergranular porosity.

The Taglu Sequence is characterized by a predominance of laminated and massive fine to coarse grained sandstones with localized analcime cement. The dispersal of coarse to pebble sized grains within both the laminated and massive sandstones may be a product of short-lived violent flood events (bank scour).

Ellice O-14

Early mechanical compaction of ductile framework grains has reduced to virtually eliminated effective macropores in the Ellice O-14 sandstones. Poikilotopic ferroan dolomite cement occludes both intergranular and intragranular pores in the sandstones recovered from core at 3929.5 feet. Partial dissolution of feldspathic grains has created isolated macropores.

Mallik A-06

Five core samples represent the Taglu Sequence recovered from core at Mallik A-06. An overall coarsening upwards trend is observed in the sandstones recovered from Mallik A-06. Qualitative petrographic data show an overall increase in grain size, quartz and feldspar content. A discrepancy exists between the X-ray diffraction data and the qualitative petrographic data generated in Open File 1534, whereby there appears to be a significant petrographic underestimation of feldspar content within the Taglu sandstones recovered at Mallik A-06. Feldspars are considered to be mechanically stable but chemically unstable. This can significantly impact the porosity development within the sandstone interval.

Eogenetic cryptocrystalline siderite commonly rims the framework grains in the upper Taglu Sequence recovered at 10522 feet. Primary porosity is significantly lost by mechanical compaction. Subsequent leaching of feldspathic grains ensued with the filling of ferroan carbonate cement.

Niglintgak M-19

Early mechanical compaction is the main pore reducing mechanism shown in these sidewall core samples. Eogentic siderite cement is replacive and occurs along grain rims in minor volumes. Two generations of carbonate cement are observed at 3901.7 feet. Minor finely crystalline, pore filling poikilotopic slightly ferroan calcite is replaced by pore filling mesogentic ferroan ankerite cement.

Both carbonate cements are absent from partially leached volcanic rock fragments indicating leaching of these lithoclasts post-dated carbonate cementation. Loosely packed kaolinite clays have precipitated within open pores.

Deep burial brittle mechanical compaction of framework grains is shown by fractured grains.

Unipkat I-22

Drill cuttings recovered between 4804 to 6215 feet represent the Taglu Sequence. Primary porosity is lost mainly by mechanical compaction of ductile framework constituents between the more competent grains. Early precipitated ferroan calcite cement preserved primary porosity at 4804 feet. Dissolution of this carbonate cement has slightly enhanced the pore system plus the complete to partial dissolution of feldspars has enhanced the pore system.

Richards Sequence

A significant lateral variation of pore filling carbonate cement is observed from the Amerk O-09 to Taglu C-42 locations. The samples representing the Richards sequence at Amerk O-09 consist of non-ferroan pink stained calcite cement that has precipitated early and infills partially leached feldspar grains. Early dissolution of the feldspars with meteoric waters has resulted in early precipitation of kaolinite verms. The kaolinite clays are encased by the calcite cement. These sandstones are underlain by ferroan calcite cemented clastics with the calcite encasing ferroan dolomite cement. Tectonic uplift may have also caused meteoric water recharge from exposed areas into the basin.

Hydrocarbons, in the form of bitumen, are encased within the dolomite crystals indicating that hydrocarbon emplacement was contemporaneous with ferroan dolomite precipitation.

Well developed, very finely crystalline to poikilotopic ankerite cement is the main carbonate cement found in the wells to the south. Brittle mechanical failure is evident at the Mallik A-06 well with ferroan dolomite/ankerite filled microfractures crosscutting framework grains. The lower portion of the Ivik J-26 well has barite cement filling pores indicative of faulting. Pullen E-17 shows ferroan ankerite cemented sandstone intervals with “dead” oil encased within the crystal lattice.

Ivik J-26

Eogentic sideritization of detrital grains is common in these very fine to fine grained litharenites. Early mechanical compaction is evident by the squeezing of labile lithoclasts between the more competent grains. Ferroan carbonate cement has preserved primary porosity in some of the intervals. Dissolution of this pore preserving cement and feldspathic grains has enhanced the effective pore system. Pore filling barite and microfractured grains in the lower Richards Sequence suggest major fault influences.

Mallik A-06

Deep burial, brittle mechanical compaction is the main diagenetic process observed in the two thin sections representing the lower Richards Sequence at Mallik A-06. The ferroan carbonate (ankerite/dolomite) filled microfractures crosscut the framework grains and fill rare intergranular pores. An apparent conjugate set of microfractures at 9669.7 feet shows evidence of grain slippage. Rare pore filling authigenic cements consist of ferroan dolomite/?ankerite and loosely packed kaolinite clays. Effective macropores, created from the dissolution of feldspars and unstable framework grains, are isolated in this interval.

Pullen E-17

Drill cuttings represent the Richards Sequence recovered at Pullen E-17. Common pore filling ferroan dolomite is the main pore occluding cement in this well. “Dead” oil is common at crystal edges suggestive that a hydrocarbon event occurred contemporaneous with dolomite cementation. Zones of excellent reservoir quality were also observed with no evidence of precursor cement.

Poikilotopic cement and cracked grains at circa 10390-10490 feet indicate brittle mechanical compaction interpreted to follow dissolution of a precursor cement.

Amerk O-09

Early mechanical compaction is slight to moderate in the Amerk O-09 Richards Sequence sandstones. Eogenetic non-ferroan pink stained calcite occludes primary porosity and partially fills leached framework grains, mainly feldspars. Early precipitated kaolinite verms, resulting from the dissolution of feldspars, are encased by poikilotopic calcite cement. Deep burial cementation is indicated by well developed, finely crystalline baroque ferroan dolomite. Hydrocarbons, in the form of bitumen, are incorporated within the crystal lattice (4602.90 meters) which indicates contemporaneous hydrocarbon emplacement with dolomite precipitation. This is similar to carbonate cemented Pullen E-17 Richards Sequence clastics. Ferroan calcite engulfs the ferroan dolomite cement which suggests the occurrence of significant tectonic uplift and incursion of meteoric waters.

Kugmallit Sequence

A significant lateral variation is shown between the Kugmallit sandstones recovered from Amerk O-09 and Issungnak 2O-61 in comparison to Pullen E-17 and Mallik A-06. Excellent reservoir quality porous, well sorted, fine grained sandstones characterize the Kugmallit sandstones to the north and east of Pullen E-17.

Early slight mechanical compaction is thought to be the main pore occluding phase with early carbonate cementation. Complete dissolution of carbonate cement created a solution enlarged intergranular pore system that significantly improved the reservoir quality of the sandstones. Dissolution of carbonate cement in the acidic waters that preceded the migration of hydrocarbons enhanced porosity and reservoir quality. Complete to partial dissolution of feldspar-rich lithoclasts also enhanced the effective pore system. Authigenic cements are rare and poorly preserved.

In contrast, the porosity in the Kugmallit Sequence is occluded by ferroan dolomite cement in the Pullen E-17 well. Some framework grains exhibit brittle mechanical fracturing caused by the evolution of secondary porosity, dissolution of unstable framework constituents and burial compaction. The lower Kugmallit Sequence, represented by three samples at Mallik A-06, shows common clinoptilolite cement precipitated as pore fill. Early mechanical compaction of ductile grains is also common.

Overpressure

Water movement in the basin can come from a variety of sources including shale compaction, dehydration reactions and meteoric water. Growth faults in the Beaufort Mackenzie Basin appear to be a major contributor to fluid flow paths. Fluid transport affecting diagenesis is thought to be related to the fault block reservoirs encountered in the Beaufort Mackenzie Basin area. The fluid flow can occur not only along the fault planes but faults also act as a conduit for fluids to penetrate and mobilize along the more porous sandstone medium. Vertical and lateral displacement of fluids can occur along the plane of fault when there is a period of fault displacement.

This implies that the diagenetic system is open and solutes from underlying Paleozoic carbonates can move up along the growth faults vertically and laterally.

A dissolution-cementation cycle can occur with the introduction of fault migrating pore fluids into the more porous intervals. The release of overpressure can lead to compaction fabrics such as those seen by grain contacts, fractured framework competent grains, collapsed leached grains and fractured cements.

Recommendations

1. Extend the Petrographic/Diagenetic study to other wells in the basin to gain a better correlation between depositional environments, burial and diagenetic history.
2. Cathodo-luminescence on select samples to determine carbonate evolution.
3. X-ray diffraction on samples to ascertain feldspar composition and variability in the basin.
4. Systematic electron microprobe analysis of feldspars.
5. Palynology studies to determine age of sand bodies and possibility of slump blocks within marine shale.
6. Grain size analysis to determine trends within the basin.
7. Stable isotope composition of carbon and oxygen on some of the carbonate cements.

References

Coleman, J.M., Prior, D.B., 1976.Deltas: Processes of Deposition & Models for Exploration. Continuing Education Publ.Co.., Champaign, IL, 102 p.

Dixon, J. Deitrich, J.R. McNeil, D. H., 1992, Jurassic to Pleistocene sequence stratigraphy of the Beaufort-Mackenzie Delta and Banks Island areas, Northwest Canada, Geol. Surv. Can. Bull. 407.

Dixon, J., Morrel, G.R., Dietrich, J.R. Taylor, G.C., Proctor, R.M., Conn, R.F., Dalaire, S.M., Christie, J.A., 1994. Petroleum resources of the Mackenzie Delta and Beaufort Sea, Geol. Surv. Can. Bull. 474.

Schmidt, V., 1987. Petrological/Diagenetic Study of Upper Cretaceous and Tertiary Strata, Beaufort-Mackenzie Basin Phase 1: Preliminary analysis and interpretation of samples from core, outcrop and drill cuttings. Geol. Surv. Can. Open File Rep. 1534.

Schmidt, V., 1989. Petrographic/Diagenetic Study of Upper Cretaceous and Tertiary Strata, Beaufort-Mackenzie Basin Phase II: Geol. Surv. Can. Open File Rep. 1534.

Project: Geological Survey of Canada
Diagenetic Study of Tertiary Sequences, Beaufort Mackenzie Basin – Phase 1
Aklak, Taglu, Richards, Kugmallit Sequences

Wells: **Amerk O-09**
Issungnak 2O-61
Pullen E-17
Ivik J-26
Mallik A-06
Taglu C-42
Niglintgak M-19
Unipkat I-22
Ellice O-14
Reindeer D-27
Ikattok J-17
Adlartok P-09

Date: September 2009 - March 2010

Professional(s): Cathy M. Hamel, MSc., P.Geol.

Tables and Figures

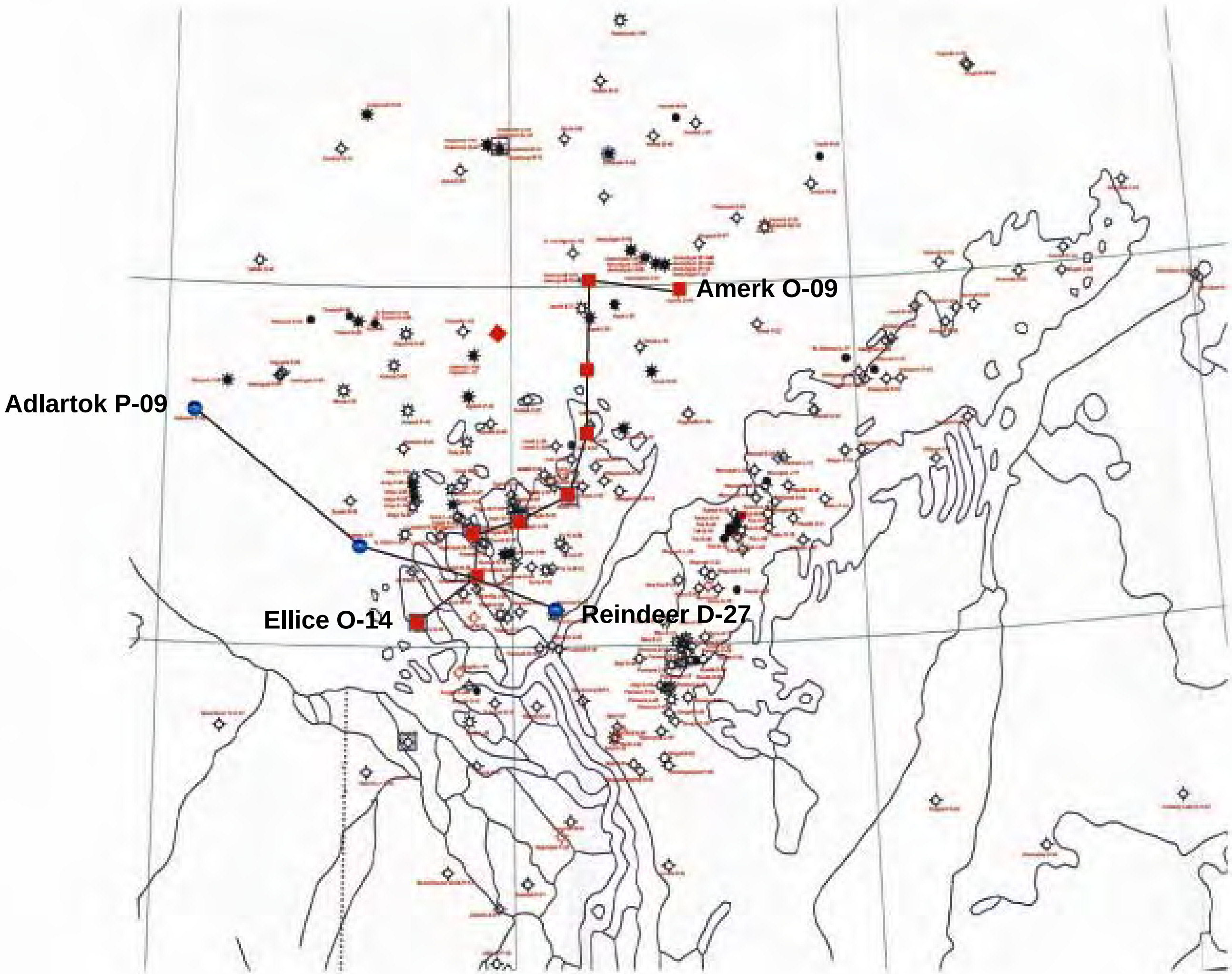
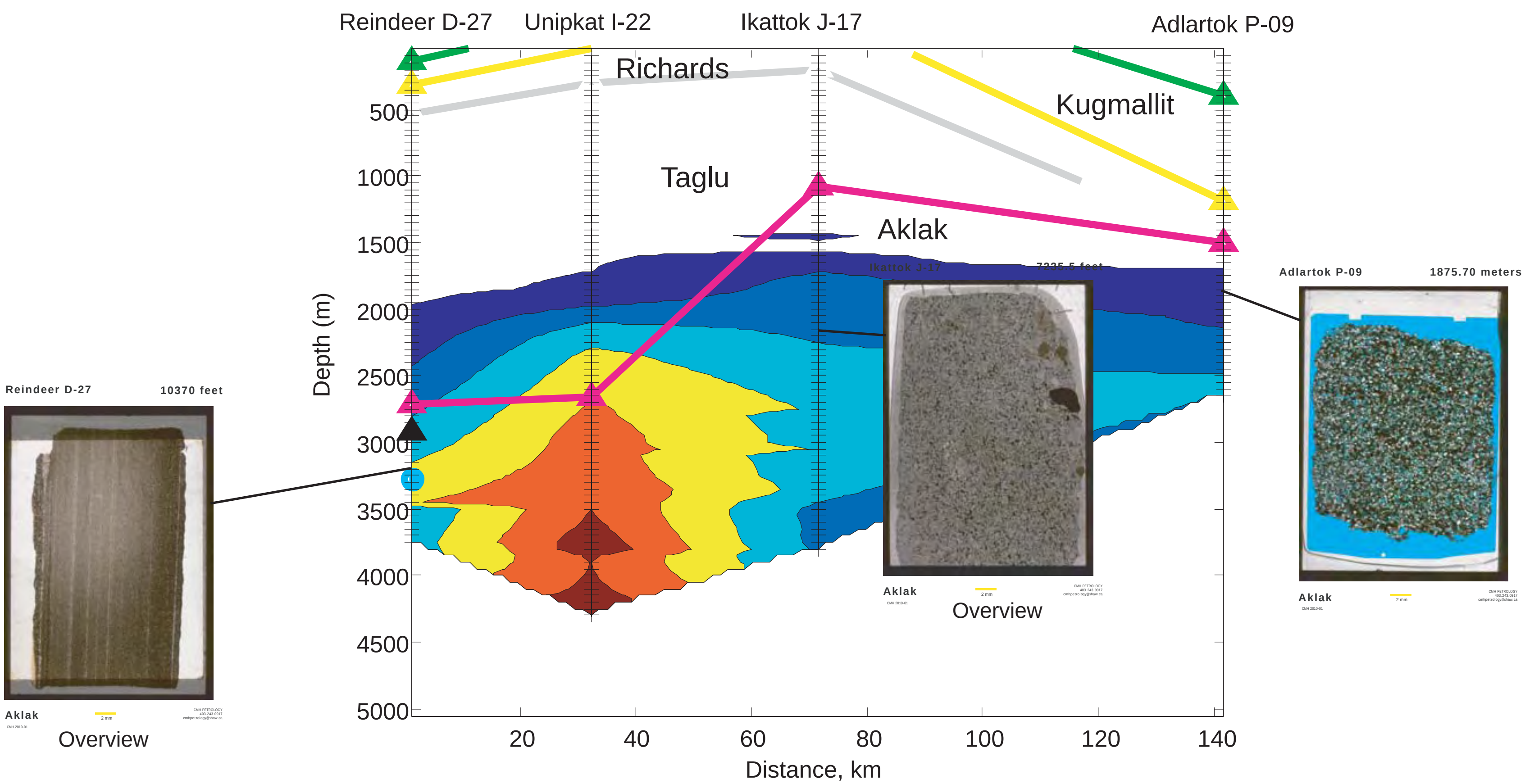


Figure 1: Well Locations for the Beaufort Mackenzie Basin

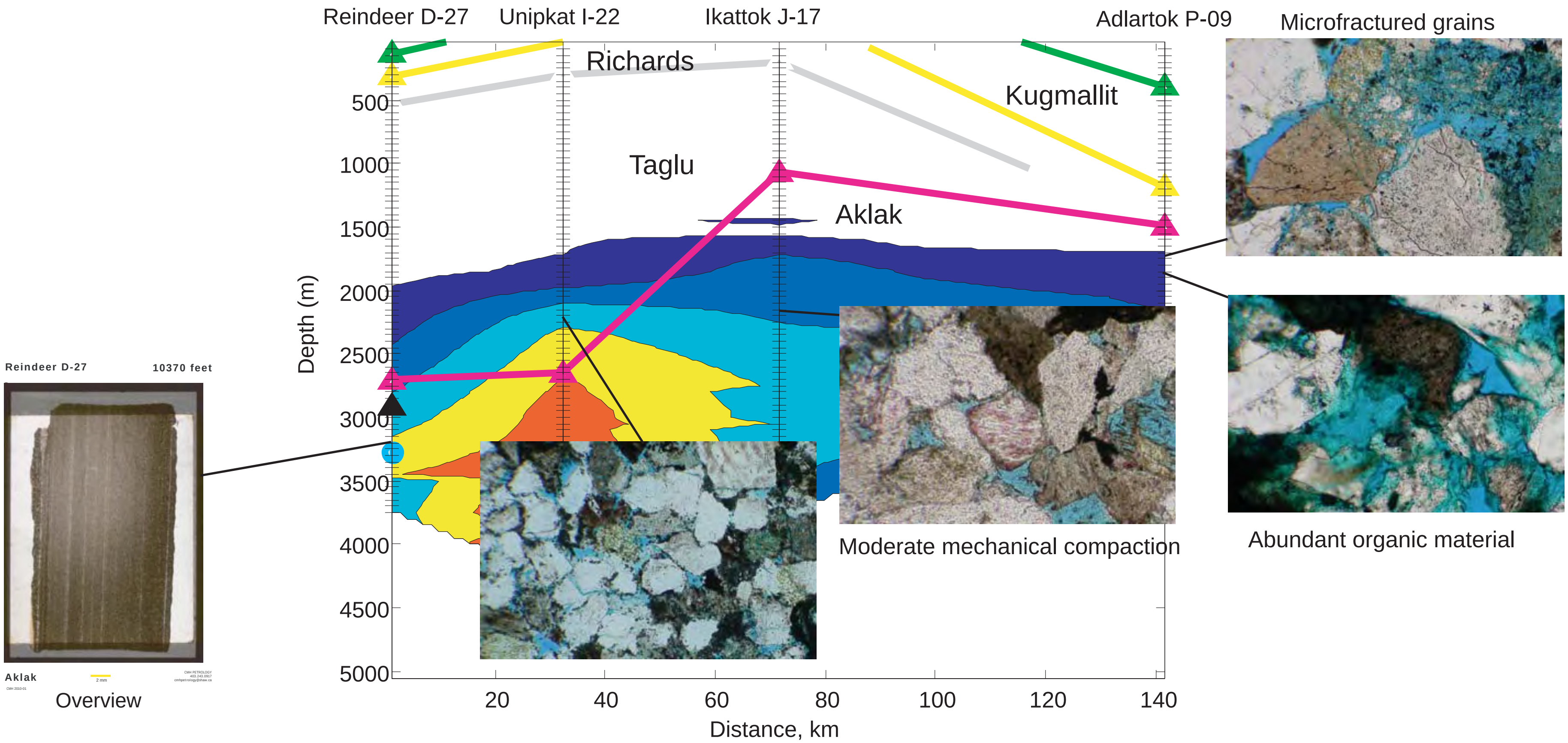
Figure A: Schematic Cross Section illustrating Aklak Sequence Overviews



Notes: 1) Colored overburden pressure signature provided by G.S.C. (Zhuoheng Chen) is superimposed on the cross section

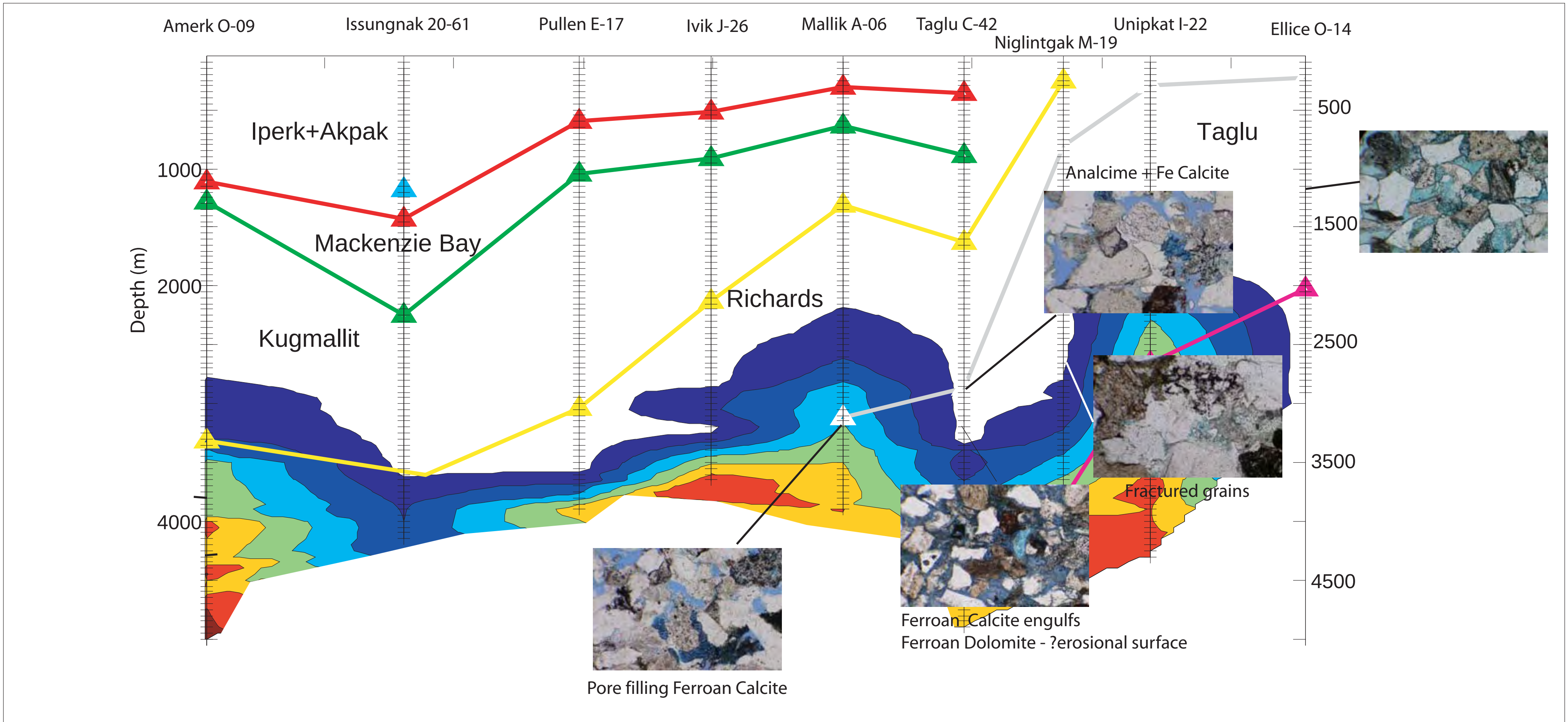
2) Formations Tops - provided by G.S.C.

Figure B: Schematic Cross Section illustrating Aklak Sequence



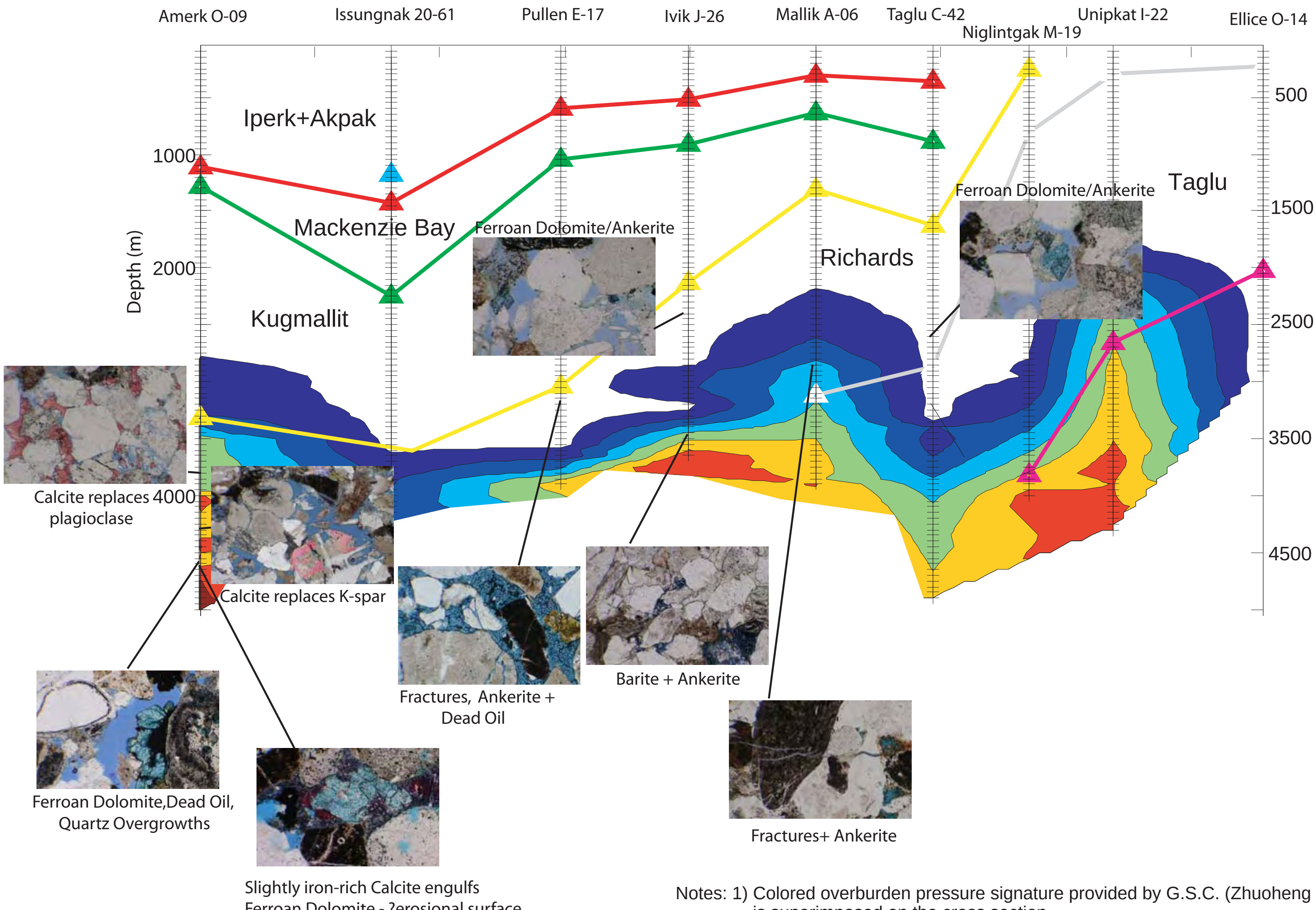
Notes: 1) Colored overburden pressure signature provided by G.S.C. (Zhuoheng Chen)
is superimposed on the cross section
2) Formations Tops - provided by G.S.C.

Figure C: Schematic Cross Section - Taglu Sequence



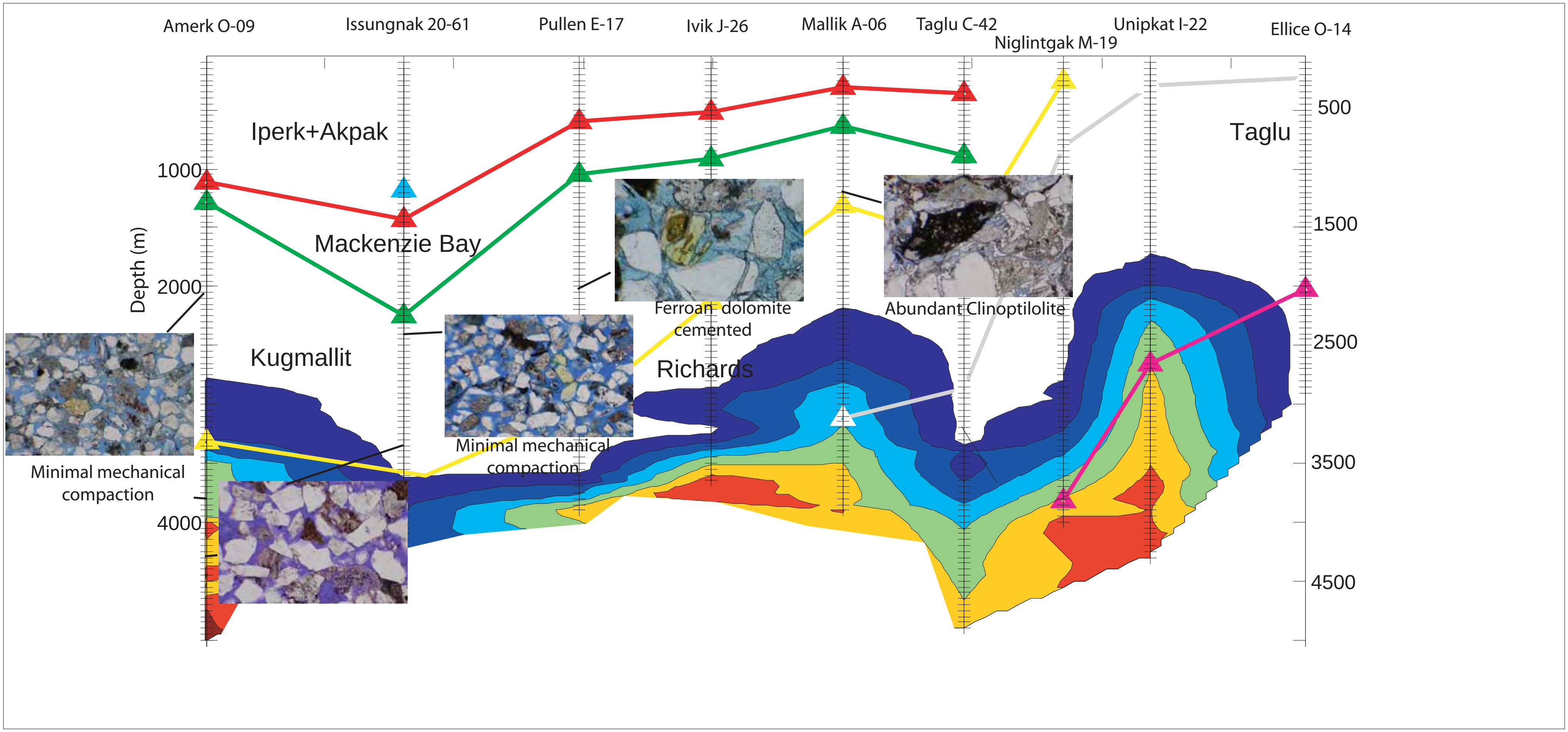
Notes: 1) Colored overburden pressure signature provided by G.S.C. (Zhuoheng Chen) is superimposed on the cross section
2) Formations Tops - provided by G.S.C.

Figure D: Schematic Cross Section - Richards Sequence



Notes: 1) Colored overburden pressure signature provided by G.S.C. (Zhuoheng Chen) is superimposed on the cross section
2) Formations Tops - provided by G.S.C.

Figure E: Schematic Cross Section- Kugmallit Sequence



Notes: 1) Colored overburden pressure signature provided by G.S.C. (Zhuoheng Chen)
is superimposed on the cross section
2) Formations Tops - provided by G.S.C.

Well: Amerk O-09
Sequences: Kugmallit, Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

*TABLE 1a: POINT COUNT DATA AND MINERALOGY

ESTIMATED MODAL ANALYSIS (%) - INCLUDES POROSITY

Depth (m)	Framework Grains										Accessory				Clays					Cement										Mineralogy							Porosity			
	MQ	PQ	Ch	Plag	K-spar	CRF	SidRF	QRF	MRF	VL	Micas	OM	Phos	HM	Mtx	Glauc	Other	Chl	Kaol	Si	Ca	FeC	Ba	Sid	Do	FeDo	Zeolite	Leuc	Py	Sil	Ca	Dol	Phos	Clays	Other	HC	Primary	Undet	Secon	TOTAL
Kugmallit																																								
1534.35	15	-	3	1	-	9	-	-	-	-	0.5	1	-	0.3	64	0.2	0.2	-	-	-	-	-	-	5	-	-	-	0.1	0.4	0.180	0.000	0.000	0.000	0.739	0.083	-	-	-	0	0
1534.35	31	-	15	3	-	15	-	-	-	-	1	2	-	0.5	18	0.5	0.2	-	-	-	-	-	-	1.7	-	-	-	0.1	1	0.511	0.000	0.000	0.000	0.386	0.106	-	-	3	7	10
2067.10	30	-	15	3	-	20	-	-	-	-	1	1	-	0.5	0.9	0.5	0.2	-	-	0.1	-	-	-	1	1	-	-	0.1	0.4	0.601	0.000	0.013	0.000	0.301	0.087	-	-		25	25
2069.43	35	-	7	2	-	25	-	-	-	-	2	0.2	-	0.6	4	0.2	0.5	-	-	-	0.1	-	-	1	0.4	-	-	0.5	0.5	0.532	0.001	0.005	0.000	0.401	0.067	-	-	-	21	21
Richards																																								0
3860.17	31	-	25	5	-	10	-	-	-	-	0.5	1	-	0.5	0.5	-	2	-	1.2	3	0.4	-	-	1	-	-	-	0.4	0.4	0.720	0.005	0.000	0.000	0.173	0.126	-	-	-	-	0
3862.67	32	-	25	5	-	10	-	-	-	-	0.4	1	-	-	0.5	-	1	-	1	1	5.5	-	-	0.5	-	-	-	0.4	0.1	0.695	0.066	0.000	0.000	0.155	0.096	-	-	-	17	17
3867.50	32	-	20	5	-	16	-	-	-	-	0.5	1	-	1	2	0.5	3	-	1	0.7	0.5	-	-	2	-	-	-	0.8	1	0.606	0.006	0.000	0.000	0.264	0.159	-	-	-	12	12
3867.50	33	-	25	4	-	12	-	-	-	-	0.5	0.5	-	0.5	-	0.5	1	-	1	1	12.5	-	-	0.5	-	-	-	0.5	1	0.631	0.134	0.000	0.000	0.160	0.086	-	-	-	6	6
4370.94	42	-	18.5	4	-	18	-	-	-	-	0.5	0.2	-	0.3	-	-	1	-	1.5	1	2	-	-	3.5	-	-	-	0.5	1	0.654	0.021	0.000	0.000	0.223	0.112	-	-	-	5	5
4374.90	40	-	20	3	-	15	-	-	-	-	1	0.4	-	0.4	-	0.2	1	-	3.5	1	0.4	-	-	5.2	0.2	-	-	0.4	0.3	0.663	0.004	0.002	0.000	0.225	0.116	-	-	-	8	8
4374.90	34	-	25	3	-	12	-	-	-	-	0.5	0.5	-	0.5	-		1	-	2	2	11	-	-	0.2	0.2	-	-	0.4	0.4	0.658	0.119	0.002	0.000	0.167	0.065	-	-	-	5	5
4377.75	35	-	20	3	-	16	-	-	-	-	0.5	0.5	-	0.5	-	0.5	0.6	-	2.8	1	0.2	-	-	1.2	0.2	-	-	0.5	0.5	0.675	0.002	0.002	0.000	0.246	0.082	-	-	-	16	16
4378.77	25	-	10	2	-	7	-	-	-	-	0.3	0.5	-	0.2	-	-	0.4	-	0.5	0.4	0.2	-	-	0.5	50	-	-	0.5	0.5	0.361	0.002	0.510	0.000	0.084	0.047	-	-	-	2	2
3864.20	30	-	24	5	-	15	-	-	-	-	0.5	1	-	0.5	-	-	1	-	1	0.7	1	-	-	2	-	-	-	0.3	1	0.659	0.012	0.000	0.000	0.211	0.130	-	-	-	16	16
4602.90	35	-	33	1	-	3.5	-	-	-	-	-	0.3	-	0.3	0.2	-	0.1	-	3.1	3	-	-	-	0.1	3.6	-	-	0.1	1	0.842	0.000	0.043	0.000	0.082	0.034	-	-	-	16	16
4604.60	20	-	44	0.5	-	8	-	-	-	-	-	-	-	0.5	1	-	0.2	-	4	1	15	-	-	0.2	0.5	-	-	0.1	1	0.677	0.156	0.005	0.000	0.138	0.026	-	-	-	3	3
4604.60	34	-	34	1	-	12	-	-	-	-	0.2	0.4	-	0.4	2	-	0.2	-	4	2	2	-	-	0.2	2.5	-	-	0.1	1	0.729	0.021	0.026	0.000	0.192	0.034	-	-	-	3	3
4608.30	25	-	25	0.2	-	9.7	-	-	-	-	0.1	-	-	-	-	-	0.5	-	1	1	35	-	-	-	0.3	-	-	0.1	1	0.516	0.354	0.003	0.000	0.114	0.018	-	-	-	1	1
4860.20	29.5	-	28	1	-	21	-	-	-	-	1	0.5	-	-	2	-	4	-	2	1	1	-	-	1	0.2	-	0.5	0.4	0.4	0.626	0.011	0.007	0.000	0.321	0.078	-	-	-	6	6

MQ - monocrystalline quartz	QRF - quartz rock fragments	Mtx - matrix	Si - silica	Leuc - leucoxene	HC - hydrocarbon (bitumen)
PQ - polycrystalline quartz	MRF - metamorphic rock fragments	Glauc - glauconite	Ca - calcite	Py - pyrite	Undet - undetermined
Ch - chert	VL - volcanic lithoclasts	Smec - smetitic clays	FeC - ferroan calcite		Secon - secondary
Plag - plagioclase	Micas - muscovite, biotite	Chl - chlorite	Ba - barite		TOTAL - primary+undetermined+secondary
K-spar - potassium feldspar	OM - organic material	Kaol - kaolinite	Sid - siderite		
CRF - clay rock fragments	Phos - phosphatic grains, fish debris		Do - dolomite		
SidRF - sideritized clay rock fragments	HM - heavy minerals		FeDo - ferroan dolomite		

***Data compiled from Open File 1534**

Well: Issungnak 20-61
Sequence: Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

*TABLE 1b: POINT COUNT DATA AND MINERALOGY

ESTIMATED MODAL ANALYSIS (%) - INCLUDES POROSITY																																								
Depth (m)	Framework Grains										Accessory				Clays					Cement										Mineralogy							Porosity			
	MQ	PQ	Ch	Plag	K-spar	CRF	SidRF	QRF	MRF	VL	Micas	OM	Phos	HM	Mtx	Glauc	Other	Chl	Kaol	Si	Ca	FeC	Ba	Sid	Do	FeDo	Zeolite	Leuc	Py	Sil	Ca	Dol	Phos	Clays	Other	HC	Primary	Undet	Secon	TOTAL
Kugmallit																																								
2377.30	15.2	16.4	17.3	0.7	6.7	0.5	-	3.5	3.7	0.9	1.4	-	-	7.6	-	-	-	0.2	0.5	-	-	-	-	-	-	-	-	-	-	0.702	0.000	0.000	0.000	0.084	0.213	-	3	5	17	25
2380.40	15	-	5	2	-	15	1	-	-	-	5	1	-	-	50	-	-	-	-	-	-	-	-	5	-	-	-	-	1	0.200	0.000	0.000	0.000	0.700	0.100	-	-	1	3	4
2380.40	25	-	10	4	-	30	1	-	-	-	3	-	-	-	3	-	-	-	-	-	-	-	-	1	-	-	-	-	1	0.449	0.000	0.000	0.000	0.462	0.090	-	-	5	18	23
2383.45	27.5	8.4	2.7	-	7.9	1.2		5.2	3.9	1	12.2	-	-	4.7	1	-	-	-	-	-	-	-	-		-	-	-	-		0.579	0.000	0.000	0.000	0.242	0.180	-	5	5	14.1	24.1
2387.70	30	-	14	8	-	15	-	-	-	-	tr	-	-	-	-	-	-	-	tr	-	-	-	-		-	-	-	-	3	0.629	0.000	0.000	0.000	0.214	0.157	-	3	5	20	28
2390.70	25.8	11.5	6.3	3	5.6	0.7	-	5.2	10.5	0.5	3.3	-	-	3.5	-	-	-	tr	tr	-	-	-	-		-	-	-	-	tr	0.643	0.000	0.000	0.000	0.191	0.166	-	2	3	19.1	24.1
2402.80	39	-	5	3	-	25	2	-	-	-	2	tr	-	tr	-	-	-	-	-	-	-	-	-	1	-	-	-	-	tr	0.571	0.000	0.000	0.000	0.351	0.078	-	-	3	20	23
2407.00	20	-	2	2	-	19	1	-	-	-	5	1	-	-	10	tr	-	-	-	-	40	-	-	1	-	-	-	-	-	0.218	0.396	0.000	0.000	0.337	0.050	-	-	-	-	0
2413.20	24	-	2	2	-	25	2	-	-	-	5	15	-	-	13	-	-	-	-	-	-	-	-	4	-	-	-	-	tr	0.283	0.000	0.000	0.000	0.467	0.250	-	-	-	8	8
2413.60	24.6	9.5	2.4	0.2	-	1.5	-	4.6	4.6	-	12.6	-	-	8.5	8.7	-	-	-	-	-	-	-	-	0.5	-	-	-	-	-	0.529	0.000	0.000	0.000	0.353	0.118	-	-	-	22.4	22.4
2497.80	34	-	10	3	-	25	-	-	-	-	tr	-	-	-	-	-	-	-	tr	-	-	-	-	tr	-	-	-	tr	tr	0.611	0.000	0.000	0.000	0.347	0.042	-	-	5	22	27
2499.10	30	-	12	6	-	20	5	-	-	-	4	1	-	tr	-	-	tr	-	-	-	-	-	-	2	-	-	-	tr	tr	0.525	0.000	0.000	0.000	0.300	0.175	-	-	-	-	0
2598.80	39	-	5	4	-	25	1	-	-	-	3	2	-	tr	4	tr	-	-	-	-	-	-	-	1	-	-	-		1	0.518	0.000	0.000	0.000	0.376	0.106	-	-	-	16	16
3145.70	23.4	10.7	8.6	4.2	11.1	0.5		9.3	5.3	-	3.7	tr	-	3.2	-	tr	-	tr	0.5	tr	-	-	-	-	-	-	-	tr	tr	0.646	0.000	0.000	0.000	0.124	0.230	-	-	-	19.5	19.5
3146.80	45	-	5	5	-	25	1	-	-	-	1	tr	-	tr	9	tr	-	-	tr	-	-	-	-	2	-	-	-		1	0.532	0.000	0.000	0.000	0.372	0.096	-	-	-	5	5
3198.20	33	-	20	8	-	15	tr	-	-	-	tr	tr	-	tr	-	-	-	-	tr	-	-	-	-	tr	-	-	-	-	tr	0.697	0.000	0.000	0.000	0.197	0.105	-	-	-	24	24
3276.30	32	-	15	4	-	25	3	-	-	-	3	1	-	tr	3	-	-	-	-	-	-	-	-	2	tr	-	-	-	tr	0.534	0.000	0.000	0.000	0.352	0.114	-	-	-	12	12
3291.40	22.1	16	9.4	6.4	7.3	-	-	4.5	7.1	-	0.7	-	-	4	-	-	-	-	0.7	-	-	-	-	-	-	-	-	-	-	0.665	0.000	0.000	0.000	0.109	0.226	-	-	-	21.6	21.6
3302.10	15.9	18	8.3	3.2	8.5	-	-	4.6	9.3	tr	3.9	-	-	5.1	-	-	-	tr	0.5	-	-	-	-	tr	-	-	-	-	tr	0.605	0.000	0.000	0.000	0.177	0.217	-	-	-	19	19
3307.30	24	18.4	10.4	3.4	4.6	-	-	6	3.9	tr	1.5	-	-	3.2	-	-	tr	tr	tr	-	-	-	-	tr	-	-	-	-	-	0.780	0.000	0.000	0.000	0.072	0.149	-	-	-	24.6	24.6
3312.70	32	-	15	10	-	20	-	-	-	-	tr	-	-	tr	-	-	2	-	-	-	-	-	-	-	-	-	-	-	1	0.588	0.000	0.000	0.000	0.275	0.138	-	-	-	20	20

MQ - monocrystalline quartz
PQ - polycrystalline quartz
Ch - chert
Plag - plagioclase
K-spar - potassium feldspar
CRF - clay rock fragments
SidRF - sideritized clay rock fragments

QRF - quartz rock fragments
MRF - metamorphic rock fragments
VL - volcanic lithoclasts
Micas - muscovite, biotite
OM - organic material
Phos - phosphatic grains, fish debris
HM - heavy minerals

Mtx - matrix
Glauc - glauconite
Smec - smetitic clays
Chl - chlorite
Kaol - kaolinite

Si - silica
Ca - calcite
FeC - ferroan calcite
Ba - barite
Sid - siderite
Do - dolomite
FeDo - ferroan dolomite

Leuc - leucoxene
Py - pyrite

HC - hydrocarbon (bitumen)
Undet - undetermined
Secon - secondary
TOTAL - primary+undetermined+secondary

***Data compiled from Open File 1534**

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Well: Ivik J-26
Sequence: Richards

*TABLE 1c: POINT COUNT DATA AND MINERALOGY

ESTIMATED MODAL ANALYSIS (%) - INCLUDES POROSITY

Depth (ft)	Framework Grains										Accessory				Clays					Cement										Mineralogy							Porosity			
	MQ	PQ	Ch	Plag	K-spar	CRF	SidRF	QRF	MRF	VL	Micas	OM	Phos	HM	Mtx	Glauc	Other	Chl	Kaol	Si	Ca	FeC	Ba	Sid	Do	FeDo	Zeolite	Leuc	Py	Sil	Ca	Dol	Phos	Clays	Other	HC	Primary	Undet	Secon	TOTAL
Richards																																								
8102.50	30	-	24	5	-	23	2	-	-	-	tr	1	-	tr	-	-	-	-	-	-	-	-	-	2	-	-	-	-	2	0.607	0.000	0.000	0.000	0.258	0.135	-	-	7	15	22
8107.70	25	-	20	5	-	30	5	-	-	-	1	4	-	tr	-	tr	-	-	-	-	-	-	-	2	-	-	-	-	1	0.484	0.000	0.000	0.000	0.333	0.183	-	-	4	8	12
8119.30	20	-	12	3	-	30	3	-	-	-	1	1	-	tr	18	tr	-	-	-	-	-	-	-	10	-	-	-	-	tr	0.327	0.000	0.000	0.000	0.500	0.173	-	-	-	2	2
8138.00	20	-	10	2	-	17	3	-	-	-	1	1	-	-	15	-	-	-	tr	-	24		-	10	-	-	-	-	-	0.291	0.233	0.000	0.000	0.320	0.155	-	-	-	1	1
8141.10	25	-	20	4	-	20	3	-	-	-	1	tr	-	tr	-	tr	-	-	1	-	13		-	1	-	-	-	-	-	0.511	0.148	0.000	0.000	0.250	0.091	-	-	2	10	12
8156.50	30	-	15	4	-	16	1	-	-	-	1	1	-	tr	17	tr	-	-		-	-	5	-	5	-	-	-	-	5	0.450	0.050	0.000	0.000	0.340	0.160	-	-	-	tr	0
8166.00	25	-	24	5	-	20	tr	-	-	-	tr	tr	-	-	-	tr	-	-	2	-	-	-	-	-	-	-	-	-	tr	0.645	0.000	0.000	0.000	0.289	0.066	-	-	5	18	23
8177.20	30	-	20	3	-	22	8	-	-	-	tr	tr	-	-	-	tr	-	-	1	-	-	-	-	6	-	-	-	-	-	0.556	0.000	0.000	0.000	0.256	0.189	-	-	-	10	10
8181.80	25	-	15	2	-	10	1	-	-	-	tr	-	-	-	-	-	-	-	-	-	45	-	-	1	-	-	-	-	-	0.404	0.455	0.000	0.000	0.101	0.040	-	-	-	1	1
8193.80	25	-	15	3	-	14	3	-	-	-	tr	1	-	tr	-	-	-	-	-	-	35	-	-	2	-	-	-	-	-	0.408	0.357	0.000	0.000	0.143	0.092	-	-	-	2	2
8745.50	25	-	15	3	-	35	4	-	-	-	1	2	-	tr	-	tr	-	-	-	-	-	-	-	2	-	-	-	1	-	0.455	0.000	0.000	0.000	0.409	0.136	-	-	2	10	12
8776.00	35	-	14	5	-	22	1	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	tr	0.598	0.000	0.000	0.000	0.293	0.110	-	-	6	12	18
8794.20	25	-	20	4	-	11	1	-	-	-	tr	1	-	-	3	-	-	-	2	-	-	-	-	1	-	-	-	1	1	0.643	0.000	0.000	0.000	0.229	0.129	-	-	5	20	25
8795.60	22	-	17	5	-	20	1	-	-	-	tr	1	-	1	-	-	-	-	2	-	-	-	-	1	-	-	-	1	tr	0.549	0.000	0.000	0.000	0.310	0.141	-	-	4	14	18
8840.80	15	-	5	2	-	17	4	-	-	-	5	2	-	-	28	-	-	-	-	-	-	-	-	20	-	-	-	-	tr	0.204	0.000	0.000	0.000	0.510	0.286	-	-	-	2	2
10216.30	17	-	10	3	-	35	3	-	-	-	3	1	-	tr	5	-	-	-	-	-	-	-	-	3	20	-	-	-	-	0.270	0.000	0.200	0.000	0.430	0.100	-	-	-	-	0
10490.00	39	-	15	4	-	25	tr	-	-	-	1	tr	-	1	-	tr	-	-	-	-	-	-	-	1	-	-	-	-	tr	0.628	0.000	0.000	0.000	0.302	0.070	-	-	2	10	12
10493.40	30	-	15	4	-	33	2	-	-	-	4	1	-	tr	-	tr	-	-	-	-	-	-	-	3	-	-	-	-	-	0.489	0.000	0.000	0.000	0.402	0.109	-	-	-	8	8
11344.50	30	-	10	4	-	30	5	-	-	-	4	1	-	tr	5	1	-	-	2	-	-	-	-	3	-	-	-	-	tr	0.421	0.000	0.000	0.000	0.442	0.137	-	-	-	5	5
11347.30	24	-	15	5	-	25	1	-	-	-	tr	tr	-	tr	-	tr	-	2	4	1	tr	-	-	1	-	-	-	1	1	0.500	0.000	0.000	0.000	0.388	0.113	-	-	3	17	20
11349.60	25	-	17	5	-	24	1	-	-	-	1	1	-	tr	-	tr	-	-	-		4	-	20	tr	-	-	-	-	tr	0.429	0.041	0.000	0.000	0.255	0.276	-	-	-	1	1

MQ - monocrystalline quartz
PQ - polycrystalline quartz
Ch - chert
Plag - plagioclase
K-spar - potassium feldspar
CRF - clay rock fragments
SidRF - sideritized clay rock fragments

QRF - quartz rock fragments
MRF - metamorphic rock fragments
VL - volcanic lithoclasts
Micas - muscovite, biotite
OM - organic material
Phos - phosphatic grains, fish debris
HM - heavy minerals

Mtx - matrix
Glauc - glauconite
Smec - smetitic clays
Chl - chlorite
Kaol - kaolinite

Si - silica
Ca - calcite
FeC - ferroan calcite
Ba - barite
Sid - siderite
Do - dolomite
FeDo - ferroan dolomite

Leuc - leucoxene
Py - pyrite

HC - hydrocarbon (bitumen)
Undet - undetermined
Secon - secondary
TOTAL - primary+undetermined+secondary

***Data compiled from Open File 1534**

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Well: Mallik A-06
Sequences: Kugmallit, Richards, Reindeer

*TABLE 1d: POINT COUNT DATA AND MINERALOGY

ESTIMATED MODAL ANALYSIS (%) - INCLUDES POROSITY																																								
Depth (ft)	Framework Grains										Accessory				Clays					Cement										Mineralogy							Porosity			
	MQ	PQ	Ch	Plag	K-spar	CRF	SidRF	QRF	MRF	VL	Micas	OM	Phos	HM	Mtx	Glauc	Other	Chl	Kaol	Si	Ca	FeC	Ba	Sid	Do	FeDo	Zeolite	Leuc	Py	Sil	Ca	Dol	Phos	Clays	Other	HC	Primary	Undet	Secon	TOTAL
Kugmallit																																								
4040.30	17	-	20	5	-	20	5	-	-	-	2	1	-	-	8	tr	-	-	-	-	10	-	-	2	-	-	3	-	-	0.398	0.108	0.032	0.000	0.323	0.172	-	-	2	5	7
4040.80	17	-	20	5	-	23	5	-	-	-	4	1	-	-	5	tr	-	-	-	-	5	2	-	2	-	-	4	-	-	0.398	0.075	0.043	0.000	0.344	0.183	-	-	2	6	8
Richards																																								0
9669.70	30	-	34	5	-	8	2	-	-	-	-	tr	2	-	1	-	-	-	-	2	5	-	-	3	-	-	-	-	3	0.695	0.053	0.000	0.021	0.095	0.158	-	-	-	5	5
9669.70	30	-	30	5	-	13	1	-	-	-	-	tr	-	tr		-	-	-	10	3		1	-	2	-	-	-	-		0.663	0.011	0.000	0.000	0.242	0.084	-	-	1	4	5
Taglu																																								
10522.80	30	-	23	5	-	10	3	-	-	-	1	tr	-	tr	-	tr	-	-	-	-	tr	1	-	11	-	-	-	1	-	0.624	0.012	0.000	0.000	0.129	0.235	-	-	3	12	15
10529.50	20	-	10	5	-	17	5	-	-	-	10	1	-	-	4	-	-	-	-	-	2	-	-	3	-	-	-	-	-	0.390	0.026	0.000	0.000	0.403	0.182	-	-	-	20	20
10535.00	26	-	25	5	-	15	1	-	-	-	5	-	-	tr	-	tr	-	-	tr	-	1	1	-	1	-	-	-	-	-	0.638	0.025	0.000	0.000	0.250	0.088	-	-	-	20	20
10538.10	28	-	20	3	-	20	3	-	-	-	10	1	-	-	-	tr	-	-	-	-	tr	1	-	2	-	-	-	-	-	0.545	0.011	0.000	0.000	0.341	0.102	-	-	-	12	12
11854.50	25	-	18	1	-	17	3	-	-	-	-	2	-	-	-	tr	-	-	-	-	25	-	-	2	-	-	-	-	1	0.457	0.266	0.000	0.000	0.181	0.096	-	-	-	5	5

MQ - monocrystalline quartz
PQ - polycrystalline quartz
Ch - chert
Plag - plagioclase
K-spar - potassium feldspar
CRF - clay rock fragments
SidRF - sideritized clay rock fragments
QRF - quartz rock fragments
MRF - metamorphic rock fragments
VL - volcanic lithoclasts
Micas - muscovite, biotite
OM - organic material
Phos - phosphatic grains, fish debris
HM - heavy minerals
Mtx - matrix
Glauc - glauconite
Smec - smetitic clays
Chl - chlorite
Kaol - kaolinite
Si - silica
Ca - calcite
FeC - ferroan calcite
Ba - barite
Sid - siderite
Do - dolomite
FeDo - ferroan dolomite
Leuc - leucoxene
Py - pyrite
HC - hydrocarbon (bitumen)
Undet - undetermined
Secon - secondary
TOTAL - primary+undetermined+secondary

***Data compiled from Open File 1534**

Well: Taglu C-42
Sequences: Richards, Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

*TABLE 1e: POINT COUNT DATA AND MINERALOGY

ESTMATED MODAL ANALYSIS (%) - INCLUDES POROSITY

Depth (ft)	Framework Grains										Accessory				Clays					Cement										Mineralogy							Porosity			
	MQ	PQ	Ch	Plag	K-spar	CRF	SidRF	QRF	MRF	VL	Micas	OM	Phos	HM	Mtx	Glauc	Other	Chl	Kaol	Si	Ca	FeC	Ba	Sid	Do	FeDo	Zeolite	Leuc	Py	Sil	Ca	Dol	Phos	Clays	Other	HC	Primary	Undet	Secon	TOTAL
Richards																																								
8472.90	21.8	14.1	7.6	0.9	1.4	0.9	5.5	8.1	5.1	1.2	3.7	-	-	2.08	2.5	-	-	tr	-	0.2	14.5	0.5	-	-	-	-	-	-	-	0.575	0.167	0.000	0.000	0.135	0.123	-	-	-	5.8	5.8
8474.40	19.7	16	12.3	1.2	2	0.5	4.6	8.1	5.3	1.1	3.6	tr	-	3.2	1	-	-	-	2.5	0.5	6.4		-	-	-	-	-	-	-	0.627	0.071	0.000	0.000	0.143	0.159	-	-	-	9.1	9.1
Taglu																																								
9419.10	12.9	18.3	13.1	1.5	5	0.9	-	9.8	5.1	1.6	0.5	tr	-	5.6	-	-	-	0.2	2.8	1.2	3.8	0.4	-	0.5	-	-	-	tr	-	0.665	0.050	0.000	0.000	0.114	0.171	-	-	-	17.1	17.1
9432.40	10	-	52	2	-	15	1	-	-	-	-	1	-	-	-	-	-	-	2	-	tr	-	-		-	-	-	tr	-	0.747	0.000	0.000	0.000	0.205	0.048	-	-	-	17	17
9475.60	17	23.6	17.5	0.1	0.1	0.9	-	4.2	3.3	5.9	-	-	-	5.7	-	-	-	-	1.2	-	12.9	-	-	tr	-	-	-	-	-	0.674	0.140	0.000	0.000	0.058	0.128	-	-	-	7.4	7.4
9481.00	30	-	20	3	-	11	1	-	-	-	2	-	-	-	-	-	-	-	-	-	30	-	-	1	-	-	-	-	-	0.510	0.306	0.000	0.000	0.133	0.051	-	-	-	2	2
9524.20	10.1	12.8	14.1	1	8	0.4	0.4	3.3	2.7	1.2	-	-	-	2.3	-	-	-	-	4.7	-	26.2	-	-		-	-	-	-	-	0.462	0.300	0.000	0.000	0.089	0.148	-	-	-	12.3	12.3
9526.91	10.1	14.4	33.3	0.5	6	0.2	0.2	2.8	5.7	1.9	-	-	-	1.4	-	-	-	0.2	2.6	0.2	3.1	-	-	0.7	-	-	-	-	-	0.730	0.037	0.000	0.000	0.104	0.128	-	-	-	16.5	16.5
9536.00	30	-	30	3	-	12	-	-	-	-	5	2	-	-	15	tr	-	2	-	-	tr	-	-	tr	-	-	-	tr	tr	0.606	0.000	0.000	0.000	0.343	0.051	-	-	-	3	3
9540.01	8.3	13.2	52.1	0.9	4	0.2	3.5	-	-	1.4			-	0.7	-	-	-	tr	2.1	0.2	2.6	-	-	-	-	-	-	tr	tr	0.827	0.029	0.000	0.000	0.026	0.118	-	-	-	10.6	10.6
9648.41	30	-	20	5	-	17	4	-	-	-	7	4	-	tr	5	tr	-	3	-	-	tr	1	-	1	-	-	-	tr	tr	0.515	0.010	0.000	0.000	0.330	0.144	-	-	-	3	3
9673.60	20	-	29	5	-	20	-	-	-	-	tr	2	-	-	-	-	-	2	tr	-	2	1	-	1	-	-	-	tr	tr	0.598	0.037	0.000	0.000	0.268	0.098	-	-	-	18	18
9687.40	7.6	9.3	12.1	1.2	3.2	0.2	2.2	1	4.4	3	1	3.5	-	-	0.2	-	-	tr	0.5	-	18.3	10	-	tr	16	-	-	-	-	0.320	0.302	0.171	0.000	0.067	0.140	-	-	-	6.2	6.2
9742.80	25	-	15	7	-	21	1	-	-	-	3	2	-	-	3	-	-	1	1	-	1	2	-	3	-	-	-	tr	tr	0.471	0.035	0.000	0.000	0.341	0.153	-	-	-	15	15
10430.80	24	-	15	6	-	30	3	-	-	-	7	1	-	-	5	tr	-	1	tr	-	-	-	-	3	-	-	-	tr	tr	0.411	0.000	0.000	0.000	0.453	0.137	-	-	-	5	5
10444.70	18.6	14.4	15	0.5	4.8		1.6	7.3	7.5	2.7	4.8	0.7	-	2.1	-	tr	-	-	4.1	tr	-	tr	-	5	-	-	-	-	-	0.621	0.000	0.000	0.000	0.184	0.195	-	-	-	10.9	10.9
10464.40	25	-	35	6	-	12	tr	-	-	-	1	1	-	-	-	-	-	tr	tr	2	tr	-	-	tr	-	-	-	tr	tr	0.756	0.000	0.000	0.000	0.159	0.085	-	-	-	17	17
10476.00	31	-	25	7	-	10	1	-	-	-	4	tr	-	-	-	1	-	-	3	1	2	-	-	2	-	-	-	tr	-	0.655	0.023	0.000	0.000	0.207	0.115	-	-	-	12	12
10497.00	30	-	10	6	-	9		-	-	-	2	tr	-	-	-	1	-	-	-	-	38	-	-	2	-	-	-	-	-	0.408	0.388	0.000	0.000	0.122	0.082	-	-	-	2	2
10516.00	19	18.2	4.4	2.2	7.4	1	2.2	3.9	5.5	1.5	5.5	0.5	-	5.3	-	tr	-	tr	3.6	-	4.6	-	-	4.1	-	-	-	tr	tr	0.512	0.052	0.000	0.000	0.175	0.261	-	-	-	11.4	11.4
11508.50	29	-	13	7	-	25	1	-	-	-	6	1	-	-	-	1		3	4	-	1	-	-	1	-	-	-	1	-	0.452	0.011	0.000	0.000	0.419	0.118	-	-	-	5	5

MQ - monocrystalline quartz
PQ - polycrystalline quartz
Ch - chert
Plag - plagioclase
K-spar - potassium feldspar
CRF - clay rock fragments
SidRF - sideritized clay rock fragments

QRF - quartz rock fragments
MRF - metamorphic rock fragments
VL - volcanic lithoclasts
Micas - muscovite, biotite
OM - organic material
Phos - phosphatic grains, fish debris
HM - heavy minerals

Mtx - matrix
Glauc - glauconite
Smec - smetitic clays
Chl - chlorite
Kaol - kaolinite

Si - silica
Ca - calcite
FeC - ferroan calcite
Ba - barite
Sid - siderite
Do - dolomite
FeDo - ferroan dolomite

Leuc - leucoxene
Py - pyrite

HC - hydrocarbon (bitumen)
Undet - undetermined
Secon - secondary
TOTAL - primary+undetermined+secondary

***Data compiled from Open File 1534**

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Well: Niglintgak M-19
Sequence: Taglu

*TABLE 1f: POINT COUNT DATA AND MINERALOGY

ESTIMATED MODAL ANALYSIS (%) - INCLUDES POROSITY

Depth (ft)	Framework Grains										Accessory				Clays					Cement										Mineralogy							Porosity			
	MQ	PQ	Ch	Plag	K-spar	CRF	SidRF	QRF	MRF	VL	Micas	OM	Phos	HM	Mtx	Glauc	Other	Chl	Kaol	Si	Ca	FeC	Ba	Sid	Do	FeDo	Zeolite	Leuc	Py	Sil	Ca	Dol	Phos	Clays	Other	HC	Primary	Undet	Secon	TOTAL
Taglu																																								
3190.20	20	-	10	2	-	29	2	-	-	-	5	1	-	-	-	-	-	-		-	30	-	-	2	-	-	-	-	-	0.297	0.297	0.000	0.000	0.337	0.069	-	-	-	-	0
3273.00	15	-	25	3	-	20	1	-	-	-		tr	-	-	-	-	3	-	3	-	-	-	-	2	-	-	-	tr	-	0.556	0.000	0.000	0.000	0.361	0.083	-	-	10	18	28
3306.50	17	-	20	3	-	25	3	-	-	-	tr	1	-	-	-	tr	3	-	10	-	-	-	-	3	-	-	-	tr	-	0.435	0.000	0.000	0.000	0.447	0.118	-	-	-	15	15
3589.50	23	-	15	3	-	25	1	-	-	-	2	tr	-	-	-	tr	3	-	8	-	1	-	-	1	-	-	-	tr	tr	0.463	0.012	0.000	0.000	0.463	0.061	-	-	-	20	20
3901.70	17	-	16	2	-	18	2	-	-	-	2	tr	-	-	-	tr	-	-	2	-	35	-	-	2	-	-	-	tr	-	0.344	0.365	0.000	0.000	0.229	0.063	-	-	-	4	4
3907.00	25	-	20	4	-	25	1	-	-	-	2	1	-	-	-	-	-	-	6	-	-	-	-	1	tr	-	-	tr	tr	0.529	0.000	0.000	0.000	0.388	0.082	-	-	-	18	18
4290.60	28	-	15	3	-	30	2	-	-	-	5	1	-	-	5	-	-	-	tr	-	-	-	-	8	-	-	-	tr	-	0.443	0.000	0.000	0.000	0.412	0.144	-	-	-	3	3
4375.50	25	-	24	4	-	20	2	-	-	-	2	-	-	-	-	tr	-	-	3	tr	-	-	-	7	5	-	-	-	-	0.533	0.000	0.054	0.000	0.272	0.141	-	-	3	5	8
8909.00	40	-	42	2	-	10	tr	-	-	-	-	-	-	-	-	tr	-	-	tr	4	tr	-	-	tr	tr	-	-	-	-	0.878	0.000	0.000	0.000	0.102	0.020	-	-	-	2	2
9025.5 (9052.5)	30	-	20	3	-	33	3	-	-	-	4	-	-	-	4	tr	-	-		tr	tr	-	-	2	tr	-	-	-	-	0.505	0.000	0.000	0.000	0.414	0.081	-	-	-	1	1

MQ - monocrystalline quartz
PQ - polycrystalline quartz
Ch - chert
Plag - plagioclase
K-spar - potassium feldspar
CRF - clay rock fragments
SidRF - sideritized clay rock fragments
QRF - quartz rock fragments
MRF - metamorphic rock fragments
VL - volcanic lithoclasts
Micas - muscovite, biotite
OM - organic material
Phos - phosphatic grains, fish debris
HM - heavy minerals
Mtx - matrix
Glauc - glauconite
Smec - smetitic clays
Chl - chlorite
Kaol - kaolinite
Si - silica
Ca - calcite
FeC - ferroan calcite
Ba - barite
Sid - siderite
Do - dolomite
FeDo - ferroan dolomite
Leuc - leucoxene
Py - pyrite
HC - hydrocarbon (bitumen)
Undet - undetermined
Secon - secondary
TOTAL - primary+undetermined+secondary

***Data compiled from Open File 1534**

Well: Ellice O-14
Sequences: Taglu, Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

*TABLE 1g: POINT COUNT DATA AND MINERALOGY

ESTIMATED MODAL ANALYSIS (%) - INCLUDES POROSITY

Depth (ft)	Framework Grains										Accessory				Clays					Cement										Mineralogy							Porosity			
	MQ	PQ	Ch	Plag	K-spar	CRF	SidRF	QRF	MRF	VL	Micas	OM	Phos	HM	Mtx	Glauc	Other	Chl	Kaol	Si	Ca	FeC	Ba	Sid	Do	FeDo	Zeolite	Leuc	Py	Sil	Ca	Dol	Phos	Clays	Other	HC	Primary	Undet	Secon	TOTAL
Taglu																																								
800.00	20	-	10	3	-	47	1	-	-	-	2	1	-	-	1	1	-	-	-	-	-	-	-	2	-	-	-	2	1	0.330	0.000	0.000	0.000	0.560	0.110	-	5	5	5	15
1802.00	19	-	8	2	-	40	1	-	-	-	3	2	-	-	8	tr	-	-	-	-	-	-	-	3	-	-	-	-	1	0.310	0.000	0.000	0.000	0.586	0.103	-	1	4	8	13
2892.00	20	-	5	5	-	41	2	-	-	-	5	3	-	-	13	tr	-	-	-	-	tr	-	-	4	-	-	-	-	-	0.255	0.000	0.000	0.000	0.602	0.143	-	-	-	2	2
3928.00	22	-	20	4	-	15	2	-	-	-	-	-	-	-	-	-	-	-	-	-	34	-	-	2	-	-	-	-	-	0.424	0.343	0.000	0.000	0.152	0.081	-	-	-	1	1
3932.50	25	-	23	5	-	15	1	-	-	-		tr	-	-	5	-	-	-	1	-	-	-	-	tr	-	-	-	-	-	0.640	0.000	0.000	0.000	0.280	0.080	-	-	5	19	24
5261.50	19	-	19	3	-	40	2	-	-	-	2	1	-	-	-	tr	-	-	2	-	tr	-	-	1	-	-	-	tr	-	0.427	0.000	0.000	0.000	0.494	0.079	-	-	-	11	11
5279.80	20	-	18	3	-	45	3	-	-	-	2	1	-	-	-	-	-	-	2	-		-	-	2	-	-	-	tr	-	0.396	0.000	0.000	0.000	0.510	0.094	-	-	-	4	4
6297.00	20	-	10	3	-	36	4	-	-	-	3	tr	-	-	-	-	-	-	-	-	20	-	-	4	-	-	-	-	-	0.300	0.200	0.000	0.000	0.390	0.110	-	-	-	-	0
Aklak																																								0
6790.30	20	-	20	4	-	35	1	-	-	-	tr	1	-	-	-	-	-	-	3	-	tr	-	-	1	-	-	-	-	-	0.471	0.000	0.000	0.000	0.447	0.082	-	-	-	15	15
6830.70	20	-	13	4	-	35	2	-	-	-	2	1	-	-	-	-	-	-	1	-	tr	-	-	3	-	-	-	1	tr	0.402	0.000	0.000	0.000	0.463	0.134	-	-	-	8	8
7883.80	35	-	25	4	-	25	2	-	-	-	2	1	-	-	-	-	-	-	1	-	tr	-	-	1	-	-	-	tr	-	0.625	0.000	0.000	0.000	0.292	0.083	-	-	-	4	4
7915.50	30	-	24	4	-	25	2	-	-	-	1	1	-	-	10	-	-	tr		-	1	-	-	2	-	-	-	-	-	0.540	0.010	0.000	0.000	0.360	0.090	-	-	-	-	0
8840.30	30	-	25	4	-	30	3	-	-	-	3	1	-	-	-	tr	-	-		-	tr	-	-	3	-	-	-	-	-	0.556	0.000	0.000	0.000	0.333	0.111	-	-	-	1	1
9471.00	30	-	30	4	-	20	1	-	-	-	tr	tr	-	-	-	-	-	-	1	3	2	-	-	1	tr	-	-	-	-	0.685	0.022	0.000	0.000	0.228	0.065	-	-	-	8	8
9483.50	25	-	15	4	-	43	1	-	-	-	4	tr	-	-	-	-	-	-	1	1	3	-	-	3	-	-	-	tr	-	0.410	0.030	0.000	0.000	0.480	0.080	-	-	-	-	0
9527.00	37	-	30	3	-	18	1	-	-	-	2	-	-	-	-	-	-	-		3	1	-	-	2	-	-	-	-	-	0.722	0.010	0.000	0.000	0.206	0.062	-	-	-	3	3

MQ - monocrystalline quartz
PQ - polycrystalline quartz
Ch - chert
Plag - plagioclase
K-spar - potassium feldspar
CRF - clay rock fragments
SidRF - sideritized clay rock fragments

QRF - quartz rock fragments
MRF - metamorphic rock fragments
VL - volcanic lithoclasts
Micas - muscovite, biotite
OM - organic material
Phos - phosphatic grains, fish debris
HM - heavy minerals

Mtx - matrix
Glauc - glauconite
Smec - smetitic clays
Chl - chlorite
Kaol - kaolinite

Si - silica
Ca - calcite
FeC - ferroan calcite
Ba - barite
Sid - siderite
Do - dolomite
FeDo - ferroan dolomite

Leuc - leucoxene
Py - pyrite

HC - hydrocarbon (bitumen)
Undet - undetermined
Secon - secondary
TOTAL - primary+undetermined+secondary

***Data compiled from Open File 1534**

Amerk A-09

Thin Section Overviews

And

Select Described Photomicrographs

Amerk A-09 1534.35 meters (a)

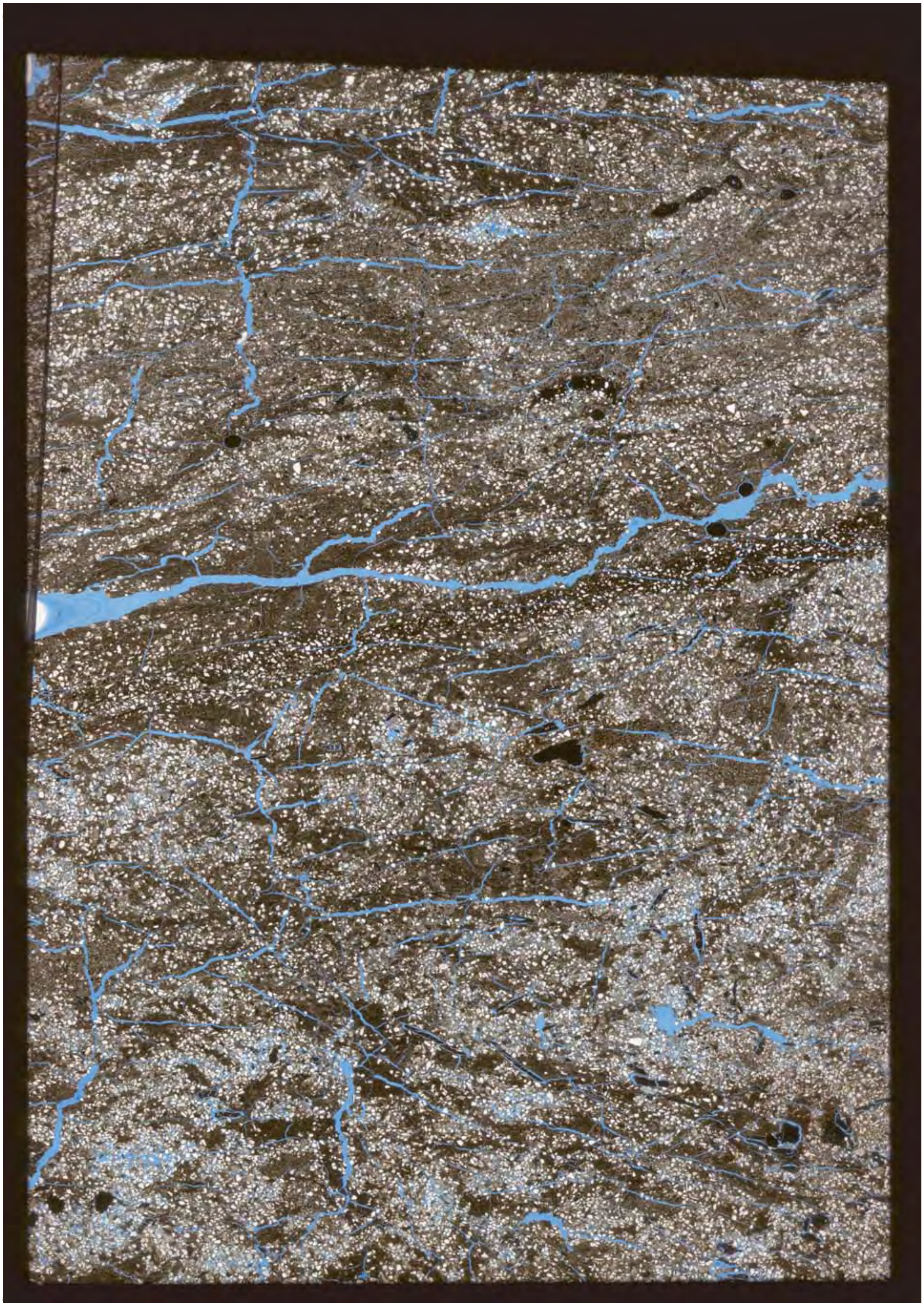
Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Amerk A-09 1534.35 meters (b)



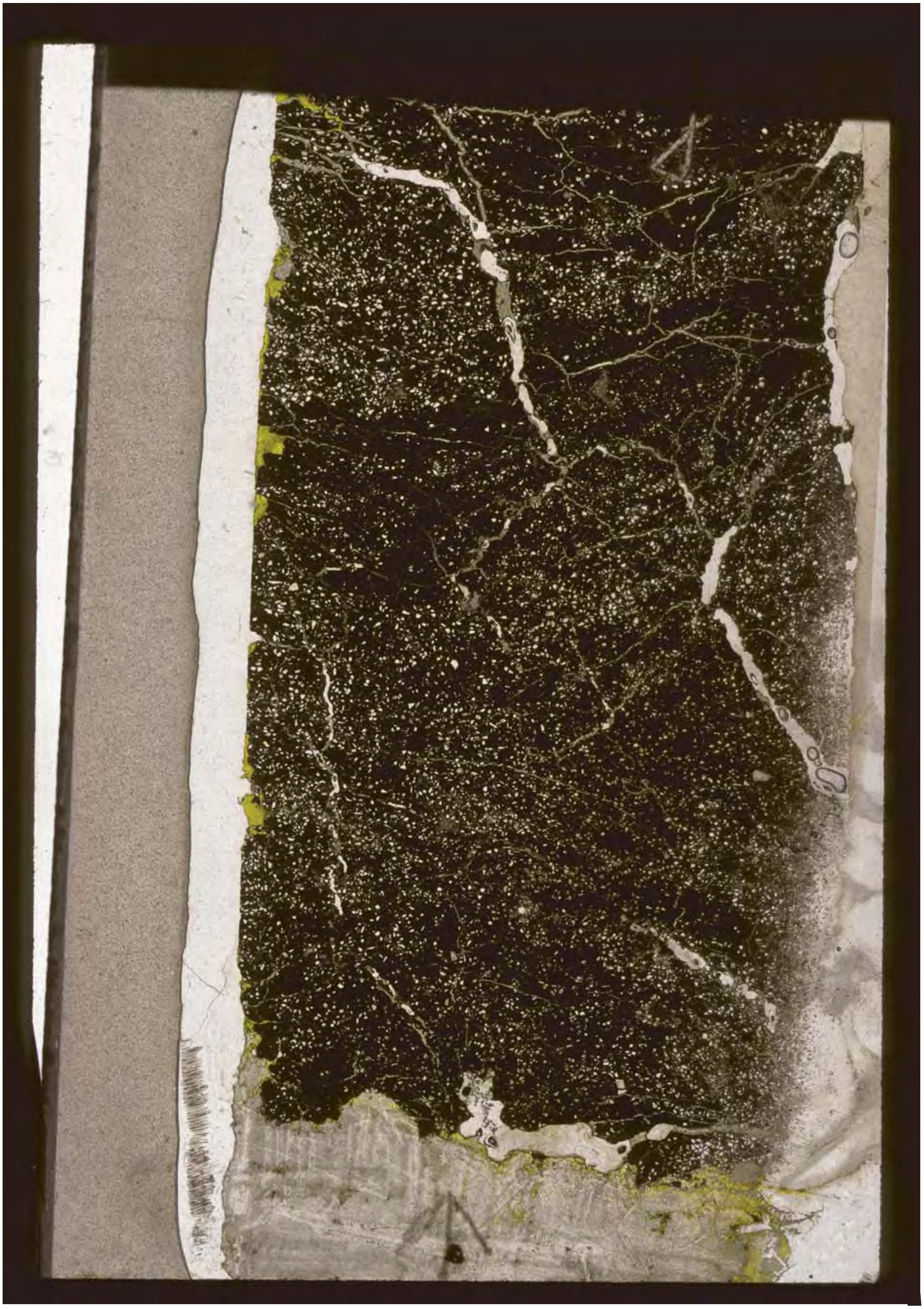
Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Amerk A-09 1534.35 meters (c)



Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 01

Amerk O-09
Kugmallit
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 26-02
Depth: 1534.35 meters

Poorly sorted, lower fine grained litharenites characterize the Kugmallit clastics recovered from core at 1534.35 meters. Grain contacts are mainly tangential with labile constituents compacted between more competent grains. Framework grains include monocrystalline quartz (Q), chert, K-feldspar, plagioclase, organic material (OM) and micas (biotite, muscovite). Authigenic phases are poorly developed and patchily distributed comprised of trace amounts of non-ferroan dolomite cement (Views C and D, P:10). Small yellow arrows highlight the effective macropore system. Note three Overview thin section images illustrate the Kugmallit clastics recovered from this interval. The “a” Overview shows preferential alignment of organic material. The “b and c” Overview photographs show abundant silt-sized framework grains and minor organic material scattered in a brown clay matrix.

Photo A: 40X PPL, Photo B: 100X PPL, Photo C: 200X PPL, Photo D: 200X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

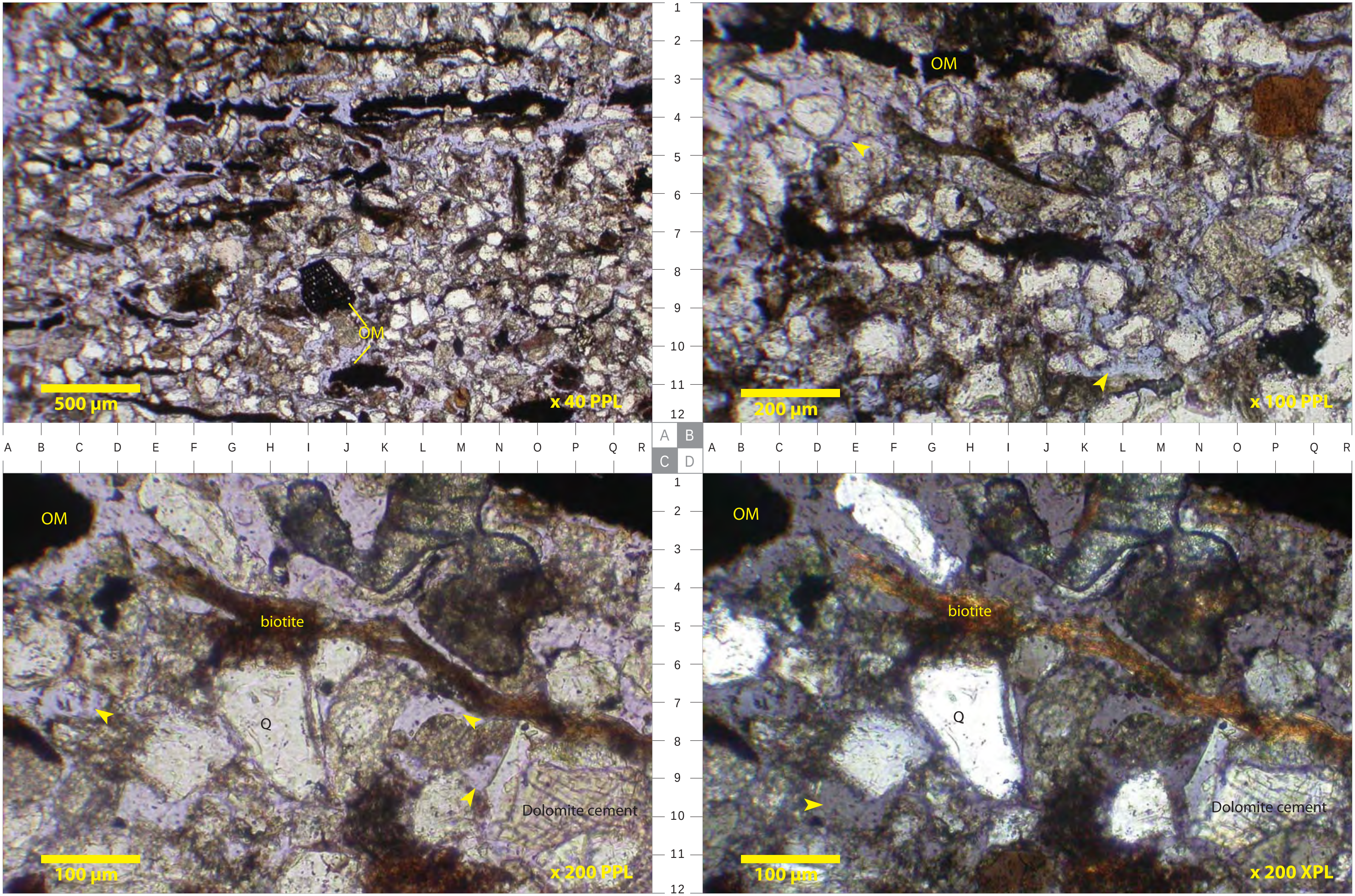


Plate 01
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Amerk A-09 2067.10 meters (a)

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Amerk A-09 2067.10 meters (b)

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Amerk A-09 2067.10 meters (c)

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 02

Amerk O-09
Kugmallit
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 26-03
Depth: 2067.10 meters

Laminated and bioturbated silt to lower fine grained, moderately sorted Kugmallit sandstones were recovered from core taken at 2067.10 meters. Subangular to subrounded moncrystalline quartz, chert, organic material (OM), yellow stained K-feldspar (View B, G:7-8) and clay-rich sedimentary grains are the main framework constituents. Diagenetic cements are poorly developed comprised of rare non-ferroan dolomite cement (View D, large green arrow). Dissolution of feldspathic framework grains (Views C and D) post-dates carbonate cementation. Grain contacts are mainly tangential and concavo-convex. The latter is mainly associated with labile constituents compacted between more competent framework grains. Enlarged secondary pores result from the complete dissolution of feldspathic grains (View B, M-N:6) and carbonate cement (View D, large green arrow).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

Amerk O-09

2067.10 meters

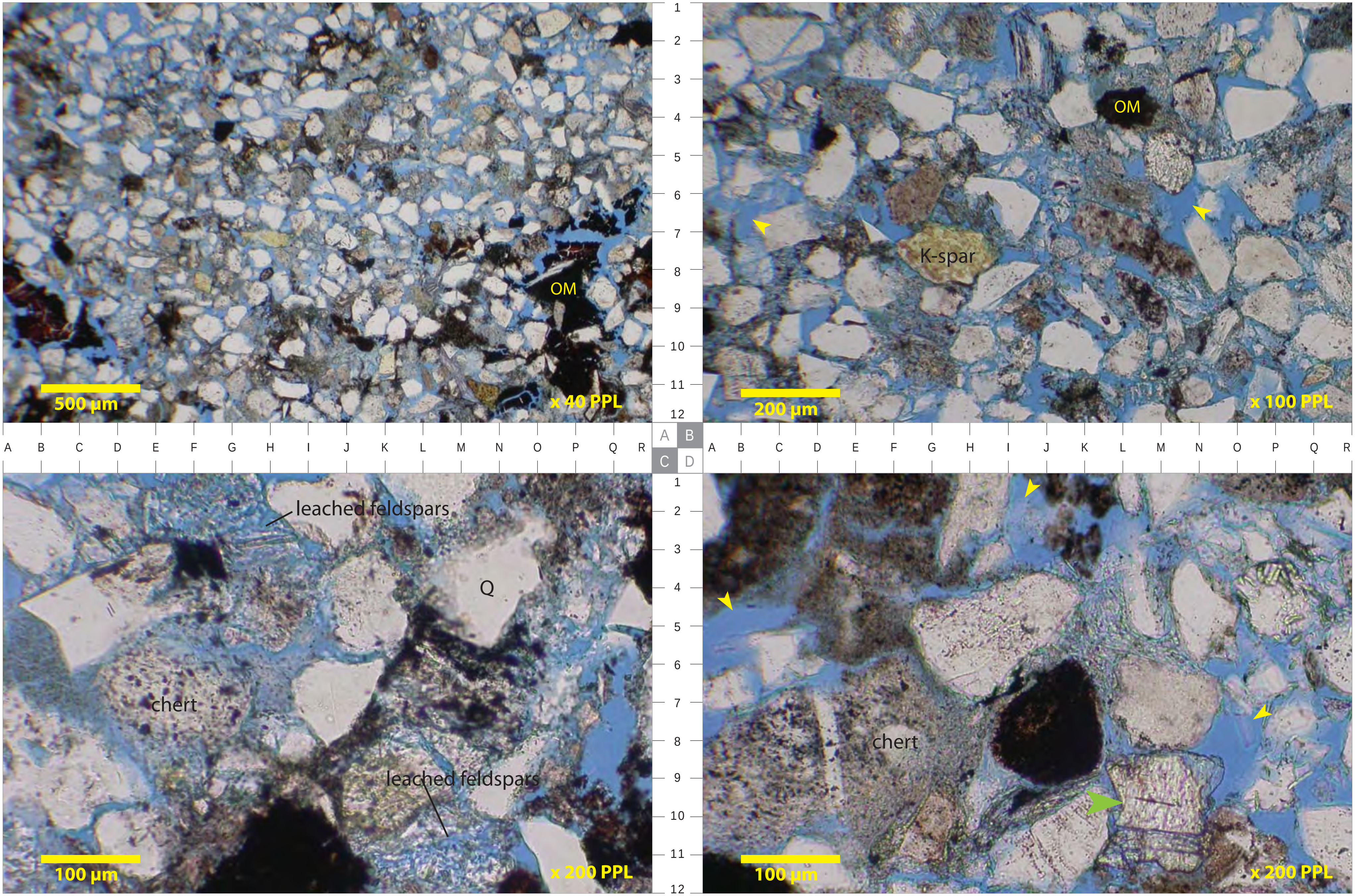


Plate 02
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Amerk A-09 2069.43 meters (a)

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Amerk A-09 2069.43 meters (b)

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 03

Amerk O-09
Kugmallit
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 26-04
Depth: 2069.43 meters

Laminated, well sorted slit to very fine grained litharenites were encountered by core recovered at 2069.43 meters from Amerk O-09. Effective macroporosity is poorly developed in this interval. Framework grains are dominated by subrounded to subangular monocrystalline quartz (Q), yellow stained K-feldspar, muscovite (View D, H-I:3), and organic material (OM). Authigenic cements are very poorly developed in this section. Note tangential and concavo-convex grain contacts.

Photo A: 100X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

Amerk O-09

2069.43 meters

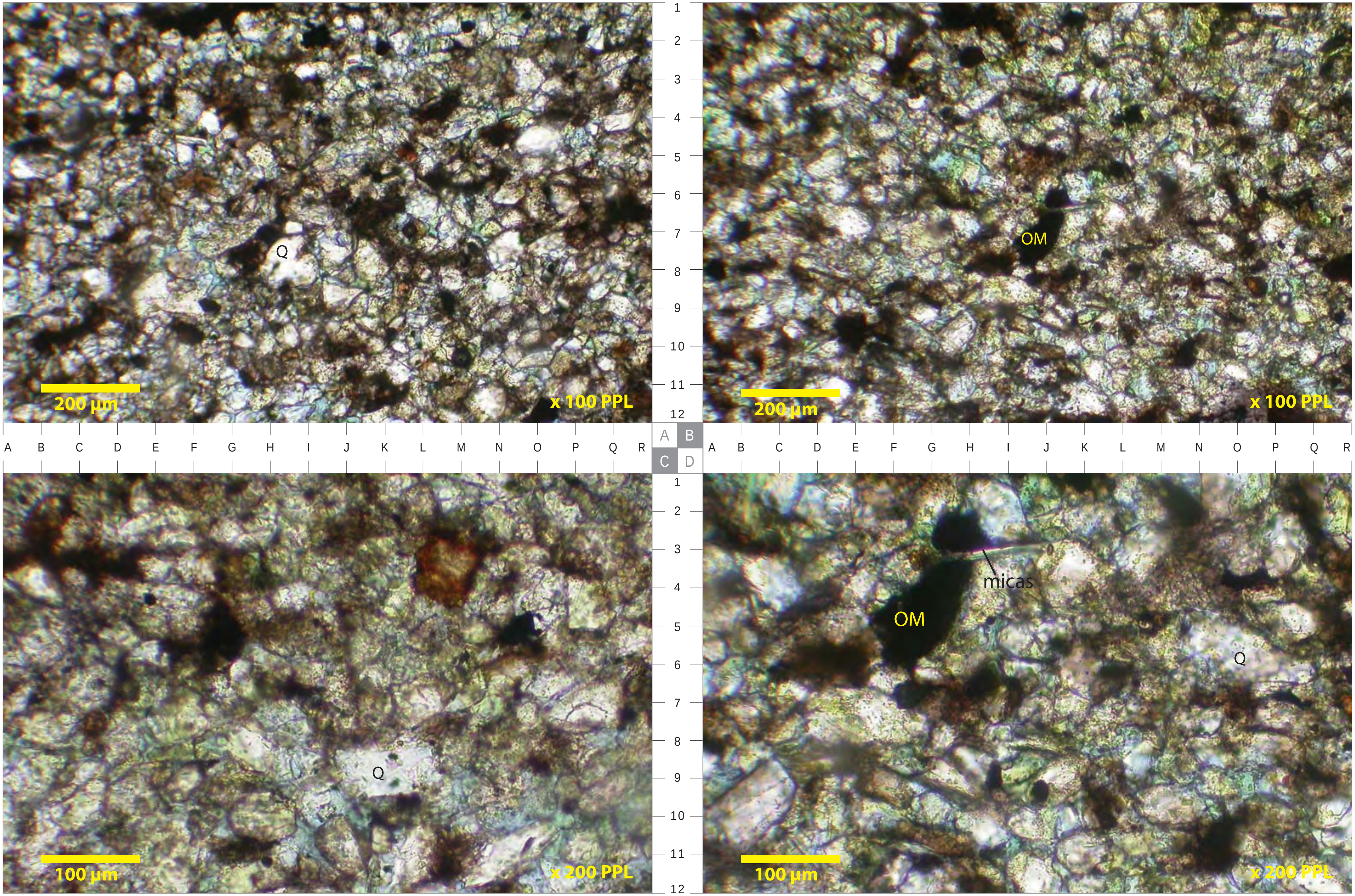


Plate 03
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Amerk A-09 3860.17 meters (a)

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Amerk A-09 3860.17 meters (b)

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 04

Amerk O-09
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 26-05
Depth: 3860.17 meters

Laminated, moderately well sorted, fine grained litharenites characterize the Richards Sequence recovered from core at 3860.17 meters. Effective macroporosity (small yellow arrows) is very well developed in this interval. Authigenic phases include syntaxial quartz overgrowths (small black arrows), rare kaolinite clays loosely packed within open pores (View C, “K”) pyrite precipitated within framework grain micropores (View D, I:11) and rare patchily distributed non-ferroan pink stained calcite cement (View A, M:9-10). Framework grains include fine grained subrounded to subangular monocrystalline quartz (Q), chert, yellow stained K-feldspar, clay-rich sedimentary lithoclasts (CRF) and preferentially partially leached feldspathic grains (View B; View D). Note mechanical compaction of labile framework grain constituents. (View A, K:7).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Amerk O-09

3860.17 meters

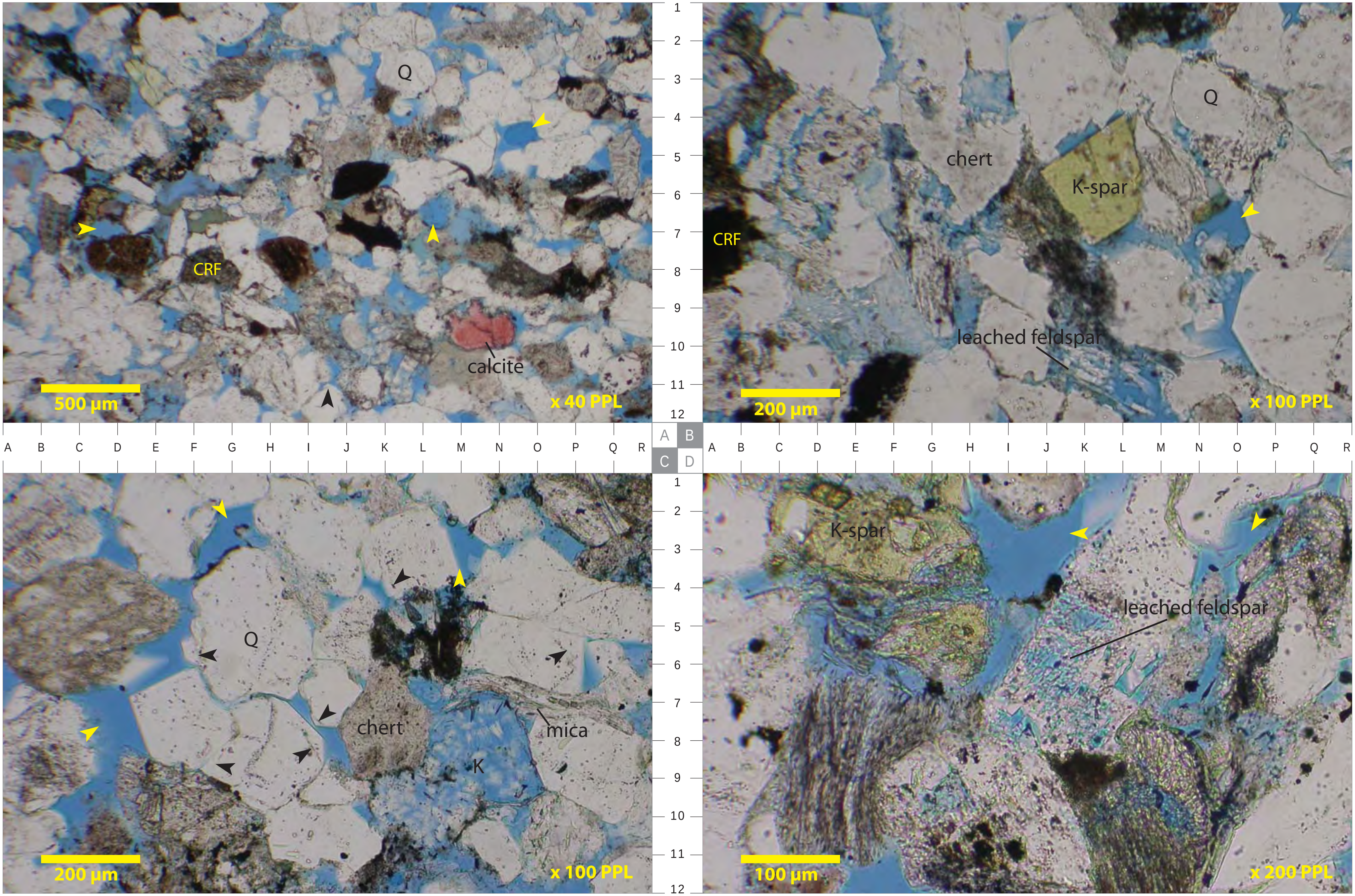


Plate 04
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Amerk A-09 3860.75 meters

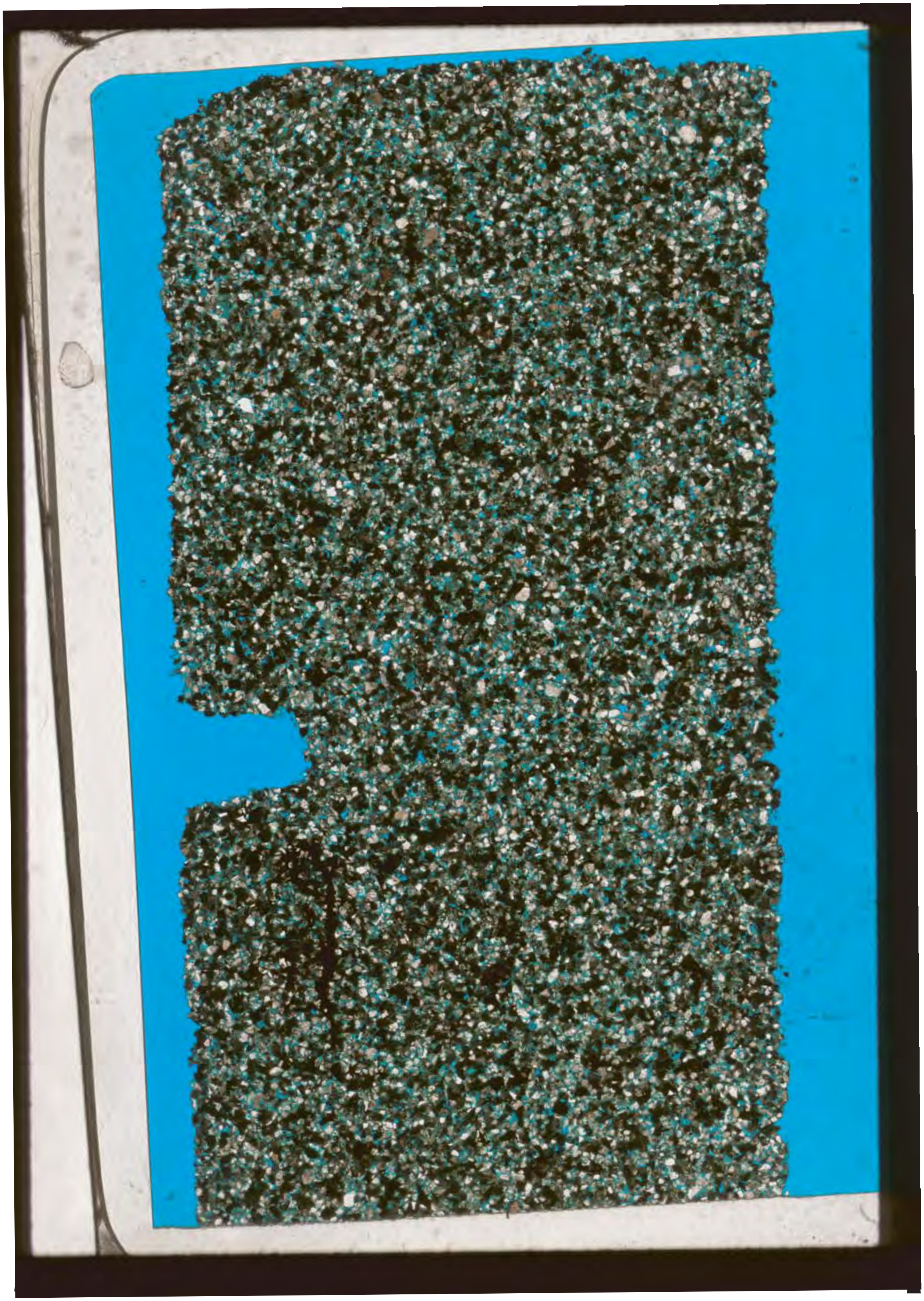
Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Amerk A-09 3862.50 meters



Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 05

Amerk O-09
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 3862.50 meters

Effective porosity (small yellow arrows) is preserved between framework constituents in this laminated, fine grained, well sorted litharenite. Common subrounded dark brown to black clay-rich sedimentary grains (?organic material) plus subordinate amounts of monocrystalline quartz and chert dominate the framework components. Dissolution of non-ferroan carbonate cement (View D, M:8) has enhanced the effective macropore system (small yellow arrows). Note poorly developed, discontinuous quartz overgrowths (small black arrow) precipitated on host quartz grains (possibly reworked quartz grain). Dust rim on host quartz grain outlines the quartz overgrowth. Partially leached feldspar grains (View C) contribute to non-effective microporosity.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Amerk O-09

3862.50 meters

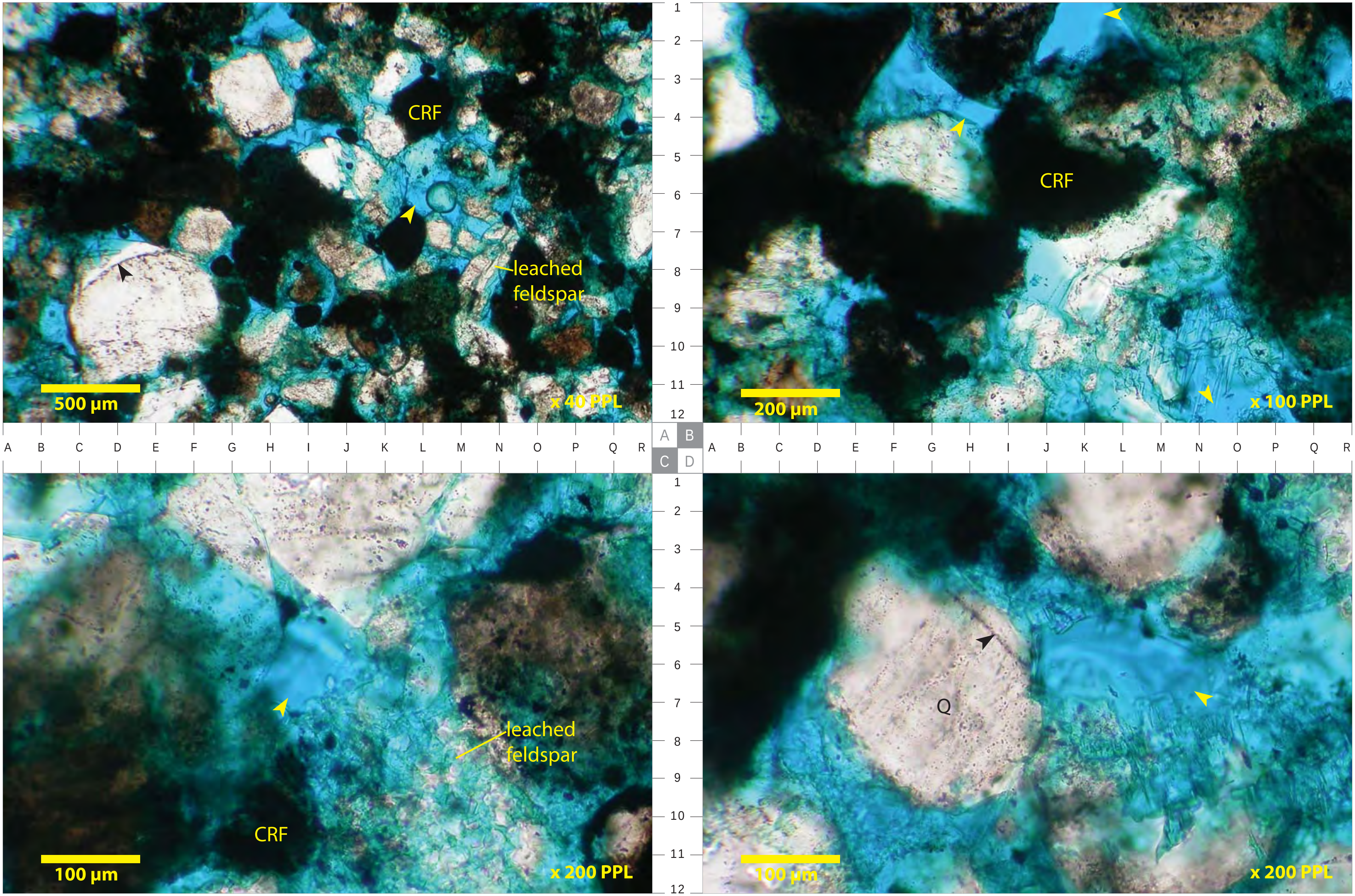


Plate 05
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Amerk A-09 3862.67 meters

2 mm

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Amerk A-09 3862.67 meters (b)

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 06

Amerk O-09
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 26-06
Depth: 3862.67 meters

Bioturbated and faintly laminated litharenites characterize the Richards Sequence recovered from core at 3862.67 meters. Patchily distributed non-ferroan pink stained sparry calcite cement is illustrated in Views B and D. Non-ferroan calcite cement replaces feldspars as shown in View D. Dissolution of feldspathic grains predates calcite precipitation. Partial dissolution of feldspathic grains results in intragranular porosity (View C, F:5). Note trace loosely packed kaolinite fines (View D, K-L:11; H:6). Quartz overgrowths are poorly developed on host quartz grains. Trace amounts of pyrite has precipitated within chert micropores. Framework grains are comprised of monocrystalline quartz (Q), chert, dark brown to black clay-rich sedimentary grains, organic material, yellow stained K-feldspar. Grain contacts are mainly tangential in this section. The calcite cement in Views A (K:6) and C (K:9) is not stained.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Amerk O-09 **3862.67 meters**

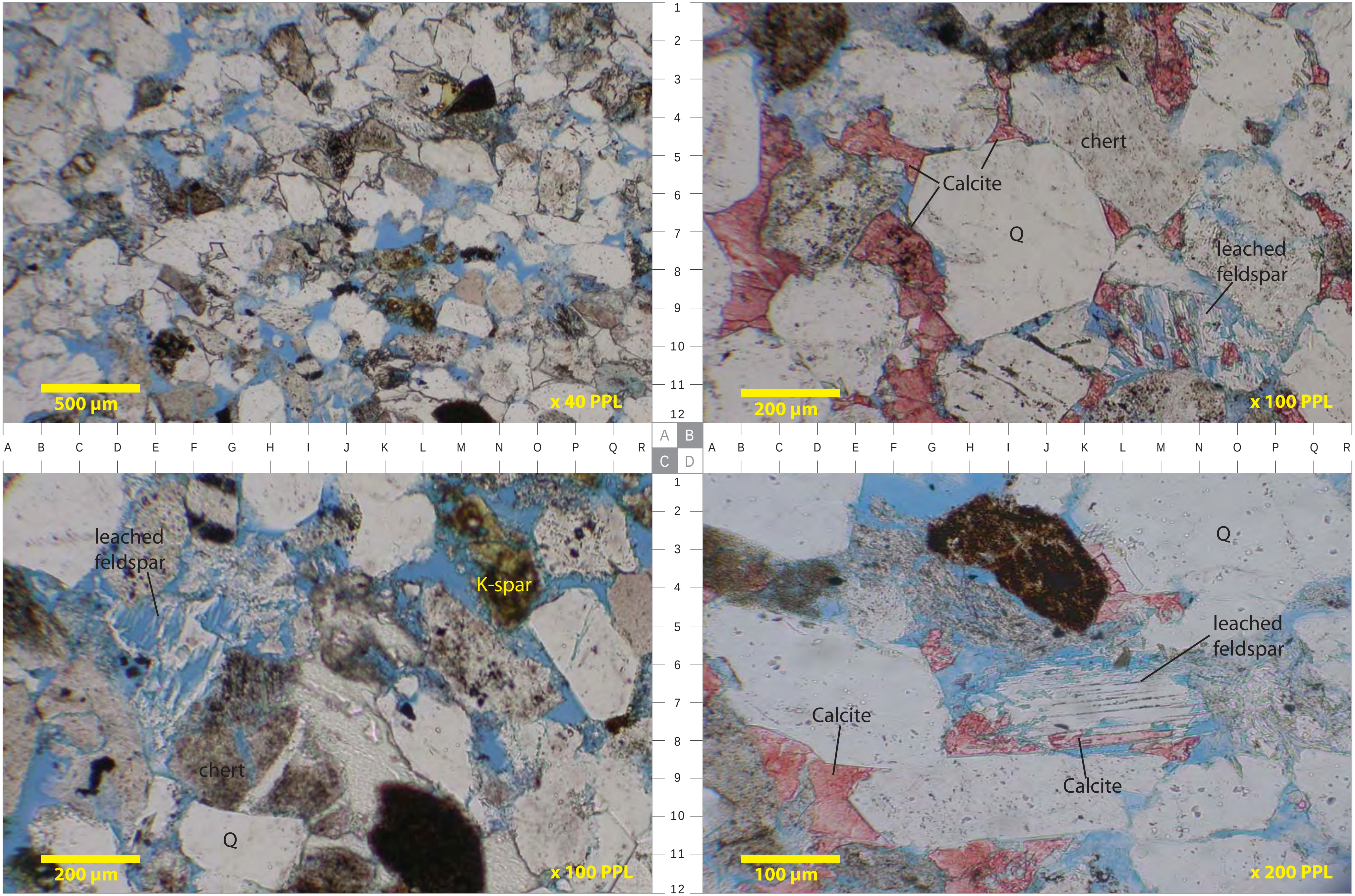


Plate 06
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 07

Amerk O-09
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 3867.20 meters

Thin section photomicrographs illustrate dissolution of feldspathic grains resulting in enlarged effective secondary macropores. Trace pyrite has precipitated within chert micropores (View C, M:10). Non-ferroan pink stained calcite spar cement is patchily distributed (View C, R:5; View D, O:6). Early precipitation of the calcite cement has prevented extensive mechanical compaction. Subsequent dissolution of this carbonate cement has enhanced the effective pore system. Rare loosely packed kaolinite is shown in View C, F-G:11-12). Monocrystalline quartz (Q), chert, dark brown to black clay-rich sedimentary grains (CRF), organic material, muscovite and feldspathic grains are the main framework constituents.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Amerk O-09 **3867.20 meters**

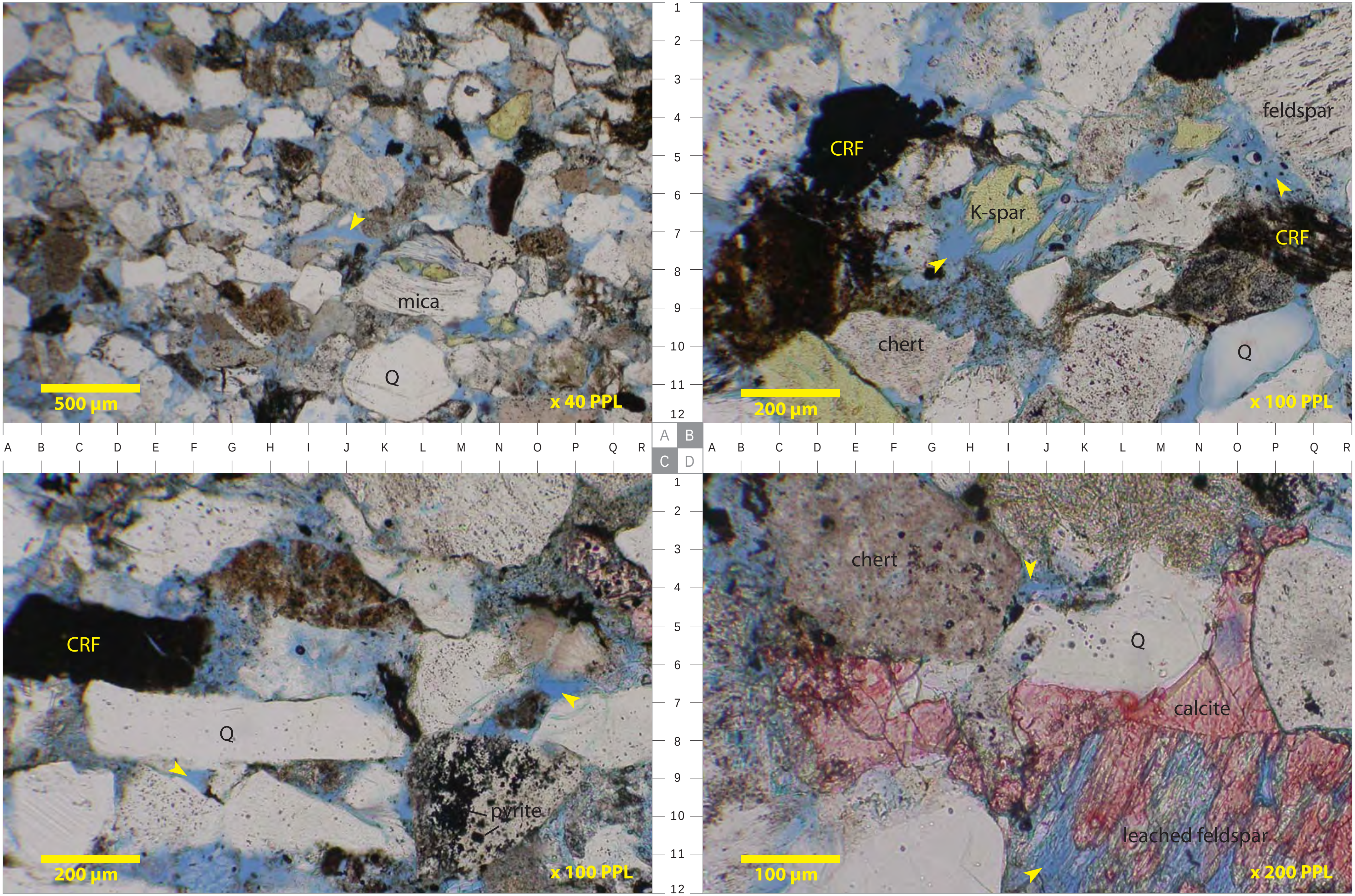


Plate 07
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Amerk A-09 3867.50 meters (a)

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Amerk A-09 3867.50 meters (b)

2 mm

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 08

Amerk O-09
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 26-07
Depth: 3867.50 meters

Unevenly distributed, non-ferroan pink stained calcite cement is the main pore occluding authigenic phase in this laminated, fine grained, moderately well sorted Richards litharenite. Kaolinite booklets are engulfed by calcite cement (View D, O:8) suggesting that the kaolinite clays predate carbonate precipitation. Calcite cement predates feldspathic grain dissolution (View B) and postdates feldspar dissolution (View C). Subsequent carbonate dissolution has enhanced the effective pore system (small yellow arrows). View C shows microsiderite predates calcite cementation (H:2). Note pyrite precipitated within chert micropores (View D, H:9). Quartz overgrowths are rare, precipitated on host monocrystalline quartz grains. Framework grains are comprised of subrounded to subangular monocrystalline quartz (Q), chert, feldspars, clay-rich sedimentary grains and micas.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Amerk O-09 **3867.50 meters**

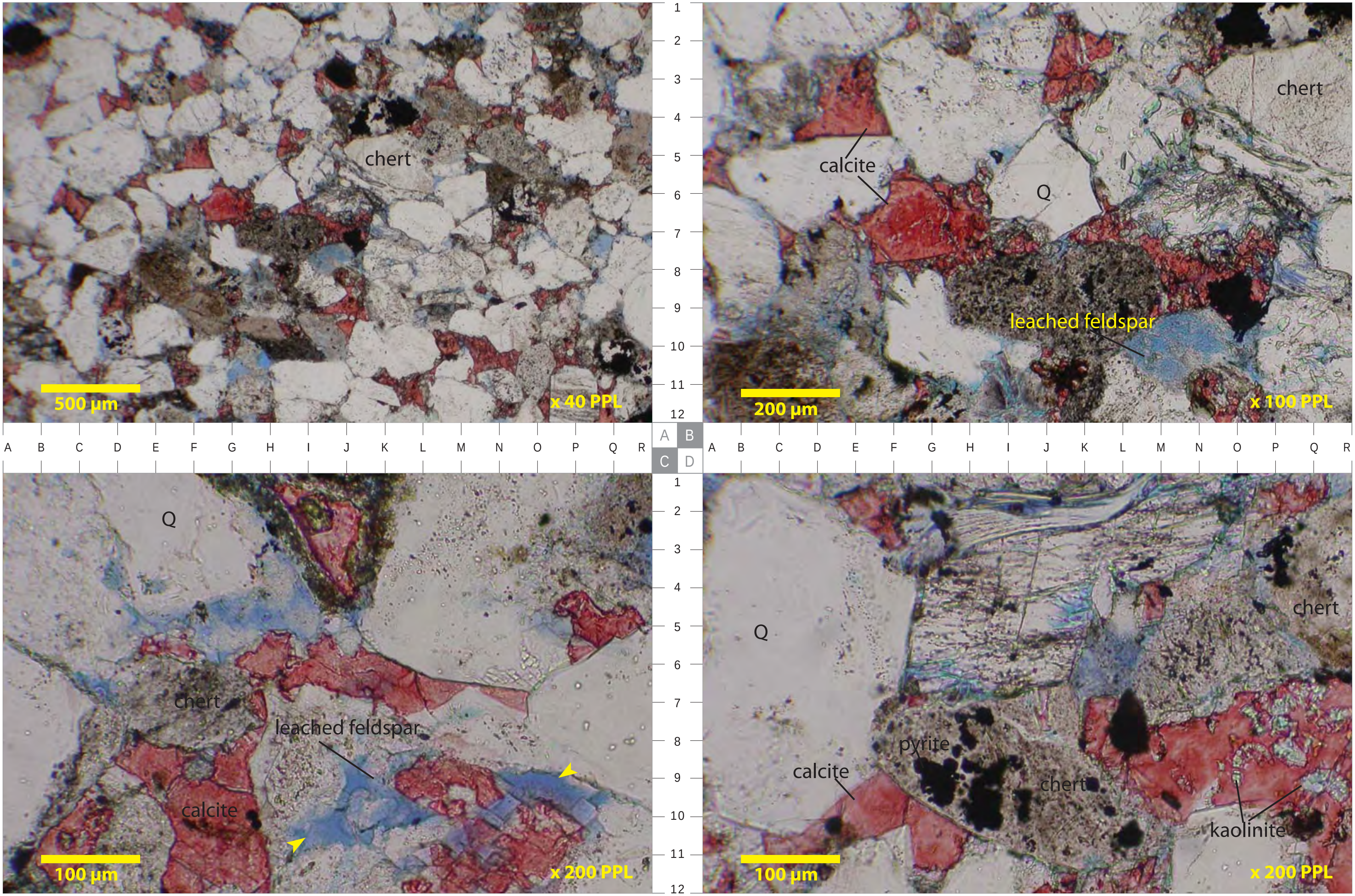
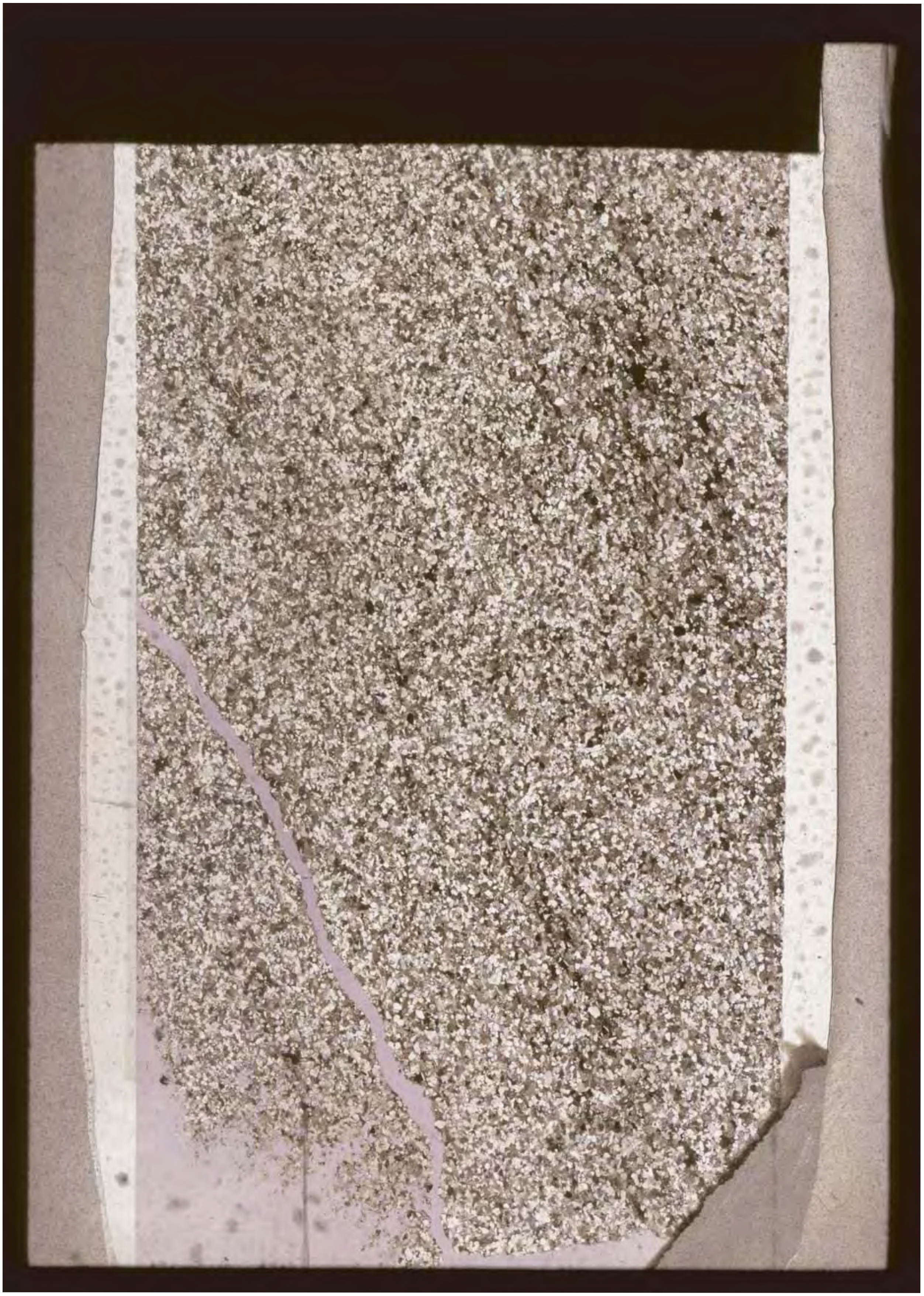


Plate 08
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Amerk A-09 4307.94 meters



Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Amerk A-09 4370.94 meters

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 09

Amerk O-09
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 26-08
Depth: 4370.94 meters

Faintly laminated, bioturbated moderately well sorted fine grained litharenites are recognized from core recovered at 4370.94 meters. Grain contacts are tangential and concavo-convex, the latter reflecting moderate mechanical compaction. Preferential dissolution of feldspathic grains has yielded isolated effective macropores (View A, small yellow arrow). Microsiderite (View D: large green arrows) unevenly rims framework grains. Kaolinite is found loosely packed within macropores (View C, “K”). Rare pyrite has precipitated within chert micropores (View B). Pink stained non-ferroan calcite is patchily distributed (View B). Views A and D show rare quartz syntaxial cement (small black arrows) precipitated on host monocrystalline quartz (Q) grains. Monocrystalline quartz, chert, sideritic clasts, feldspars and micas are the main framework lithoclasts.

Photo A: 100X PPL,   Photo B: 100X PPL,   Photo C: 200X XPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Amerk O-09 **4370.94 meters**

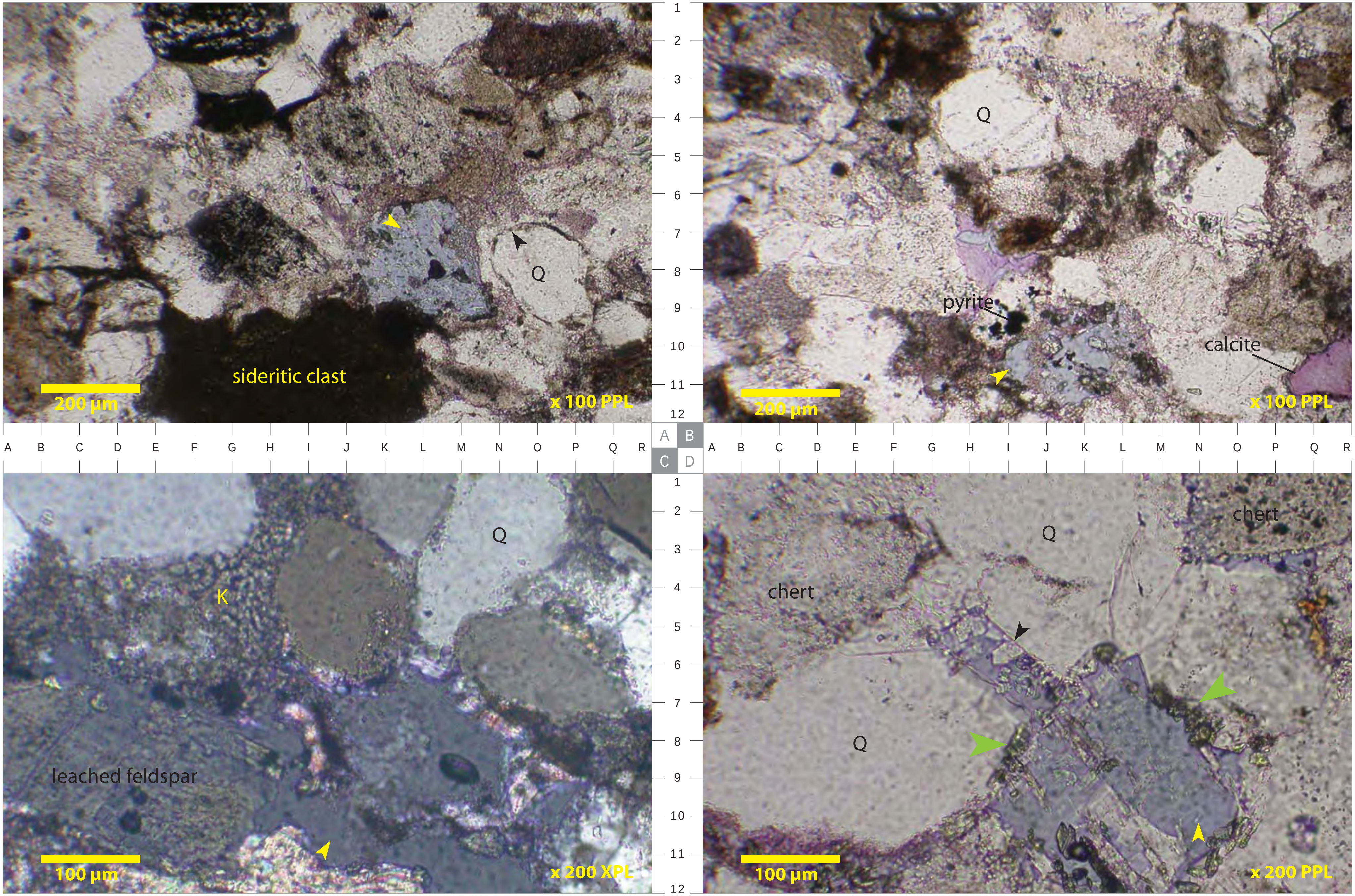


Plate 09
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Amerk A-09 4374.90 meters

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Amerk A-09 4377.75 meters(a)

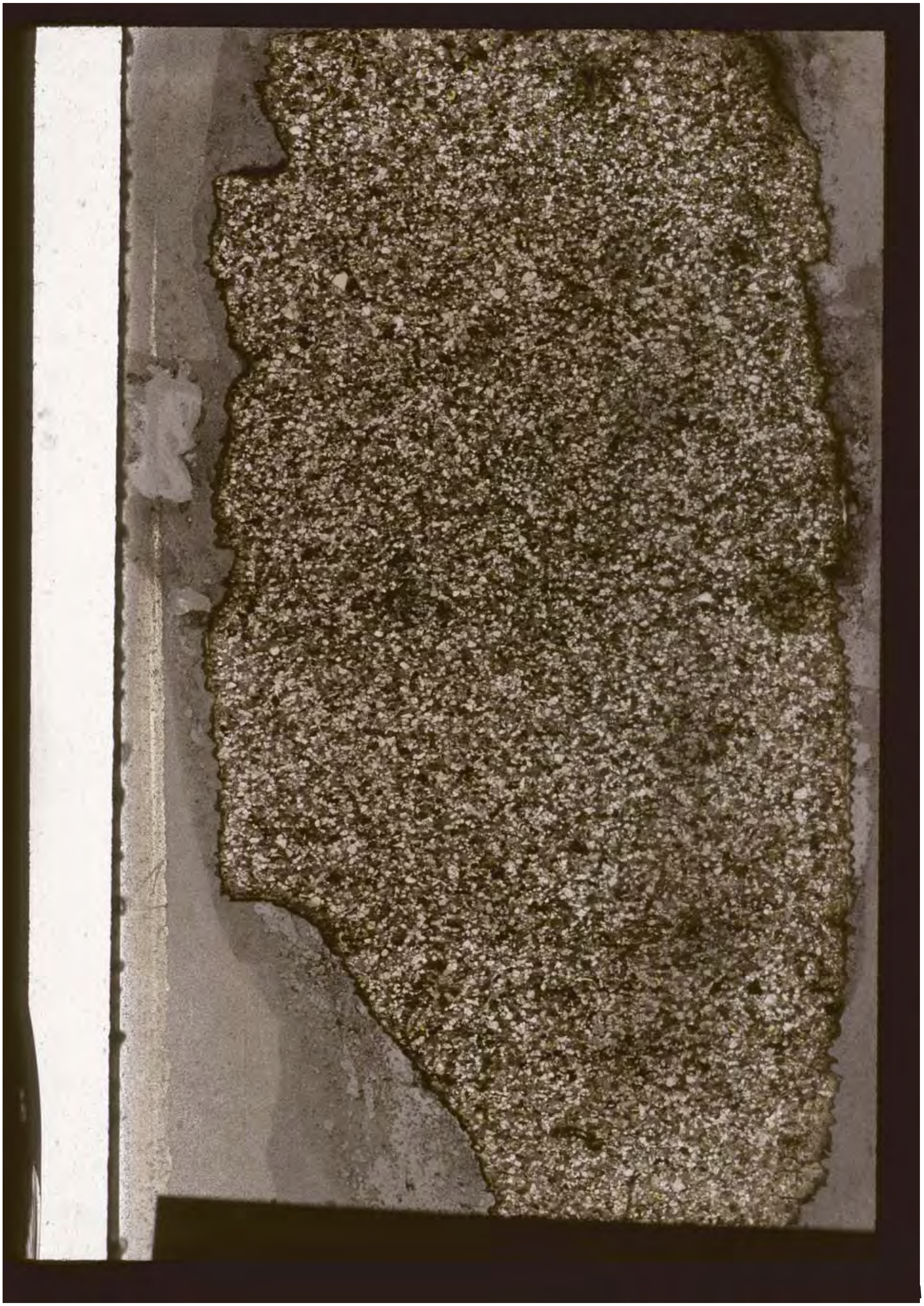
Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Amerk A-09 4377.75 meters(b)



Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Amerk A-09 4377.75 meters(c)

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 10a

Amerk O-09
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 26-10
Depth: 4377.75 meters

Fine to medium grained, moderately well sorted litharenites are recognized from core retrieved at 4377.75 meters. Framework components include monocrystalline quartz (Q) and chert, with subordinate amounts of yellow stained K-feldspar (View B), plagioclase, micas and clay-rich sedimentary grains. Early emplacement of pink stained non-ferroan calcite inhibited extensive mechanical compaction. Complete dissolution of feldspathic grains and carbonate cement has enhanced the effective macropore system (small yellow arrows). Minor kaolinite fines are loosely packed within pores (View D, "K").

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

Amerk O-09 **4377.75 meters**

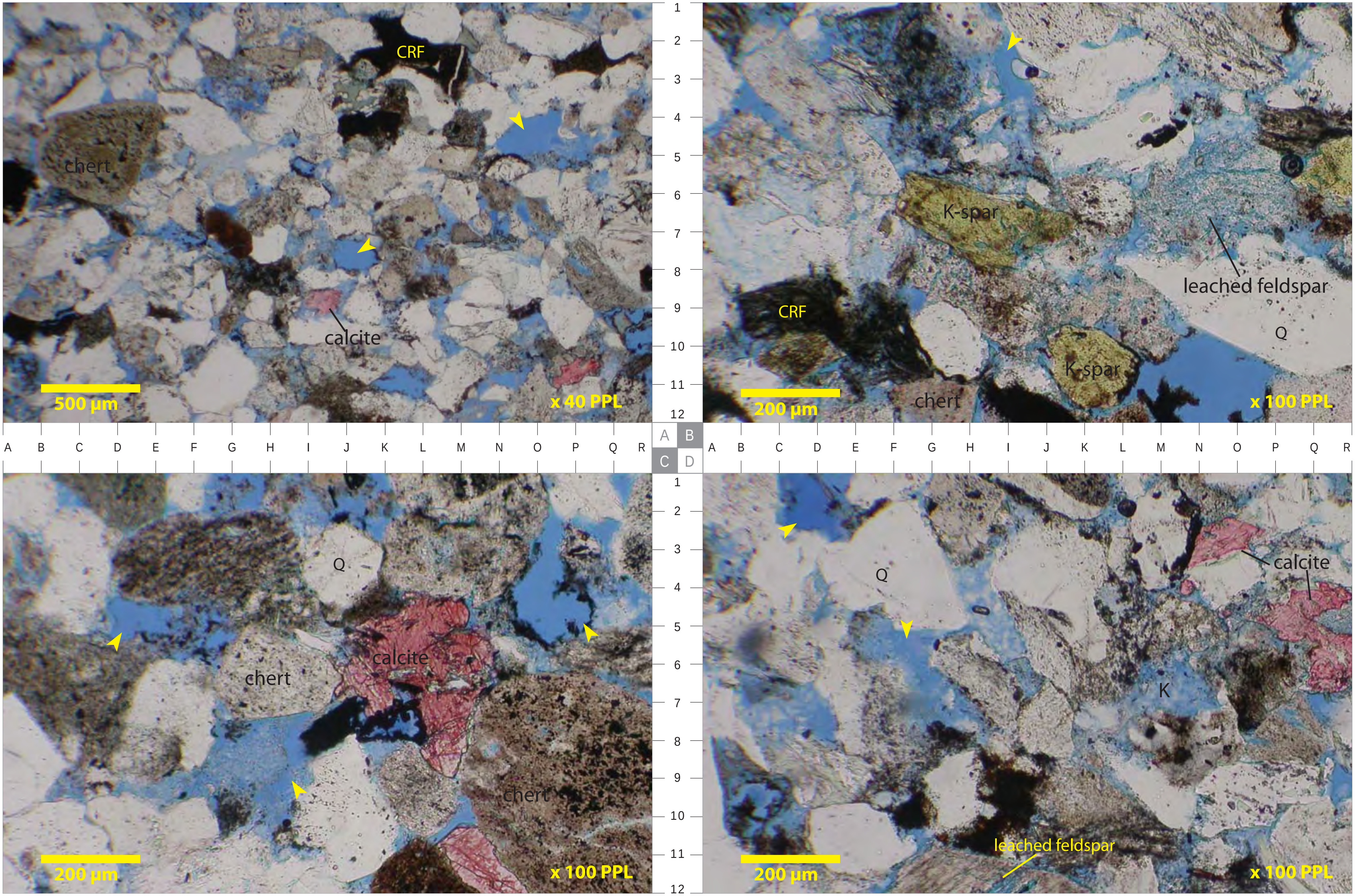


Plate 10a
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 10b

Amerk O-09
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 26-10
Depth: 4377.75 meters

Close up thin section photomicrographs show unevenly distributed ferroan calcite cement (FeC) precipitated within open macropores. The ferroan calcite also replaces feldspar clasts (Views C and D). Rare pyrite has precipitated within chert micropores. Trace loosely packed kaolinite clays have precipitated within macropores (View B, “K”). Subsequent dissolution of carbonate cement has enhanced the effective macropore system (small yellow arrows). Note rare blue stained ferroan dolomite (FeD) in View B. Grain contacts are tangential in this interval. Framework grains are dominated by monocrystalline quartz with common chert, clay-rich sedimentary lithoclasts, and lesser volumes of feldspars, sideritic clasts and micas.

Photo A: 100X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Amerk O-09 **4377.75 meters**

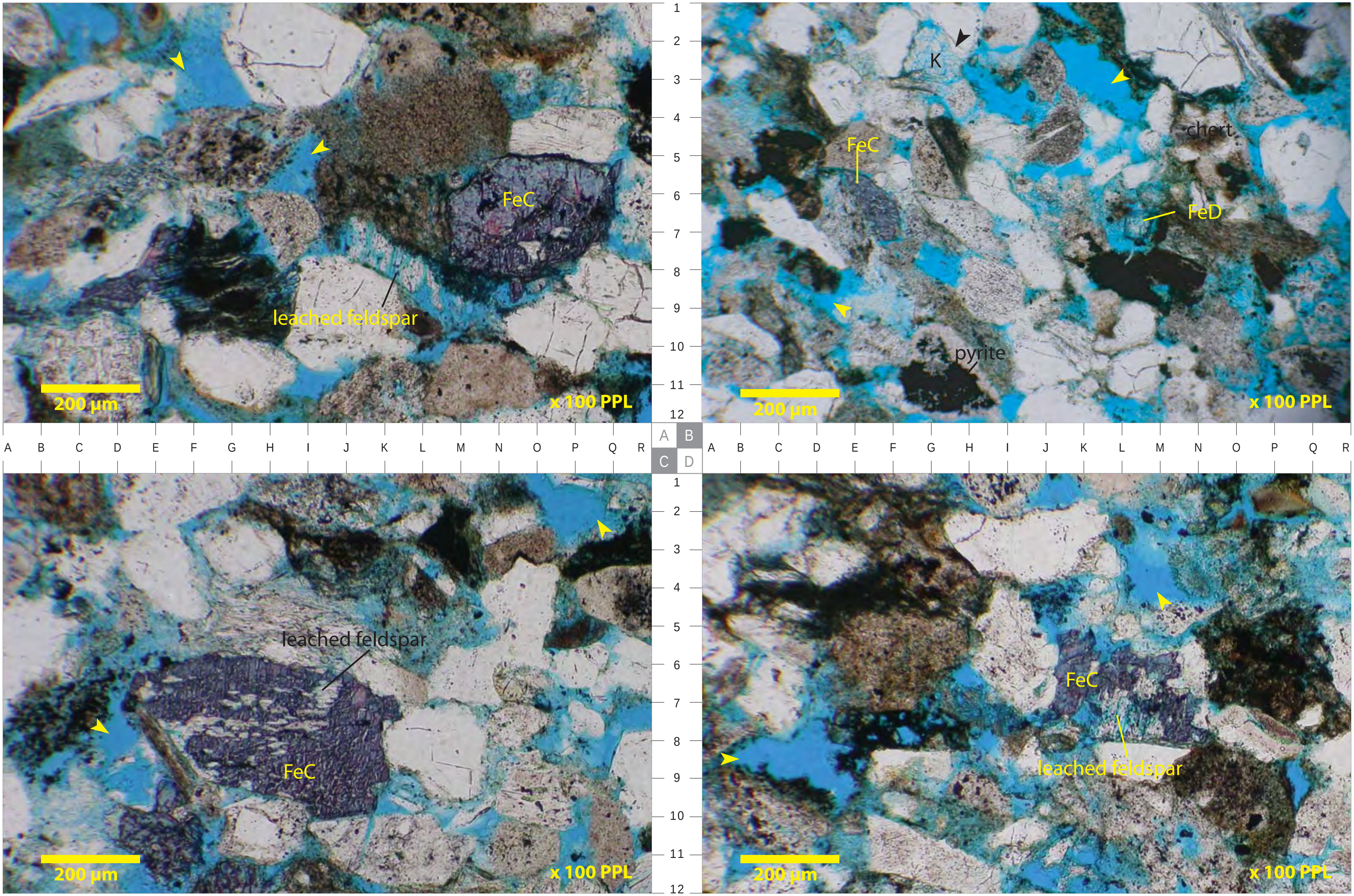


Plate 10b
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 10c

Amerk O-09
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 26-10
Depth: 4377.75 meters

Thin section photomicrographs illustrate the following features:

- Grain contacts are mainly tangential
- Concavo-convex grain contacts are associated with labile components compacted between competent grains
- Common partial dissolution of feldspathic framework grains resulting in grain remnants (View A, E-F:6-7) within macropores
- Patchily distributed non-ferroan pink stained calcite cement
- Partial dissolution of tartan twinned K-feldspar, subsequently filled by calcite cement
- Loosely packed kaolinite clays (View C, “K”) within macropores
- Monocrystalline quartz, chert, feldspars, clay-rich sedimentary grains (CRF) and polycrystalline quartz (PxQ) are some of the framework lithoclasts

Photo A: 40X PPL,   Photo B: 100X XPL,   Photo C: 200X PPL,   Photo D: 200X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Amerk O-09 **4377.75 meters**

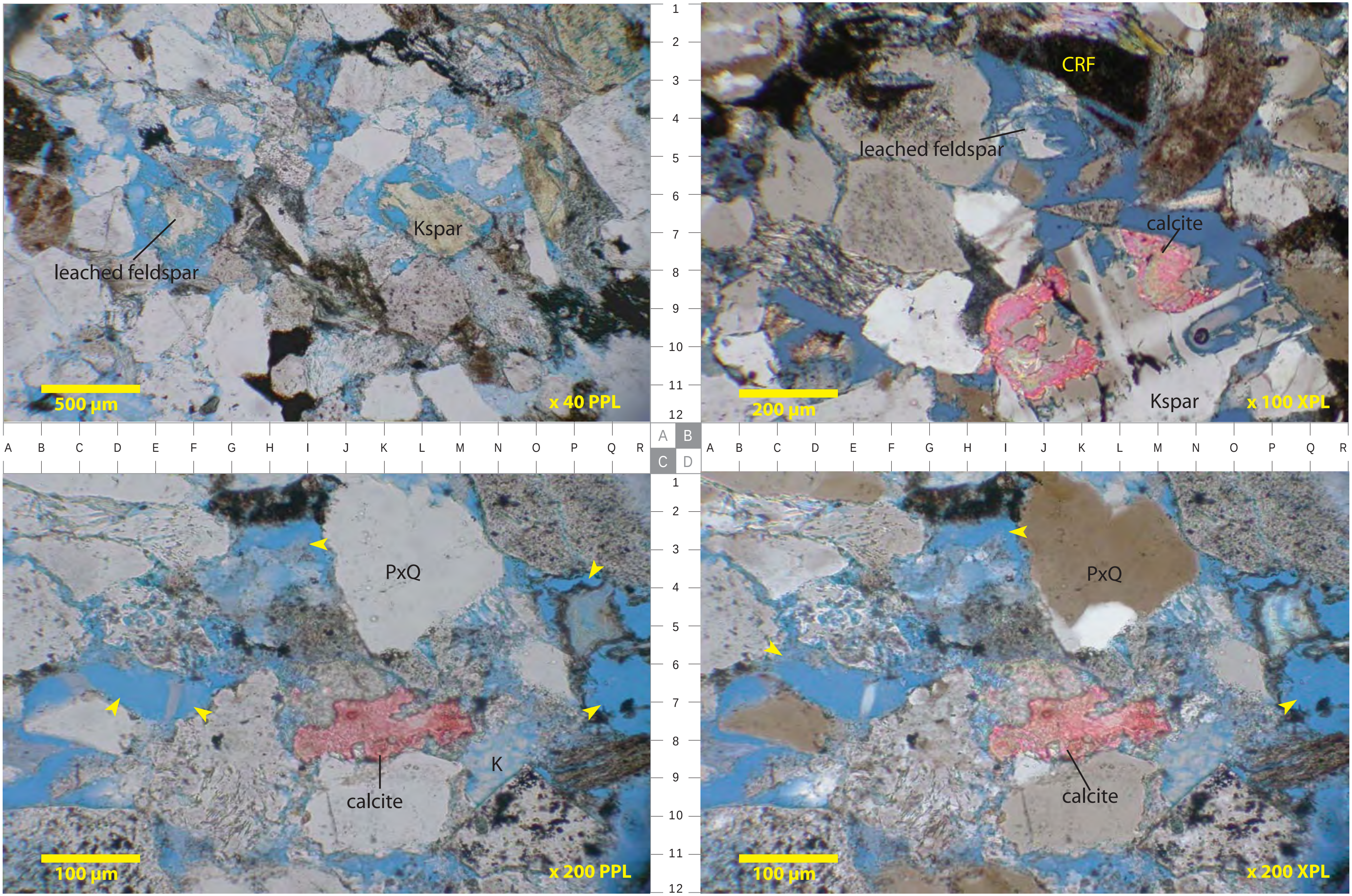


Plate 10c
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Amerk A-09 4377.80 meters

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Amerk A-09 4378.77 meters

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 11

Amerk O-09
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 26-11
Depth: 4378.77 meters

Dolomite cemented (large green arrows), fine grained bioturbated litharenites are recognized as Richards clastics recovered from core at 4378.77 meters. Grain contacts are floating and point-point in this carbonate cemented interval. Subangular to subrounded monocrystalline quartz (Q), chert, yellow stained K-feldspar, argillic sedimentary grains and organic material are some of the framework constituents. Rare pyrite has precipitated within chert micropores.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Amerk O-09 4378.77 meters

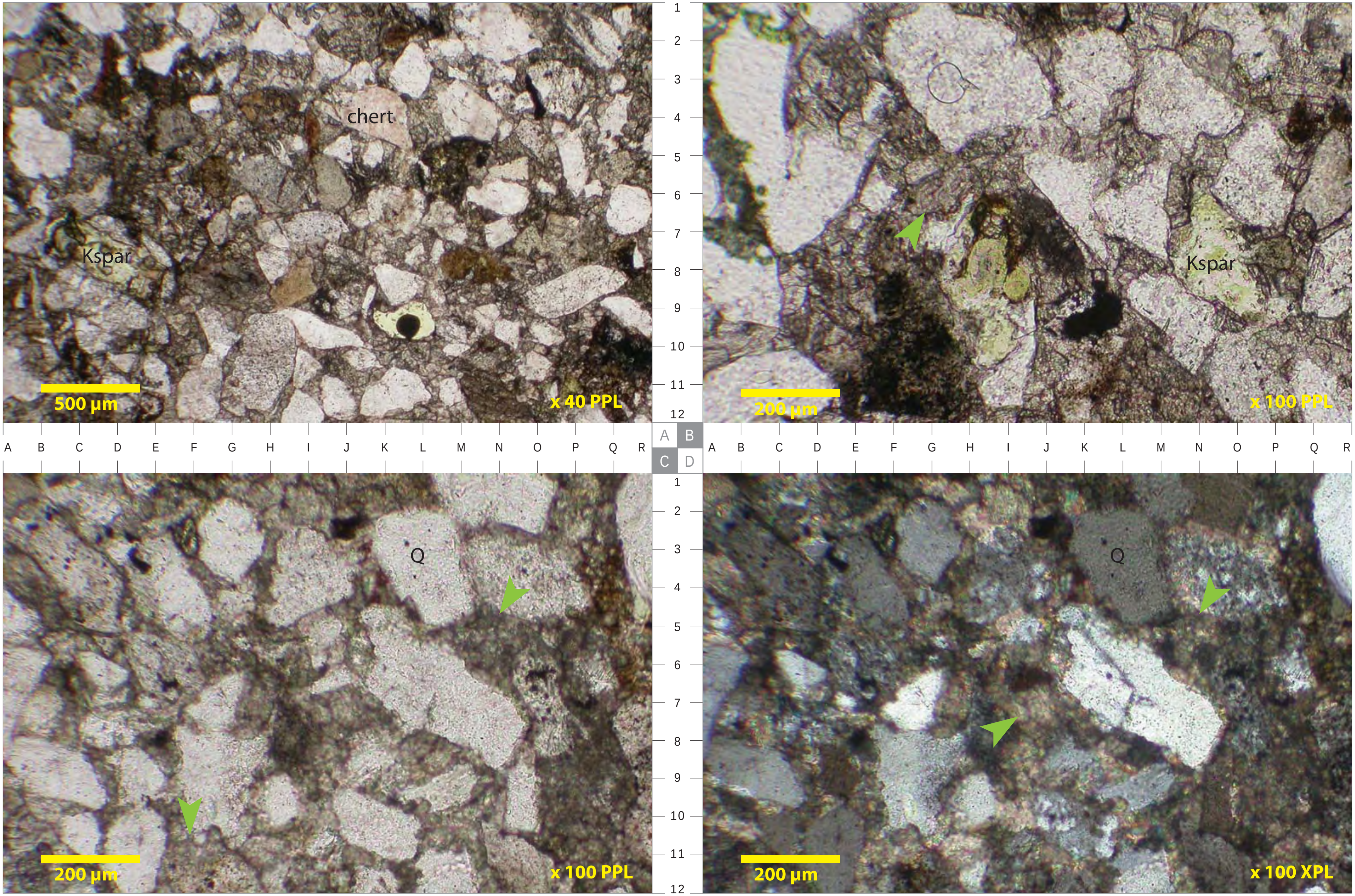


Plate 11
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Amerk A-09 4602.90 meters (a)

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 12a

Amerk O-09
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 26-13
Depth: 4602.90 meters

Moderately well sorted, medium to coarse grained Richards Sequence litharenites are recognized from core recovered at 4602.90 meters. Framework grains are dominated by chert and monocrystalline quartz with subordinate volumes of argillic lithoclasts (CRF), quart-rich sedimentary grains (View B, “QRF”) and feldspars. Grain contacts are mainly tangential in this porous and permeable section. Dissolution of feldspars has enhanced the effective pore system. Curvilinear, baroque dolomite cement (large green arrows) has precipitated within open pores (small yellow arrows). Dolomite cement, as shown in Views C and D, has precipitated within partially leached feldspar. Quartz cement is minor (View B, D:4). Hydrocarbons, in the form of bitumen, is rare, lining framework grains (Views C and D, E:2). Rare pyrite has precipitated within chert micropores.

Photo A: 40X PPL, Photo B: 100X XPL, Photo C: 200X PPL, Photo D: 200X XPL

Amerk O-09

4602.90 meters

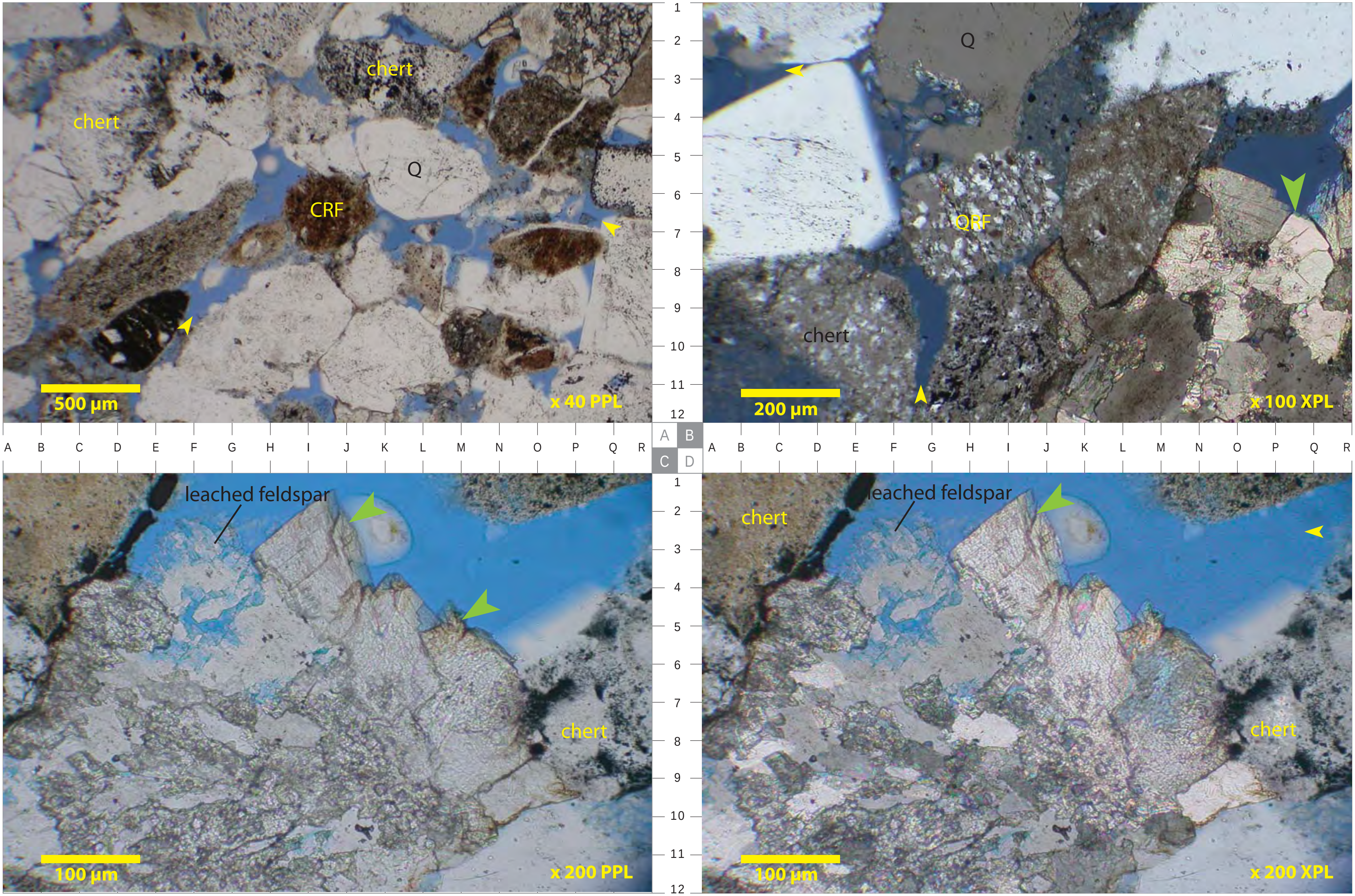


Plate 12a
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 12b

Amerk O-09
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 26-13
Depth: 4602.90 meters

Two types of carbonate cement are illustrated in these thin section photomicrographs. Rare purple-pink stained ferroan calcite spar cement (View A, "FeC") is patchily distributed. Dissolution of this cement has enhanced the effective pore system. Well developed, blue-turquoise stained ferroan dolomite is also patchily distributed in this medium to coarse grained litharenite. Hydrocarbons, in the form of bitumen (View C, small red arrows), is encompassed within the dolomite crystal cleavage structure. Rare to minor loosely packed kaolinite clays (Views B and View D, "K") have precipitated within open macropores. Syntaxial quartz overgrowths (small black arrows) have precipitated on host monocrystalline quartz (Q) grains and to a lesser extent on chert grains. Rare pyrite and ferroan dolomite rhombs have precipitated within chert micropores (View C, M:7)

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

Amerk O-09 **4602.90 meters**

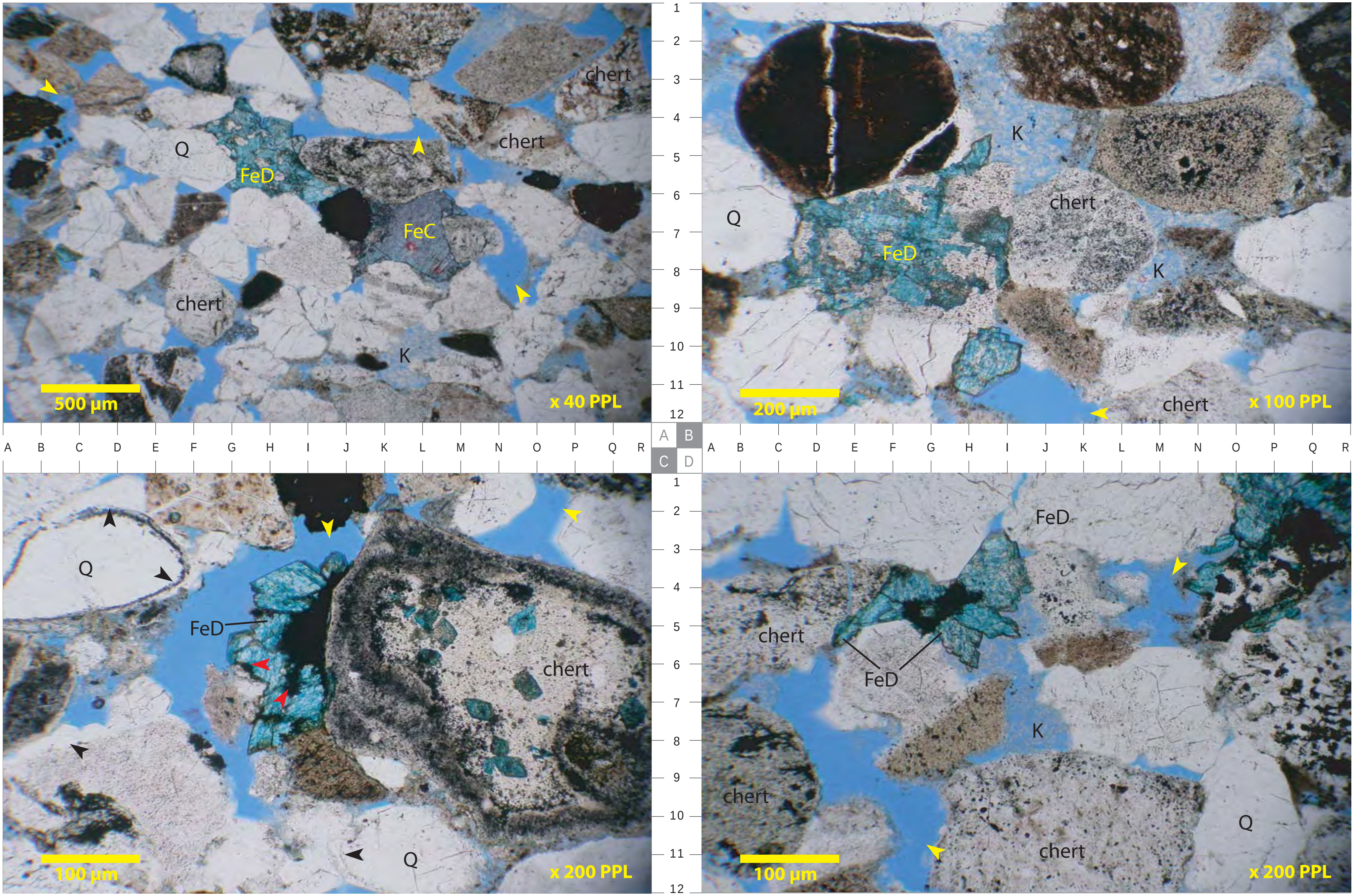


Plate 12b
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Amerk A-09 4604.60 meters

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 13

Amerk O-09
Richards
Sandy Chert Conglomeratic Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 26-14
Depth: 4604.60 meters

Early poikilotopic calcite cementation has limited mechanical grain compaction in this interval. Grain contacts are mainly point-point. Quartz cement (small black arrows) has precipitated on host chert and monocrystalline quartz grains. Microsiderite (View D, “S”) and pyrite have precipitated within chert micropores. Common loosely packed kaolinite clay fines have precipitated within macropores (K). Note microfracture cross cutting chert pebble in View B. Trace bitumen is found within the microfracture.

Photo A: 20X PPL,   Photo B: 40X PPL,   Photo C: 40X PPL,   Photo D: 100X PPL

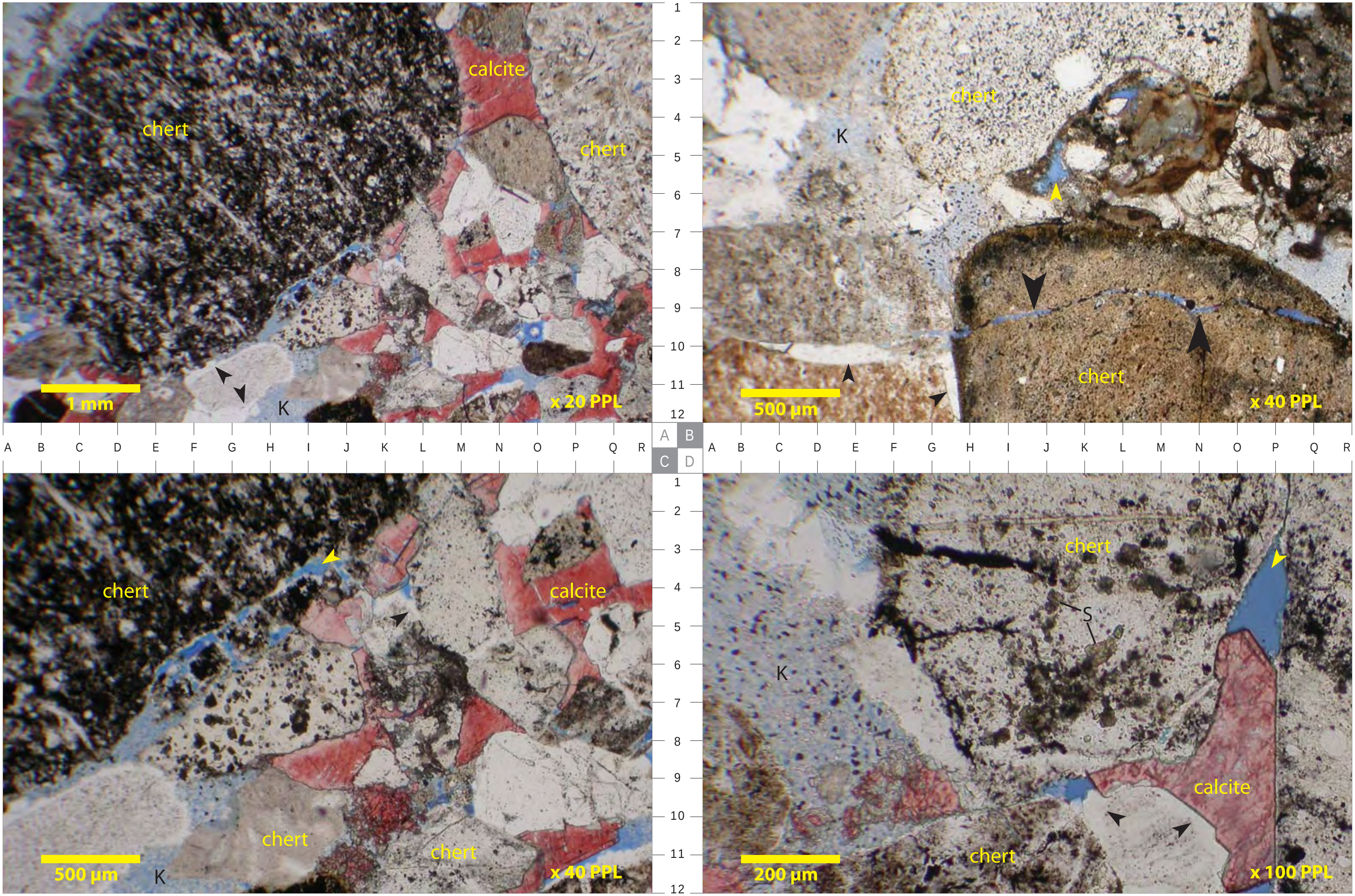


Plate 13
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 14

Amerk O-09
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 4608.00 meters

Poikilotopic non-ferroan calcite cement occludes intergranular macroporosity in this poorly sorted, medium to pebble sized litharenite. Chert and monocrystalline quartz are the main framework grains with minor amounts of clay-rich sedimentary grains and feldspars. Quartz overgrowths (small black arrows) have precipitated preferentially on host monocrystalline quartz grains and to a lesser extent on chert grains. Calcite cement has precipitated within partially leached feldspars (View D). Note microfracture crosscutting chert grain in View C (Large black arrow). Pyrite has precipitated within chert micropores.

Photo A: 20X PPL,   Photo B: 40X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

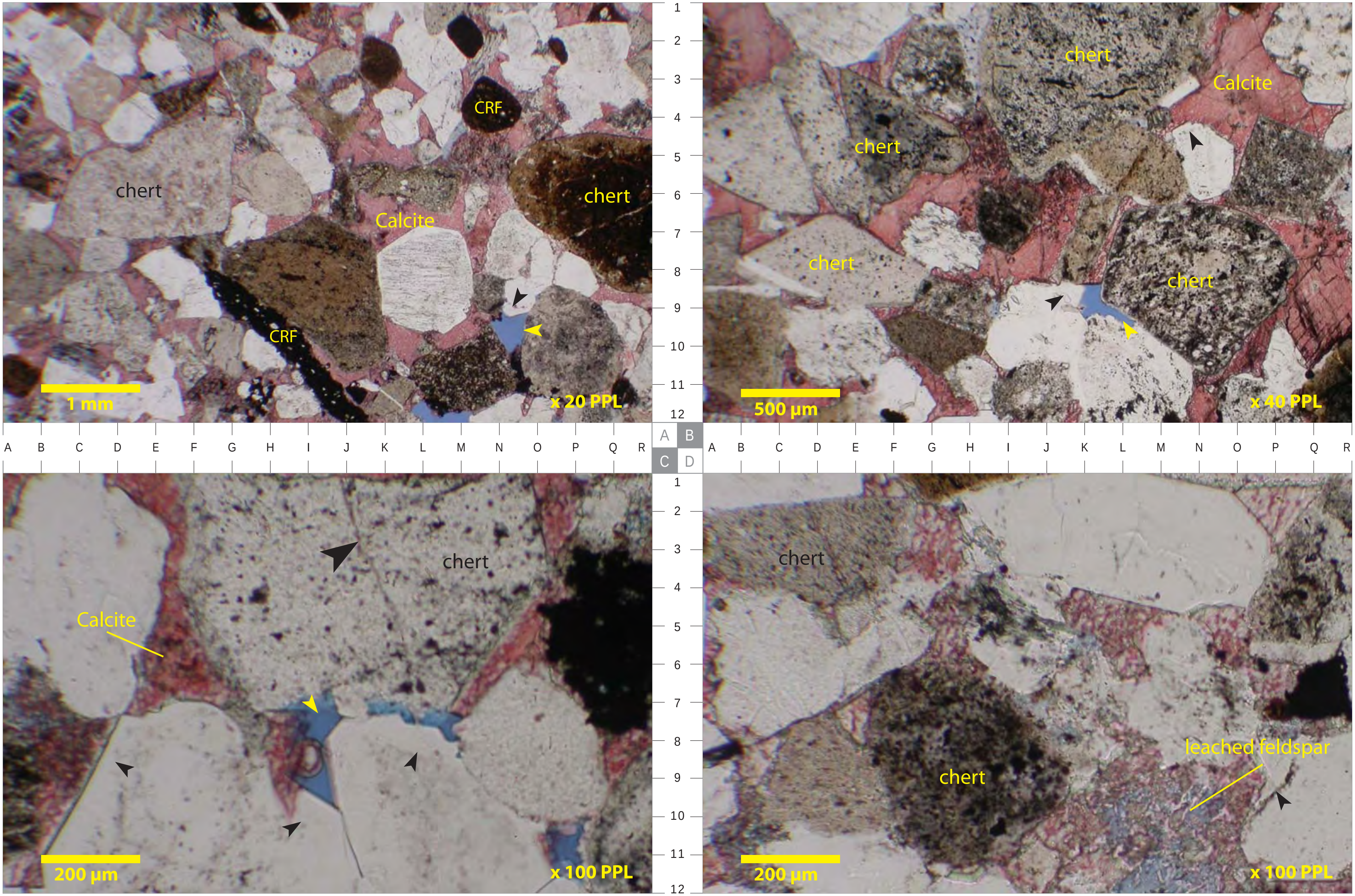
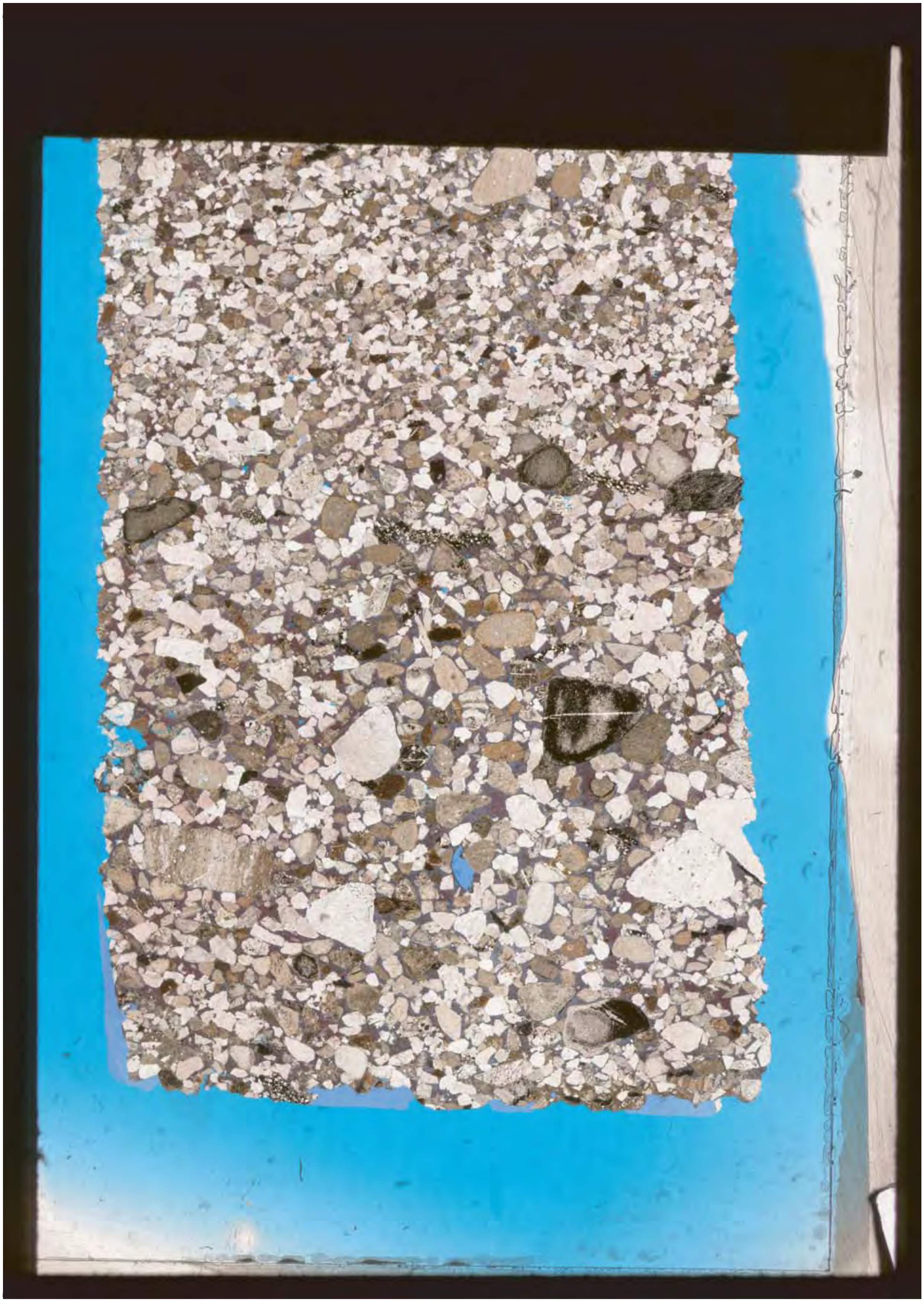


Plate 14
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Amerk A-09 **4608.30 meters (a)**



Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Amerk A-09 4608.30 meters (b)

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 15

Amerk O-09
Richards
Chert Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 26-15
Depth: 4608.30 meters

Blue-turquoise stained ferroan dolomite cement (FeD) is engulfed and encased by poikilotopic purple-pink stained ferroan calcite cement (FeC), as illustrated in these high magnification photomicrographs. View C shows ferroan dolomite cement has precipitated within partially leached feldspar. Pyrite has precipitated within chert micropores. Grain contacts are floating and tangential in this medium to pebble sized chert litharenite.

Photo A: 100X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

Amerk O-09 **4608.30 meters**

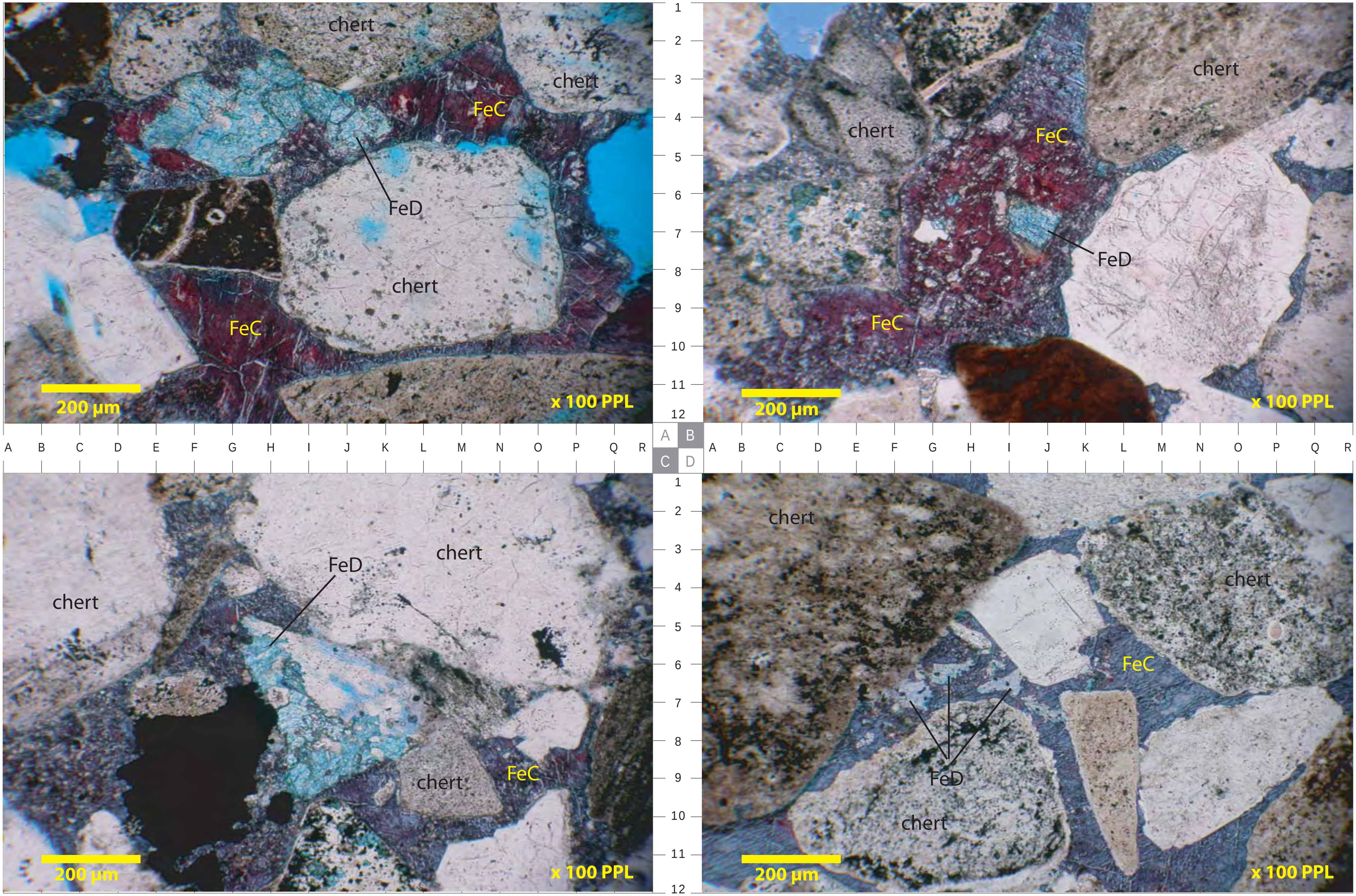


Plate 15
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Amerk A-09 4860.20 meters (a)

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Amerk A-09 4860.20 meters (b)

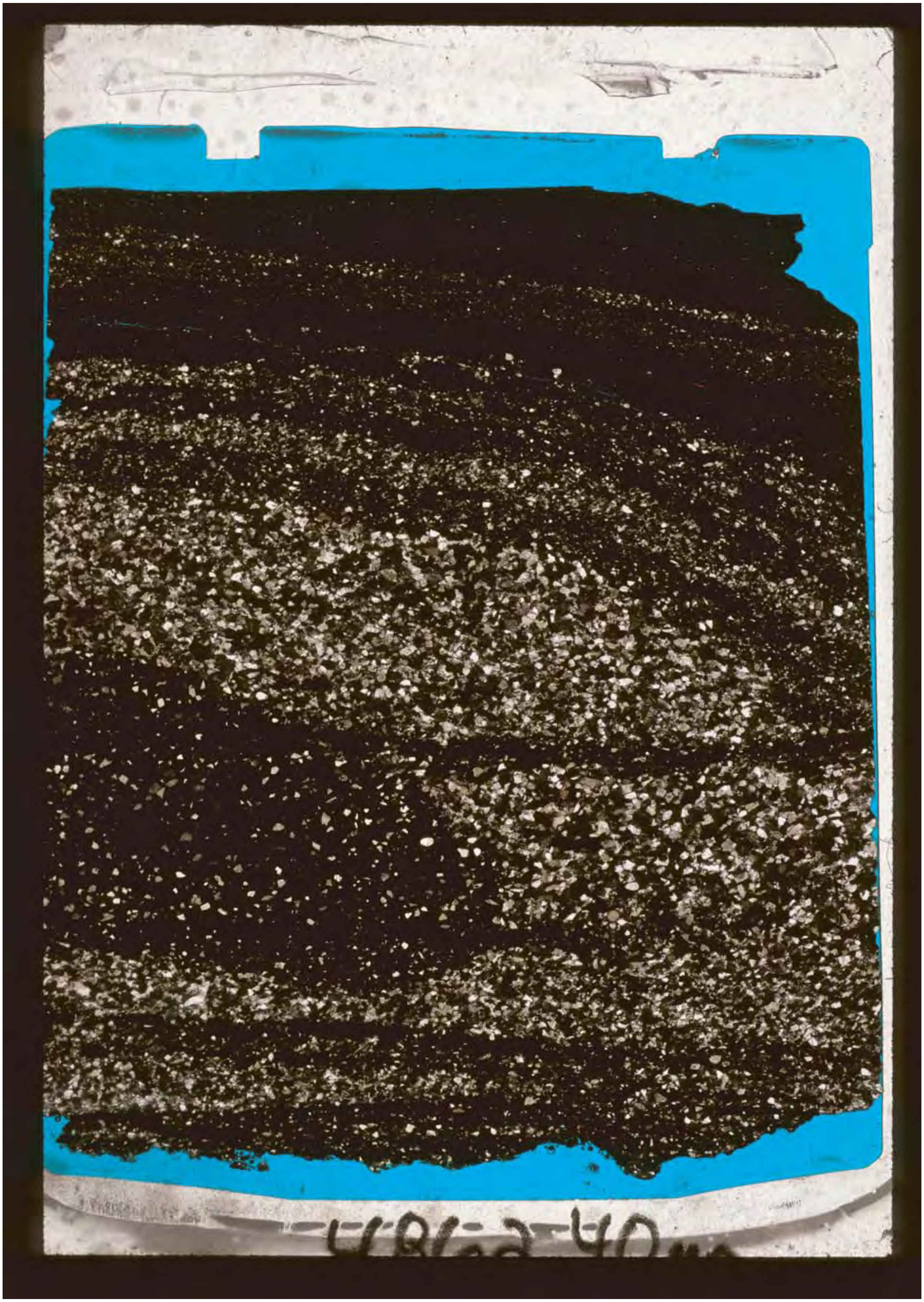
Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Amerk A-09 4862.40 meters



Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

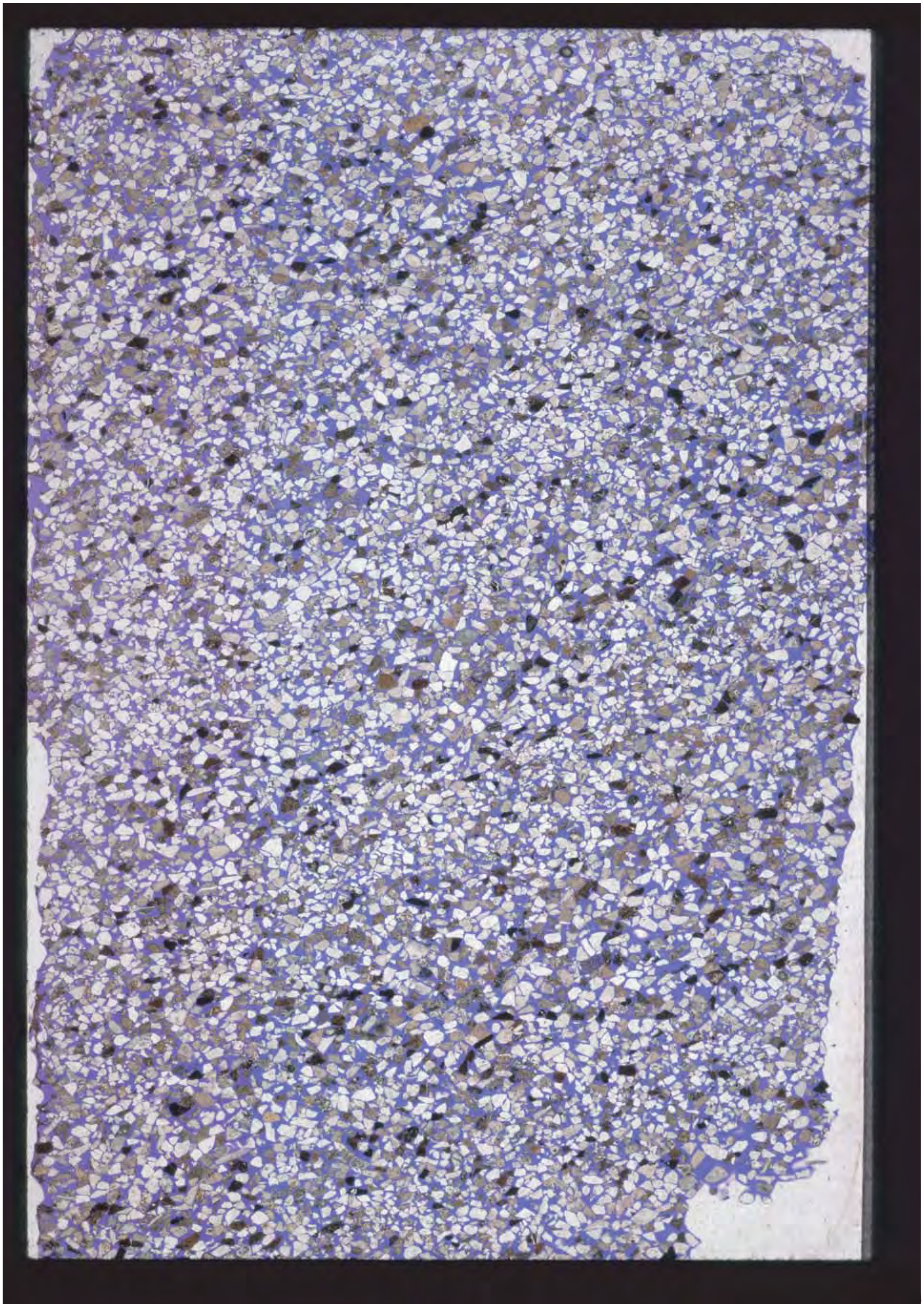
Issungnak 2O-61

Thin Section Overviews

And

Select Described Photomicrographs

Issungnak 2-O-61 2377.3 meters



2 mm

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 01

Issungnak 2-O-61
Kugmallit
Litharenite

Core Analysis Porosity: 30.4% Core Analysis Permeability: 10,120 md

Sample #: 12-02
Depth: 2377.3 meters

The Kugmallit Sequence, encountered from core recovered at 2377.3 meters, is represented by excellent reservoir quality. Effective macroporosity is very well developed and measured permeability is 10,120 md. Medium to coarse grained, well sorted litharenites characterize this section. Framework grains are comprised mainly of monocrystalline quartz (Q), polycrystalline quartz and chert with lesser amounts of yellow stained K-feldspar, plagioclase, quartz-rich sedimentary grains (QRF), clay-rich sedimentary clasts (CRF) and micas. Dissolution of feldspathic grains (View B) has enhanced the effective pore system. Note grain contacts are point-point and tangential suggesting an early precursor cement prevented significant mechanical compaction. Diagenetic phases are poorly preserved with rare pyrite precipitated within chert micropores.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X XPL

Issungnak 20-61 **2377.3 meters**

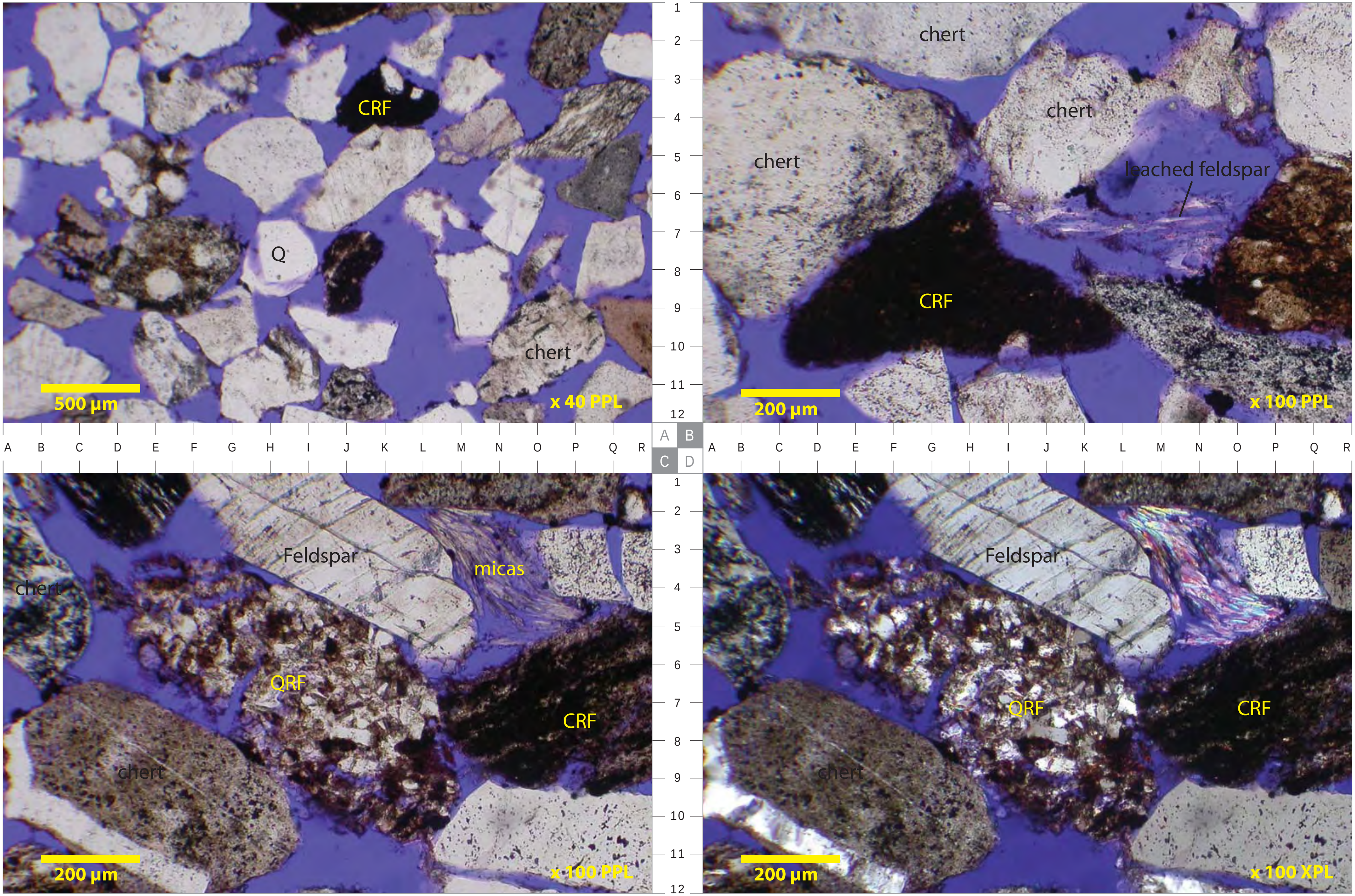
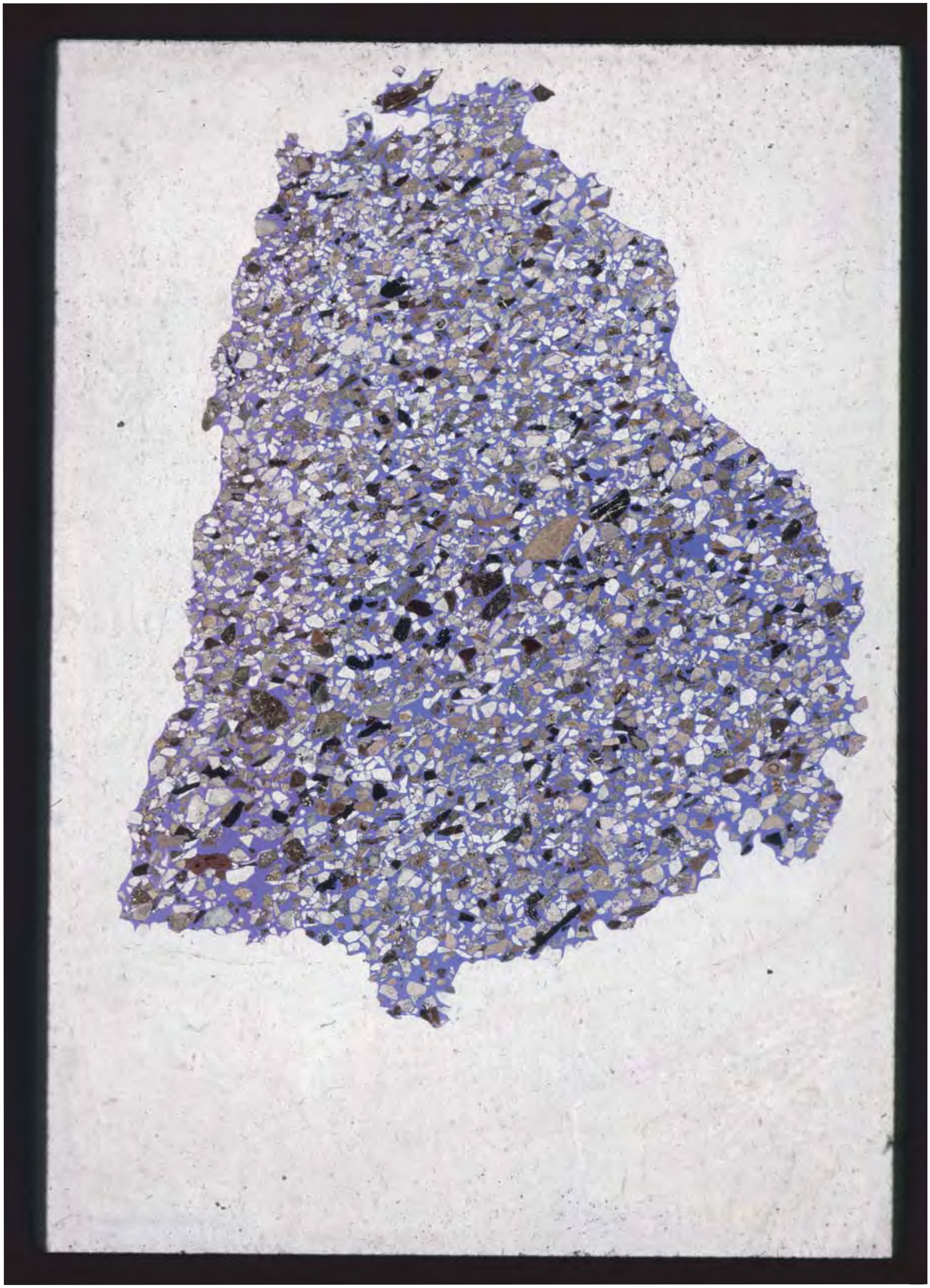


Plate 01
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 2-O-61 2379.3 meters



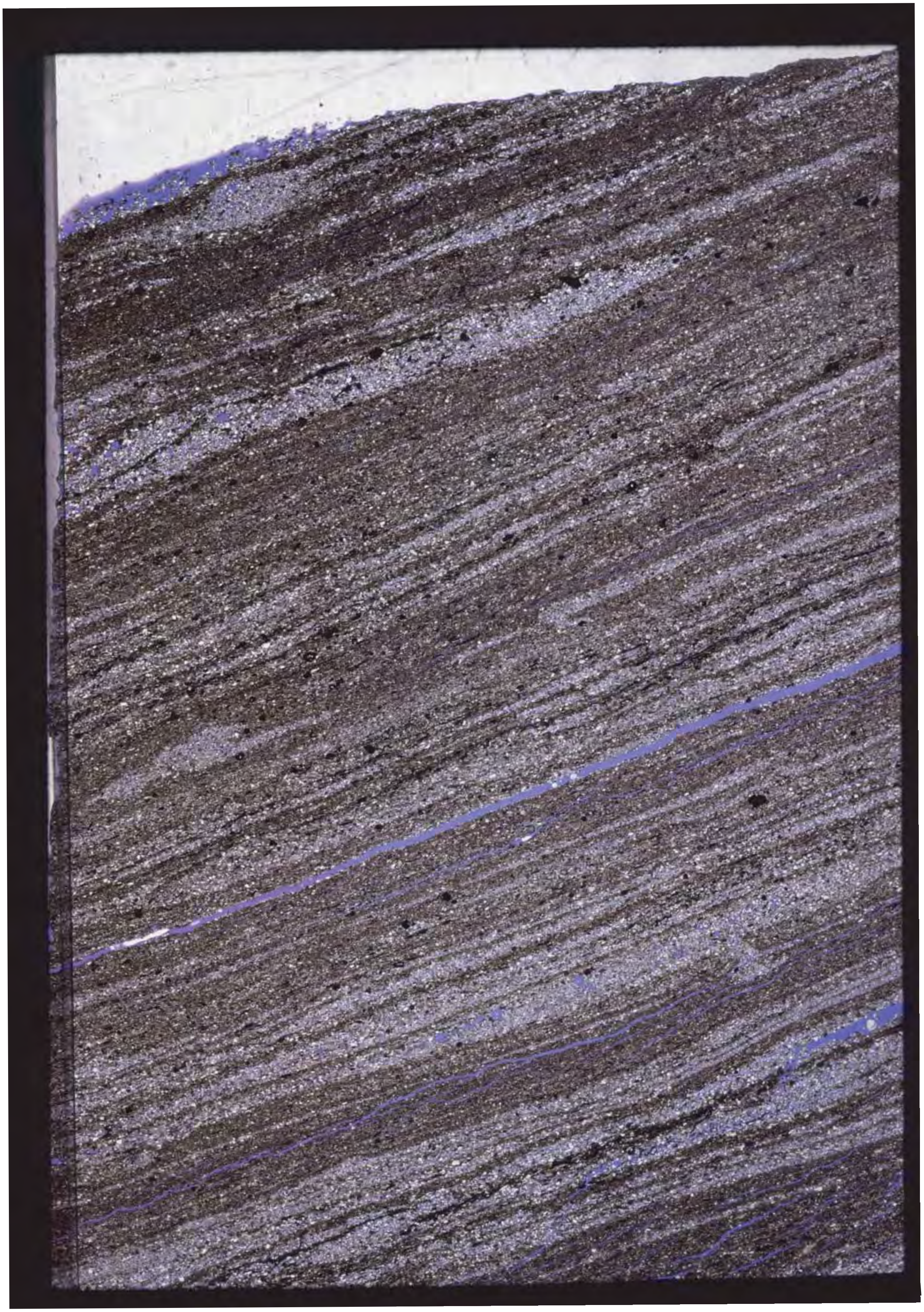
Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 2380.4 meters



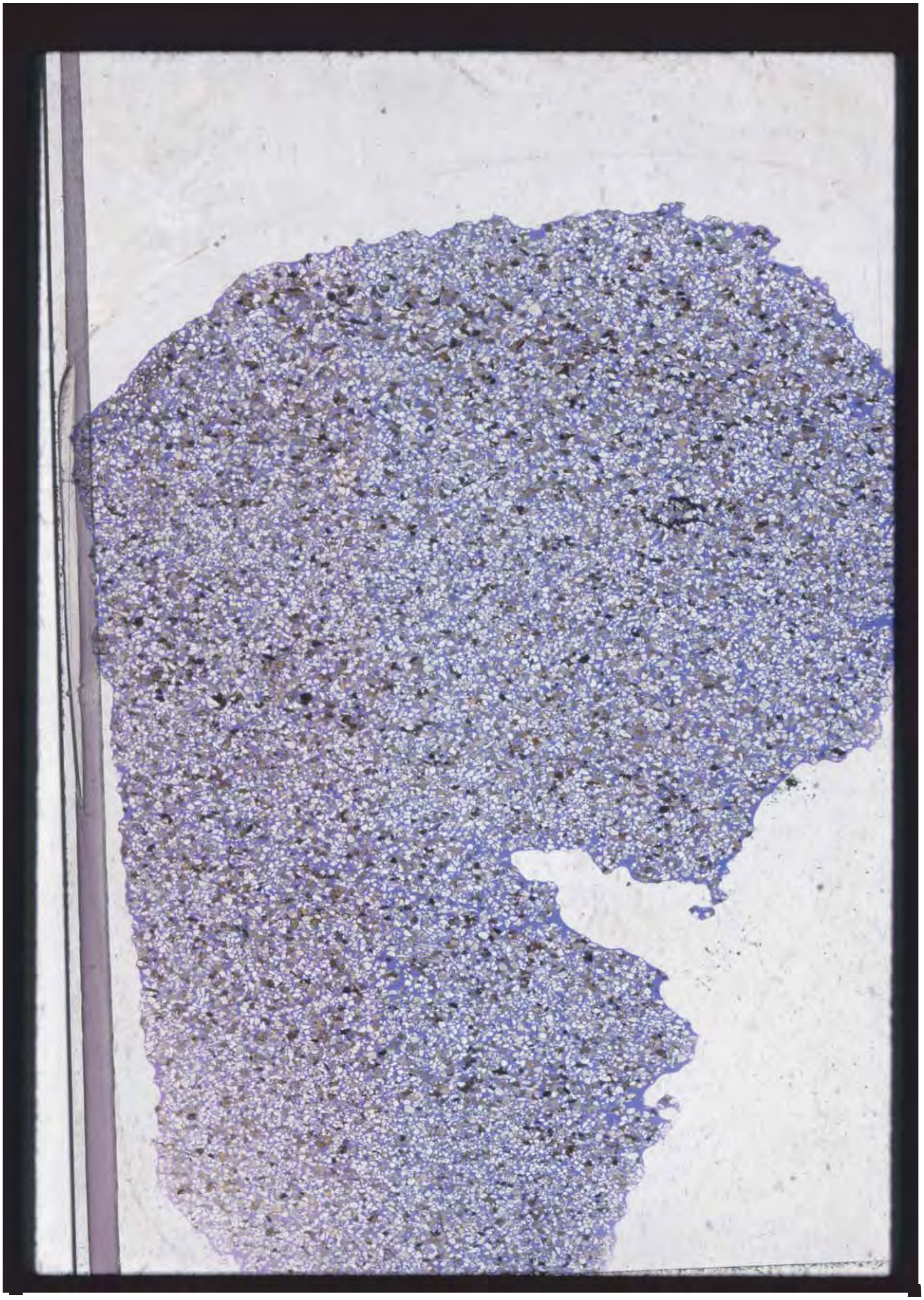
Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 2382.9-83.2 m



Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 02

Issungnak 2-O-61
Kugmallit
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 2382.9-2383.3 meters

Poorly sorted, fine to coarse grained litharenites represent the Kugmallit Sequence recovered from core at 2383.3 meters. Grain contacts are point-point and tangential. The dissolution of feldspathic grains has enhanced the effective pore system in this interval. Authigenic phases are rare consisting of grain rimming and pore filling siderite (View C, “S”) and trace loosely packed kaolinite clays (View B, E:4). Monocrystalline quartz (Q), chert, feldspars (yellow stain of K-feldspar), clay-rich sedimentary grains (CRF) are the main framework components. Dissolution of volcanic rock fragments (VRF) and feldspars have enhanced the pore system in this interval.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 20-61

2382.9-2383.3 meters

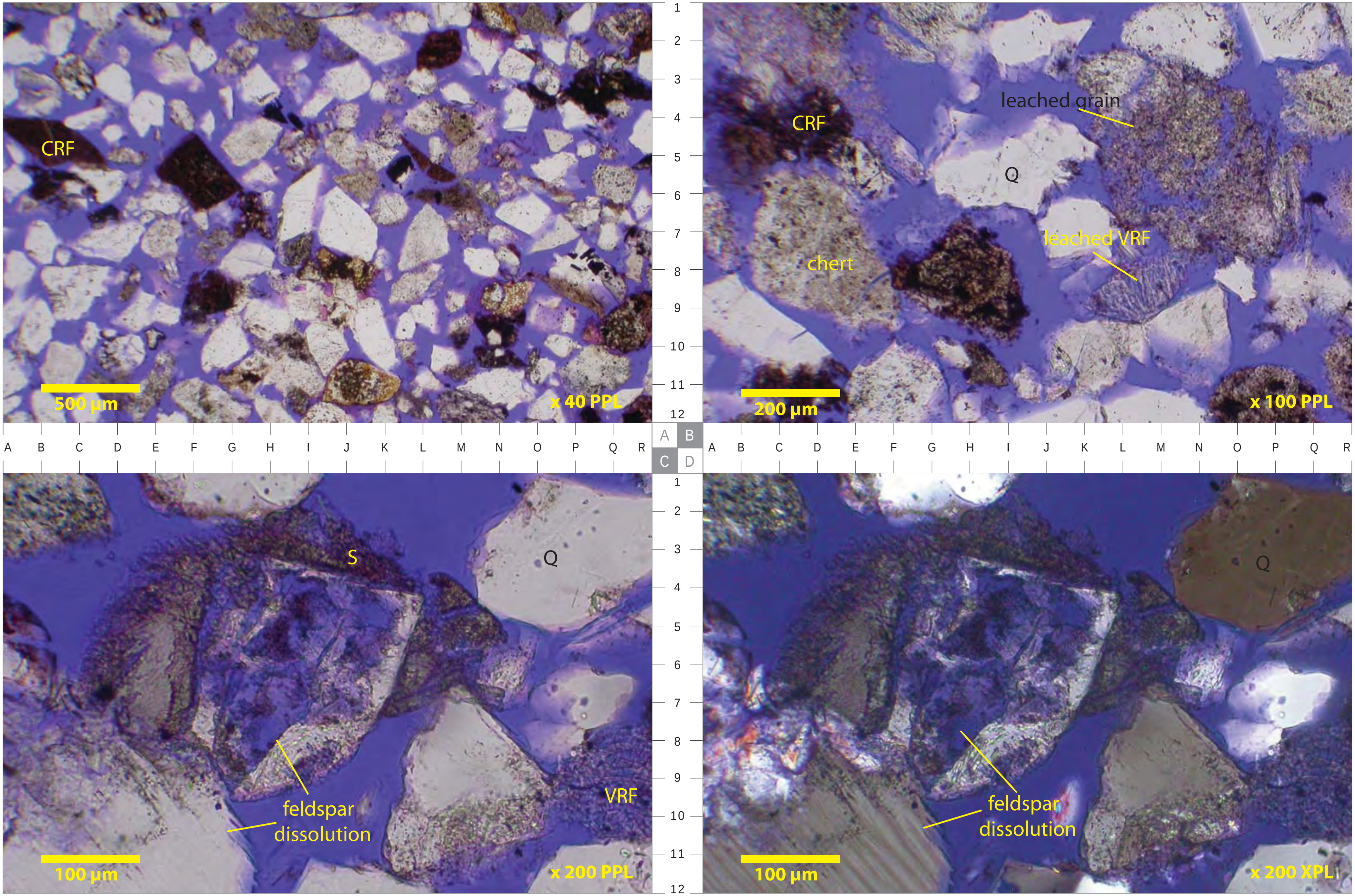


Plate 02
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 2-O-61 2383.5 meters

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 2-O-61 2386.3 meters

2 mm

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 2387 meters

2 mm

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 2389 meters

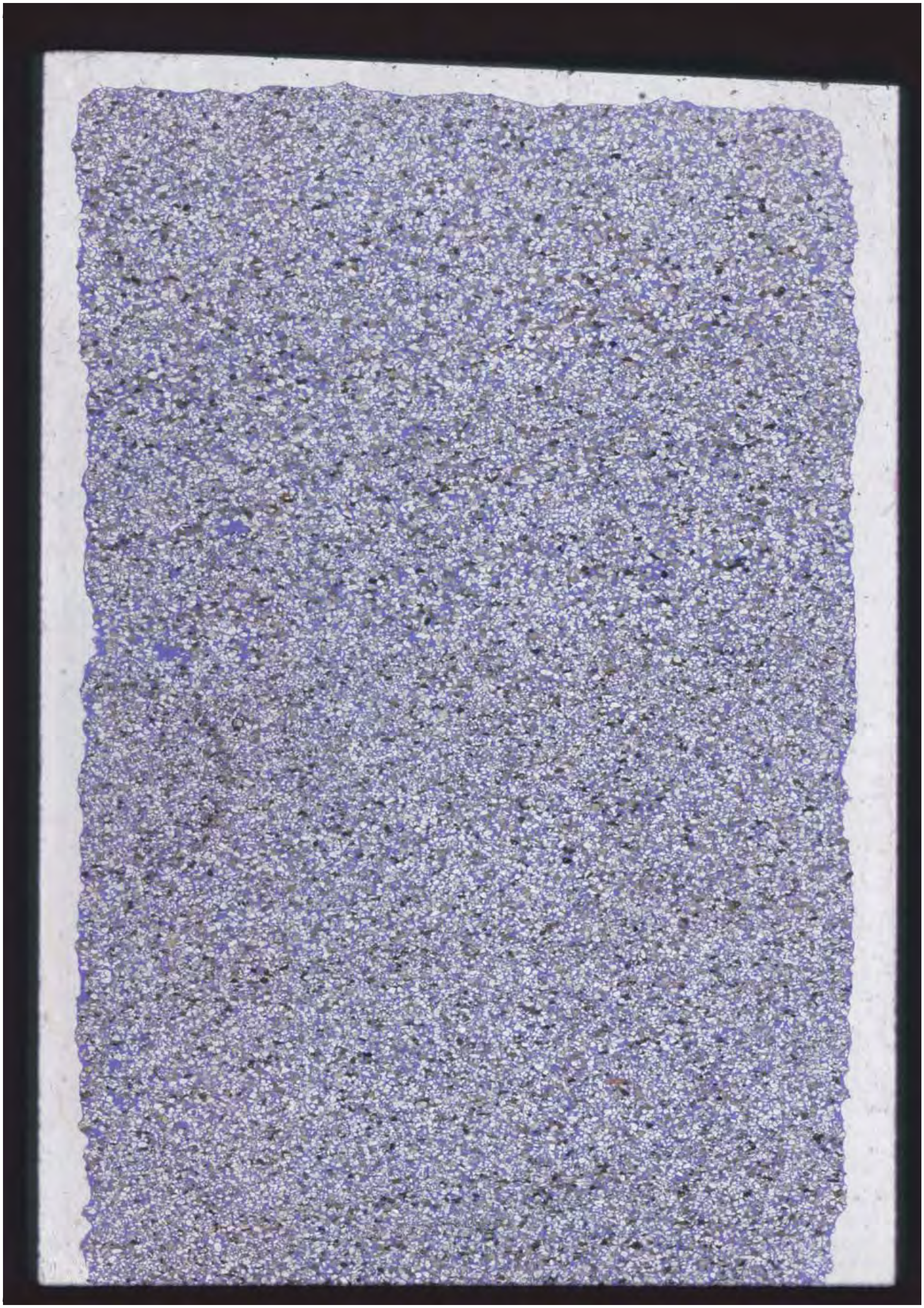
Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 2390.7 meters



Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 2392 meters

2 mm

Kugmallit

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 2-O-61 2394.4 meters

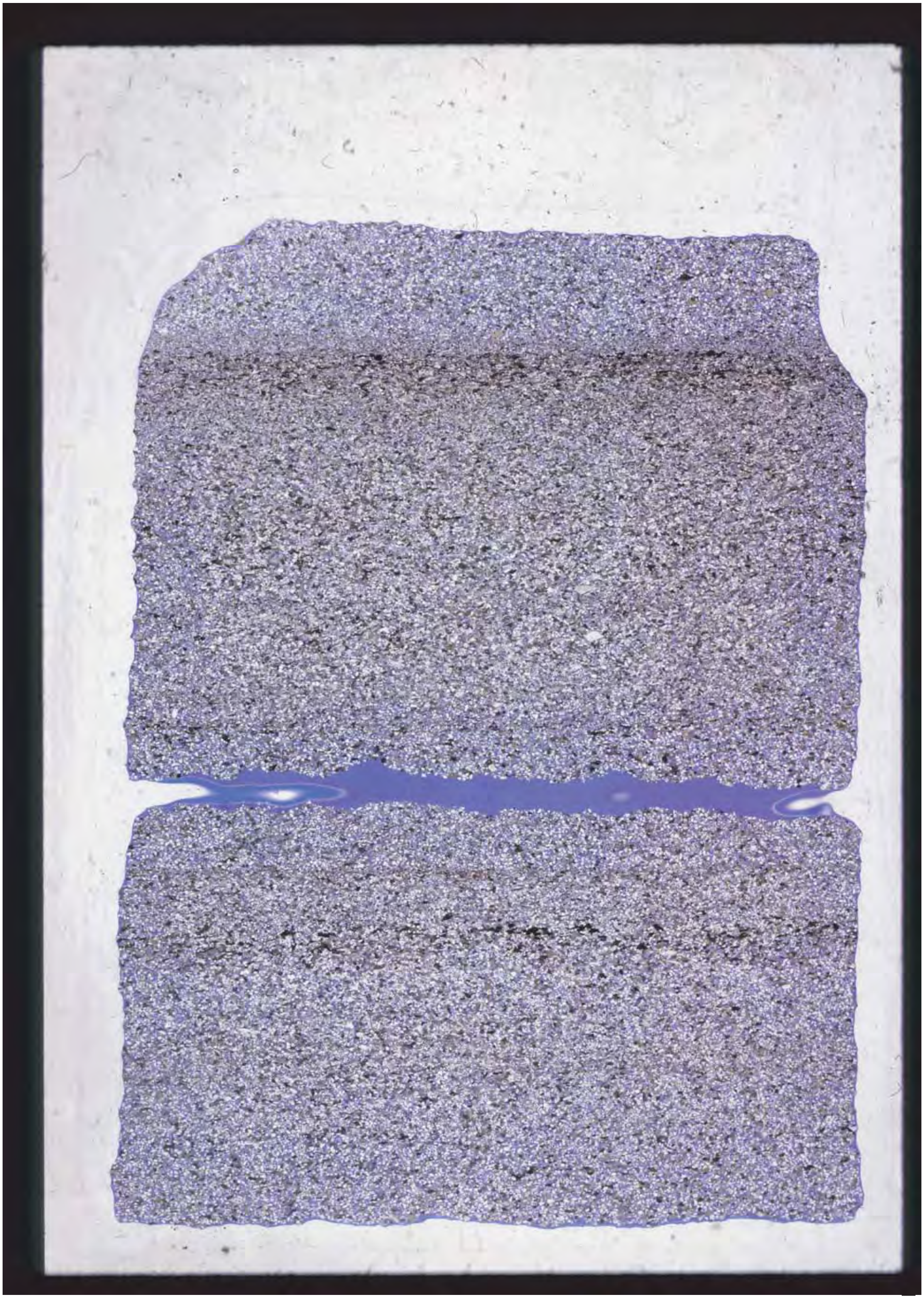
Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 2395.8 meters



Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 2397.2 meters (a)

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 2397.2 meters (b)

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 03

Issungnak 2-O-61
Kugmallit
Litharenite

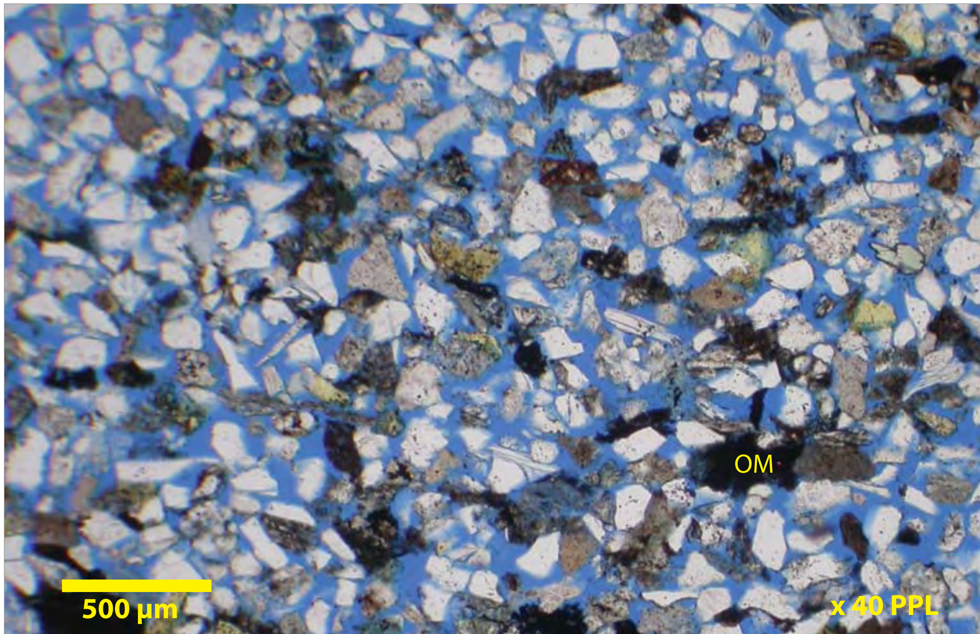
Core Analysis Porosity: na Core Analysis Permeability: na

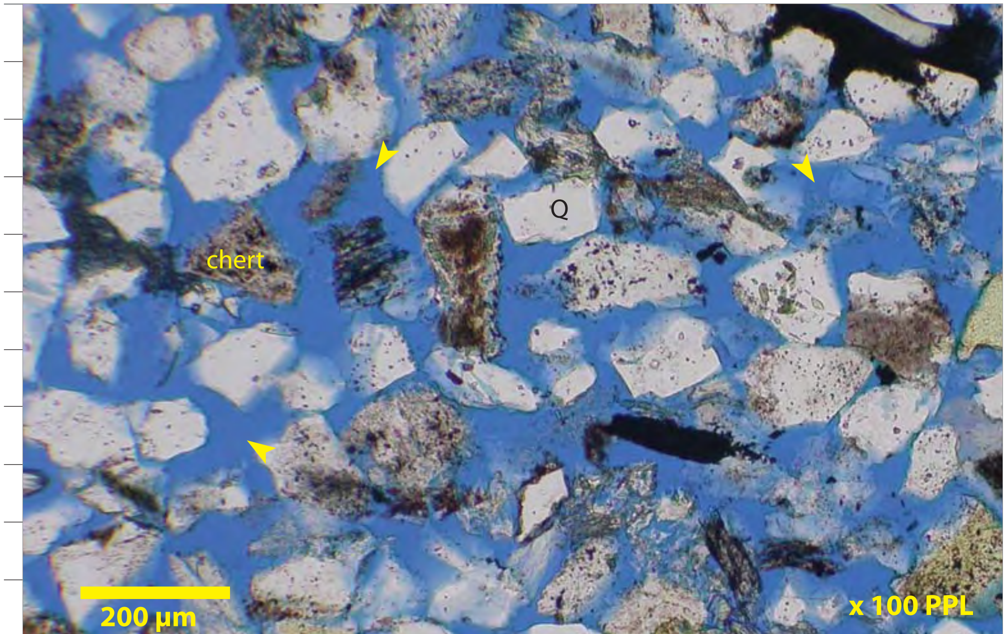
Depth: 2397.2 meters

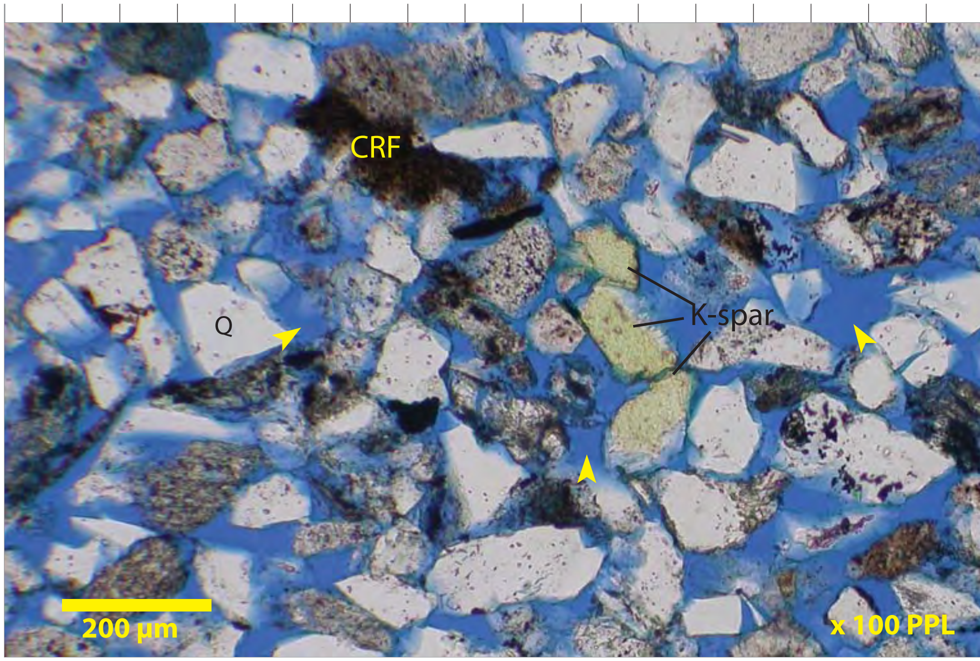
Well sorted, laminated, bioturbated fine grained litharenites characterize the core recovered at 2397.2 meters. Authigenic cements and clays are poorly preserved in this interval. Dissolution of feldspathic grains (View D, H:4) has enhanced the effective pore system (small yellow arrows). Subangular to subrounded monocrystalline quartz (Q), chert, yellow stained K-feldspar, micas, organic material (OM) and clay-rich sedimentary grains (CRF) are some of the framework constituents. Trace poorly developed quartz overgrowths (View D, D:8) have precipitated on host monocrystalline quartz grains. Grain contacts are tangential and concavo-convex.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

Issungnak 20-61 **2397.2 meters**







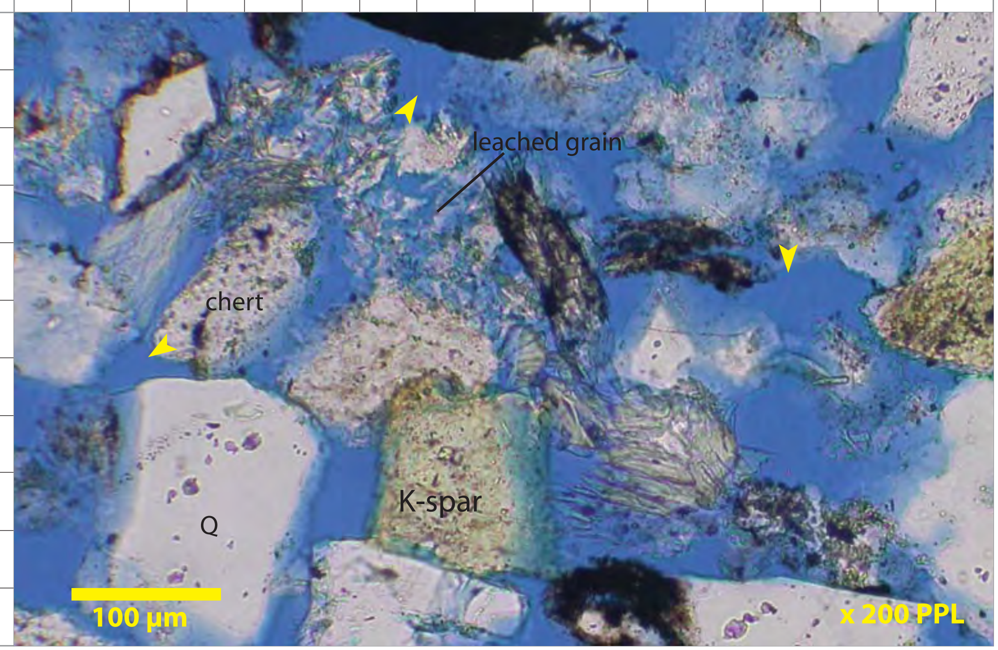


Plate 03
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 2-O-61 2398 meters

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 04

Issungnak 2-O-61
Kugmallit
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 2398 meters

Laminated and bioturbated, silt to very fine grained litharenites are recognized from core taken at 2398 meters. Organic material is commonly concentrated along laminae as shown in the Overview. Grain contacts are tangential and concavo-convex in this interval indicating moderate mechanical compaction. Monocrystalline quartz, chert, feldspars and common organic material (OM) comprise some of the framework components. Small yellow arrows show the effective pore system. Partially leached feldspathic grains are shown in View C (M:7). Note micro-faulting is observed in the center lower portion of the Overview.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 20-61

2398 meters

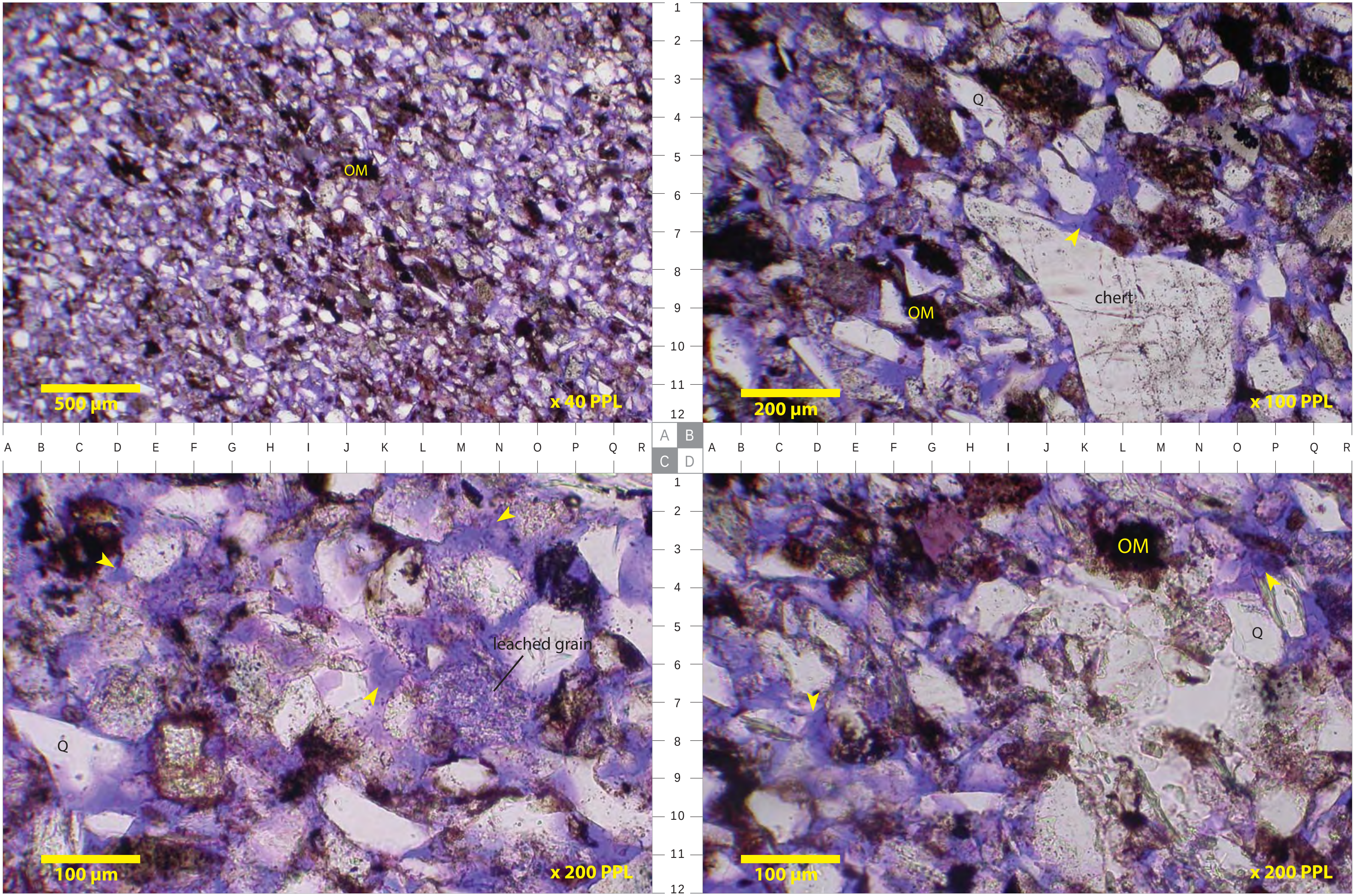
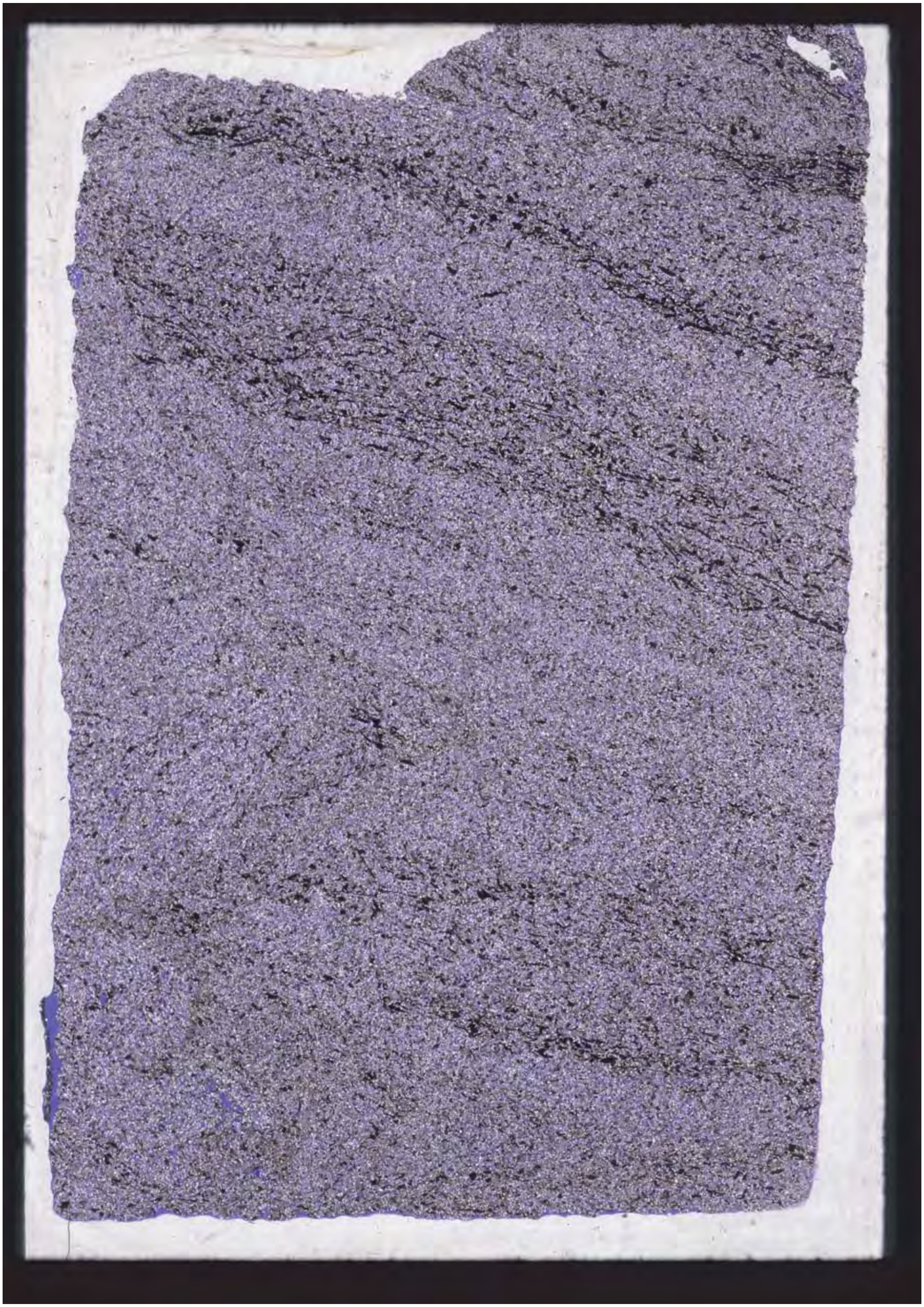


Plate 04
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 2-O-61 2401 meters



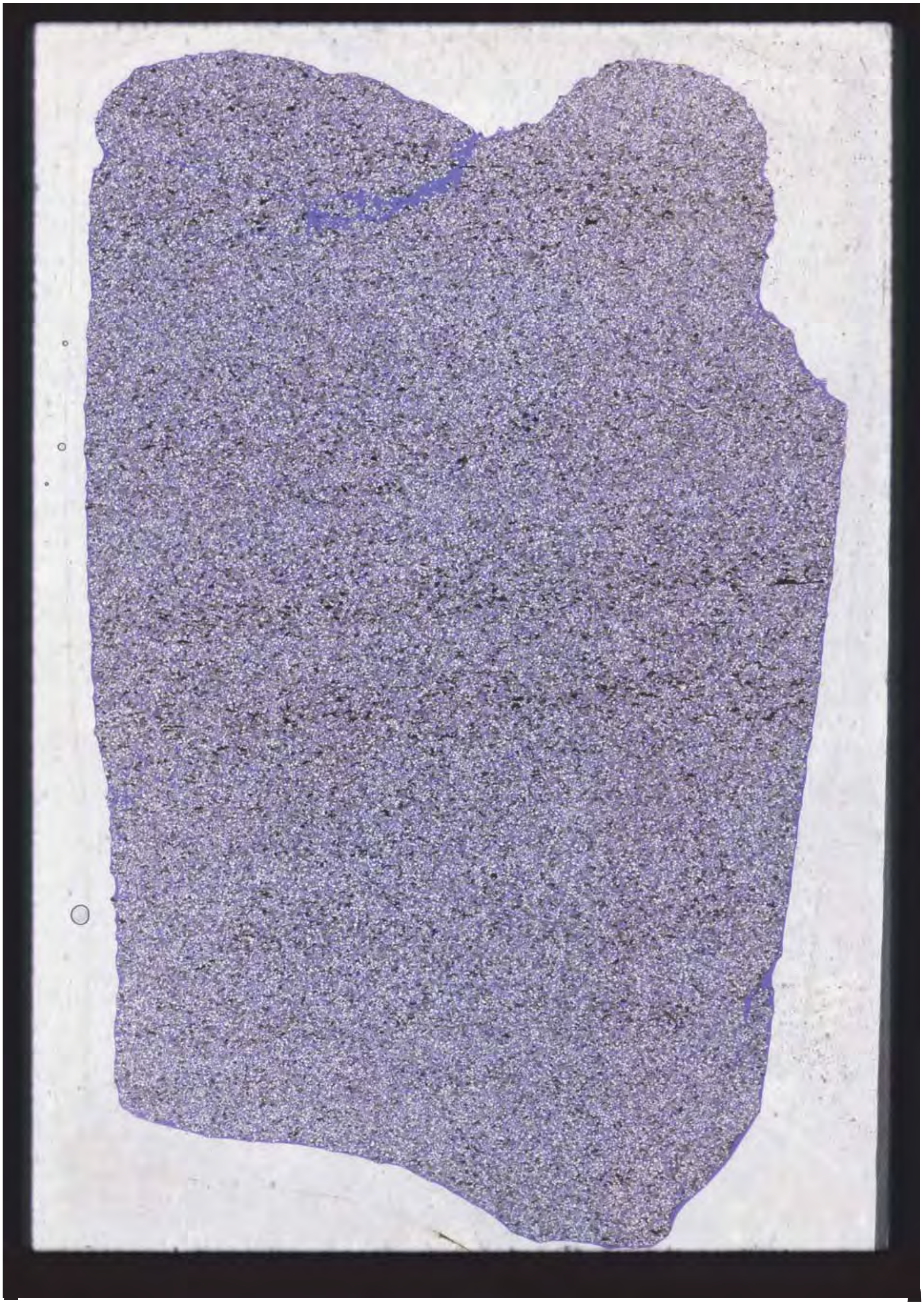
Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 2402.8 meters



2 mm

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 2407 meters

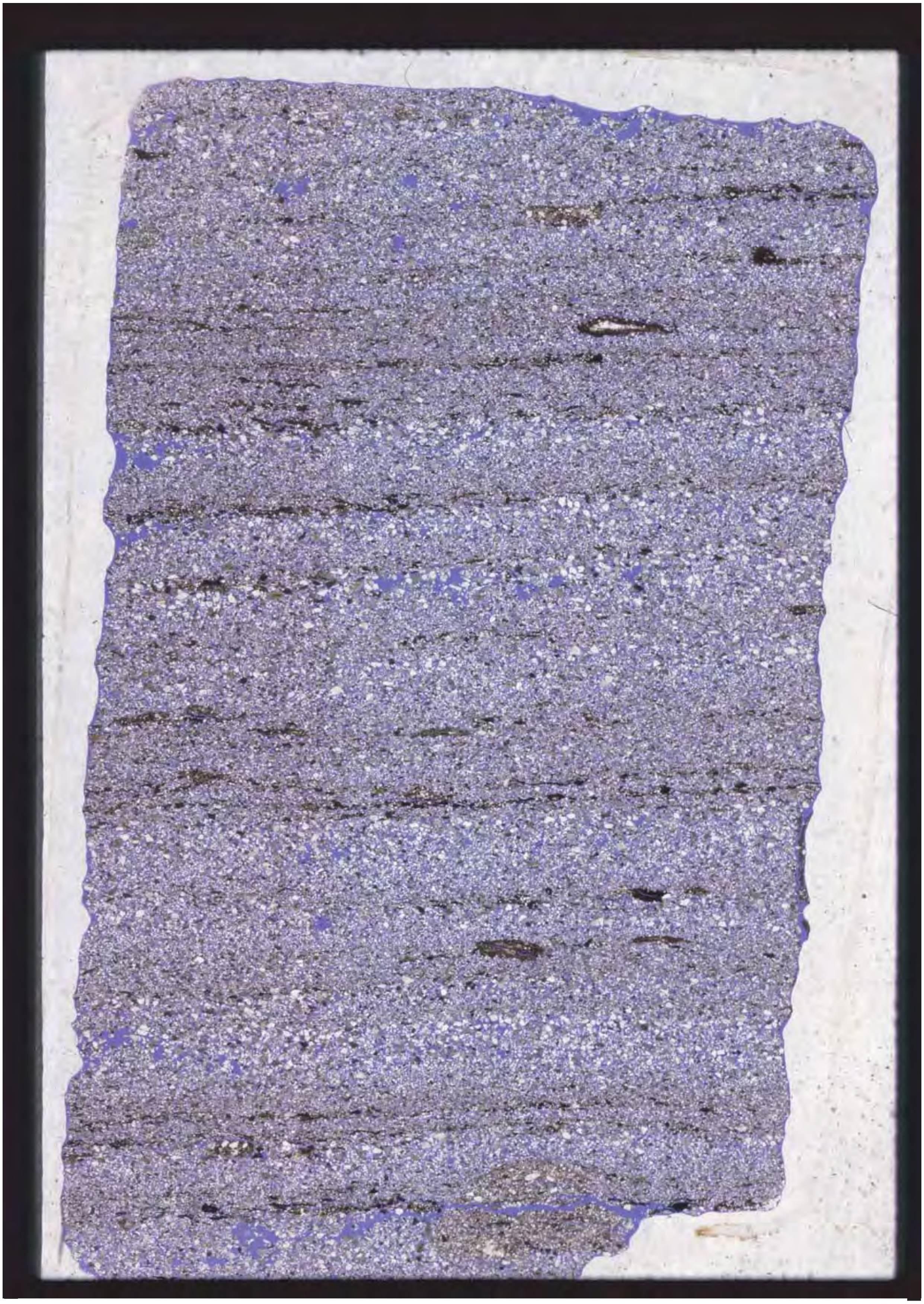
Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 2409.4 meters



2 mm

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 2411 meters

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 2412.1 meters

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 05

Issungnak 2-O-61
Kugmallit
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 2412.1 meters

Commonly bioturbated, very fine to lower fine grained, well sorted very good reservoir quality litharenites are recognized from core recovered at 2412.1 meters. Grain contacts are mainly point-point and floating in this Kugmallit interval suggesting a precursor cement, which has subsequently dissolved, preserved the macropore system and prevented mechanical compaction. Framework grains consist of monocrystalline quartz, chert, clay-rich sedimentary grains (CRF), micas, feldspars and glauconite (View B). The dissolution of unstable framework grains, such as feldspathic lithoclasts (View B, K-L:8-9; View C, H:6-7), has enhanced the effective pore system (small yellow arrows).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

Issungnak 20-61 2412.1 meters

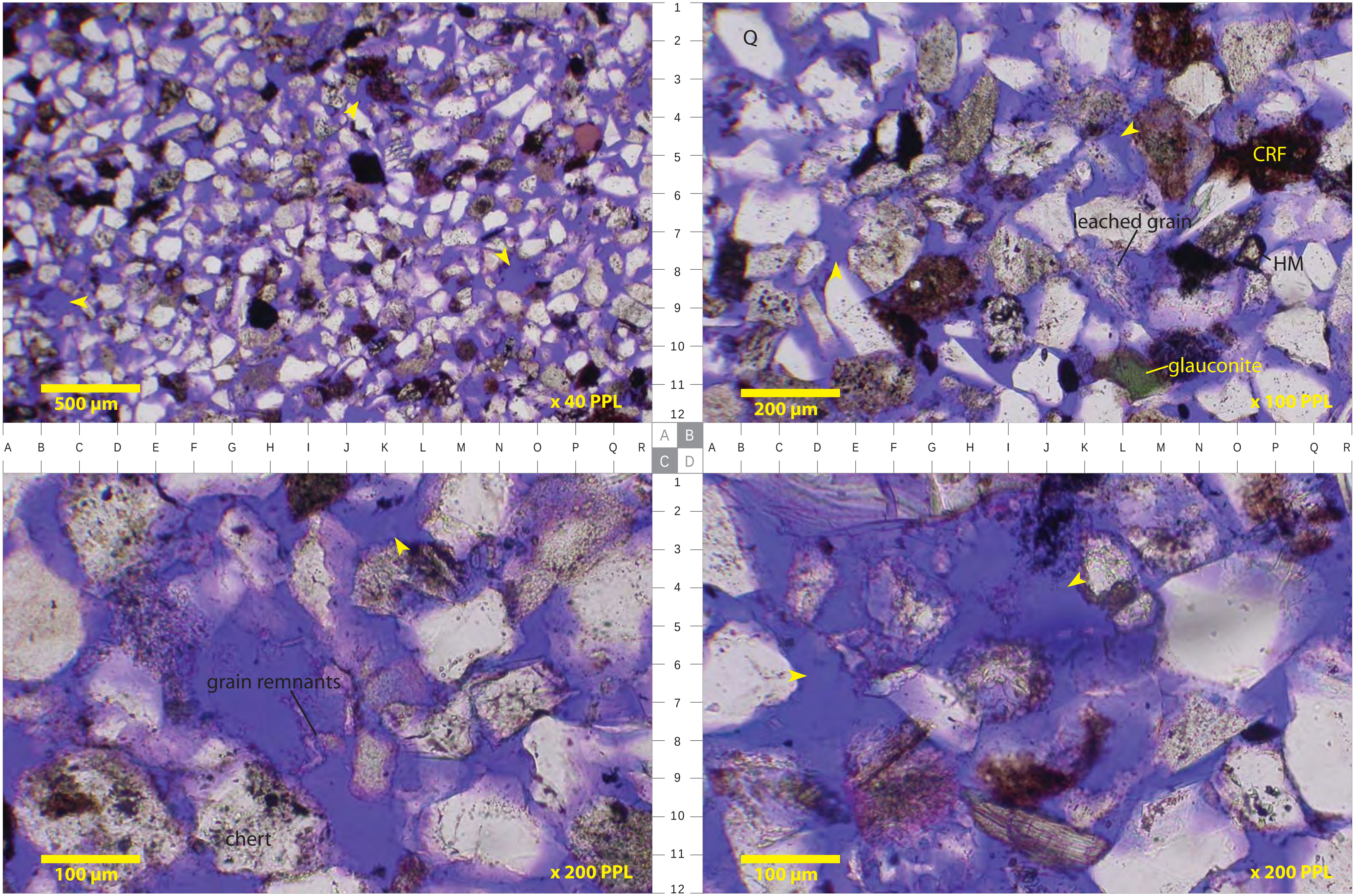
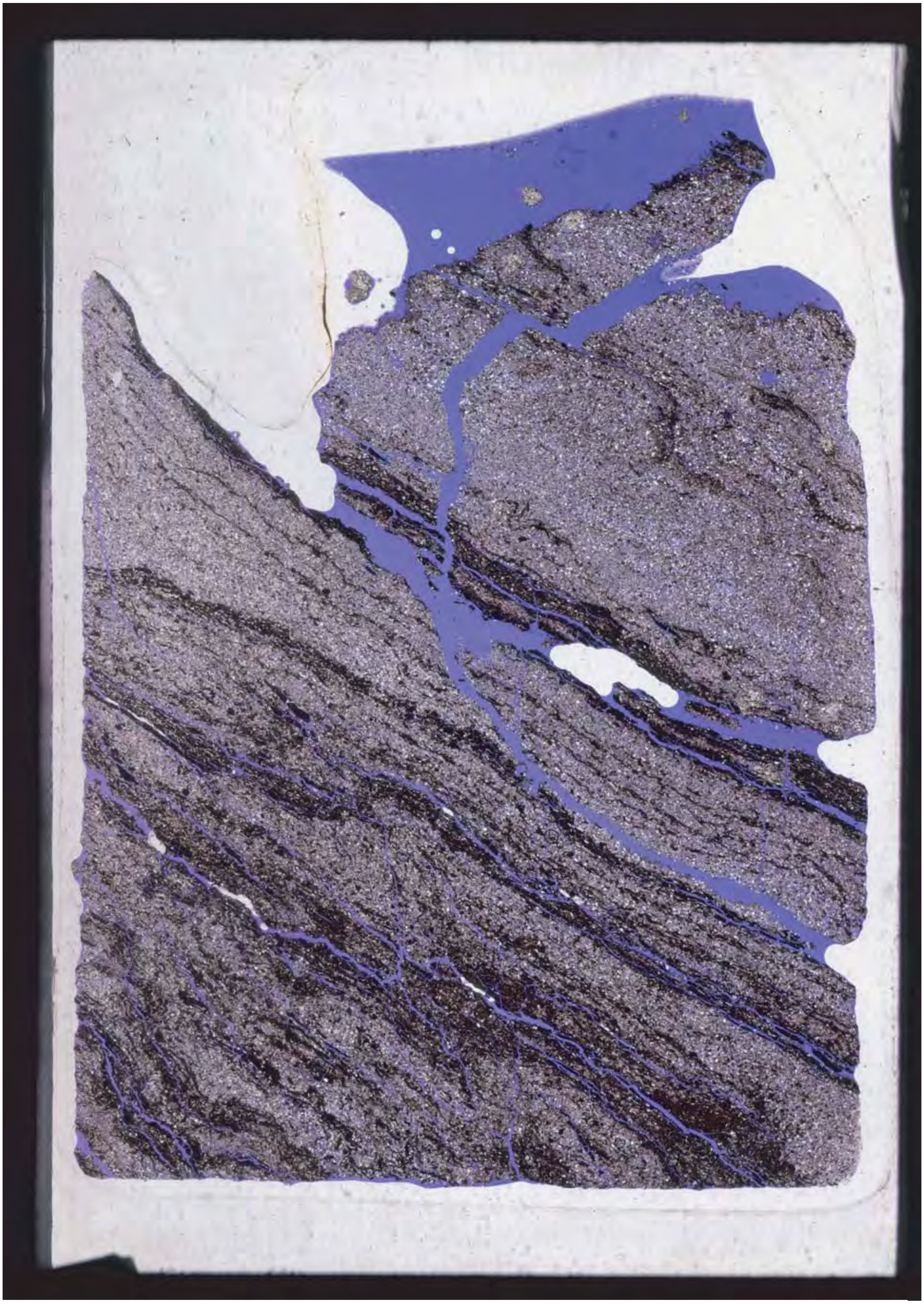


Plate 05
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 2-O-61 2412.7 meters



2 mm

Kugmallit

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 2-O-61 2413.2 meters


2 mm

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 2413.6 meters

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 2418.7 meters

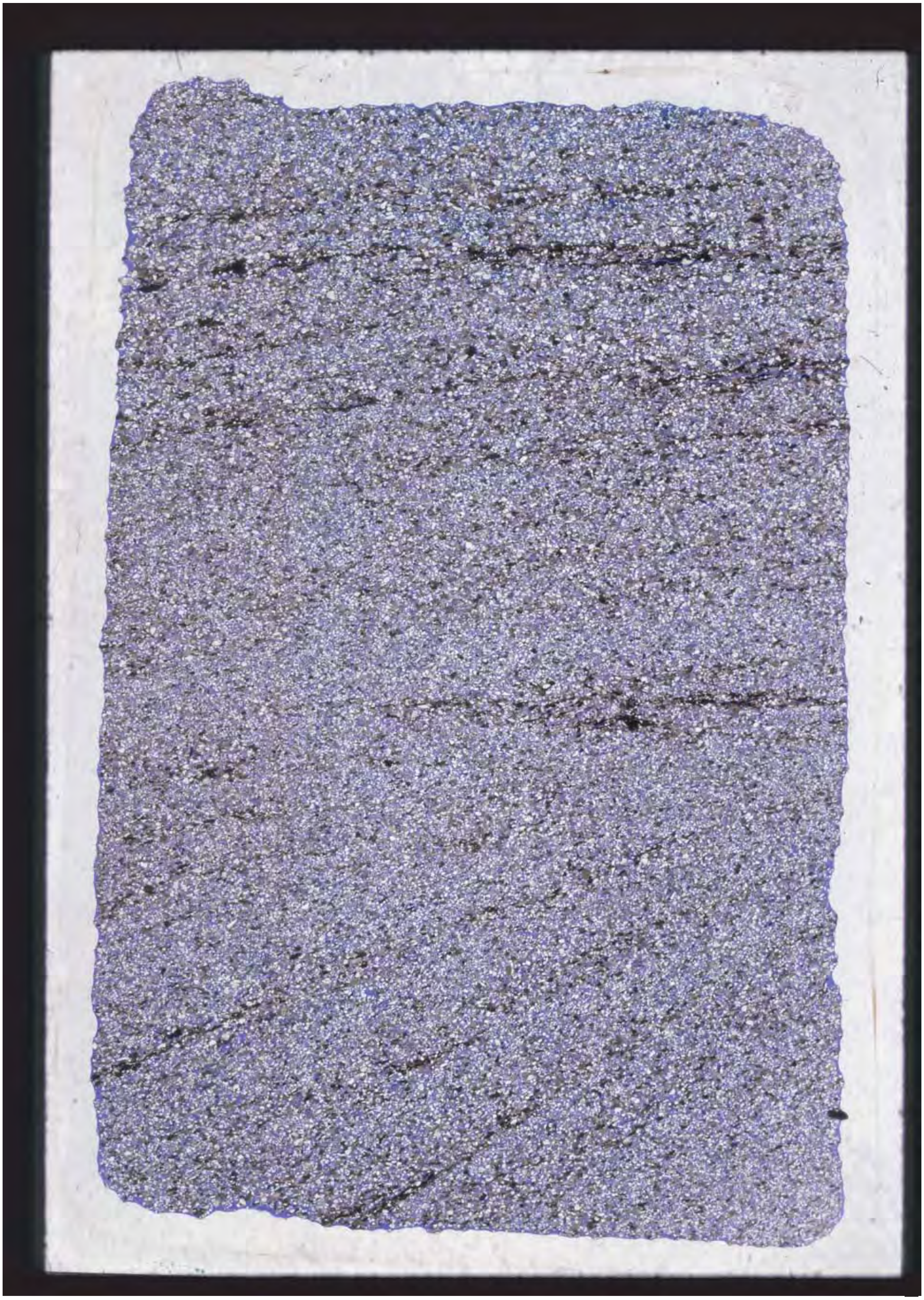
Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 2494.6 meters



Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 2497.8 meters (a)

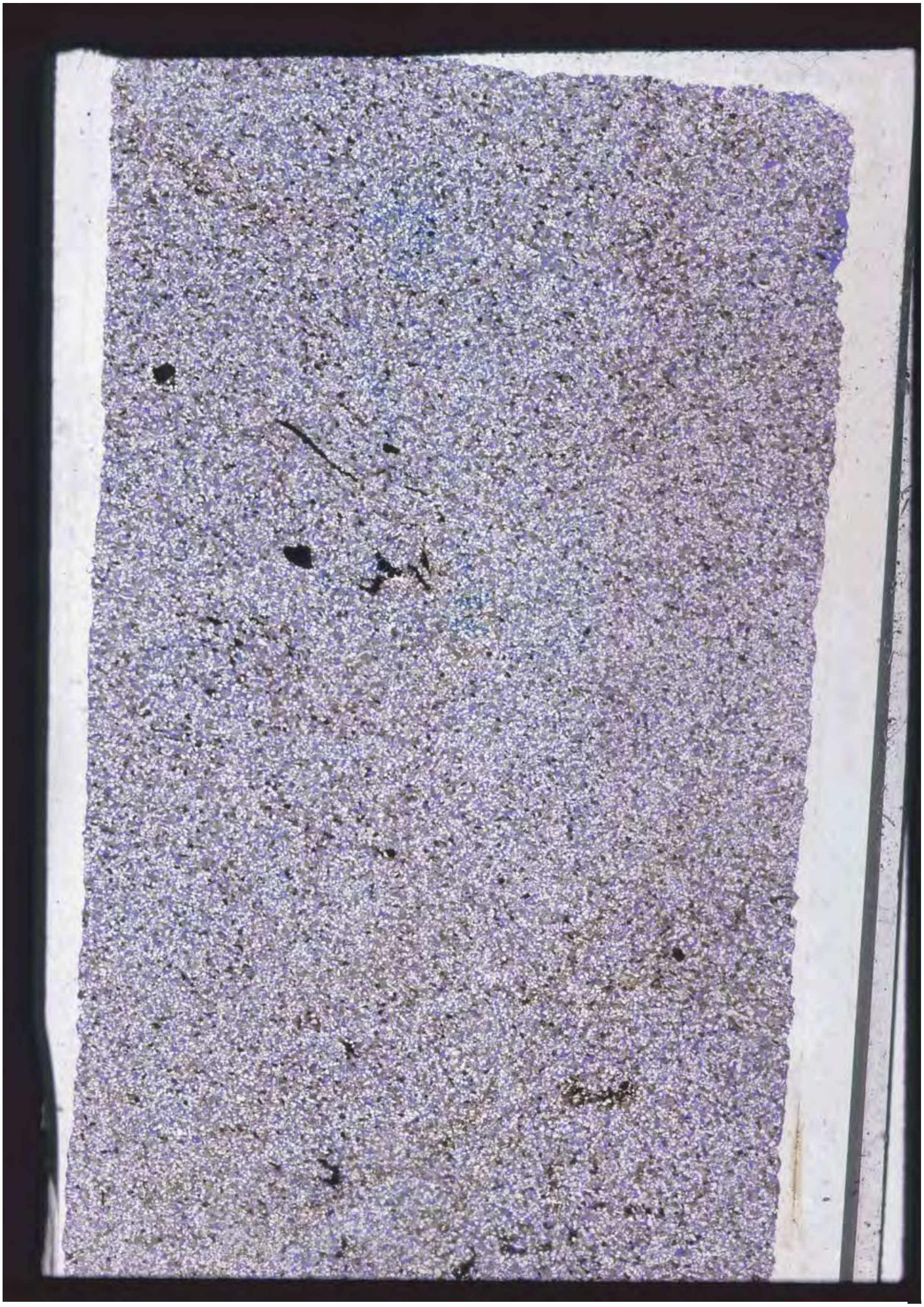
Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61   2497.8 meters (b)



Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 06

Issungnak 2-O-61
Kugmallit
Litharenite

Core Analysis Porosity: 30.3% Core Analysis Permeability: 1,510 md

Sample #: 12-28
Depth: 2497.8 meters

Very well sorted, fine grained and bioturbated Kugmallit litharenites are recognized from core recovered at 2497.8 meters. Framework grains are comprised mainly of monocrystalline quartz (Q), chert, clay-rich sedimentary clasts, (CRF), organic material and feldspars. The dissolution of feldspathic framework grains (View B, I:8; View C, K:9) has enhanced the effective pore system (small yellow arrows). Core analysis porosity is 30.3% and measured permeability is 1510 md in this porous and very good reservoir quality sandstone. Authigenic phases are poorly preserved consisting of rare loosely packed kaolinite clays (View D, “K”) and trace unevenly distributed syntaxial quartz cement (View C, B:9).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 20-61

2497.8 meters

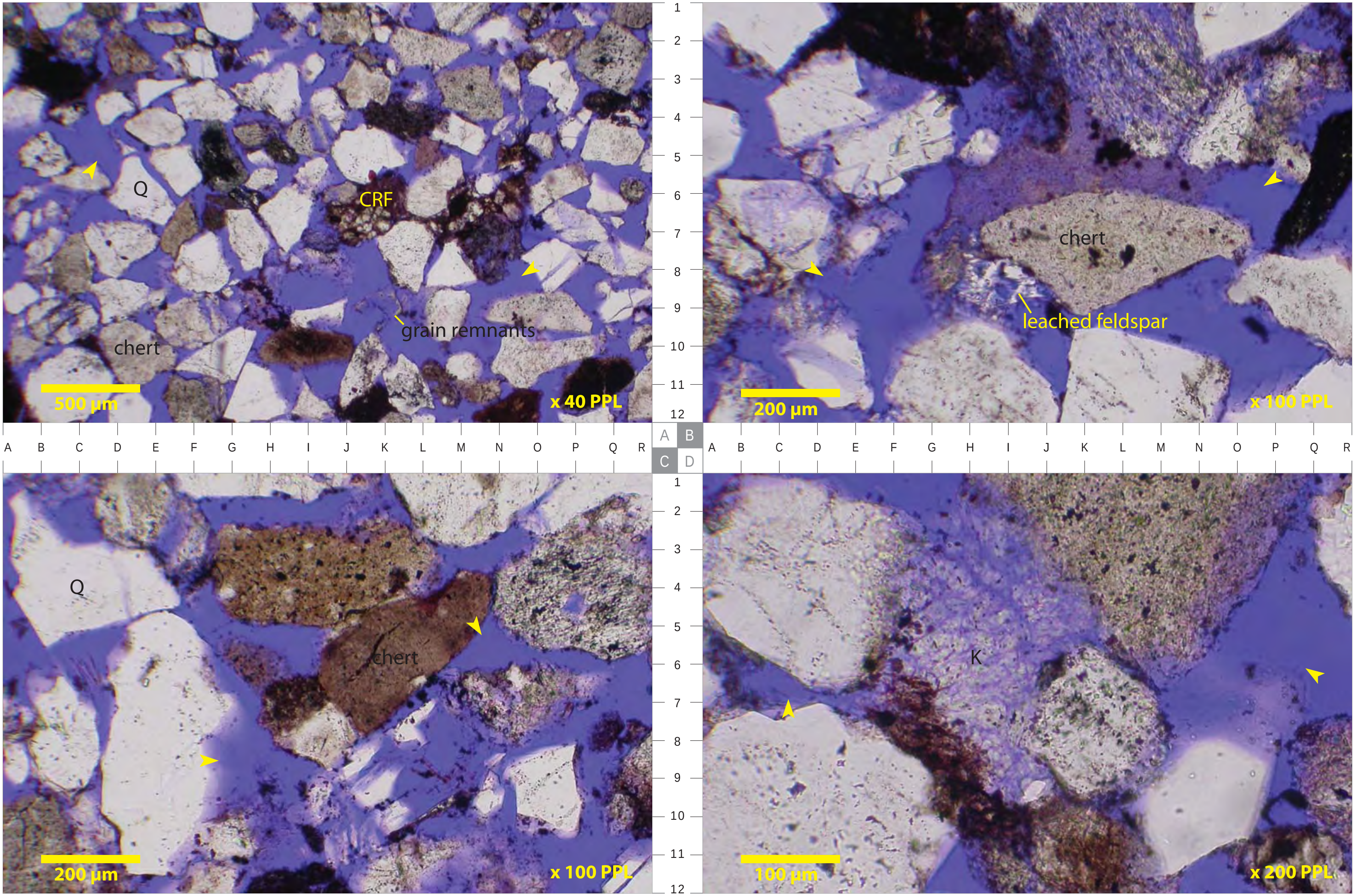
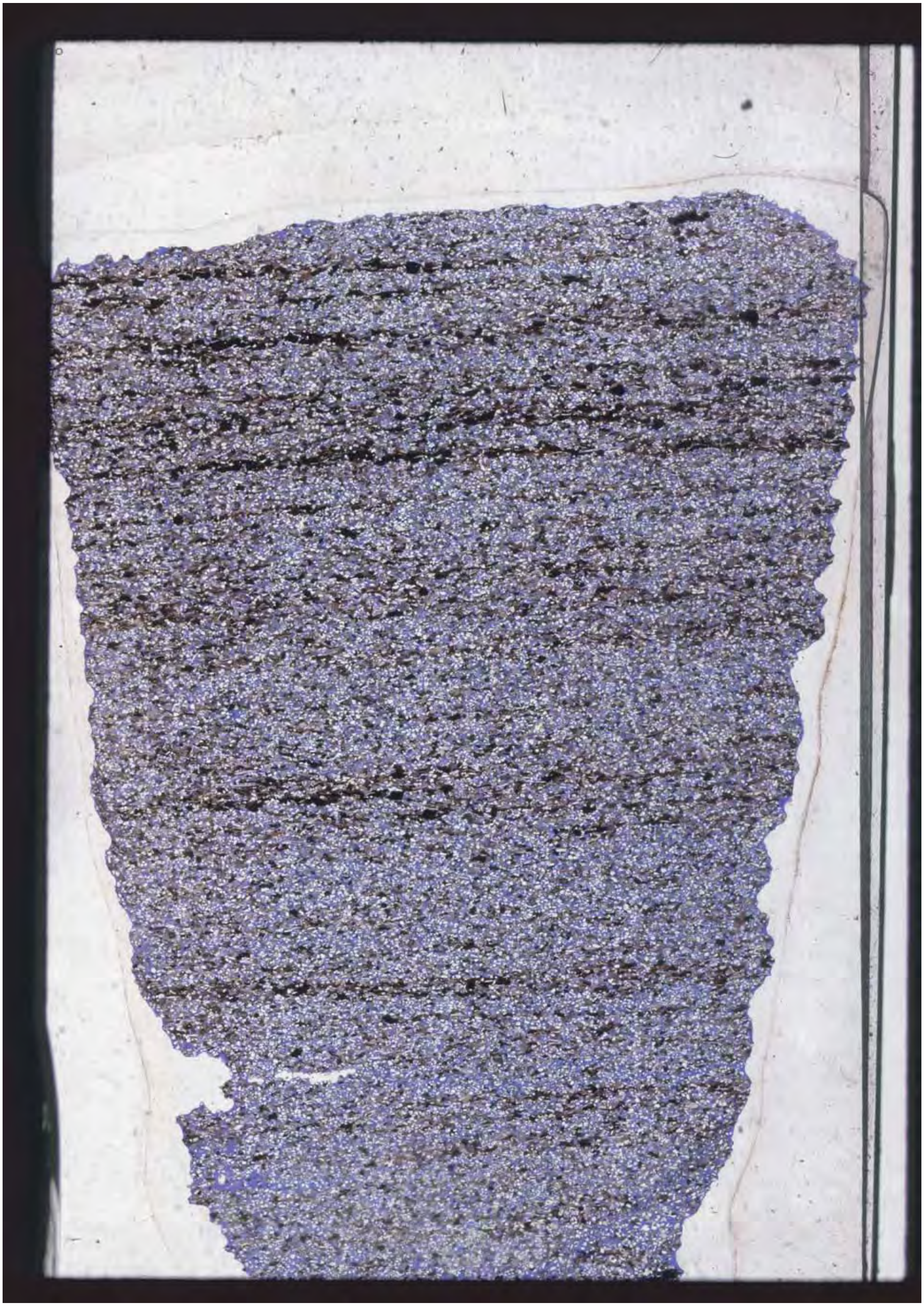


Plate 06
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 2-O-61 2499.1 meters



2 mm

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 07

Issungnak 2-O-61
Kugmallit
Litharenite

Core Analysis Porosity: 22.4% Core Analysis Permeability: 23.8 md

Sample #: 12-29
Depth: 2499.1 meters

Parallel laminated, moderately well sorted, fine grained litharenites were encountered from core recovered at 2499.1 meters. Common organic material (OM) is concentrated along laminae as illustrated in the Overview. Grain contacts are tangential and concavo-convex, with labile framework grains such as organic material compacted between more competent grains. Core analysis porosity is 22.4% and measured permeability is 23.8 md in this moderate to good reservoir quality sandstone. Diagenetic cements are poorly preserved consisting of pyrite precipitated within chert micropores (View D). The dissolution of feldspathic grains (View B, J:8) has enhanced the effective pore system (small yellow arrows). Monocrystalline quartz, chert, clay-rich sedimentary grains (CRF), organic material (OM) and micas are some of the framework constituents.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 20-61 | 2499.1 meters

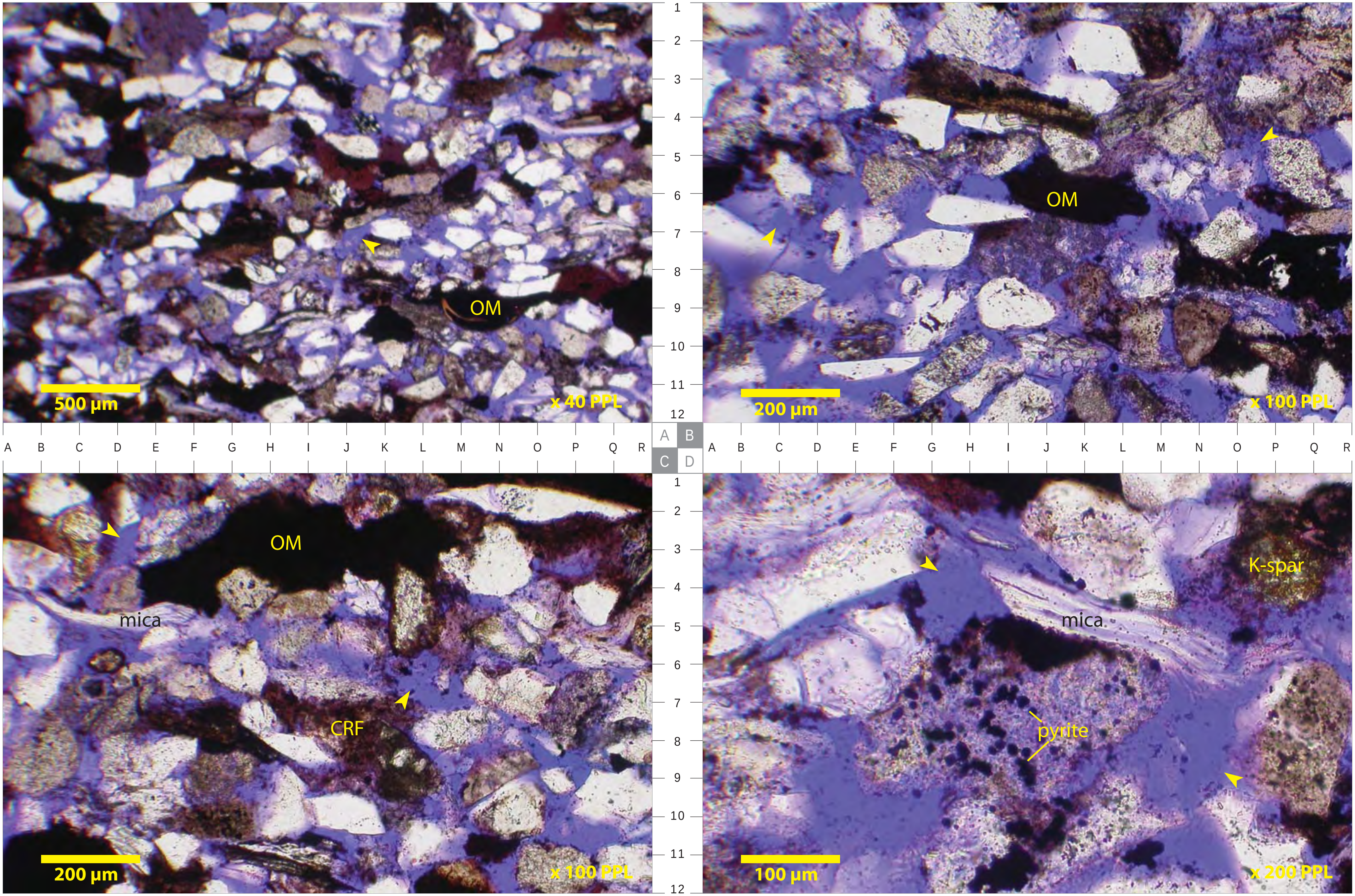


Plate 07
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 2-O-61 2511.1 meters

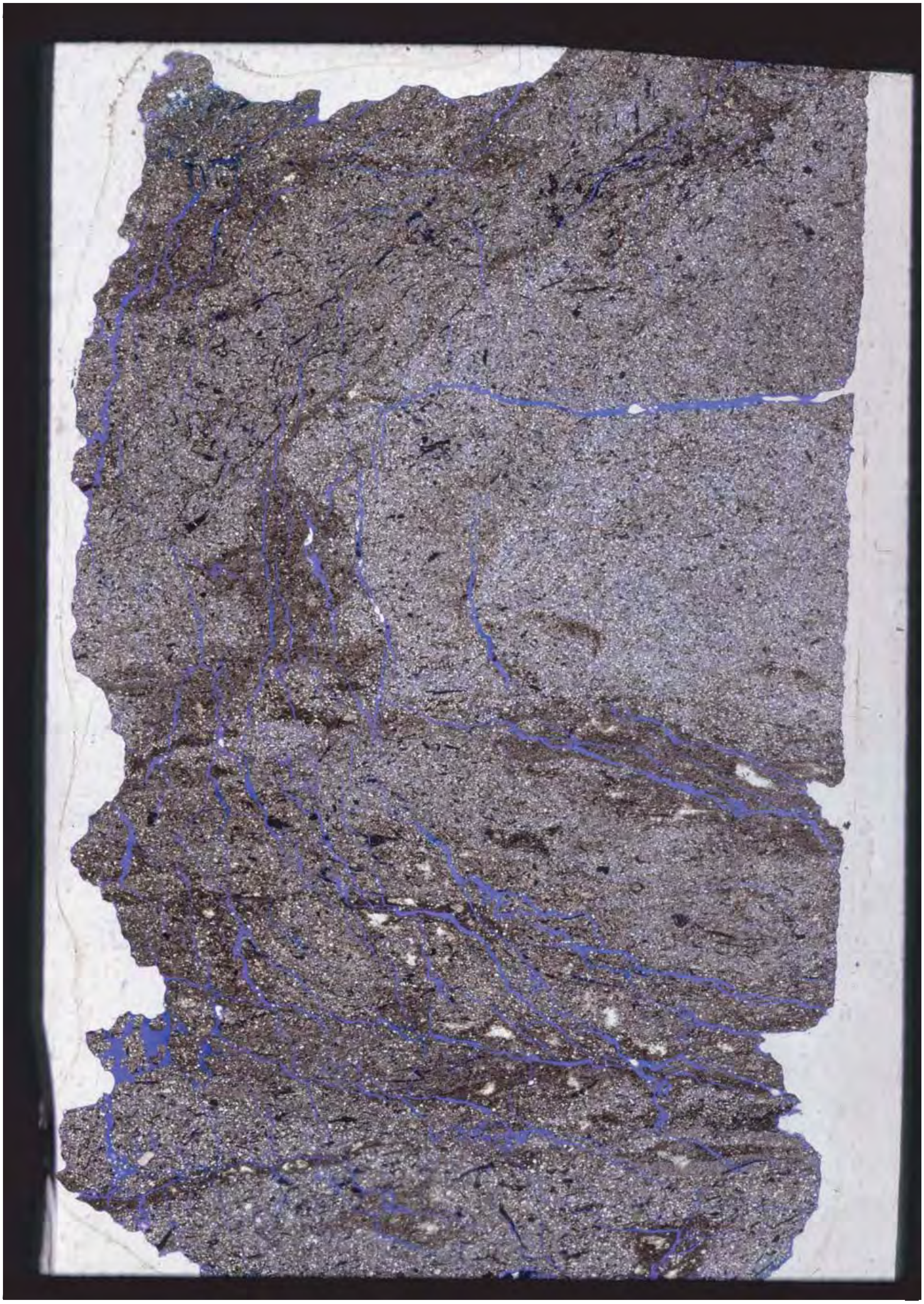
Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 2511.4 meters



2 mm

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

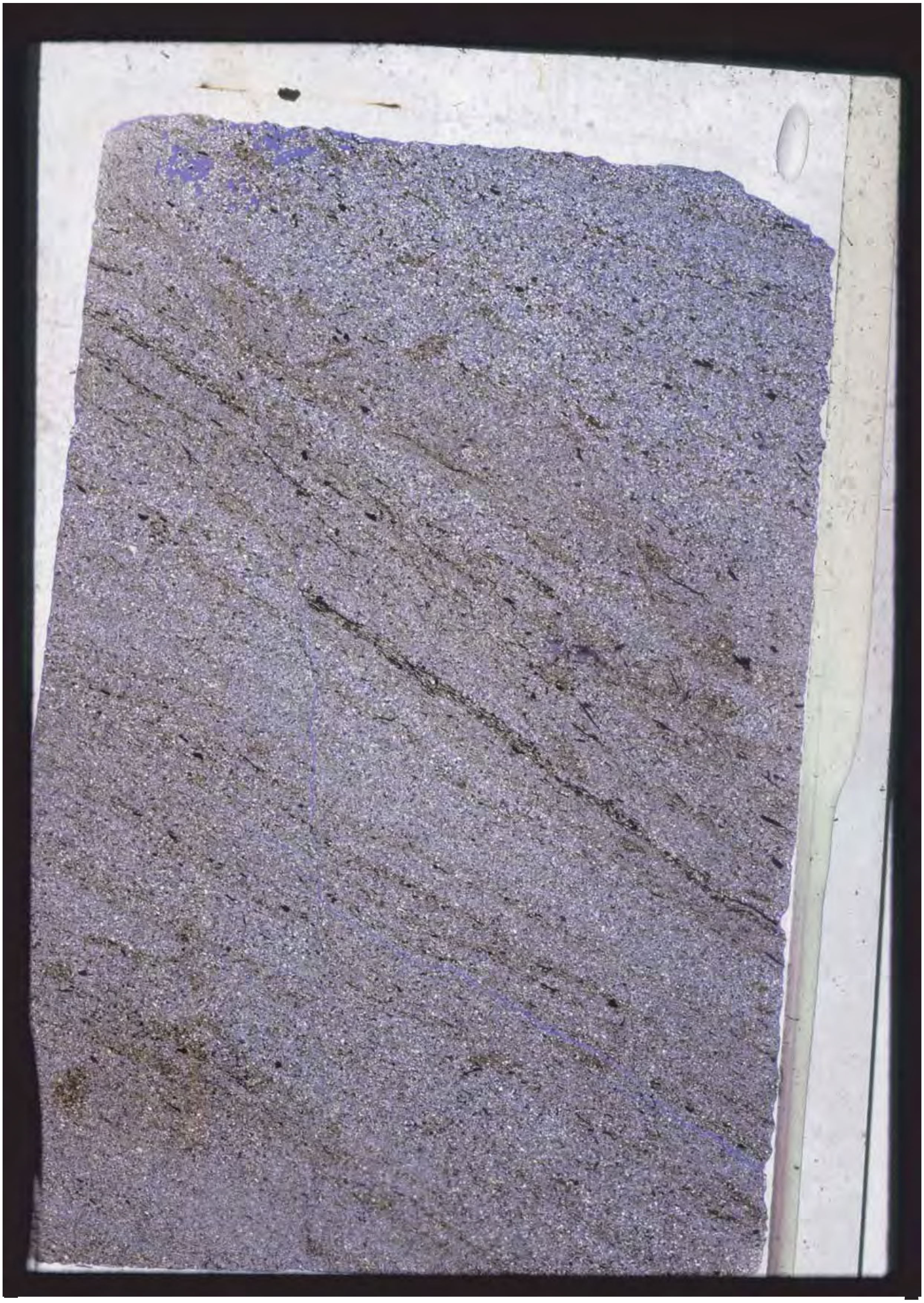
Issungnak 2-O-61 2512.9 meters

2 mm

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 2-O-61 2514.6 meters



Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

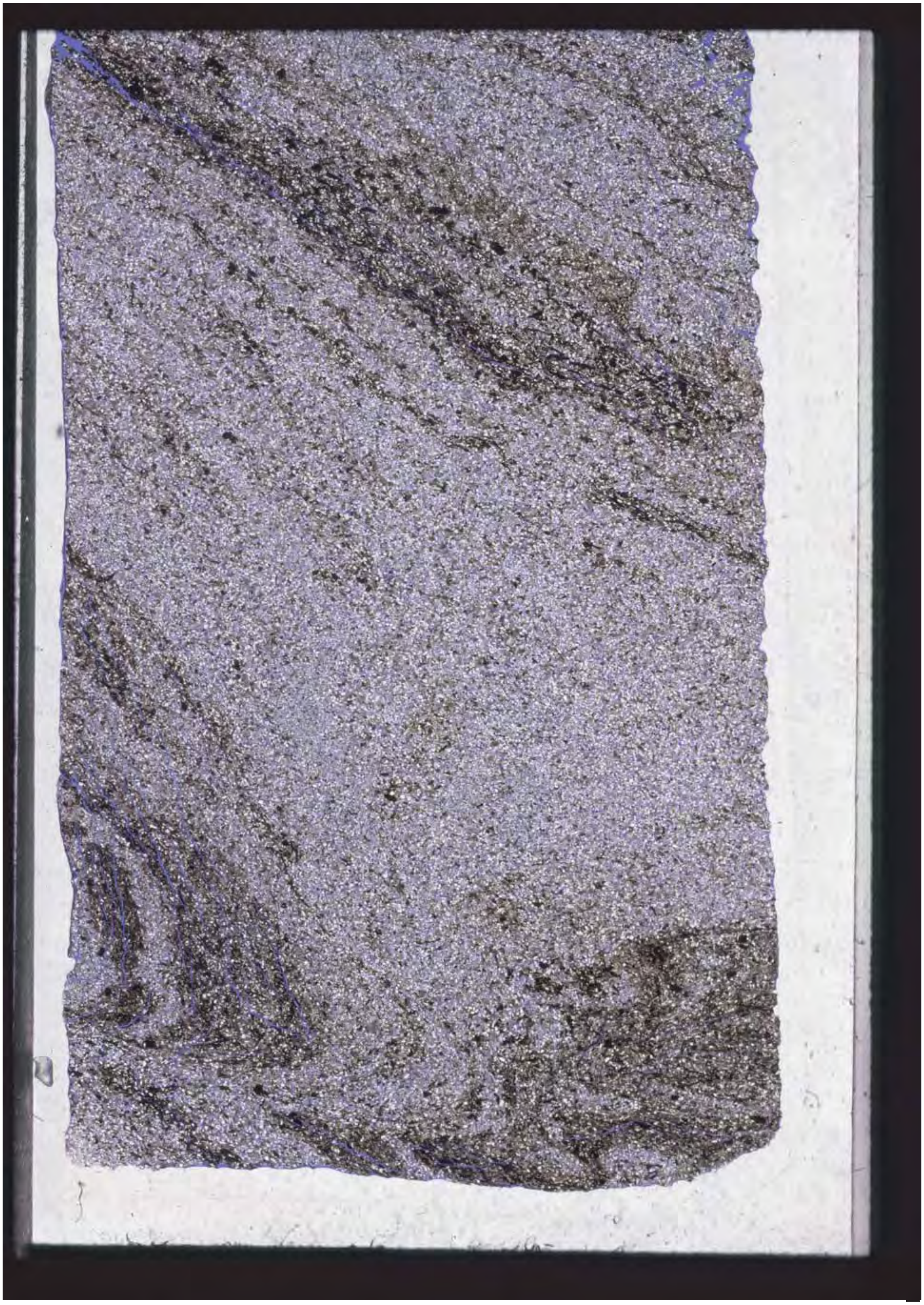
Issungnak 2-O-61 2593.9 meters

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 2598.8 meters



Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 08

Issungnak 2-O-61
Kugmallit
Litharenite

Core Analysis Porosity: 22.4% Core Analysis Permeability: 23.8 md

Sample #: 12-36
Depth: 2598.8 meters

Laminated, commonly bioturbated, well sorted, very fine to fine grained litharenites are recognized from core recovered at 2598.8 meters. Partially leached feldspathic grains (Views C and D) are shown in these high magnification photomicrographs. Complete dissolution of these unstable grains would enhance the effective pore system. Grain contacts are tangential and concavo-convex indicating moderate mechanical compaction. Framework grains include subangular to subrounded monocrystalline quartz (Q), chert, black organic material (OM), dark brown clay-rich sedimentary grains, feldspars and glauconite (View B). Concentration of organic material and clays are found along laminae and burrows. Authigenic phases are poorly developed and consist of rare siderite and pyrite.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 20-61 **2598.8 meters**

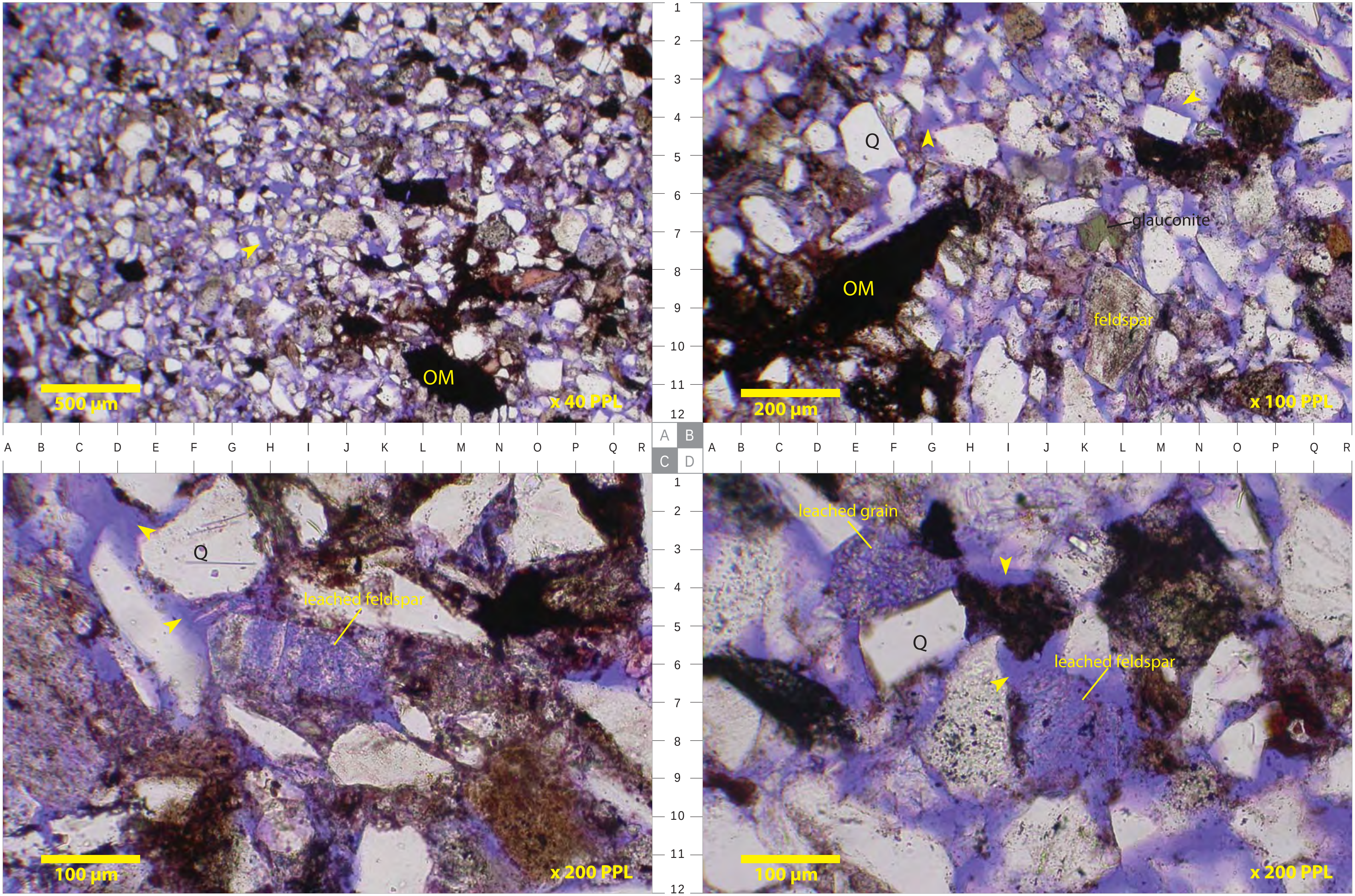


Plate 08
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 2-O-61 2618.8 meters

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 09

Issungnak 2-O-61
Kugmallit
Argillic Siltstone

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 2618.8 meters

Non-reservoir quality, commonly bioturbated, poorly sorted, argillaceous siltstones characterize the clastics recovered from core at 2618.8 meters. The partial dissolution of feldspars and feldspathic grains (Views C and D) has created isolated non-effective microporosity. Subangular monocrystalline quartz (Q), organic material (OM), feldspathic grains and micas comprise some of the framework constituents. Brown matrix clays are abundant. The effective pore system (small yellow arrows) is isolated and this interval is considered non-reservoir quality.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

Issungnak 20-61 **2618.8 meters**

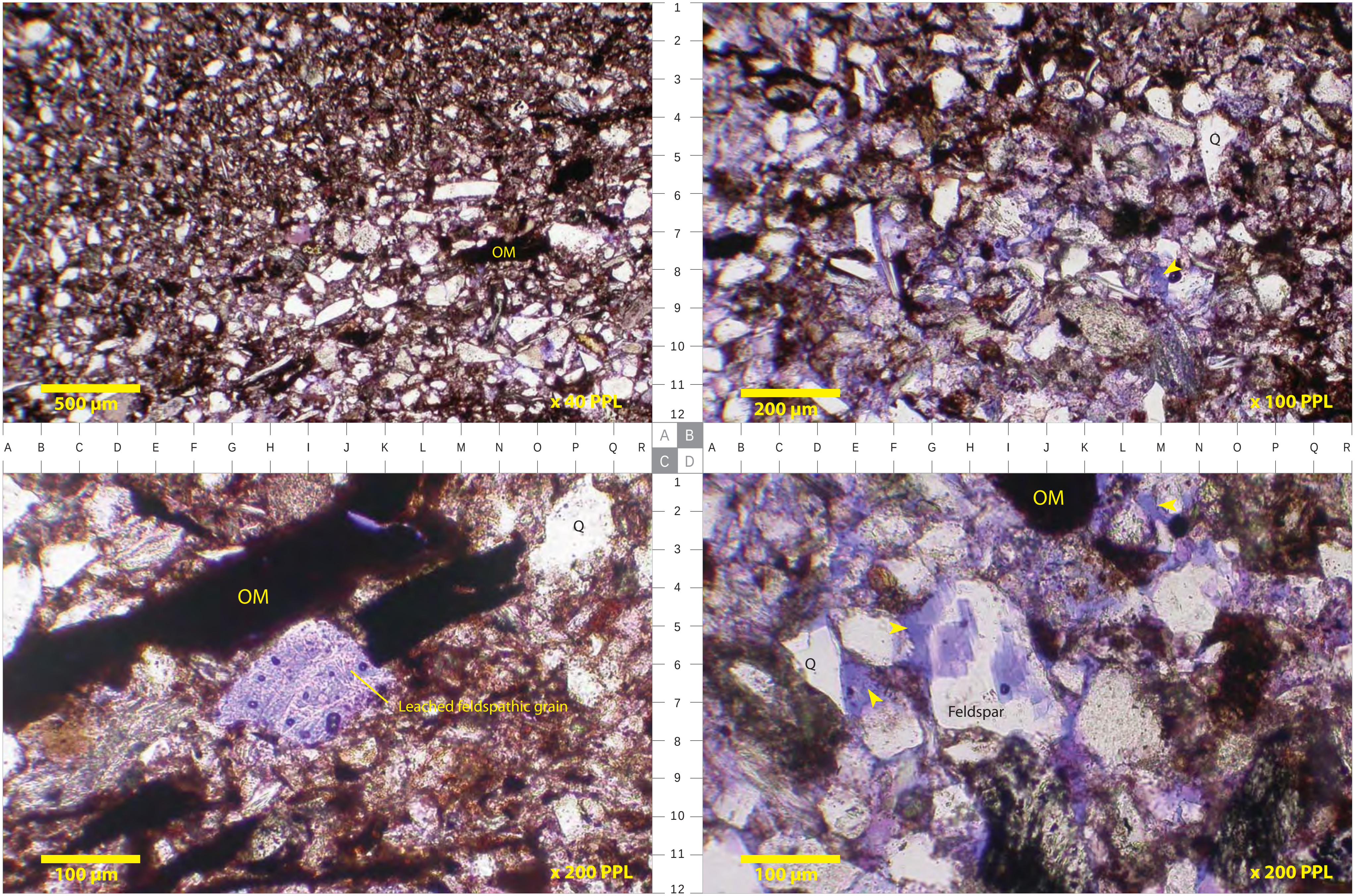
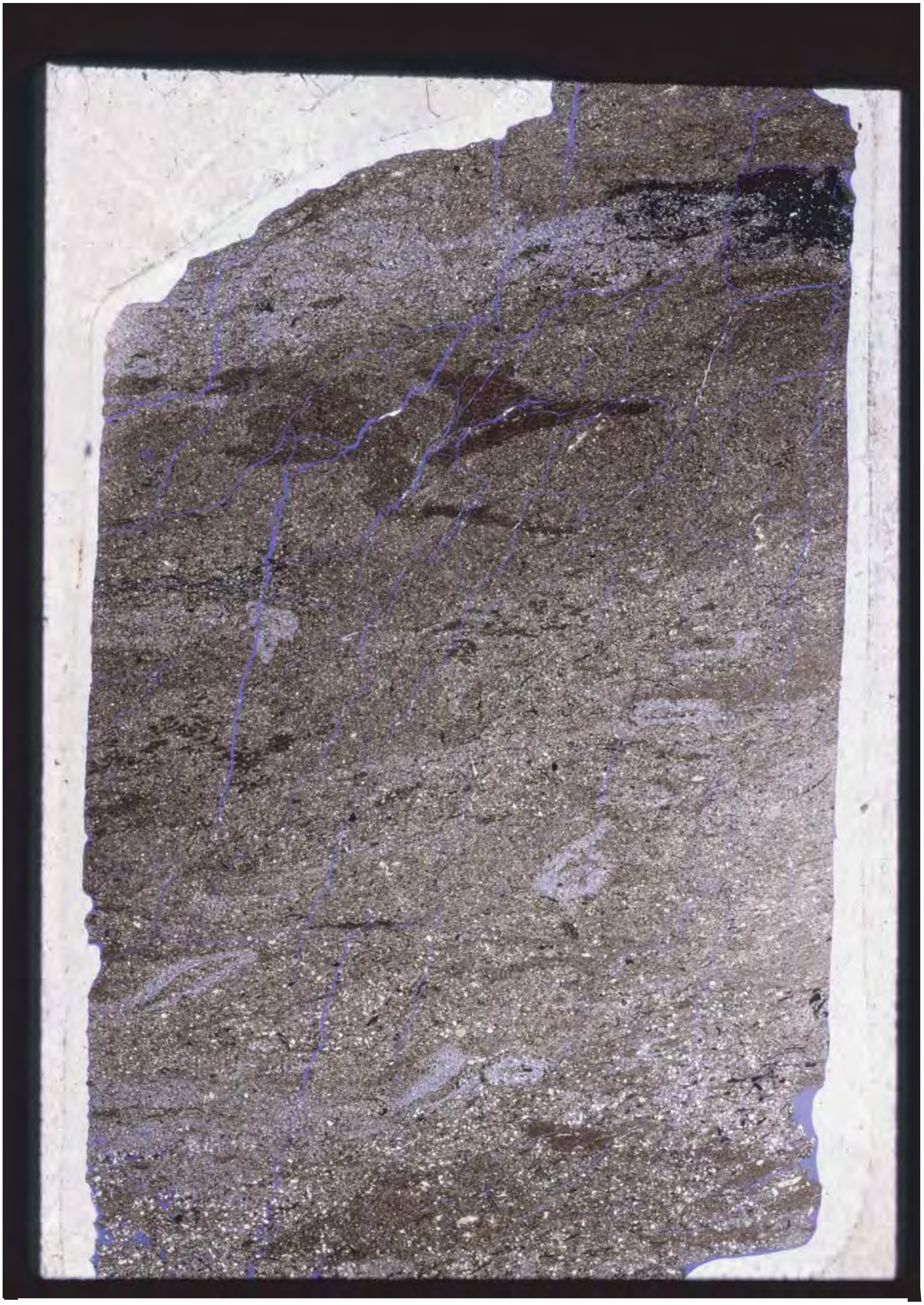


Plate 09
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 2-O-61 2622.5 meters



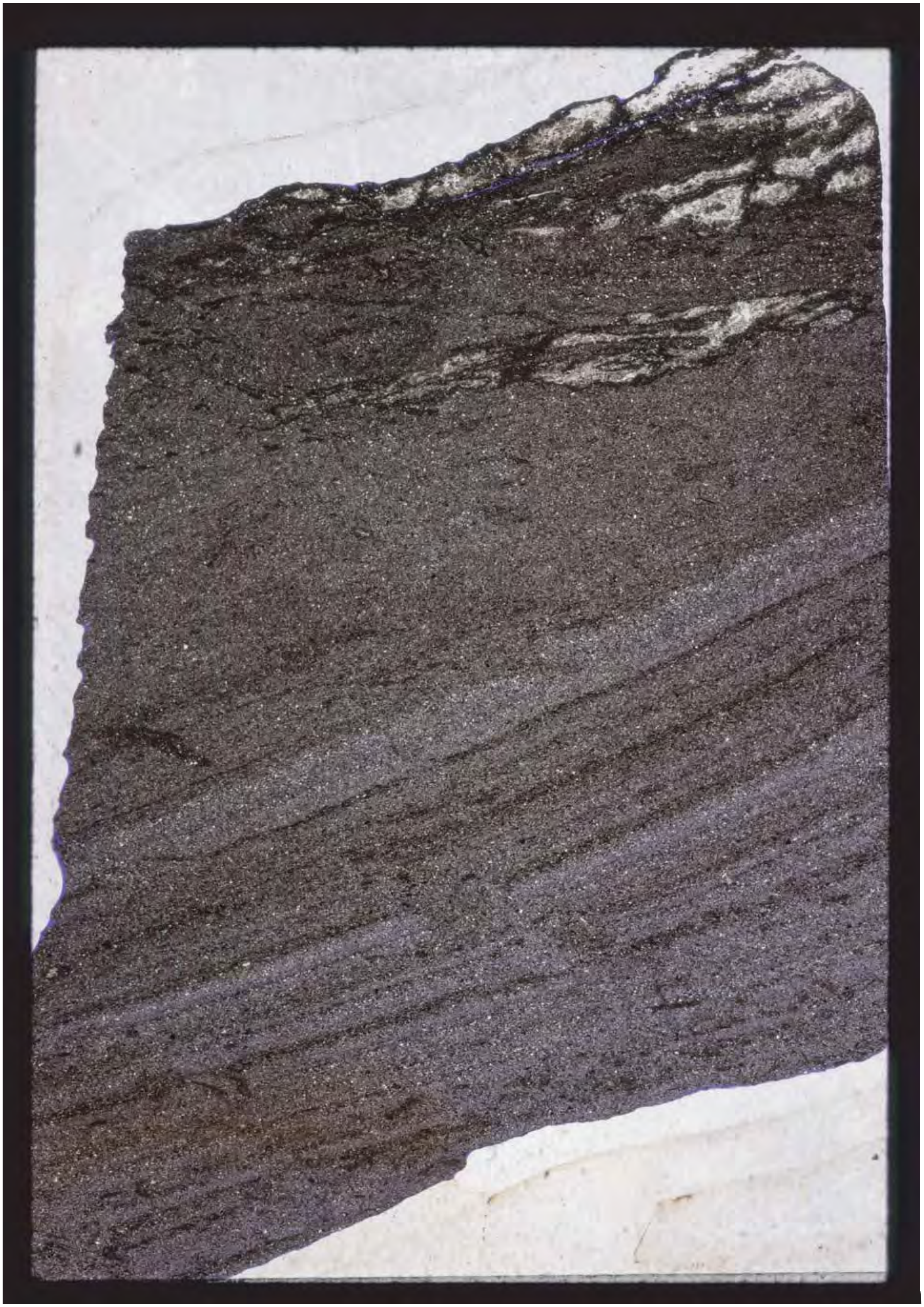
Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 2626.0 meters



Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 3145.7 meters

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 10

Issungnak 2-O-61
Kugmallit
Litharenite

Core Analysis Porosity: 23.0%   Core Analysis Permeability: 208 md

Sample #: 12-41
Depth: 3145.7 meters

Well sorted, medium grained, excellent reservoir quality litharenites characterize the Kugmallit Sequence recovered from core at 3145.7 meters. Authigenic cements are very poorly preserved in this section with rare pyrite precipitated within chert micropores and rare poorly developed quartz overgrowths (View C, D:9). Rare kaolinite clays (View B, H:9) are loosely packed within macropores. Macroporosity is very well developed in this massive sandstone with core analysis (measured) porosity yielding 23%; measured permeability is 208 md. The effective macropore system (small yellow arrows) is very well developed and enhanced by the dissolution of feldspathic framework grains (View C, M:10; View D, L:4). Framework grains consist of subrounded to subangular monocrystalline quartz (Q), chert, polycrystalline quartz, yellow stained K-feldspar (View D) and clay-rich sedimentary grains (CRF).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 20-61

3145.7 meters

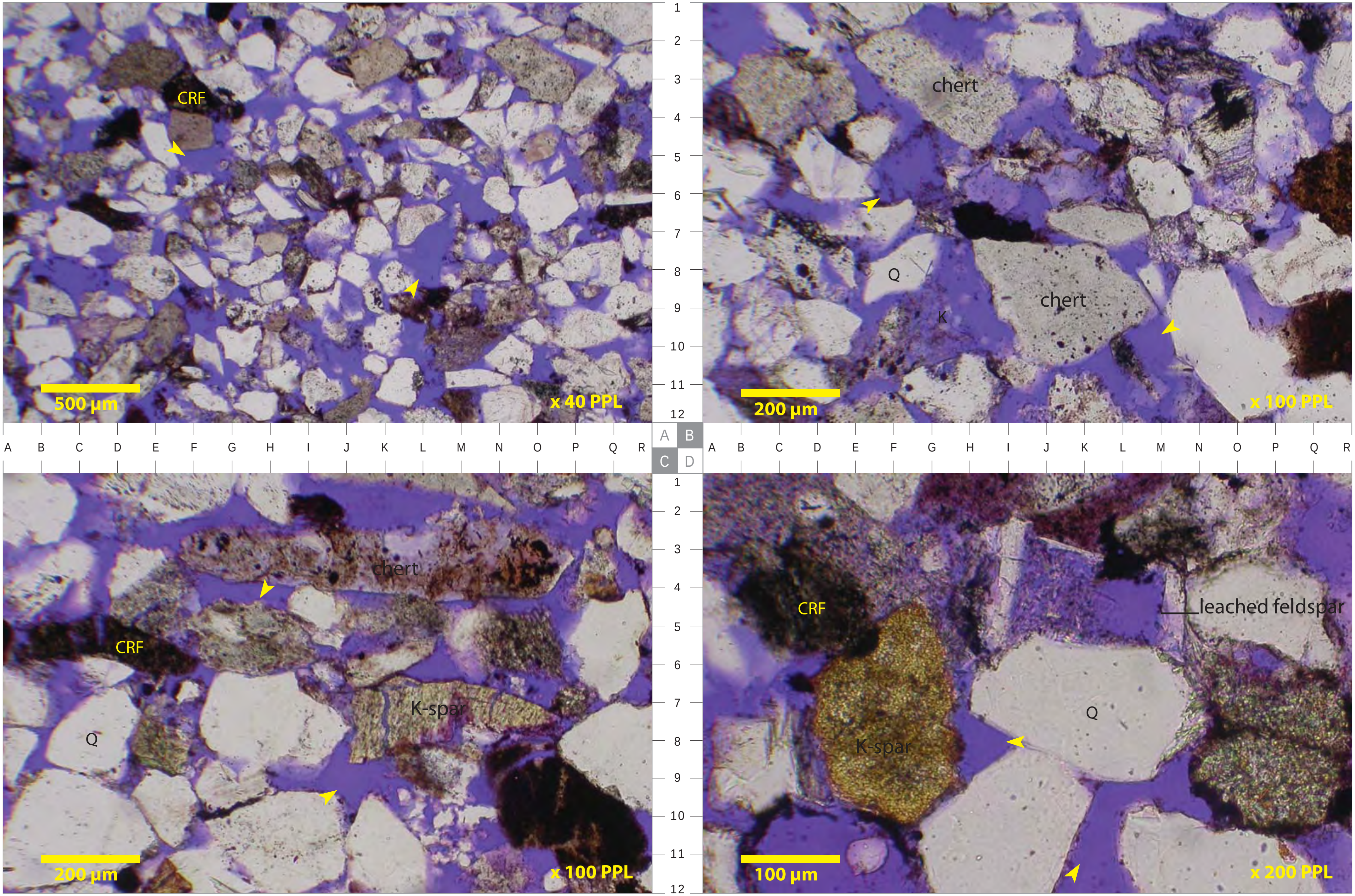


Plate 10
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 2-O-61 3146.8 meters (a)

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 3146.8 meters (b)

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 11

Issungnak 2-O-61
Kugmallit
Litharenite

Core Analysis Porosity: 13.5% Core Analysis Permeability: 0.52 md

Sample #: 12-42
Depth: 3146.8 meters

Non-reservoir, poorly sorted, laminated, bioturbated silt to fine grained argillic litharenites are recognized from core taken at 3146.8 meters. Framework gains are comprised mainly of monocrystalline quartz (Q) with common argillic grains and organic material (OM). Subordinate framework grains include chert, feldspar and micas. Note the partial dissolution of feldspathic grains in all Views. Authigeinic phases are poorly developed consisting of replacive siderite and rare pyrite.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 20-61 **3146.8 meters**

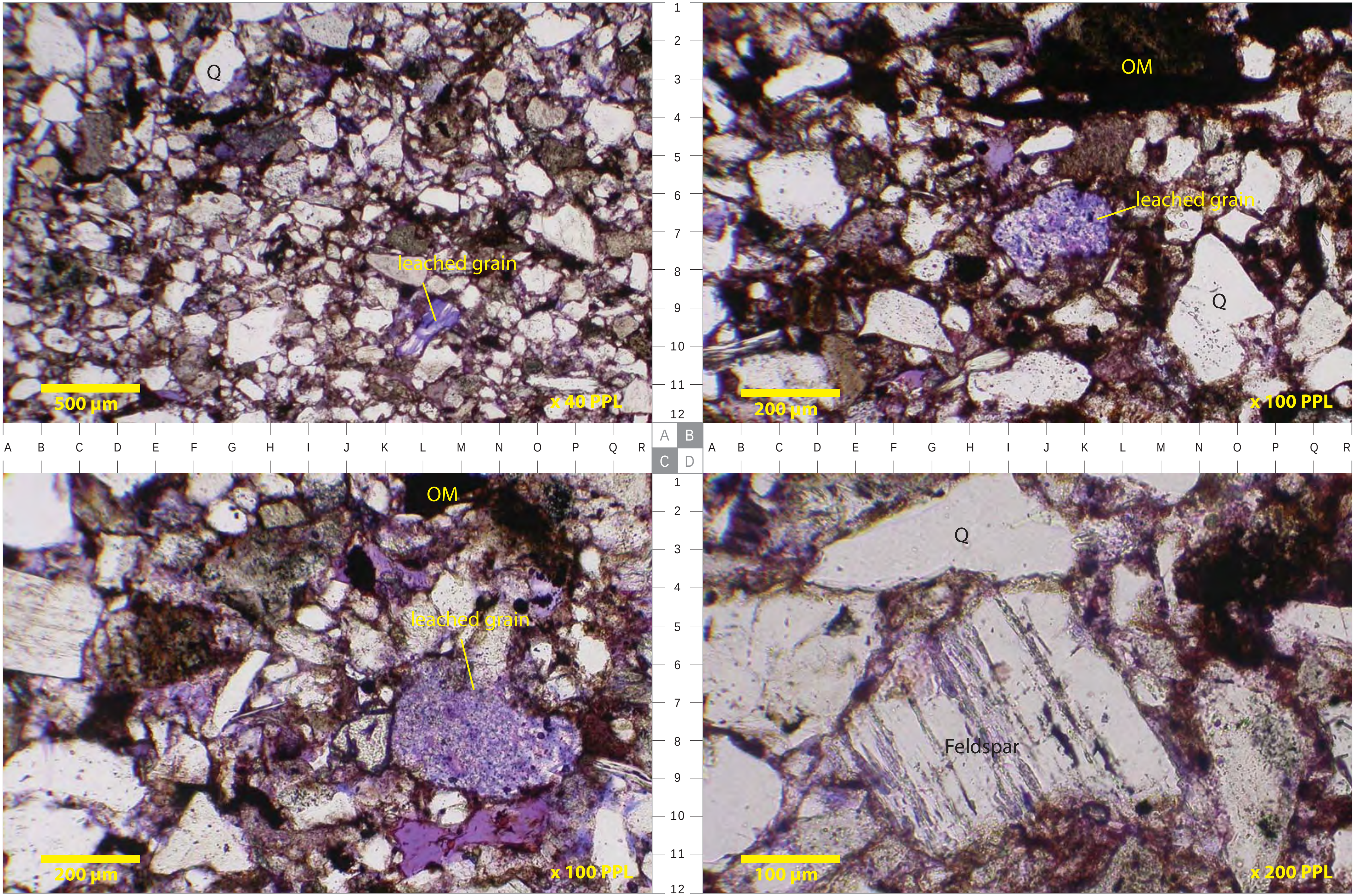
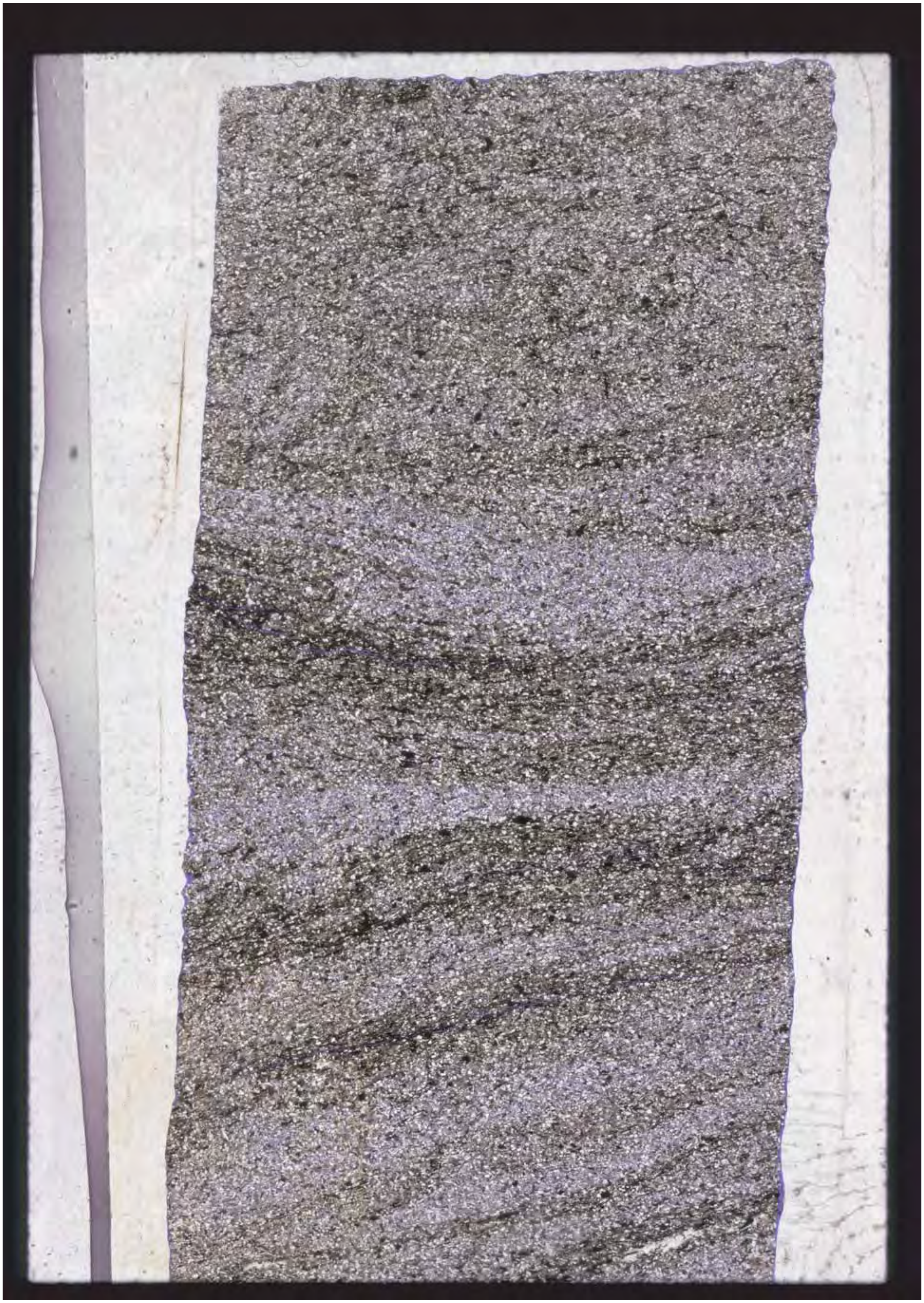


Plate 11
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 2-O-61 3150.2 meters (b)



Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 3151 meters

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 3151.7 meters

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 3153.6 meters

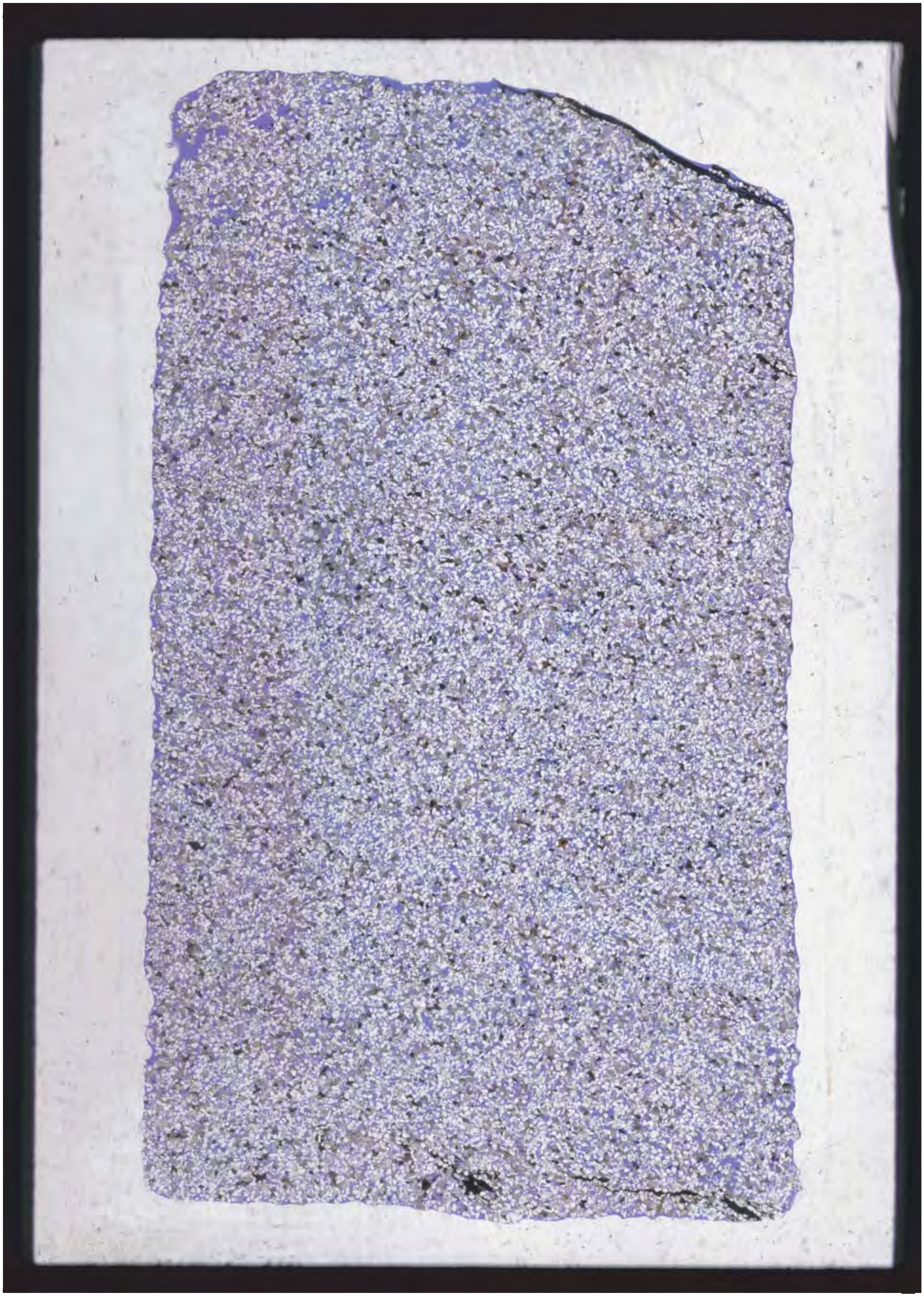
Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 3198.2 meters



2 mm

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 12

Issungnak 2-O-61
Kugmallit
Litharenite

Core Analysis Porosity: 27.7% Core Analysis Permeability: 722 md

Sample #: 12-47
Depth: 3198.2 meters

Porous and permeable, moderately well sorted, fine grained, bioturbated Kugmallit Sequence litharenites are recognized from core recovered at 3198.2 meters. Effective macroporosity (small yellow arrows) is well developed in this interval. Grain contacts are mainly tangential. Framework constituents include subrounded to subangular monocrystalline quartz (Q), chert, clay-rich sedimentary grains, organic material, feldspars and micas. The dissolution of feldspathic grains and pore preserving cement has resulted in enlarged macropores (View B, M:9). Authigenic phases are poorly preserved consisting of rare loosely packed kaolinite clays (View C, “K”) plus trace unevenly distributed quartz overgrowths (View B, small black arrows).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 20-61 **3198.2 meters**

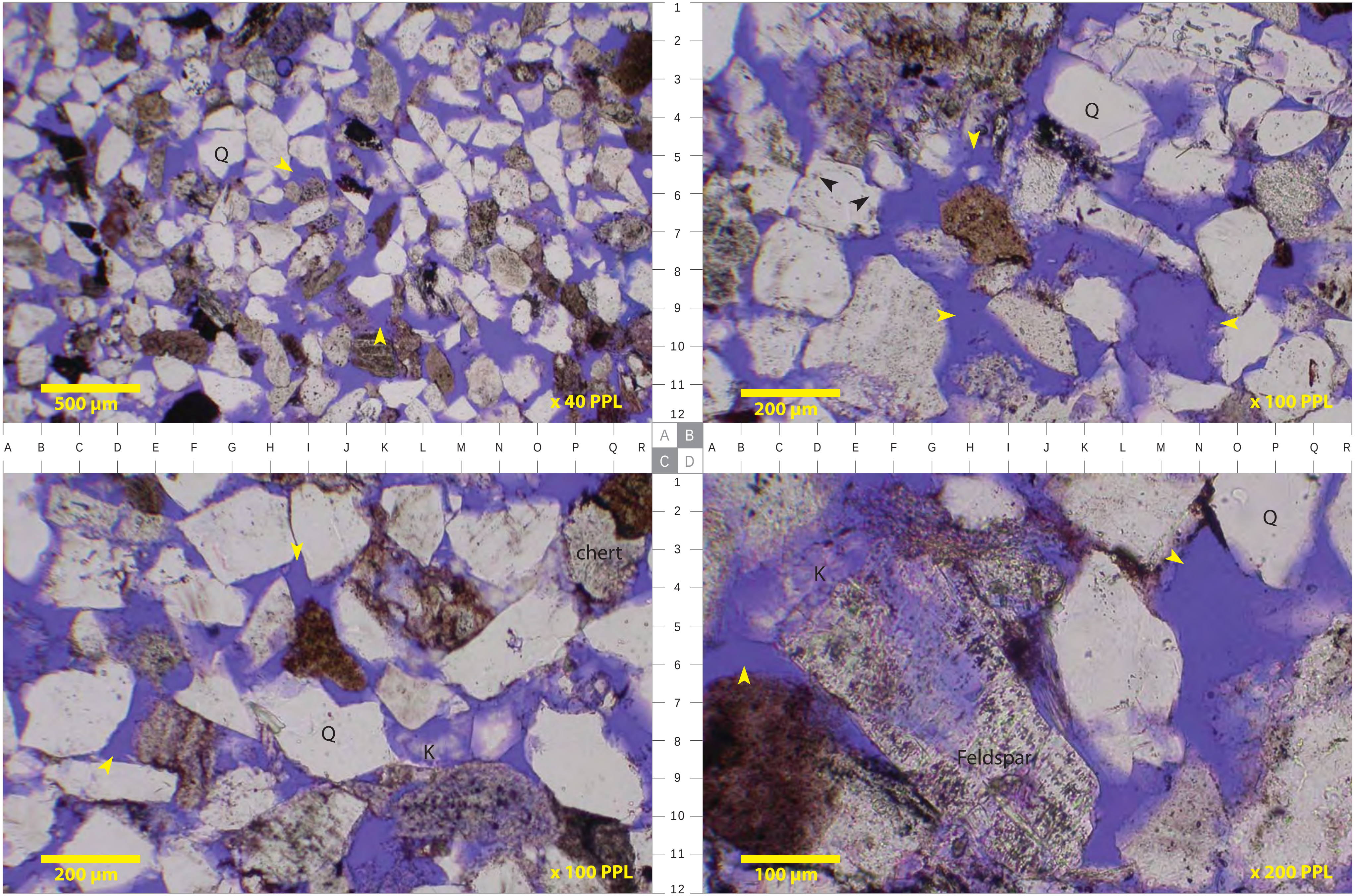


Plate 12
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 2-O-61 3200.5 meters

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 3201.5 meters

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 3202.8 meters

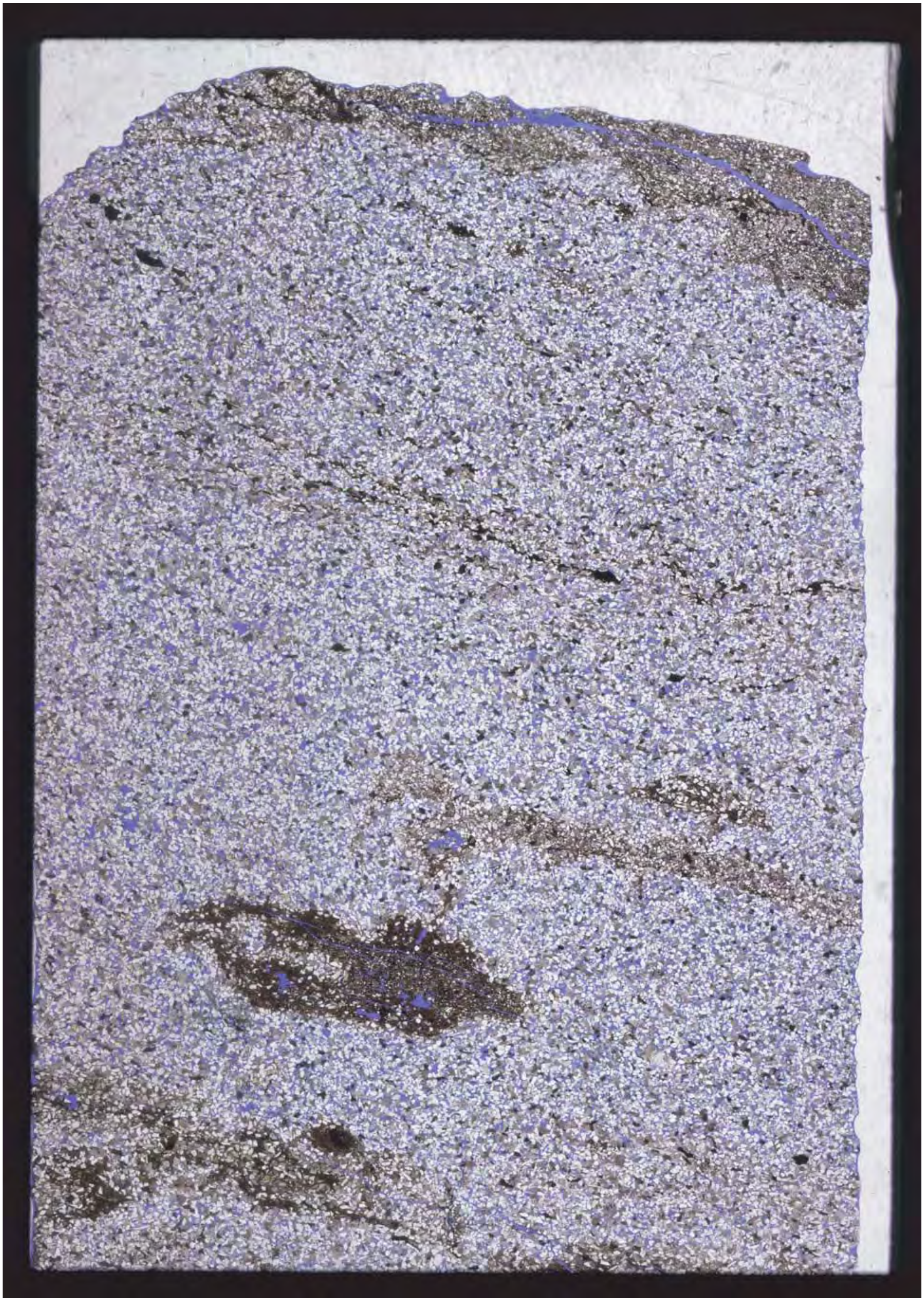
Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 3272.2 meters



Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 3274.5 meters

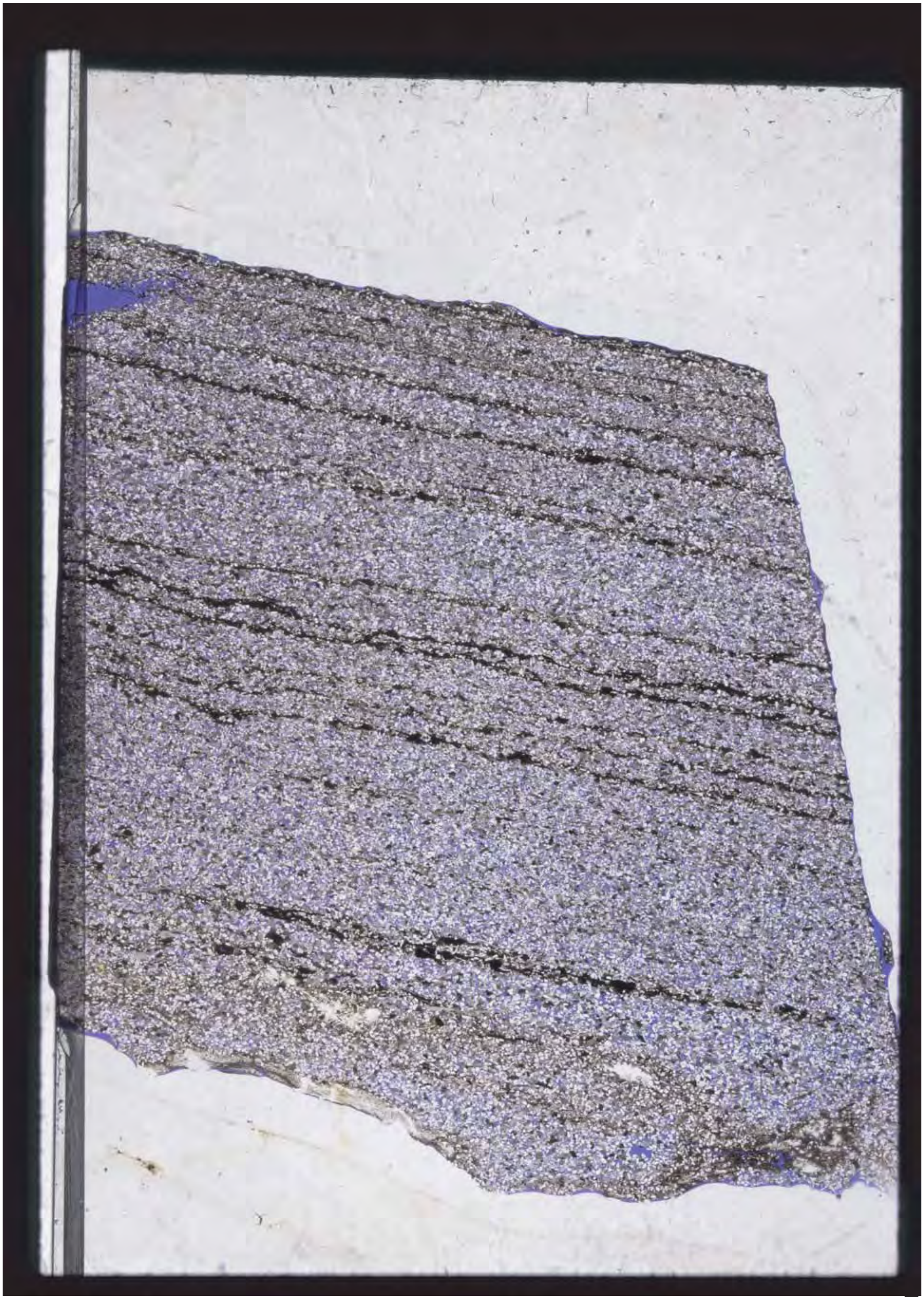
Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 3276.3 meters



2 mm

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 13

Issungnak 2-O-61
Kugmallit
Litharenite

Core Analysis Porosity: 17.6% Core Analysis Permeability: 13.9 md

Sample #: 12-55
Depth: 3276.3 meters

Parallel laminated, moderately well sorted, silt to fine grained, bioturbated litharenites were encountered by core recovered at 3276.3 meters. Framework grains are comprised mainly of monocrystalline quartz (Q), organic material (OM - mainly concentrated along laminae) and chert. Subordinate framework grains include feldspars, micas and clay-rich sedimentary grains. Authigenic cements are poorly preserved consisting of patchily distributed siderite (View C, “S”; View D, “S”) and pyrite precipitated within chert micropores. Dissolution of unstable grains, such as feldspathic grains (View D, G:7-8), has enhanced the macropore system.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

Issungnak 20-61 **3276.3 meters**

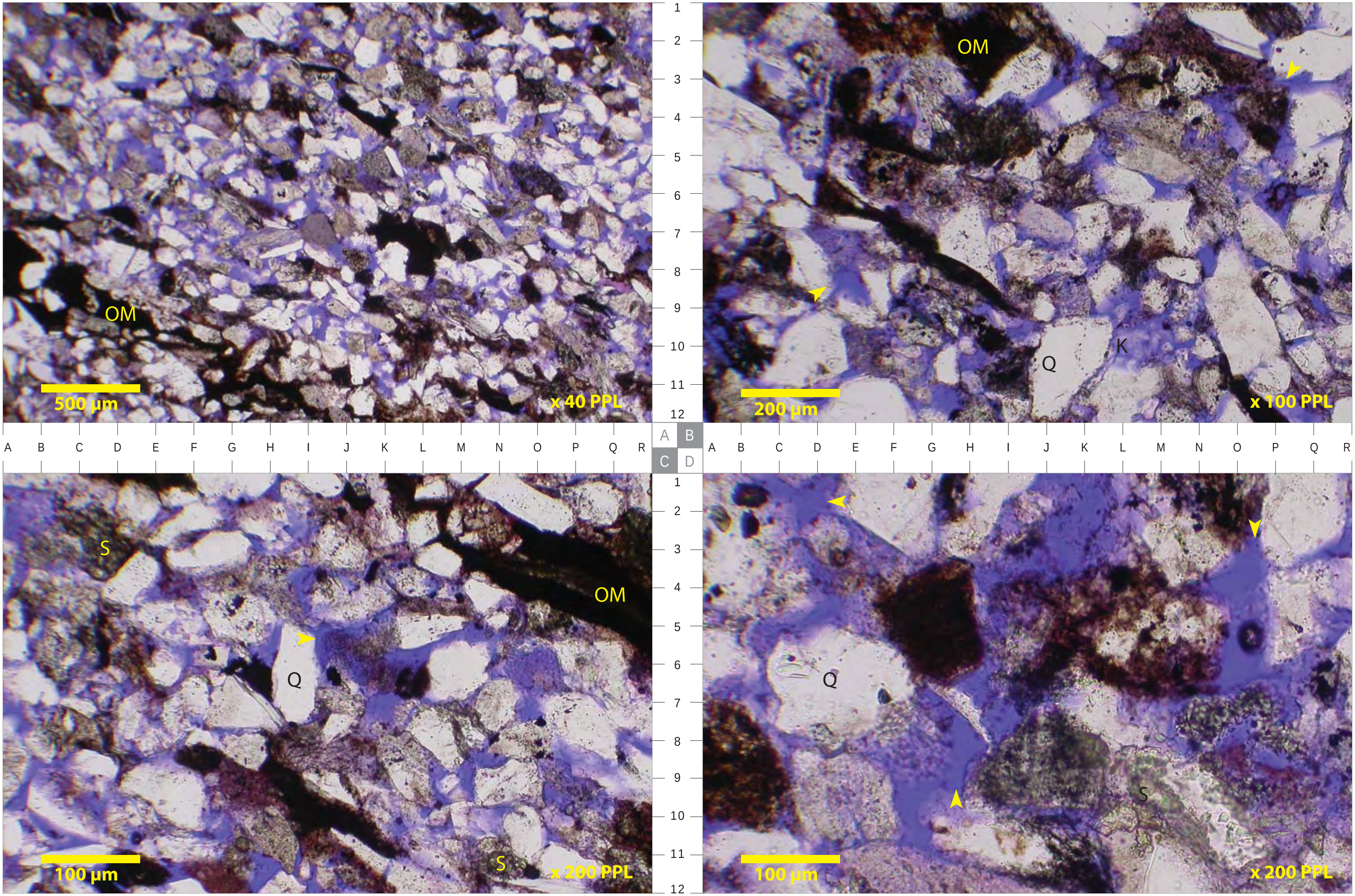
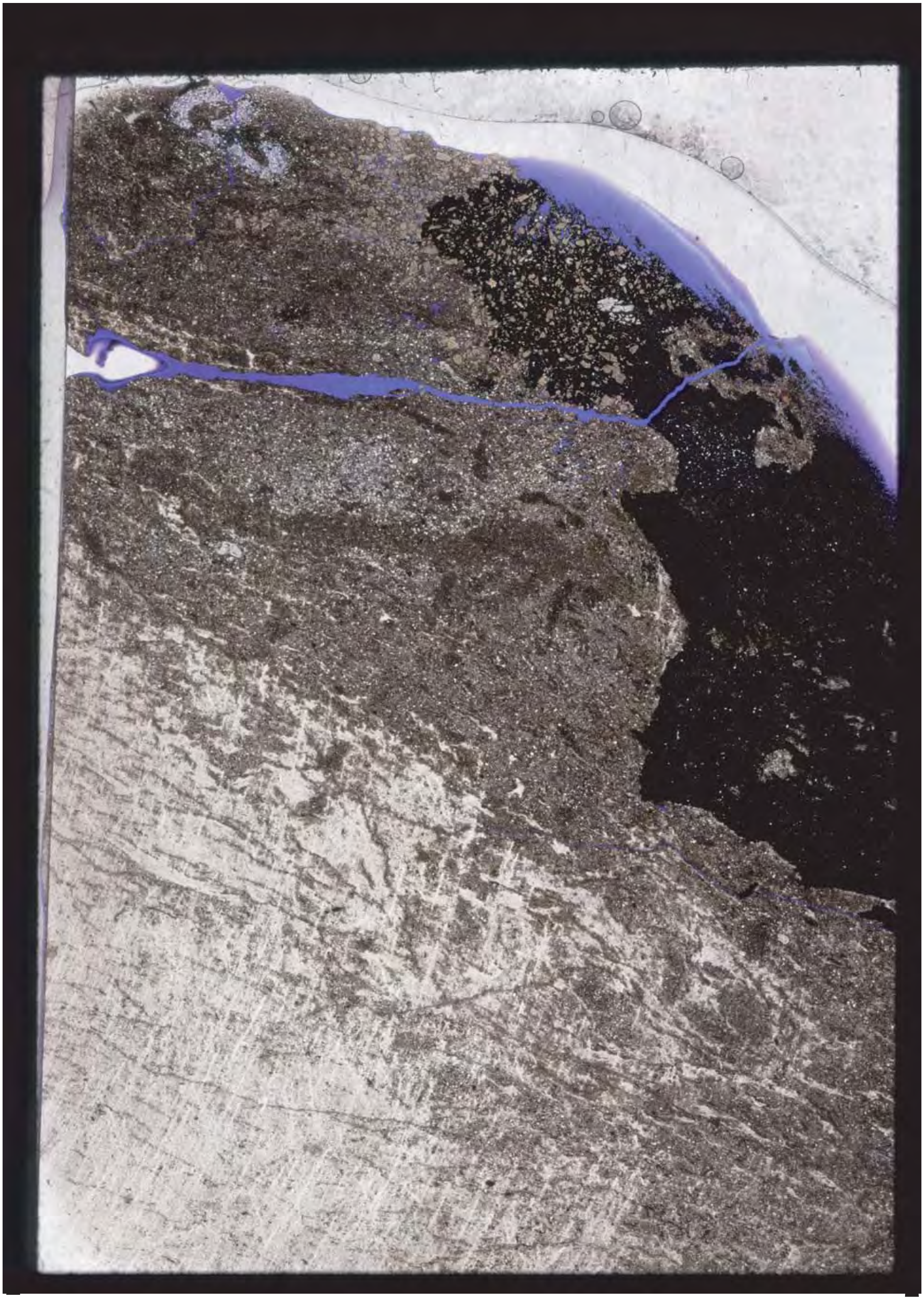


Plate 13
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 2-O-61 3284.5 meters



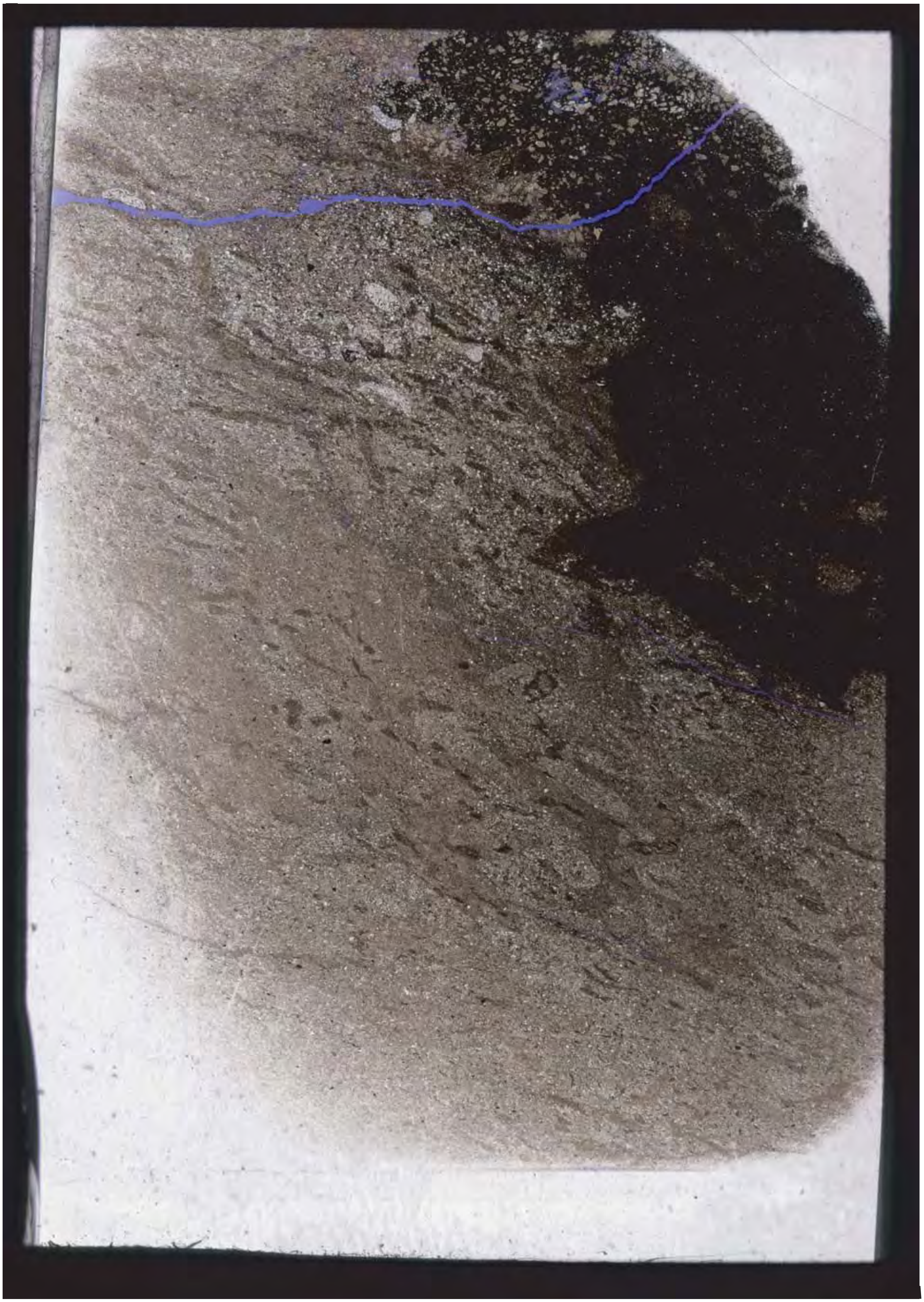
Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61   3284_5 meters (b)



Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 3289.2 meters

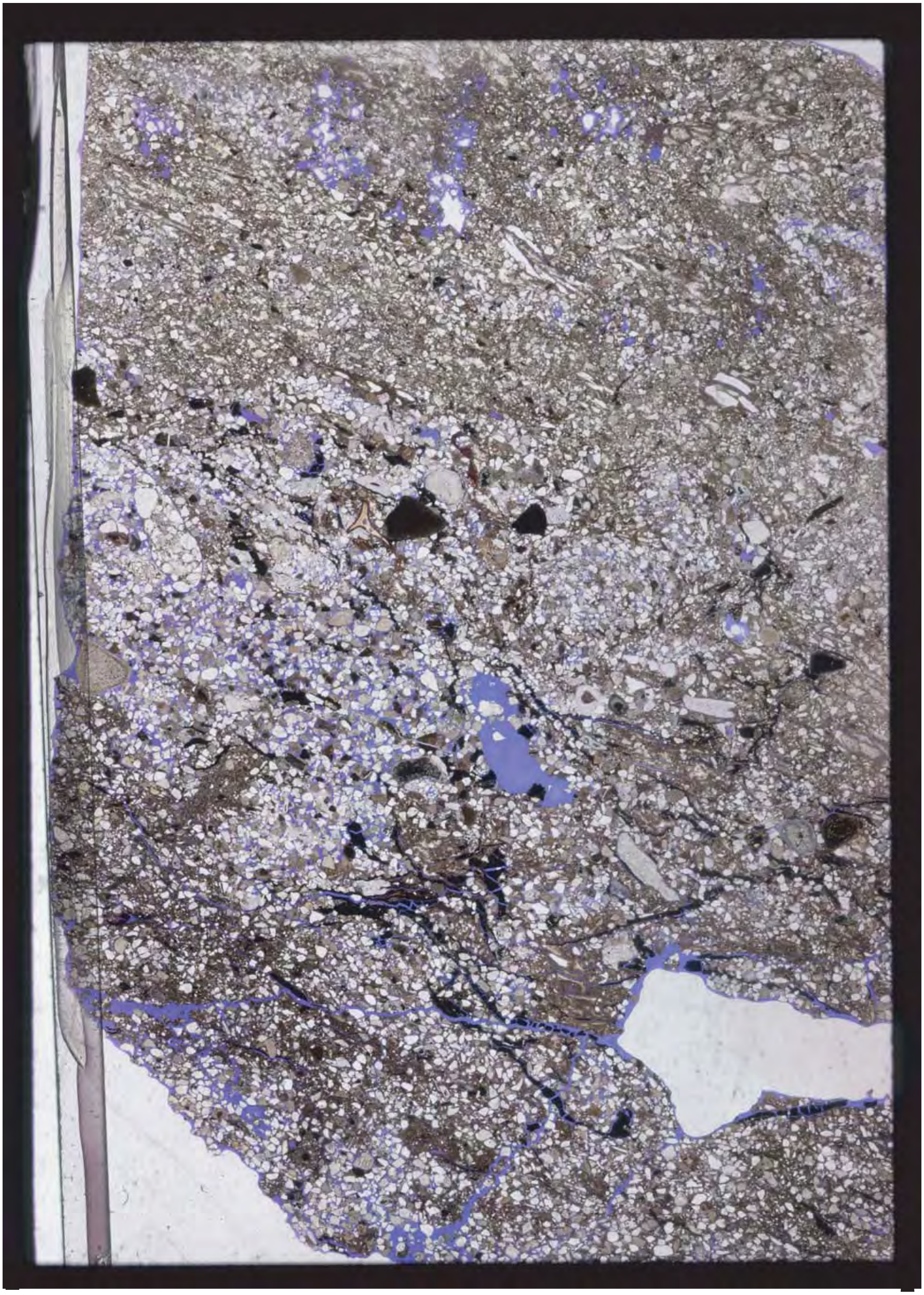
2 mm

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 3290 meters



2 mm

Kugmallit

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 2-O-61 3291.4 meters

2 mm

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 14a

Issungnak 2-O-61
Kugmallit
Litharenite

Core Analysis Porosity: 22.3% Core Analysis Permeability: 295 md

Sample #: 12-60
Depth: 3291.4 meters

Very good to excellent reservoir quality was encountered by moderately sorted, fine to coarse grained Kugmallit Sequence litharenites. Grain contacts are mainly tangential in this section. Dissolution of feldspathic grains (View C, J:7; View D, K:6) has significantly enhanced the effective macropore system (small yellow arrows). Monocrystalline quartz (Q), polycrystalline quartz, chert, feldspars and clay-rich sedimentary grains (CRF) are the main framework components. Authigenic phases are poorly preserved consisting of rare pyrite precipitated within chert micropores (View A).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 20-61 **3291.4 meters**

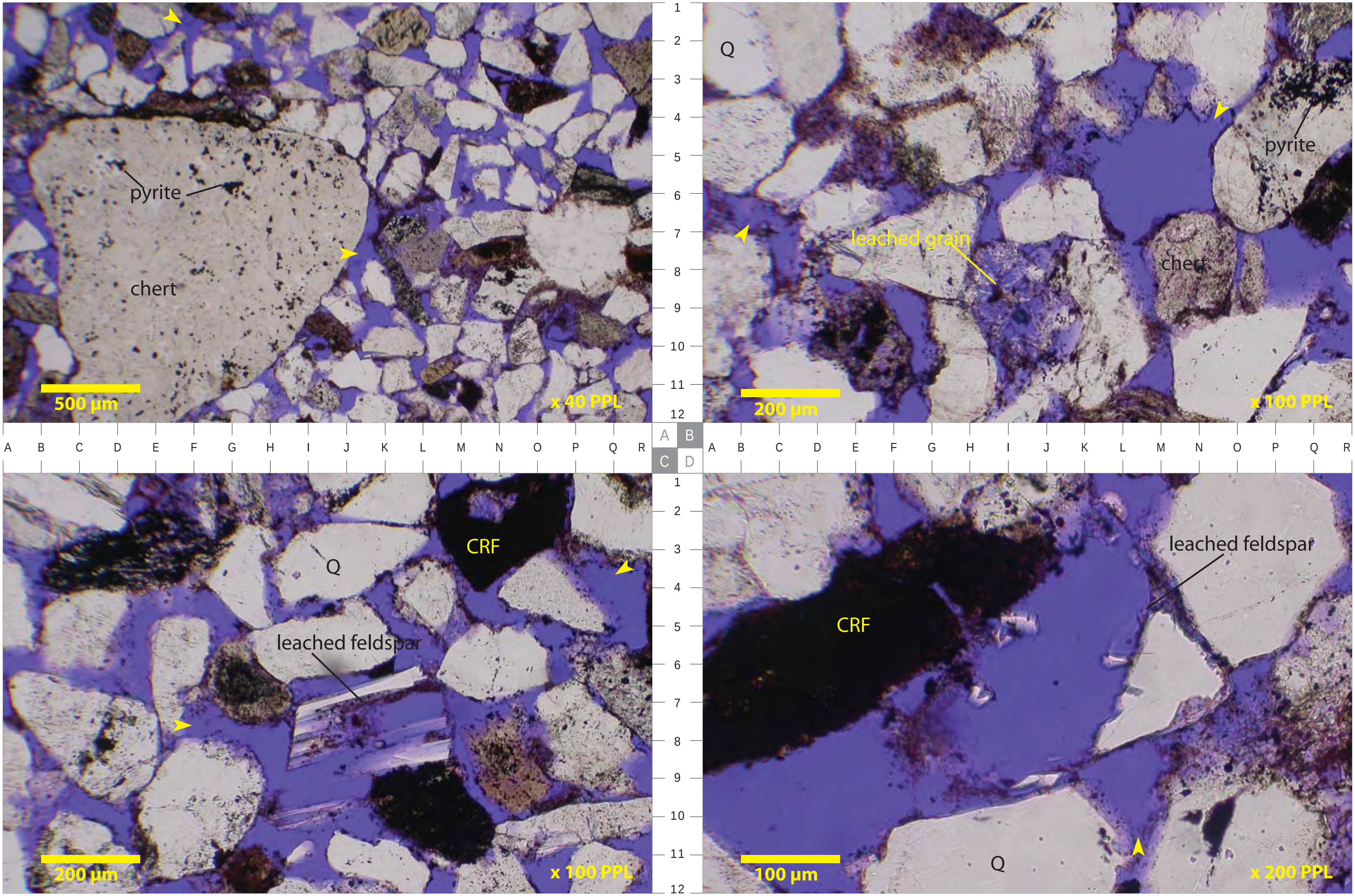


Plate 14a
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 14b

Issungnak 2-O-61
Kugmallit
Litharenite

Core Analysis Porosity: 22.3% Core Analysis Permeability: 295 md

Sample #: 12-60
Depth: 3291.4 meters

Close up thin section photomicrographs show the following features:

- Rare patchily distributed ferroan dolomite (“FeD” - stained turquoise blue) precipitated within partially leached framework grains
- Rare pyrite precipitated within chert micropores
- Tangential grain contacts
- Well developed effective macroporosity (small yellow arrows)
- Partially leached feldspathic grains (View B and D)
- Monocrystalline quartz (Q), chert, micas (View C) and feldspathic grains comprise the framework components

Photo A: 100X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

Issungnak 20-61

3291.4 meters

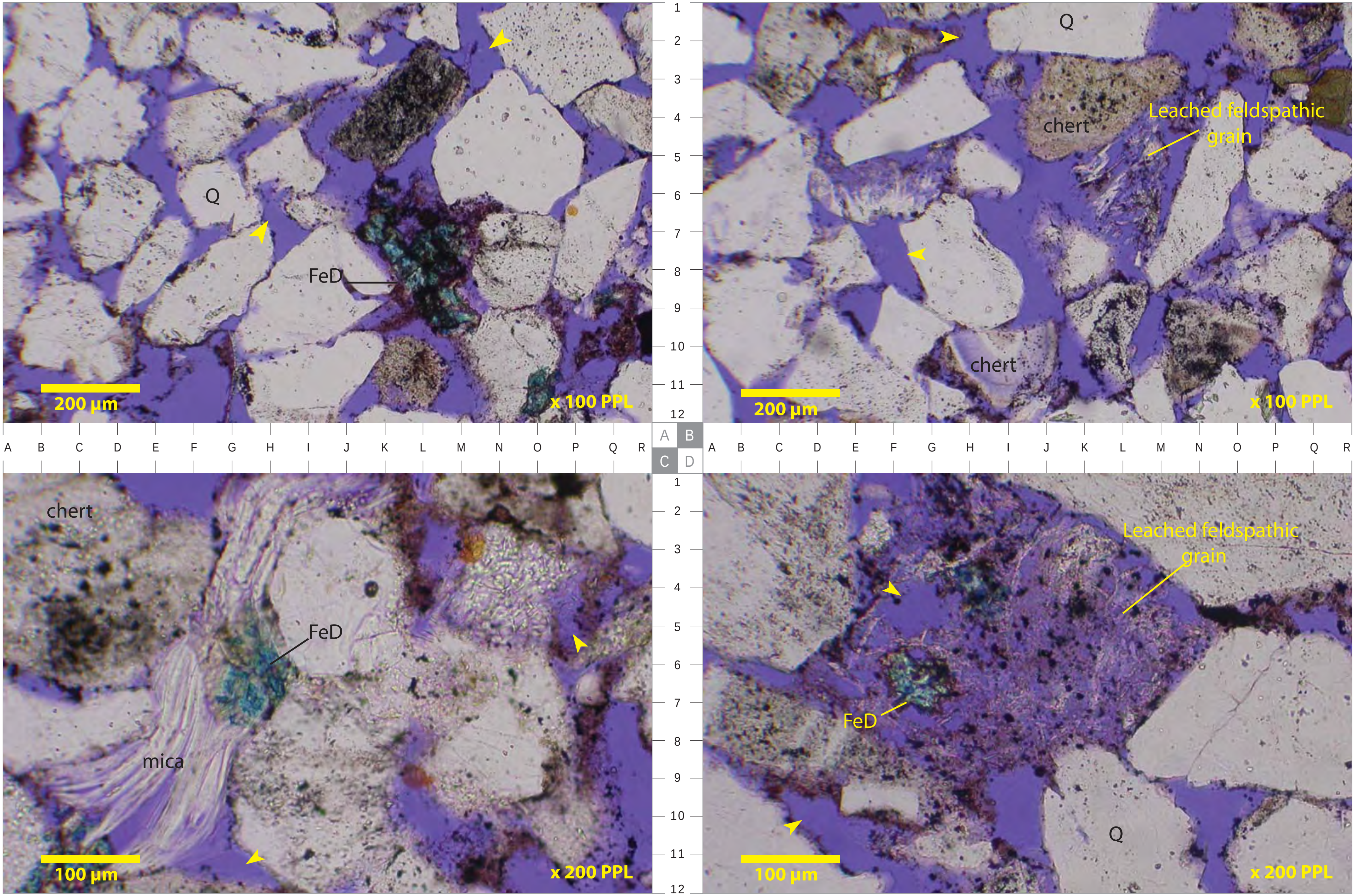


Plate 14b

January 2010

CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 2-O-61 3292 meters

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 15

Issungnak 2-O-61
Kugmallit
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 3292 meters

Bioturbated, massive, moderately well sorted, fine to medium grained litharenites were recovered from core at 3292 meters. Grain contacts are mainly tangential in this interval. Effective macroporosity is well developed as shown by the small yellow arrows. Authigenic cements are poorly preserved consisting of rare patchily distributed ferroan dolomite (turquoise blue stain – "FeD"), trace loosely packed kaolinite clays (View C, M:2) and rare pyrite precipitated within chert micropores. Monocrystalline quartz (Q), chert, clay-rich sedimentary grains and feldspars are the main framework constituents.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

Issungnak 20-61

3292 meters

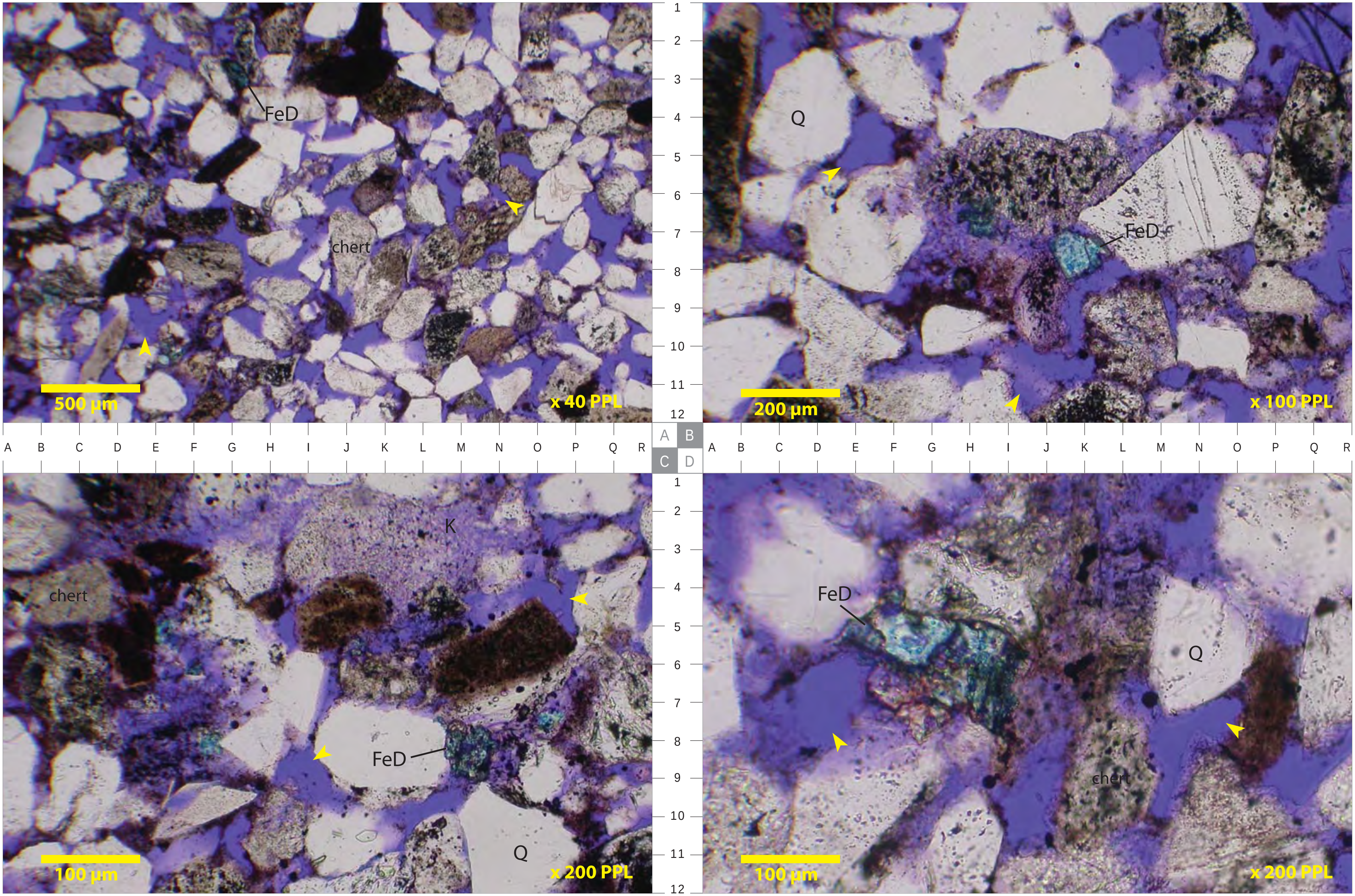


Plate 15
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 2-O-61 3300.2 meters

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 3302.1 meters

2 mm

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 3306.2 meters (a)

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 3306.2 meters (b)

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 3306.7 meters

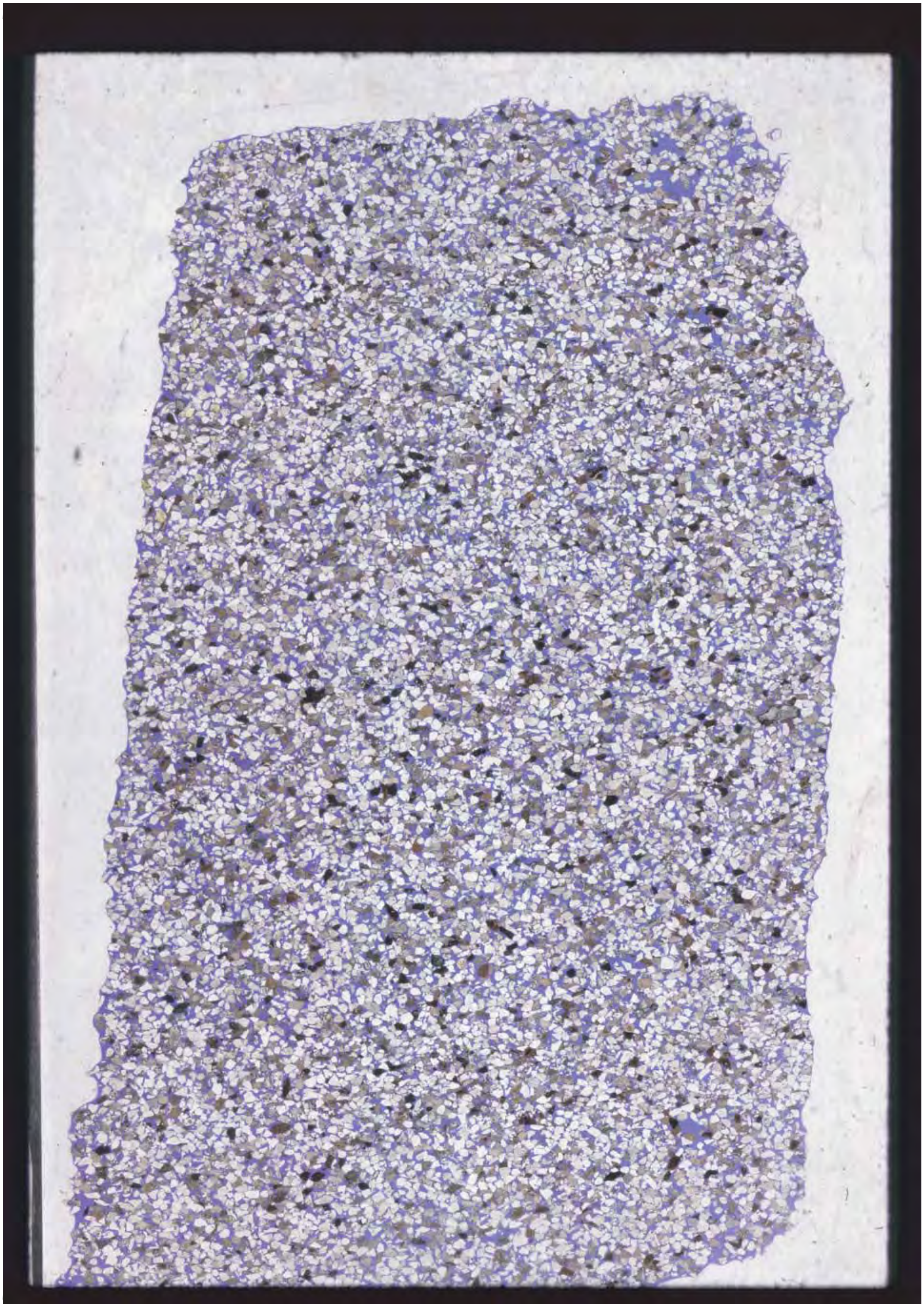
2 mm

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 3307.3 meters



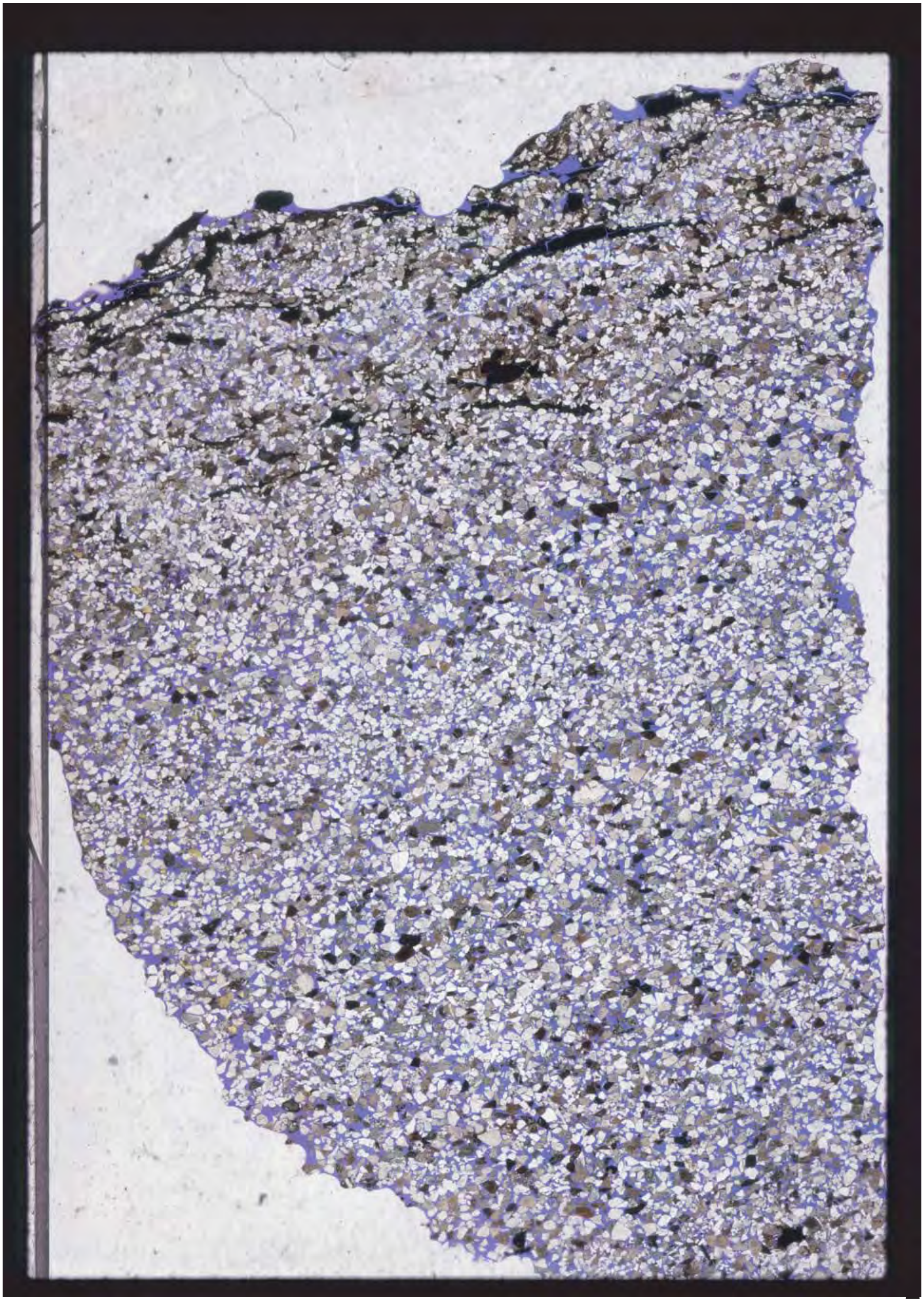
2 mm

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 3307.6 meters



Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 16

Issungnak 2-O-61
Kugmallit
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 3307.6 meters

Laminated, poor to moderately sorted, medium to coarse grained litharenites are recognized from Kugmallit Sequence core recovered at 3307.6 meters. Macroporosity (small yellow arrows) is well developed in this interval and reservoir quality is considered very good to excellent. Grain contacts are tangential with framework grains comprised mainly of monocrystalline quartz, chert, clay-rich sedimentary grains (CRF), feldspars and organic material (OM). The dissolution of feldspathic grains (View B, J:9) has enhanced the effective pore system. Authigenic phases are poorly preserved with rare pyrite precipitated within chert micropores and trace kaolinite clays loosely packed within open macropores (View B, B:4).

Photo A: 40X PPL, Photo B: 100X PPL, Photo C: 100X PPL, Photo D: 100X PPL

Issungnak 20-61 — 3307.6 meters

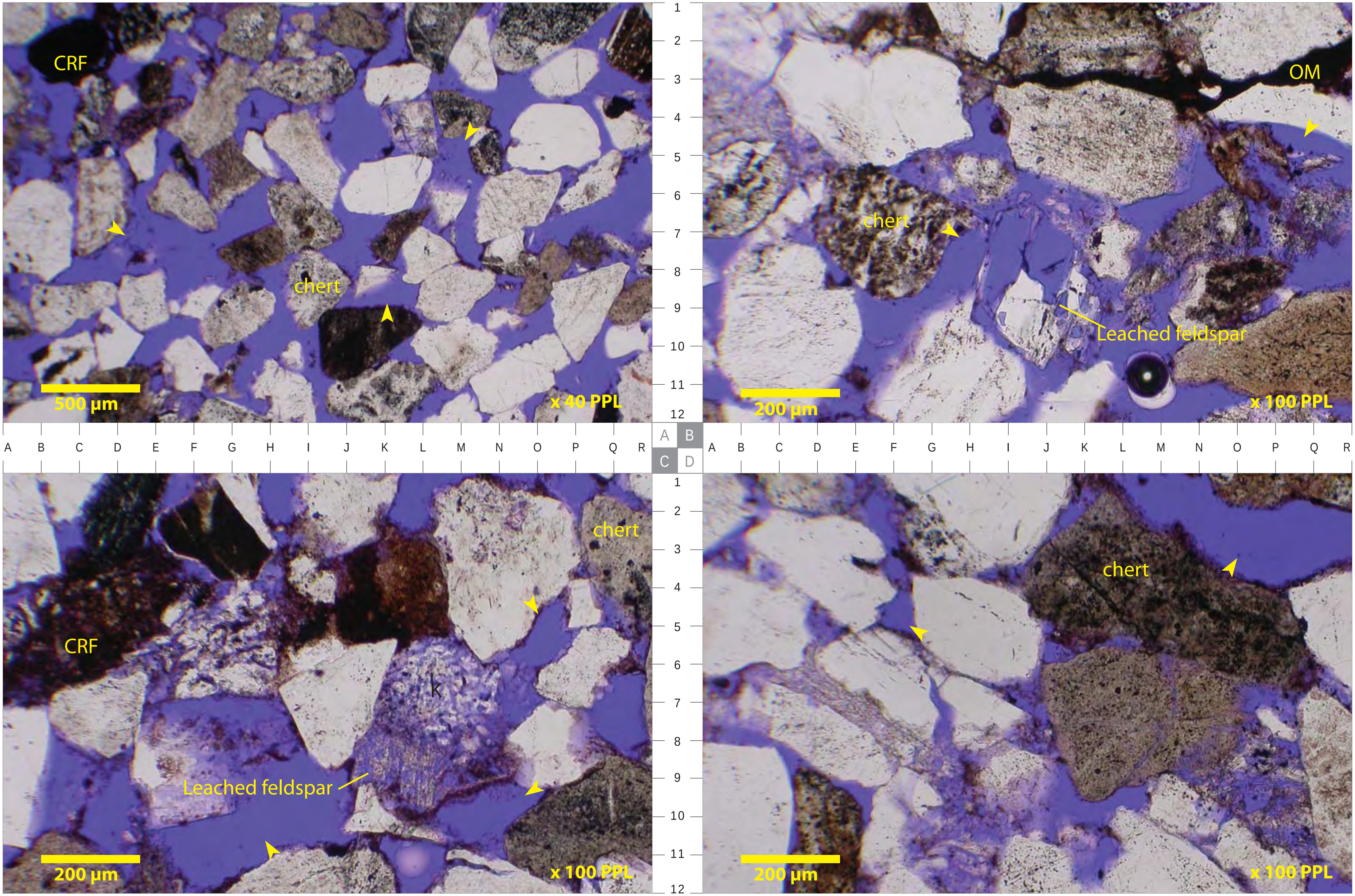


Plate 16
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 2-O-61 3310 meters

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 3312.2 meters

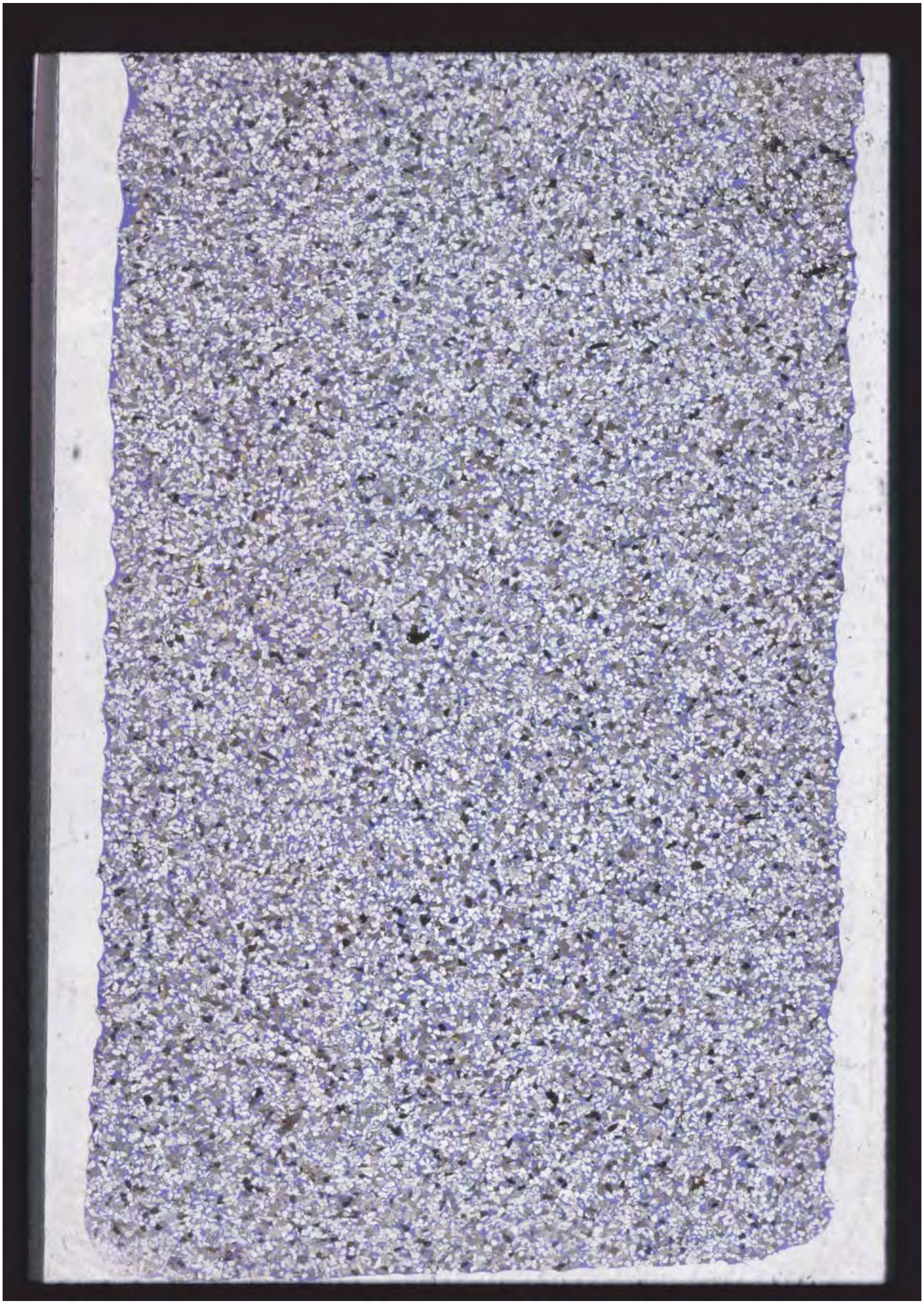
Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Issungnak 2-O-61 3312.7 meters



Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 17

Issungnak 2-O-61
Kugmallit
Litharenite

Core Analysis Porosity: 23.7% Core Analysis Permeability: 158 md

Sample #: 12-72
Depth: 3312.7 meters

Bioturbated, very well sorted, fine grained litharenites are recognized from core recovered at 3312.7 meters. Framework grains consist of monocrystalline quartz, chert, feldspars (yellow stain on K-feldspar) and clay-rich sedimentary grains. The dissolution of feldspars (View B, K:9; View C, K:7) has enhanced the macropore system (small yellow arrows). Grain contacts are mainly tangential in this interval. Authigenic phases are poorly preserved consisting of loosely packed kaolinite clays (View C, H:5) and rare pyrite. Measured core analysis porosity is 23.7% and measured permeability is 158 md.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

Issungnak 20-61

3312.7 meters

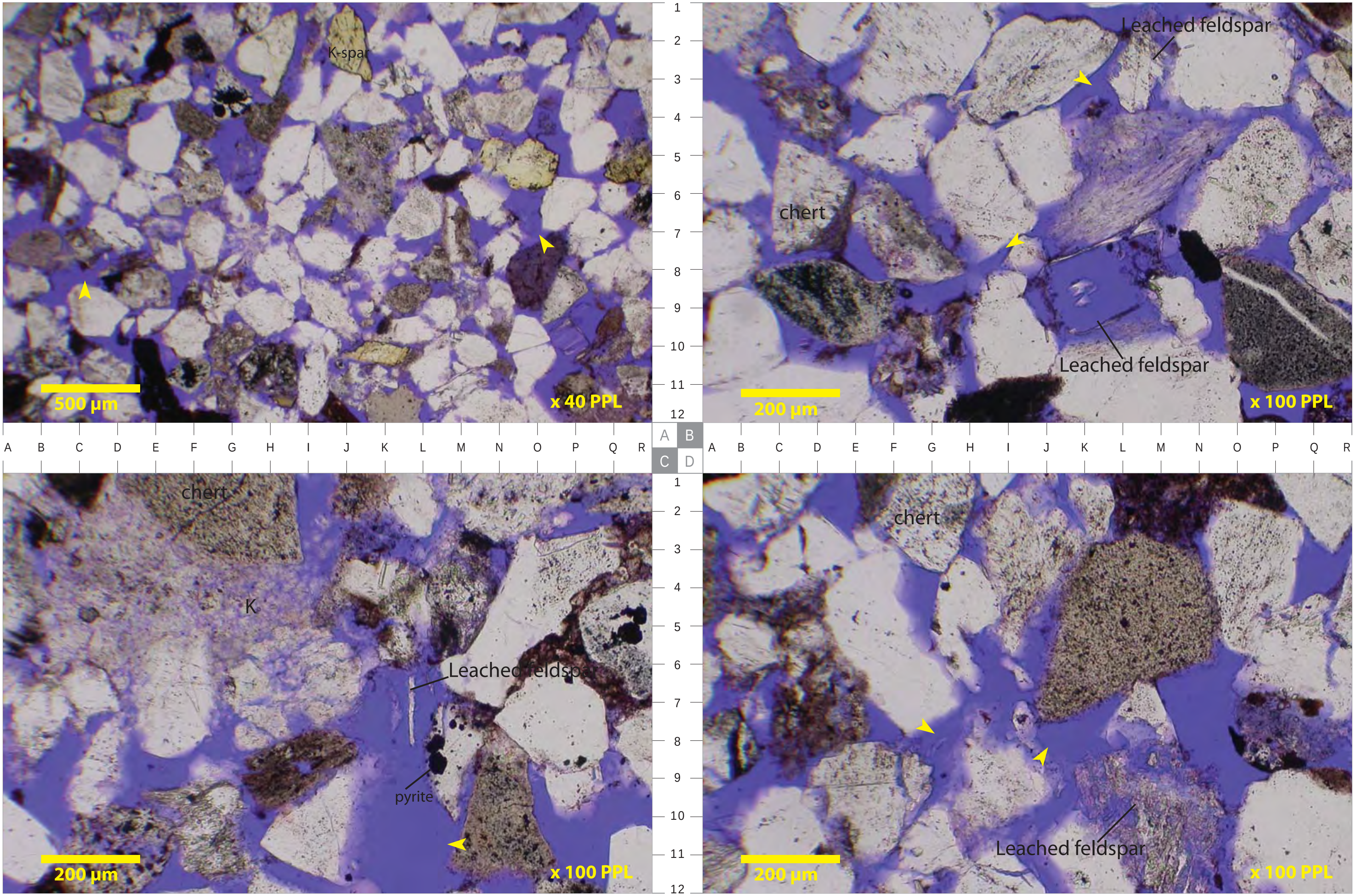


Plate 17
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Issungnak 2-O-61 3313.7 meters

2 mm

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Pullen E-17

Thin Section

Described Photomicrographs

Thin Section Photomicrograph Descriptions (Drill Cuttings) – Plate 01

Pullen E-17
Kugmallit
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 10-S02
Depth: 3800-3900 feet

Drill chips recovered between 3800 to 3900 feet consist of moderately sorted, fine grained ankerite cemented litharenites. Quartz overgrowths have precipitated unevenly on host quartz grains. Eogenetic pyrite rims framework grains and has precipitated within chert micropores. Siderite (View D, "S") is rare. Monocrystalline quartz, chert, clay-rich sedimentary grains are the main framework grains. Grain contacts are mainly tangential. Effective macroporosity is isolated and enhanced by grain dissolution (View A, L:8). Whole rock X-ray diffraction analysis generated quartz (65%), plagioclase (14%), clays (kaolinite 6%, chlorite 4%), siderite (3%) and ankerite (8%).

Photo A: 100X PPL, Photo B: 100X PPL, Photo C: 200X PPL, Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Pullen E-17

3800-3900 feet

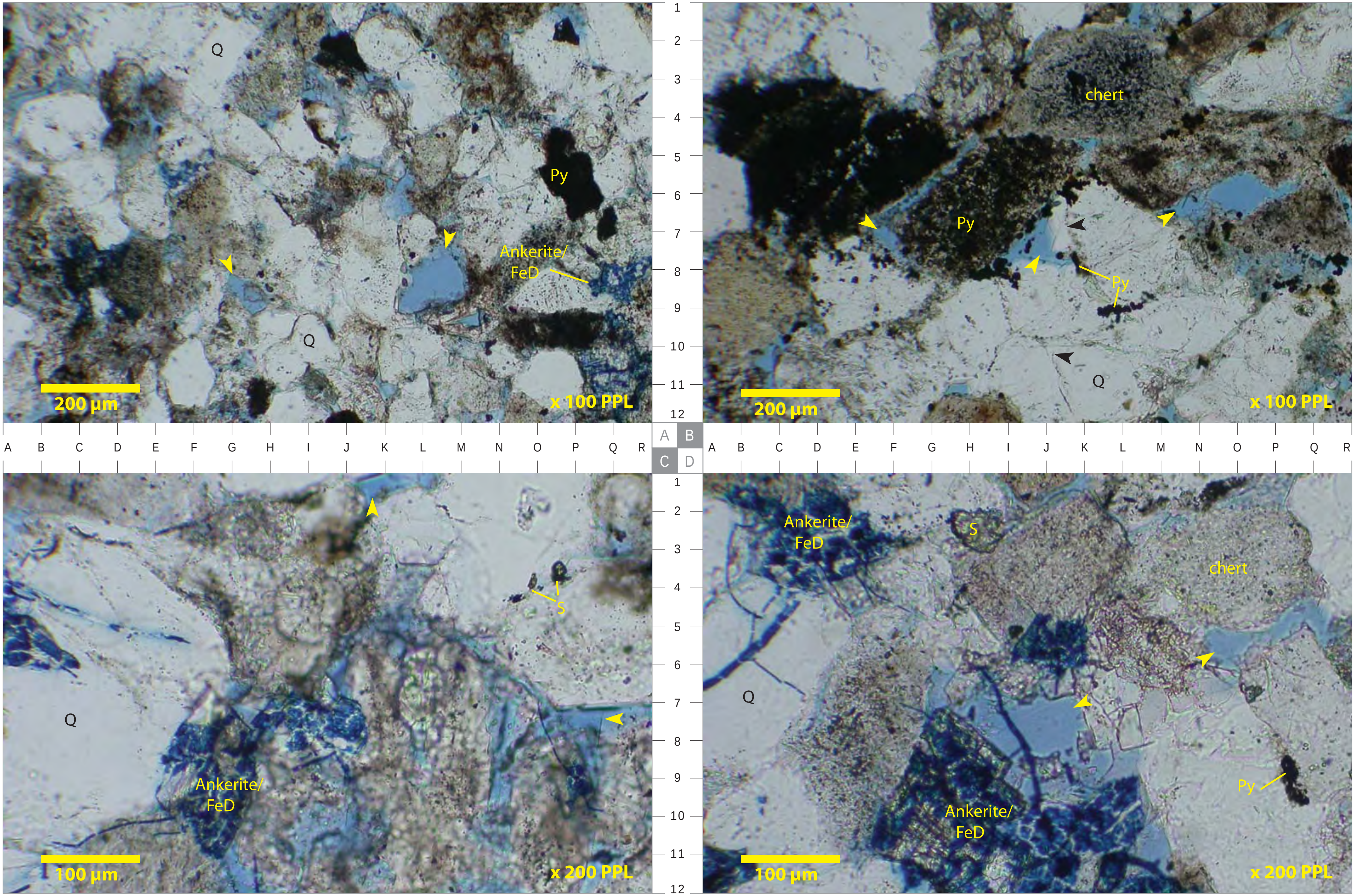


Plate 01

January 2010

CMH 2010-01

Kugmallit

CMH PETROLOGY

403.243.0917

cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions (Drill Cuttings) – Plate 02

Pullen E-17
Kugmallit
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 10-S08
Depth: 6750-6850 feet

Coarsely crystalline, poikilotopic ferroan dolomite (FeD) cemented litharenites characterize the drill cuttings recovered between 6750 to 6850 feet. Macroporosity is generally lacking and this interval is considered non-reservoir quality. Grain contacts are point-point and tangential. Ferroan dolomite (FeD) has precipitated within partially leached framework grains (View B, K:9) and within microfractured grains (View A, H:7). Framework grains include monocrystalline quartz (Q), chert, clay-rich sedimentary grains (CRF) and quartz-rich sedimentary grains (QRF). Microcrystalline pyrite has precipitated within chert micropores. Hydrocarbons, in the form of bitumen, are shown by small red arrows.

Photo A: 100X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

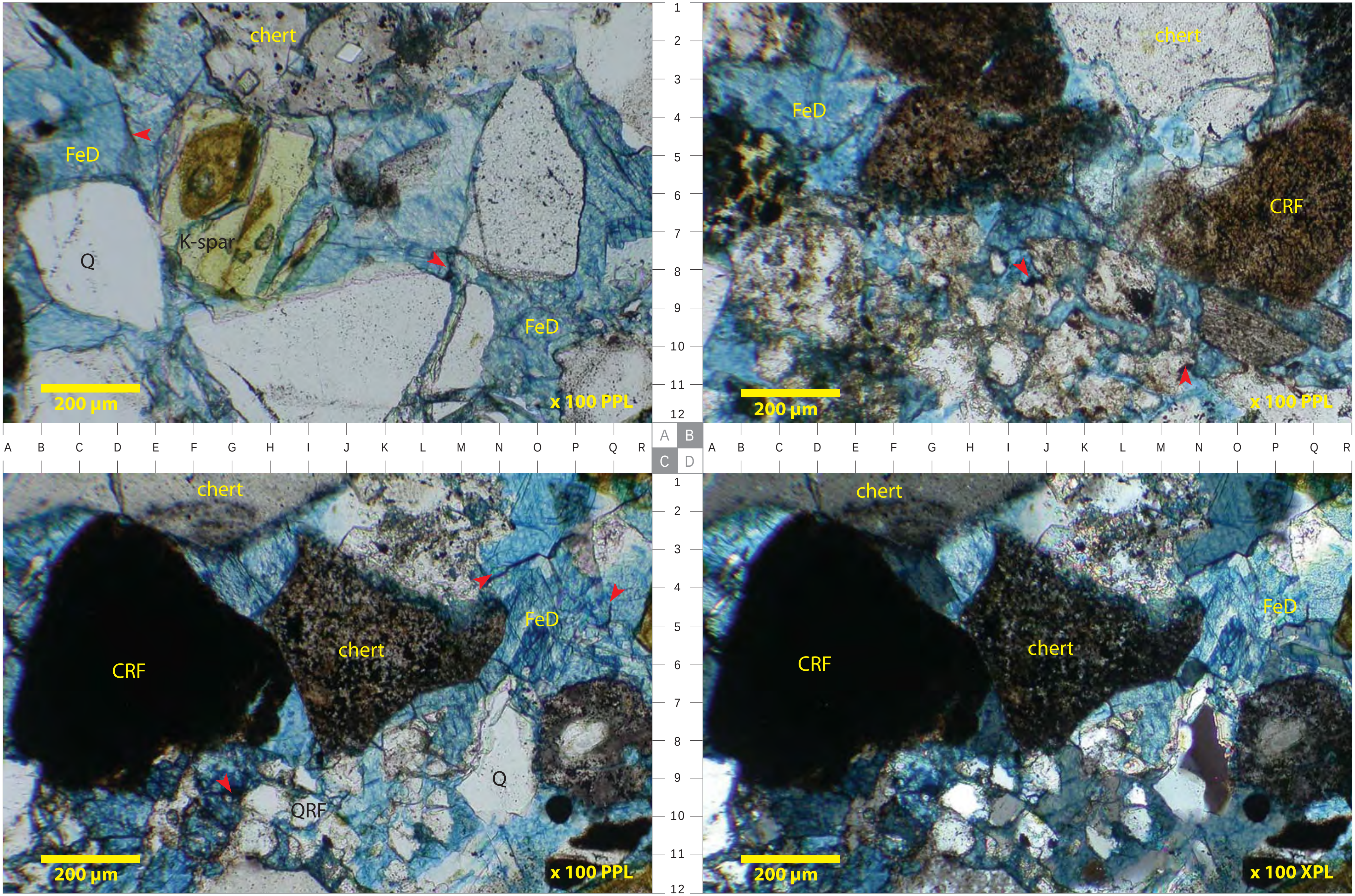


Plate 02

January 2010

CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions (Drill Cuttings) – Plate 03

Pullen E-17
Kugmallit
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 10-S09
Depth: 7050-7150 feet

Drill cuttings recovered between 7050 to 7150 feet consist of coarsely crystalline poikilotopic pore filling ferroan dolomite (FeD) cemented fine grained litharenites. Whole rock X-ray diffraction analysis of drill cuttings recovered between 7050 to 7150 feet yielded quartz (28%), plagioclase (4%), alkali feldspar (10%), kaolinite/chlorite clays (1%), dolomite (55%) and pyrite (2%). Chert, monocrystalline quartz (Q), clay-rich sedimentary grains, K-feldspar, quartz-rich sedimentary grains (reworked silt/sandstones) are the main framework components. Quartz overgrowths are rare and unevenly distributed (Views C and D, small black arrows). Note microfractured grains (i.e. Views C and D, large white arrow). Pyrite has precipitated within chert micropores. Note corroded edges on framework grains (View C).

Photo A: 100X PPL, Photo B: 100X XPL, Photo C: 100X PPL, Photo D: 100X XPL

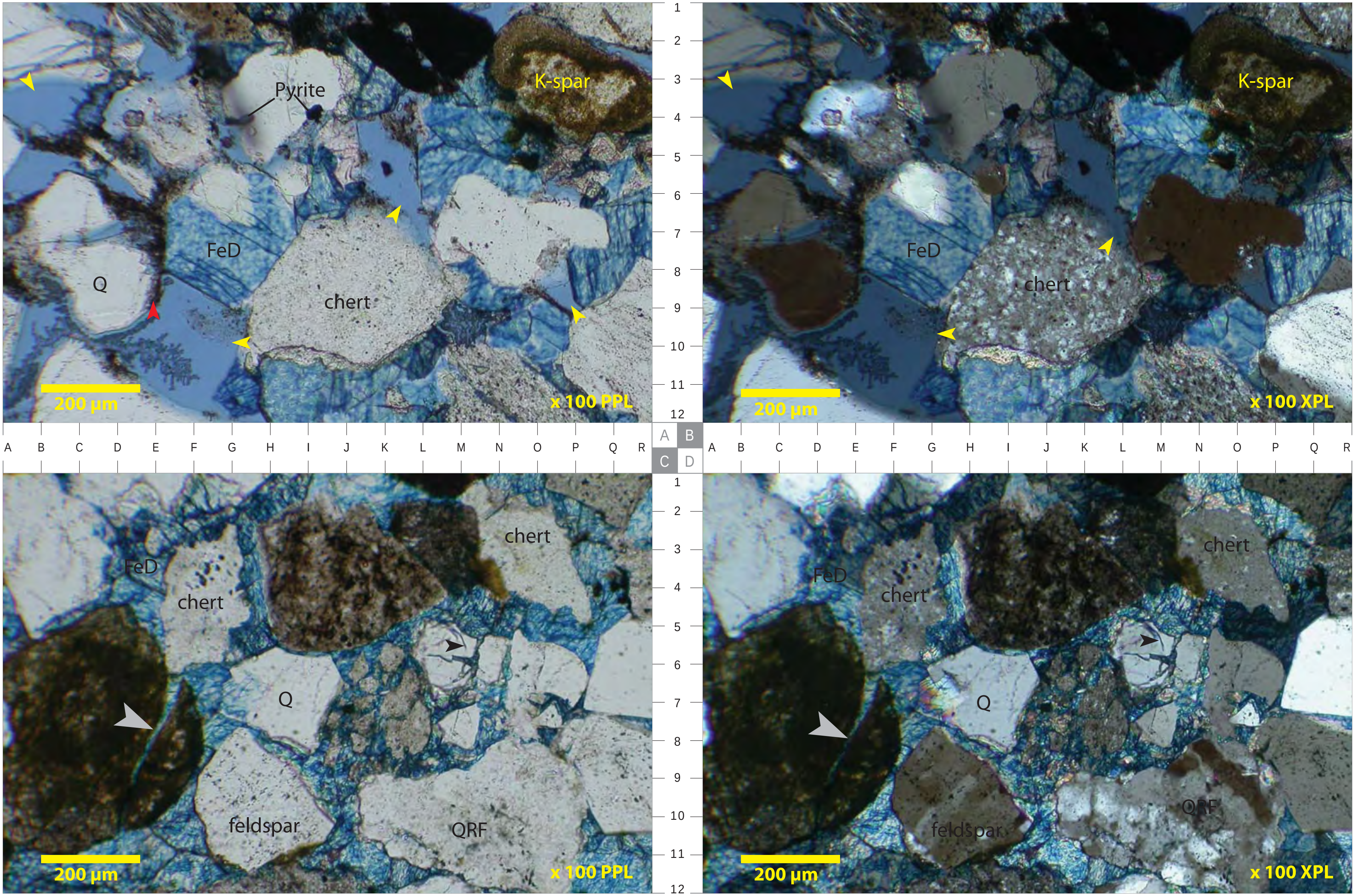


Plate 03
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions (Drill Cuttings) – Plate 04

Pullen E-17
Kugmallit
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 10-S10
Depth: 7200-7300 feet

Ferroan dolomite cemented (FeD) chert litharenites were recovered from drill chips between 7200 to 7300 feet. Coarsely crystalline ferroan dolomite occludes macropores. Subsequent dissolution of this carbonate cement has enhanced the effective pore system (small yellow arrows). Note hydrocarbons, in the form of bitumen, within the carbonate crystals (small red arrows). Rare pyrite crystallites have precipitated within chert micropores. Framework grains include monocrystalline quartz (Q), chert and clay-rich sedimentary grains.

Photo A: 100X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Pullen E-17 7200-7300 feet

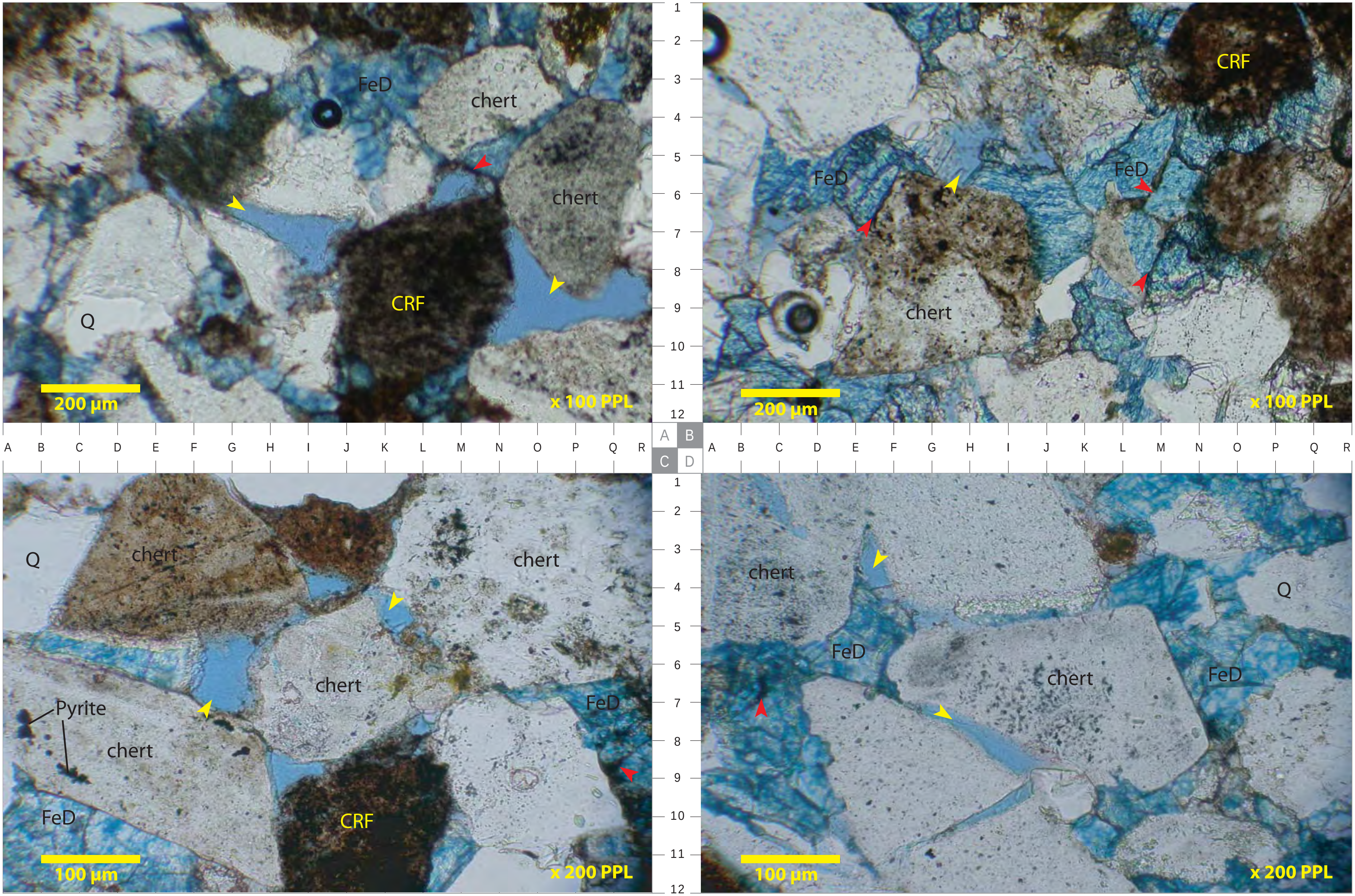


Plate 04
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions (Drill Cuttings) – Plate 05

Pullen E-17
Kugmallit
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 10-S11
Depth: 7500-7600 feet

Coarsely crystalline ferroan dolomite (FeD) is the main pore filling authigenic cement in this poorly sorted, fine to medium grained litharenite taken from drill cuttings between 7500 to 7600 feet. Grain contacts range from floating to tangential. Monocrystalline quartz (Q), chert and clay-rich sedimentary grains and feldspar (yellow stain on K-feldspar) are the main framework constituents. Rare pyrite has precipitated within chert micropores. Small red arrows highlight bitumen within carbonate crystal edges.

Photo A: 100X PPL, Photo B: 100X PPL, Photo C: 200X PPL, Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Pullen E-17 **7500-7600 feet**

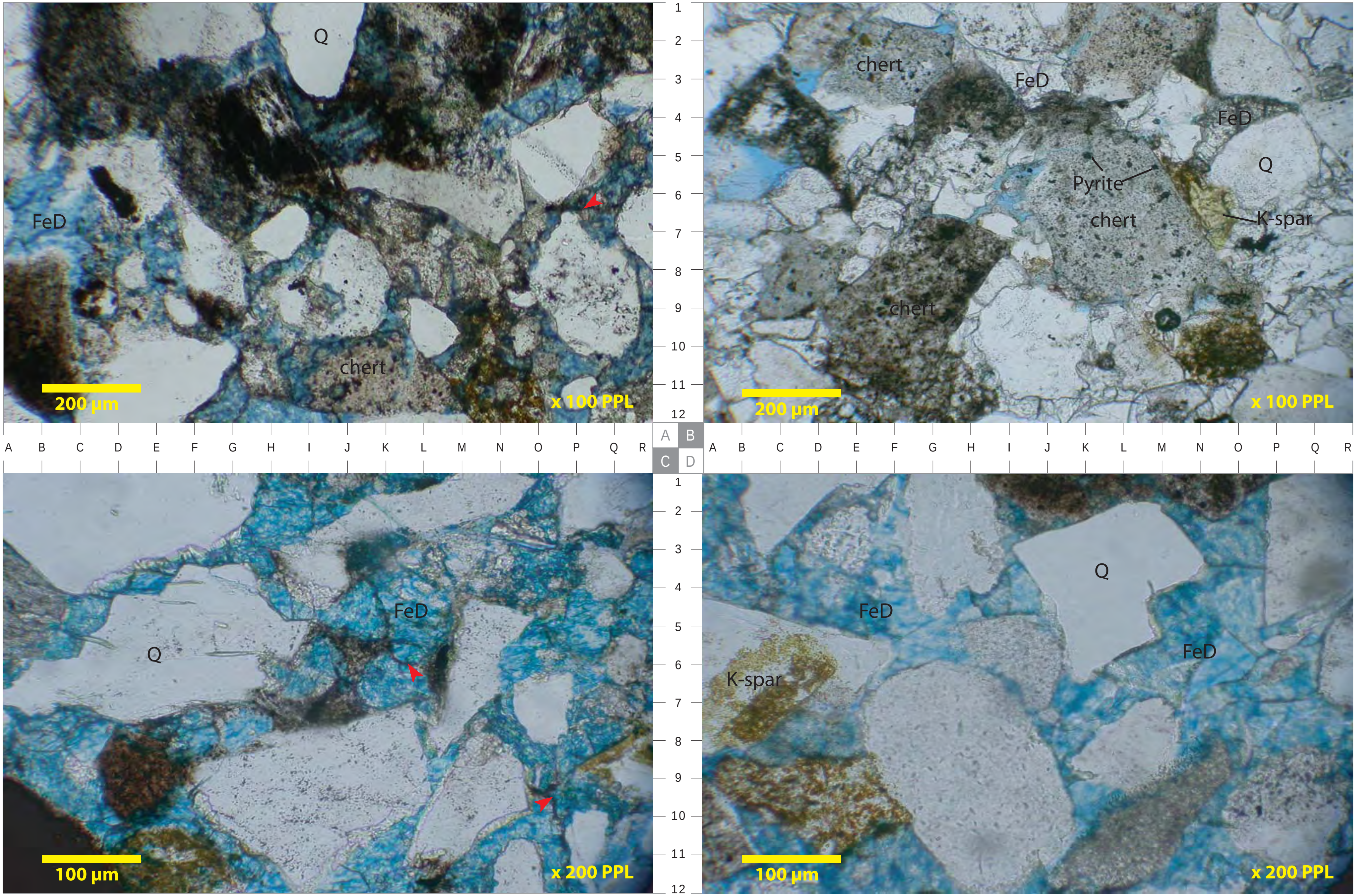


Plate 05
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions (Drill Cuttings) – Plate 06

Pullen E-17
Kugmallit
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 10-S12
Depth: 8050-8150 feet

Non-reservoir quality, ferroan dolomite cemented, poorly sorted, silt to medium grained litharenites characterize the clastics recovered from drill chips between 8050 to 8150 feet. Grain contacts are floating and point-point. Framework grains are microfractured. These microfractures are filled by ferroan dolomite cement (View B, large grey arrows). Chert, monocrystalline quartz (Q), polycrystalline quartz (PxQ) and clay-rich sedimentary grains (CRF) are the main framework constituents.

Photo A: 100X PPL, Photo B: 100X PPL, Photo C: 100X PPL, Photo D: 100X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Pullen E-17

8050-8150 feet

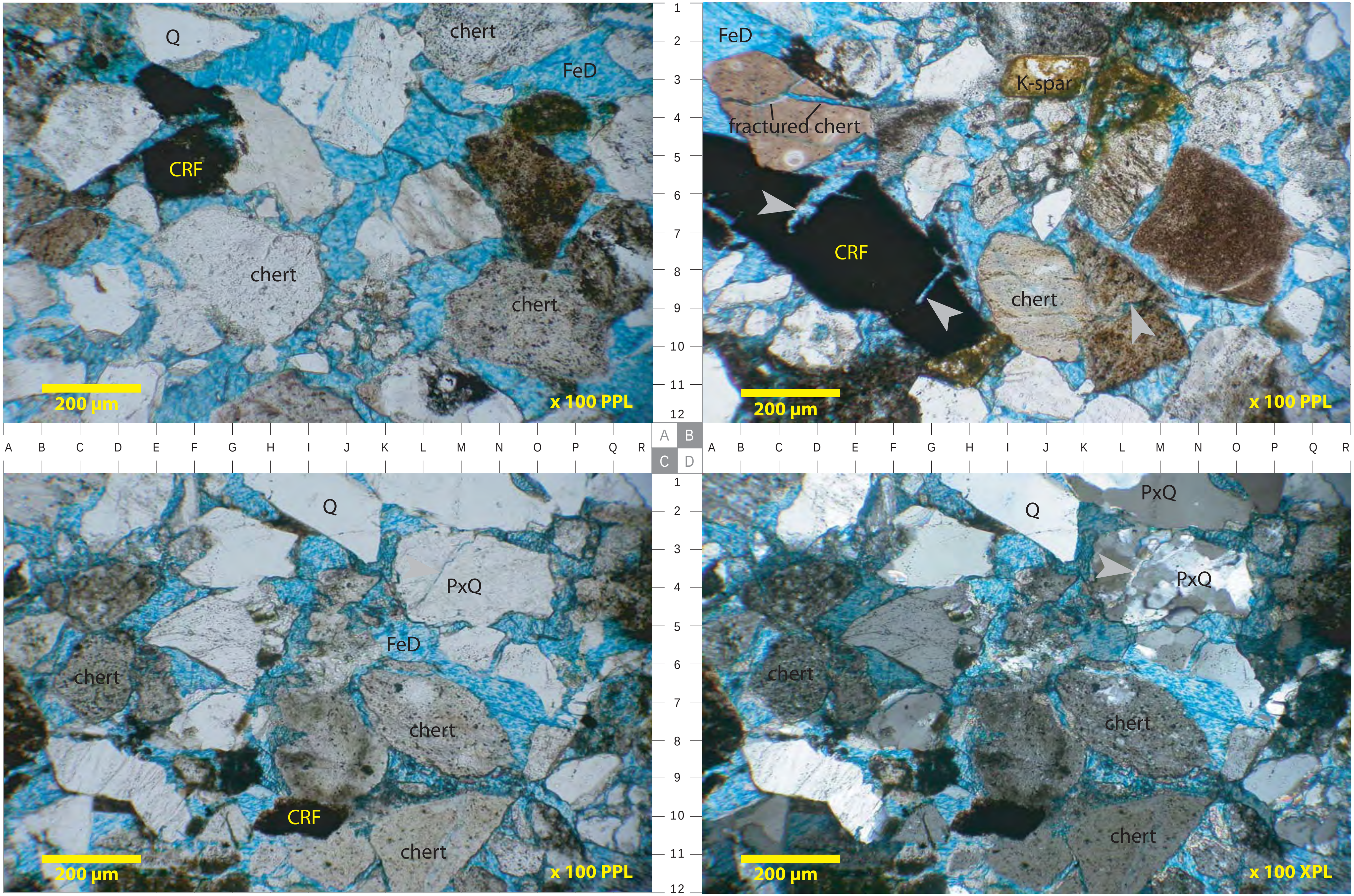


Plate 06
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions (Drill Cuttings) – Plate 07

Pullen E-17
Kugmallit
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 10-S13
Depth: 8270-8370 feet

Non-reservoir quality, ferroan dolomite cemented very fine grained litharenites are recognized from drill chips taken between 8270 to 8370 feet. Poikilotopic ferroan dolomite cement occludes intergranular pores. Rare pyrite has precipitated within chert micropores. Framework grains include chert, monocrystalline quartz (Q), K-feldspar and clay-rich sedimentary (CRF) lithoclasts.

Photo A: 100X PPL,   Photo B: 100X XPL,   Photo C: 200X PPL,   Photo D: 200X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Pullen E-17

8270-8370 feet

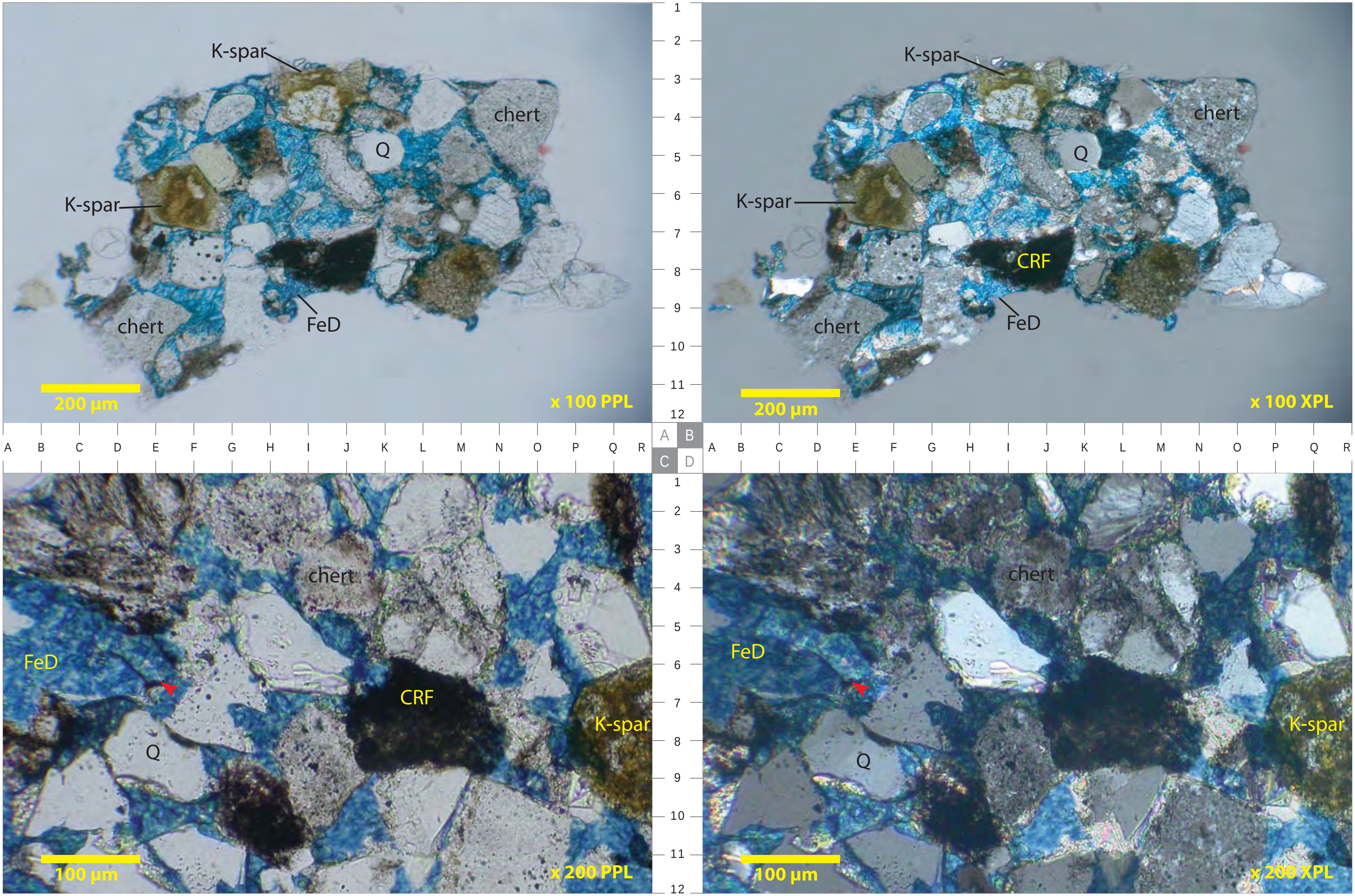


Plate 07
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions (Drill Cuttings) – Plate 08

Pullen E-17
Kugmallit
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 10-S14
Depth: 8420-8520 feet

Coarsely crystalline poikilotopic ferroan dolomite occludes macroporosity in this poorly sorted medium to coarse grained litharenite represented by drill cuttings recovered between 8420 to 8520 feet. Microfractures (View D) are filled by ferroan carbonate cement. Small red arrows in View B highlight bitumen. Chert, monocrystalline quartz (Q) and clay-rich sedimentary grains (CRF) are the main framework constituents. Effective macroporosity is rare shown by small yellow arrow in View C.

Photo A: 100X PPL, Photo B: 100X PPL, Photo C: 200X PPL, Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Pullen E-17 **8420-8520 feet**

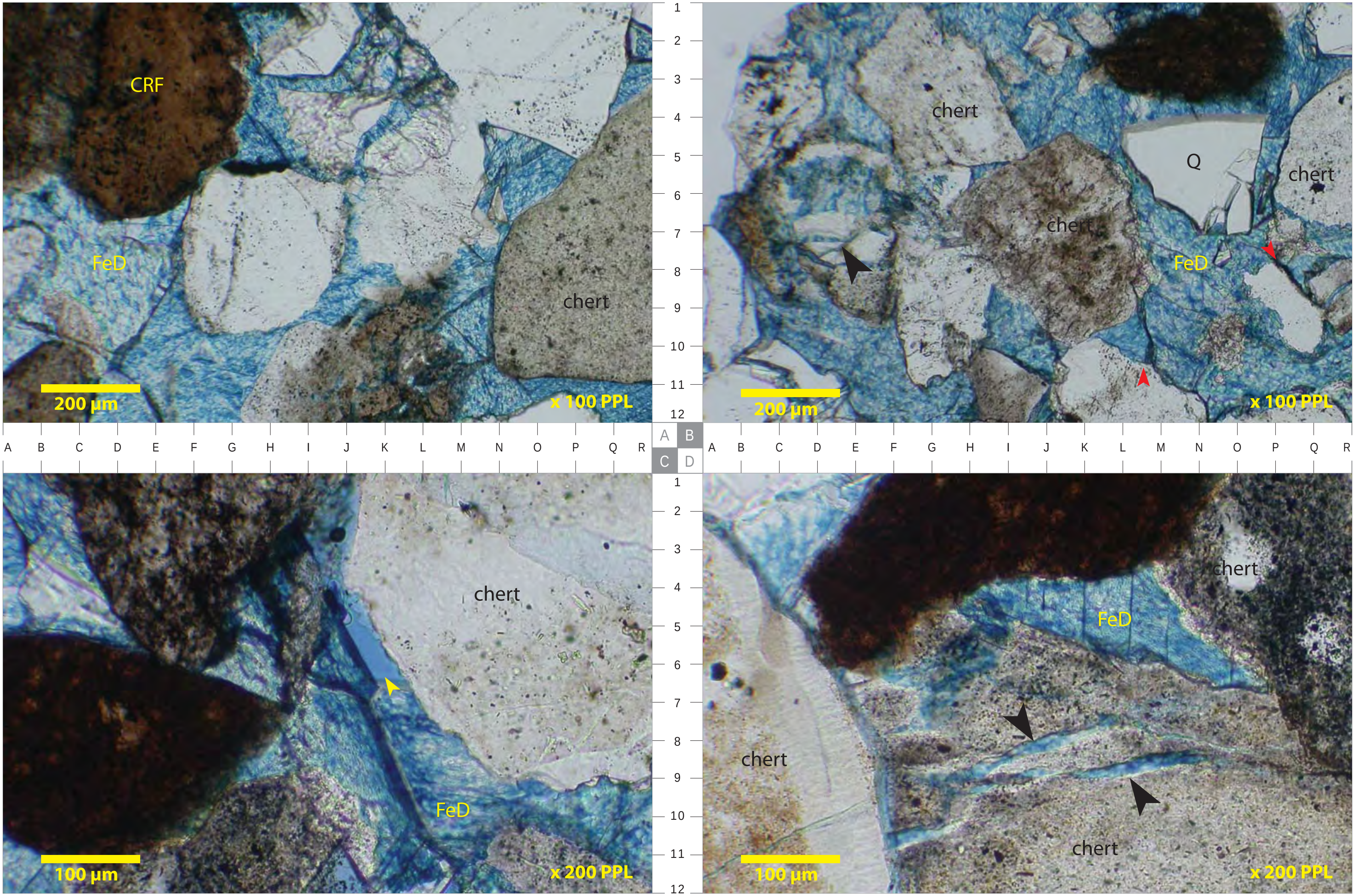


Plate 08
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions (Drill Cuttings) – Plate 09

Pullen E-17
Kugmallit
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 10-S15
Depth: 8600-8700 feet

Drill chips recovered between 8600 to 8700 feet consist of moderately sorted, fine grained carbonate cemented non-reservoir quality litharenites. Subangular to subrounded framework components include monocrystalline quartz, chert, argillic sedimentary grains and minor K-feldspar. Poikilotopic ferroan dolomite cement is coarsely crystalline occluding macroporosity. Grain contacts are floating and tangential. Note minor fractured framework grains with ferroan dolomite filling microfractures (View D, I:9). Framework grain remnants are engulfed by carbonate cement as illustrated in View C. Rare pyrite crystallites have precipitated within chert micropores.

Photo A: 100X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

Pullen E-17

8600-8700 feet

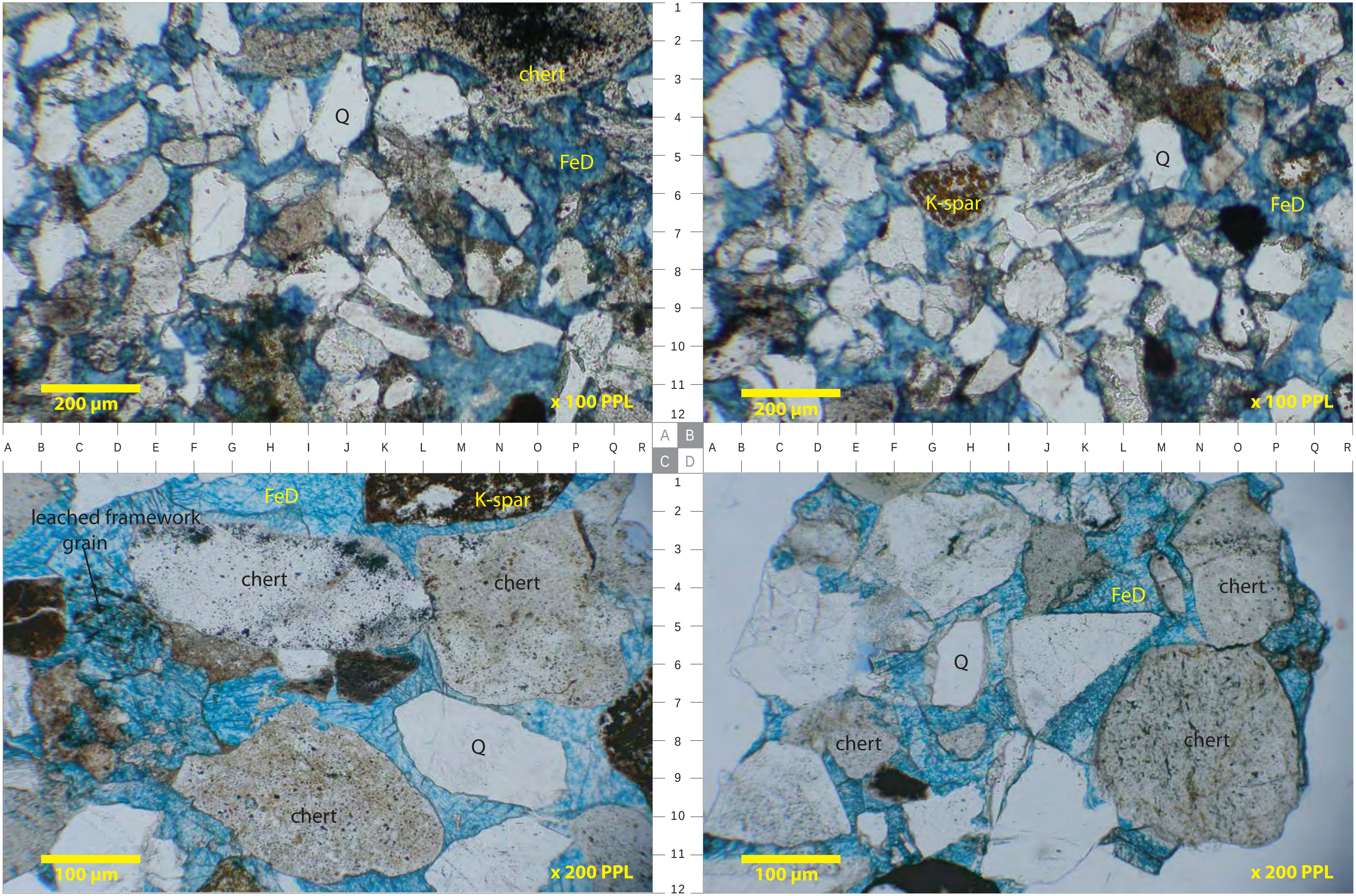


Plate 09

January 2010

CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions (Drill Cuttings) – Plate 10

Pullen E-17
Kugmallit
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 10-S16
Depth: 8800-8900 feet

High magnification views of drill chips recovered between 8800 to 8900 feet illustrate common dissolution of pore filling ferroan dolomite cement. Well sorted, very fine grained litharenites characterize the Kugmallit Sequence in this interval. Monocrystalline quartz (Q), chert and argillic sedimentary lithoclasts plus minor yellow stained K-feldspar constitute the main framework grains. Effective macroporosity (small yellow arrows) is moderately well developed reflecting ferroan dolomite dissolution. Pyrite and siderite are found in trace volumes.

Photo A: 100X PPL, Photo B: 200X PPL, Photo C: 200X PPL, Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Pullen E-17 — 8800-8900 feet

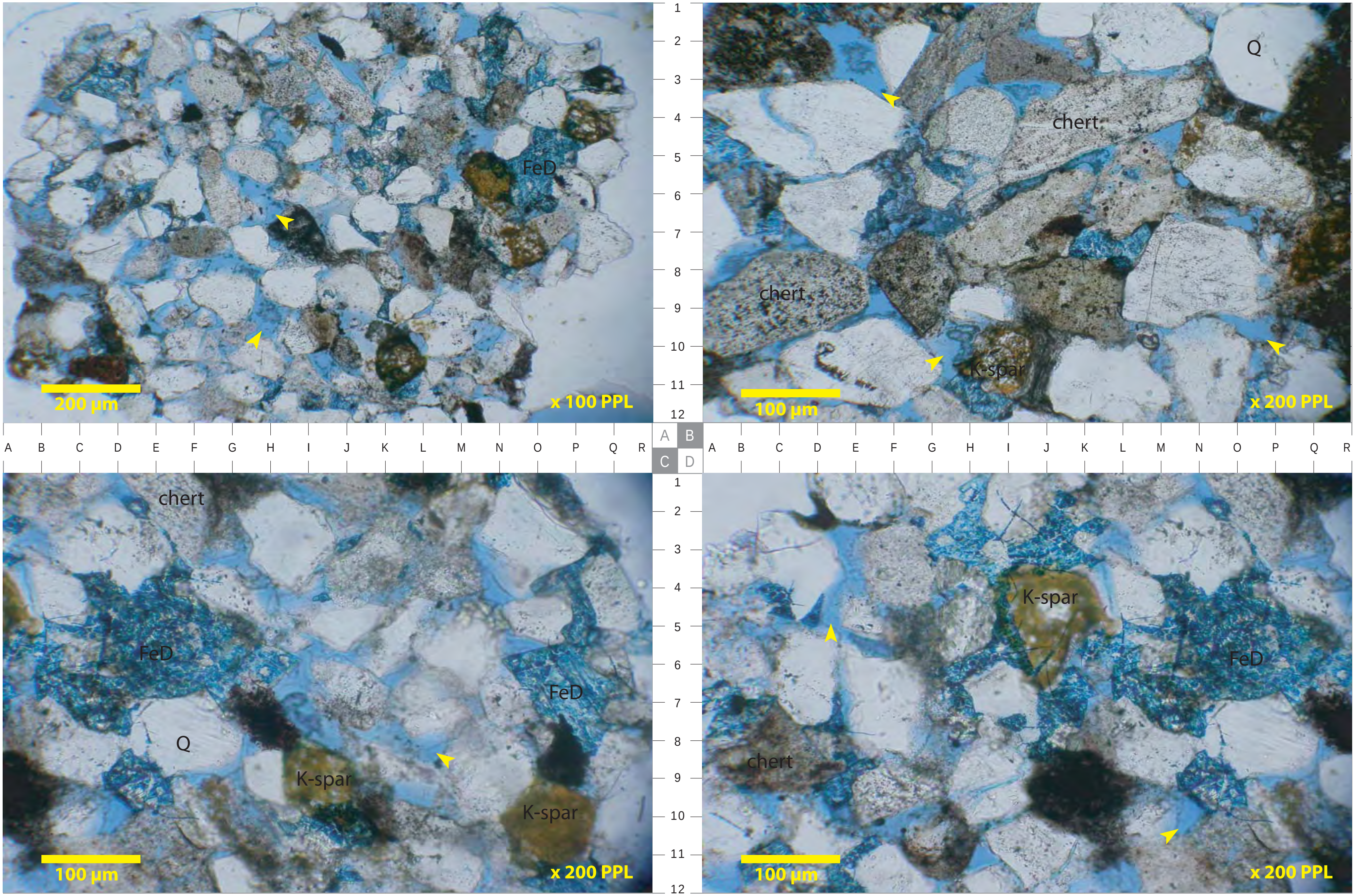


Plate 10
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions (Drill Cuttings) – Plate 11

Pullen E-17
Kugmallit
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 10-S17
Depth: 9280-9380 feet

Poikilotopic coarsely crystalline ferroan dolomite (FeD) cement occludes macroporosity (small yellow arrows) in the drill chips recovered between 9280 to 9380 feet. Moderately well sorted, fine grained litharenites are recognized in this interval. Framework grains show carbonate filled microfractures (View C, large grey arrows). Chert, monocrystalline quartz, clay-rich sedimentary grains (CRF) and yellow stained K-feldspar are the main framework constituents. Grain contacts are tangential and point-point.

Photo A: 40X PPL, Photo B: 100X PPL, Photo C: 200X PPL, Photo D: 200X PPL

Pullen E-17

9280-9380 feet

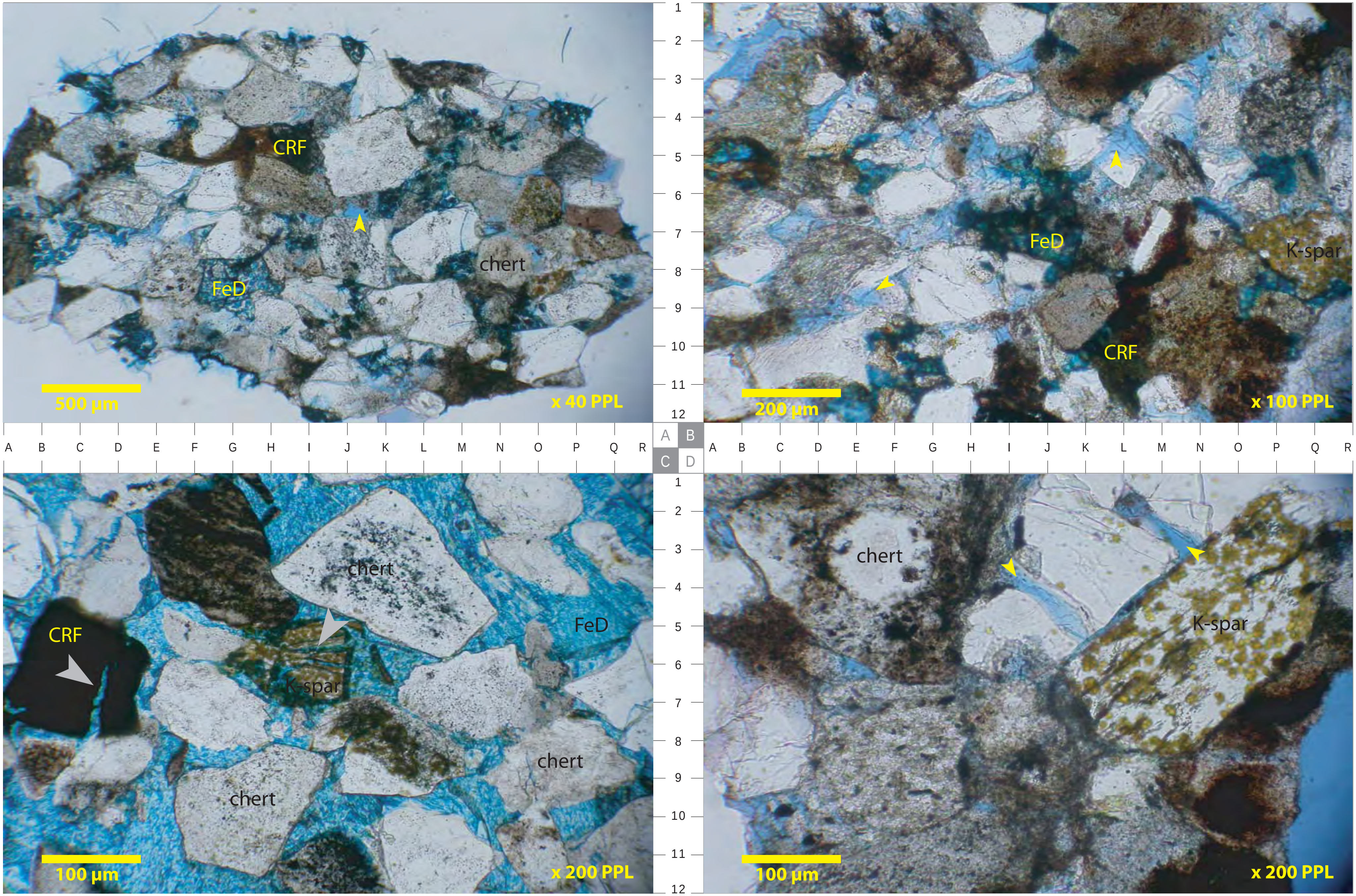


Plate 11

January 2010

CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions (Drill Cuttings) – Plate 12

Pullen E-17
Kugmallit
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 10-S19
Depth: 9750-9850 feet

High magnification views of drill cuttings retrieved between 9750 to 9850 feet show common ferroan dolomite cement partially occluding macroporosity (small yellow arrows). Framework grains are comprised of monocrystalline quartz (Q), chert, clay-rich sedimentary grains and yellow stained K-feldspar. Microfractures cross cut framework clasts as illustrated in View A (large black arrows). Note corroded edges on framework lithoclasts (View B, M:4) indicating dissolution of framework grains by secondary replacement processes. Whole rock X-ray diffraction analysis of drill chips generated quartz (43%), K-feldspar (11%), plagioclase (9%), micas (2%), kaolinite/chlorite clays (3%) and dolomite (30%).

Photo A: 100X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Pullen E-17 — 9750-9850 feet

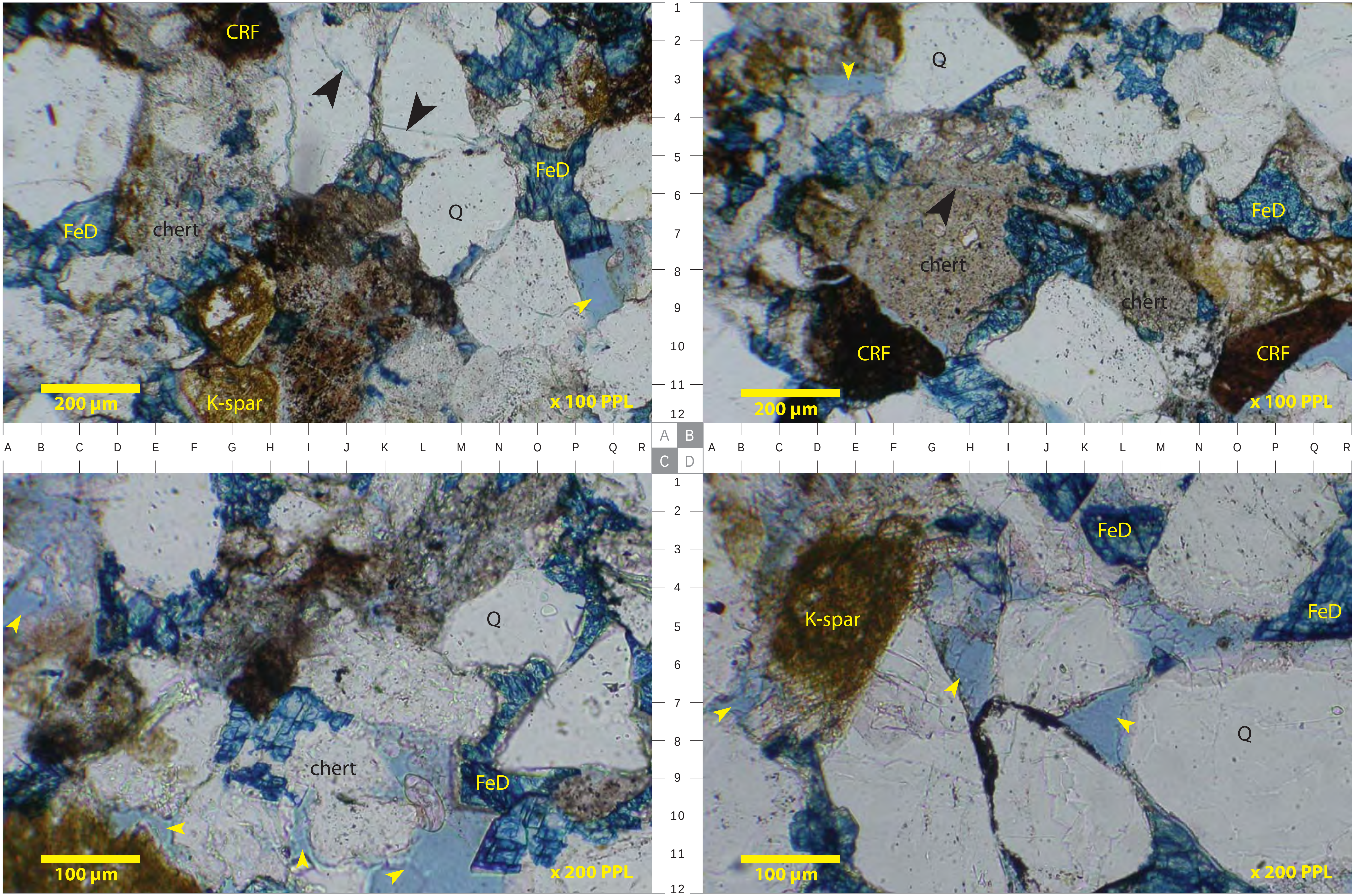


Plate 12
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions (Drill Cuttings) – Plate 13

Pullen E-17
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 10-S21
Depth: 10390-10490 feet

Grain contacts are floating to tangential in this coarsely crystalline ferroan dolomite cemented litharenite. Poorly sorted, very fine to medium grained sandstones with common microfractured grains (large black arrows) are shown in these high magnification views. Carbonate cement engulfs partially leached framework lithoclasts (View B, M:11).Effective macroporosity (View D, L:4) is poorly developed. Note hydrocarbon stain on dolomite crystal edges (View D, K-L:1-2). Rare pyrite has precipitated within chert micropores.

Photo A: 100X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Pullen E-17 **10390-10490 feet**

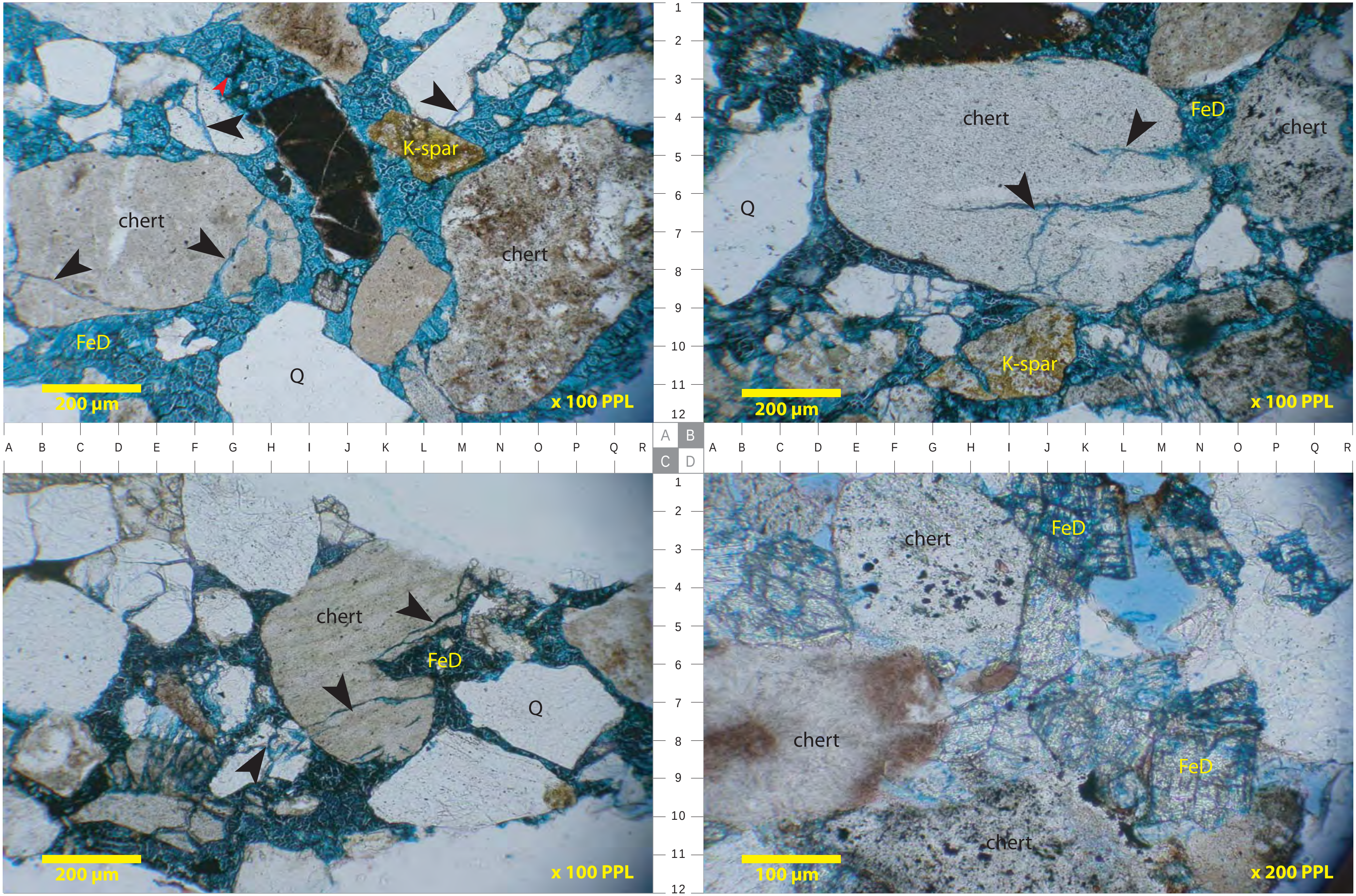


Plate 13
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions (Drill Cuttings) – Plate 14

Pullen E-17
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 10-S22
Depth: 10770-10900 feet

Fine grained, well sorted litharenites, representing the Richards Sequence, are recognized from drill cuttings recovered between 10770 to 10900 feet. Effective macroporosity (small yellow arrows) is well developed in this interval. Monocrystalline quartz (Q), chert, clay-rich sedimentary grains (CRF) plus yellow stained K-feldspar and minor quartz-rich sedimentary grains (QRF) are the main framework constituents. Rare authigenic phases consist of pyrite precipitated within chert micropores. Whole rock X-ray diffraction analysis of drill chips yielded quartz (43%), plagioclase (32%), K-feldspar (8%), micas (3%), dolomite (3%) and clays (chlorite 5%, kaolinite 3%).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Pullen E-17 **10770-10900 feet**

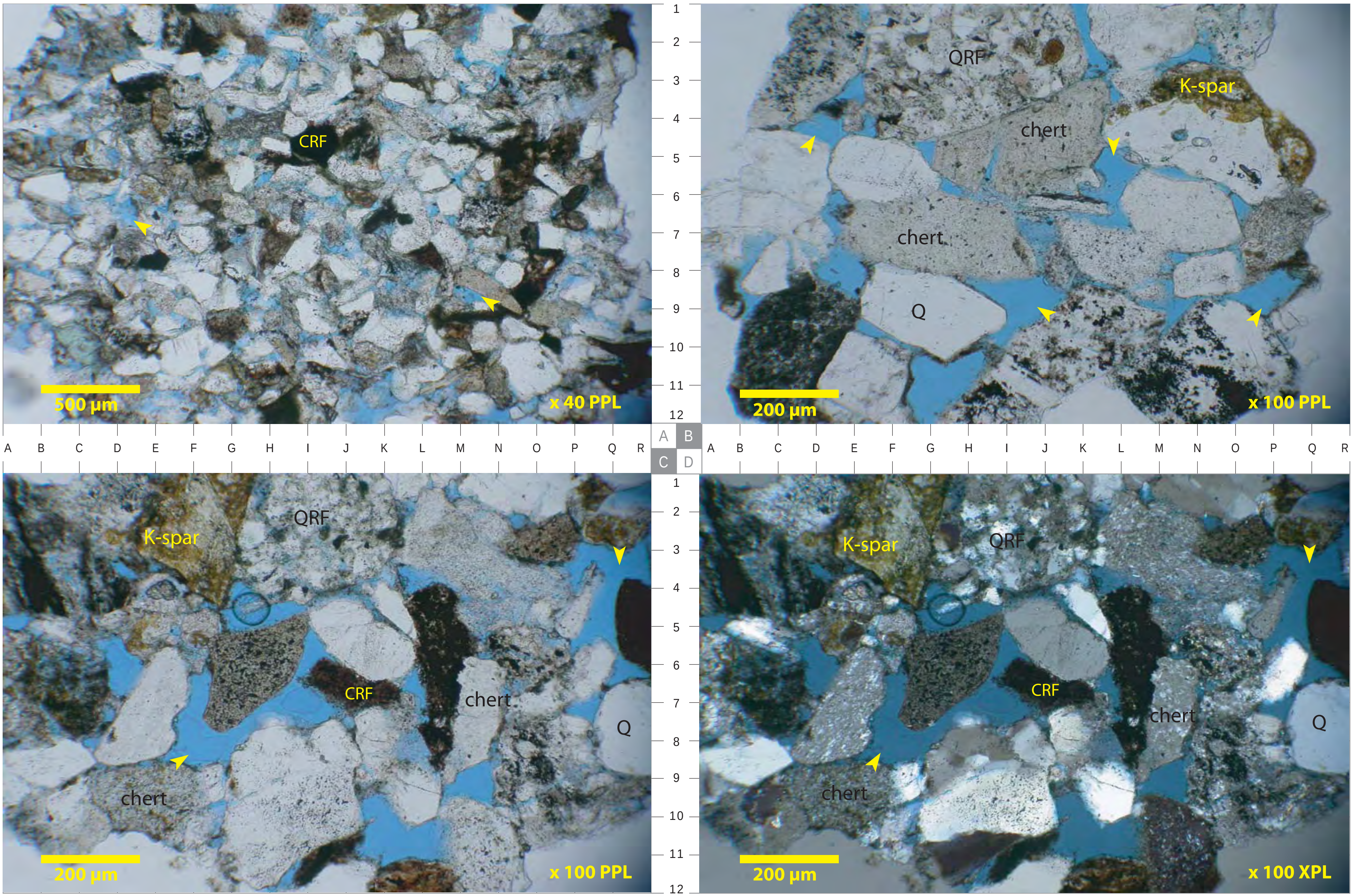


Plate 14
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions (Drill Cuttings) – Plate 15

Pullen E-17
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 10-S23
Depth: 11000-11100 feet

Very fine to fine grained, moderately well sorted litharenites characterize the drill cuttings recovered between 11000 to 11100 feet. Grain contacts are tangential and concavo-convex reflecting considerable mechanical compaction. Pseudo-matrix is created from the compaction of labile framework clasts between the more competent grains. Framework components include clay-rich sedimentary grains, monocrystalline quartz, chert, yellow stained K-feldspar and feldspathic grains. Rare pyrite has precipitated within chert micropores. Small yellow arrows show effective macroporosity. Whole rock X-ray diffraction analysis generated quartz (41%), plagioclase (12%), micas (14%), clays (kaolinite/chlorite 15%, mixed/expandable 9%) and siderite (9%).

Photo A: 100X PPL, Photo B: 100X PPL, Photo C: 200X PPL, Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

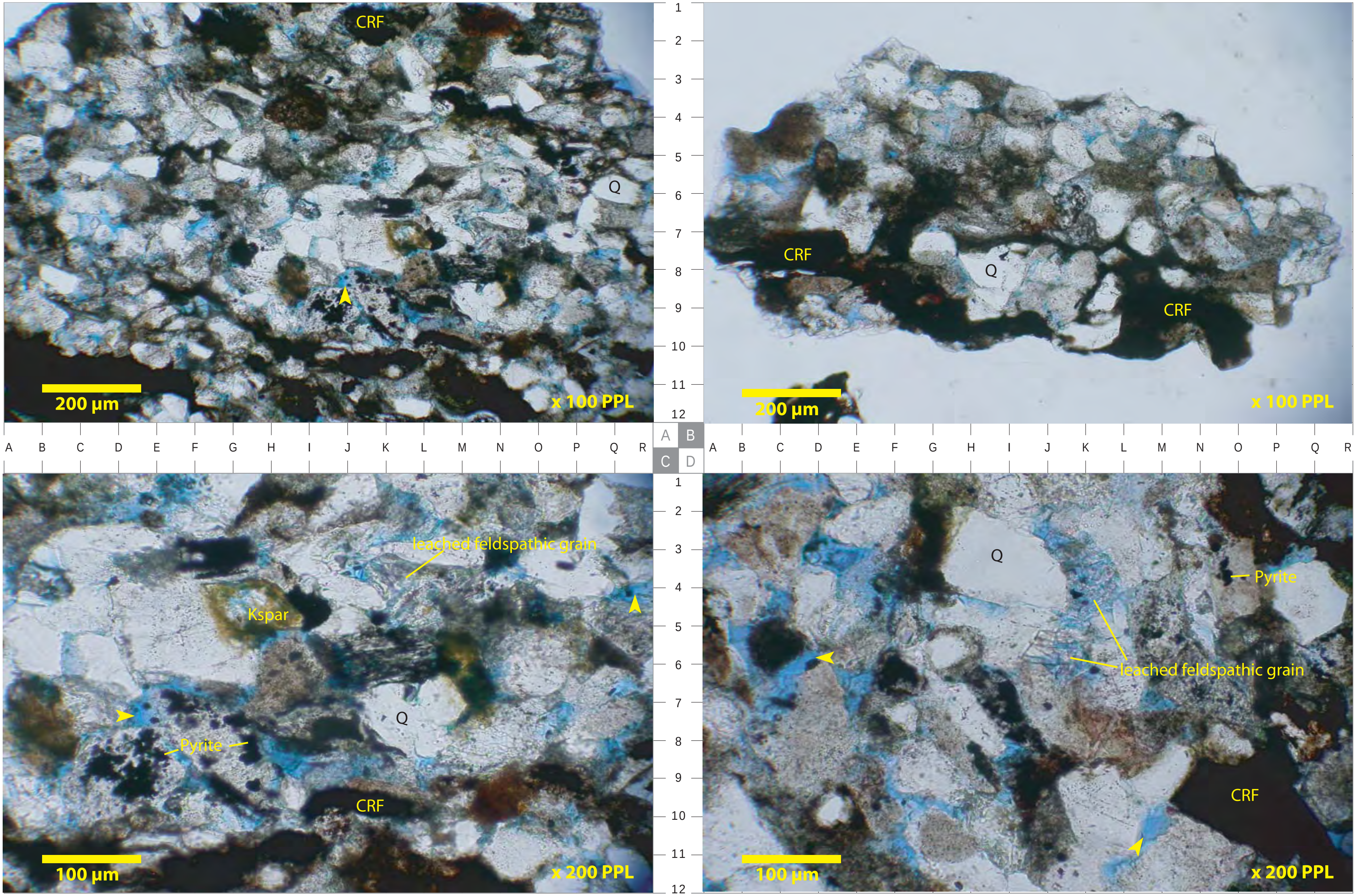


Plate 15
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions (Drill Cuttings) – Plate 16

Pullen E-17
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 10-S24
Depth: 11330-11380 feet

Drill cuttings recovered between 11330 to 11380 feet consist of very fine to medium grained, moderately sorted litharenites. Dolomite cement (View C and D, "Dol") is the main pore occluding authigenic phase with rare pyrite precipitated within chert micropores. Effective macroporosity (small yellow arrows) is moderately developed enhanced by the dissolution of carbonate cement and unstable framework constituents. Framework grains include monocrystalline quartz (Q), polycrystalline quartz (PxQ), chert, clay-rich sedimentary grains (CRF) and K-feldspar.

Photo A: 100X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X XPL

Pullen E-17 **11330-11380 feet**

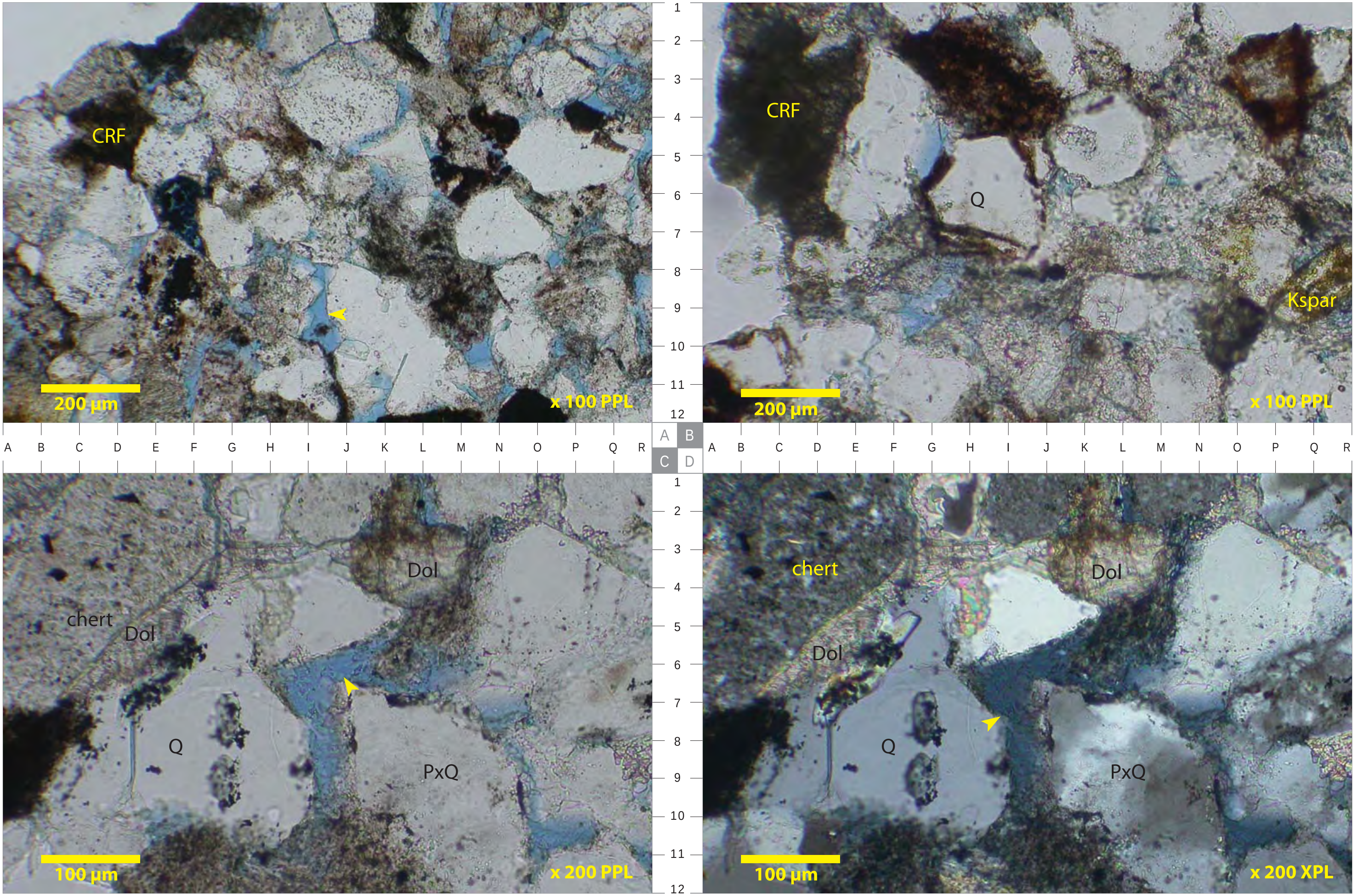


Plate 16
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions (Drill Cuttings) – Plate 17

Pullen E-17
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 10-S25
Depth: 11600-11700 feet

Well developed effective macroporosity (small yellow arrows) is shown in these high magnification thin section photomicrographs. Grain contacts are mainly tangential in this fine grained, moderately well sorted litharenite. Monocrystalline quartz, chert, partially leached feldspars, clay-rich sedimentary grains and yellow stained K-feldspar are the main framework lithoclasts. Dissolution of unstable framework grains yields intragranular porosity. Whole rock X-ray diffraction analysis generated quartz (56%), K-feldspar (20%), plagioclase (14%), calcite (4%), dolomite (3%) and kaolinite/chlorite (3%).

Photo A: 100X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Pullen E-17 11600-11700 feet

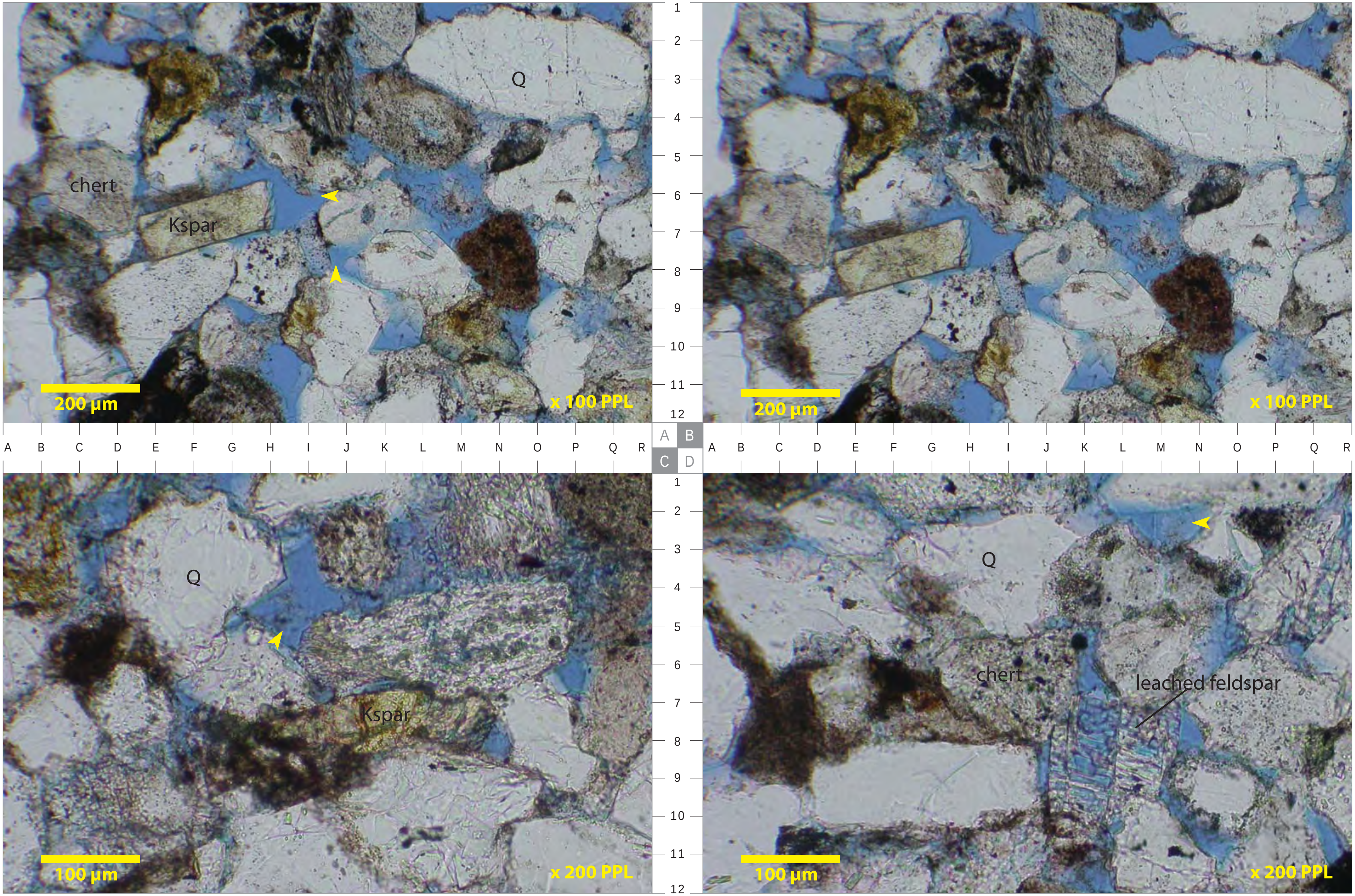


Plate 17
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions (Drill Cuttings) – Plate 18

Pullen E-17
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 10-S26
Depth: 11770-11820 feet

Drill cuttings recovered between 11770 to 11820 feet consist of moderately well sorted, fine grained litharenites. Grain contacts are mainly tangential in this interval. Subrounded to subangular monocrystalline quartz (Q), chert and argillic sedimentary grains with minor K-feldspar are the main framework lithoclasts. Ferroan dolomite is the main pore occluding cement with rare poorly developed quartz overgrowths. Dissolution of carbonate cement (FeD) has enhanced the effective macropore system (small yellow arrows). Trace amounts of siderite and pyrite are eogenetic cements.

Photo A: 100X PPL, Photo B: 100X PPL, Photo C: 200X PPL, Photo D: 200X PPL

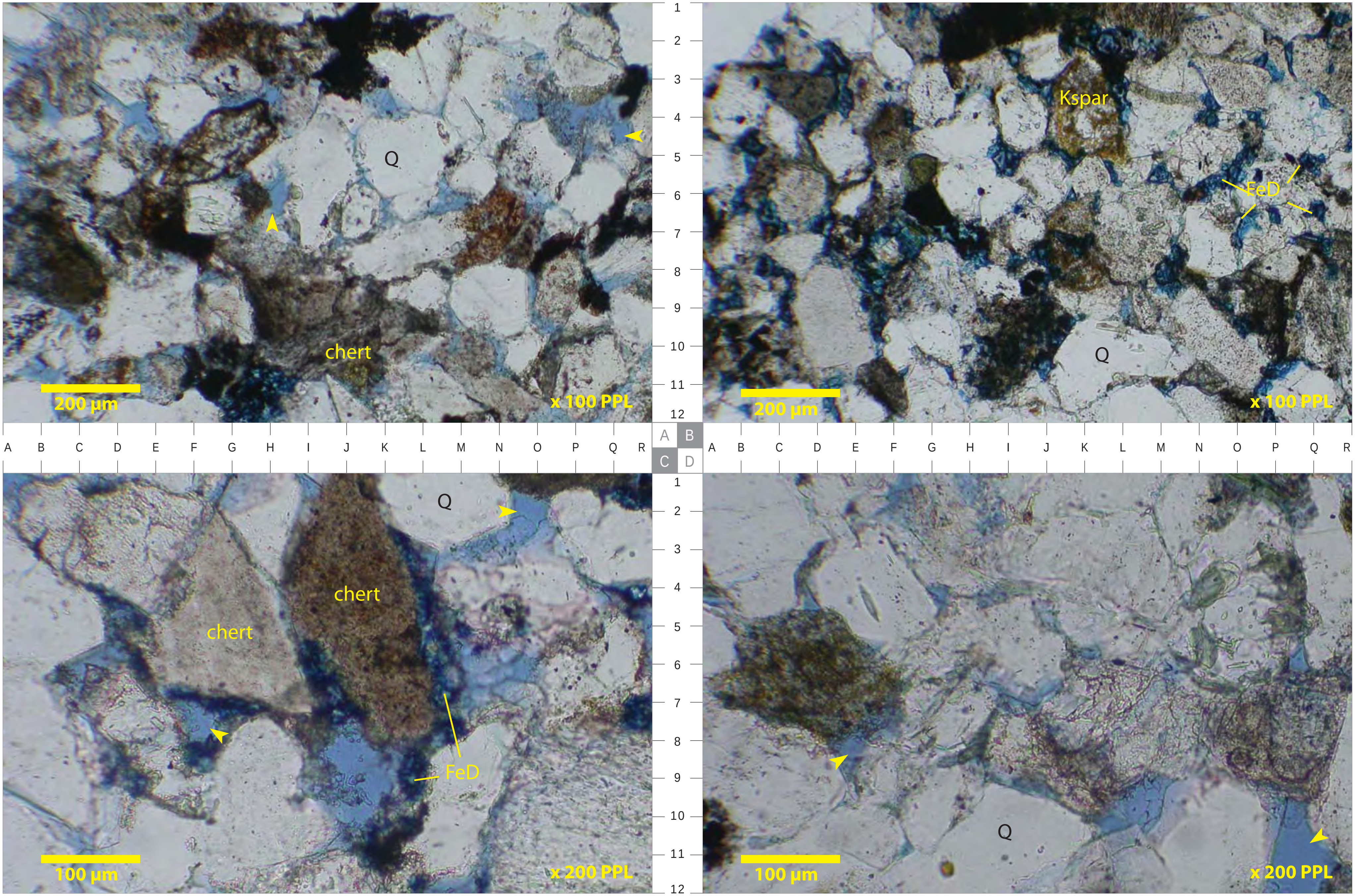


Plate 18
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions (Drill Cuttings) – Plate 19

Pullen E-17
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 10-S28
Depth: 12310-12400 feet

Drill cuttings retrieved between 12310 to 12400 feet consist of fine to fine grained moderately well sorted litharenites. Grain contacts are mainly tangential and concavo-convex. The partial to complete dissolution of feldspathic grains (View C, N:9) has resulted in isolated moldic macropores (View D, E:5). Pyrite is found in minor volumes and rare kaolinite clays (View B, “K”) have precipitated loosely within open pores. Quartz overgrowths are very poorly developed and are found in trace volumes (View C, small black arrows).

Photo A: 100X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Pullen E-17

12310-12400 feet

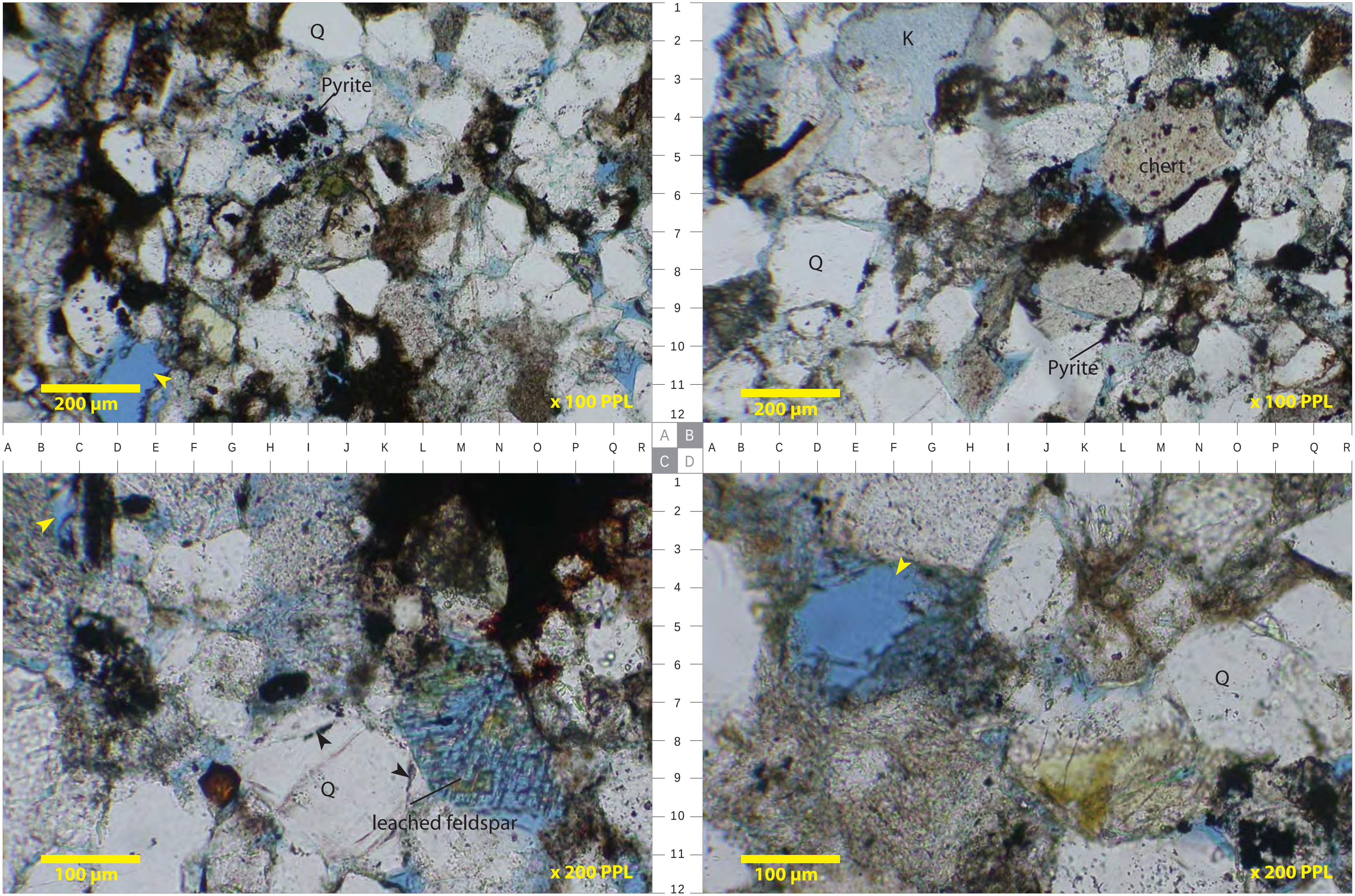


Plate 19
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26

Thin Section Overviews

And

Select Described Photomicrographs

Ivik J-26

8102.5 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 01

Ivik J-26
Richards
Litharenite

Core Analysis Porosity: 29.2% Core Analysis Permeability: 404 md

Sample #: 09-01
Depth: 8102.5 feet

Commonly bioturbated, moderately well sorted, fine grained litharenites characterize the Richards Sequence recovered from core at 8102.5 feet. Monocrystalline quartz (Q), chert, clay-rich sedimentary grains (CRF) are the main framework constituents with lesser volumes of feldspar and micas. Pore occluding authigenic phases are rare consisting of microcrystalline pyrite and minor replacive siderite. Dissolution of unstable feldspar grains (View B, L:11) has enhanced the effective pore system (small yellow arrows). Loosely packed kaolinite clays are rare (View C, K:9).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

Ivik J-26 **8102.5 feet**

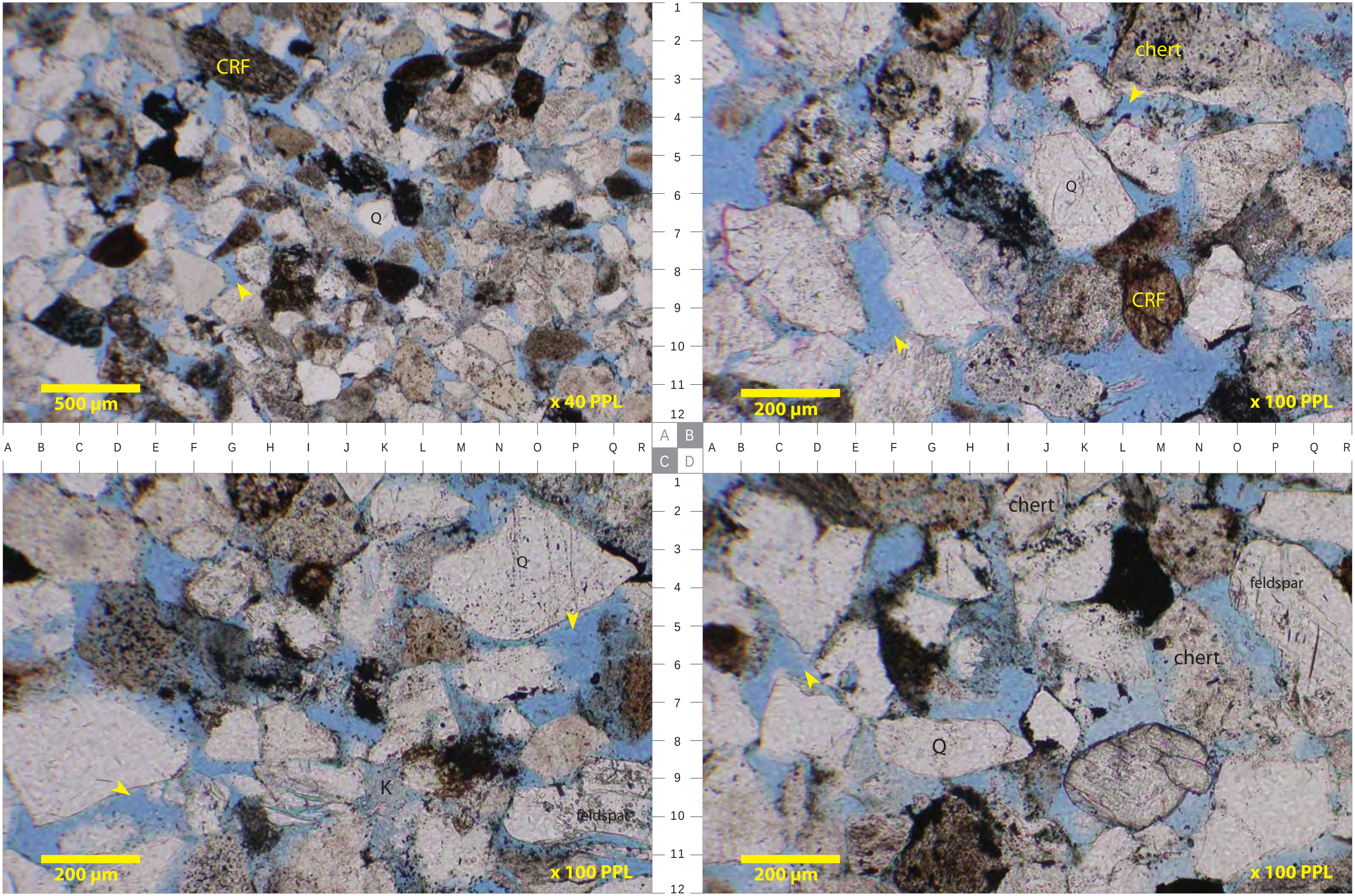


Plate 01
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26

8107.7 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 02

Ivik J-26
Richards
Litharenite

Core Analysis Porosity: 22.6% Core Analysis Permeability: 76.4 md

Sample #: 09-02
Depth: 8107.7 feet

Laminated, fine grained Richards Sequence litharenites were recovered from core at 8107.7 feet. Authigenic phases are poorly preserved consisting of replacive siderite and pyrite. Framework grains are comprised mainly of monocrystalline quartz (Q), chert, brown clay-rich sedimentary grains (CRF) with lesser amounts of feldspars and micas. Organic material (OM) and clays are concentrated along laminae as illustrated in the Overview. Grain contacts are tangential and concavo-convex. The latter suggest moderate mechanical compaction.

Photo A: 20X PPL,   Photo B: 40X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

Ivik J-26 8107.7 feet

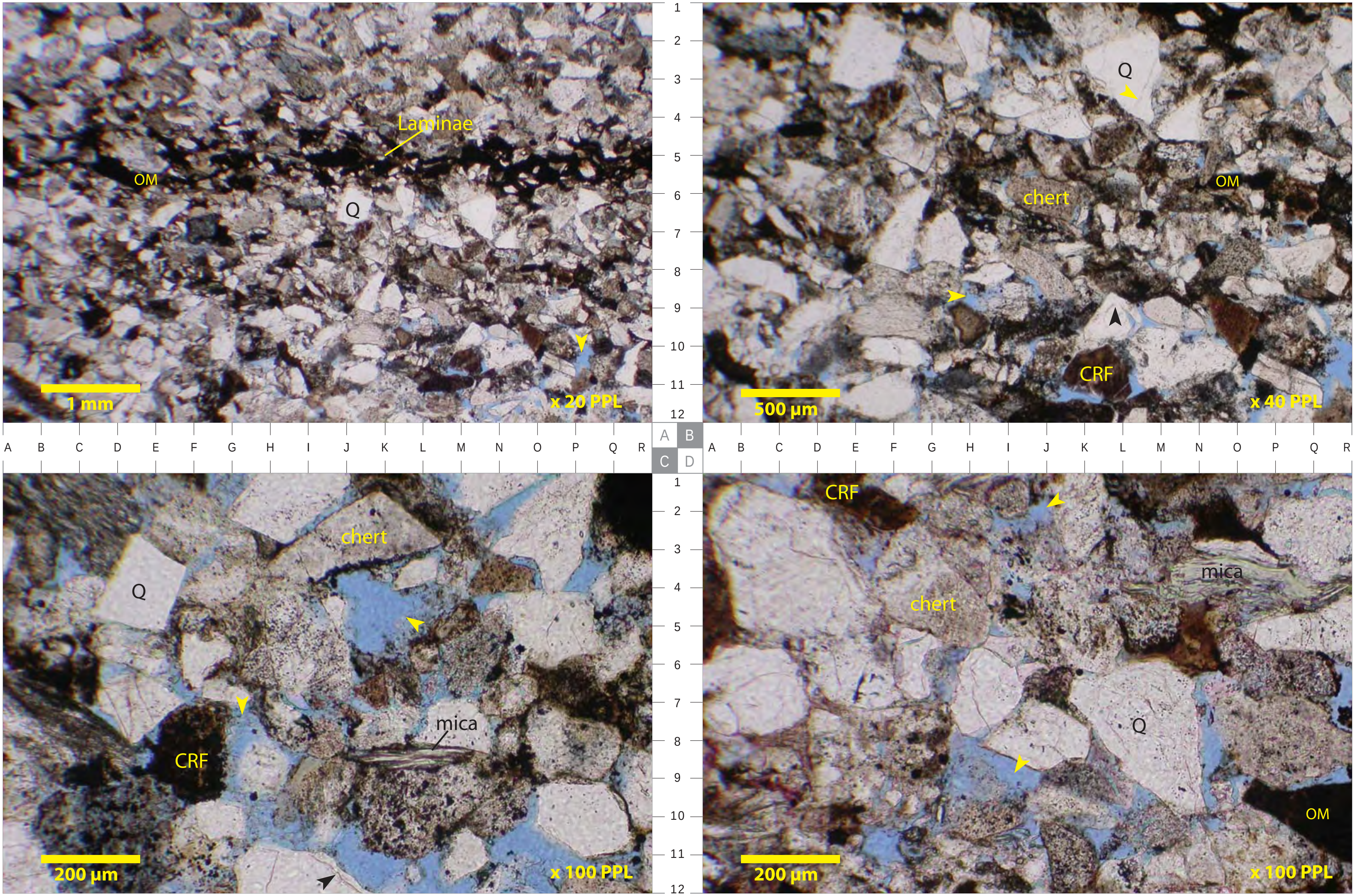


Plate 02
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26

8116.2 feet

2 mm

Richards

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 03

Ivik J-26
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 09-03
Depth: 8116.2 feet

Preferential dissolution of feldspathic grains (Views B-D) has enhanced the effective pore system (small yellow arrows) in this Richards Sequence interval. Fine grained well sorted litharenites characterize the core sampled at 8116.2 feet. Macroporosity (small yellow arrows) is very well developed and reservoir quality is expected to be very good. Framework grains are dominated by monocrystalline quartz (Q), chert, clay-rich sedimentary grains (CRF) and feldspars. Authigenic minerals are poorly preserved consisting of rare microcrystalline pyrite precipitated within chert micropores and unevenly distributed quartz overgrowths (View D, small black arrow).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26 **8116.2 feet**

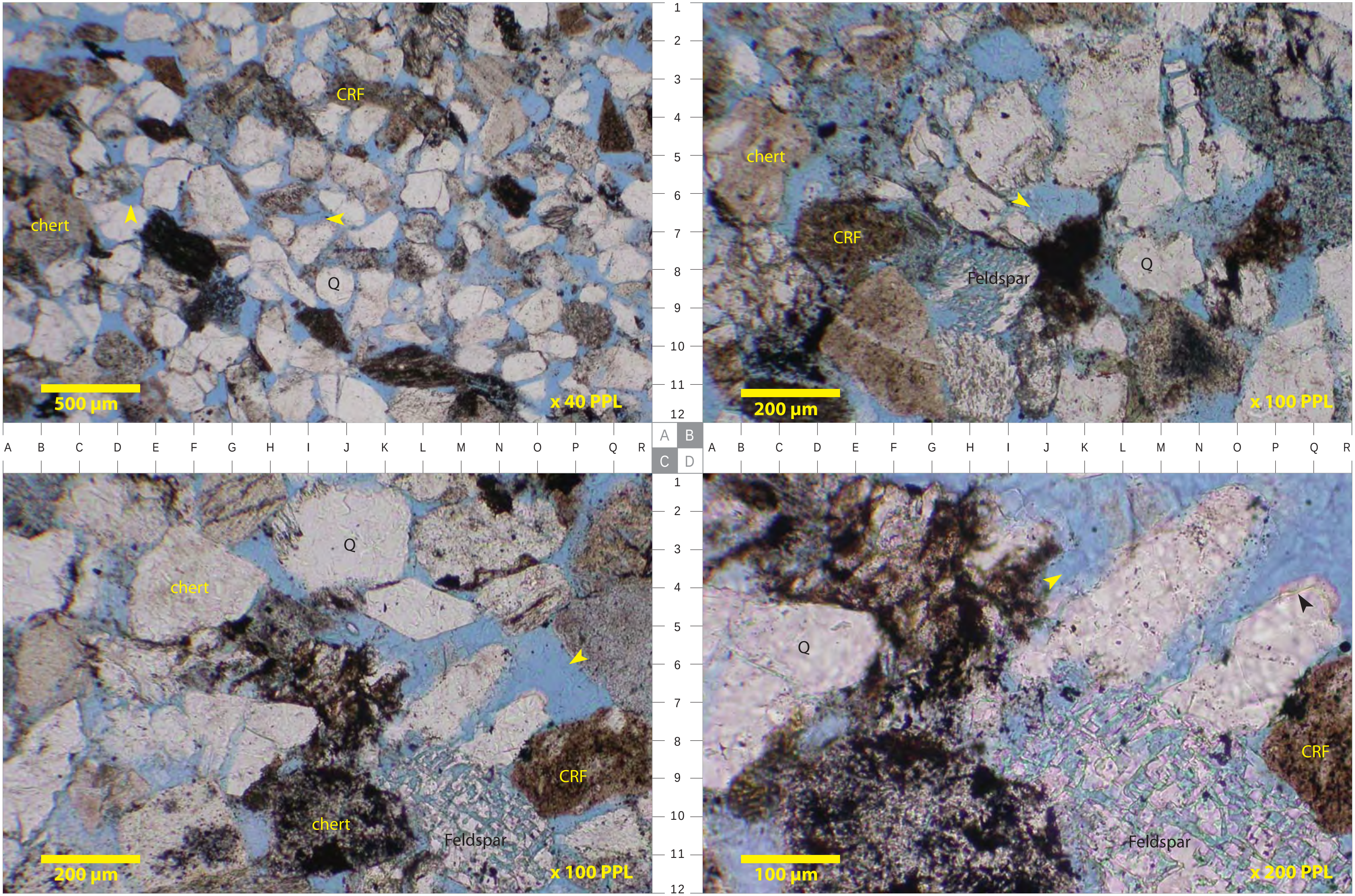


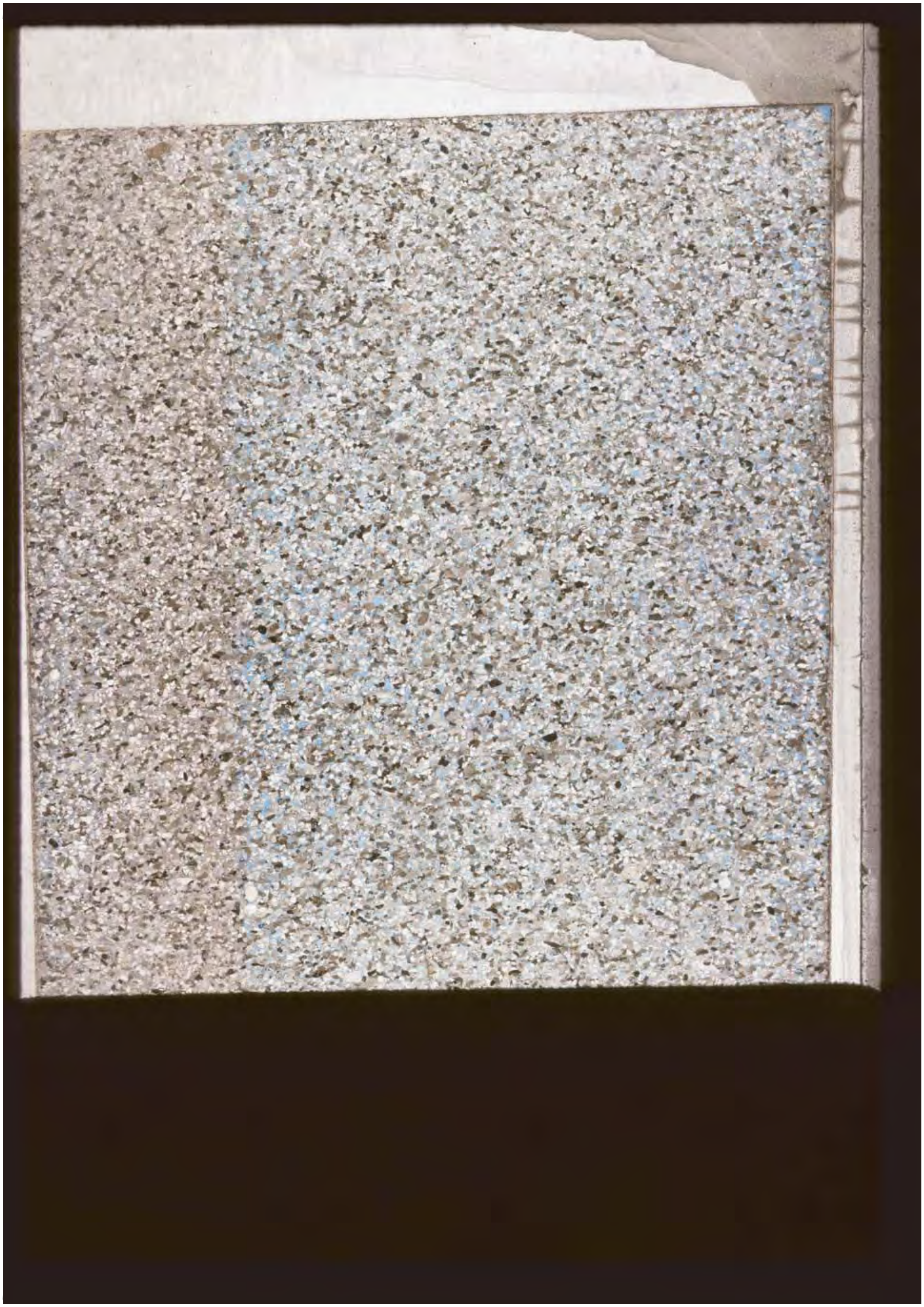
Plate 03
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26

8126 feet



Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 04

Ivik J-26
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 09-05
Depth: 8126 feet

Well sorted, bioturbated, good reservoir quality fine to medium grained litharenites were encountered by core recovered at 8126 feet. Dissolution of unstable framework grains, such as feldspathic grains and volcanic lithoclasts, results in enlarged effective macropores (small yellow arrows). Authigenic cements are poorly preserved consisting of rare patchily distributed leucoxene (View C, M:10), pyrite precipitated within chert micropores. Monocrystalline quartz, chert, clay-rich sedimentary grains (CRF), volcanic rock fragments (VRF) and feldspars comprise some of the framework constituents. Grain contacts are mainly tangential in this interval.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

Ivik J-26 8126 feet

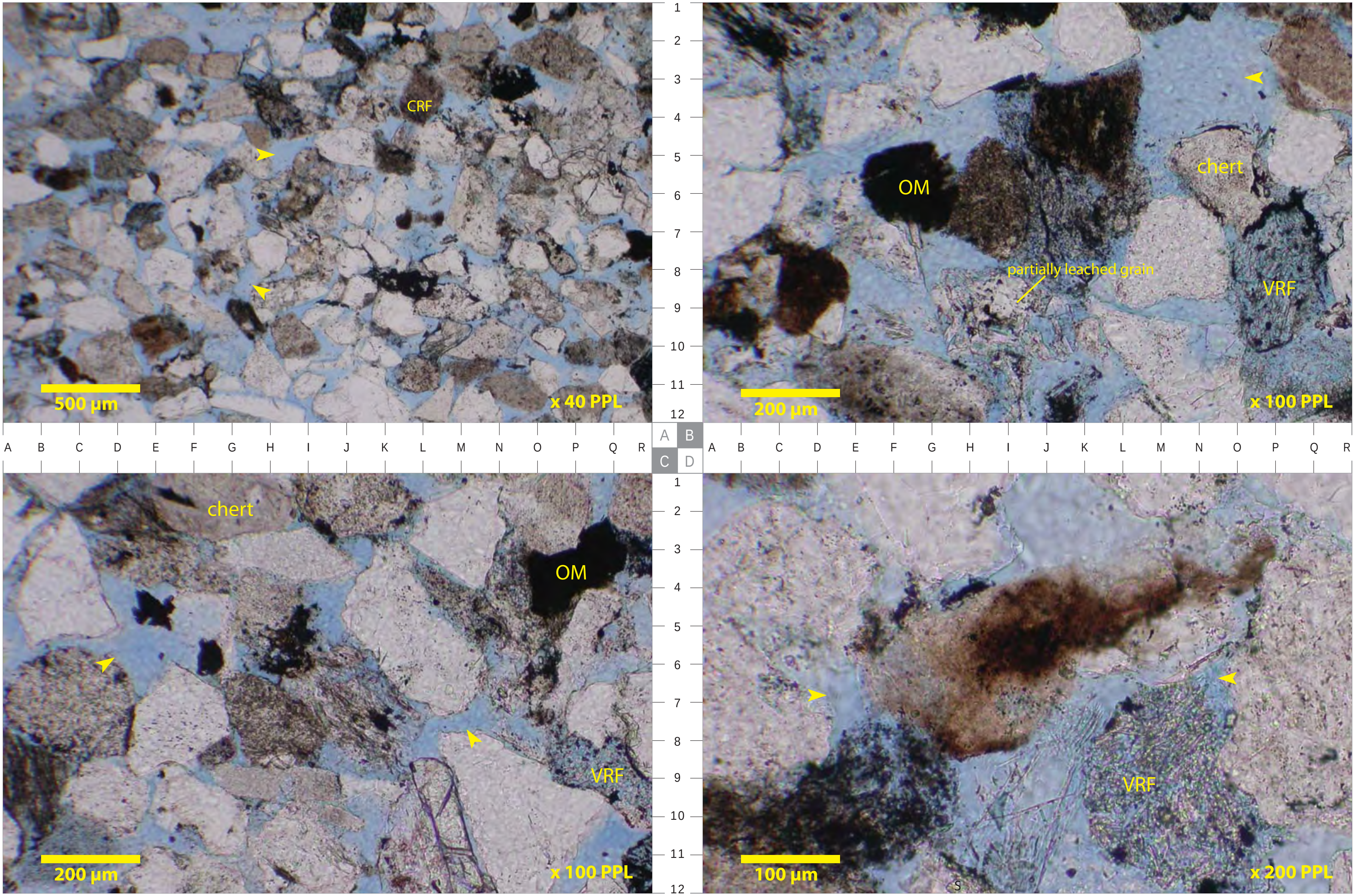


Plate 04
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26

8133 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

8138 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 05

Ivik J-26
Richards
Argillic Sandy Siltstone

Core Analysis Porosity: 5.9% Core Analysis Permeability: 1.42 md

Sample #: 09-07
Depth: 8138 feet

Very poorly sorted, silt to fine grained sand grains are floating in a sideritic matrix. Discontinuous non-stained carbonate (?ankerite) filled biomolds are shown in View A and in the Overview. The matrix is extensively replaced by cryptocrystalline siderite. Angular framework grains are comprised of monocrystalline quartz, chert and argillic sideritic clasts. View C illustrates an ankerite filled bioclast chambers.

Photo A: 20X PPL,   Photo B: 40X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26 **8138 feet**

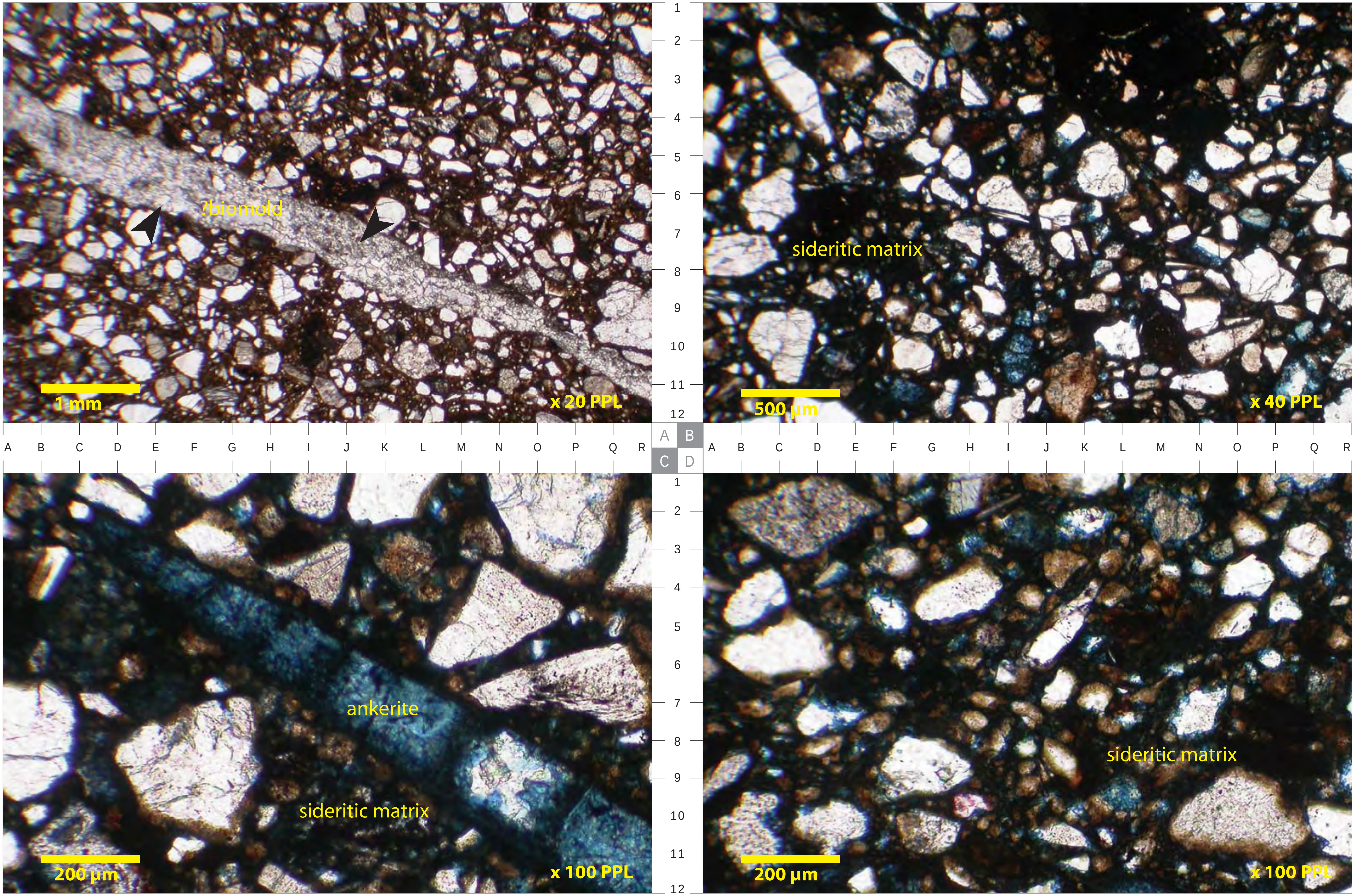


Plate 05
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26

8141.1 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 06

Ivik J-26
Richards
Litharenite

Core Analysis Porosity: 17.4% Core Analysis Permeability: 24.8 md

Sample #: 09-08
Depth: 8141.1 feet

Moderately sorted, very fine to fine grained litharenites are recognized from Richards Sequence core retrieved at 8141.1 feet. Grain compaction is moderate to high, reflected by concavo-convex grain contacts (View C, H:6-7). Common pore occluding purple stained ferroan calcite is unevenly distributed. Monocrystalline quartz, chert, feldspars, volcanic rock fragments, organic material and clay-rich sedimentary grains comprise some of the framework components. Replacive eogenetic siderite (View D, K:10) commonly replaces grain rimming and pseudo-matrix clays.

Photo A: 40X PPL, Photo B: 100X PPL, Photo C: 200X PPL, Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26 **8141.1 feet**

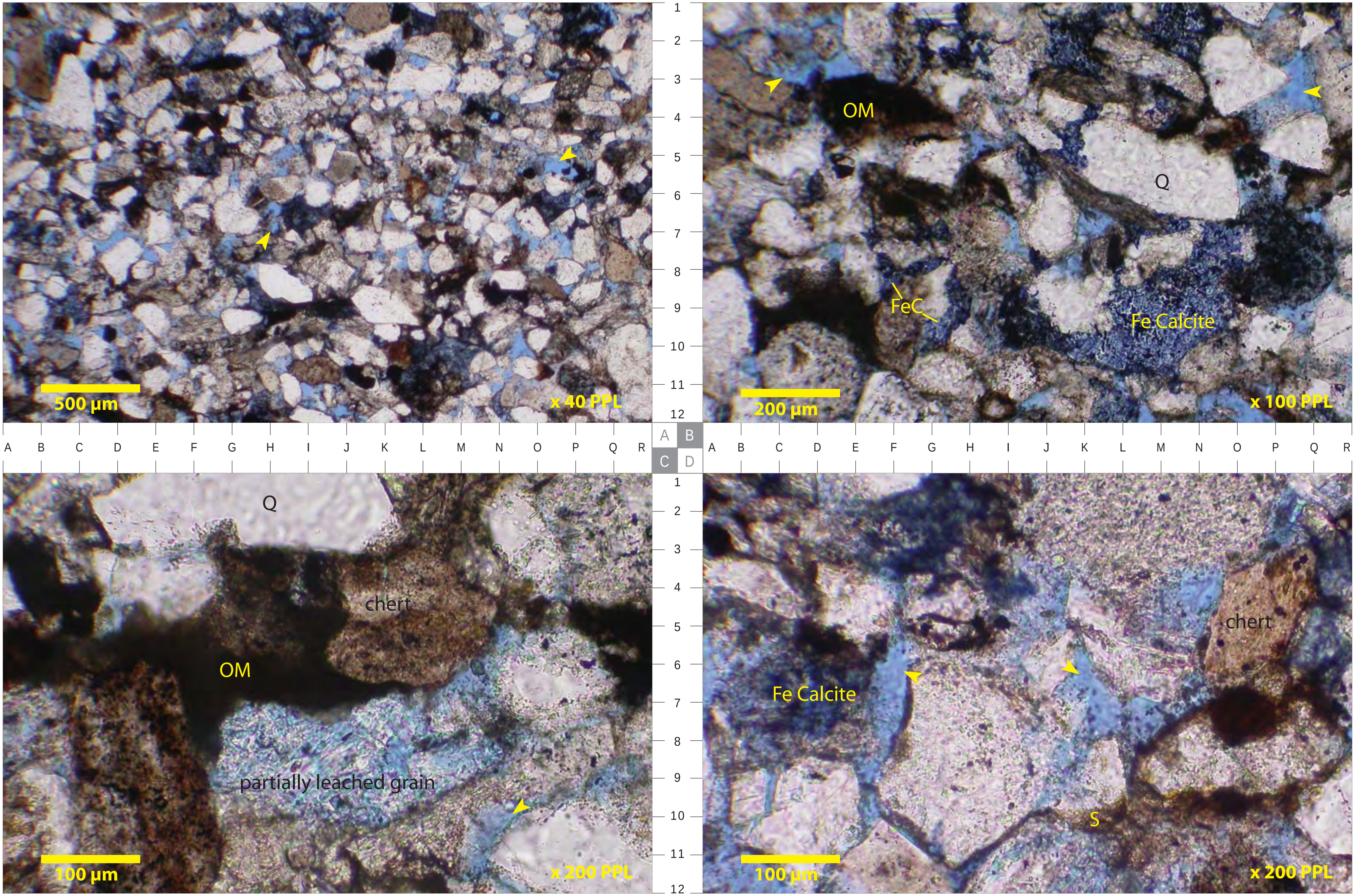


Plate 06
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26

8147.5 feet

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

8151 feet

Richards

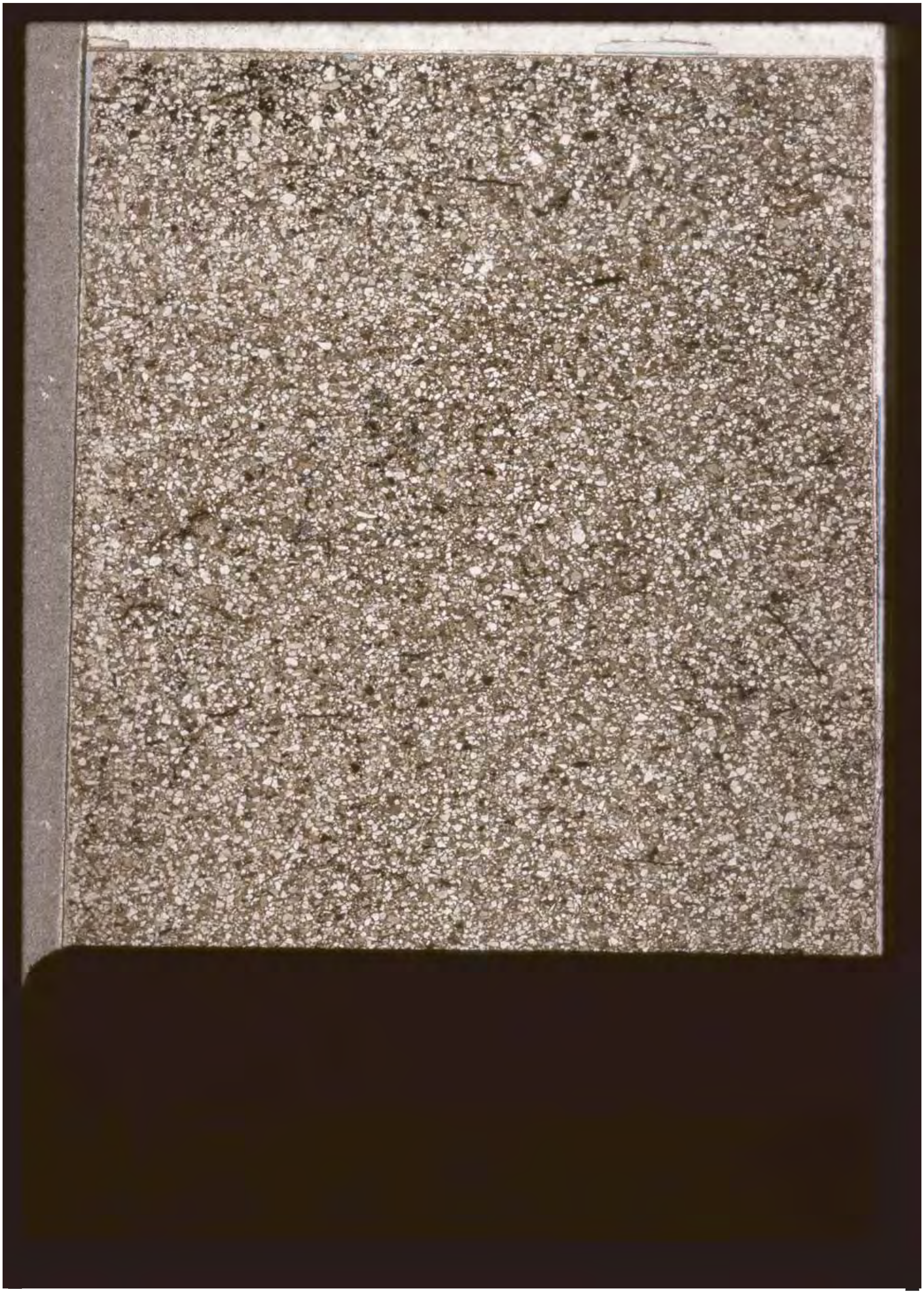
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

8156.5 feet



Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 07

Ivik J-26
Richards
Argillic Silty Litharenite

Core Analysis Porosity: 11.5% Core Analysis Permeability: 0.39 md

Sample #: 09-11
Depth: 8156.5 feet

Bioturbated, argillaceous fine grained, poor to moderately sorted litharenites are recognized from core recovered at 8156.5 feet. Pore occluding cement is found in minor volumes consisting of patchily distributed ankerite. Eogenetic siderite replaces matrix clays in this interval. Angular monocrystalline quartz, chert, clay-rich sedimentary grains (CRF) and partially leached feldspars comprise some of the framework grains. Whole rock X-ray diffraction analysis yielded quartz (47%), albite (14%), K-feldspar (trace), micas (12%), clays (kaolinite 9%, chlorite 8%, mixed/expandable clays 4%), siderite (4%) and pyrite (2%). Effective macroporosity (small yellow arrows) is isolated, resulting in very low permeability.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

Ivik J-26

8156.5 feet

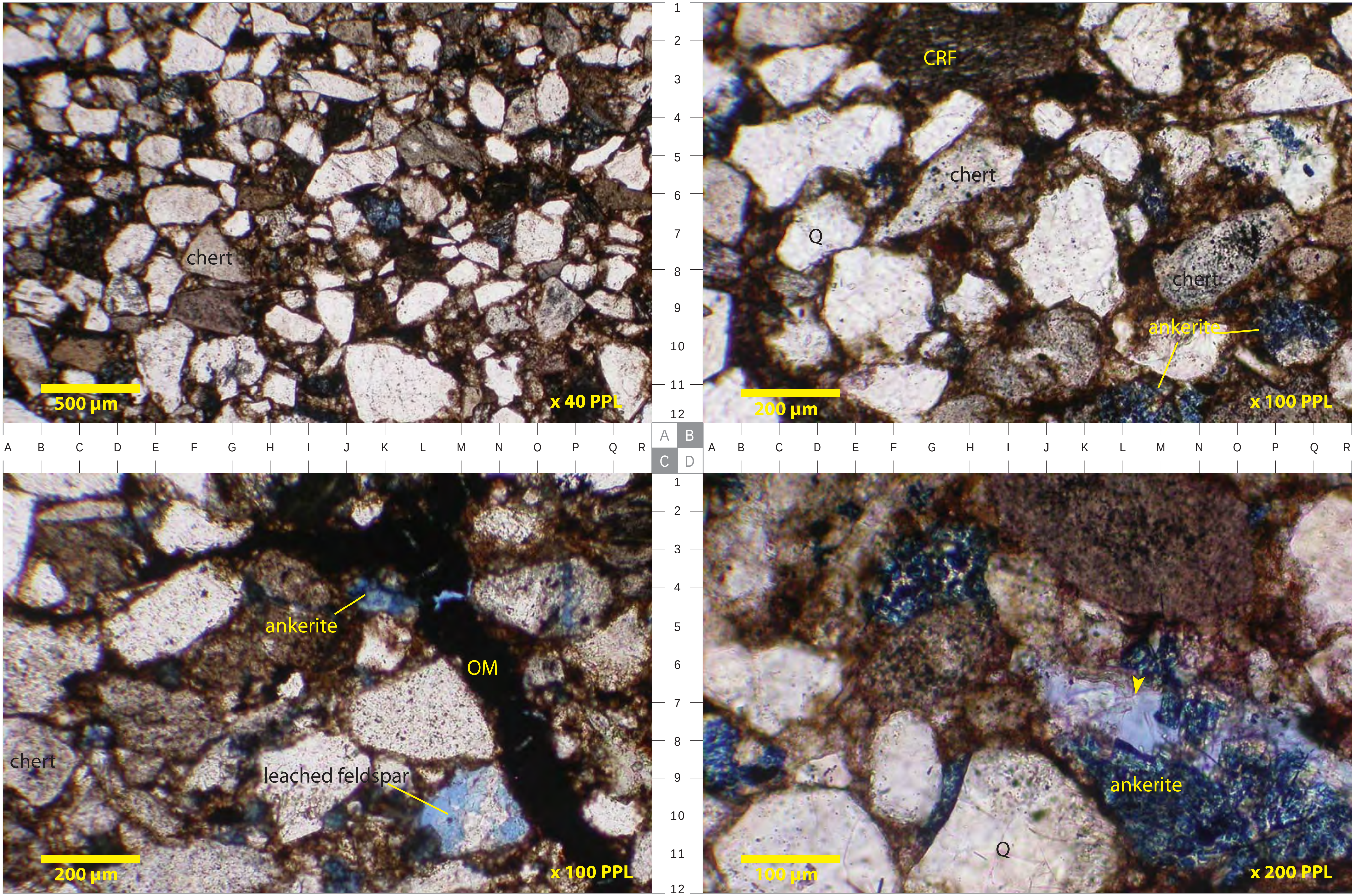


Plate 07
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26

8166 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 08

Ivik J-26
Richards
Litharenite

Core Analysis Porosity: 27.8% Core Analysis Permeability: 424 md

Sample #: 09-13
Depth: 8166 feet

Porous and permeable, moderately well sorted, fine to medium grained litharenites are recognized from Richards Sequence core recovered at 8166 feet. Framework grains are dominated by subrounded to subangular monocrystalline quartz (Q), chert, clay-rich sedimentary grains (CRF) and lesser volumes of organic material (OM), feldspars and glauconite (View A). Authigenic phases are poorly preserved consisting of loosely packed kaolinite clays (View D, N:8) plus trace pyrite precipitated within chert micropores. Grain contacts are mainly tangential in this interval.

Photo A: 40X PPL, Photo B: 100X PPL, Photo C: 100X PPL, Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26 **8166 feet**

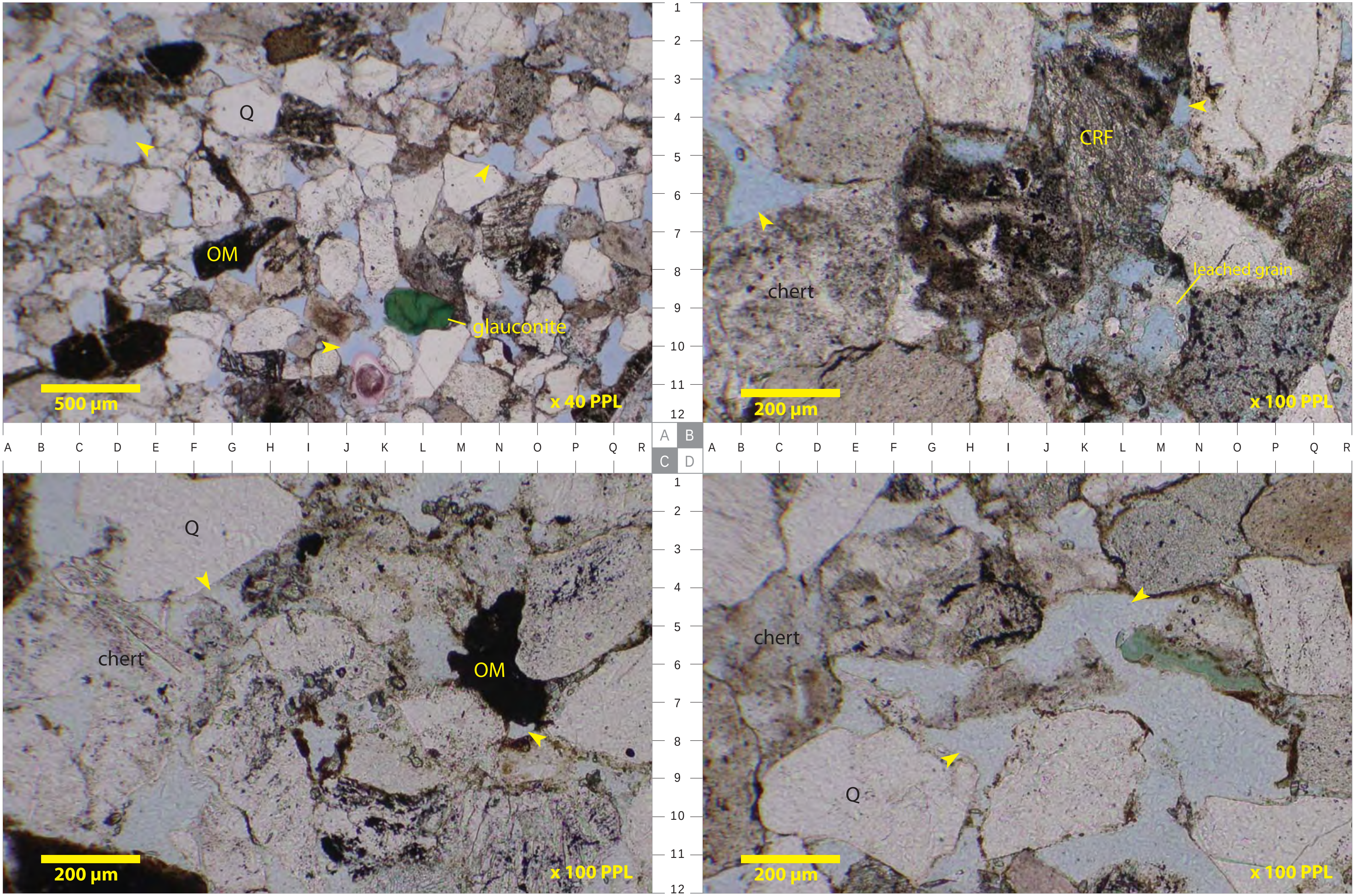


Plate 08
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26

8168.7 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

8171.9 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

8177.2 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 09

Ivik J-26
Richards
Litharenite

Core Analysis Porosity: 16.8% Core Analysis Permeability: 8.28 md

Sample #: 09-17
Depth: 8177.2 feet

Very fine to fine grained, moderately sorted bioturbated litharenites are recognized from core recovered at 8177.2 meters. Common eogenetic siderite (View B, “S”) unevenly rims framework grains and replaces clays. Rare kaolinite clays are loosely packed within macropores. Enlarged macropores (View D, L:8) reflect framework grain dissolution. Grain contacts are tangential and concavo-convex in this interval reflecting moderate mechanical compaction.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

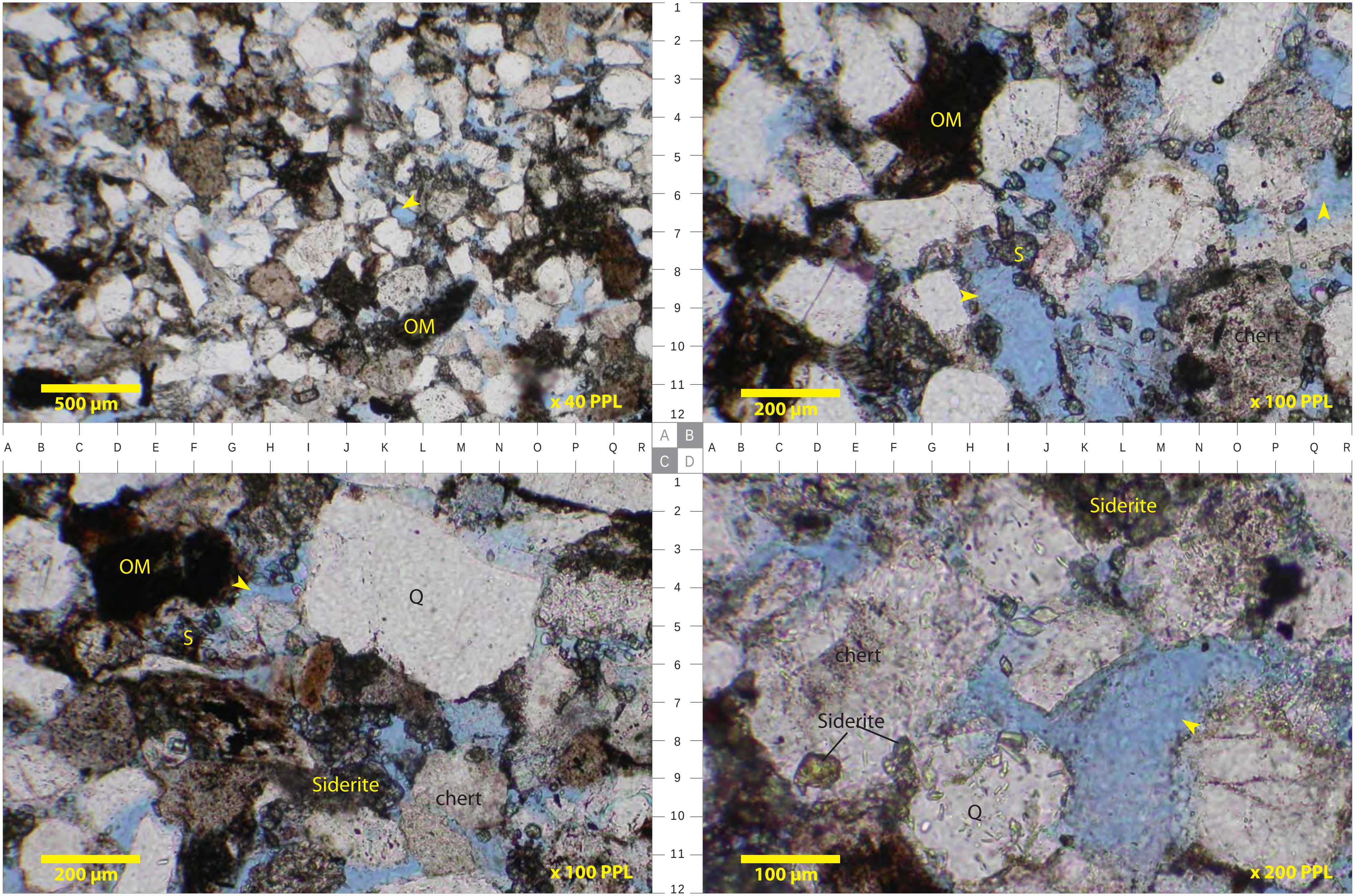


Plate 09
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26

8181.8 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

8193.8 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 10

Ivik J-26
Richards
Litharenite

Core Analysis Porosity: 6.8% Core Analysis Permeability: 0.60 md

Sample #: 09-20
Depth: 8193.8 feet

Parallel laminated fine grained moderately well sorted litharenites characterize the Richards Sequence clastics recovered from core at 8193.8 feet. Organic material is commonly concentrated along laminae. Abundant poikilotopic ferroan dolomite occludes intergranular pores in this non-reservoir quality interval. Note hydrocarbons, in the form of bitumen, concentrated along adjoining carbonate crystal contacts (View C, M:9). Rare pyrite has precipitated within chert micropores. Framework grains consist of monocrystalline quartz, chert, organic material, clay-rich sedimentary grains, micas and feldspars. Grain contacts are mainly tangential in this interval. Note grain remnants engulfed by carbonate cement in View B (J-K:9-10).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26

8193.8 feet

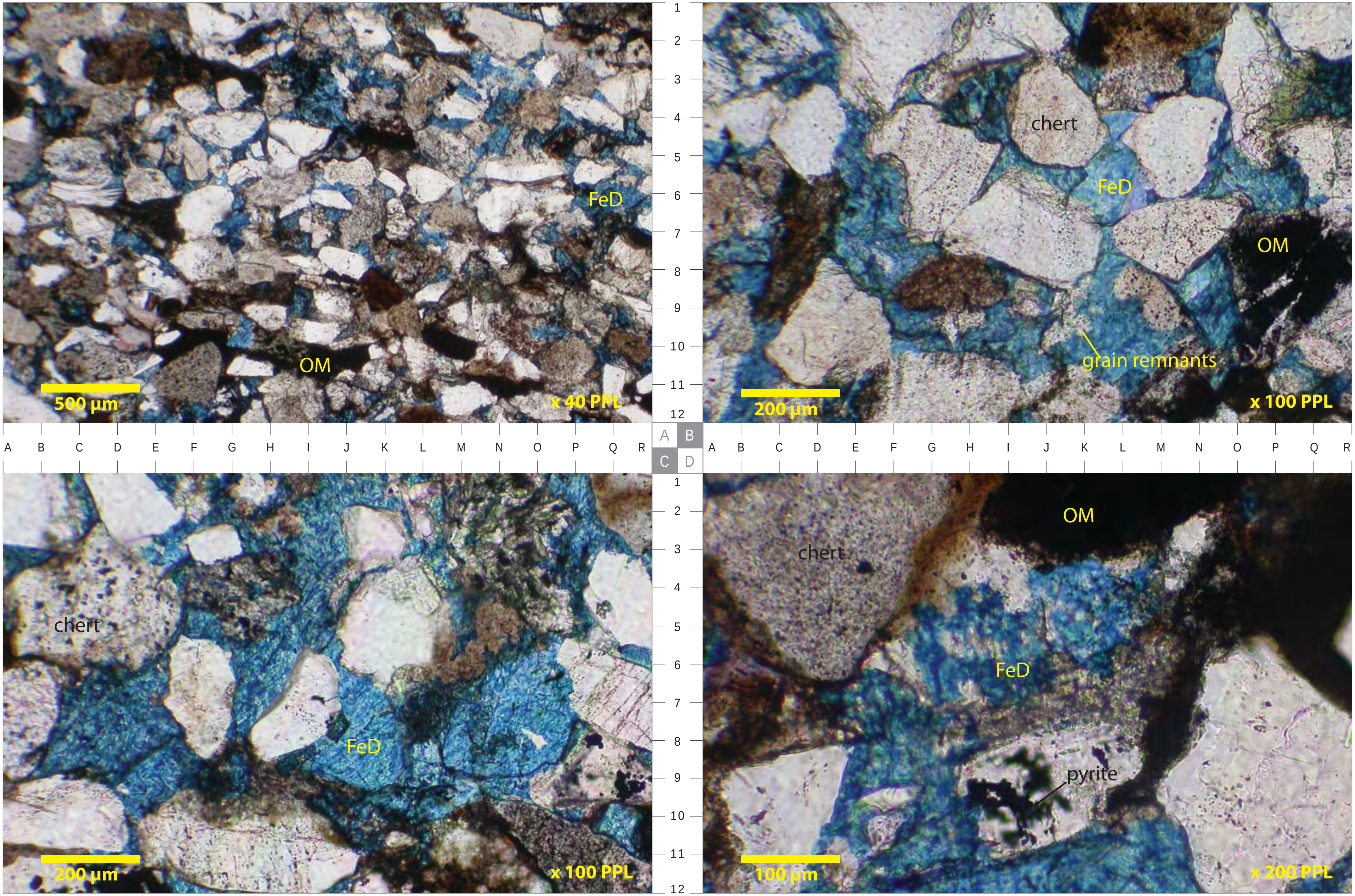


Plate 10

January 2010

CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26

8199.5 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

8211 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

8221.5 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26

8745.5 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 11

Ivik J-26
Richards
Litharenite

Core Analysis Porosity: 18.5% Core Analysis Permeability: 6.25 md

Sample #: 09-25
Depth: 8745.5 feet

Moderately well sorted, very fine to fine grained, parallel laminated Richards Sequence litharenites are recognized from core retrieved at 8745.5 feet. Organic material is commonly concentrated along laminae and compacted between more competent framework grains. Rare pink stained calcite cement is shown in View C. Minor microcrystalline siderite ("S") is replacive and grain rimming. Monocrystalline quartz (Q), chert, volcanic rock fragments (VRF), organic material (OM) and clay-rich sedimentary grains (CRF) are the main framework constituents. Note incomplete dissolution of volcanic rock fragments as shown in View D. Effective macroporosity (small yellow arrows) is isolated resulting in low permeability. Whole rock X-ray diffraction analysis generated quartz (57%), plagioclase (13%), micas (8%) and clays (kaolinite 7%, chlorite 8%, mixed/expandable clays 7%)

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

Ivik J-26 **8745.5 feet**

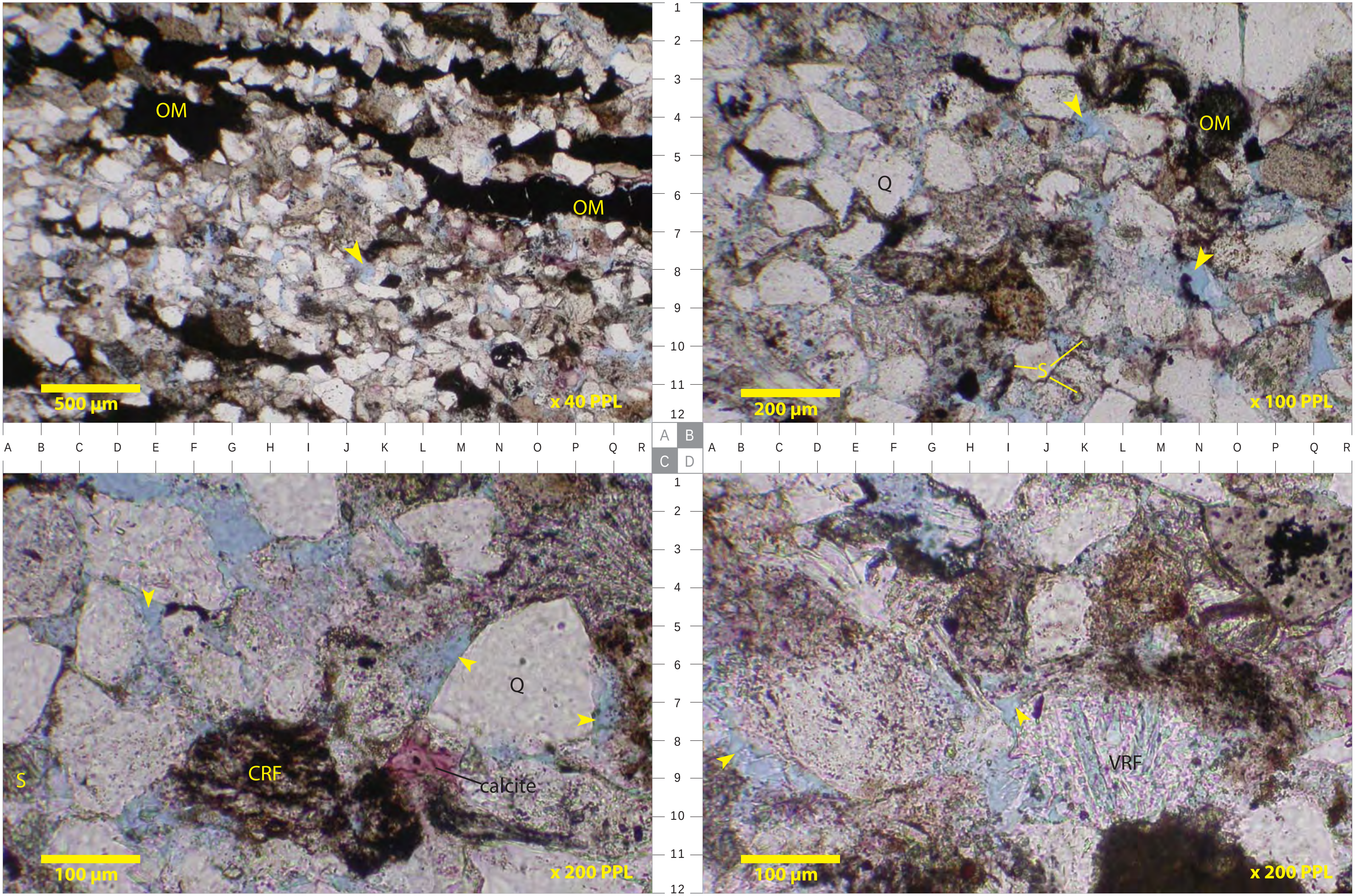


Plate 11
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26

8752.2 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

8765 feet

Richards

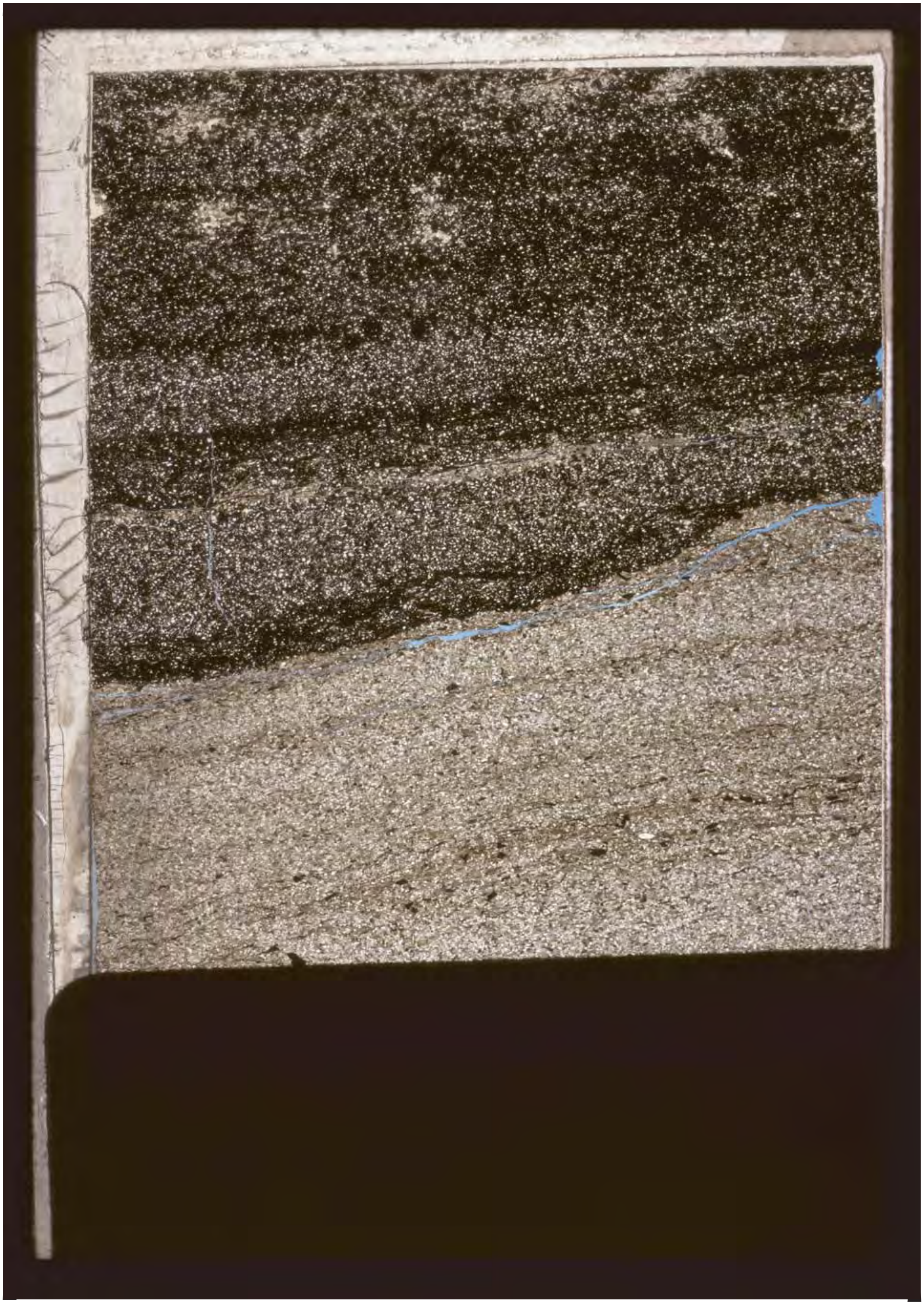
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

8766.3 feet



Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26 **8759 feet**

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26

8768 feet

Richards

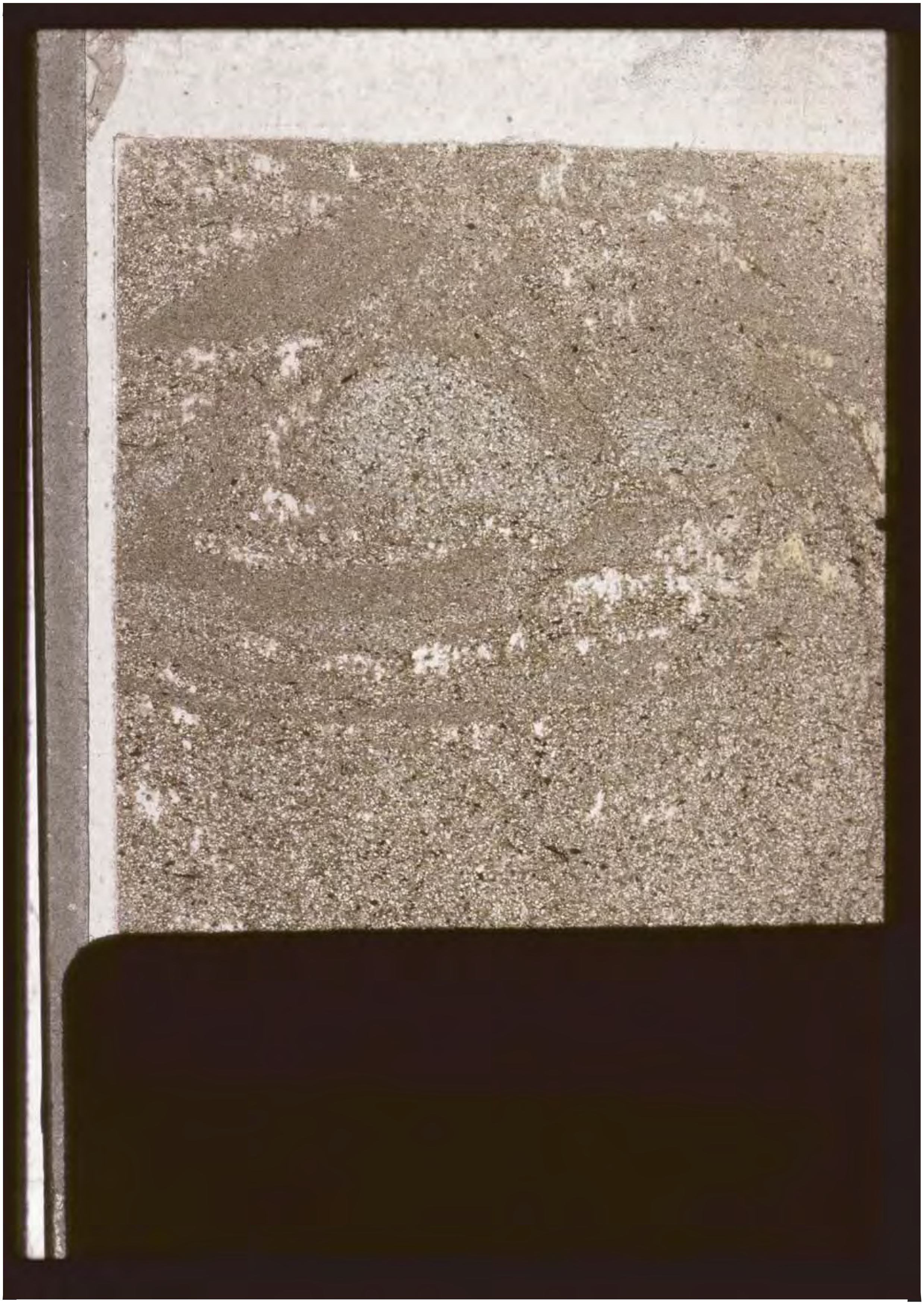
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

8773.3 feet



Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

8776 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

8781.5 feet

Richards

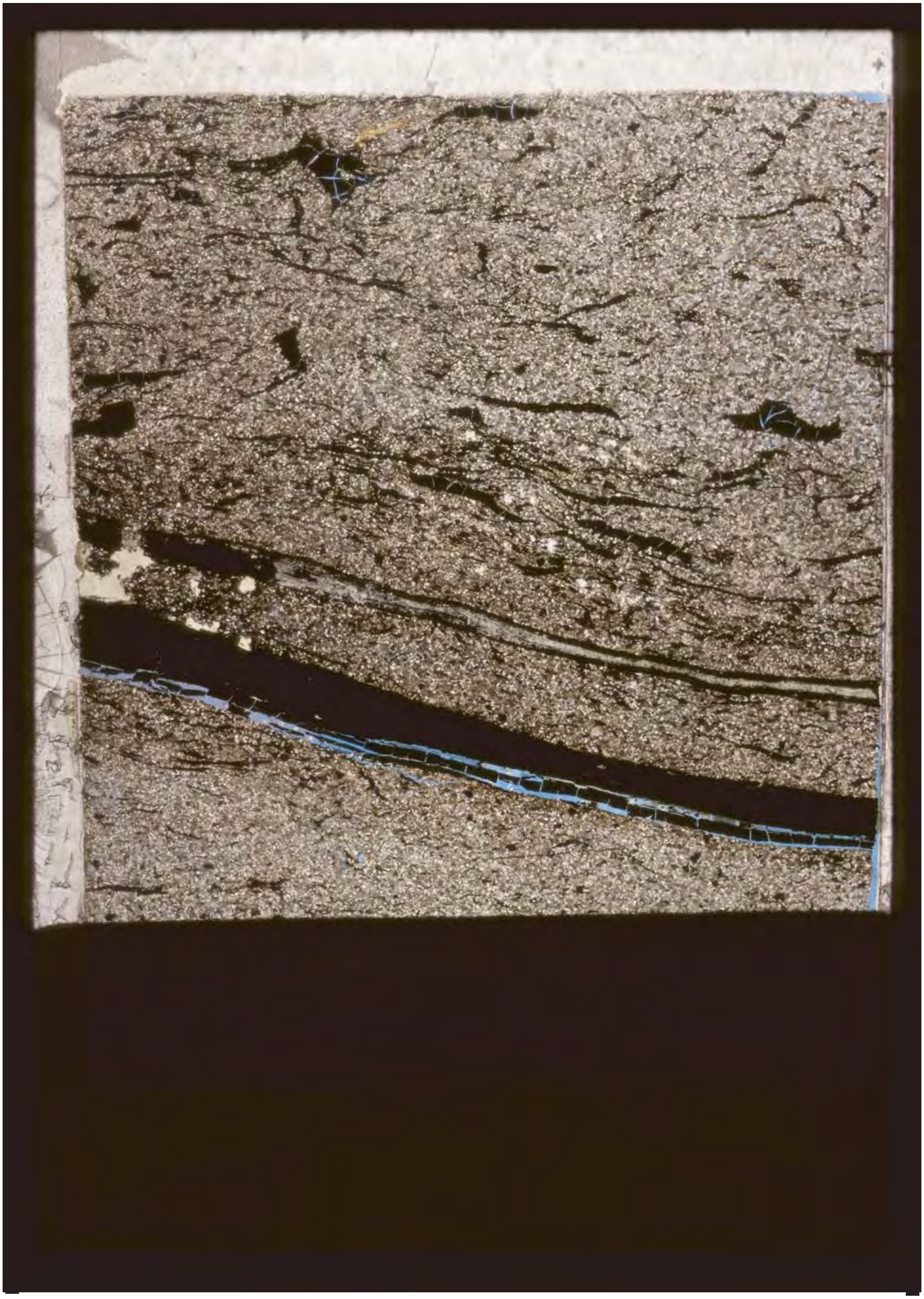
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

8788 feet



Richards

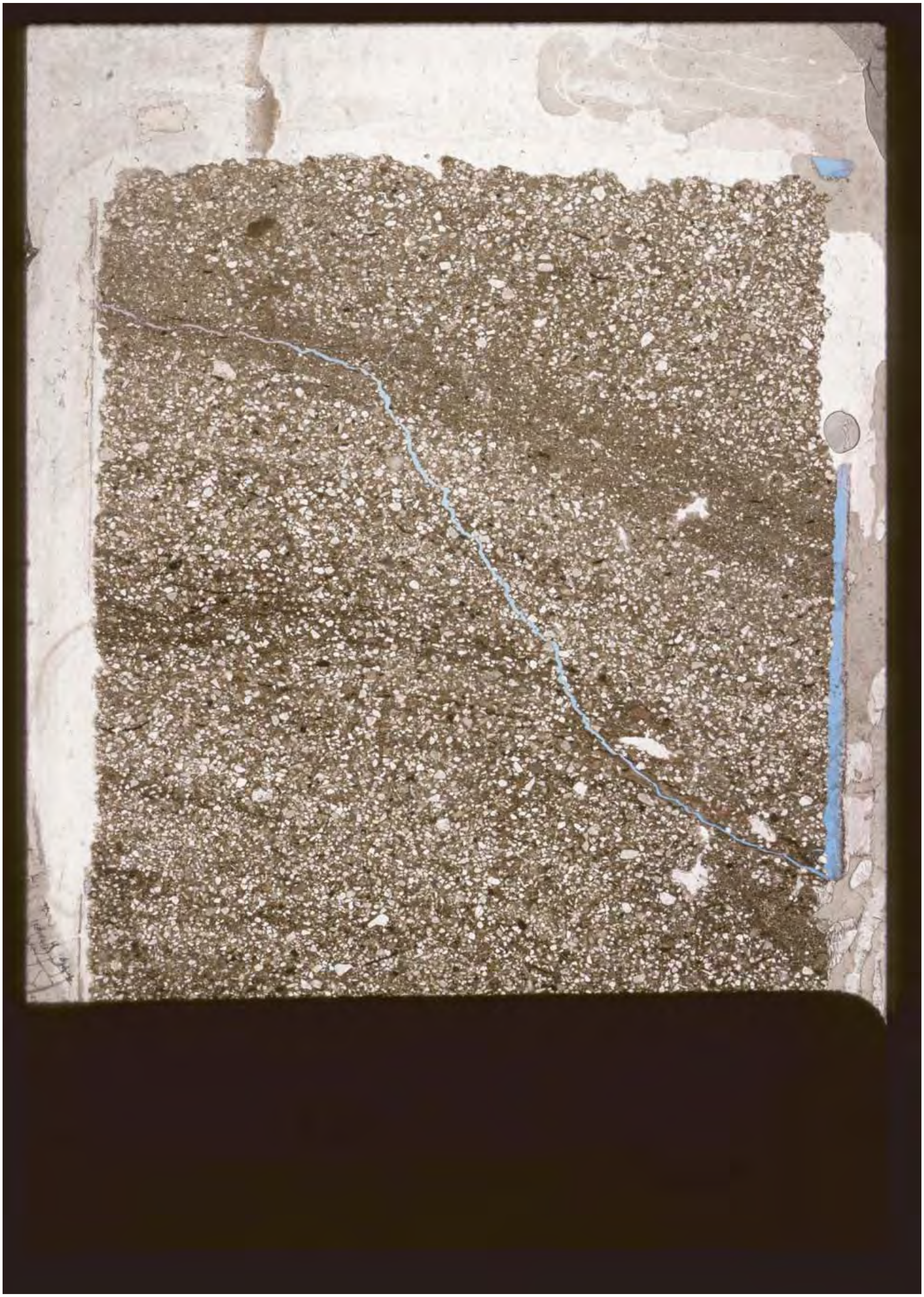
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

8792.2 feet



Richards

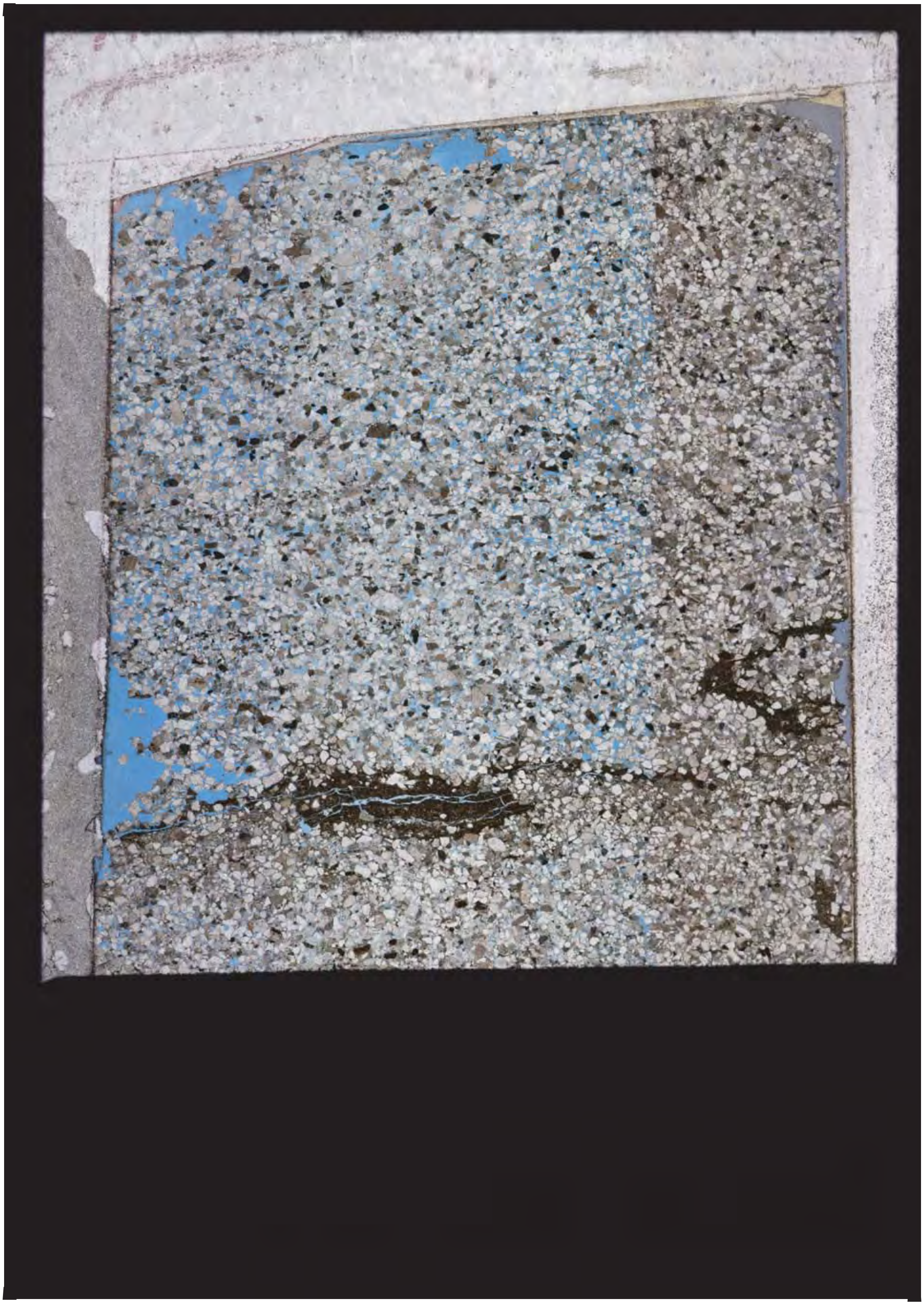
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

8794.2 feet



Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 12

Ivik J-26
Richards
Litharenite

Core Analysis Porosity: 29.3% Core Analysis Permeability: 500 md

Sample #: 09-39
Depth: 8794.2 feet

Bioturbated, faintly laminated, upper fine to medium grained, moderately sorted litharenites characterize the core recovered at 8794.2 feet. Grain contacts are tangential and point-point in this porous and permeable section. Complete dissolution of unstable framework grains, such as volcanic lithoclasts (View D, M:8), has yielded enlarged effective macropores (small yellow arrows). Authigenic phases are poorly developed including rare unevenly precipitated quartz overgrowths (small black arrows), framboidal pyrite (view D), and loosely packed kaolinite clays View B (“K”). Eogenetic siderite (View B, “S”) is replacive and found in trace volumes. Note rare patchily distributed leucoxene in View A. Framework grains include monocrystalline quartz (Q), chert, clay-rich sedimentary grains (CRF), volcanic rock fragments (VRF) and feldspathic grains.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

Ivik J-26 — 8794.2 feet

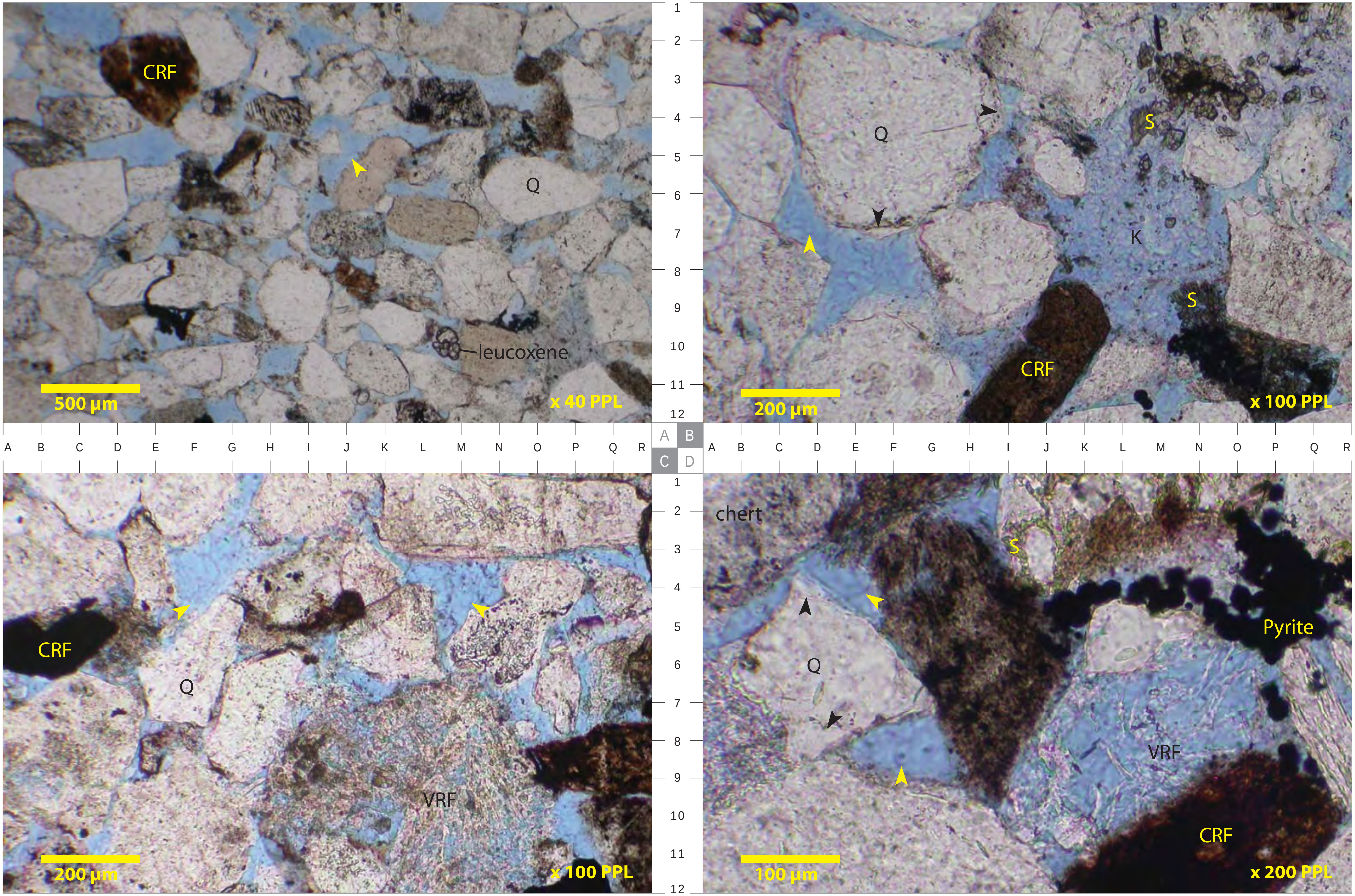


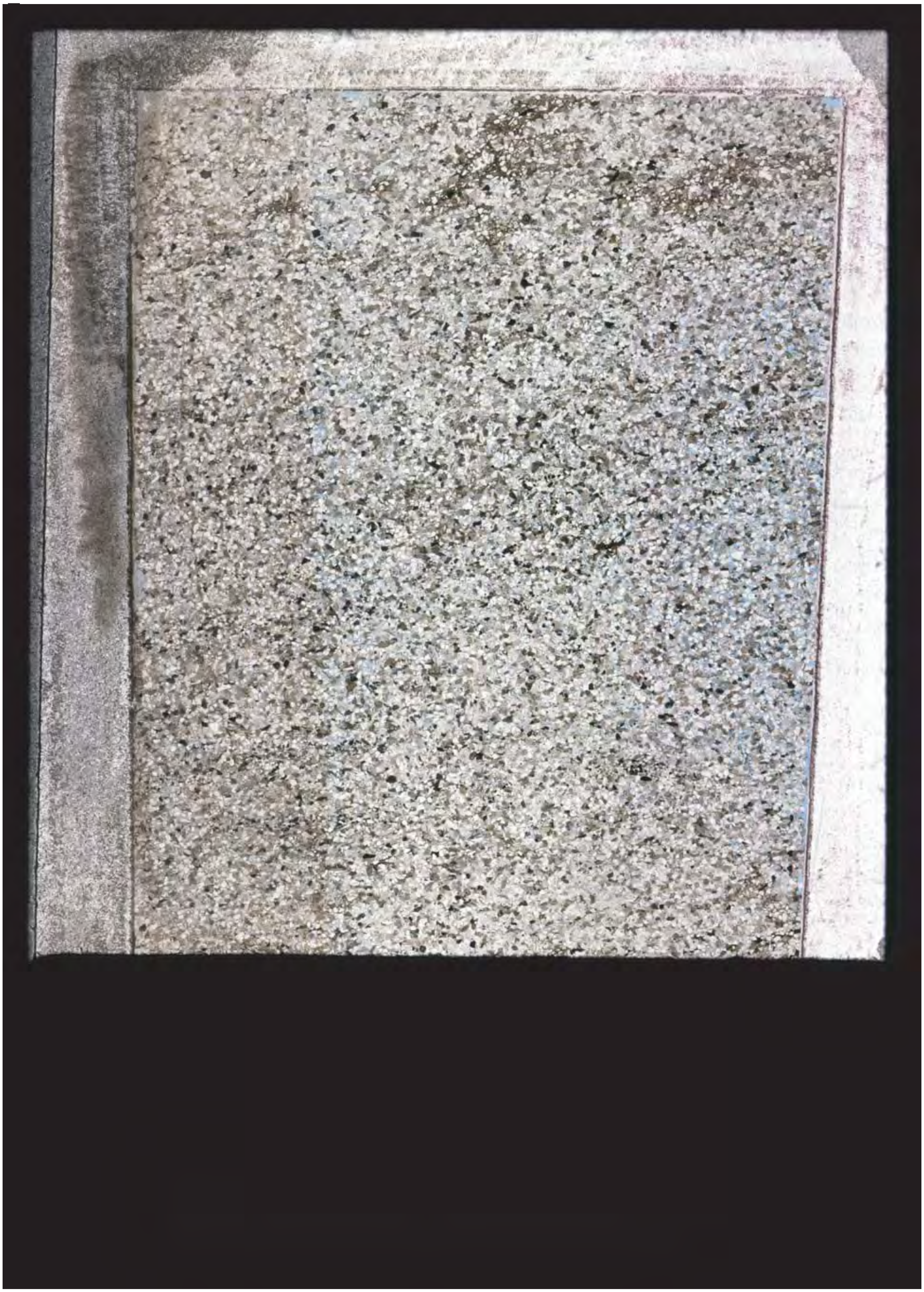
Plate 12
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26

8795.6 feet (a)

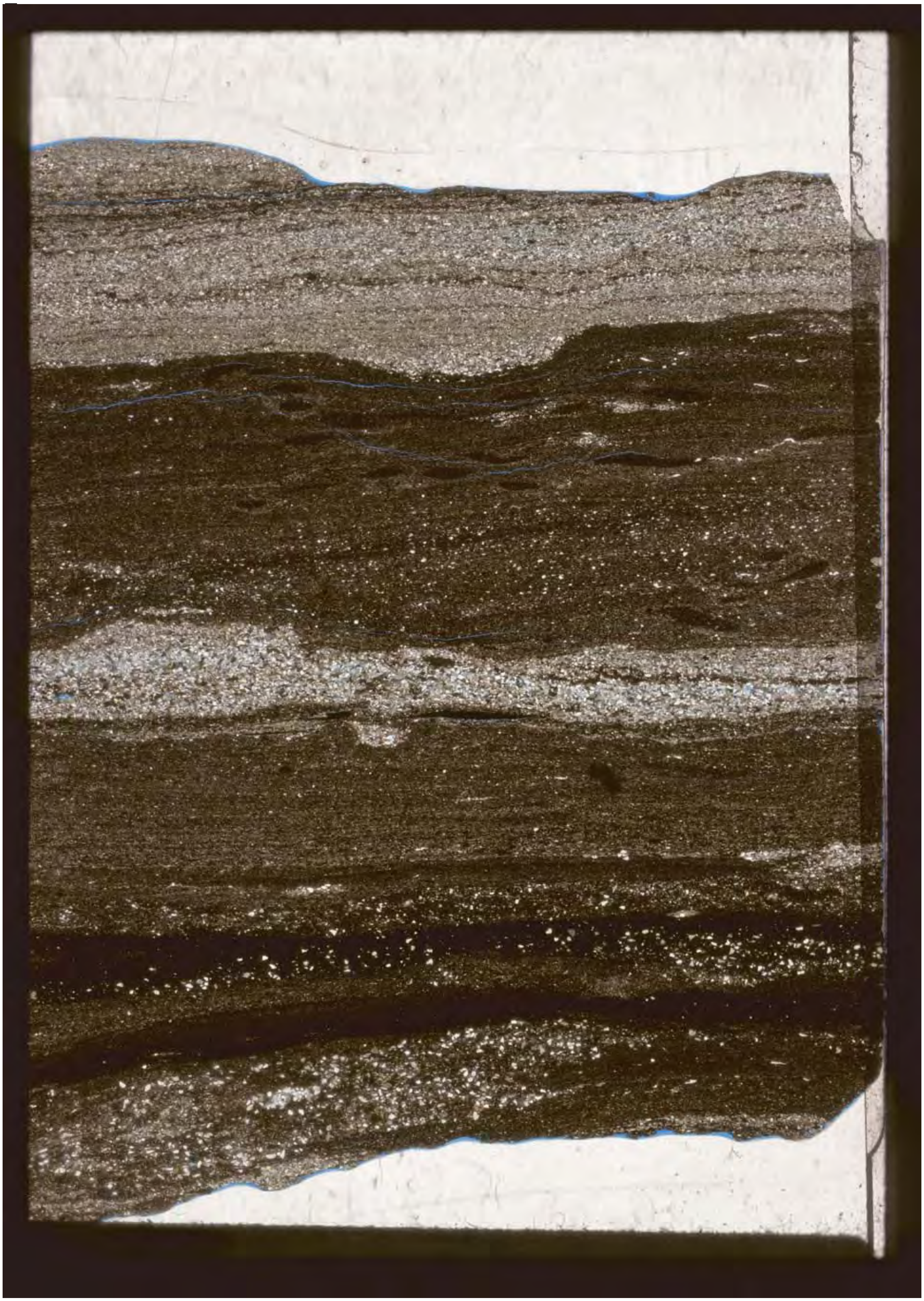


Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26 8795.6 feet (b)



Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 13

Ivik J-26
Richards
Litharenite

Core Analysis Porosity: 22.4% Core Analysis Permeability: 269 md

Sample #: 09-40
Depth: 8795.6 feet

Bioturbated, massive moderately well sorted, fine grained litharenites characterize the clastics encountered by core at 8795.6 feet. Authigenic phases are poorly preserved in this interval with rare pink stained calcite cement (View C), leucoxene (View D), replacive siderite and pyrite precipitated within chert micropores. Grain contacts are mainly tangential in this porous section. Effective macroporosity (small yellow arrows) is well developed with measured core analysis porosity of 22.4%; measured permeability is 269 md. Dissolution of feldpsathic grains (View B, L:8) has enhanced the effective pore system.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

Ivik J-26

8795.6 feet

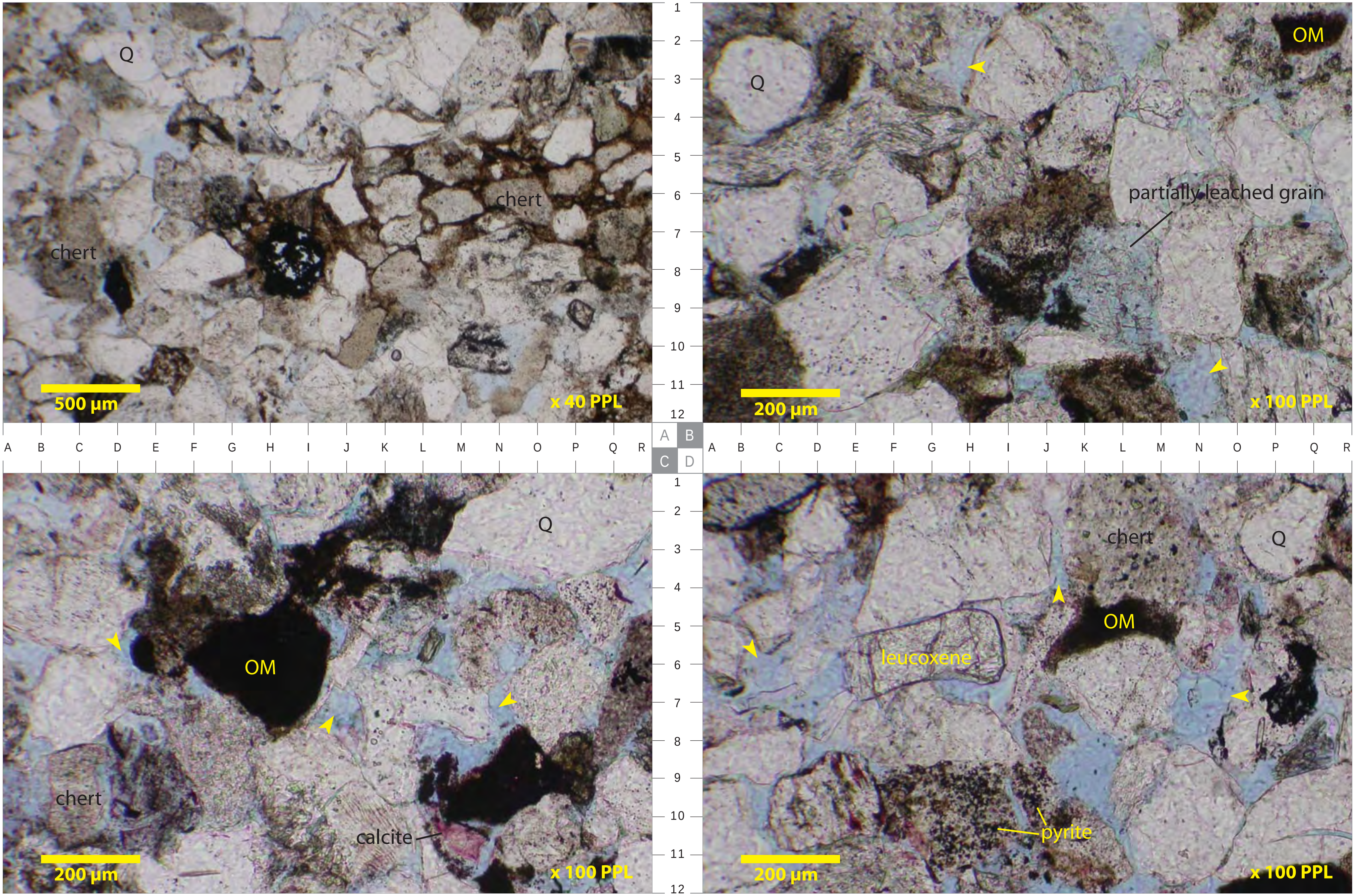


Plate 13

January 2010

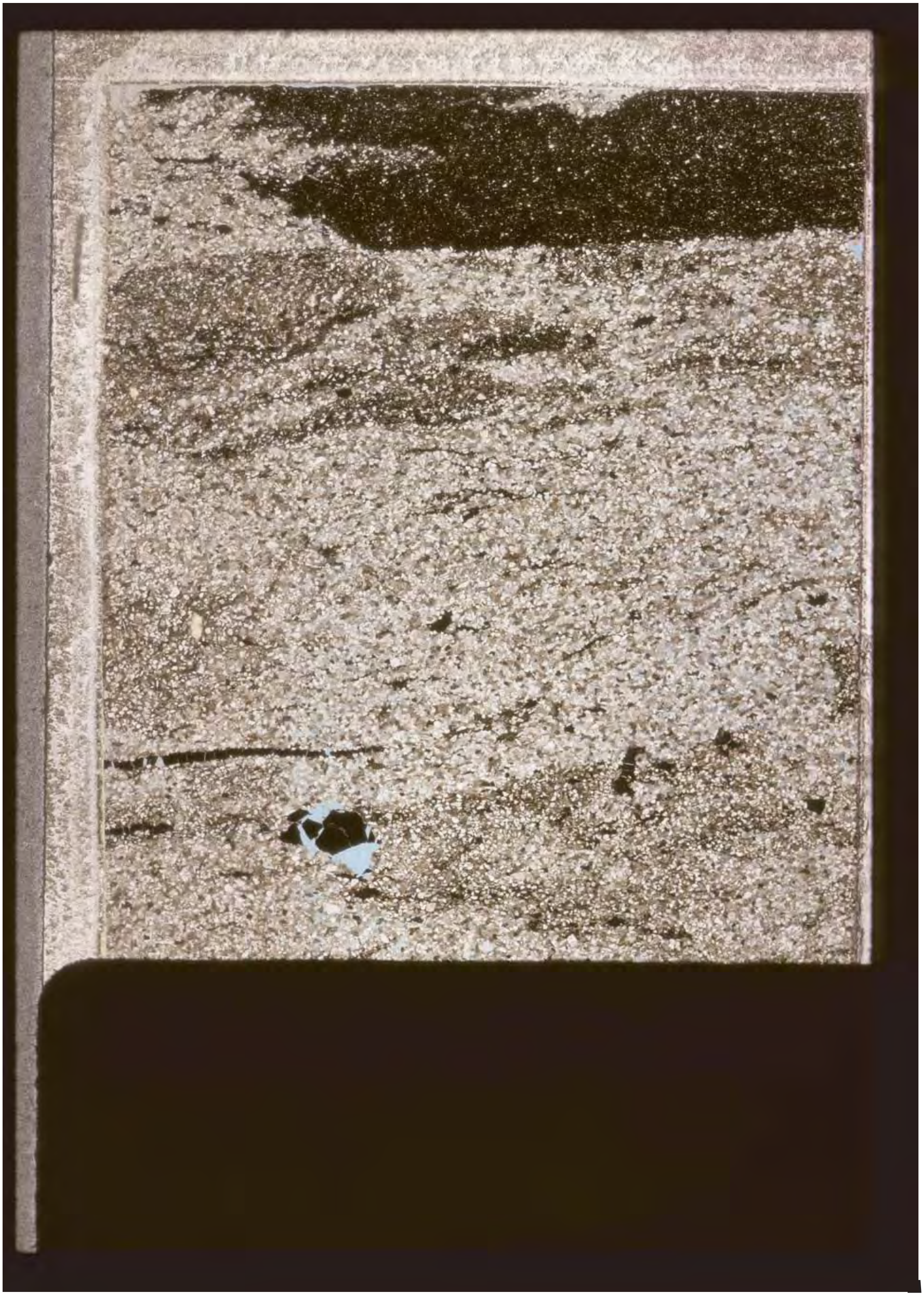
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26

8801.2 feet



Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26

8804.8 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 14

Ivik J-26
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 8804.8 feet

Richards Sequence core retrieved at 8804.8 feet is recognized as porous and permeable, moderately well sorted, fine to medium grained litharenites. Grain contacts are mainly tangential in this interval. Monocrystalline quartz (Q), chert, organic material (OM), clay-rich sedimentary grains and feldspars (View C, N:6) are the main framework components. Preferential dissolution of feldspathic grains (View B, M:9; View D, L:7) has enhanced the effective macropore system (small yellow arrows). Authigenic phases are poorly preserved consisting of patchily distributed leucoxene (Views A and B), rare pyrite and loosely packed kaolinite clays (View C, "K").

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

Ivik J-26 **8804.8 feet**

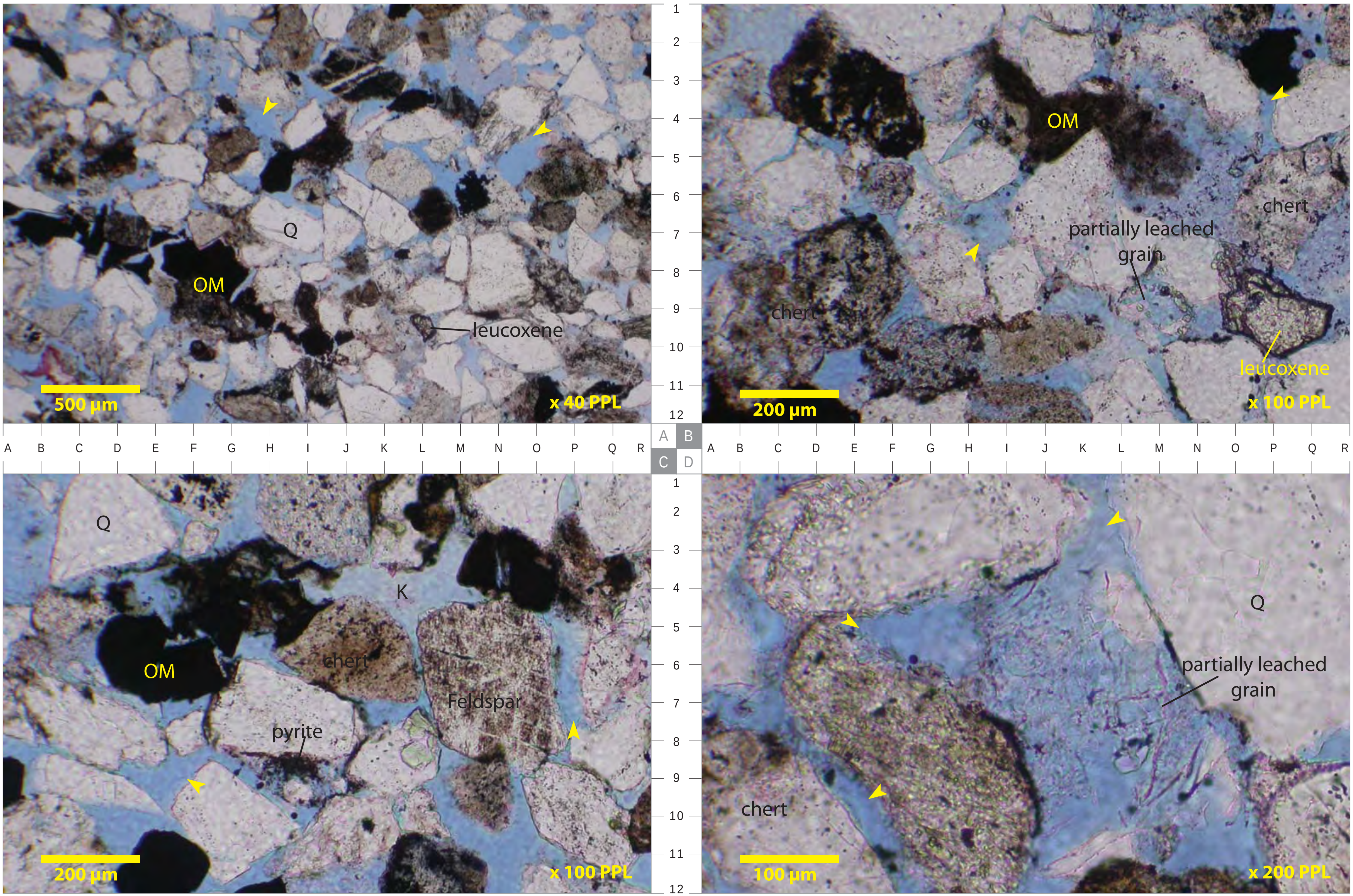


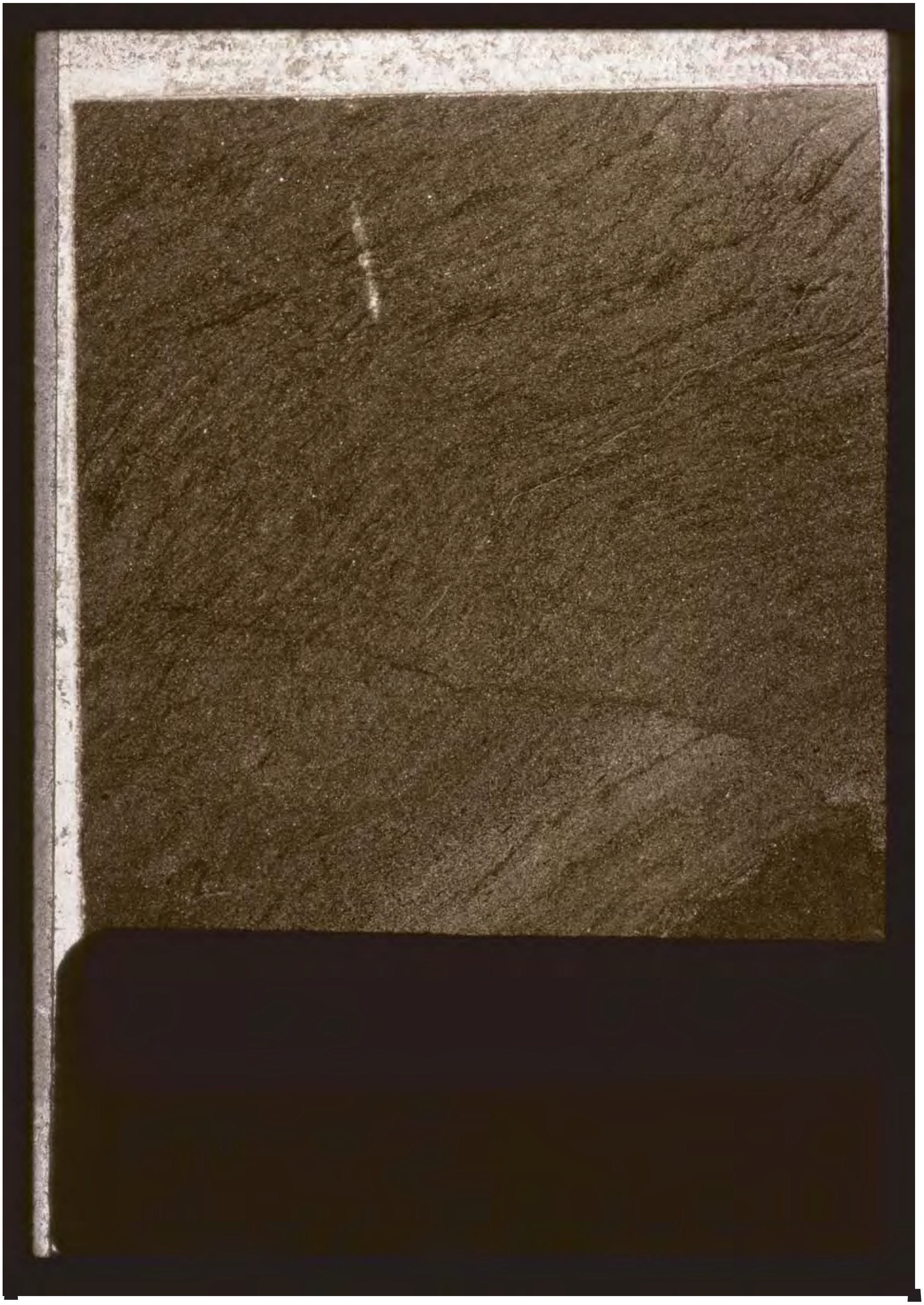
Plate 14
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26

8805.5 feet



Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

8812.8 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

8822 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

8829 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

8829.5 feet

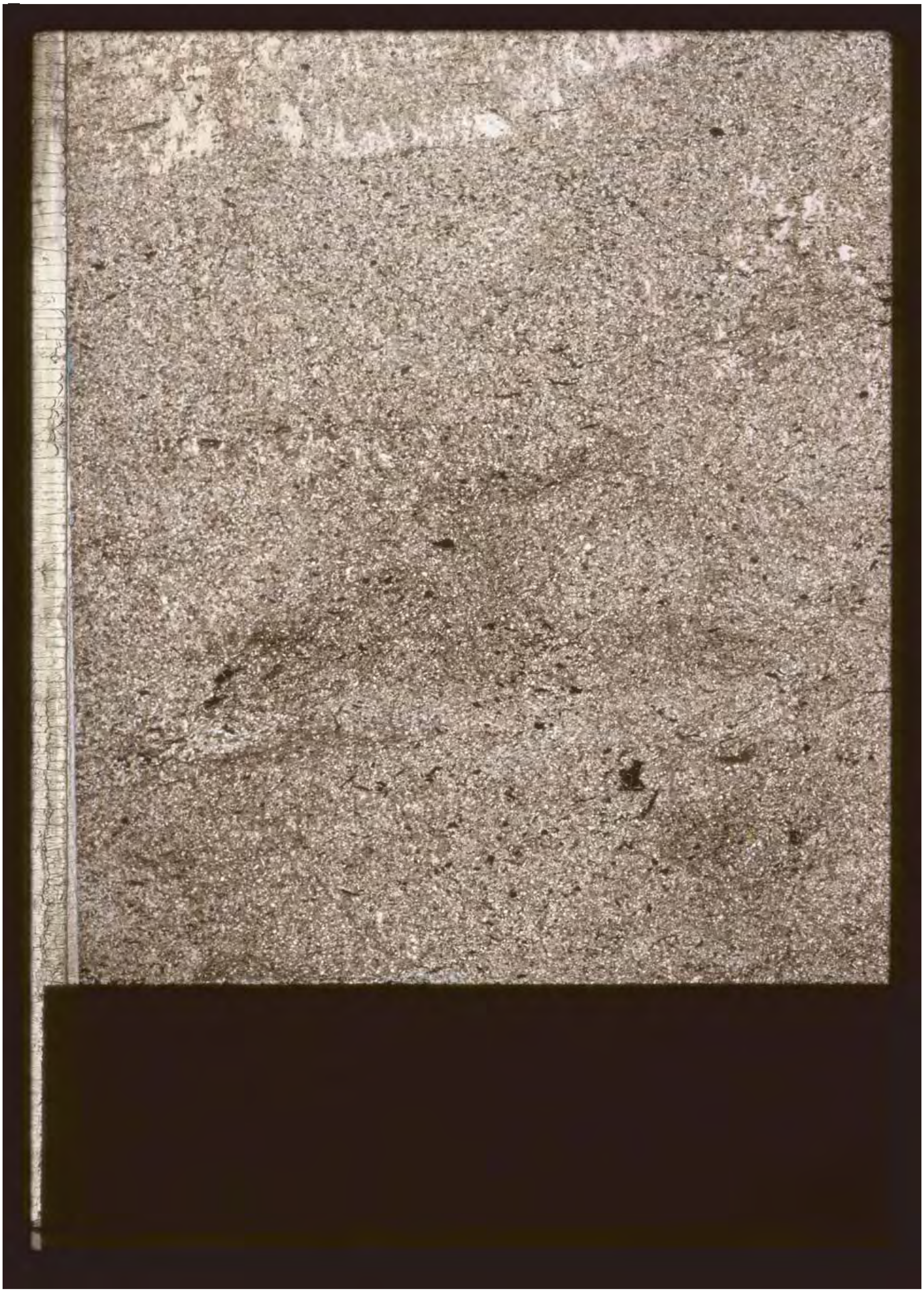
Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26

8834 feet



Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

8837.4 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

8840.8 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

10216.3 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

10230.5 feet

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

10490 feet

2 mm

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

10493.4 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 15

Ivik J-26
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 09-58
Depth: 10493.4 feet

Bioturbated, very fine grained, well sorted litharenites are recognized from core recovered at 10493.4 meters. Grain compaction of labile constituents is common in this interval. Effective macroporosity (small yellow arrows) is isolated and enhanced by the dissolution of unstable (feldspathic) framework constituents (Views C, M:9; View D, K:6). Subangular to subrounded framework grains are dominated by monocrystalline quartz (Q), chert, organic material (OM), clay-rich sedimentary grains, feldspathic lithoclasts and micas. Authigenic cements consist of replacive siderite.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

Ivik J-26 **10493.4 feet**

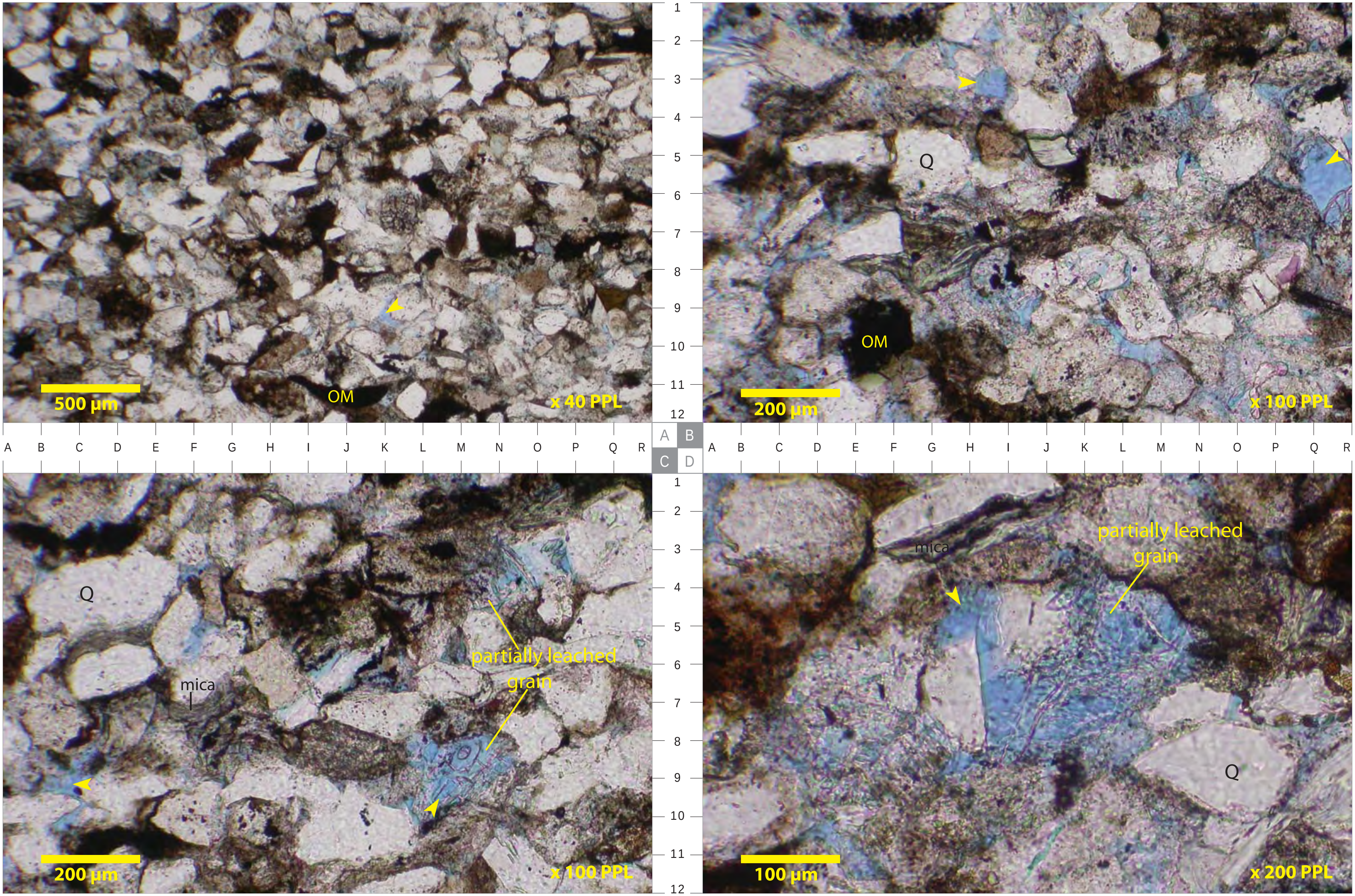


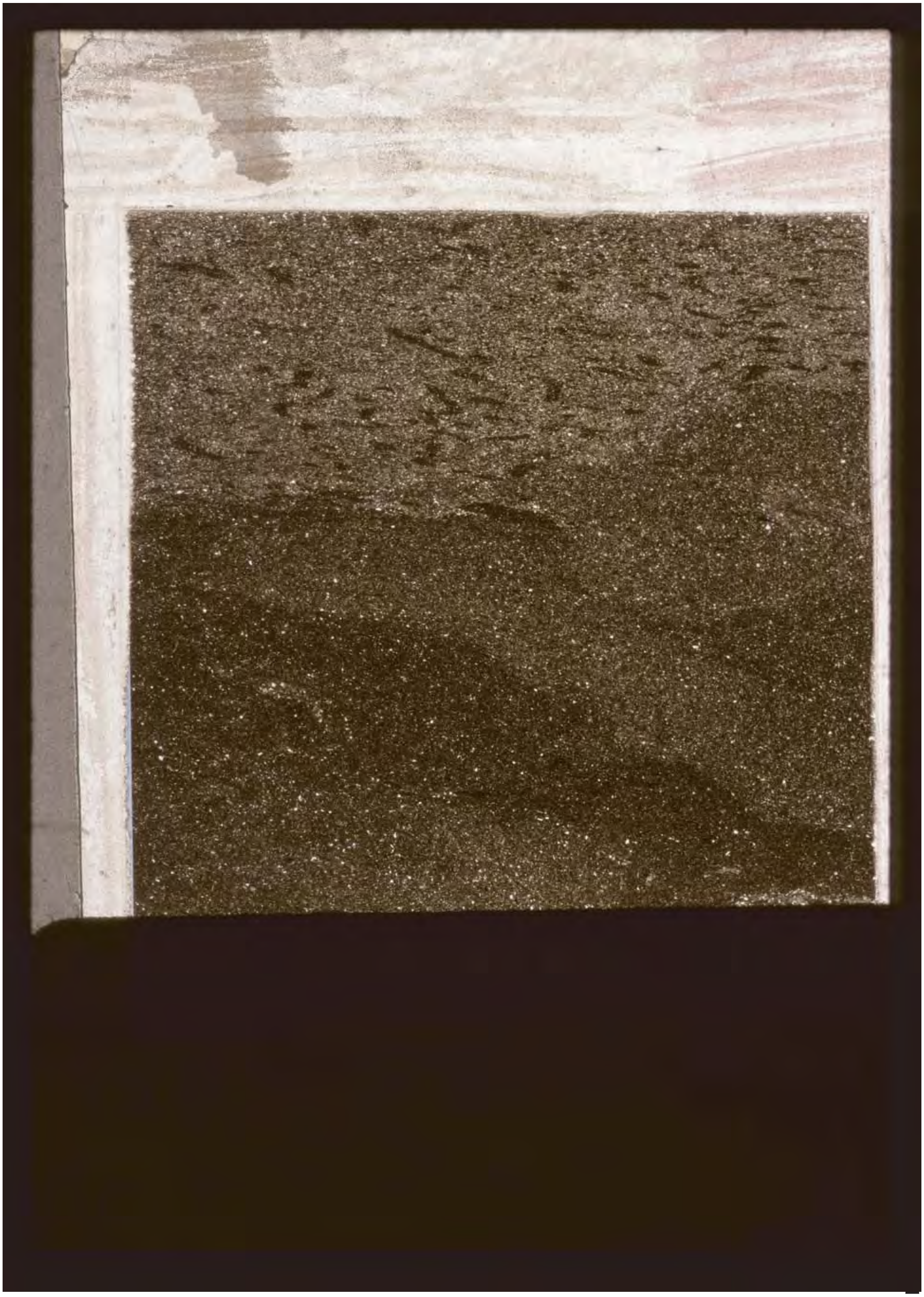
Plate 15
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26

10489.8 feet



Richards

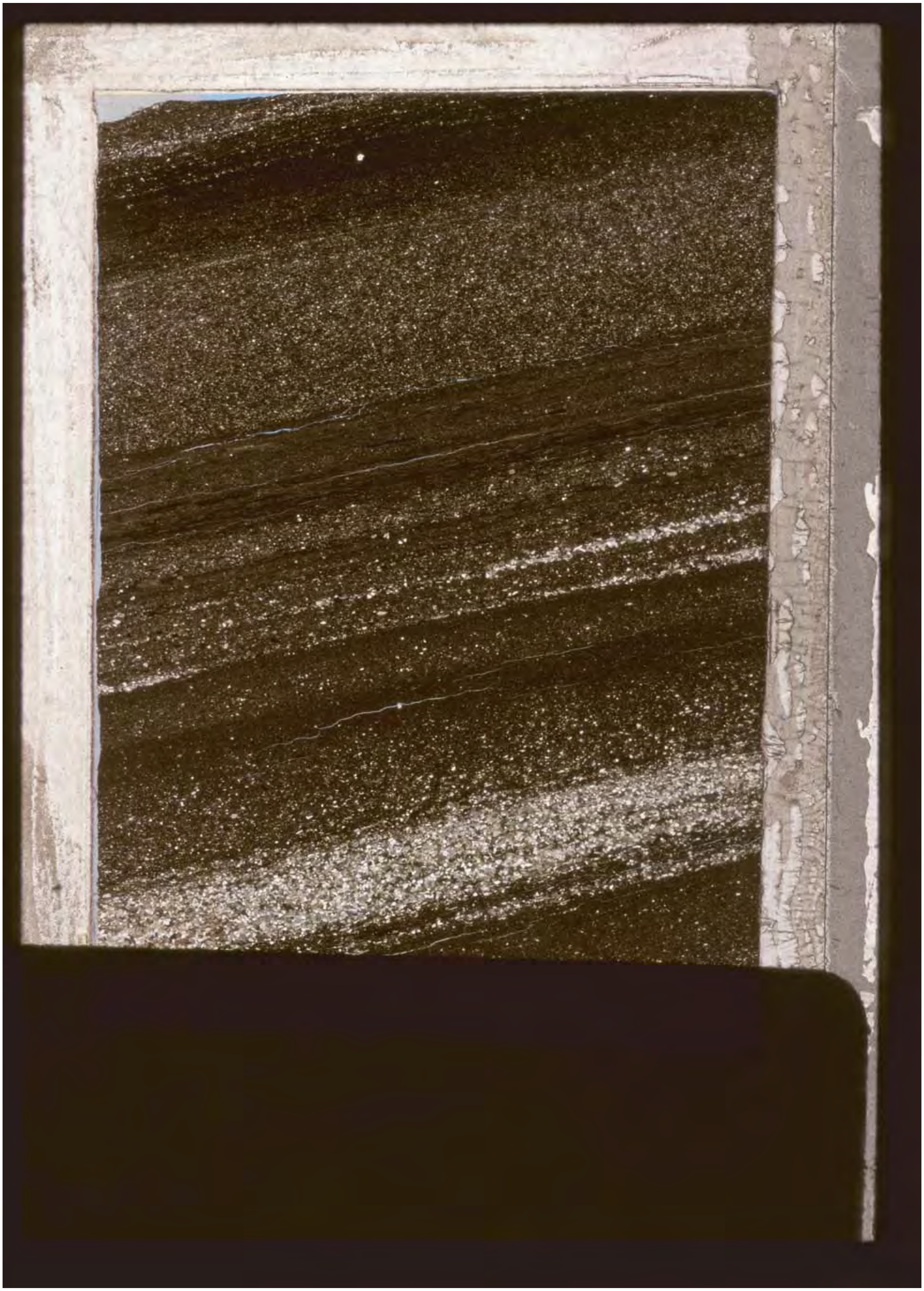
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

11344.5 feet



Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ivik J-26

11347.3 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 16

Ivik J-26
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 09-61
Depth: 11347.3 feet

Bioturbated, massive fine to medium grained, well sorted litharenites characterize the Richards Sequence clastics recovered from core at 11347.3 feet. Authigenic cements are poorly preserved consisting of rare unevenly distributed quartz overgrowths (small black arrows), patchily distributed ankerite cement (Views B and D) and pyrite precipitated within chert micropores. Monocrystalline quartz, argillic sedimentary grains, chert, feldspars and volcanic lithoclasts are the main framework constituents. Dissolution of carbonate cement and feldspathic grains has enhanced the effective pore system (small yellow arrows). Note hydrocarbons, in the form of bitumen, within carbonate crystals edges (View D, Q:8).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

Ivik J-26 11347.3 feet

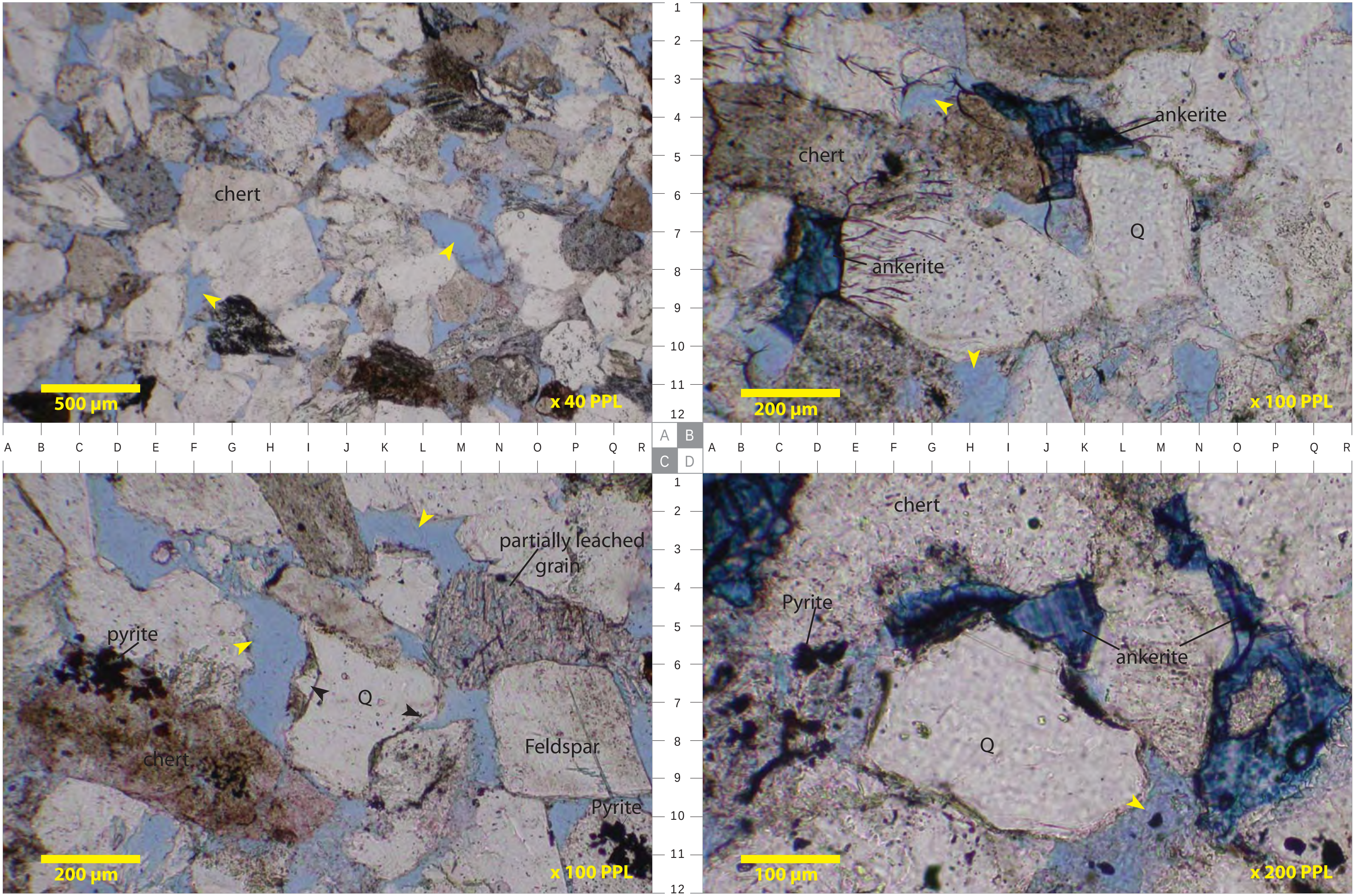


Plate 16
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26

11349.6 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 17

Ivik J-26
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 09-62
Depth: 11349.6 feet

Bioturbated, moderately well sorted, fine grained, barite cemented litharenites are recognized from core recovered at 11349.6 feet. Grain contacts are floating, point-point and tangential in this interval. Poikilotopic coarsely crystalline barite occludes macroporosity and engulfs partially leached framework grain remnants (View C, J:9) in this sandstone. Patchily distributed ankerite cement (Views B, C and D) is found in trace volumes. Pyrite has precipitated within chert micropores (View B). Note extensively corroded edges of chert and quartz in Views C (J:6) and D. Isolated effective macropores reflects dissolution of unstable framework grains (View A, H:11; View B, O:10).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ivik J-26

11349.6 feet

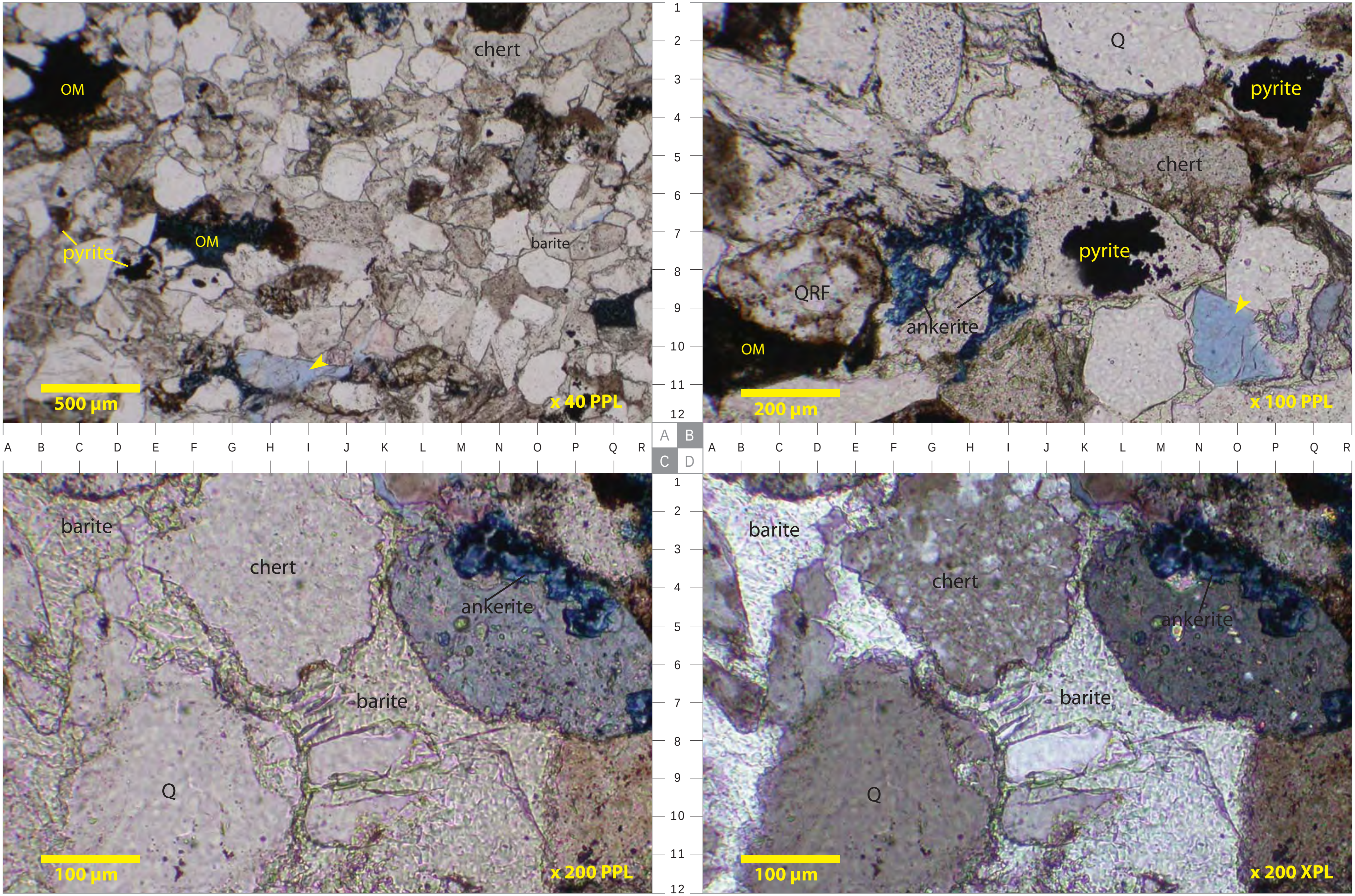


Plate 17
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Mallik A-06

Thin Section Overviews

And

Select Described Photomicrographs

Mallik A-06

4039 feet

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Mallik A-06 **4040 feet**

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Mallik A-06

4040.3 feet

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 01

Mallik A-06
Kugmallit
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 08-01
Depth: 4040.3 feet

The Kugmallit Sequence recovered from core at 4040.3 feet consists of laminated, bioturbated, fine to medium grained, moderately well sorted litharenites. Grain contacts are mainly tangential with commonly compacted organic material (OM) between more competent grains. Framework grains are comprised mainly of subangular to subrounded monocrystalline quartz (Q) and chert with subordinate amounts of feldspars (View D, E:4) and mica (View C, E:6). Organic material (OM) is commonly concentrated along laminae. Pore occluding cements include abundant clinoptilolite (large pink arrows) and ferroan calcite (View B, “FeC”).

Photo A: 40X PPL, Photo B: 200X PPL, Photo C: 100X PPL, Photo D: 100X XPL

Mallik A-06 **4040.3 feet**

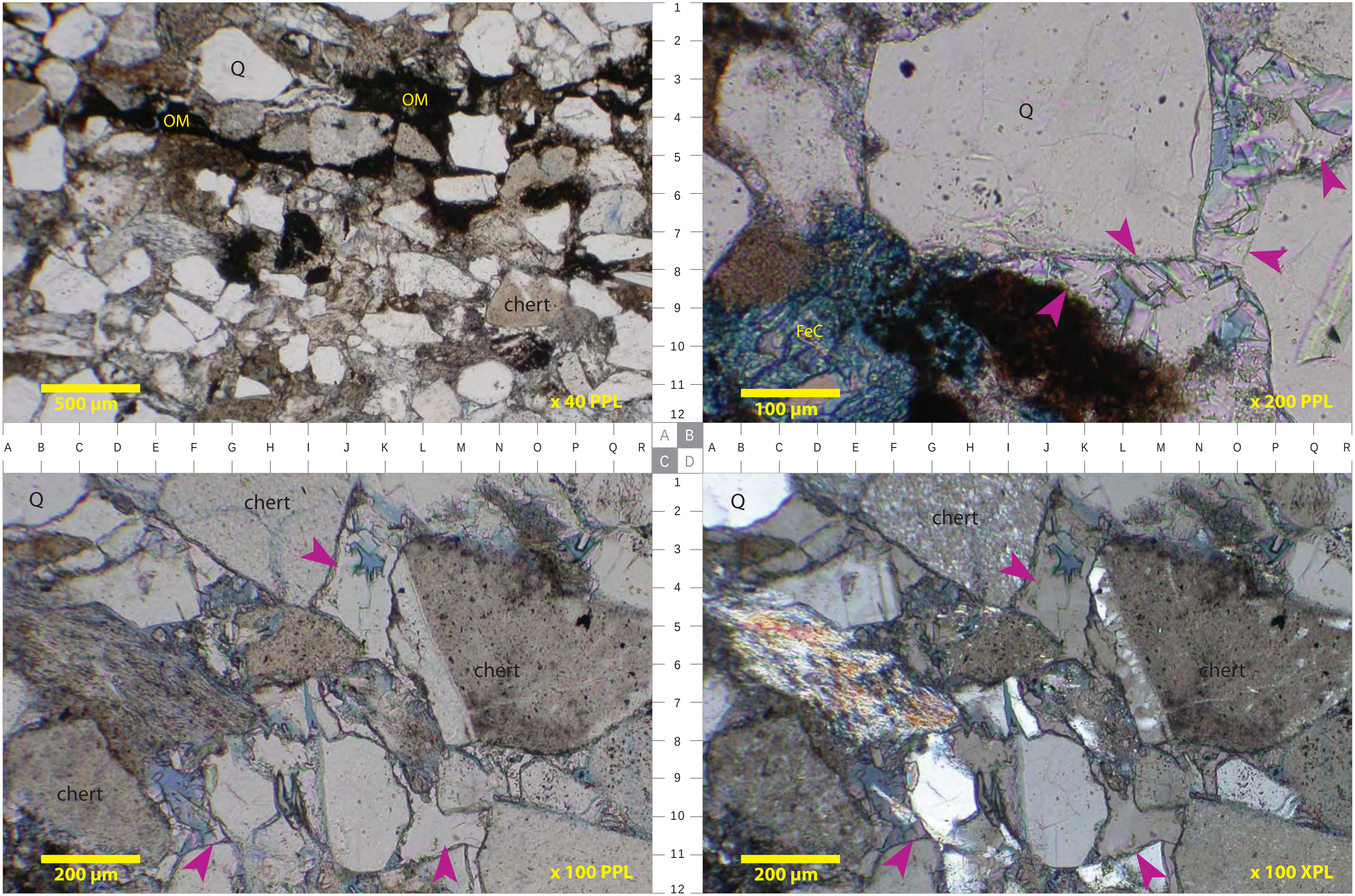


Plate 01
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Mallik A-06

4040.8 feet

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 02

Mallik A-06
Kugmallit
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 4040.8 feet

Pore occluding clinoptilolite (large pink arrows) is the main pore filling authigenic phase in this poorly sorted, fine to medium grained Kugmallit Sequence litharenite. Subangular monocrystalline quartz (Q), chert and clay-rich sedimentary grains (CRF) are the predominant framework constituents. Whole rock X-ray diffraction analysis yielded quartz (49%), plagioclase (9%), K-feldspar (8%), micas (4%), siderite (5%), calcite (7%), clinoptilolite (15%) and kaolinite clays (3%). There is a significant discrepancy between estimated thin section feldspar content (5%) and X-ray diffraction analysis, reflecting a significant underestimation of feldspar content in the qualitative modal analysis estimates.

Photo A: 40X PPL, Photo B: 100X PPL, Photo C: 100X PPL, Photo D: 100X PPL

Mallik A-06 4040.8 feet

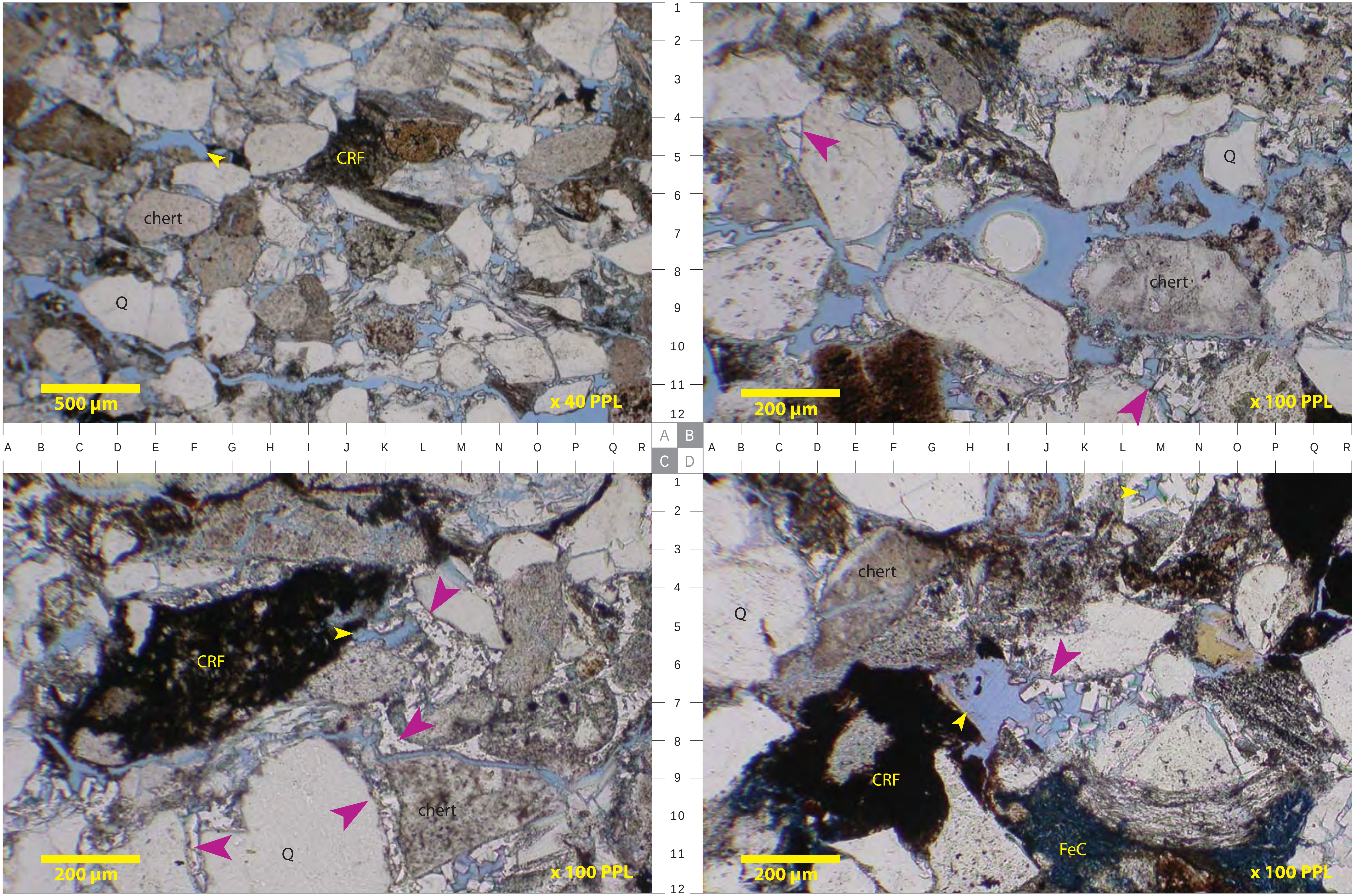


Plate 02
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Mallik A-06

4041 feet

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 03

Mallik A-06
Kugmallit
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 4041 feet

Laminated, poor to moderately sorted, fine grained non-reservoir quality Kugmallit Sequence litharenites are recognized from core recovered at 4041 feet. Common organic material (OM) is concentrated along laminae as illustrated in the Overview. Grain contacts are tangential and concavo-convex. The latter suggests moderate to significant mechanical compaction. Framework grains are commonly microfractured (large black arrows). Authigenic phases are poorly developed consisting of minor grain rimming and fracture filling siderite plus pyrite precipitated within chert micropores. Subangular monocrystalline quartz, chert, clay-rich sedimentary grains (CRF), organic material (OM) and feldspar (View B, I:7) are the main framework constituents.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Mallik A-06

4041 feet

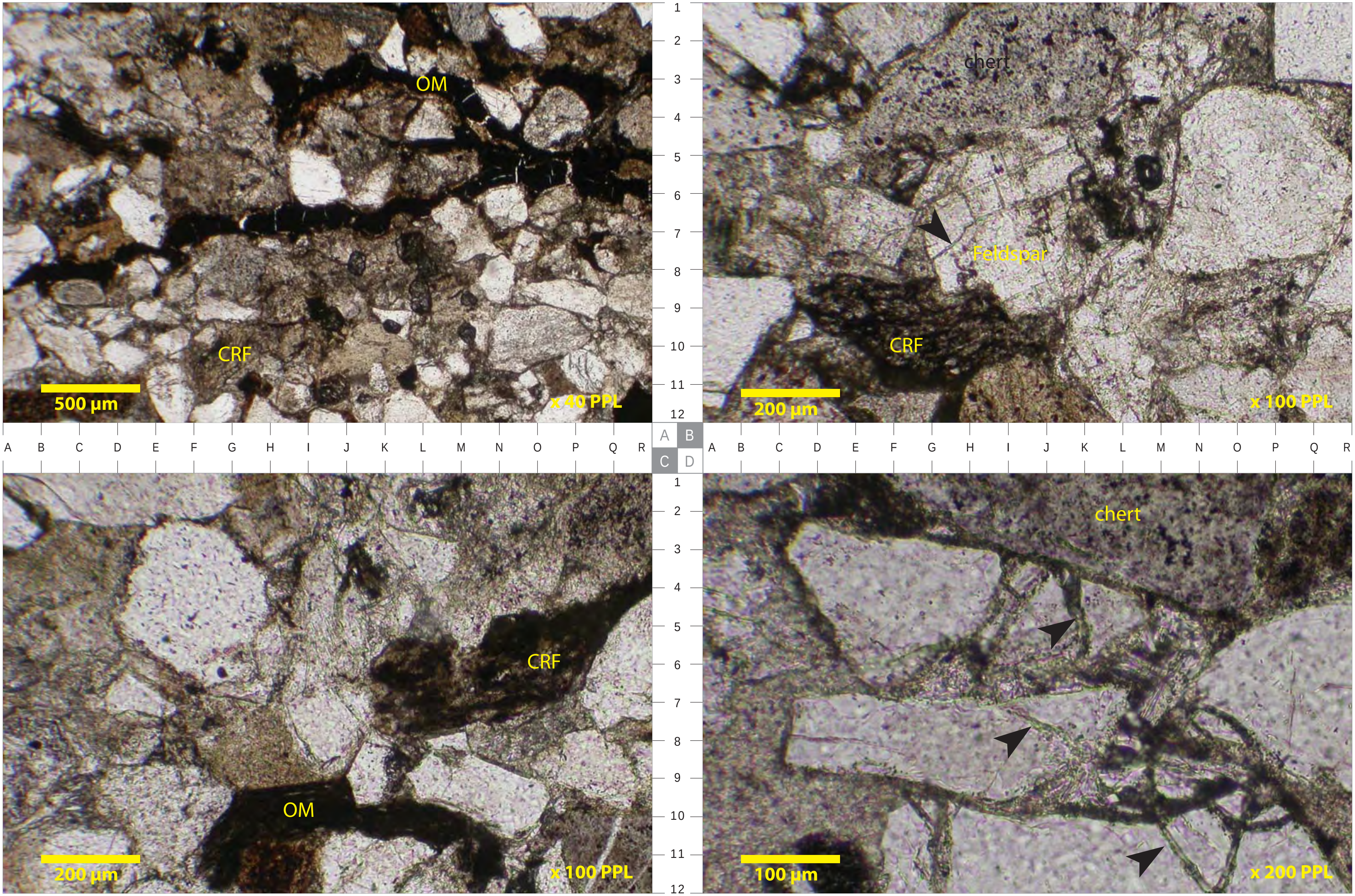


Plate 03
January 2010
CMH 2010-01

Kugmallit

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Mallik A-06

4043 feet

Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Mallik A-06

4048 feet

Kugmallit

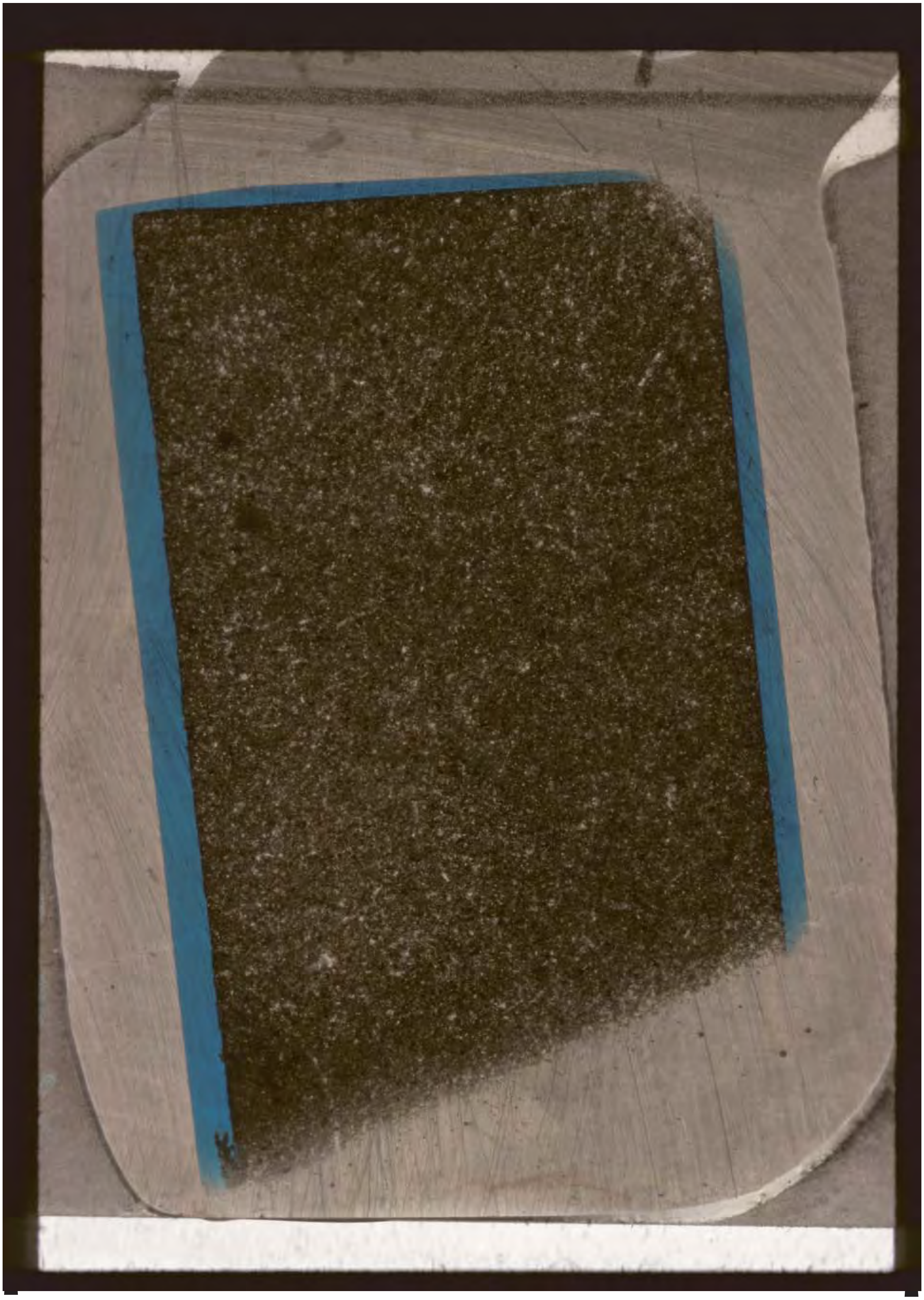
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Mallik A-06

4049 feet



Kugmallit

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Mallik A-06

9278.8 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 04

Mallik A-06
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 9278.8 feet

Carbonate filled microfractures (large black arrows) cross cut framework grains in this poorly sorted, coarse grained litharenite encountered by core at 9278.8 feet. Grain compaction is significant evidenced by concavo-convex grain contacts. The turquoise-blue stain on the carbonate cement indicates a ferroan dolomite composition. Effective macroporosity (small yellow arrows) is very poorly developed and isolated resulting in very low reservoir quality in this interval. Framework grains consist mainly of subrounded chert, polycrystalline quartz (PxQ), monocrystalline quartz with subordinate amounts of dark brown to black clay-rich sedimentary grains and fish debris (Views C and D, J:11). Rare pyrite has precipitated within chert micropores (View C, M:7).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 40X PPL,   Photo D: 40X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Mallik A-06

9278.8 feet

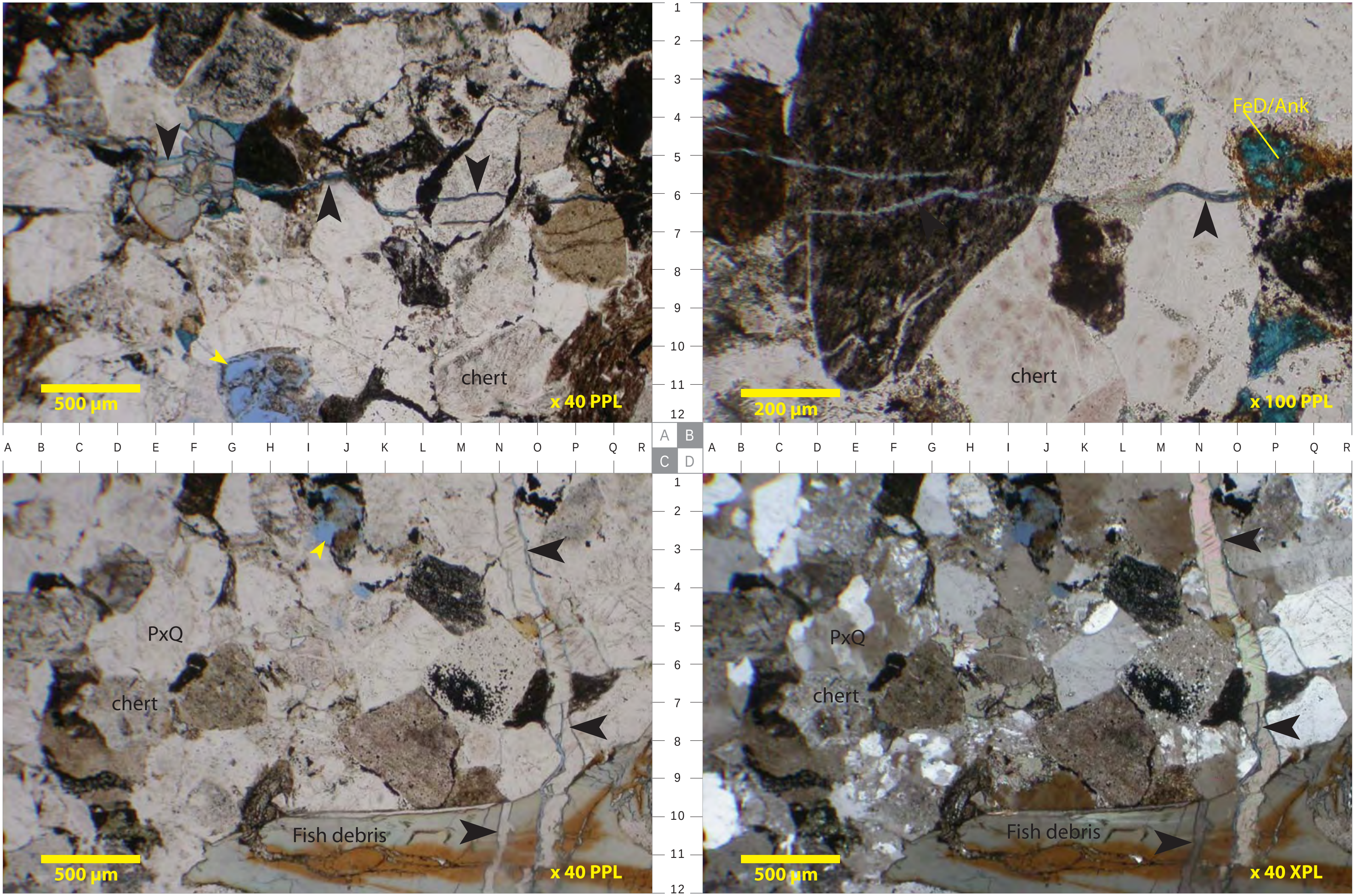


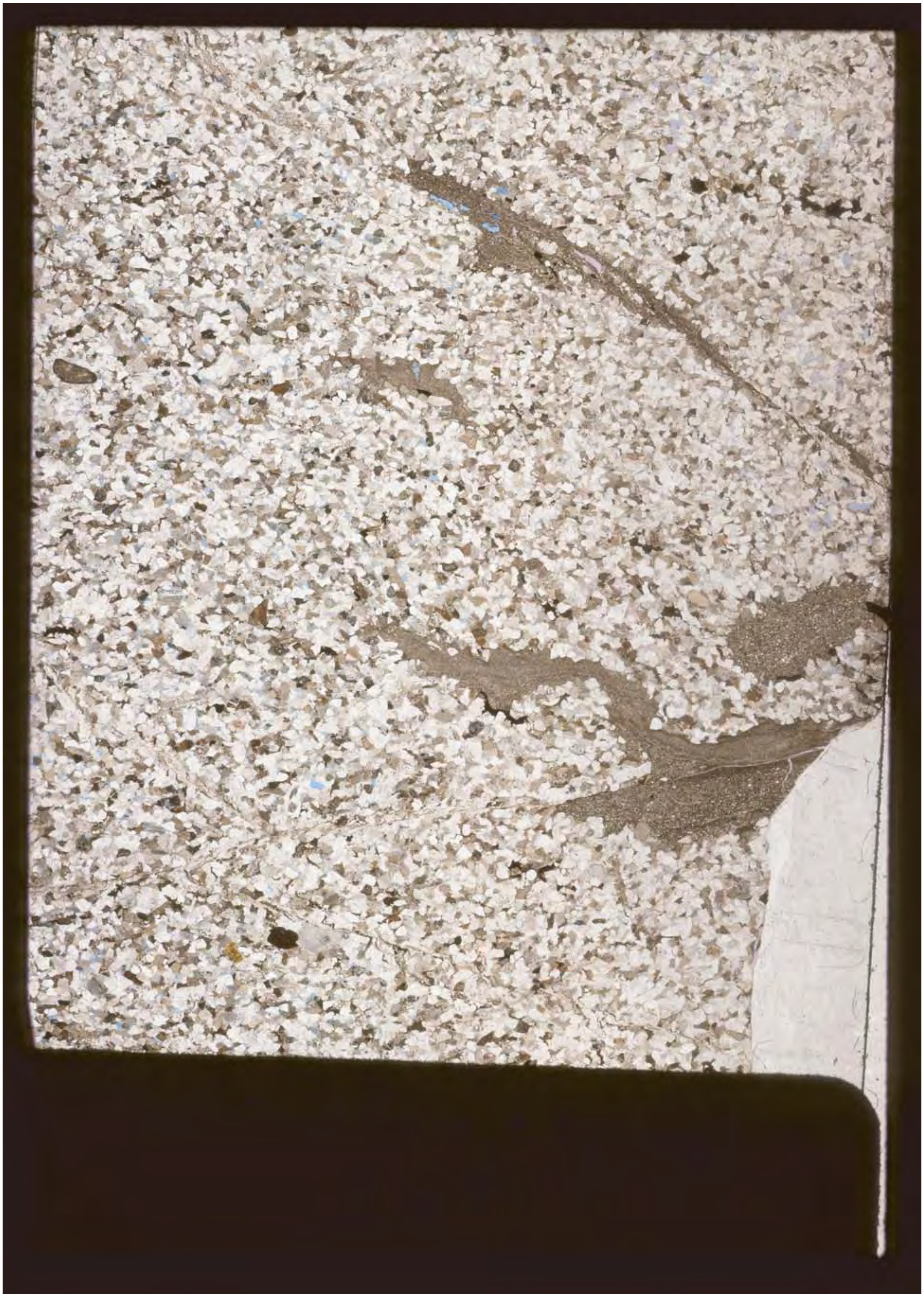
Plate 04
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Mallik A-06

9669.7 feet



Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 05

Mallik A-06
Richards
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 08-09
Depth: 9669.7 feet

An apparent conjugate microfracture system is shown in this coarse grained, moderately sorted Richards Sequence litharenite recovered at 9669.7 feet. Grain slippage is commonly observed (lower left of Overview and View B) along microfractures. Grain contacts are concavo-convex (View A – OM) and tangential indicating significant mechanical compaction. Pore occluding cements are minor comprised of patchily distributed ferroan dolomite (View C, "FeD") and rare loosely packed kaolinite clays (View C, "K"). Effective macroporosity (small yellow arrows) is isolated and slightly enhanced by the dissolution of unstable framework grains (i.e. feldspars – View D).

Photo A: 40X PPL,   Photo B: 40X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Mallik A-06

9669.7 feet

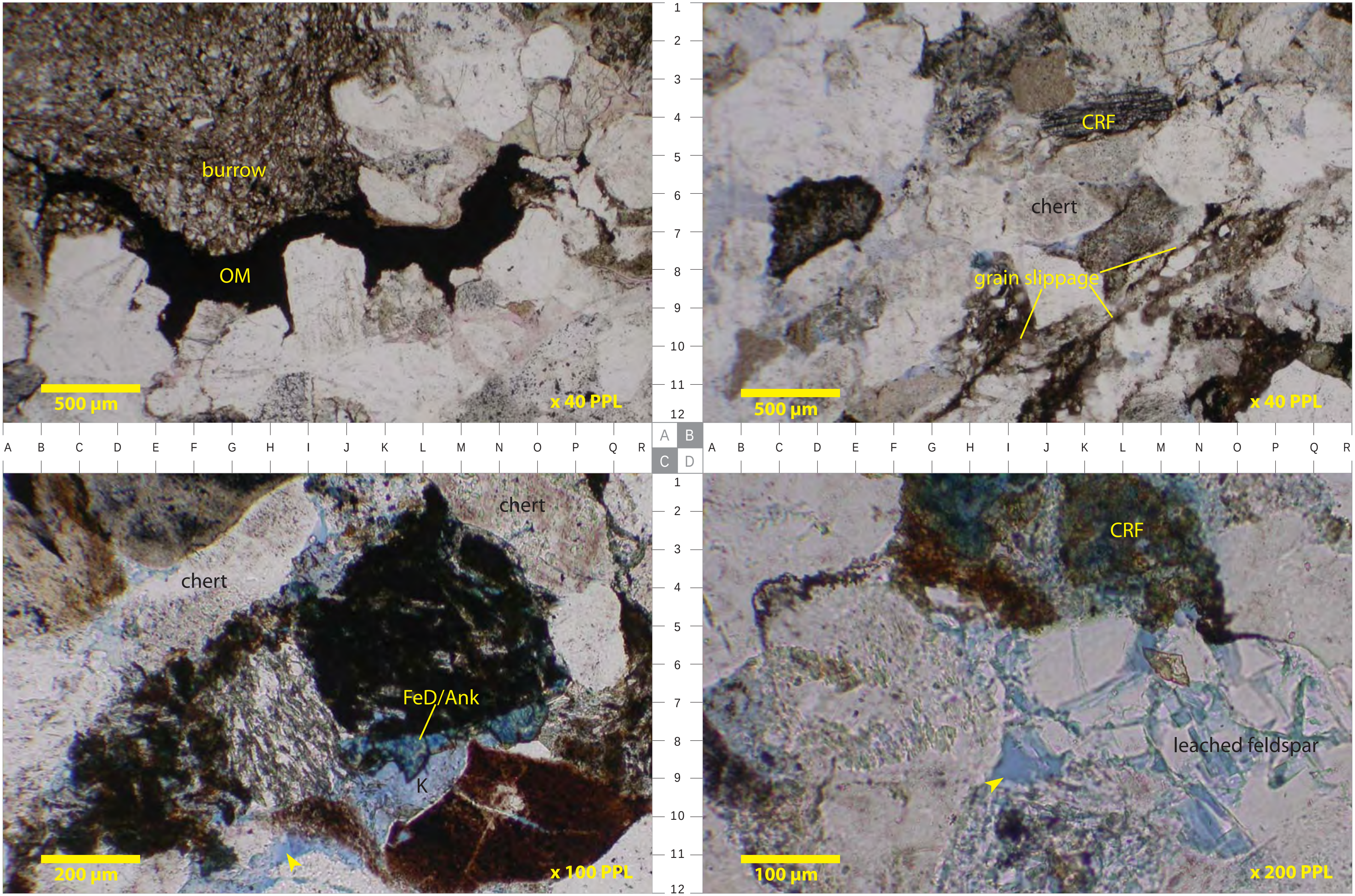


Plate 05
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Mallik A-06

10522 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 06

Mallik A-06
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 10522 feet

Abundant grain rimming microcrystalline eogenetic siderite is shown in these thin section photomicrographs taken from Taglu Sequence core recovered at 10522 feet. Monocrystalline quartz, chert, clay-rich sedimentary grains are the main framework constituents. Ferroan calcite is patchily distributed (View B, J;7; View D, L:10) and post-dates siderite precipitation. Effective (thin section) porosity is isolated (small yellow arrows) and reservoir quality is expected to be low in this clastic interval. Note grain contacts are tangential and concavo-convex in this section. Whole rock X-ray diffraction analysis, of core sample recovered at 10522.8 feet generated quartz (54%), plagioclase (10%), micas (6%), pyrite (15%) and clays (kaolinite 3%, chlorite 5%, mixed/expandable clays 7%).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Mallik A-06

10522 feet

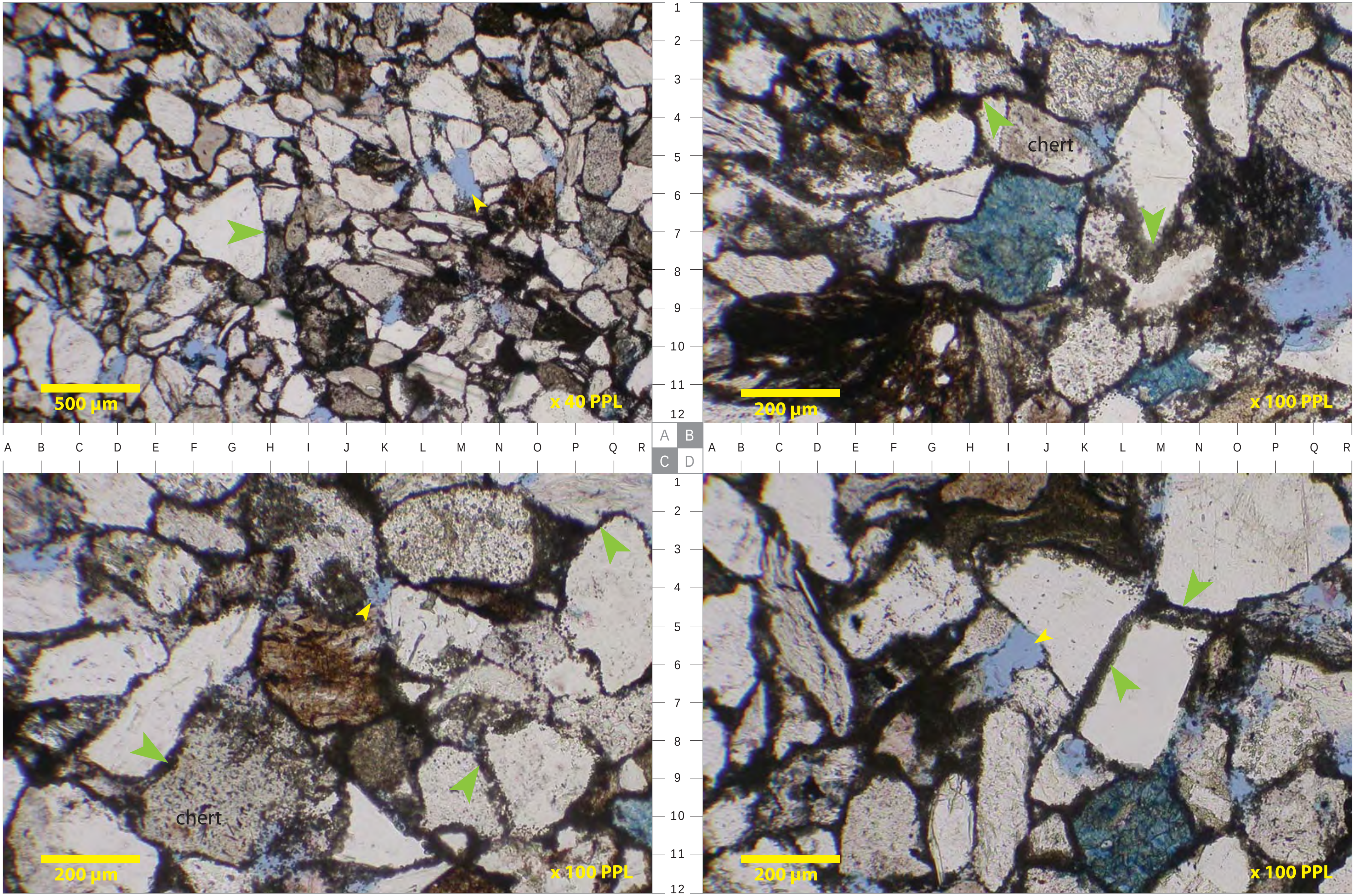


Plate 06

January 2010

CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Mallik A-06

10529.5 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 07

Mallik A-06
Taglu
Litharenite

Core Analysis Porosity: 8.1% Core Analysis Permeability: 0.27 md

Sample #: 08-11
Depth: 10529.5 feet

Parallel laminated, lower fine grained, well sorted litharenites are recognized from core taken at 10529.5 feet. Monocrystalline quartz (Q) dominates the framework grains with common dark brown to black clay-rich sedimentary grains (CRF), micas, and chert. Rare ferroan calcite filled microfractures cross cut the sandstone fabric (Views A and B, "FeC"). Non-stained carbonate cement is illustrated in View C (L:11). Grain contacts are tangential and concavo-convex indicating moderate mechanical compaction. Patchily distributed minor ferroan calcite cement and loosely packed kaolinite clays (View D, G:9) are the main authigenic phases in this interval. Note grain plucking during the thin section manufacturing process, artificially enhancing thin section porosity – blue dyed epoxy, is evident in Views A and B.

Photo A: 40X PPL,   Photo B: 40X XPL,   Photo C: 100X PPL,   Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Mallik A-06 **10529.5 feet**

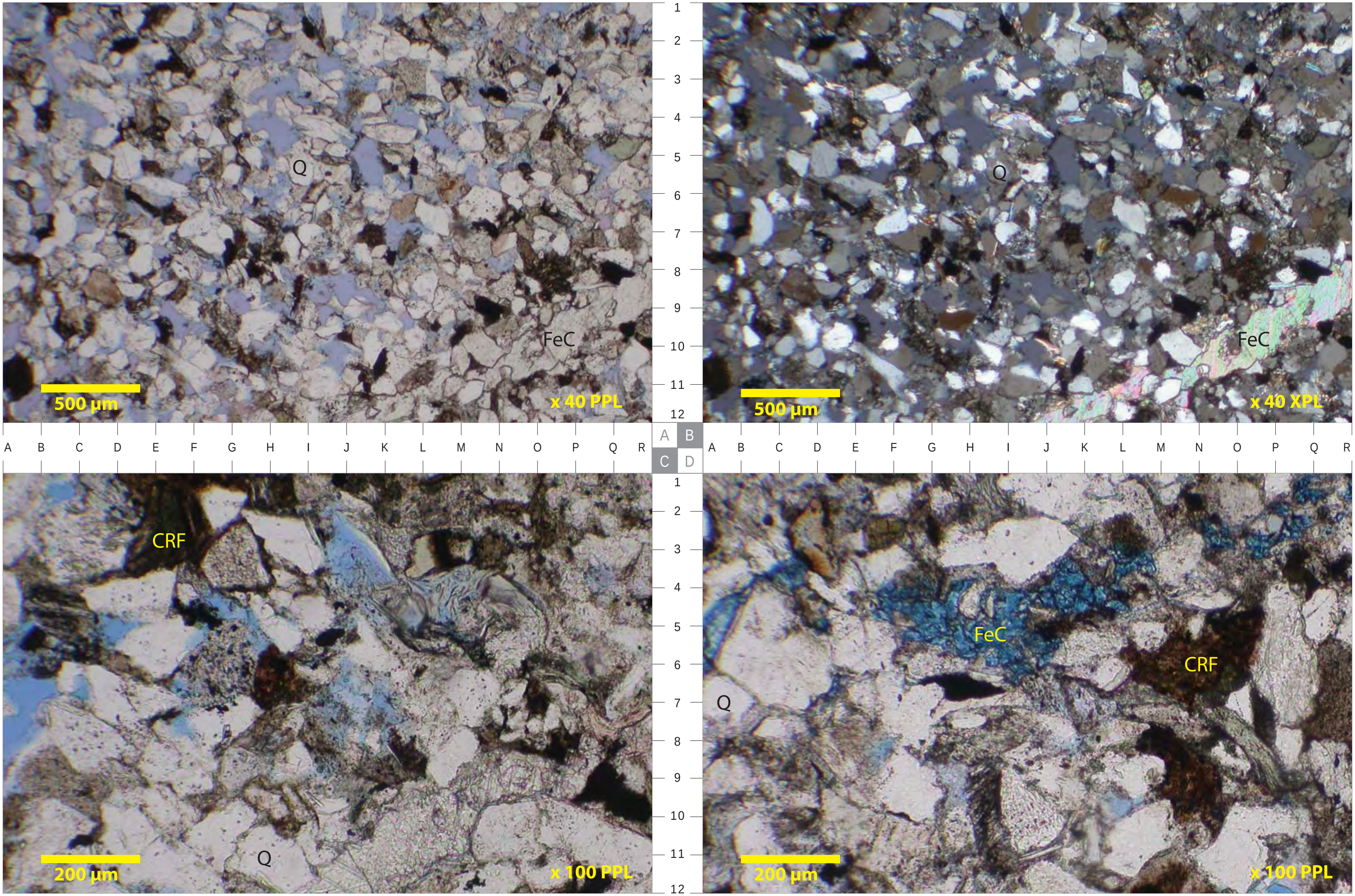


Plate 07
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Mallik A-06

10535 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 08

Mallik A-06
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 08-12
Depth: 10535 feet

Faintly laminated, bioturbated fine grained, moderately well sorted litharenites are recognized from Taglu Sequence core taken at 10535 feet. Ferroan calcite ("FeC") is patchily distributed and found in minor volumes occluding effective macroporosity. Dissolution of ferroan calcite has enhanced the macropore system. Framework grains are mainly comprised of monocrystalline quartz, chert and clay-rich sedimentary grains with subordinate amounts of feldspar and micas.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Mallik A-06 — 10535 feet

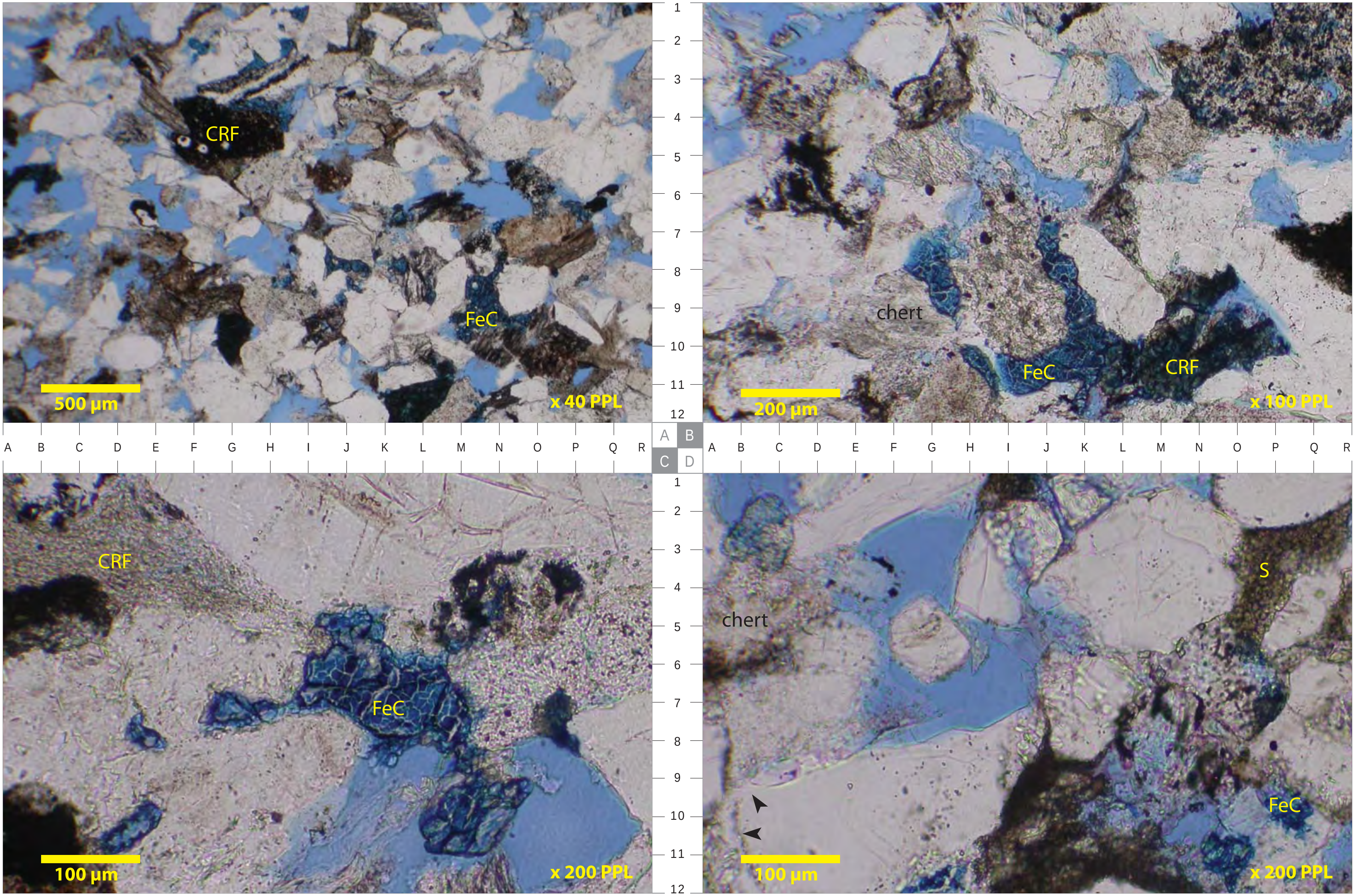


Plate 08
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Mallik A-06

10538.1 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 09

Mallik A-06
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 08-13
Depth: 10538.1 feet

Micaceous, laminated, very fine grained litharenites characterize the clastics recovered from core at 10538.1 feet. Grain contacts are tangential and concavo-convex reflecting moderate mechanical compaction. Framework grains include common monocrystalline quartz (Q), chert, micas, clay-rich sedimentary grains and feldspars. Ferroan dolomite cement (FeD) is found in minor volumes and patchily distributed. Dissolution of ferroan dolomite and unstable framework grains (View A, F:8) has enhanced the effective pore system.

Photo A: 100X PPL,   Photo B: 200X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Mallik A-06 **10538.1 feet**

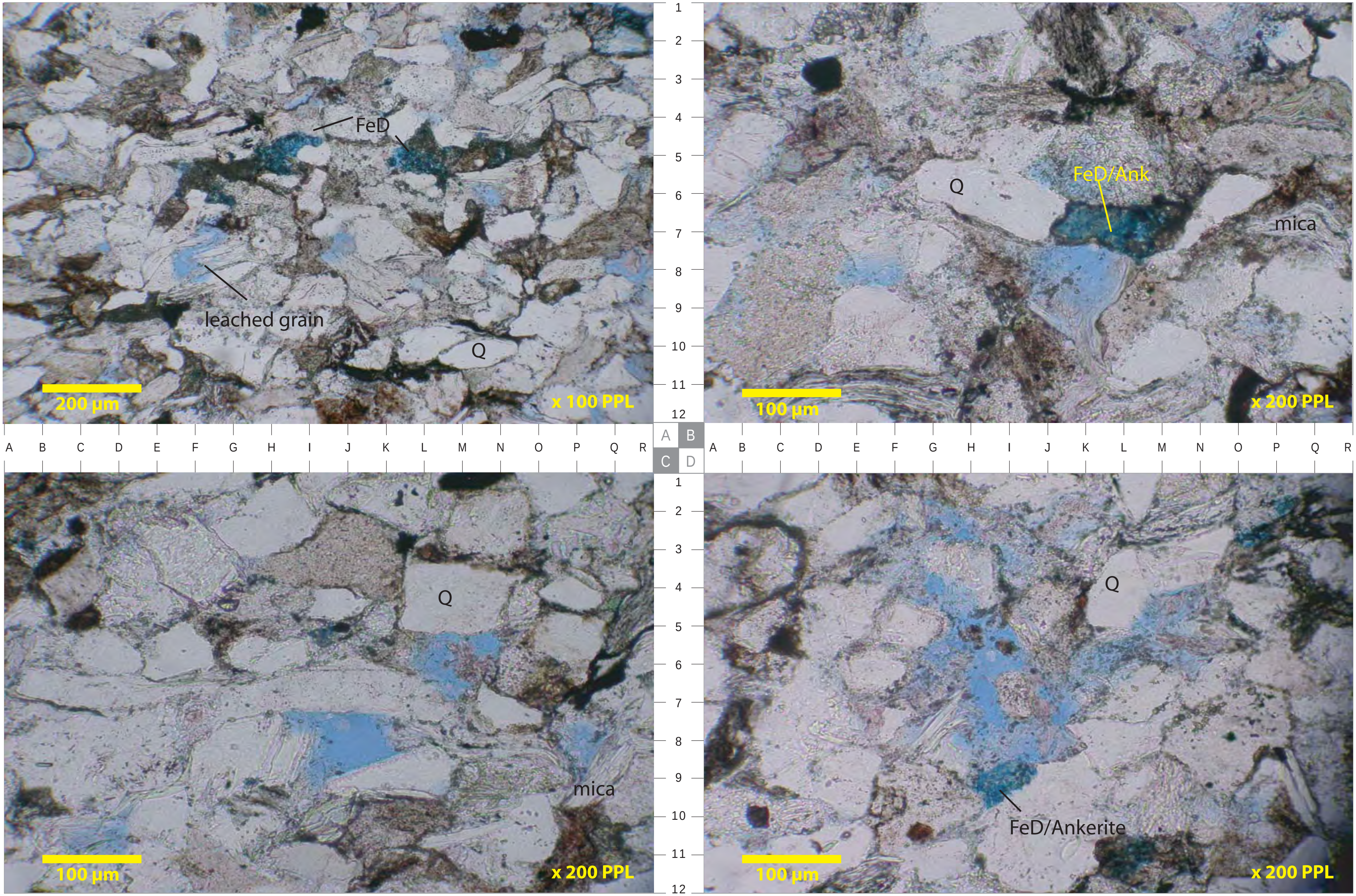


Plate 09
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Mallik A-06

11854.5 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 10

Mallik A-06
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 08-16
Depth: 11854.5 feet

Silt to very fine grained, laminated Taglu Sequence litharenites are recognized from core recovered at 11854.5 feet. Amber and black organic material (View A, "OM") is commonly concentrated along laminae. Ferroan calcite cement ("FeC") commonly occludes effective porosity and engulfs grain remnants (View C, M:5). Framework grains include monocrystalline quartz, sideritized clay-rock fragments (CRFs), organic material, micas and chert.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Mallik A-06 **11854.5 feet**

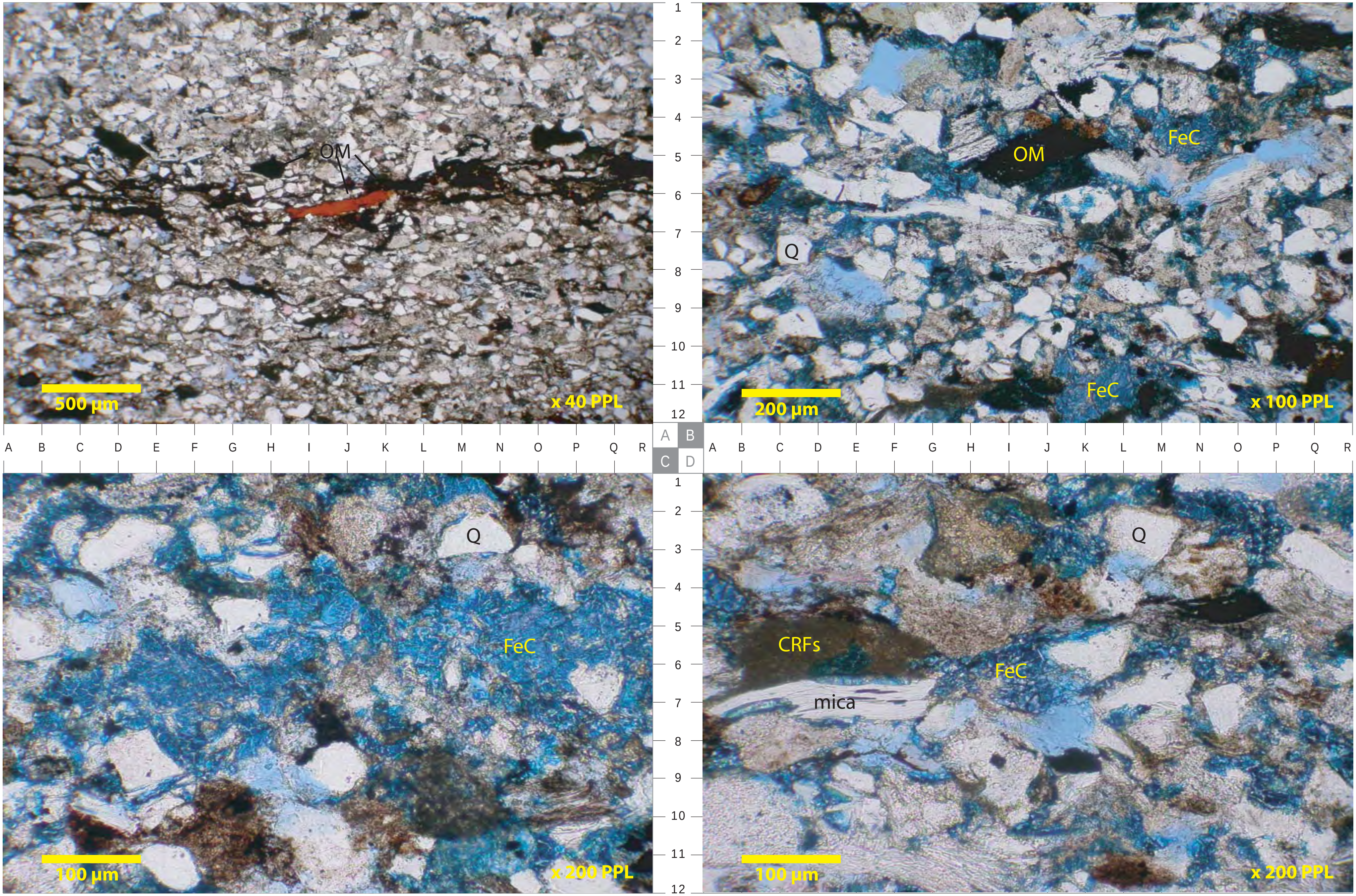


Plate 10
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

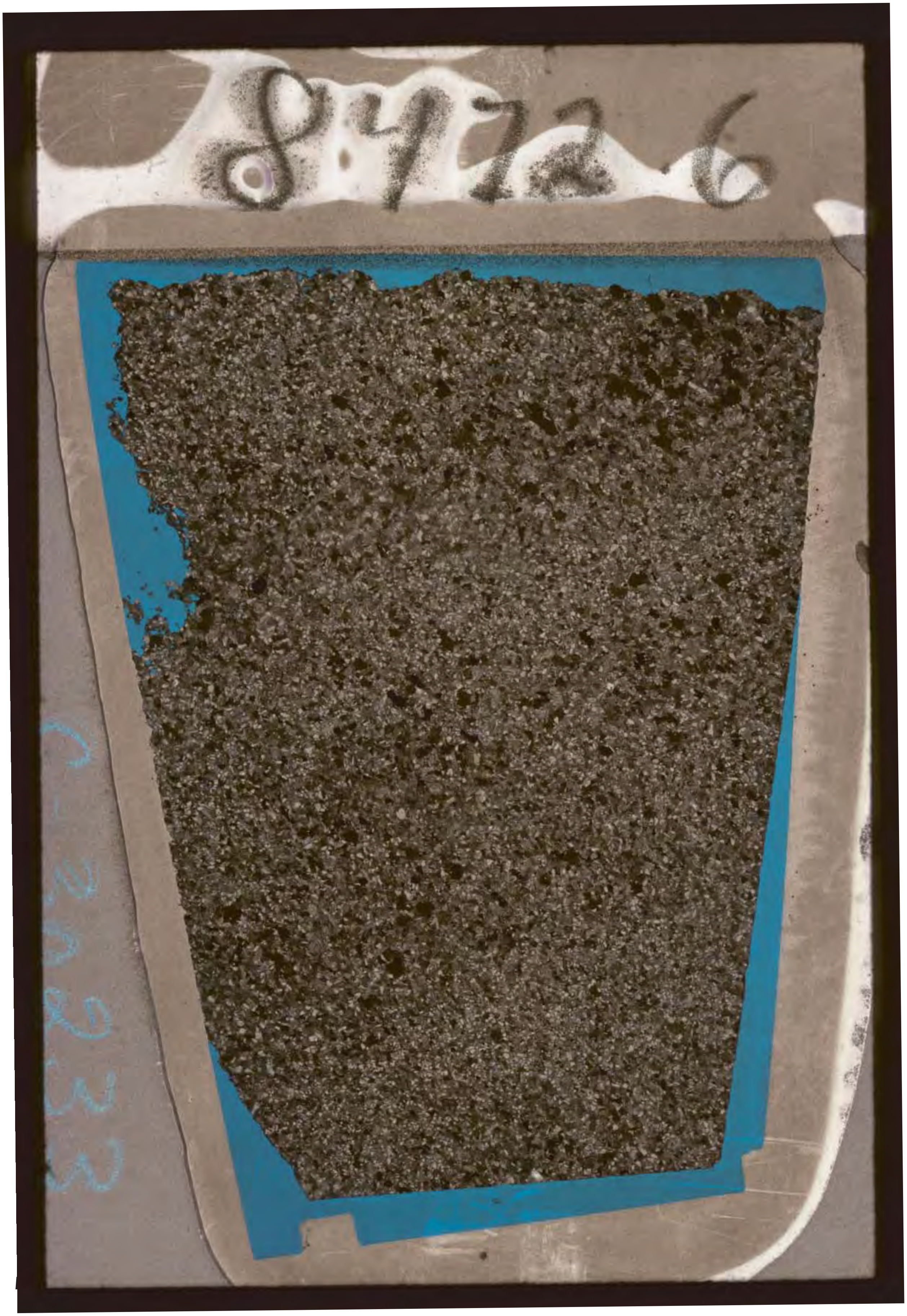
Thin Section Overviews

And

Select Described Photomicrographs

Taglu C-42

8472.6 feet



Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

8472.9 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 01

Taglu C-42
Richards
Litharenite

Core Analysis Porosity: 14.0% Core Analysis Permeability: 2.70 md

Sample #: 07-01
Depth: 8472.9 feet

Carbonate cemented, laminated and bioturbated fine grained, moderately sorted litharenites are recognized from core taken at 8472.9 feet. The main framework grains, as determined by modal analysis, generated monocrystalline quartz (Q), polycrystalline quartz with subordinate amounts of chert argillic sedimentary grains, sideritized clasts, metamorphic rock fragments, and feldspars. Macroporosity is occluded by abundant very finely crystalline ferroan dolomite cement (large green arrows). Pyrite is found in trace to minor amounts. Mechanical compaction of labile constituents is common.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

Taglu C-42 — 8472.9 feet

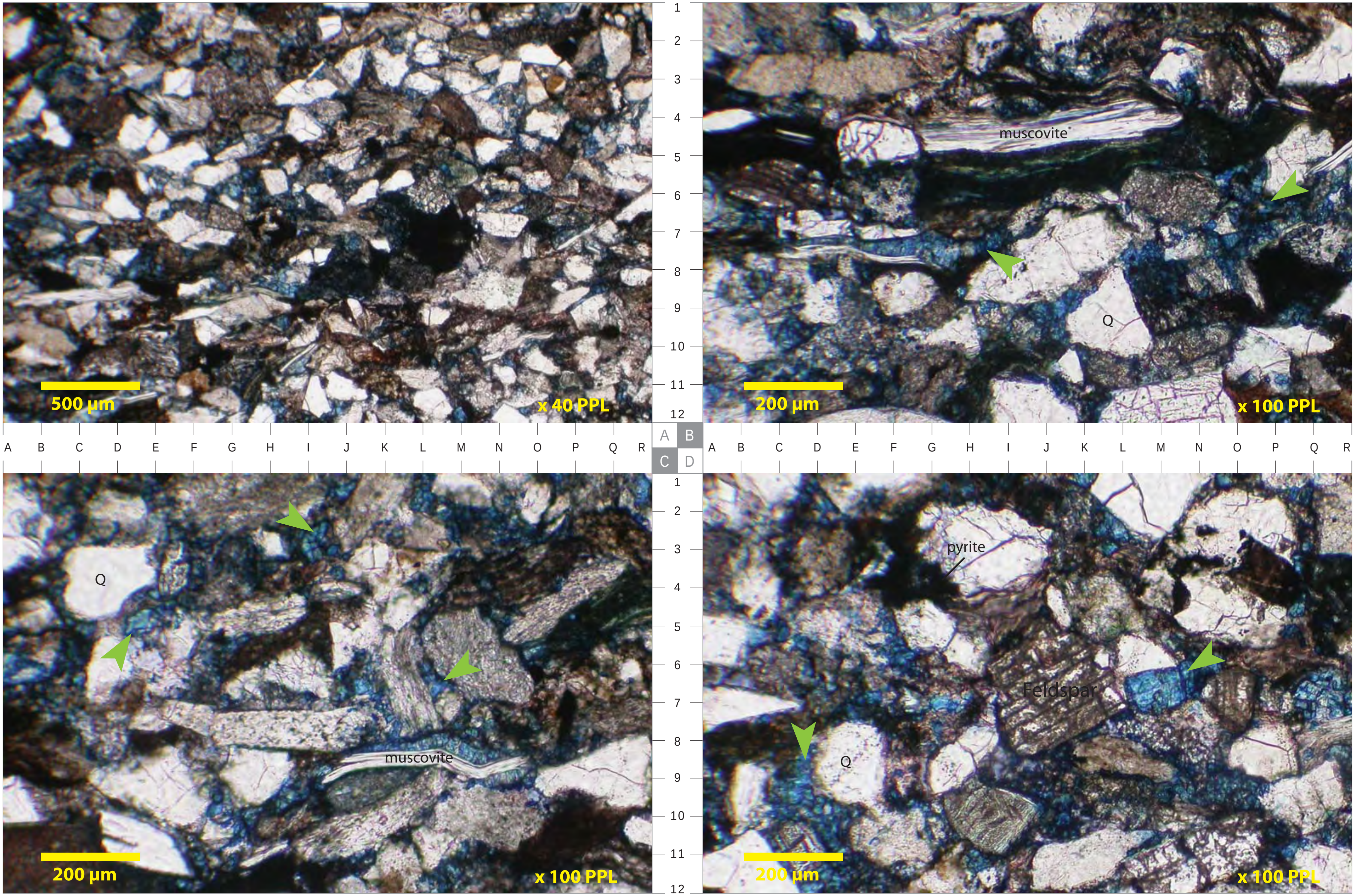


Plate 01
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

8474.4 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 02

Taglu C-42
Richards
Litharenite

Core Analysis Porosity: 18.6% Core Analysis Permeability: 16.6 md

Sample #: 07-02
Depth: 8474.4 feet

Laminated, bioturbated fine to medium grained litharenites characterize the Richards Sequence recovered from core at 8474.4 feet. Patchily distributed ferroan dolomite (large green arrows) is the main pore occluding cement with common unevenly distributed grain rimming and replacive cryptocrystalline siderite. Grain contacts are tangential and concavo-convex indicating moderate mechanical compaction. Minor kaolinite clays (View B, F-G:7-8) are loosely packed within open macropores. Framework grains are comprised mainly of monocrystalline quartz, polycrystalline quartz, chert, argillic sedimentary grains (CRF), micas (View D, L:7), sideritized lithoclasts, metamorphic grains and volcanic rock fragments.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

Taglu C-42 **8474.4 feet**

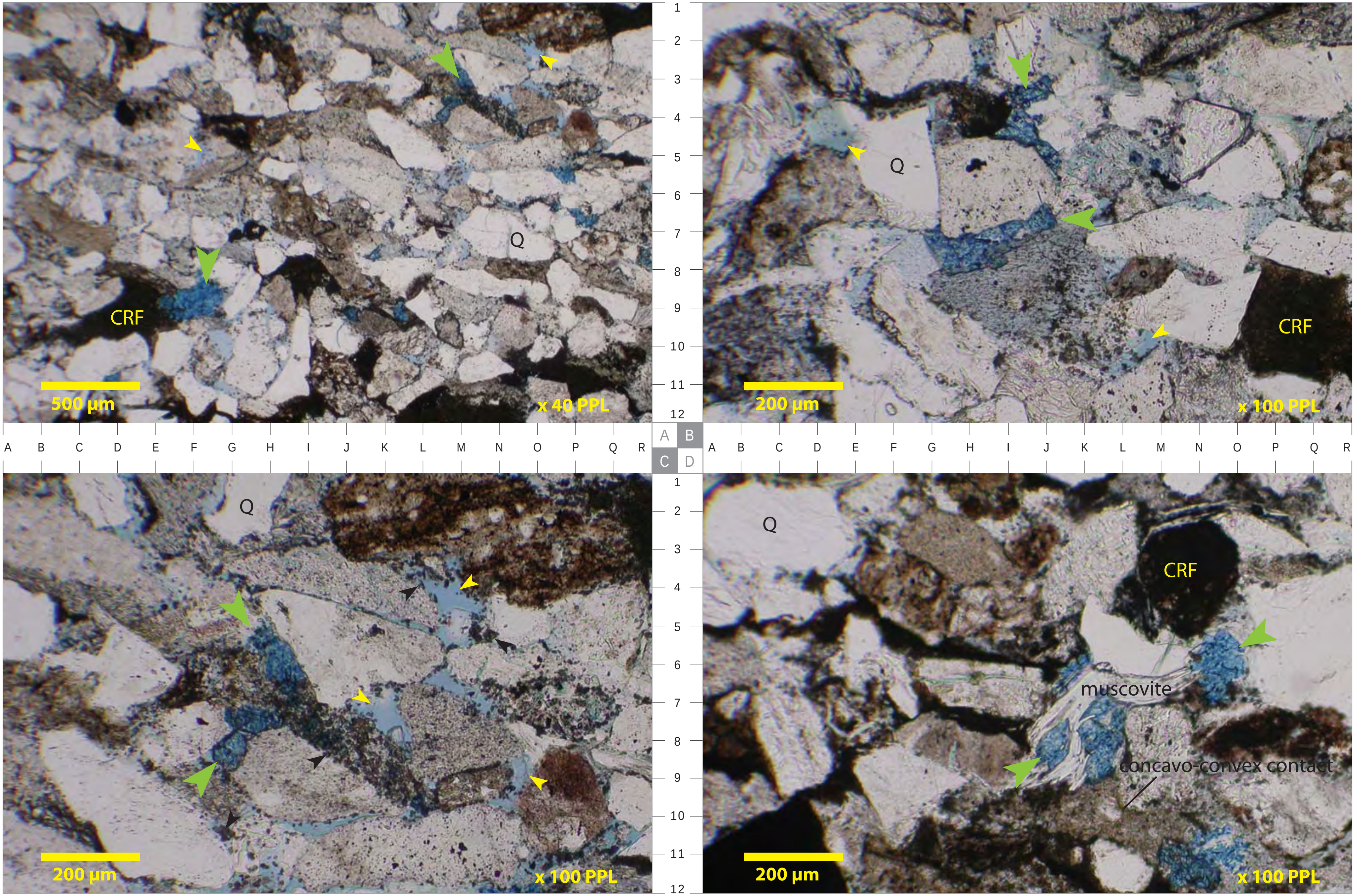


Plate 02
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

8474.9 feet

2 mm

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

8483.9 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

8487.5 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 03

Taglu C-42
Richards
Litharenite

Core Analysis Porosity: 22.1% Core Analysis Permeability: 68.4 md

Sample #: 07-03
Depth: 8487.5 feet

Faintly laminated, upper fine to medium grained, moderately well sorted litharenites are recognized from core taken at 8487.5 feet. Effective macroporosity (small yellow arrows) is well developed partially occluded by patchily distributed blue stained ferroan dolomite cement (large green arrows). Grain contacts are mainly tangential and concavo-convex. The latter, associated mainly with labile lithoclasts, are compacted between more competent framework grains. Monocrystalline quartz (Q), clay-rich sedimentary grains, chert, volcanic rock fragments (VRF) and feldspathic grains are considered some of the main framework constituents. Complete dissolution of unstable feldspathic grains (View B, M:8) has enhanced the effective pore system.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42 **8487.5 feet**

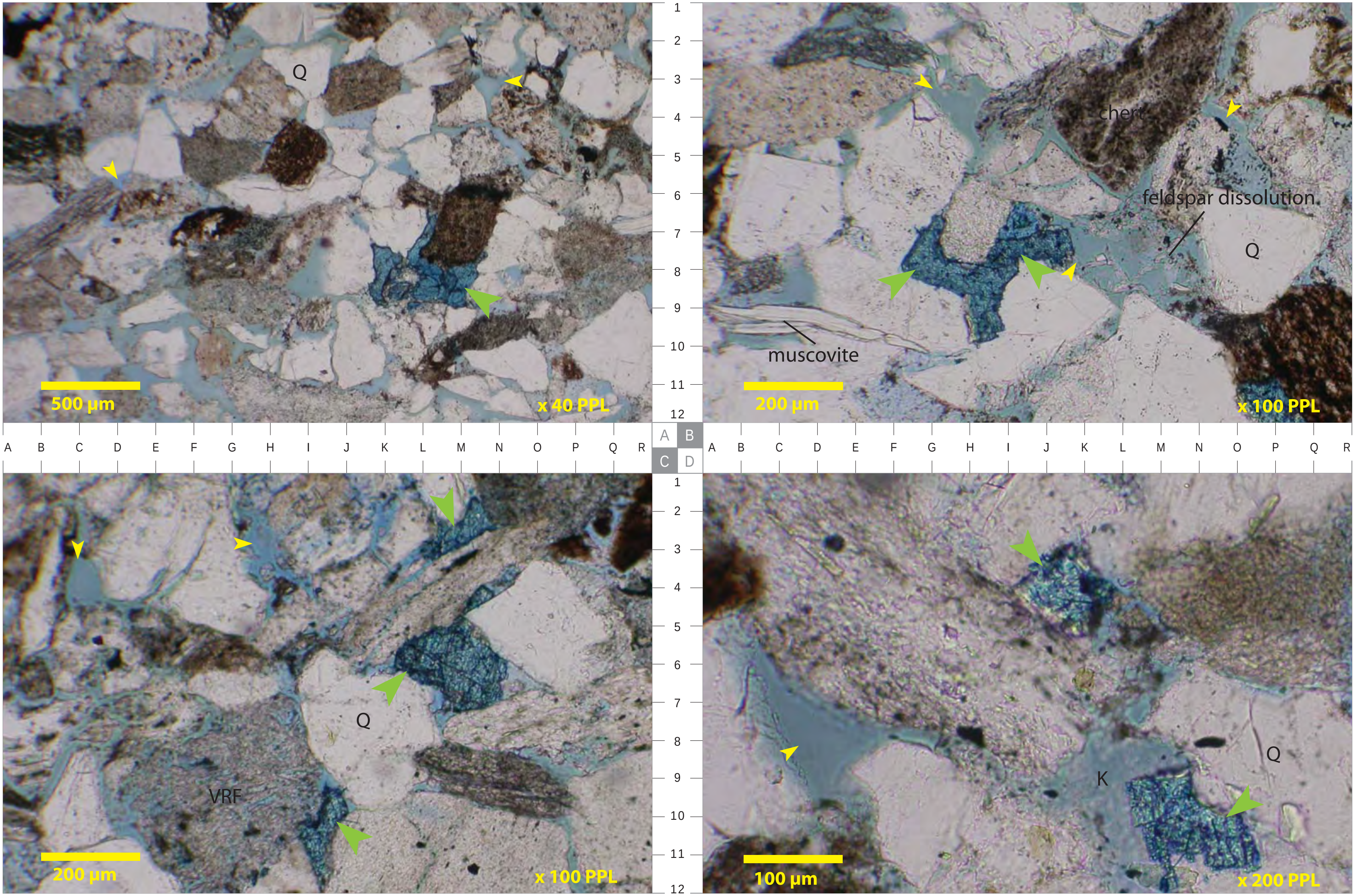


Plate 03
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

8488.4 feet

2 mm

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42 **8495.8 feet**

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9414 feet

Richards

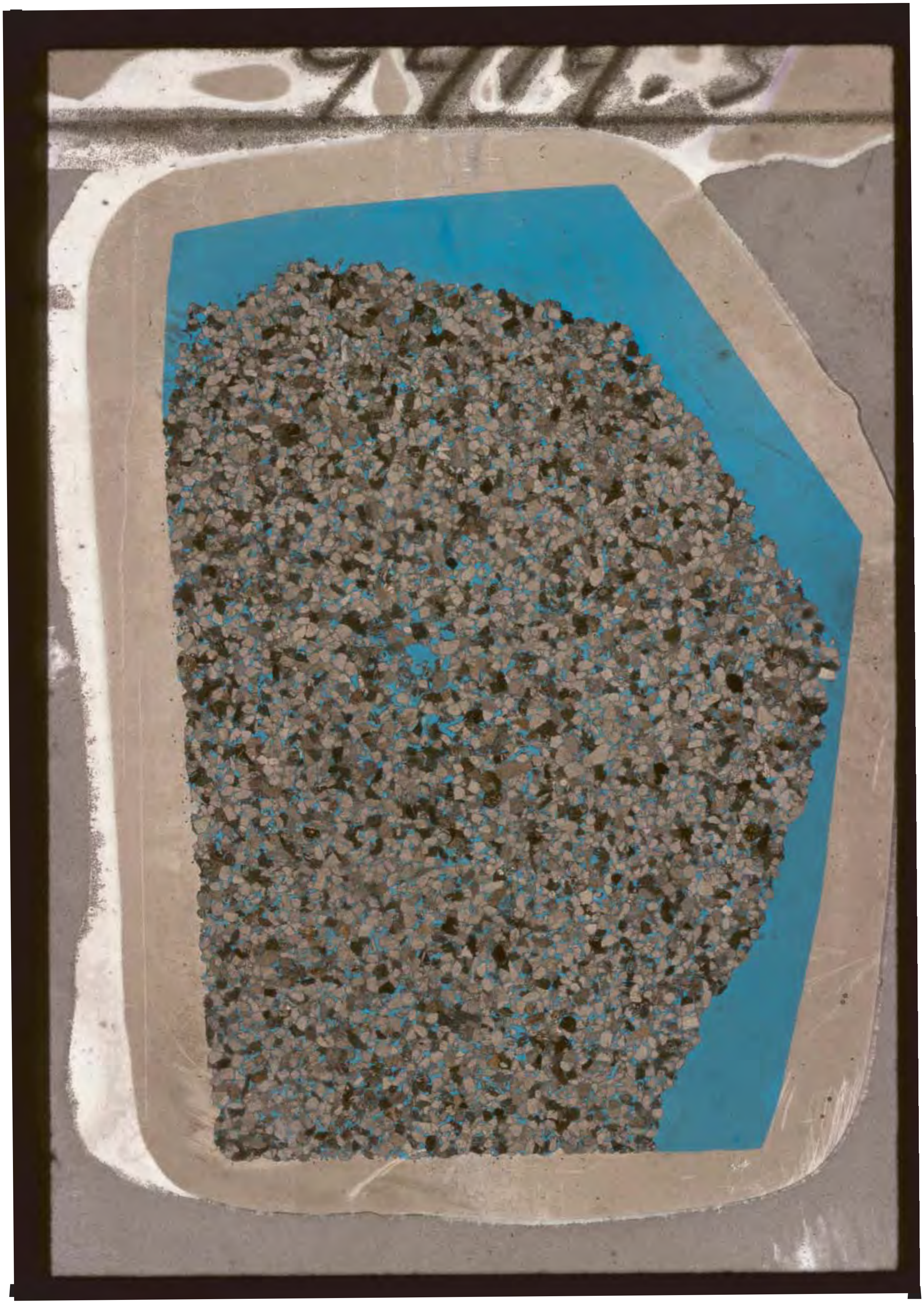
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9414.3 feet



Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9417.2 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9419 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9419.1 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 04

Taglu C-42
Richards
Litharenite

Core Analysis Porosity: 18.4% Core Analysis Permeability: 145 md

Sample #: 07-05
Depth: 9419.1 feet

Medium to coarse grained, moderately well sorted litharenites were intercepted by core recovered at 9419.1 feet. Modal analysis yielded polycrystalline quartz, monocrystalline quartz (Q) and chert as the main framework grains. Grain contacts are tangential and concavo-convex in this Richards Sequence interval. Unevenly distributed, finely crystalline, euhedral ferroan dolomite (large green arrows) cement has precipitated within open macropores and within chert micropores (View D). Dissolution of feldspars (View B, N:9) has enhanced the effective pore system (small yellow arrows).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

Taglu C-42 — 9419.1 feet

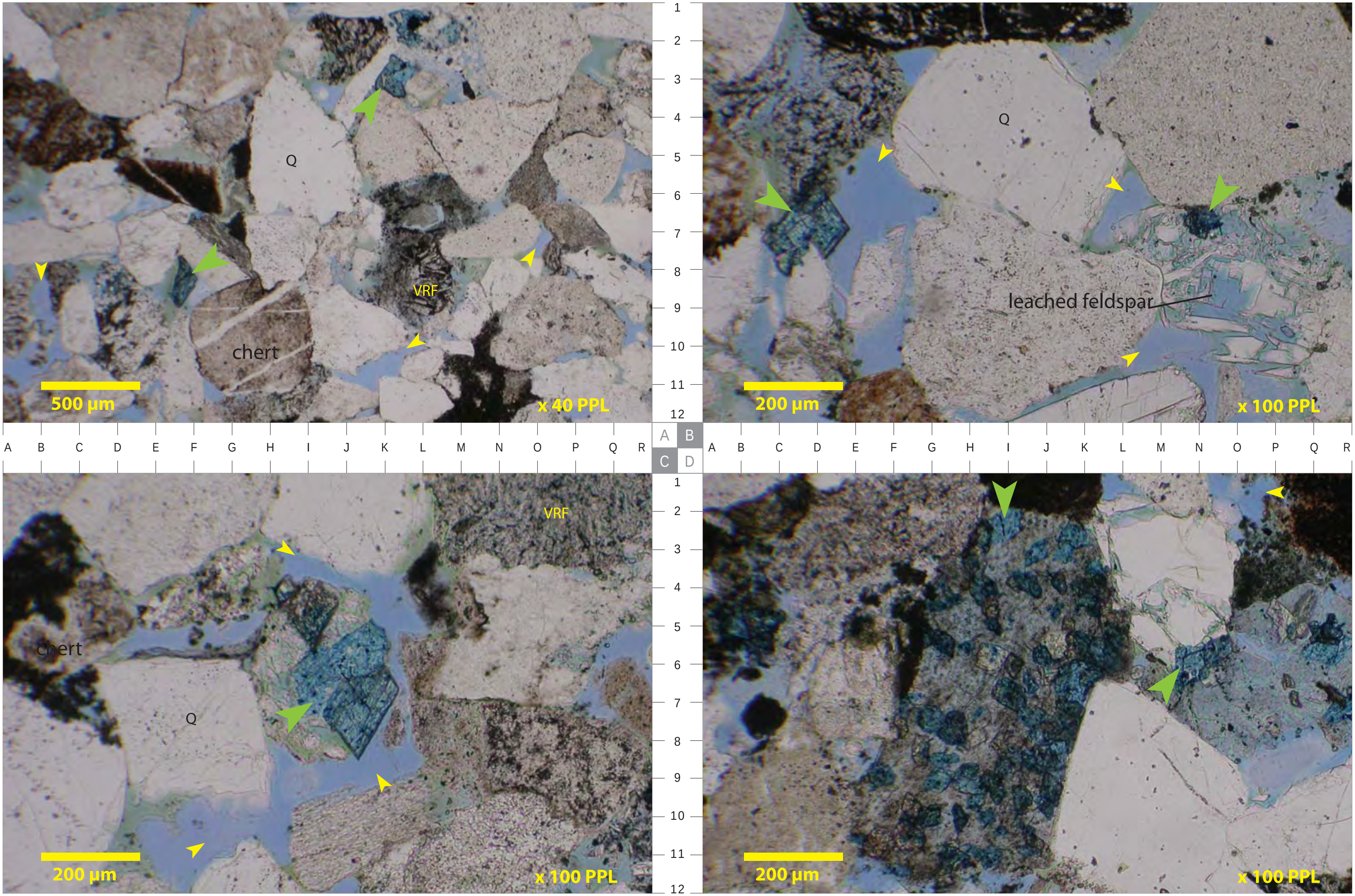


Plate 04
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9421 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 05

Taglu C-42
Richards
Litharenite

Core Analysis Porosity: na   Core Analysis Permeability: na

Depth: 9421 feet

Moderately sorted, coarse grained carbonate cemented Richards Sequence litharenites are illustrated in these non-stained thin section photomicrographs. Grain contacts are concavo-convex and tangential indicating considerable mechanical compaction. Framework grains consist of monocrystalline quartz, polycrystalline quartz, clay-rich sedimentary grains (CRF), chert and quartz-rich sedimentary grains (reworked siltstones).

Photo A: 40X PPL,   Photo B: 40X XPL,   Photo C: 100X PPL,   Photo D: 100X XPL

Taglu C-42 9421 feet

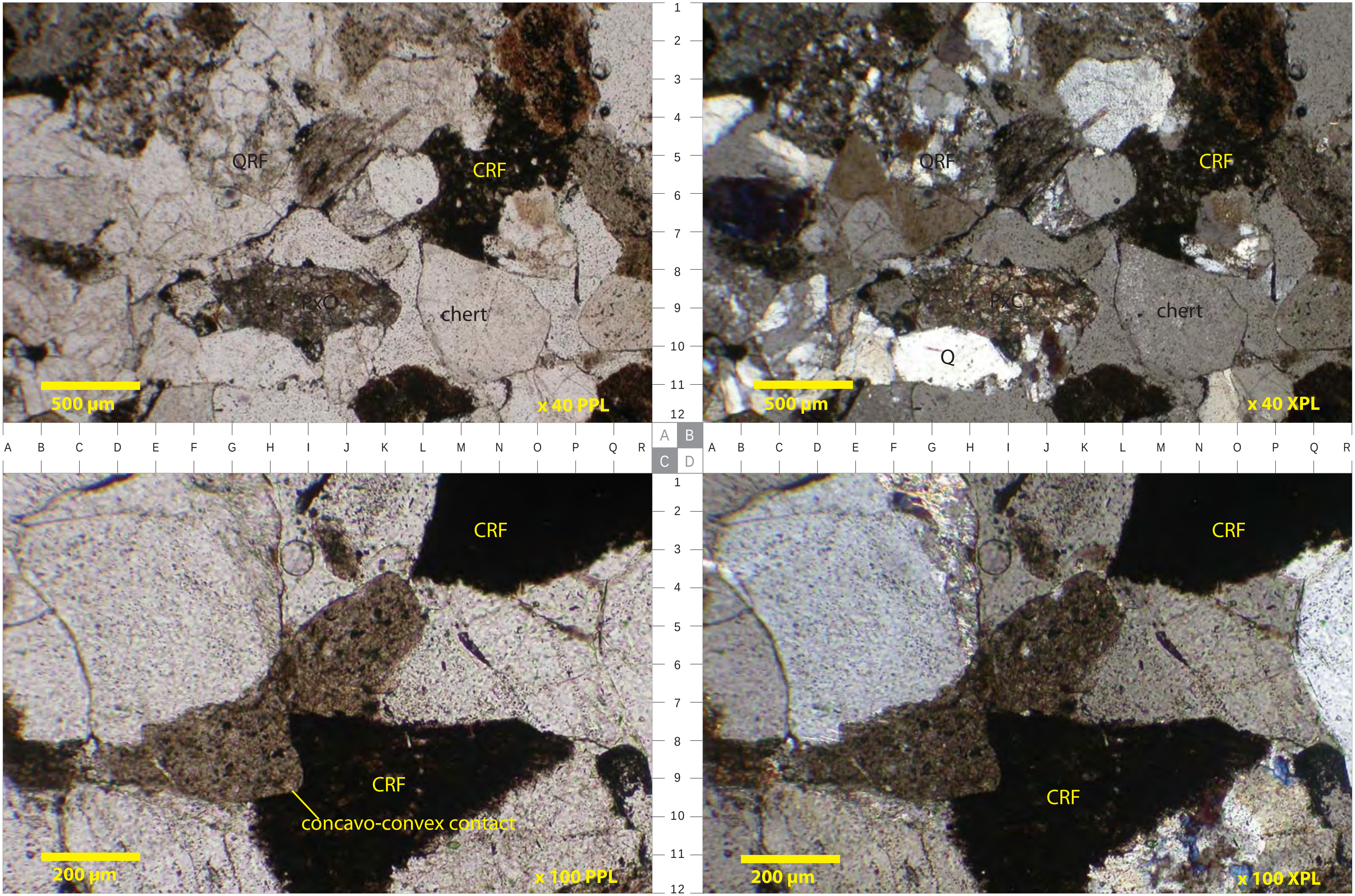


Plate 05
January 2010
CMH 2010-01

Richards

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9423 feet

Richards

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9428 feet

2 mm

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 06

Taglu C-42
Taglu
Chert Litharenite

Core Analysis Porosity: 19.2%   Core Analysis Permeability: 156 md

Depth: 9428 feet

Massive medium to coarse grained chert arenites were intercepted by core recovered at 9428 feet. Chert, monocrystalline quartz and clay-rich sedimentary grains are the main framework constituents with subordinate amounts of feldspar and volcanic rock fragments (VRF). Grain contacts are tangential and concavo-convex suggesting considerable mechanical compaction in this interval. Grain microfractures are illustrated in View A (M:6). Authigenic cements are rare and consist of pyrite precipitated within chert micropores.

Photo A: 40X PPL,   Photo B: 40X XPL,   Photo C: 100X PPL,   Photo D: 100X XPL

Taglu C-42 **9428 feet**

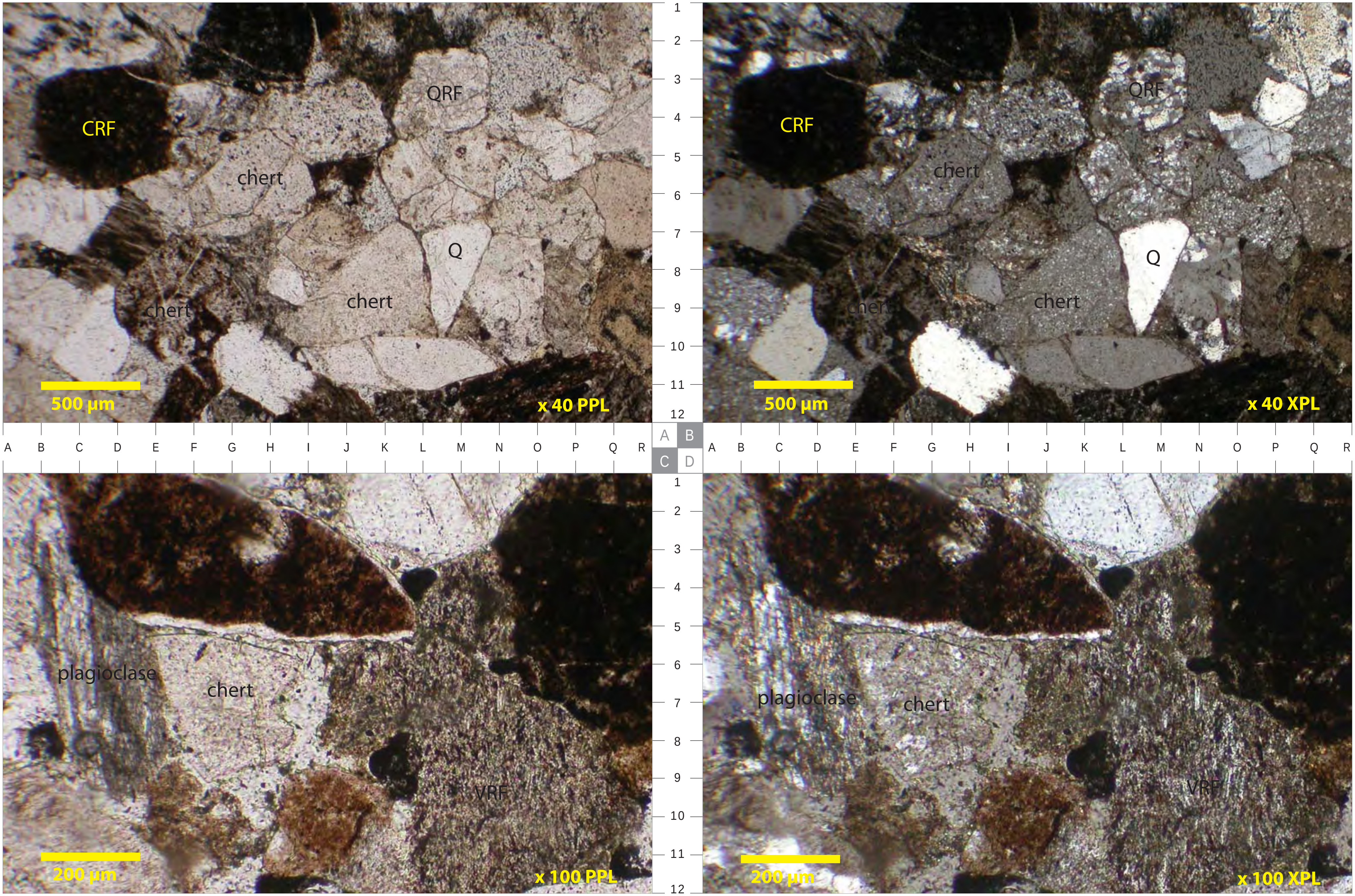
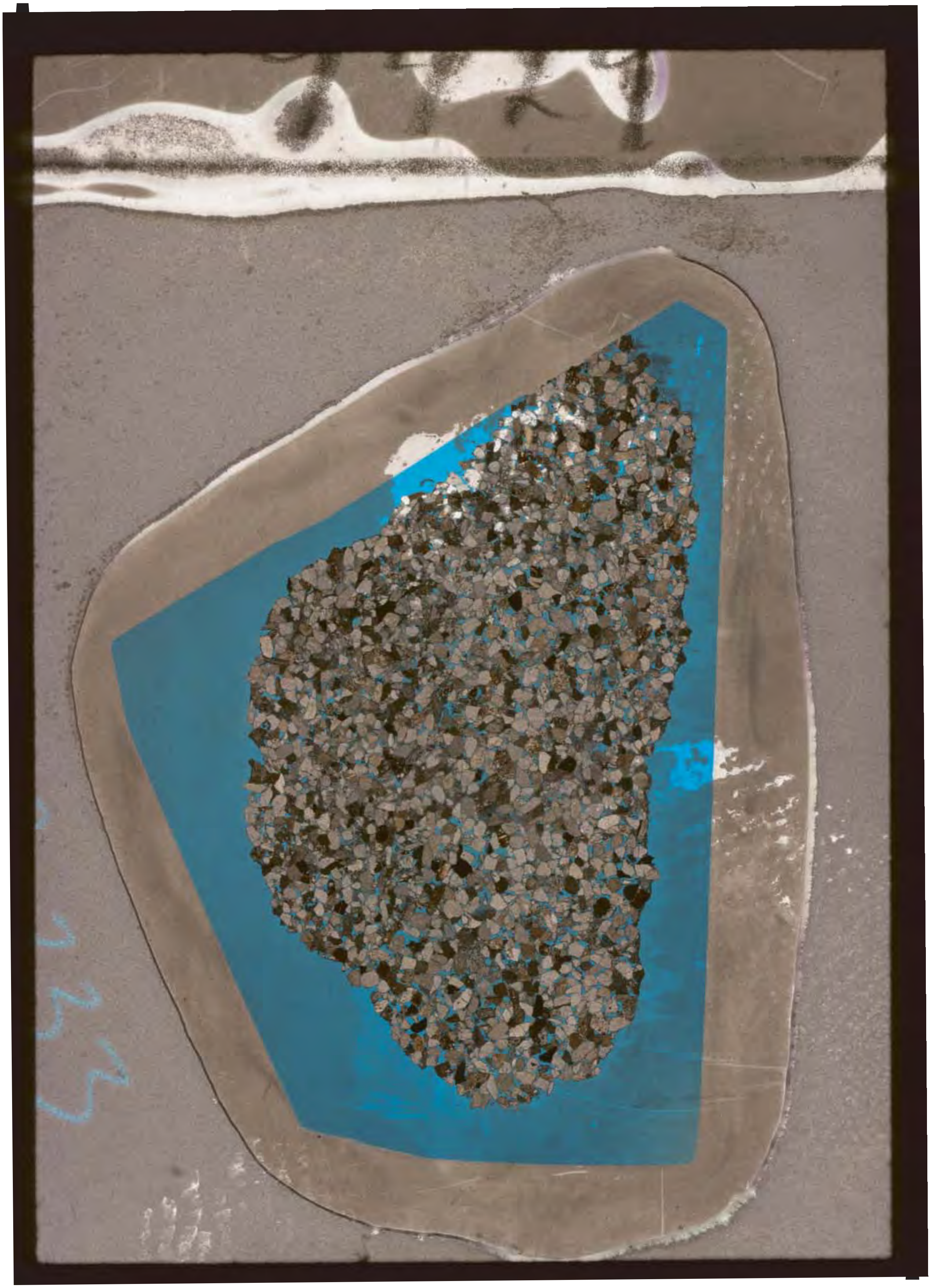


Plate 06
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42 9429 feet



Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9430 feet

Taglu

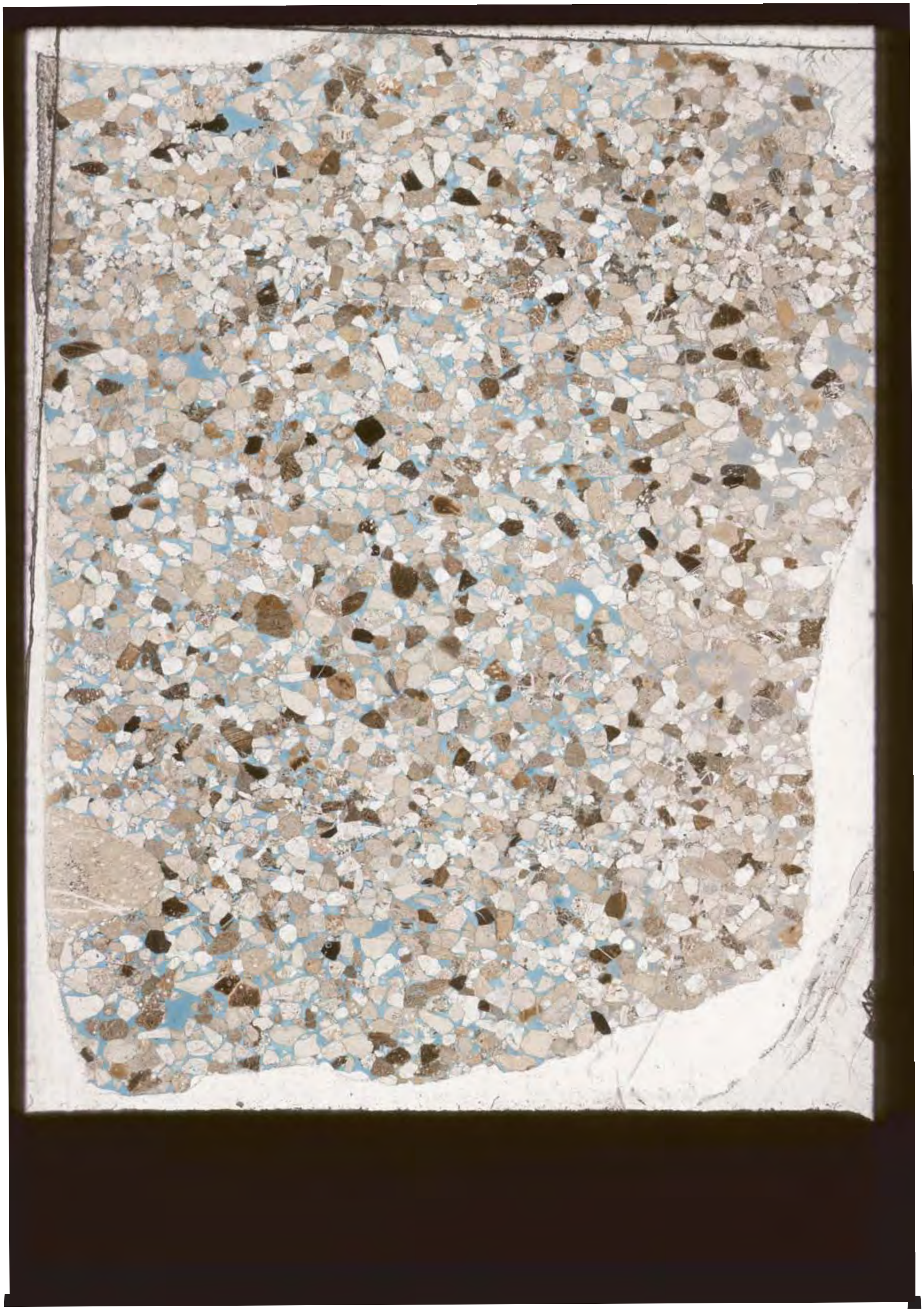
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9432.4 feet



2 mm

Taglu

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9432.5 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 07

Taglu C-42
Taglu
Argillic Silty Litharenite

Core Analysis Porosity: 18.5%   Core Analysis Permeability: 850 md

Depth: 9432.5 feet

Microfractured grains are shown in the high magnification thin section photomicrographs, indicating significant mechanical compaction has occurred. Authigenic phases are poorly preserved in this coarse grained, well sorted litharenite. Chert, feldspars and quartz-rich sedimentary grains (QRF) are some of the main framework grains in this interval. Note partially leached framework grain (View B, M:10) enhances the effective pore system in this porous and permeable Taglu section.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42 **9432.5 feet**

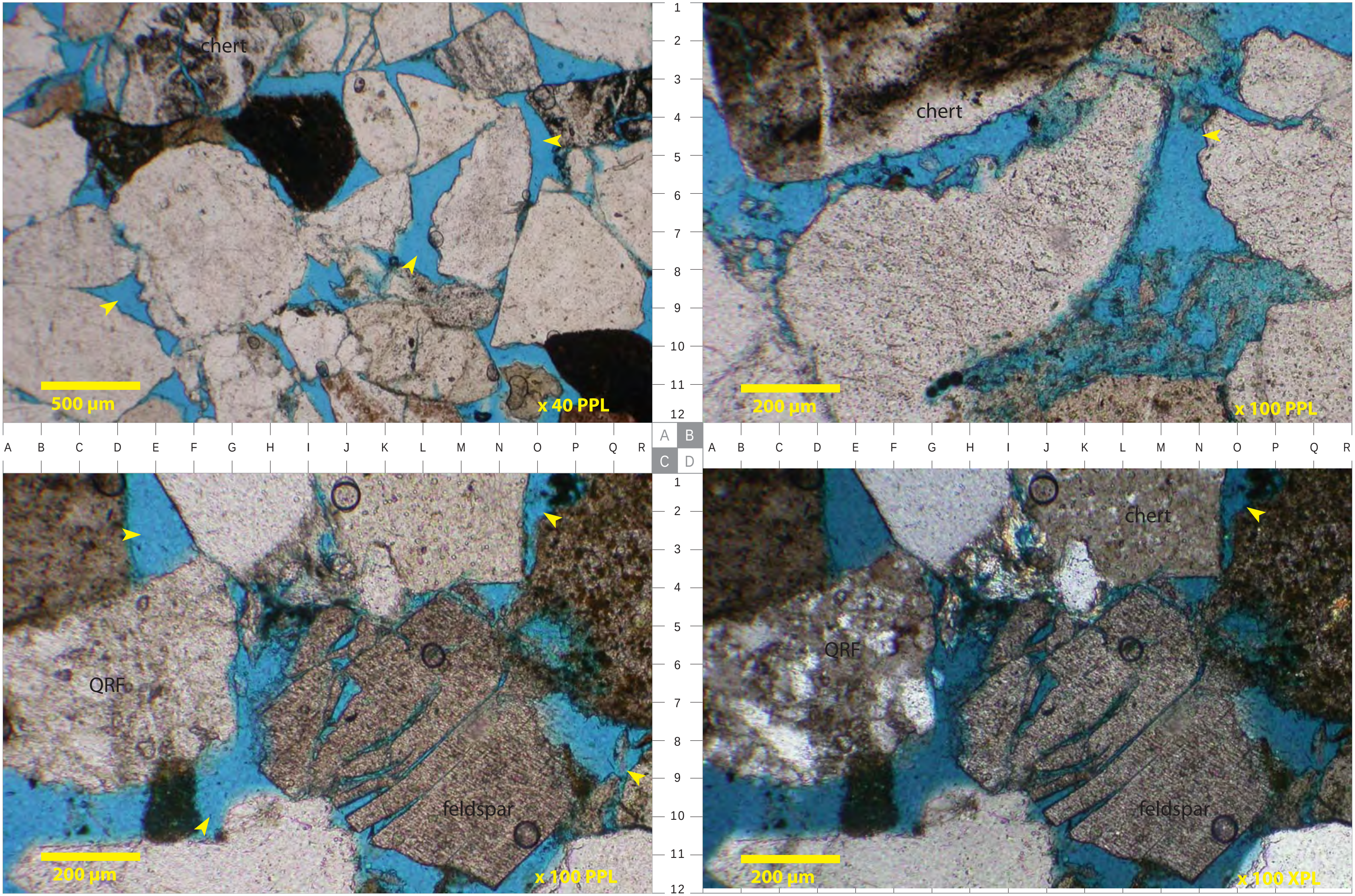


Plate 07
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42 9434 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9434.2 feet

2 mm

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 08

Taglu C-42
Taglu
Chert Litharenite

Core Analysis Porosity: 20.4%   Core Analysis Permeability: 3750 md

Depth: 9434.2 feet

Porous and permeable, excellent reservoir quality Taglu Sequence chert arenites characterize the clastics recovered from core taken at 9434.3 feet. Coarse to very coarse grained, moderately well sorted sandstones with point-point and tangential grain contacts are recognized. Chert, clay-rich sedimentary grains (CRF) and quartz-rich (QRF) sedimentary grains comprise some of the framework constituents. Authigenic phases are very poorly preserved consisting of loosely packed kaolinite clays (View C, “K”).

Photo A: 40X PPL,   Photo B: 40X XPL,   Photo C: 100X PPL,   Photo D: 100X PPL

Taglu C-42 **9434.2 feet**

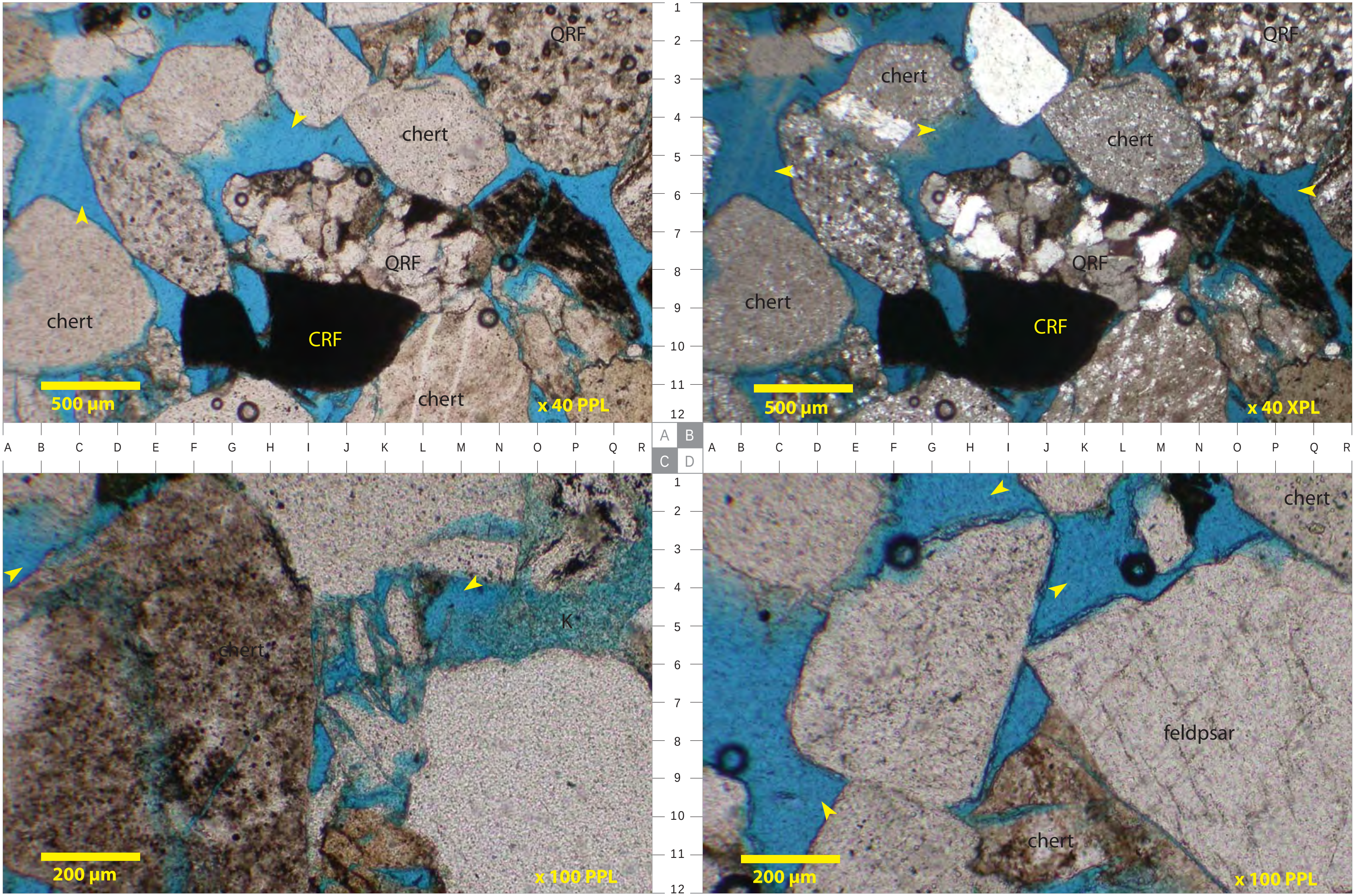


Plate 08
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9435 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9445.6 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9453 feet

Taglu

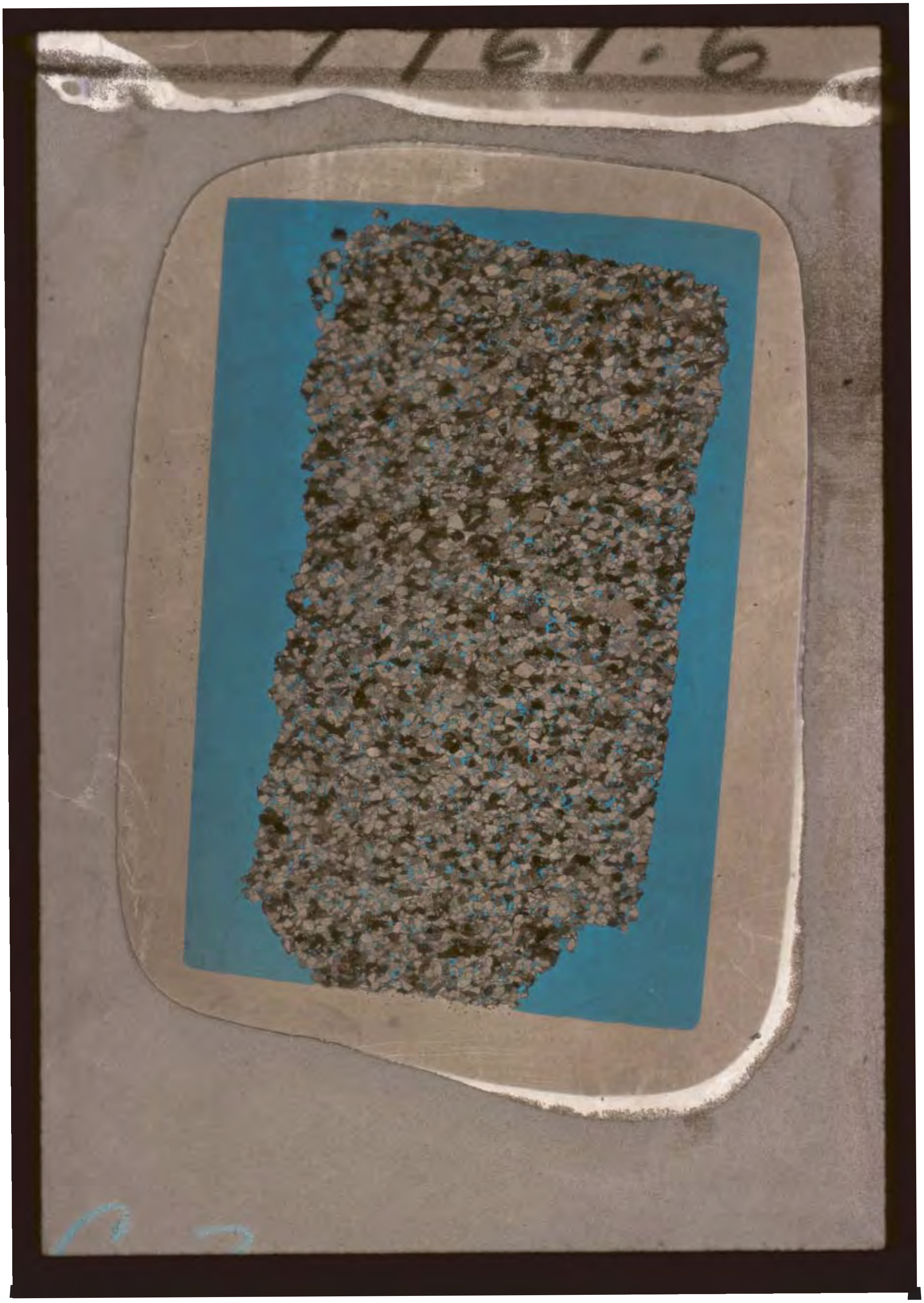
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9461.6 feet



Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9465 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9466.1 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 09

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 17.6%   Core Analysis Permeability: 15.7 md

Depth: 9466.1 feet

Well sorted, fine grained litharenites were intercepted by core recovered at 9466.1 feet. Grain contacts are tangential and concavo-convex reflecting moderate mechanical compaction. Framework constituents include monocrystalline quartz, clay-rich sedimentary grains, chert, feldspathic clasts and yellow stained K-feldspar. Dissolution of unstable grains (View D, L:7) has enhanced the effective pore system (small yellow arrows).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

Taglu C-42 **9466.1 feet**

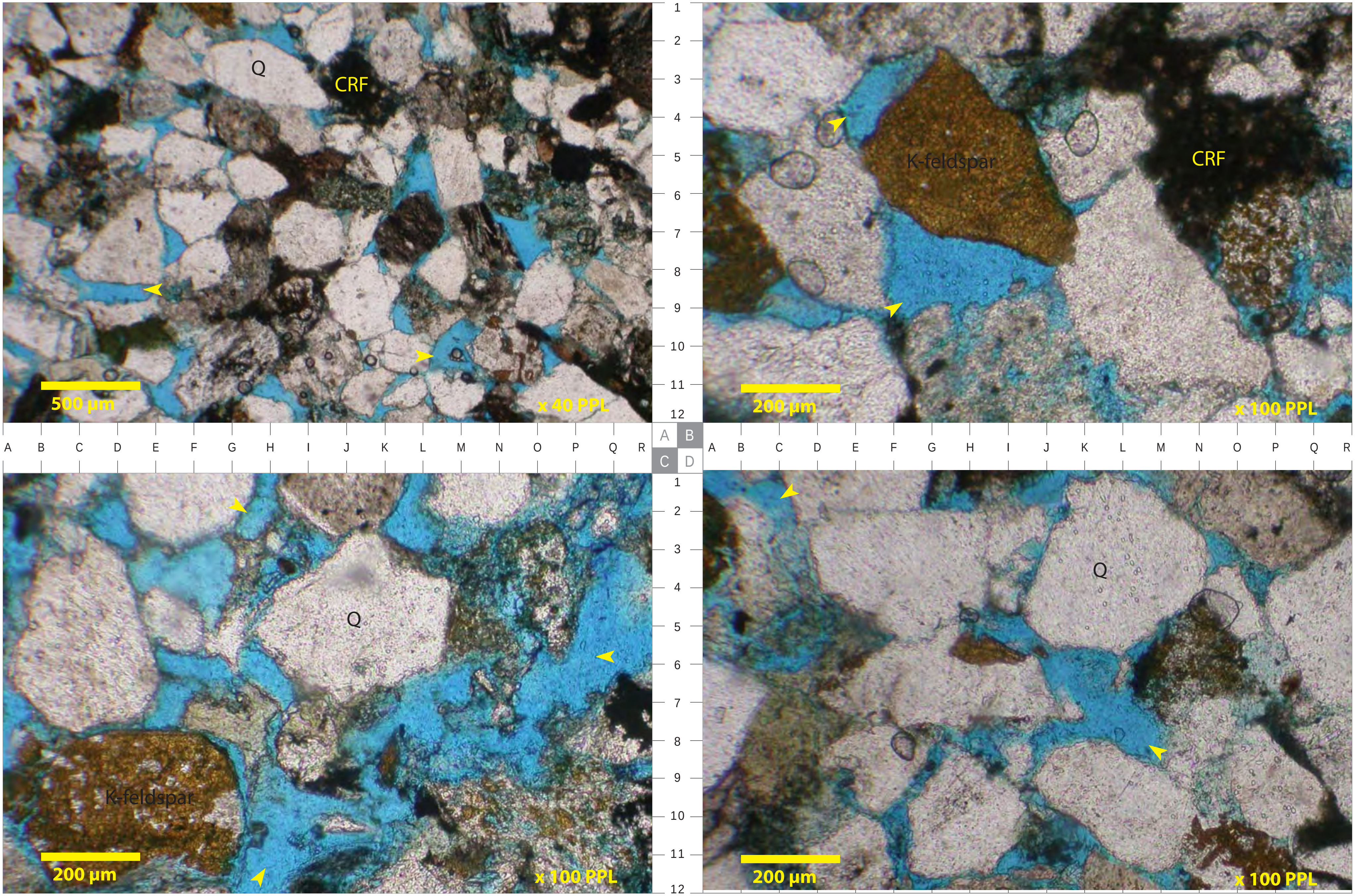


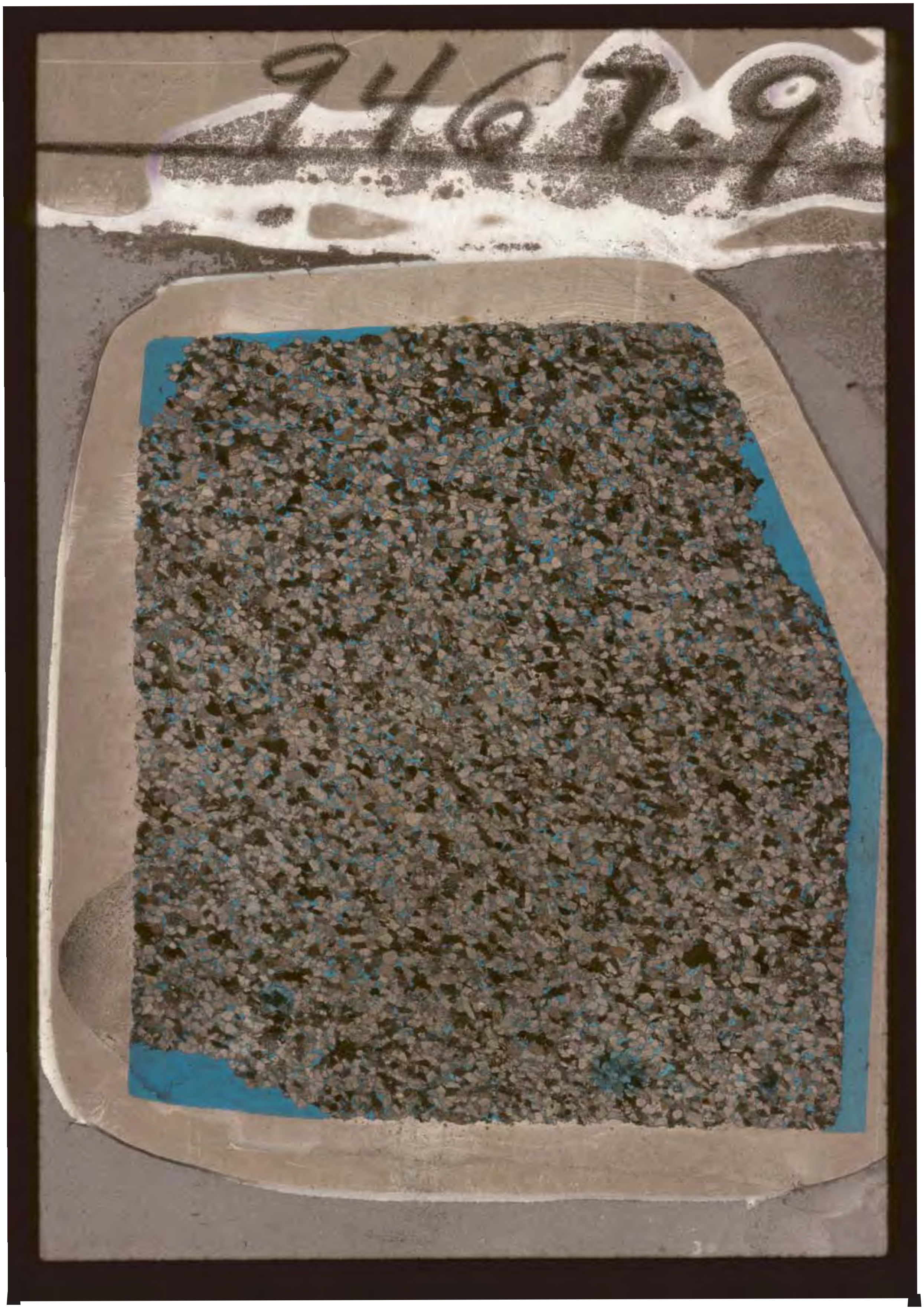
Plate 09
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9467.9 feet



Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9468 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42 9471 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 10

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 9471 feet

Massive, well sorted, non-porous Taglu Sequence litharenites were encountered by core taken at 9471 feet. This interval is considered non-reservoir quality due to the lack of effective macropores. Grain compaction, evidenced by concavo-convex and tangential grain contacts, is significant in this interval. Framework grains include chert, monocrystalline quartz (Q) and argillic sedimentary grains (CRF). Rare authigenic cements include microcrystalline pyrite precipitated within chert micropores.

Photo A: 40X PPL,   Photo B: 40X XPL,   Photo C: 100X PPL,   Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9471 feet

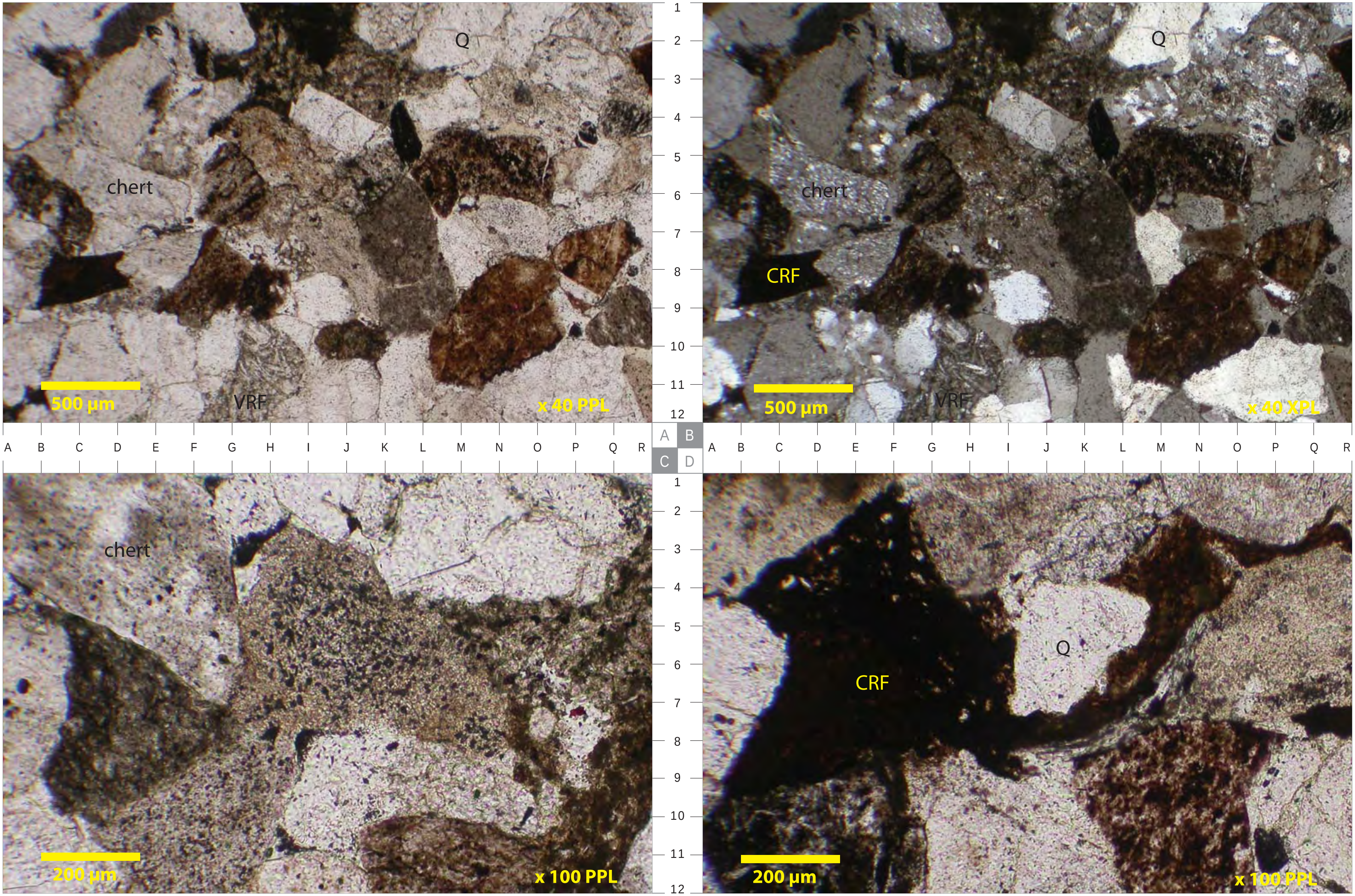


Plate 10
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9472.2 feet

2 mm

Taglu

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 11

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 18.8% Core Analysis Permeability: 44.3 md

Depth: 9472.2 feet

Moderately well sorted, fine to medium grained litharenites characterize the porous Taglu clastics recovered from core at 9472.2 feet. Trace to minor bitumen (View D, small red arrows) lines effective macropores. Note partially leached framework grains (View C, N:10) within macropores. Microfracture cross cuts chert grain in View C. Grain contacts are tangential and concavo-convex.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

Taglu C-42 | 9472.2 feet

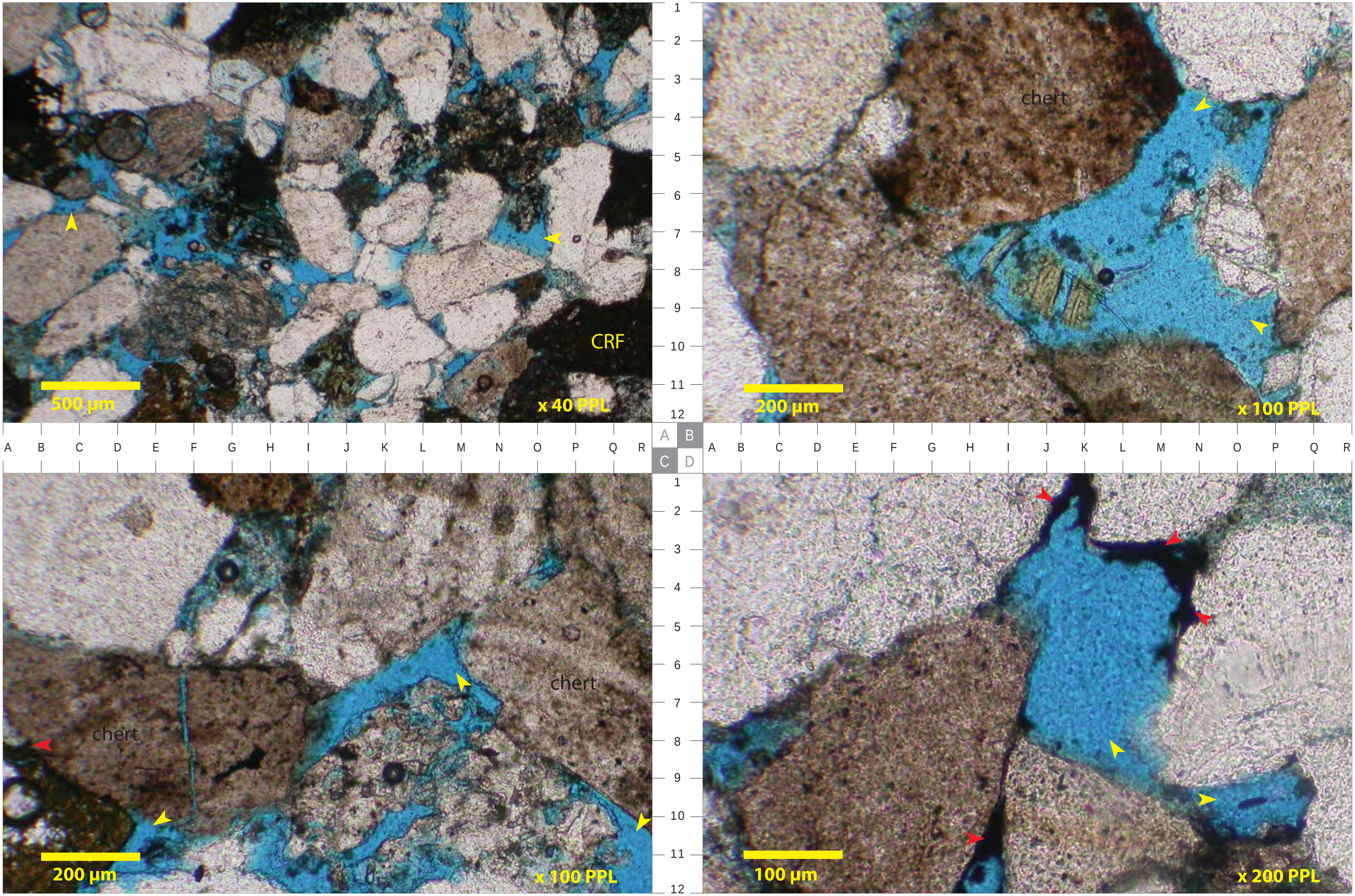


Plate 11
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9474 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 12

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 9474 feet

Carbonate cemented, non-reservoir quality Taglu clastics represent core recovered at 9474 feet. Poikilotopic non-stained carbonate cement (large green arrows) occludes effective macropores in this well sorted, medium to coarse grained litharenite. Framework grains include chert, monocrystalline quartz, yellow stained K-feldspar, argillic clasts and polycrystalline quartz (PxQ).

Photo A: 40X PPL, Photo B: 40X XPL, Photo C: 100X PPL, Photo D: 100X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9474 feet

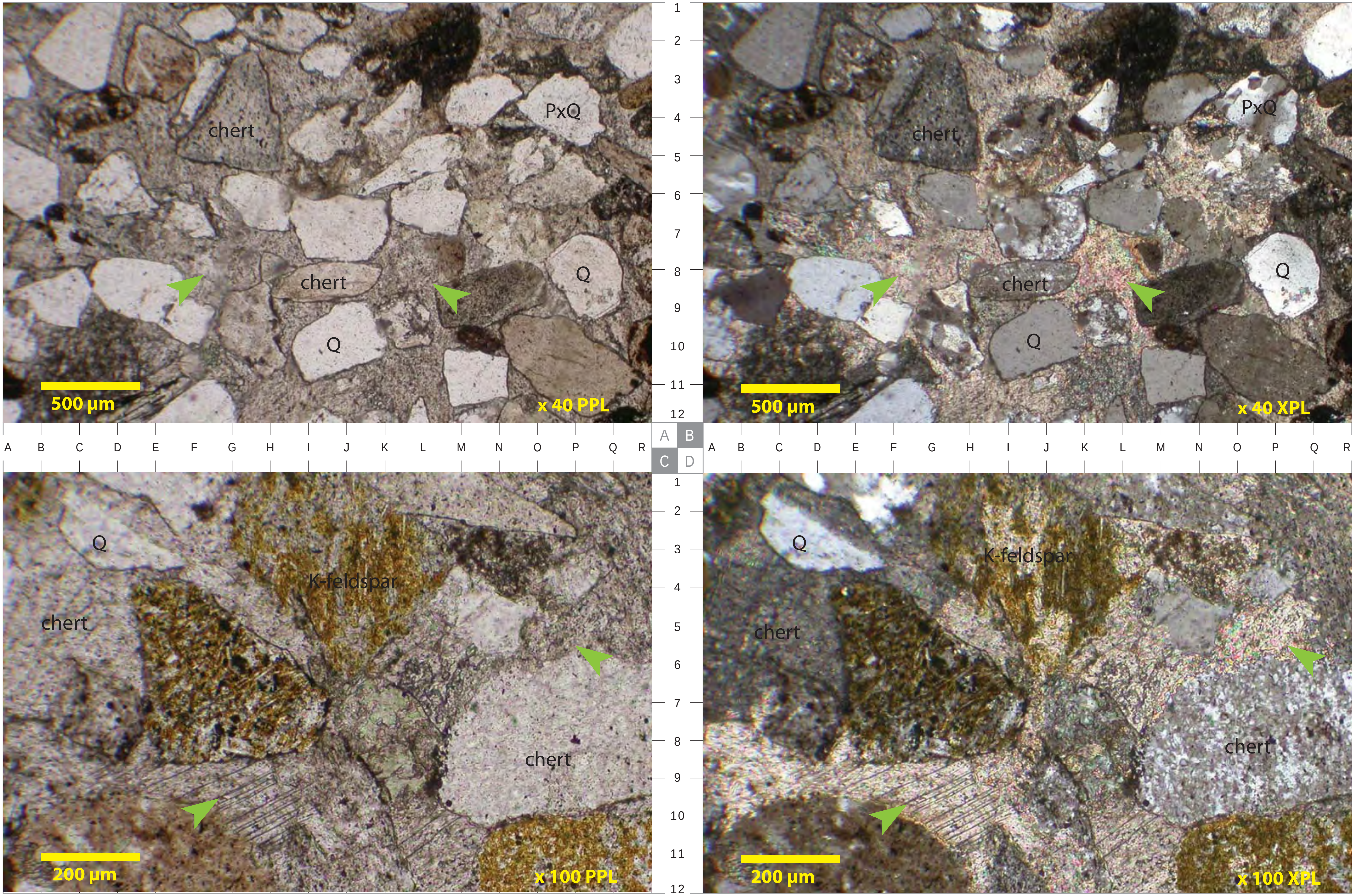


Plate 12
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9475 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 13

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 19.8% Core Analysis Permeability: 281 md

Sample #: 07-09
Depth: 9475 feet

Porous and permeable, medium to coarse grained, moderately well sorted litharenites were recovered from core at 9475 feet. Authigenic cements are rare and consist of patchily distributed finely crystalline ferroan calcite (View C, M:8; View D, N:5) and pyrite precipitated within chert micropores. Chert, monocrystalline quartz (Q), volcanic rock fragments (VRF), micas and clay-rich sedimentary grains comprise some of the framework components. The dissolution of carbonate cement and unstable framework grains has enhanced the effective macropore system (small yellow arrows).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9475 feet

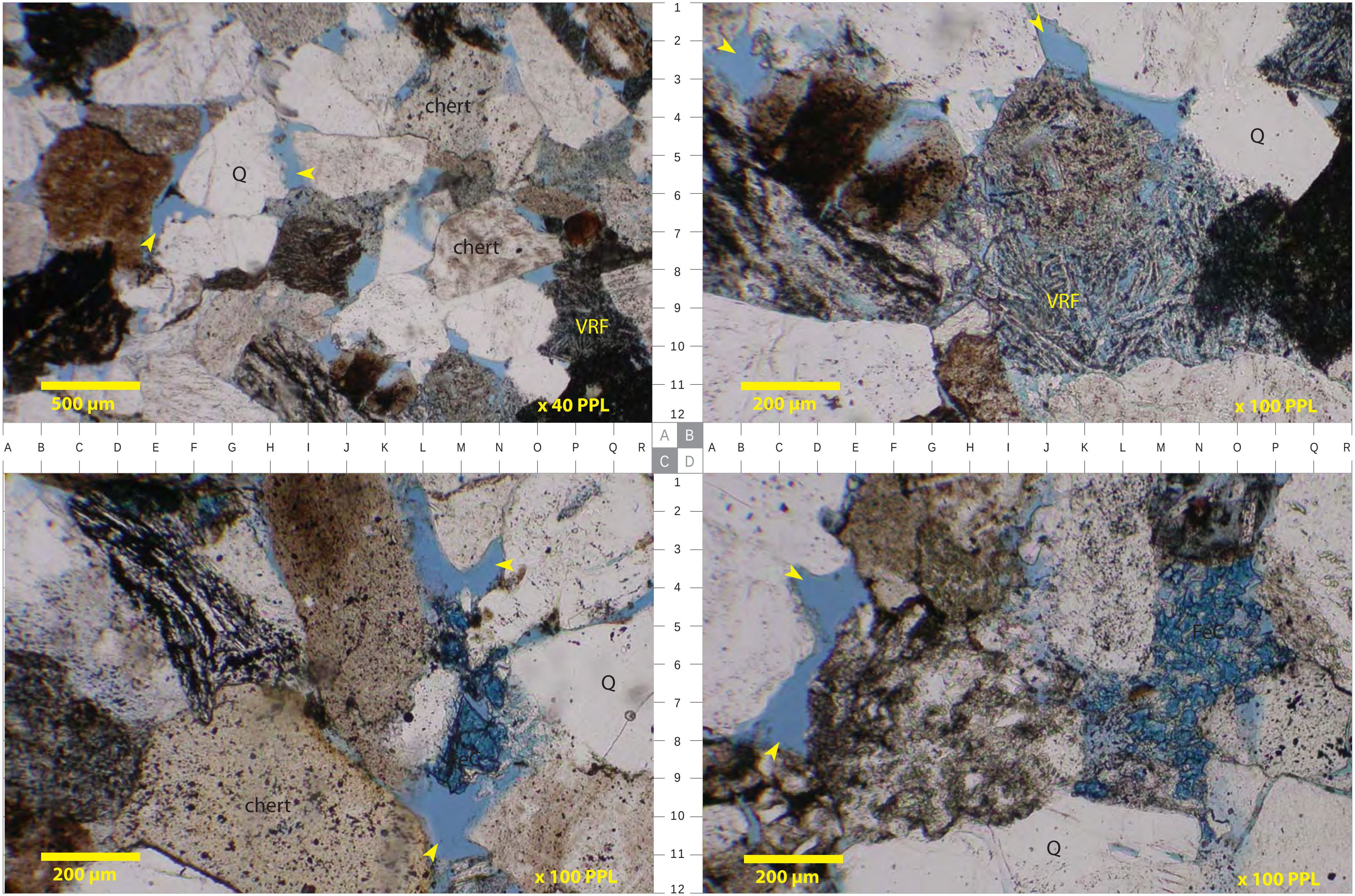


Plate 13

January 2010

CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9475.5 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9475.6 feet

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 14

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 8.6%   Core Analysis Permeability: 0.97 md

Sample #: 07-10
Depth: 9475.6 feet

Poikilotopic coarsely crystalline ferroan calcite cement partially occludes effective macroporosity in this carbonate cemented litharenite recovered from core at 9475.6 feet. Medium to coarse grained, well sorted litharenites with tangential grain contacts are recognized in this interval. Polycrystalline quartz, monocrystalline quartz (Q), chert, volcanic rock fragments (VRF), feldspars (View D) and clay-rich sedimentary grains are the main framework constituents. Effective macroporosity (small yellow arrows) is unevenly distributed in this Taglu interval.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42 **9475.6 feet**

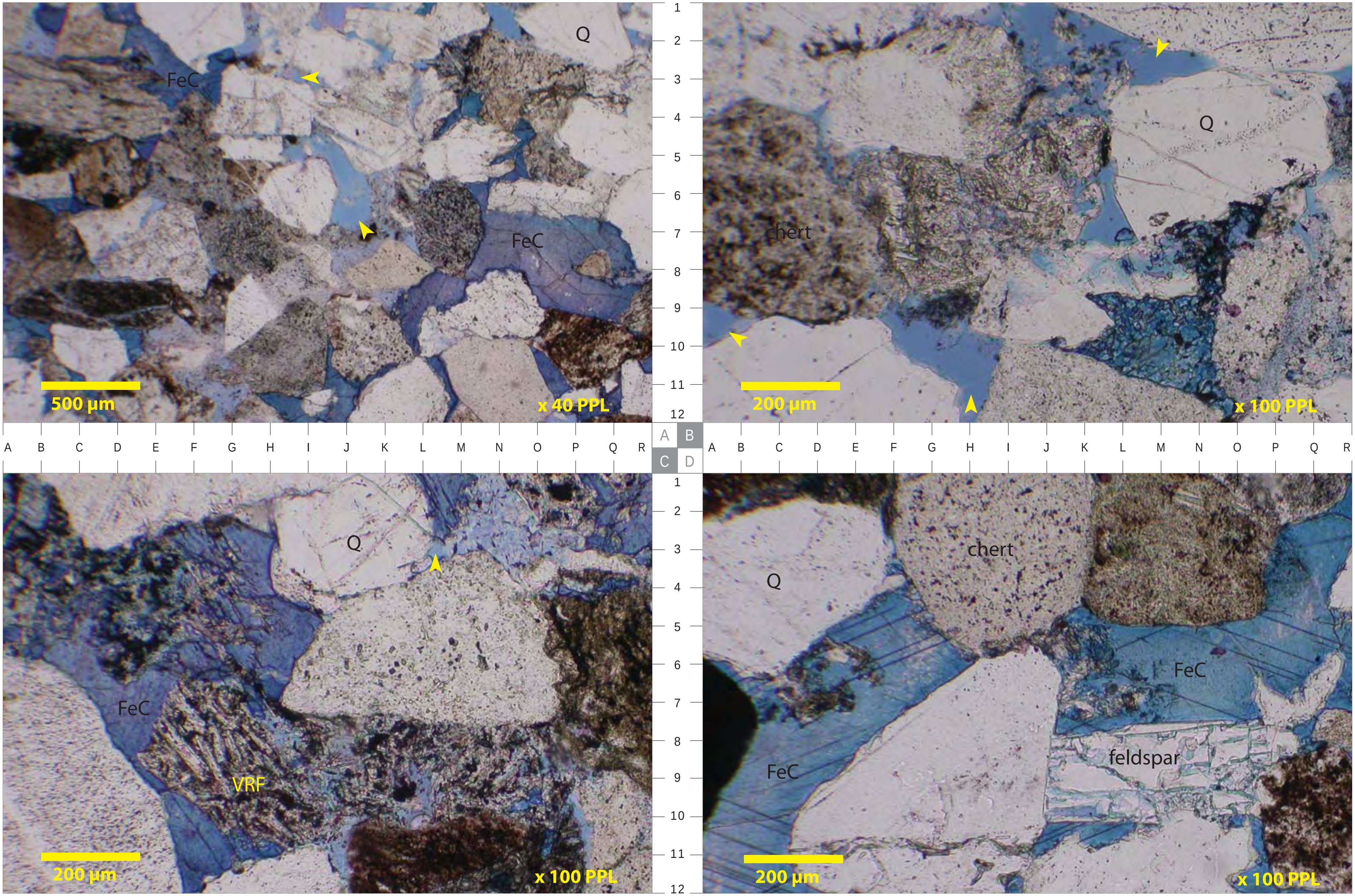


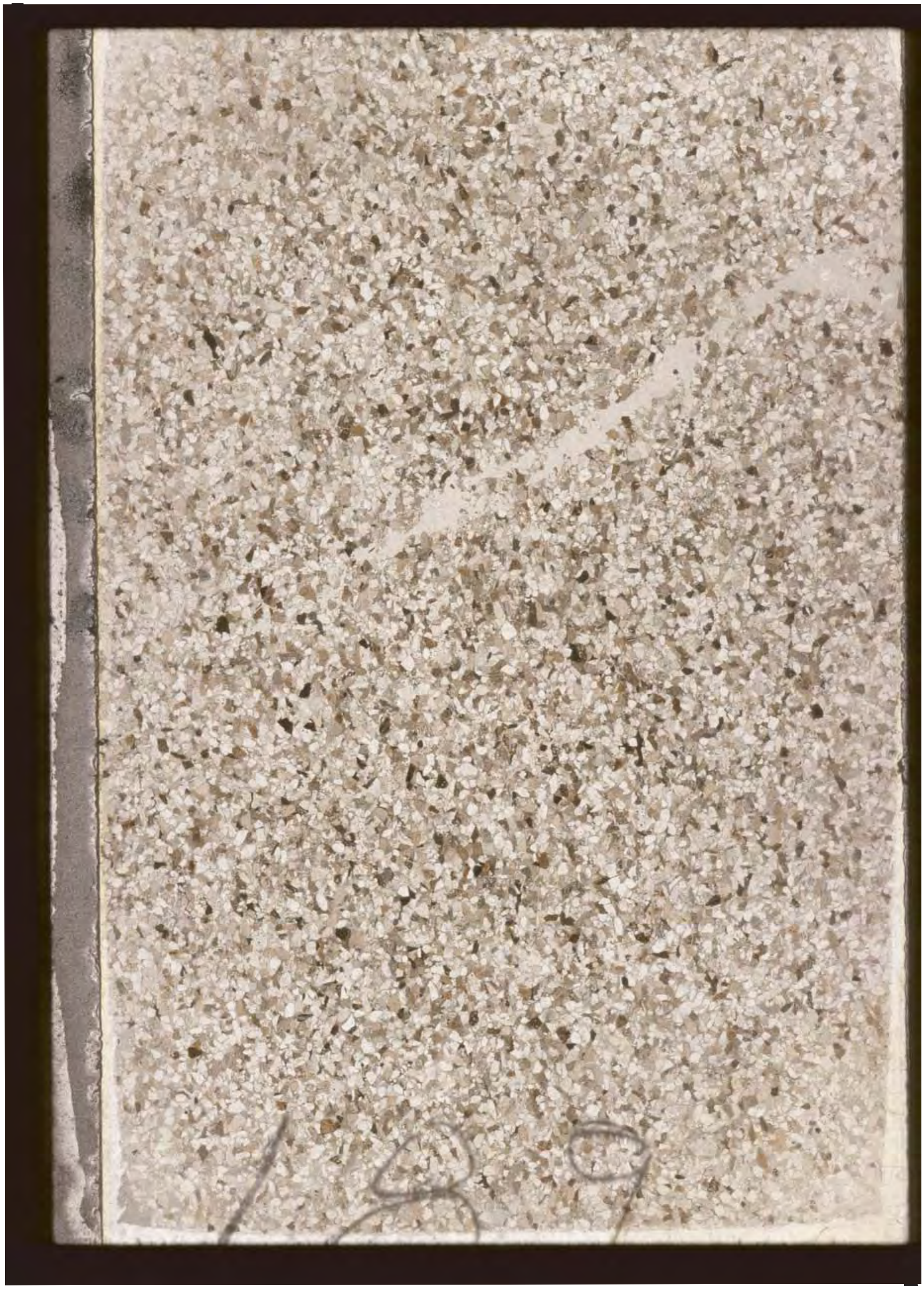
Plate 14
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9476 feet



Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9476.2 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 15

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 8.6% Core Analysis Permeability: 0.97 md

Sample #: 07-11
Depth: 9476.2 feet

Moderately well sorted, massive, ferroan carbonate cemented litharenites were encountered by core taken at 9476.2 feet. Poikilotopic ferroan calcite (FeC) is the main pore occluding carbonate cement, engulfing grain remnants (View B, H:7) and ferroan dolomite (FeD). Ferroan calcite post-dates ferroan dolomite cementation. Rare kaolinite clays are loosely packed within open macropores (View A, "K"). Monocrystalline quartz (Q), chert and clay-rich sedimentary grains are the main framework components. Note microfractured grain in View A.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

Taglu C-42

9476.2 feet

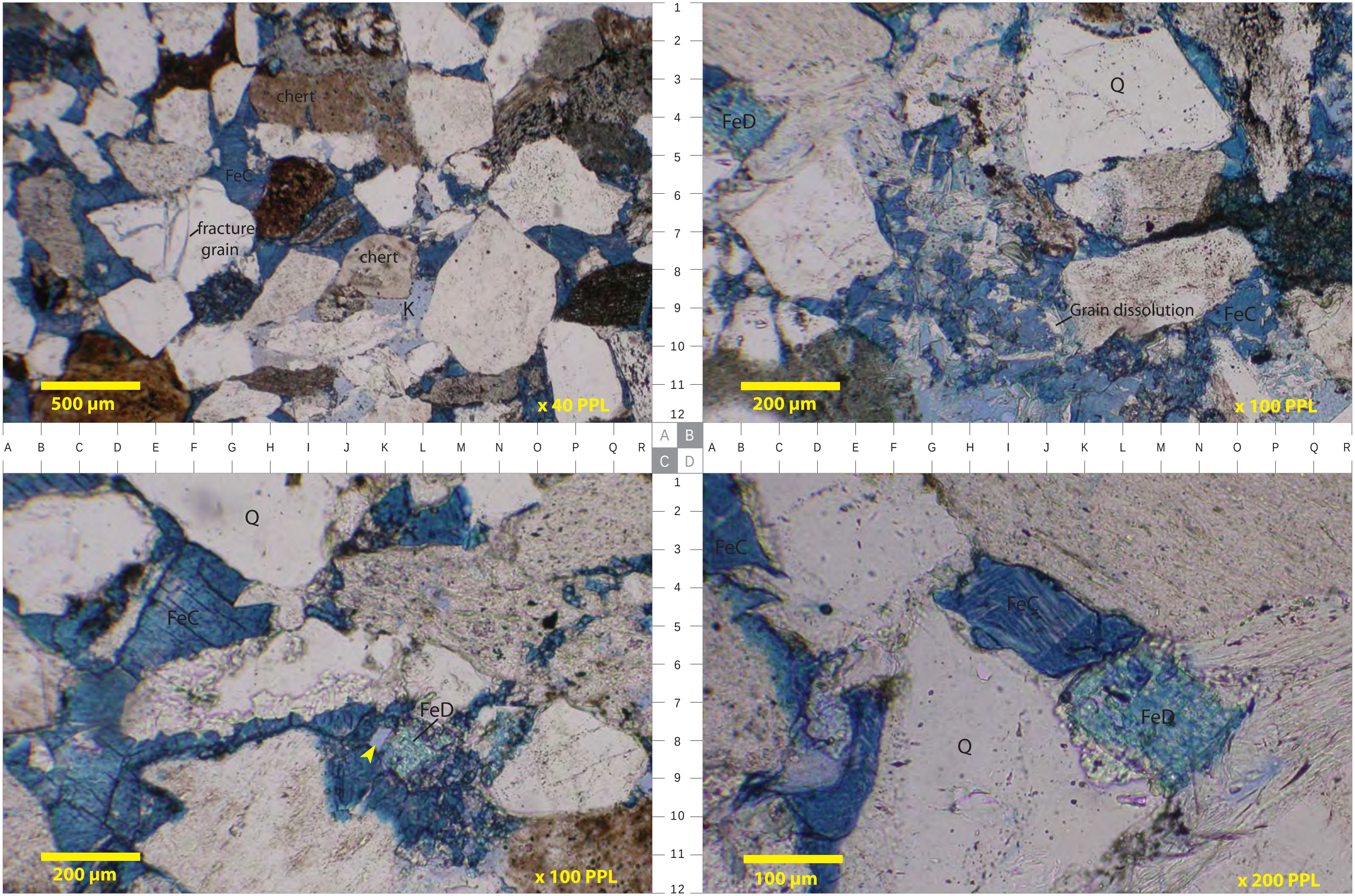


Plate 15
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9478 feet

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9480 feet

Taglu

2 mm

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9481 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 16

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 3.3%   Core Analysis Permeability: 0.03 md

Sample #: 07-12
Depth: 9481 feet

Ferroan carbonate cement occludes macroporosity in this non-reservoir quality fine to medium grained, moderately well sorted litharenites. Ferroan calcite cement (FeC) engulfs ferroan dolomite (FeD) reflecting that ferroan calcite emplacement postdates ferroan dolomite cementation. Grain contacts are floating in the poikilotopic carbonate cement. Chert, monocrystalline quartz (Q) feldspathic grains (View A, M:9) and argillic grains comprise some of the framework constituents.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9481 feet

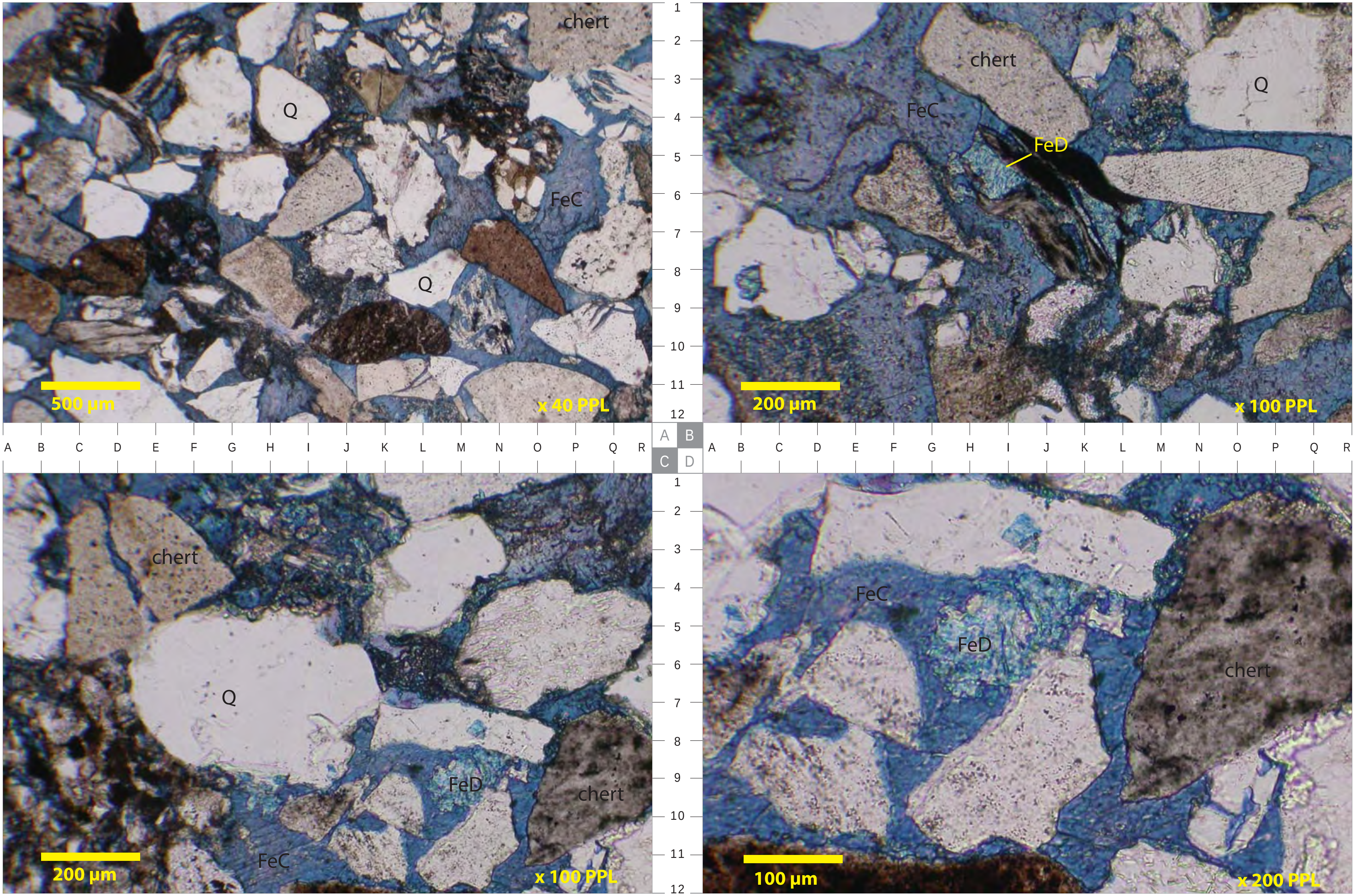


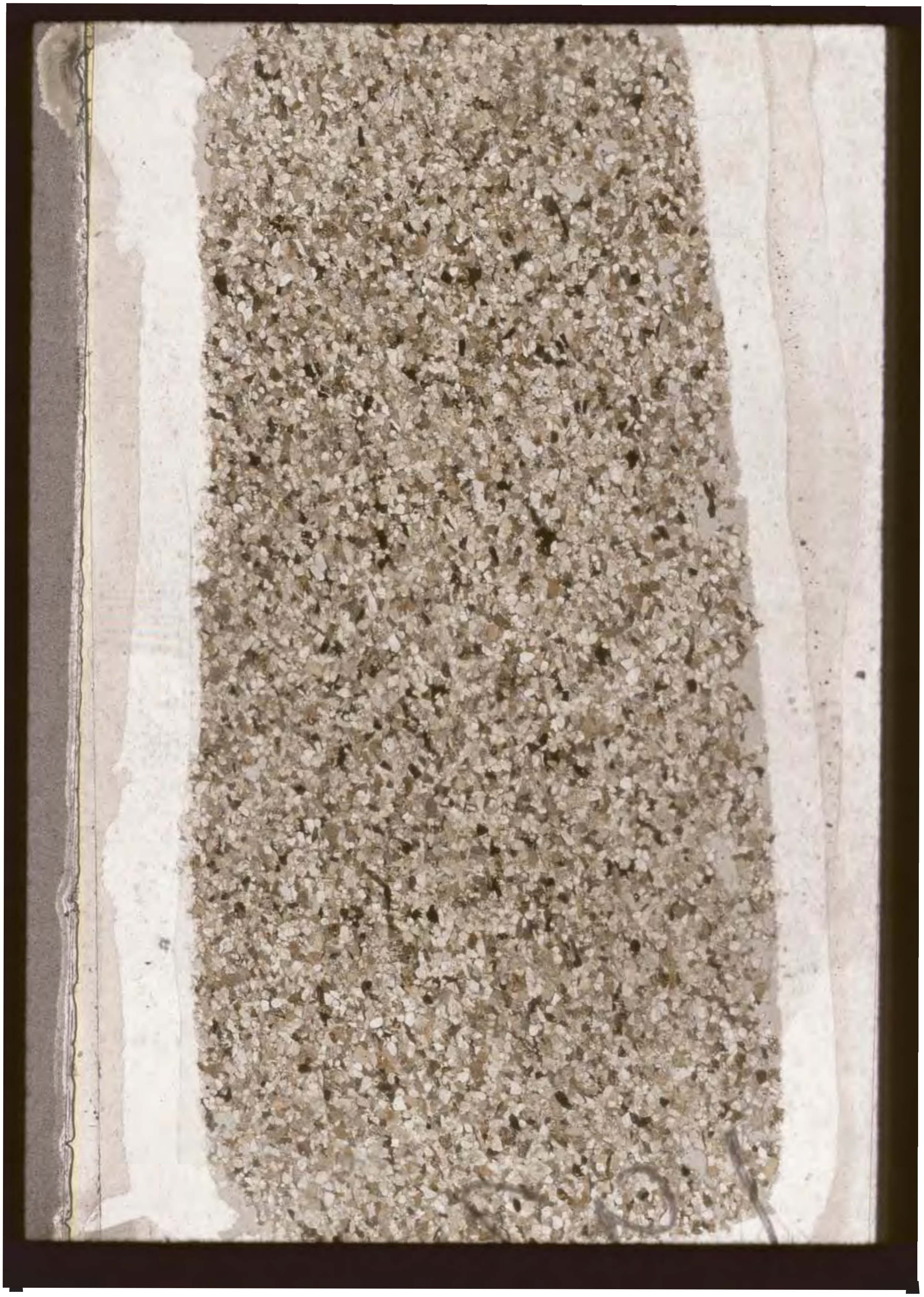
Plate 16
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9485 feet



Taglu

2 mm

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9487 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9487.7 feet

2 mm

Taglu

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 17

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 19.1% Core Analysis Permeability: 180 md

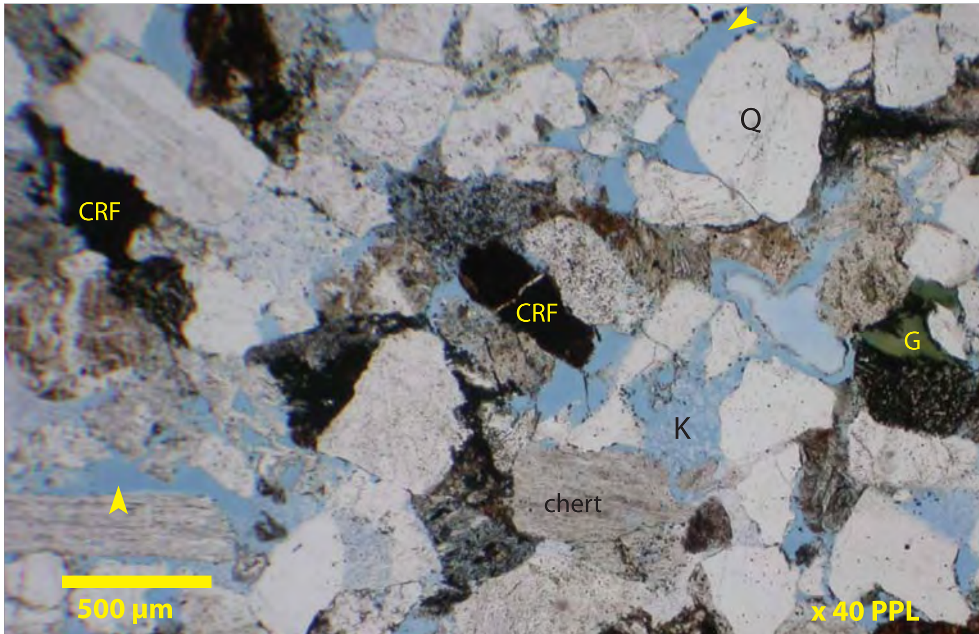
Depth: 9487.7 feet

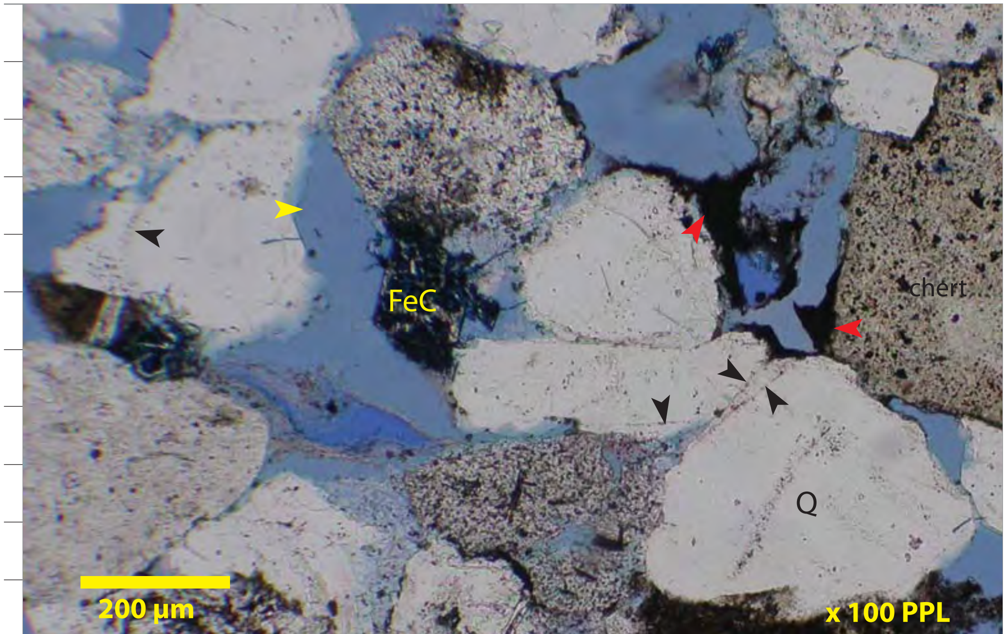
Porous, well sorted, upper fine grained litharenites are recognized from core taken at 9487.7 feet. Effective macroporosity is well developed (small yellow arrows). Ferroan calcite cement (FeC) is patchily distributed. Dissolution of ferroan calcite and unstable feldspathic framework grains has enhanced the effective pore system. Monocrystalline quartz (Q), chert, volcanic rock fragments (VRF), clay-rich sedimentary grains (CRF) and glauconite (View A, “G”) are some of the framework components. Grain contacts are mainly tangential in this interval. Note rare kaolinite clays have precipitated loosely within open macropores (Views A and C, “K”). Trace bitumen lines macropores (small red arrows) in View B.

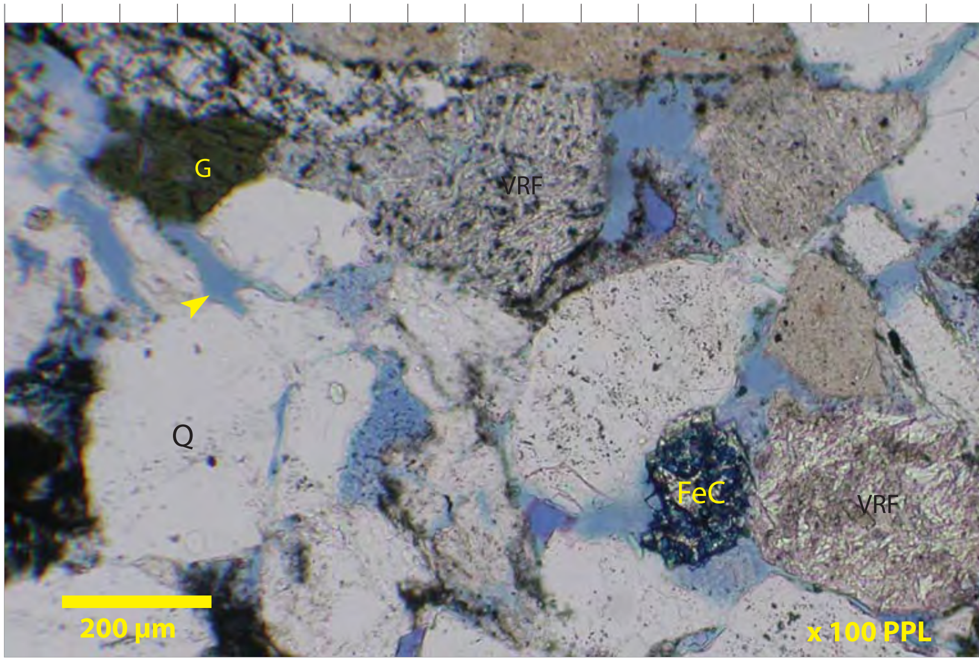
Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

Taglu C-42

9487.7 feet







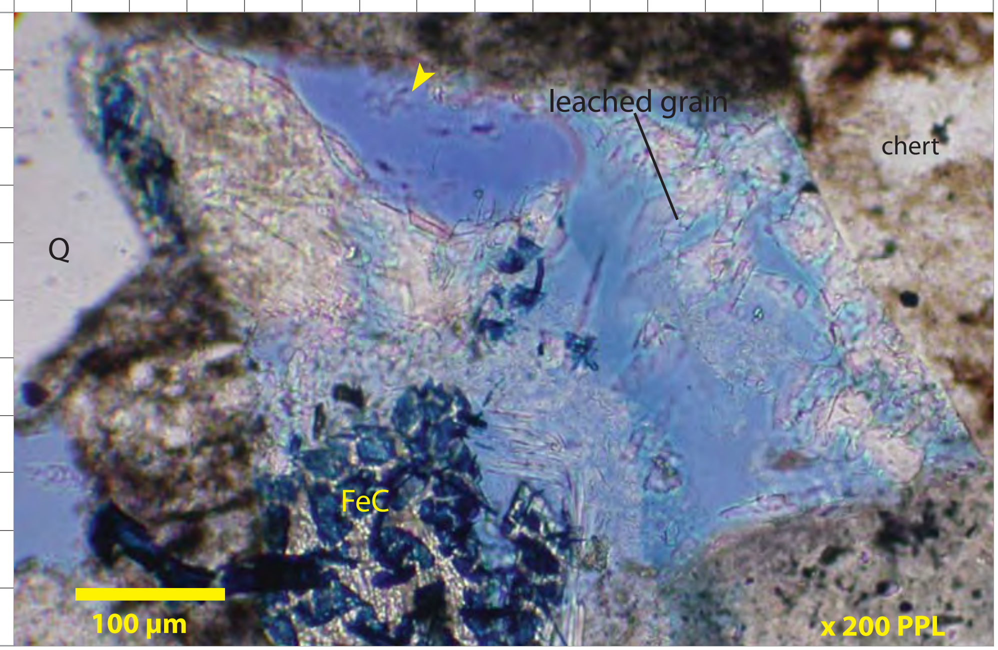


Plate 17

January 2010

CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9489.6 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9491 feet

2 mm

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9493 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9524 feet

2 mm

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42 9526.2 feet

2 mm

Taglu

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 18a

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 15.7% Core Analysis Permeability: 382 md

Sample #: 07-14
Depth: 9526.2 feet

Patchily distributed, poikilotopic coarsely crystalline ferroan calcite (FeC) cement partially occludes effective macroporosity in this medium to coarse grained, well sorted litharenite. Precipitation of carbonate cement postdates dissolution of feldspars (View B). Loosely packed kaolinite clay precipitation (Views C and D, “K”) postdates ferroan calcite emplacement. Chert, monocrystalline quartz (Q) and polycrystalline quartz are the main framework constituents

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42 — 9526.2 feet

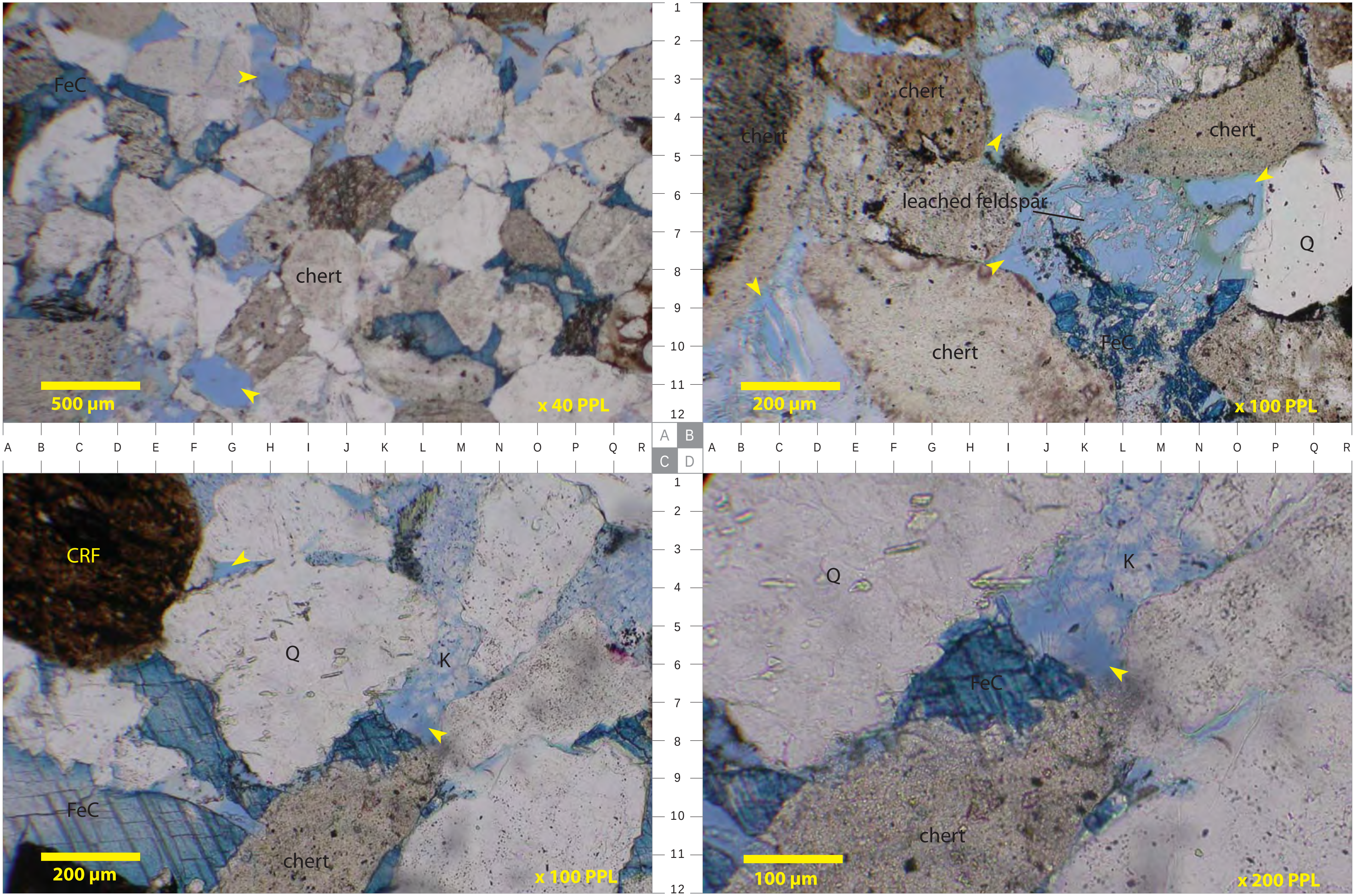


Plate 18a
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 18b

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 15.7% Core Analysis Permeability: 382 md

Sample #: 07-14
Depth: 9526.2 feet

High magnification thin section photomicrograph views illustrate coarsely crystalline ferroan calcite partially occludes macroporosity in this medium to coarse grained litharenite. Subsequent dissolution of the ferroan calcite has enhanced the macropore system (small yellow arrows). Grain contacts are tangential and floating. Chert, polycrystalline quartz (PxQ) and monocrystalline quartz dominate the framework grains. Trace pyrite has precipitated within chert micropores.

Photo A: 100X PPL,   Photo B: 100X XPL,   Photo C: 100X PPL,   Photo D: 100X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9526.2 feet

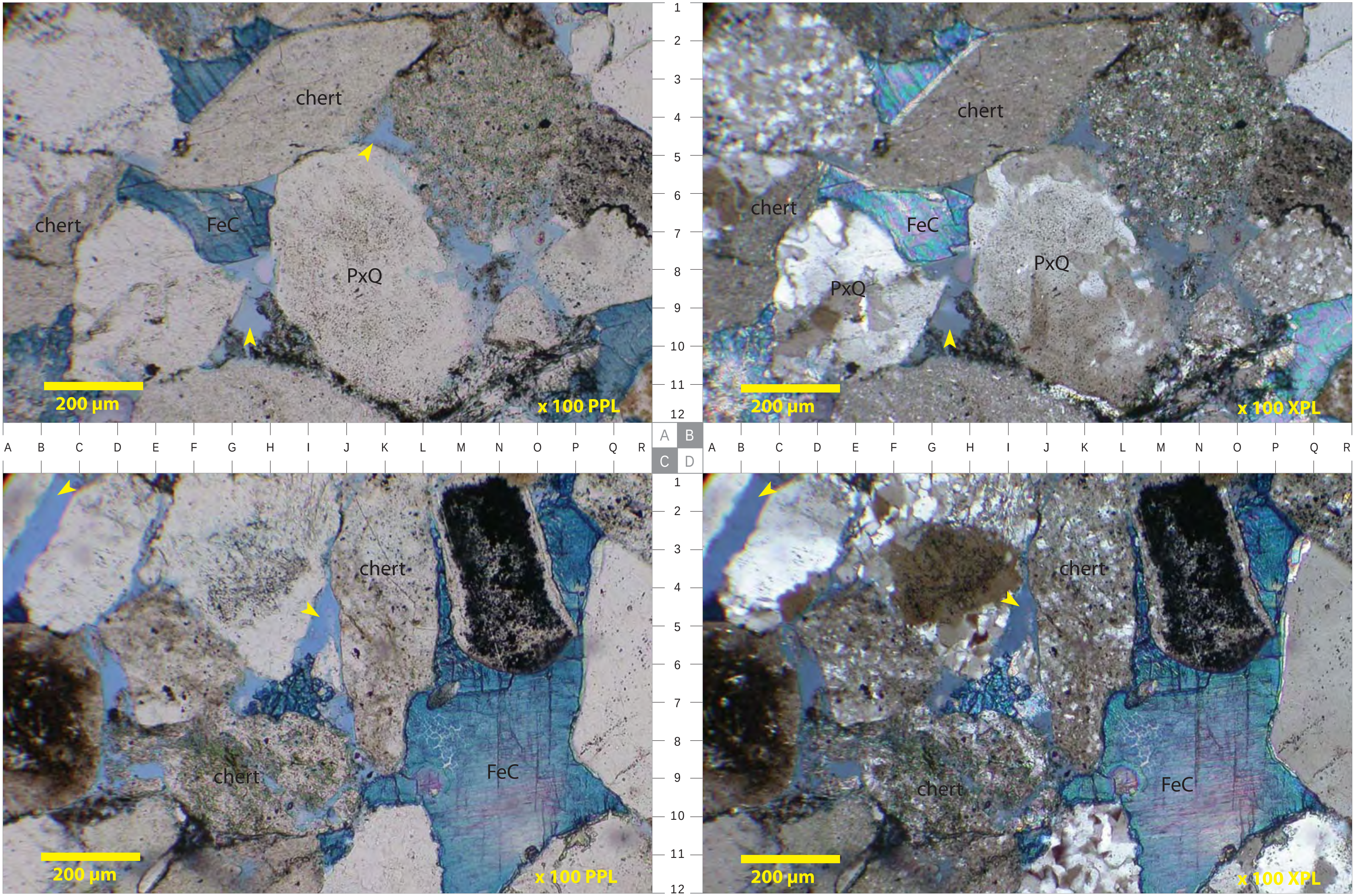


Plate 18b

January 2010

CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9526.9 feet

2 mm

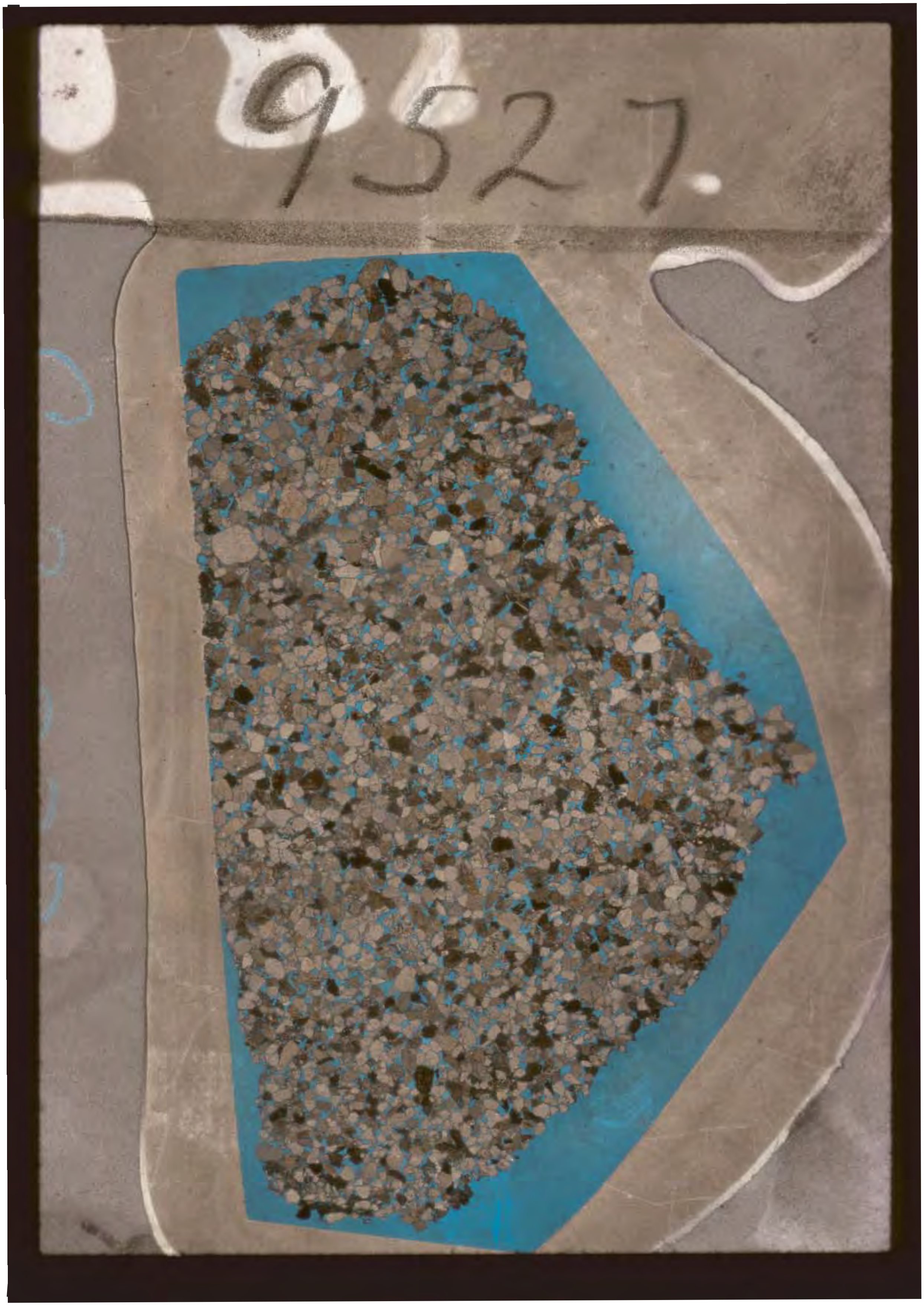
Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9527 feet



2 mm

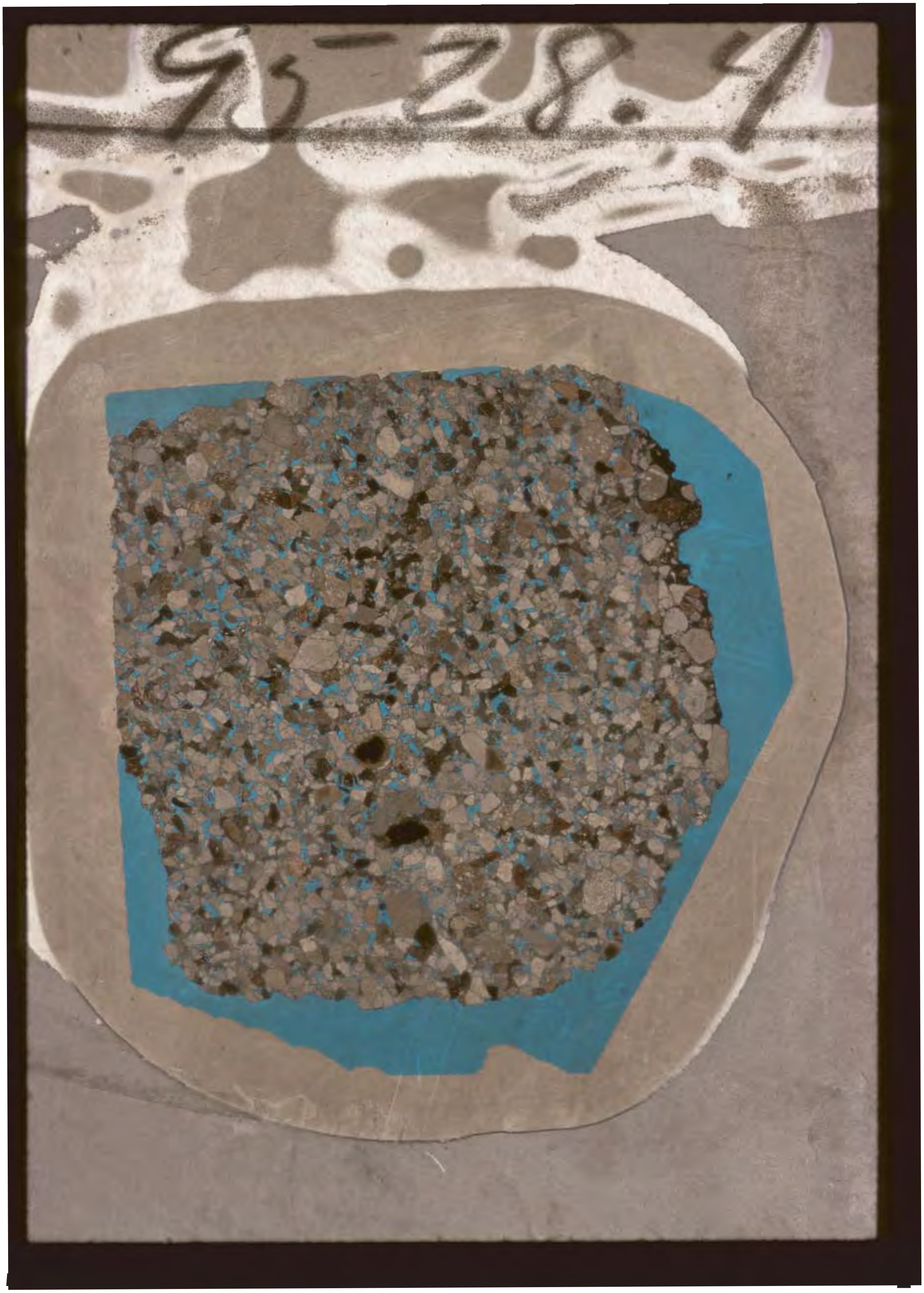
Taglu

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9528.4 feet



Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 19

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 19.8% Core Analysis Permeability: 621 md

Depth: 9528.4 feet

Poorly sorted, medium to coarse grained litharenites with excellent reservoir quality were encountered by core at 9528.4 feet. Chert, polycrystalline quartz (PxQ), monocrystalline quartz (Q) and argillic sedimentary grains (CRF) are the main framework constituents. Grain contacts are mainly tangential in this interval. Effective macroporosity (small yellow arrows) is well developed with core analysis porosity of 19.8%; measured permeability is 621 md. Partial to complete dissolution of feldspathic grains (Views C and D, M:8) has enhanced the effective pore system. Authigenic cements are poorly preserved and consist of rare pyrite precipitated within chert micropores.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9528.4 feet

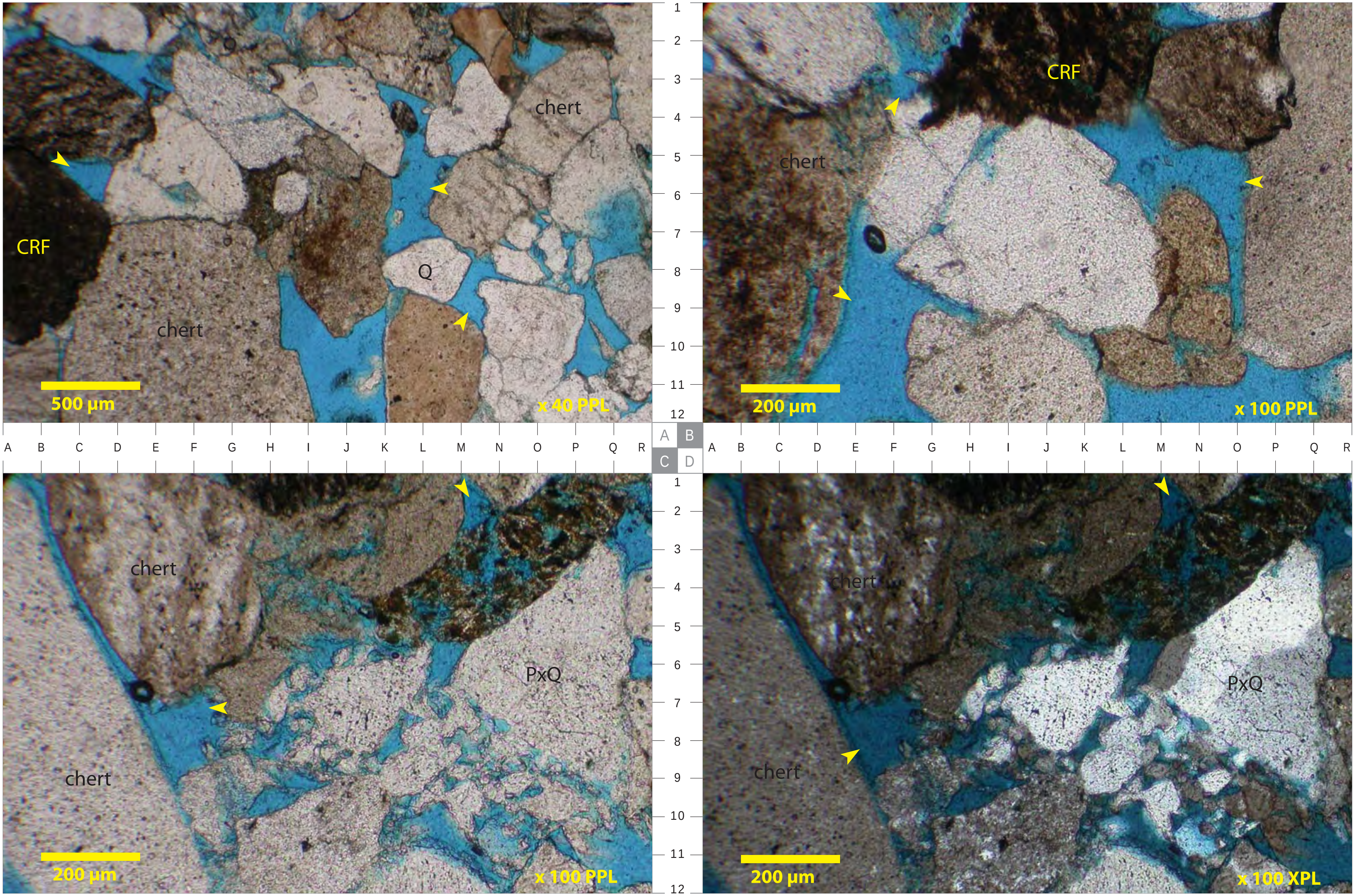


Plate 19

January 2010

CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9531 feet

2 mm

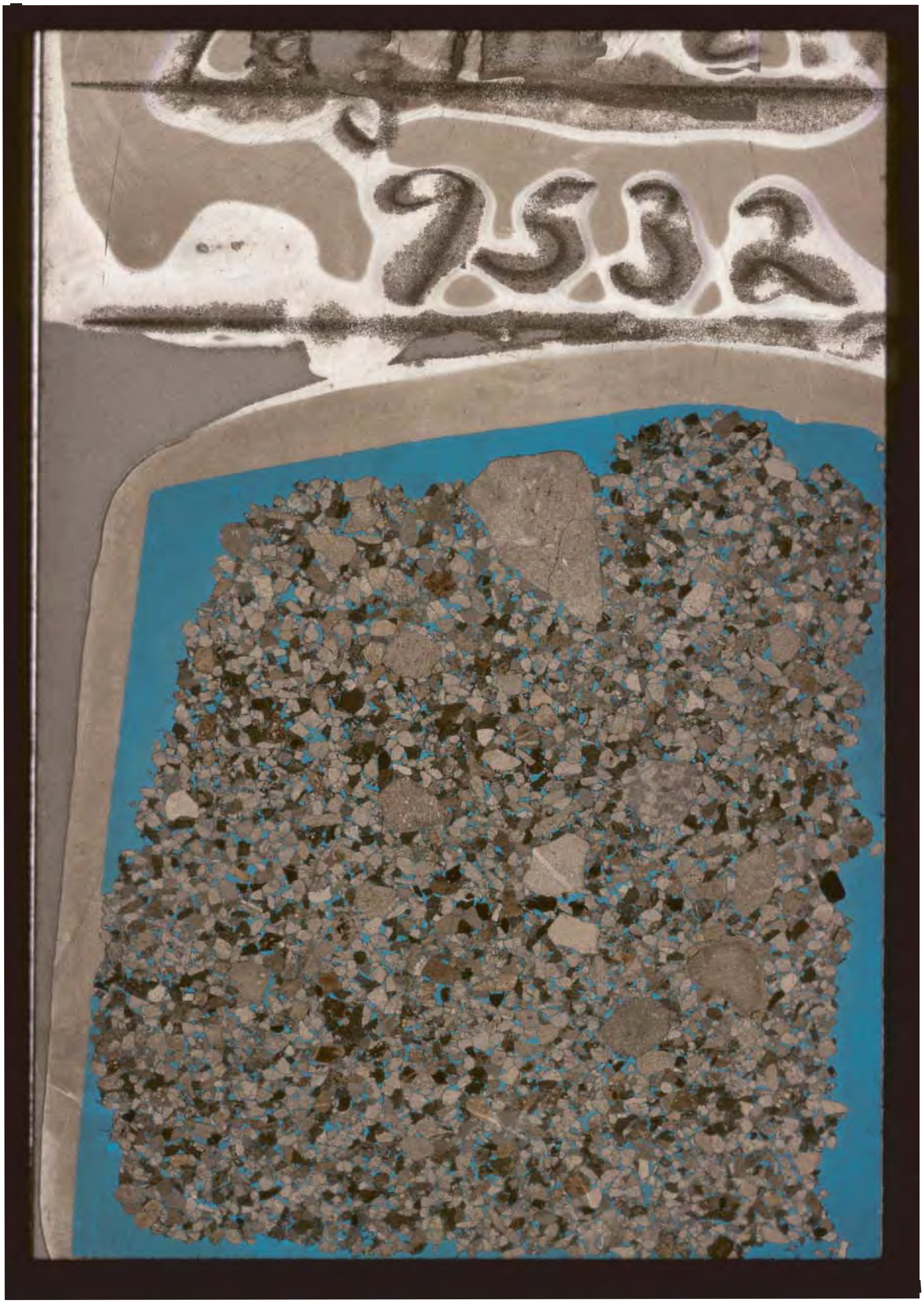
Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9532 feet



2 mm

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 20

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 18.3% Core Analysis Permeability: 830 md

Depth: 9532 feet

Very poorly sorted, coarse to granule sized grains comprise the litharenites recovered from core at 9532 feet. Framework components are dominated by chert, polycrystalline quartz (PxQ), monocrystalline quartz (Q) and clay-rich sedimentary (CRF) grains. Grain contacts are tangential and concavo-convex. Note micro-fractured grain in Views A and B. Authigenic phases are poorly preserved in this porous and permeable interval.

Photo A: 40X PPL, Photo B: 40X XPL, Photo C: 100X PPL, Photo D: 100X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42 — 9532 feet

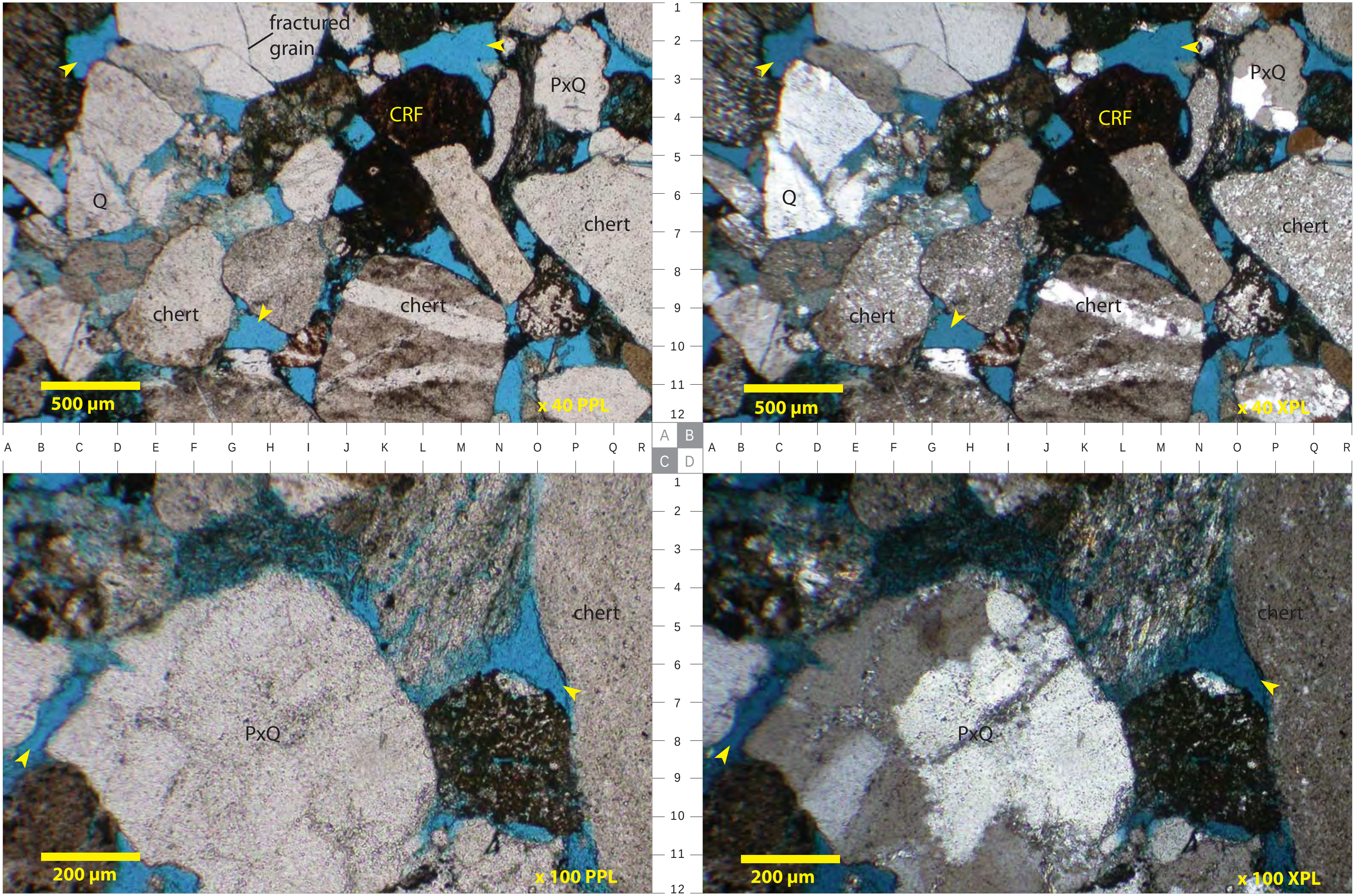


Plate 20
January 2010
CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9533 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9535.8 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9536 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 21

Taglu C-42
Taglu
Argillic Silty Litharenite

Core Analysis Porosity: 5.8%   Core Analysis Permeability: 0.06 md

Sample #: 07-16
Depth: 9536 feet

Non-reservoir quality, very poorly sorted, silt to fine grained litharenites characterize the clastics recovered from core at 9536 feet. Brown argillic clays comprise about one fifth of the rock volume. Authigenic phases are poorly developed consisting of pyrite precipitated within chert micropores. Monocrystalline quartz (Q), chert are the main framework grains with subordinate amounts of organic material and volcanic rock fragments.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

Taglu C-42 9536 feet

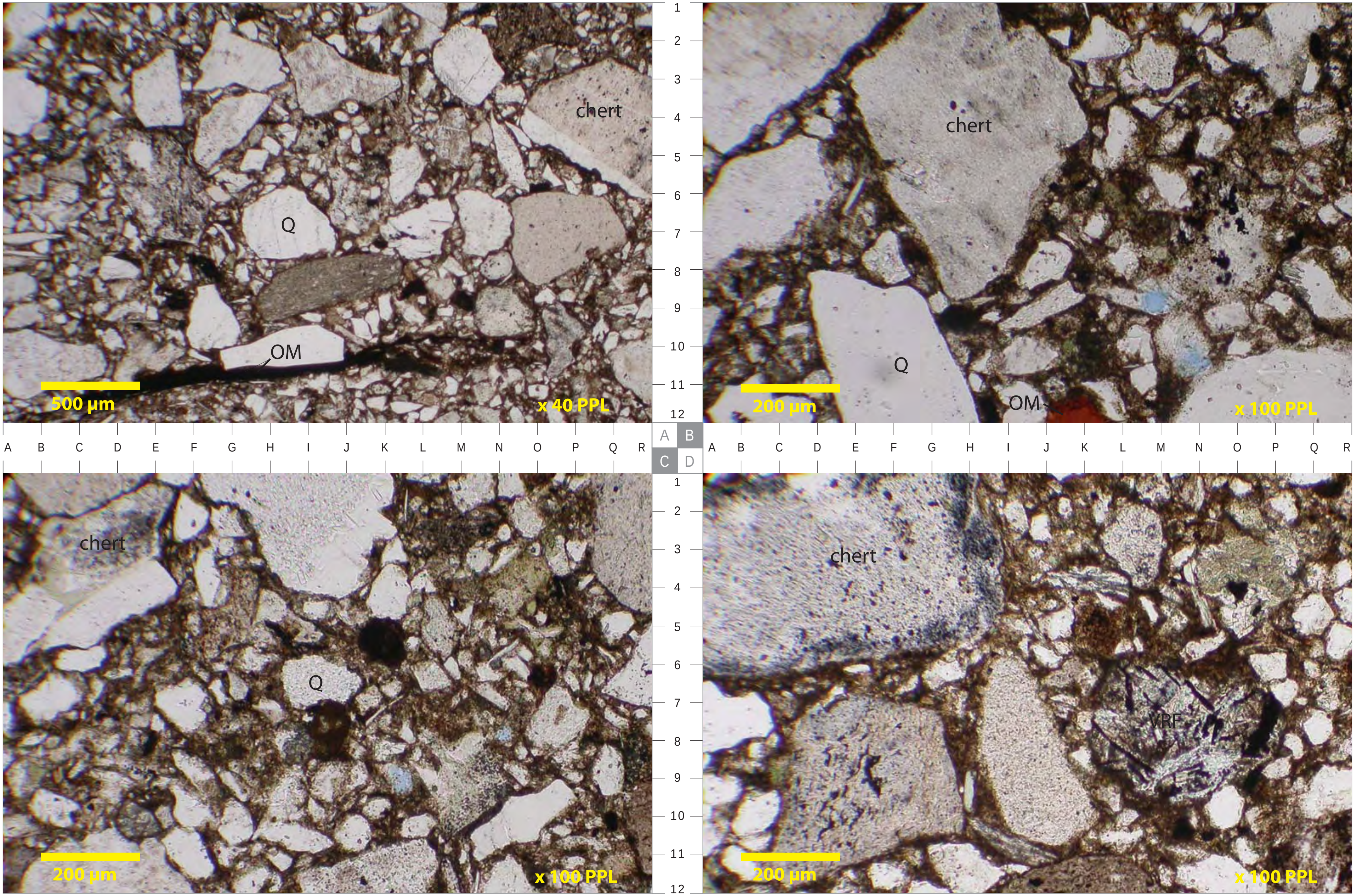


Plate 21
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9539 feet

Taglu

2 mm

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9539.8 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9540 feet

2 mm

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 22

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 18.3% Core Analysis Permeability: 349 md

Sample #: 07-17
Depth: 9540 feet

Moderately well sorted, porous and permeable coarse grained litharenites are recognized from core recovered at 9540 feet. Minor patchily distributed coarsely crystalline ferroan calcite (FeC) partially occludes effective macroporosity (small yellow arrows). Trace to minor amounts of loosely packed kaolinite clays (View D, “K”) have precipitated within open pores. Dissolution of carbonate cement has enhanced the effective pore system. Chert and monocrystalline quartz are the main framework grains in this excellent reservoir quality interval.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9540 feet

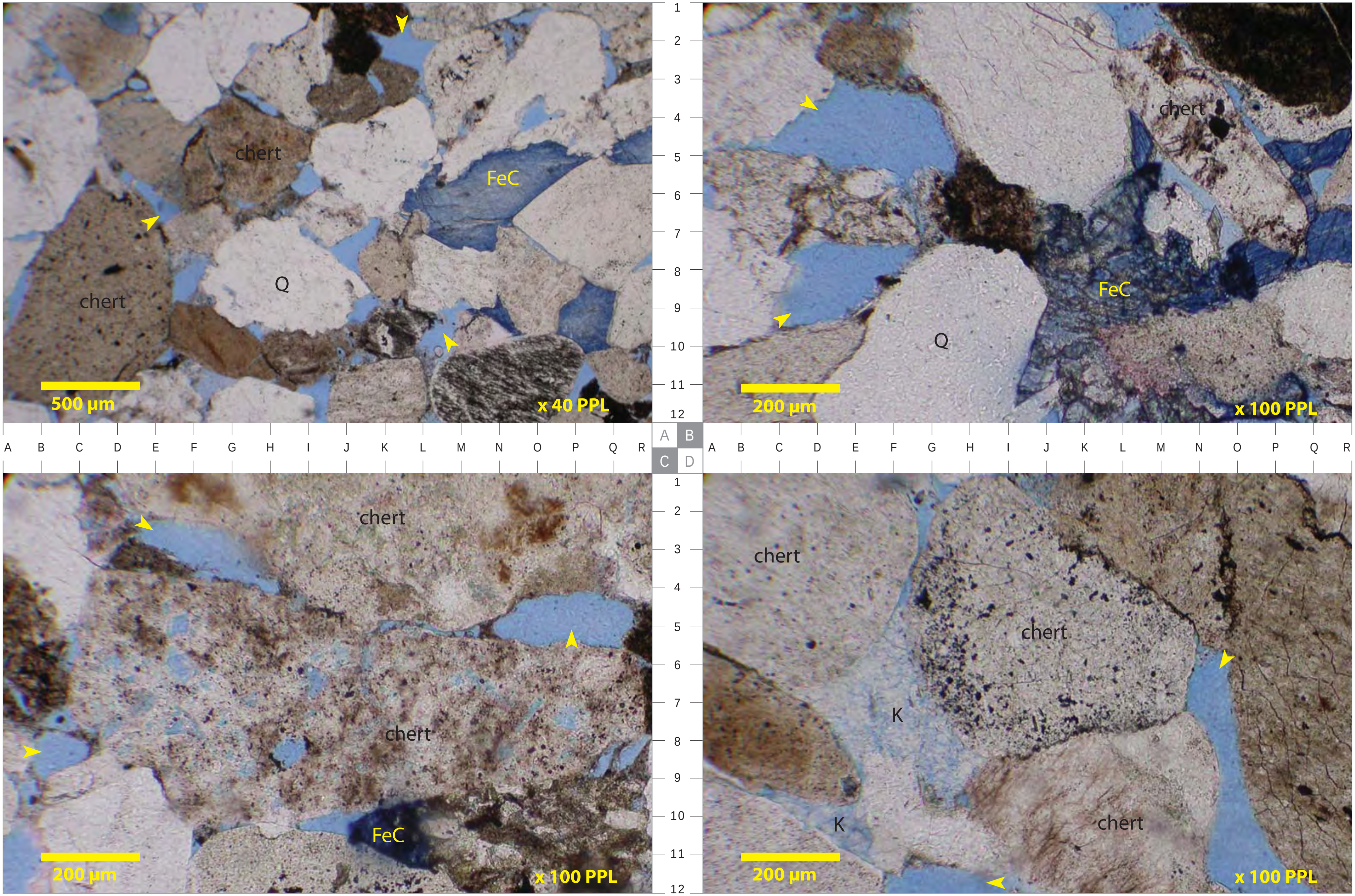


Plate 22
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9541 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9543 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9544 feet

2 mm

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9546 feet

2 mm

Taglu

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9546.1 feet

2 mm

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9574.3 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 23

Taglu C-42
Taglu
Silty Litharenite

Core Analysis Porosity: 7%   Core Analysis Permeability: 0.05 md

Sample #: 07-18
Depth: 9574.3 feet

Laminated and bioturbated, silt to very fine grained, well sorted litharenites are recognized from core recovered at 9574.3 feet. Grain contacts are tangential and concavo-convex, reflecting moderate mechanical compaction of labile clay-rich sedimentary clasts. Authigenic cements are poorly developed in this interval consisting of replacive pyrite. Framework grains include monocrystalline quartz (Q), clay-rich sedimentary grains (CRF), micas and yellow stained K-feldspar. Isolated effective macropores are rare and isolated resulting in very low permeability.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42 **9574.3 feet**

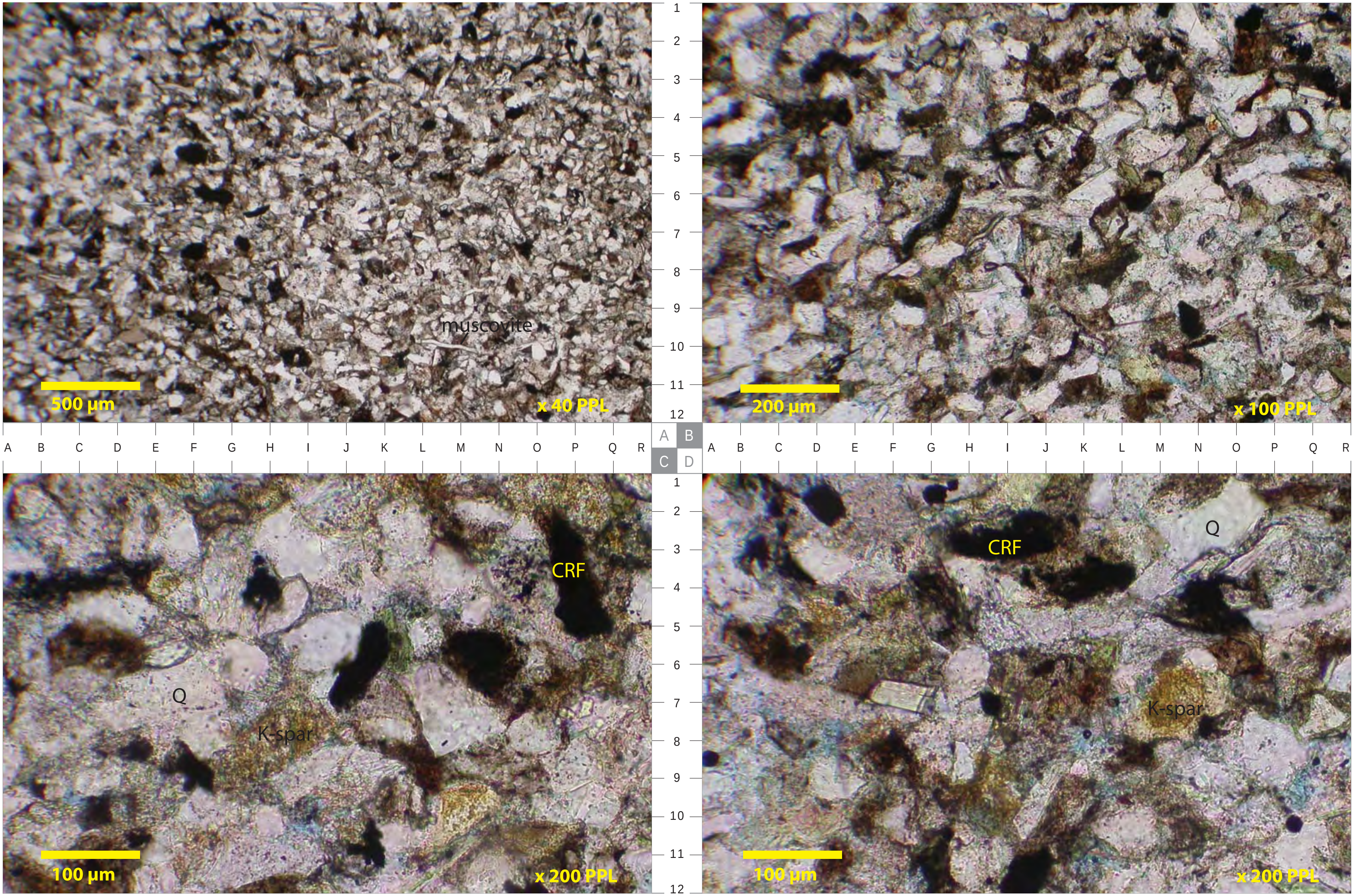


Plate 23
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9582 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9593 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9593.1 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9611 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9612.5 feet

2 mm

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9614.7 feet

Taglu

2 mm

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 24

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 13.3%   Core Analysis Permeability: 1.75 md

Sample #: 07-21
Depth: 9614.7 feet

Faintly laminated and bioturbated, very fine to fine grained, well sorted litharenites characterize the Taglu Sequence retrieved from core at 9614.7 feet. Common pore occluding ferroan calcite cement (FeC) is patchily distributed in this poor reservoir quality interval. Rare quartz overgrowths (View B, small black arrows) are unevenly distributed on host quartz grains and pyrite is found in trace amounts (view B). Monocrystalline quartz (Q), argillic sedimentary grains (CRF), feldspars (View D, N:9) and chert are the main framework constituents. Macroporosity is isolated resulting in low permeability.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9614.7 feet

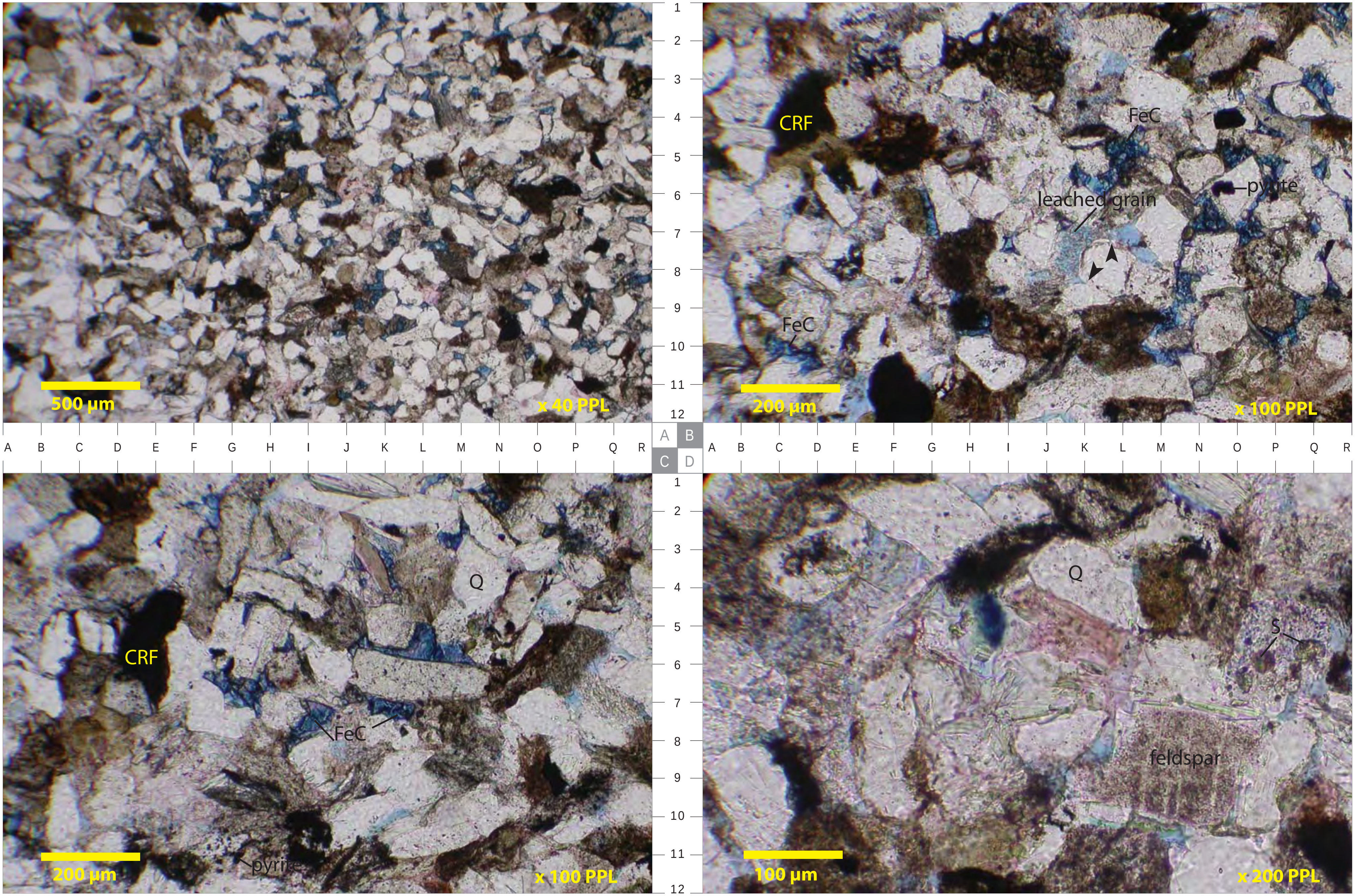


Plate 24

January 2010

CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9616 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

2 mm

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42 9621 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9622 feet

Taglu

2 mm

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9625 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9626 feet

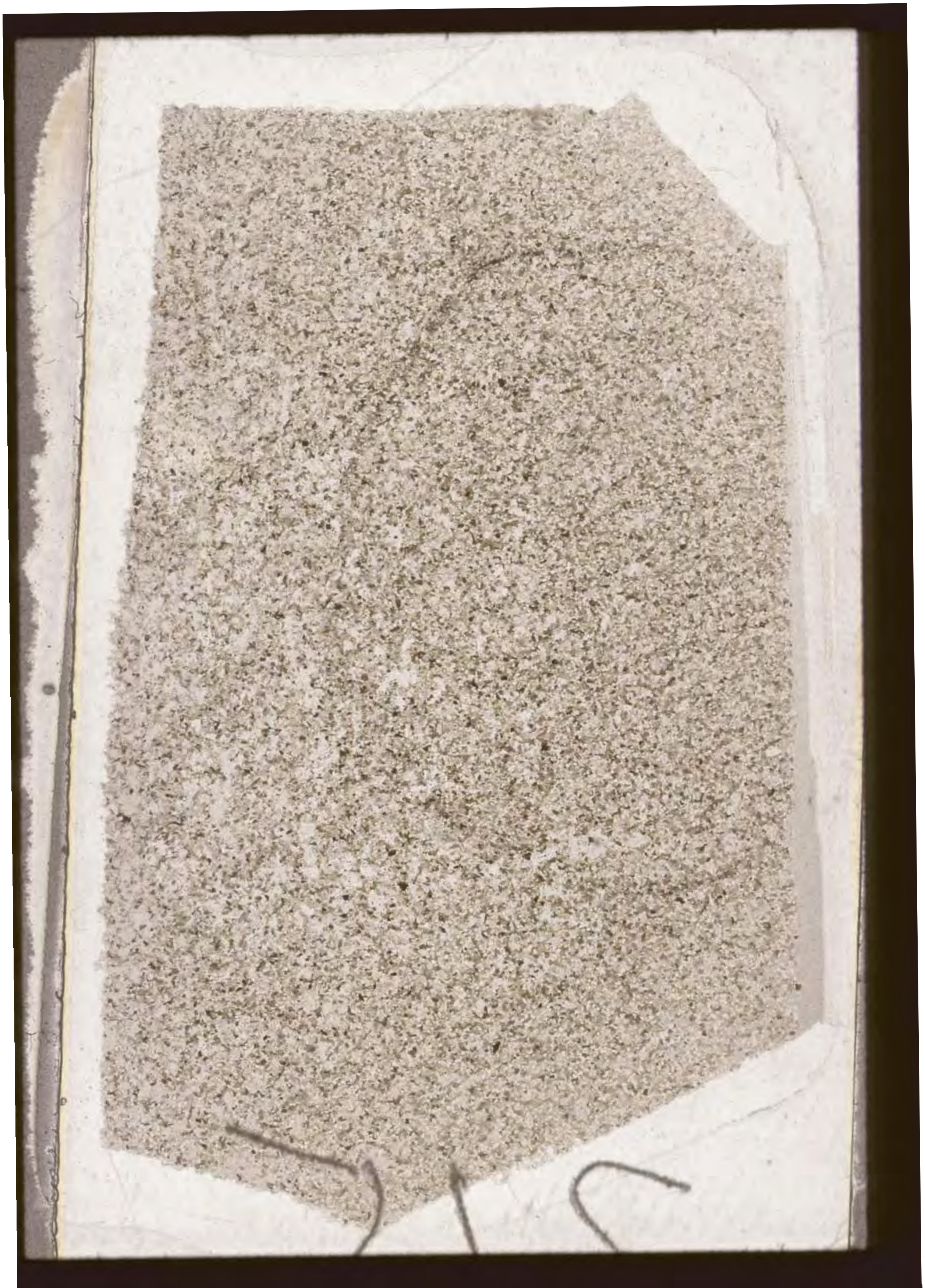
Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42 9629 feet



Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9630.1 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9642 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9649 feet

2 mm

Taglu

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9652 feet

2 mm

Taglu

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9654 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9658 feet

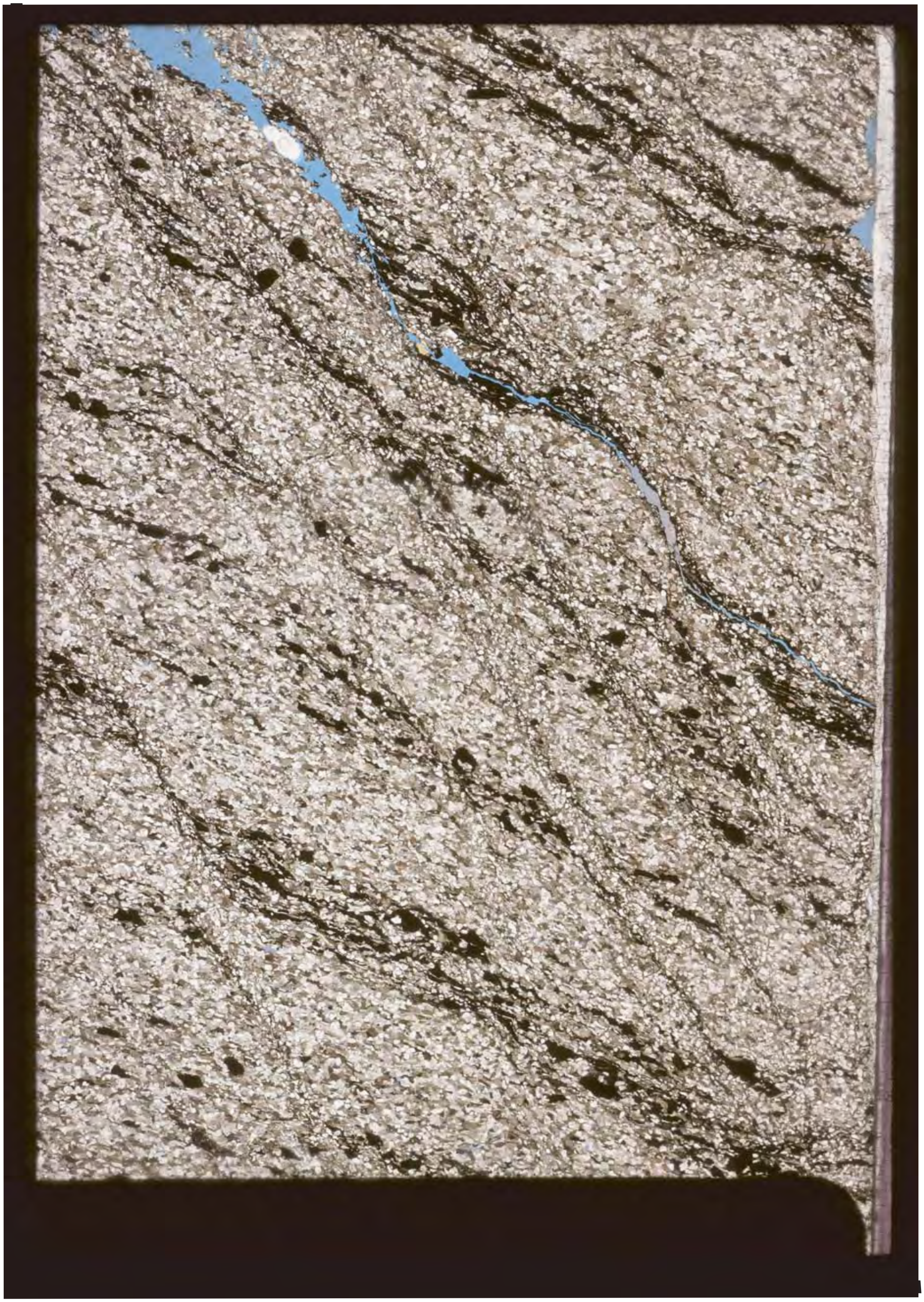
Taglu

2 mm

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42 9658.4 feet



2 mm

Taglu

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 25

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 12%   Core Analysis Permeability: 10.7 md

Sample #: 07-23
Depth: 9658.4 feet

Laminated and bioturbated moderately sorted, fine grained litharenites were recovered from core at 9658.4 feet. Organic material, clay-rich sedimentary grains and sideritized clay clasts (CRFs) are commonly concentrated along laminae. Note climbing ripples in the Overview. Grain contacts are concavo-convex and tangential indicating moderate to significant mechanical compaction. Rare pore occluding patchily distributed ferroan calcite-ankerite, replacive siderite and rare pyrite are the main authigenic phases. Dissolution of blue stained carbonate cement (FeC) has enhanced the effective pore system (small yellow arrows) in this interval. Monocrystalline quartz (Q), chert, clay-rich sedimentary grains (CRF), sideritized clay clasts (CRFs), organic material, glauconite (G), micas and partially leached feldspars (View B) comprise some of the framework components.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

Taglu C-42 **9658.4 feet**

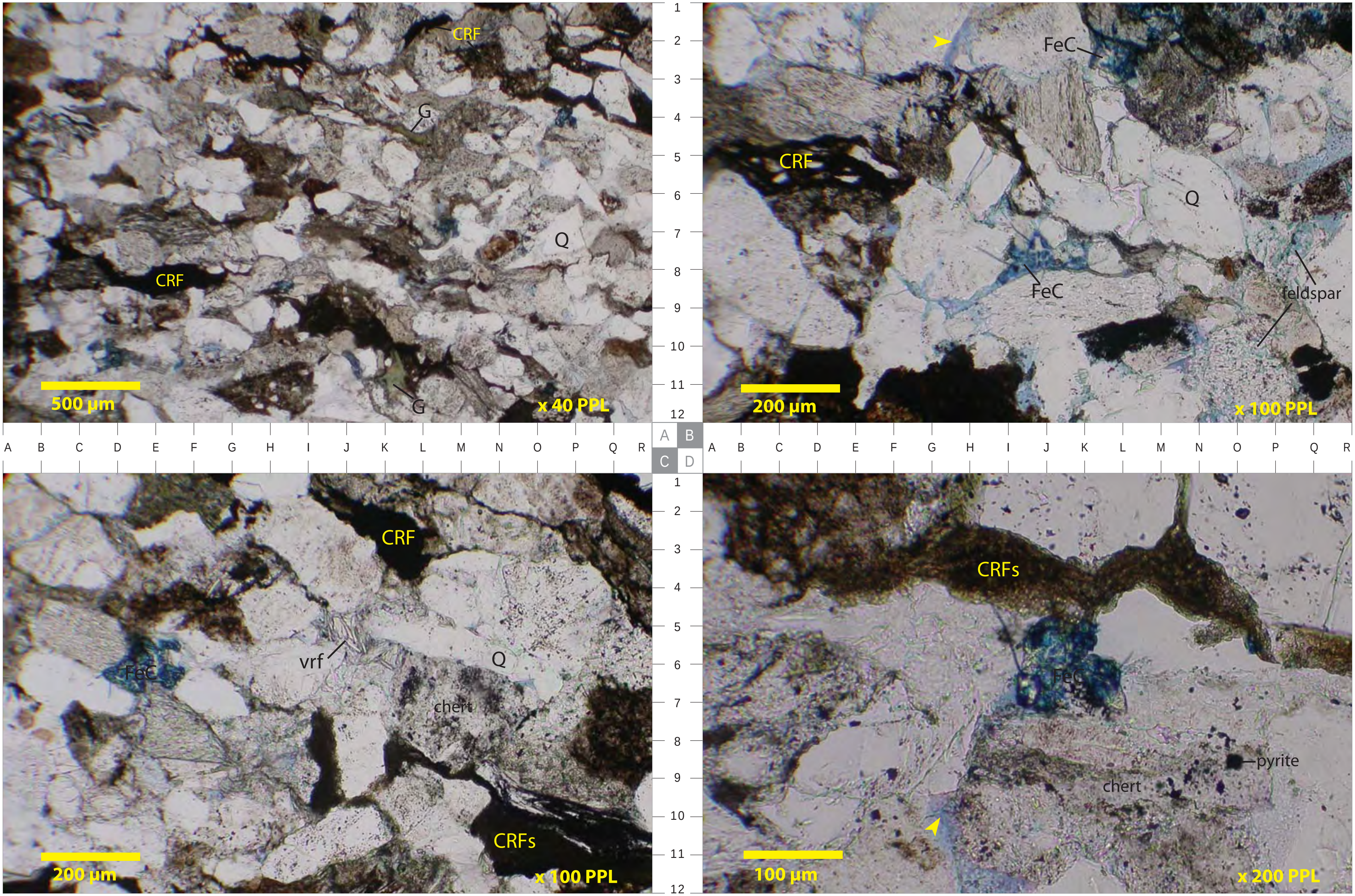


Plate 25
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9663 feet

Taglu

2 mm

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42 9666 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9666.5 feet

2 mm

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 26

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 16.5%   Core Analysis Permeability: 41.2 md

Sample #: 07-24
Depth: 9666.5 feet

Faintly laminated, bioturbated, moderately well sorted, upper fine grained, porous Taglu Sequence litharenites were encountered by core recovered at 9666.5 feet. Finely crystalline, well developed ferroan calcite-ankerite (FeC) is patchily distributed in this porous and moderately permeable interval. Loosely packed kaolinite clays are found in trace amounts (View B, “K”). Rare pyrite has precipitated within chert micropores. Framework grains include chert, monocrystalline quartz, clay-rich sedimentary grains, feldspars and micas. Grain contacts are tangential and concavo-convex suggesting moderate mechanical compaction.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

Taglu C-42

9666.5 feet

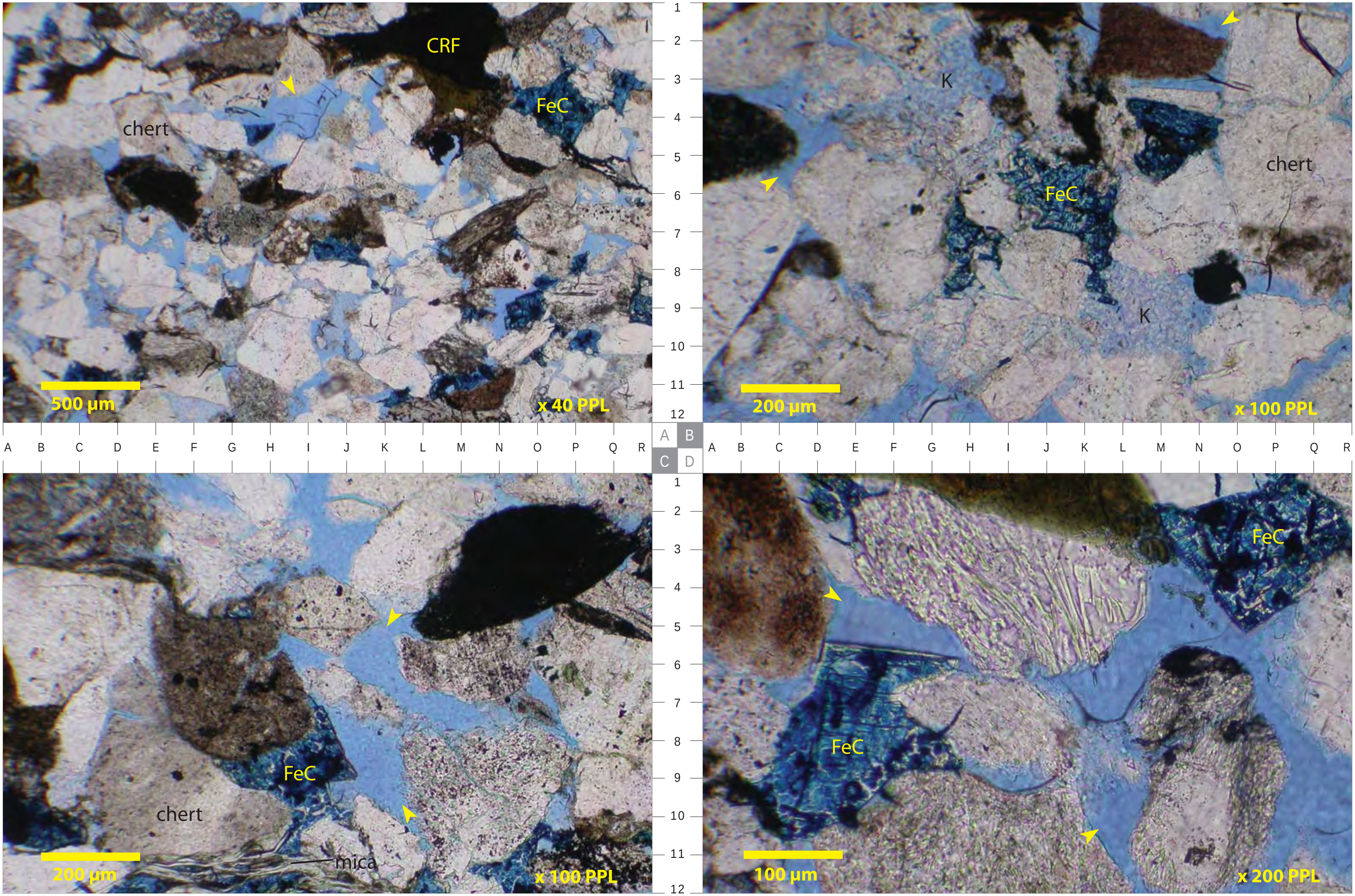


Plate 26
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9667 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9669 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9672 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9673.6 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 27

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 21.4%   Core Analysis Permeability: 444 md

Sample #: 07-25
Depth: 9673.6 feet

Pebble-sized angular elongate organic material rip-up clasts are shown in the Overview of this coarse grained, moderately well sorted Taglu Sequence litharenite recovered at 9673.6 feet. Effective porosity (small yellow arrows) is very well developed with measured core analysis porosity yielding 21.4%; measured core analysis permeability is 444 md. Pore occluding cements are patchily distributed and found in trace to minor volumes. Blue stained ferroan calcite-ankerite (FeC) has been partially leached to enhance the pore system. Rare patch of pore filling analcime cement is illustrated in View B.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42 9673.6 feet

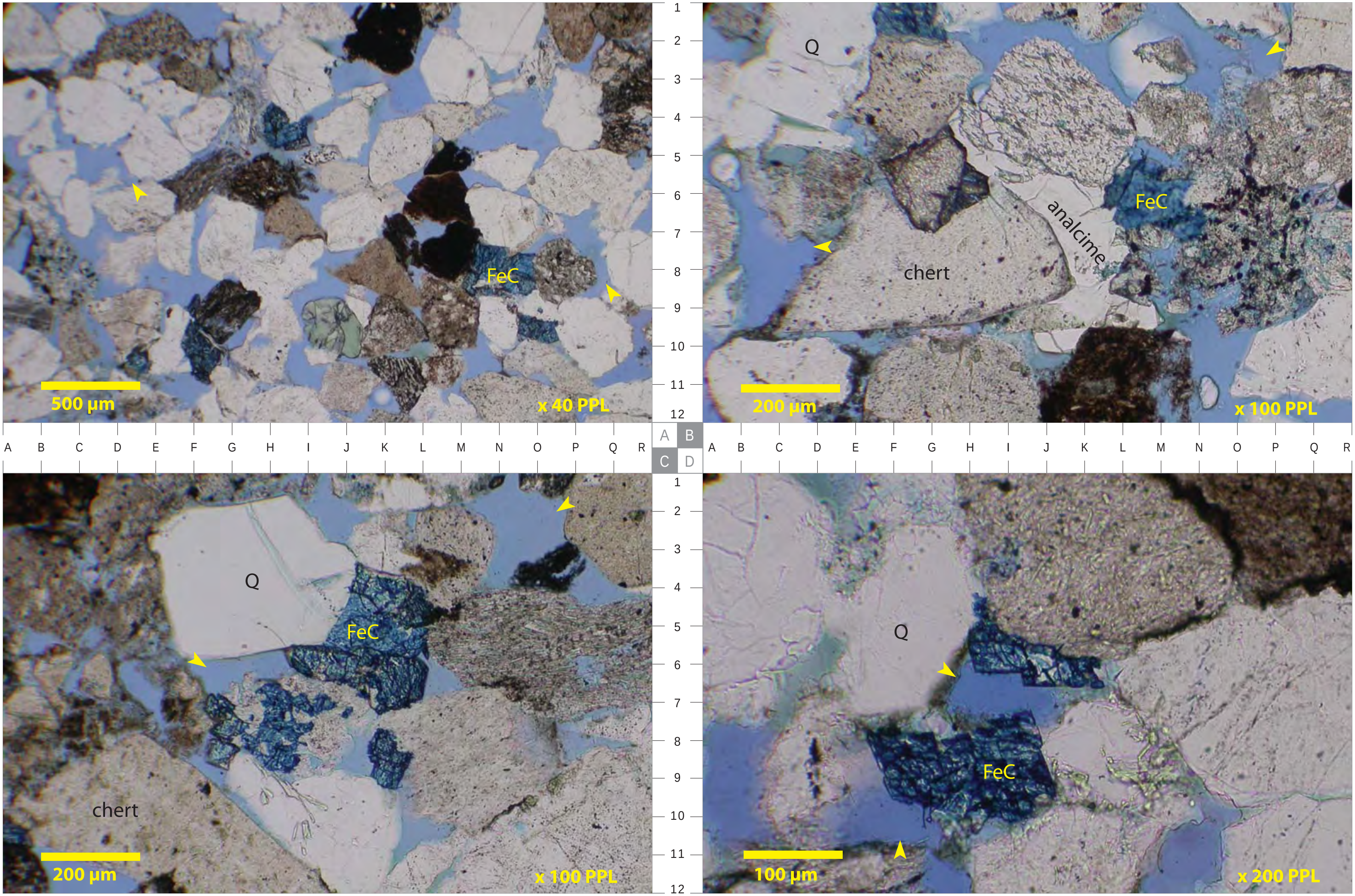


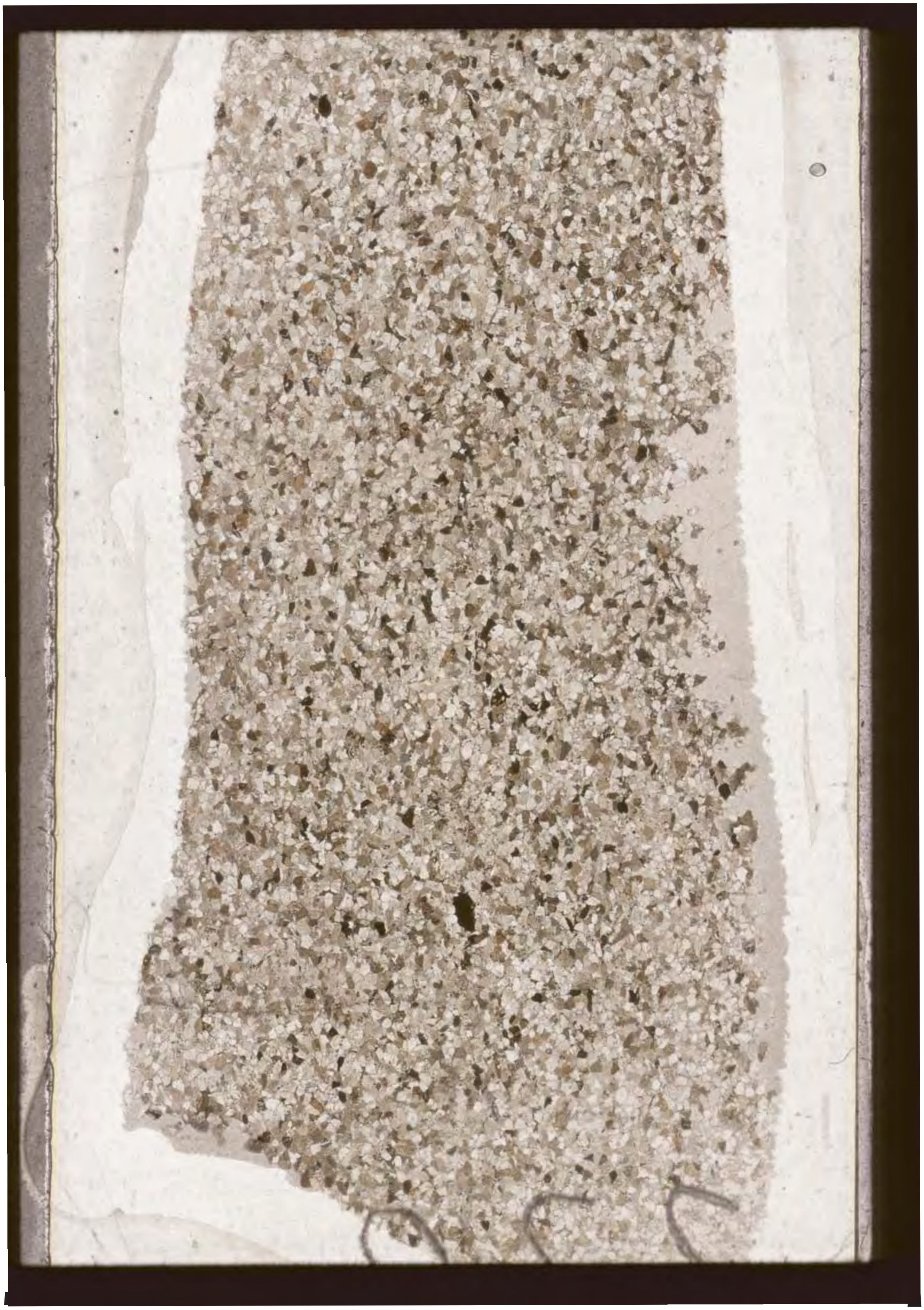
Plate 27
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9675 feet



2 mm

Taglu

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9678 feet

Taglu

2 mm

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9680 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9684 feet

2 mm

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9686 feet

2 mm

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9687.4 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 28

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 14.6%   Core Analysis Permeability: 0.94 md

Sample #: 07-26
Depth: 9687.4 feet

Carbonate cemented moderate to poorly sorted litharenites are recognized from core taken at 9687.4 feet. Subrounded silty clay-rich sedimentary granules and pebble-sized clasts are scattered in the medium to coarse grained litharenite matrix. Ferroan calcite-ankerite cement (FeC) is unevenly distributed with rare patches of analcime cement (View D). Grain contacts are mainly tangential with concavo-convex contacts associated with compaction of labile grain constituents. Framework grains include chert, monocrystalline quartz, micas, feldspars (View B, E:6) and clay-rich sedimentary (CRF) lithoclasts. Dissolution of feldspathic grains (View B), carbonate and zeolite cements has enhanced the macropore system. Note microfractured grains in View C (L:5) suggesting considerable mechanical compaction.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

Taglu C-42 **9687.4 feet**

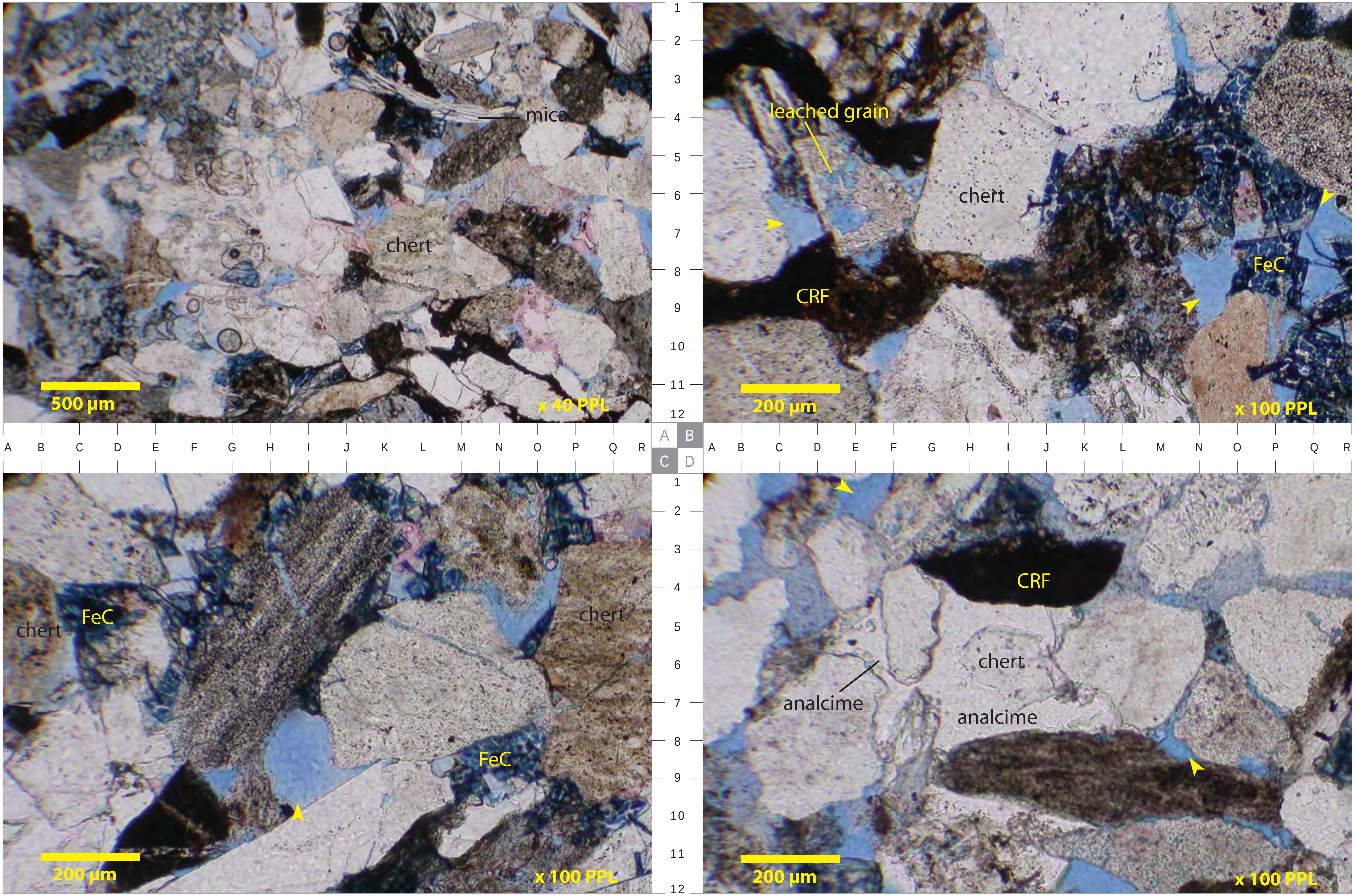


Plate 28
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9688 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9694 feet

2 mm

Taglu

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9698 feet

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9700 feet

2 mm

Taglu

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9705 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9714 feet

2 mm

Taglu

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9715.2 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 29a

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 20.3%   Core Analysis Permeability: 1560 md

Sample #: 07-27
Depth: 9715.2 feet

Well sorted, coarse to very coarse grained, massive chert arenites are recognized from core recovered at 9715.2 feet. Minor patchily distributed pore occluding analcime cement is illustrated in these high magnification thin section photomicrographs. Macroporosity (small yellow arrows) is well developed and measured permeability is 1560 md. Rare pyrite and siderite micro-crystals have precipitated within chert micropores. Subangular to subrounded chert is the main framework component with lesser amounts of monocrystalline quartz (Q), and polycrystalline quartz. Note grain contacts range from floating to tangential to concavo-convex.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42 **9715.2 feet**

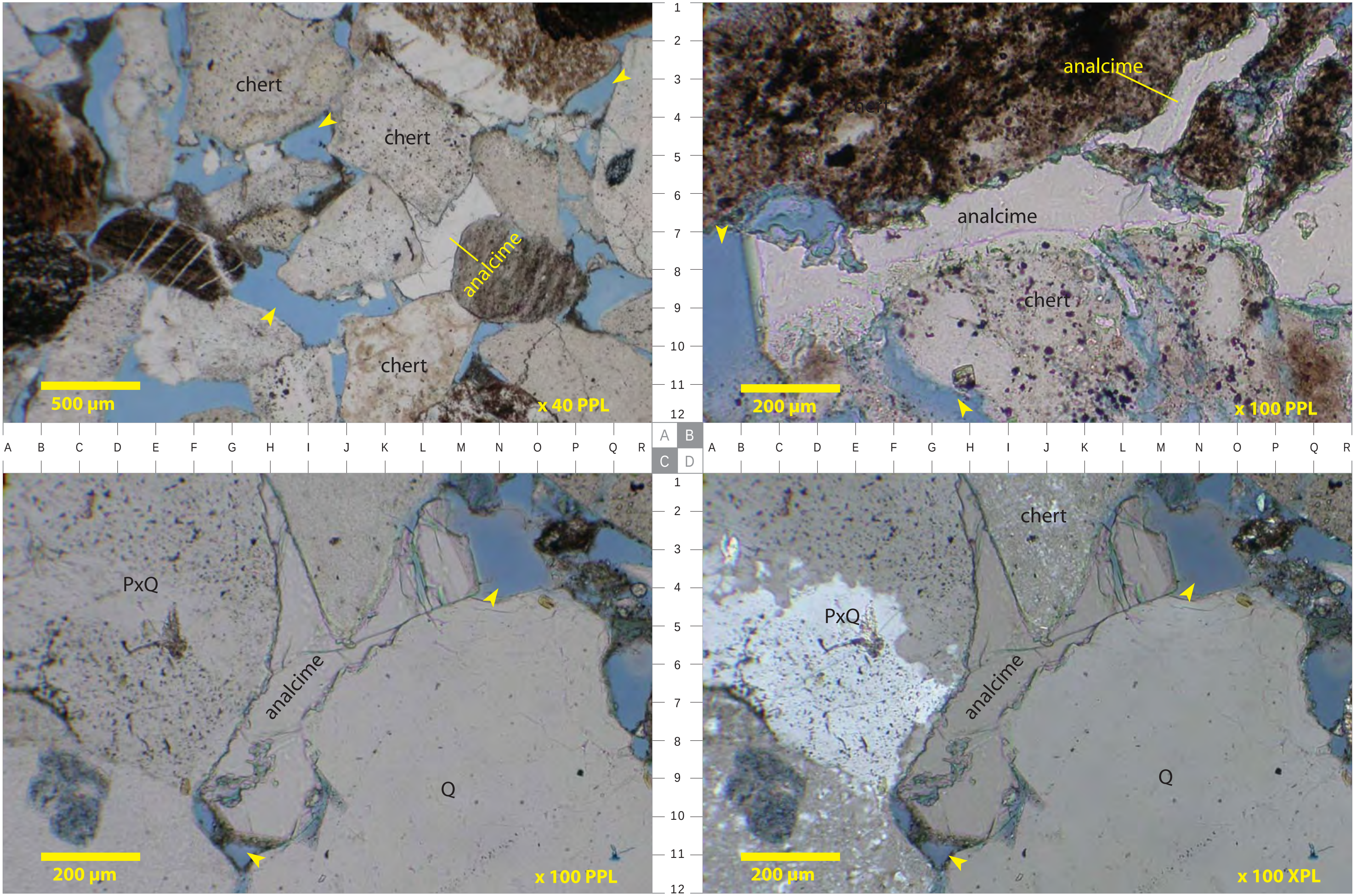


Plate 29a
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 29b

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 20.3% Core Analysis Permeability: 1560 md

Sample #: 07-27
Depth: 9715.2 feet

High magnification views show the following features:

- Patches of analcime cement occlude intergranular pores
- Microporosity associated with partially leached volcanic rock fragments (View B) and feldspathic grains (View C)
- Micro-fractured framework grains (View A, I:3; View C, D:7)
- Tangential and sutured grain contacts (View D)
- Microcrystalline pyrite precipitated within chert micropores
- Common chert, clay-rich sedimentary grains (CRF), volcanic rock fragments (VRF), monocrystalline quartz and feldspathic grains comprise some of the framework components
- Pore lining drill mud (View C, H:9)

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9715.2 feet

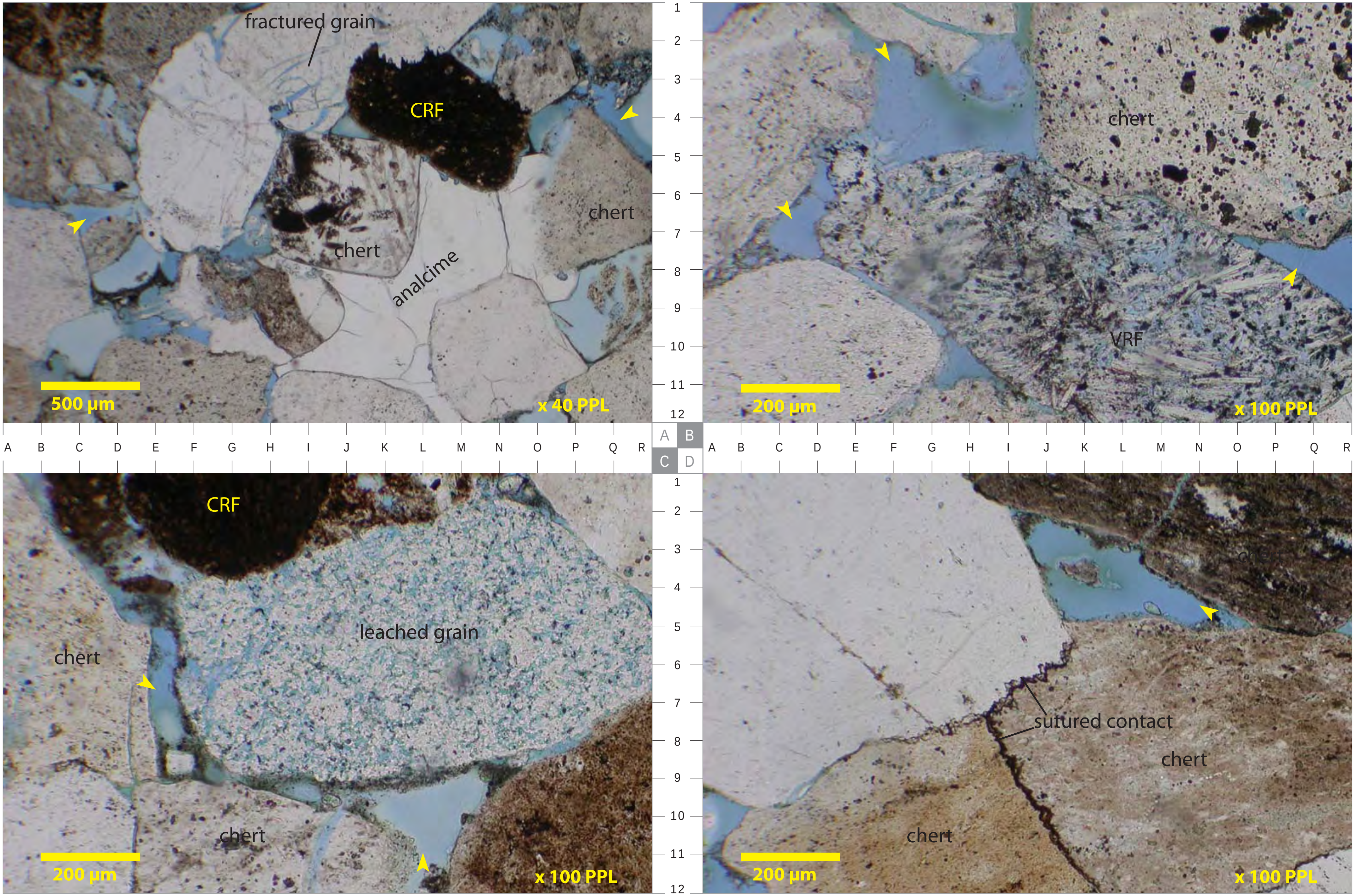


Plate 29b
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9722 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9726 feet

Taglu

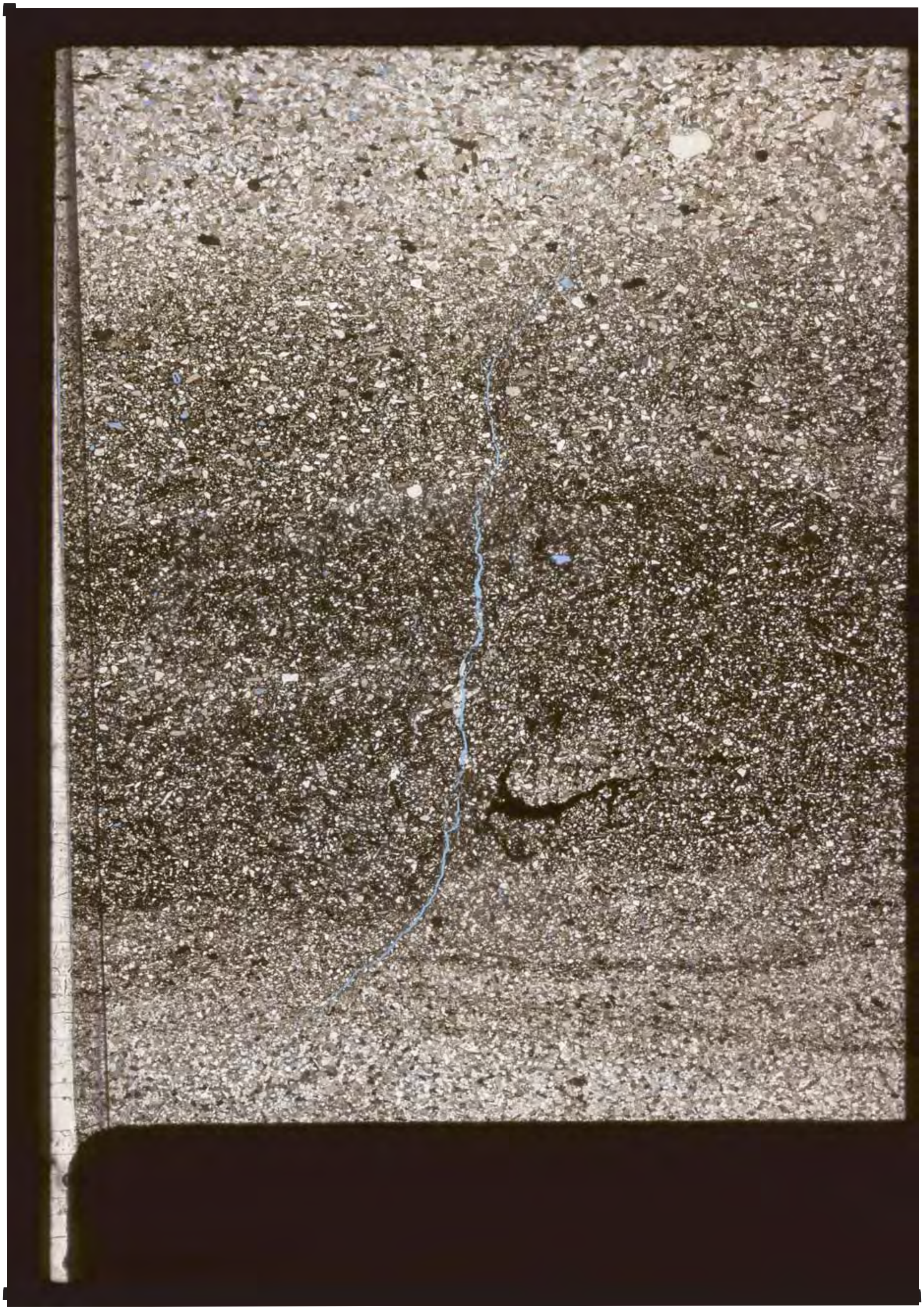
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9728.4 feet



Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 30

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 07-28
Depth: 9728.4 feet

Bioturbated, laminated, silt to fine grained, poor to moderately sorted litharenites with angular to subrounded framework grains floating in abundant sidertized clays characterize core recovered at 9728.4 feet. Effective macroporosity is isolated with patches of partially leached analcime cement (View D) and ferroan carbonate (FeC - ankerite) cements. Monocrystalline quartz, chert, micas (muscovite/biotite) are common framework lithoclasts with trace glauconite.

Photo A: 20X PPL,   Photo B: 40X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42 **9728.4 feet**

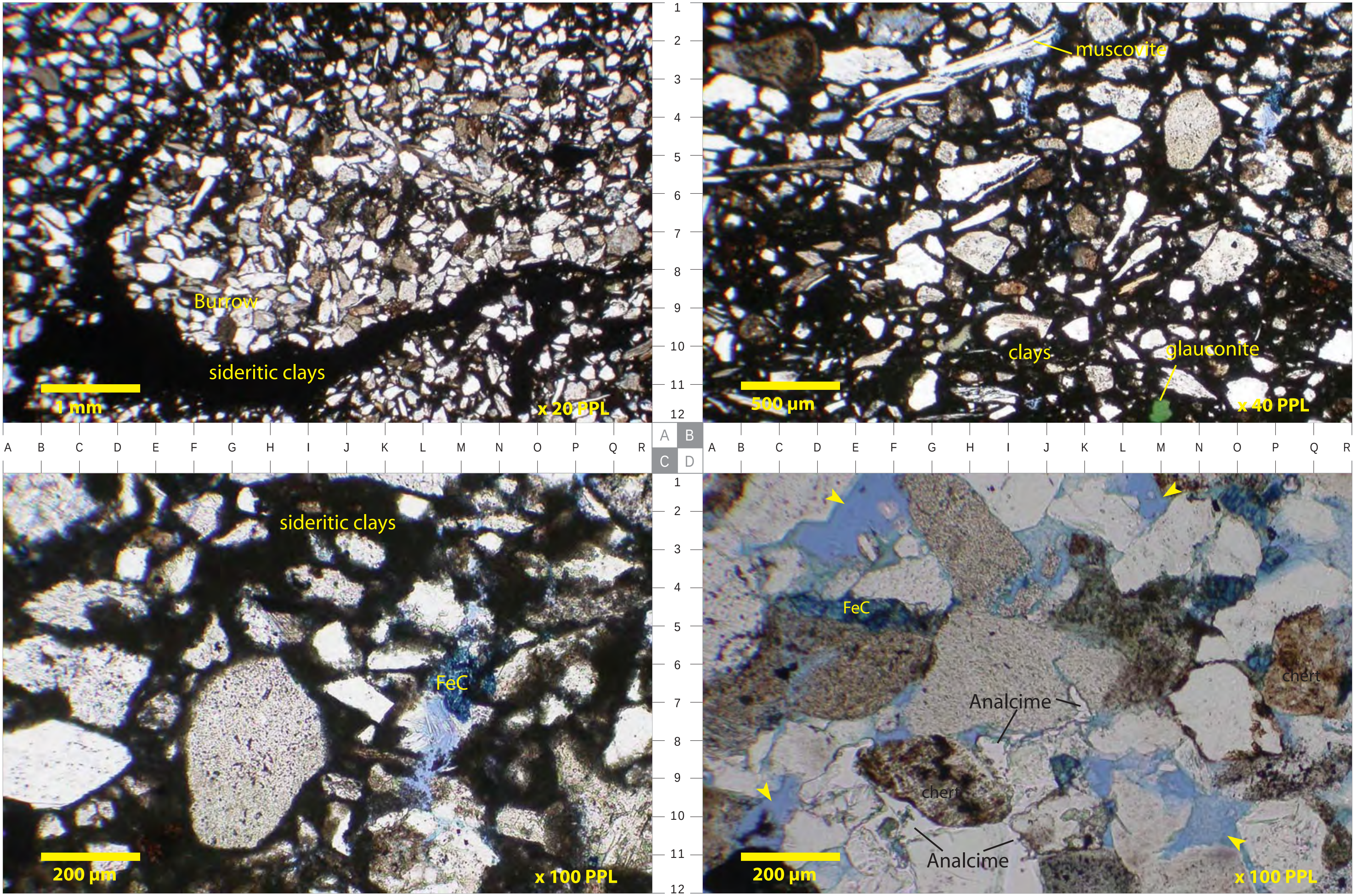


Plate 30
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9730 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9732 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 31

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 18.3%   Core Analysis Permeability: 59.5 md

Sample #: 07-29
Depth: 9732 feet

Upper fine to medium grained, moderately well sorted litharenites are recognized from Taglu Sequence core recovered at 9732 feet. Ferroan calcite cement (FeC) is rare and patchily distributed. Effective macroporosity (small yellow arrows) is well developed and enhanced by the dissolution of unstable framework grains (View B, J:9) and carbonate cement. Subrounded to subangular grains include monocrystalline quartz, chert, clay-rich sedimentary grains, volcanic rock fragments (VRF) and feldspathic clasts.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

Taglu C-42

9732 feet

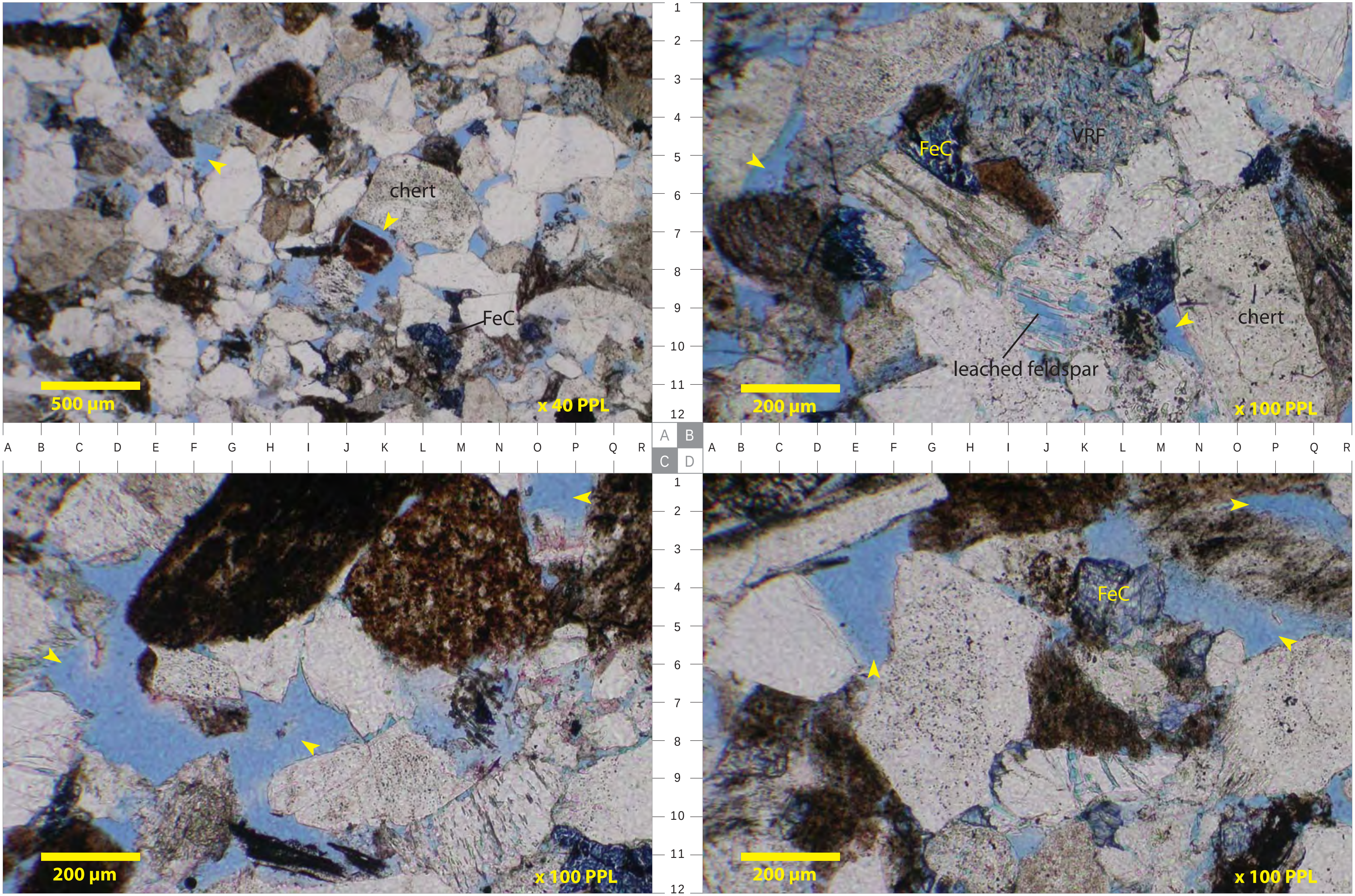


Plate 31
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42 **9733 feet**

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9735 feet

Taglu

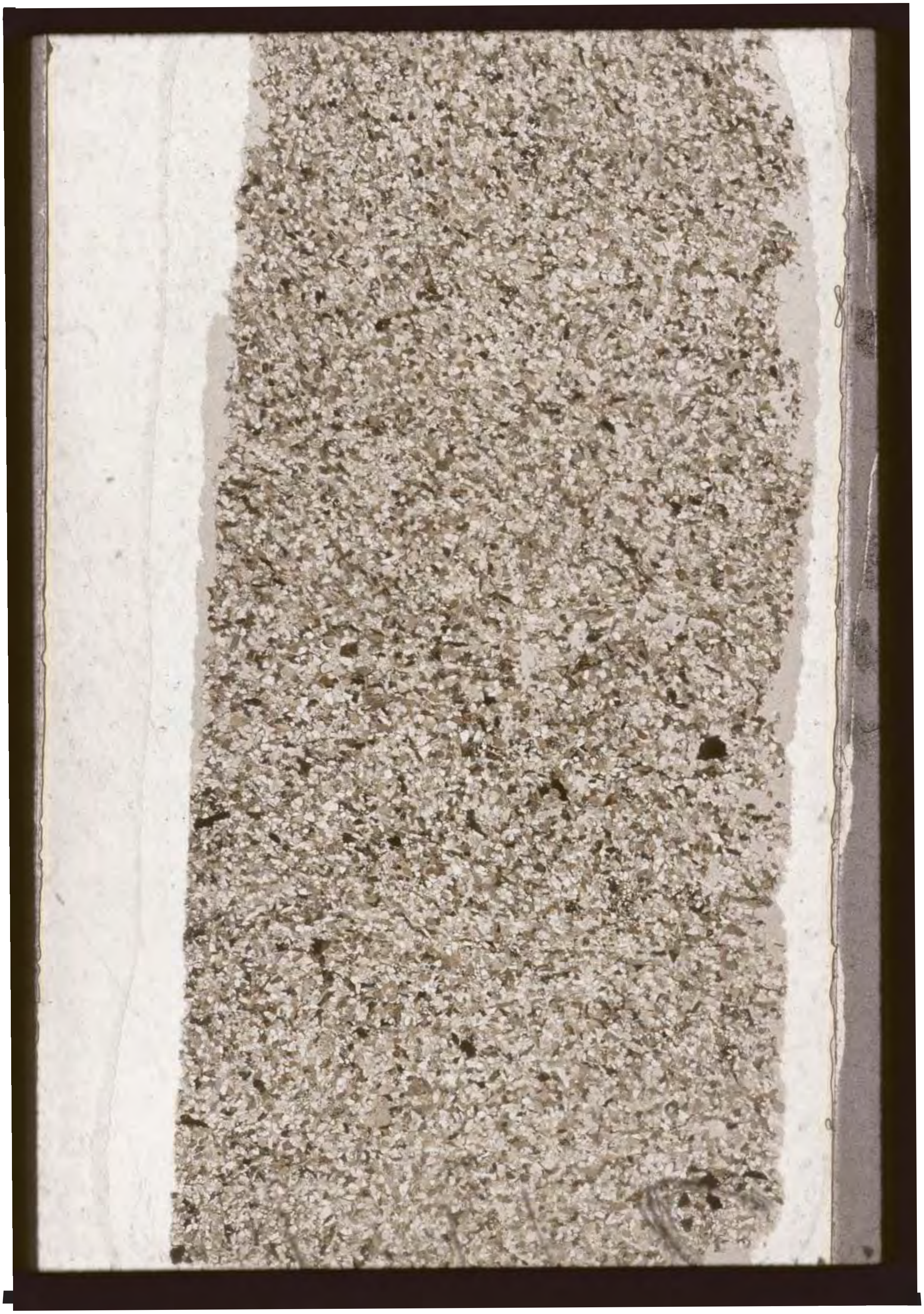
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9736 feet



Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9742.8 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 32a

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 18.9% Core Analysis Permeability: 83.4 md

Sample #: 07-30
Depth: 9742.8 feet

Bioturbated, moderately well sorted, fine grained litharenites are recognized from core recovered at 9742.8 feet. Pore occluding authigenic cements include patches of ferroan calcite (FeC), analcime (View A), grain rimming cryptocrystalline siderite (large green arrows), and kaolinite clays (View D, “K”). Dissolution of carbonate cement and unstable framework clasts has enhanced the effective pore system (small yellow arrows). Chert, monocrystalline quartz, clay-rich sedimentary grains, feldspars and volcanic rock fragments (VRF) comprise some of the framework grains.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

Taglu C-42 — 9742.8 feet

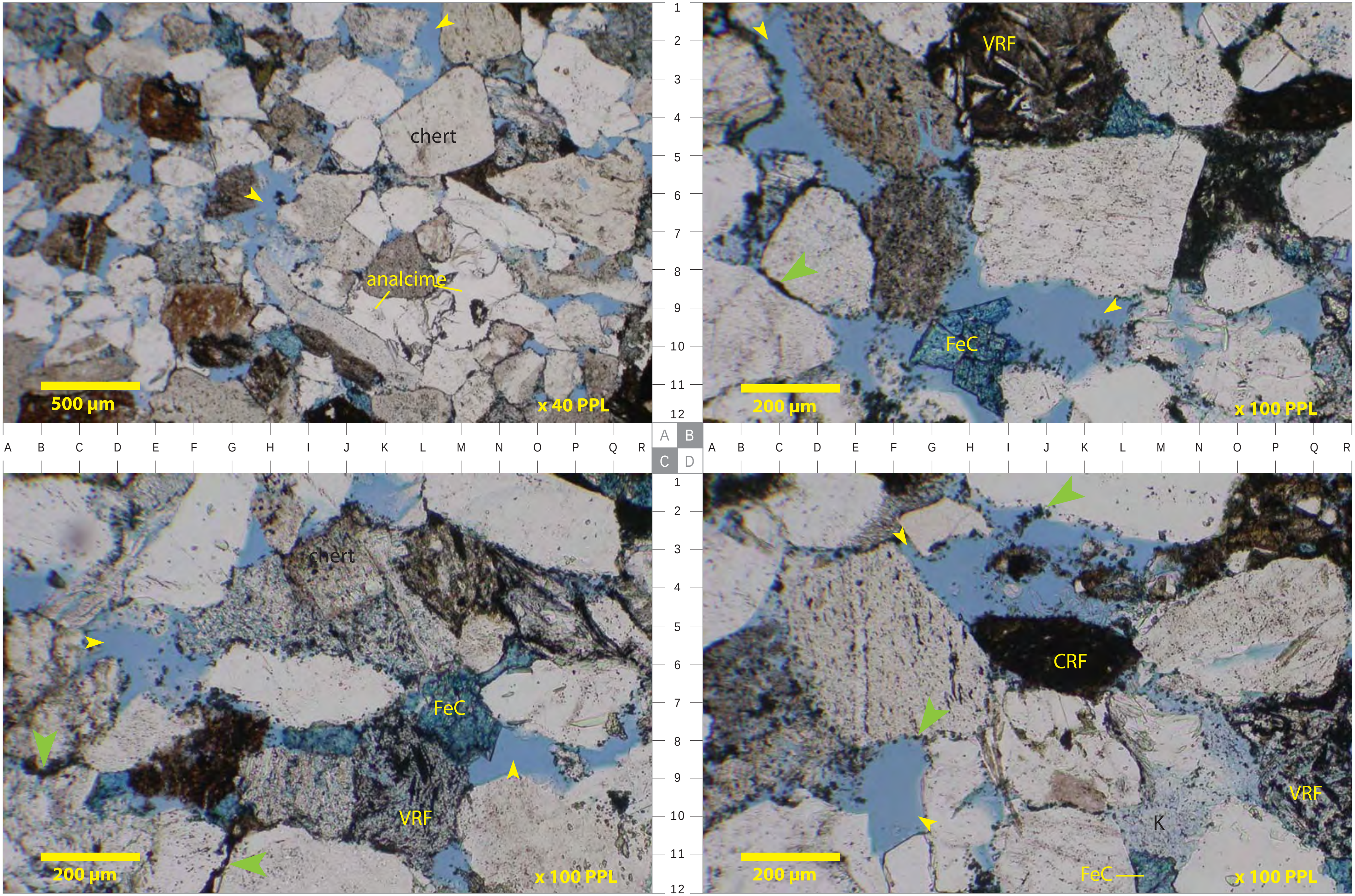


Plate 32a
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 32b

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 18.9% Core Analysis Permeability: 83.4 md

Sample #: 07-30
Depth: 9742.8 feet

Moderately well sorted, porous fine to medium grained litharenites were encountered by core recovered at 9742.8 feet. Eogenetic micro-crystalline to cryptocrystalline grain rimming siderite (large green arrows) is common with patches of rare analcime cement and ferroan carbonate (FeC : ferroan calcite-ankerite). Subrounded to subangular chert, monocrystalline quartz, volcanic rock fragments and clay-rich sedimentary grains are the main framework constituents with minor volcanic rock fragments (VRF), organic material and micas. Note hydrocarbons, in the form of bitumen engulfed (View D, P:7) along crystal edges within the carbonate cement.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

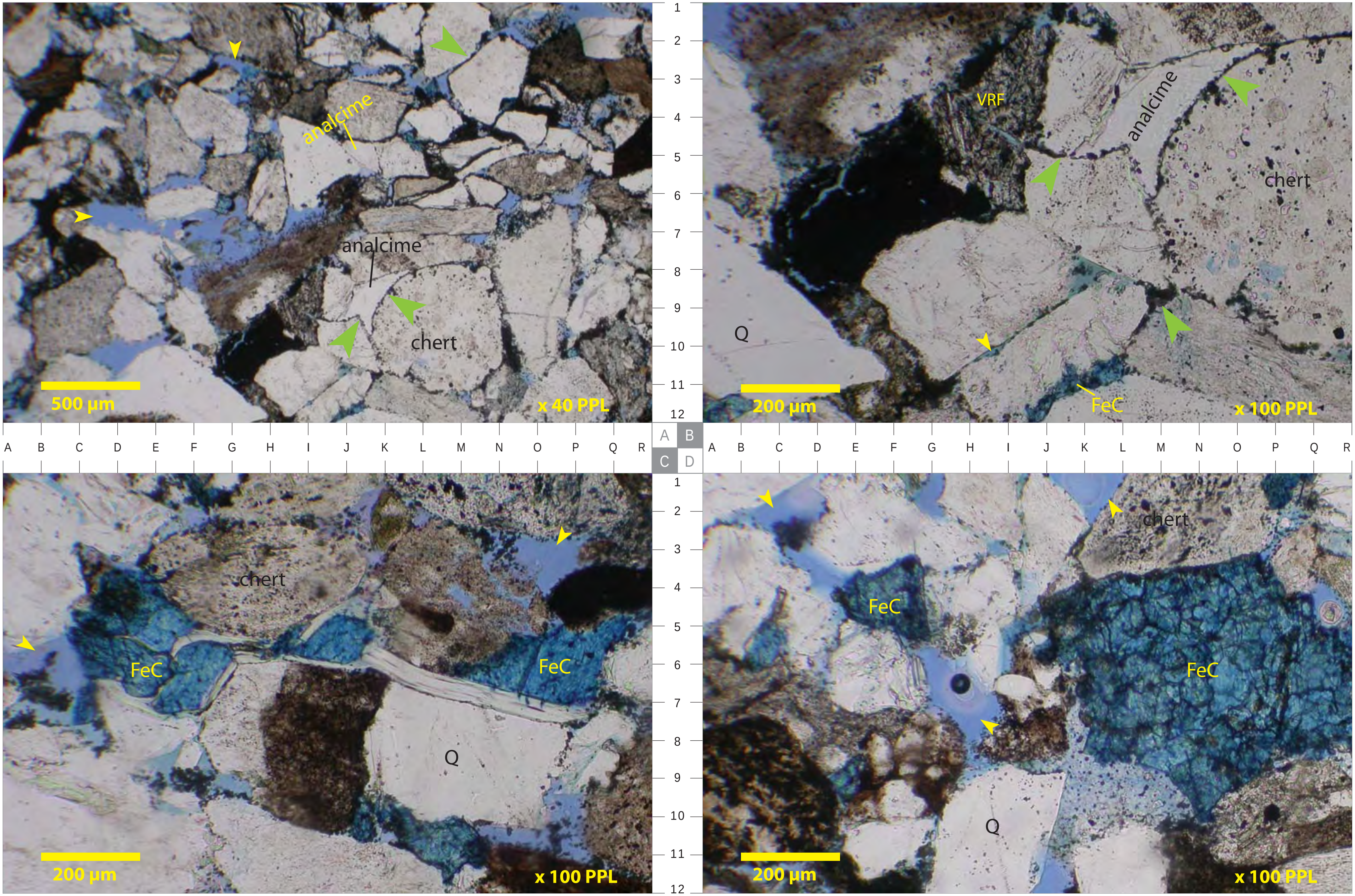


Plate 32b
January 2010
CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9743 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42 9745 feet

Taglu

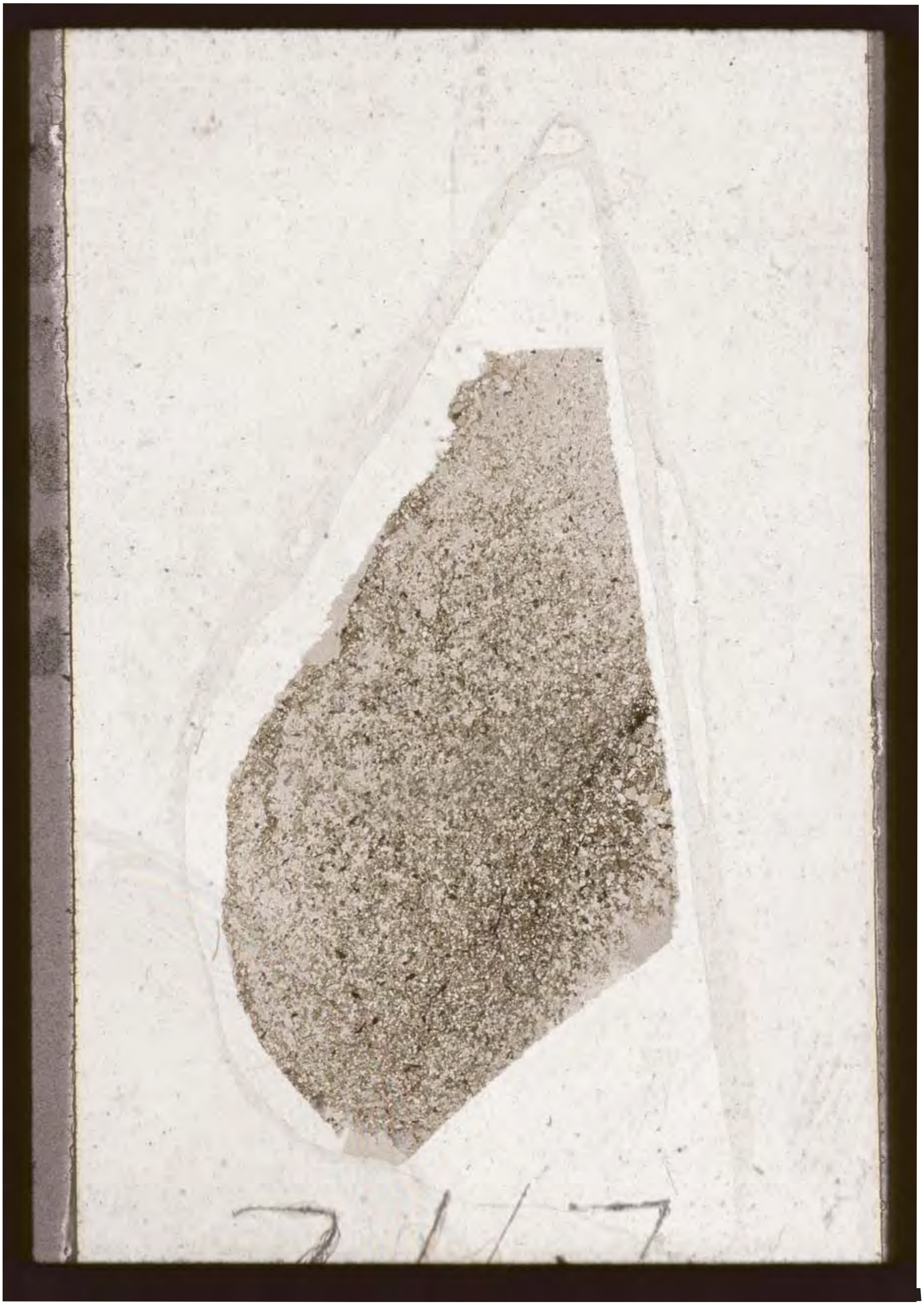
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9753 feet



Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9754 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9756.3 feet

2 mm

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 33

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 14.2% Core Analysis Permeability: 4.48 md

Sample #: 07-31
Depth: 9756.3 feet

Bioturbated, poorly sorted, compacted Taglu Sequence litharenites characterize the clastics recovered from core at 9756.3 feet. Effective macroporosity (small yellow arrows – View C) is very poorly developed and isolated resulting in low permeability. Grain contacts are concavo-convex and tangential suggesting considerable mechanical compaction. Grain rimming clays outlining framework grains are common. Ferroan calcite (FeC) is found in trace amounts and patchily distributed. Subangular to subrounded monocrystalline quartz, clay-rich sedimentary grains, chert and volcanic lithoclasts (VRF) comprise some of the framework constituents.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

Taglu C-42

9756.3 feet

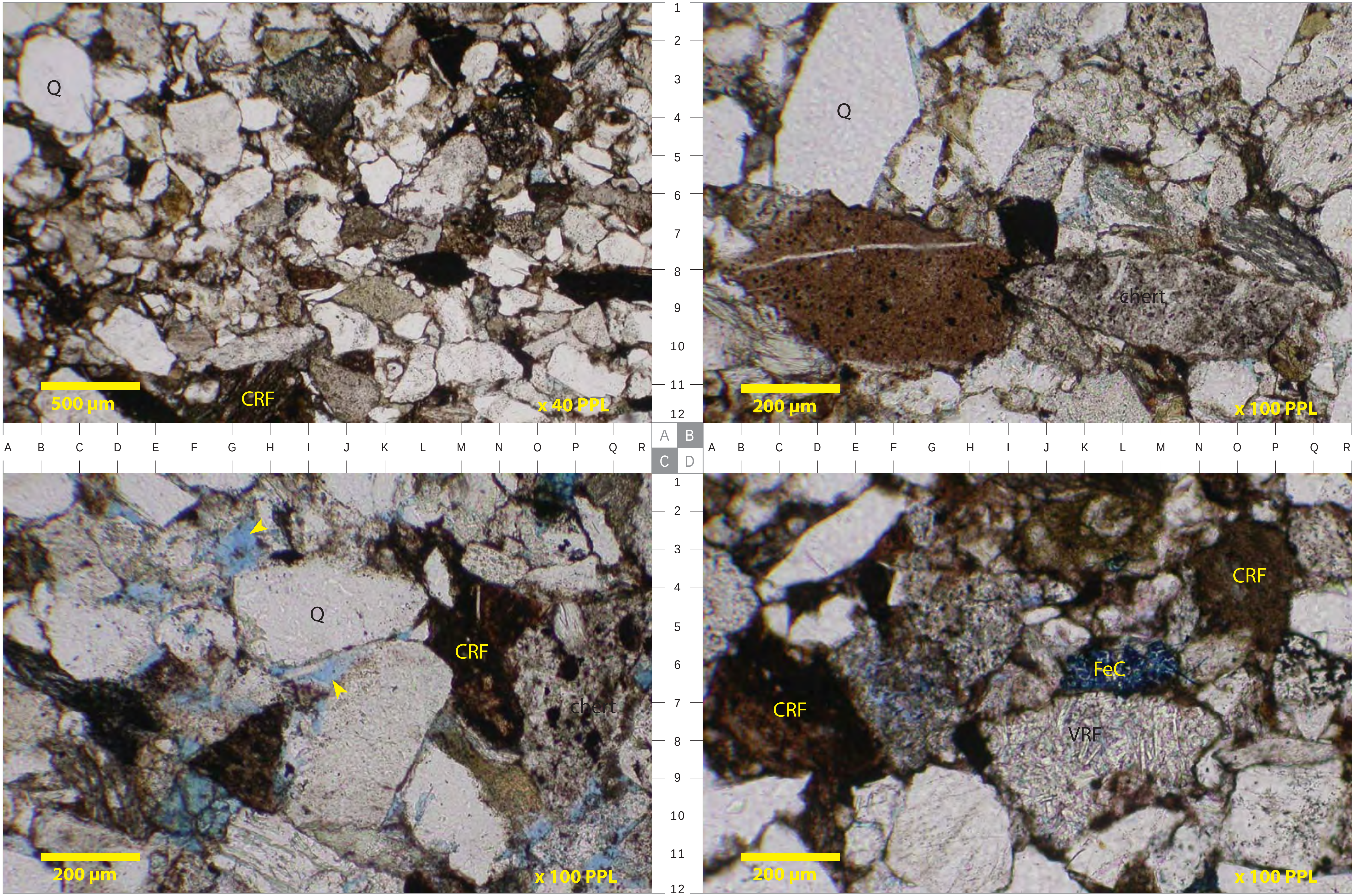


Plate 33

January 2010

CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9758 feet

2 mm

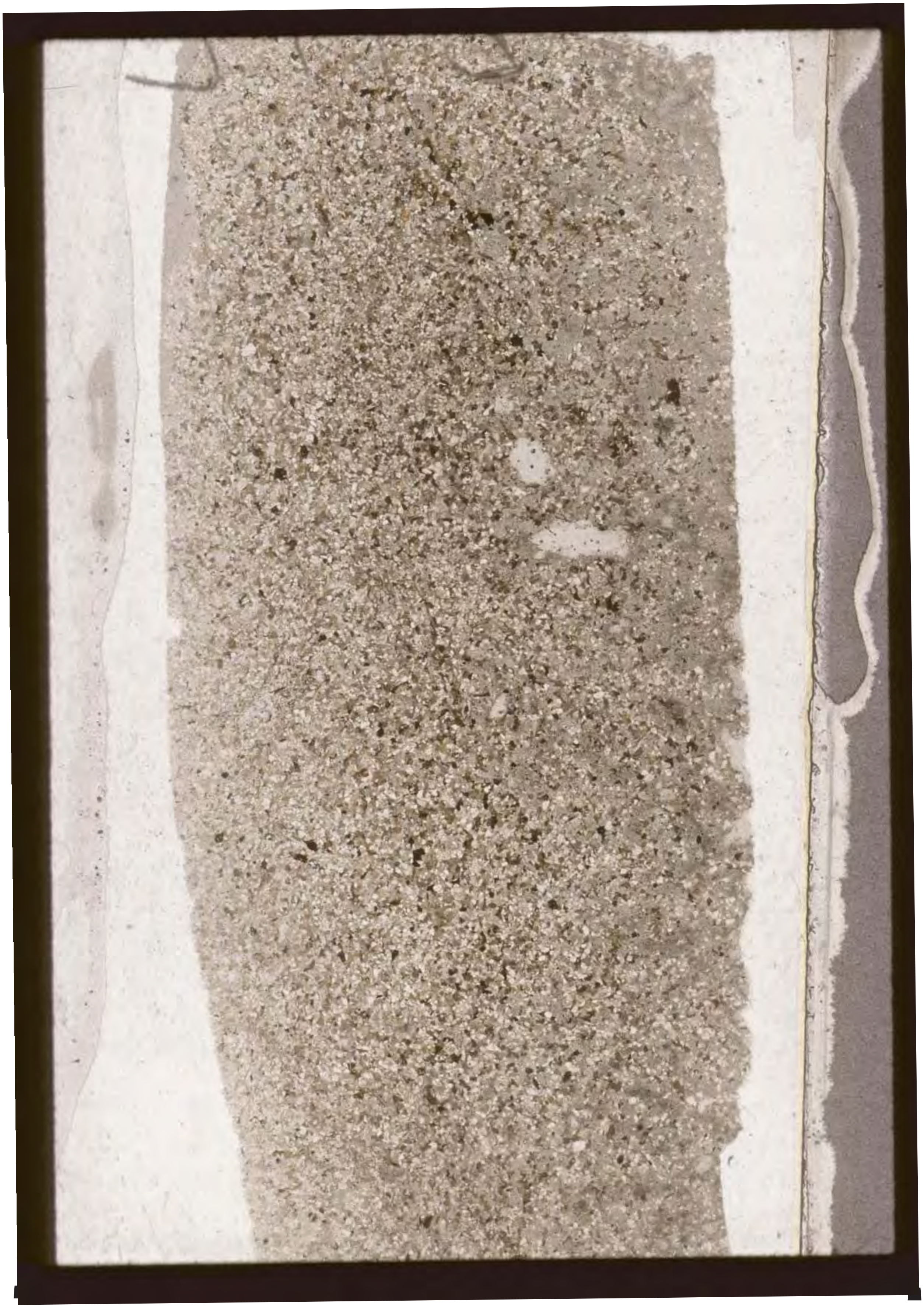
Taglu

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9764 feet



Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

9766.5 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 34

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 18.9% Core Analysis Permeability: 54.9 md

Sample #: 07-32
Depth: 9766.5 feet

Laminated, bioturbated moderately well sorted, fine to coarse grained litharenites were encountered by core at 9766.5 feet. Common eogenetic cryptocrystalline to microcrystalline grain rimming siderite (large green arrows) is illustrated in these thin section photomicrographs. Effective macroporosity (small yellow arrows) is well developed. Subrounded to subangular framework grains include monocrystalline quartz (Q), chert, yellow stained K-feldspar (View A), argillic lithoclasts and feldspathic grains. Grain contacts are mainly tangential.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42 **9766.5 feet**

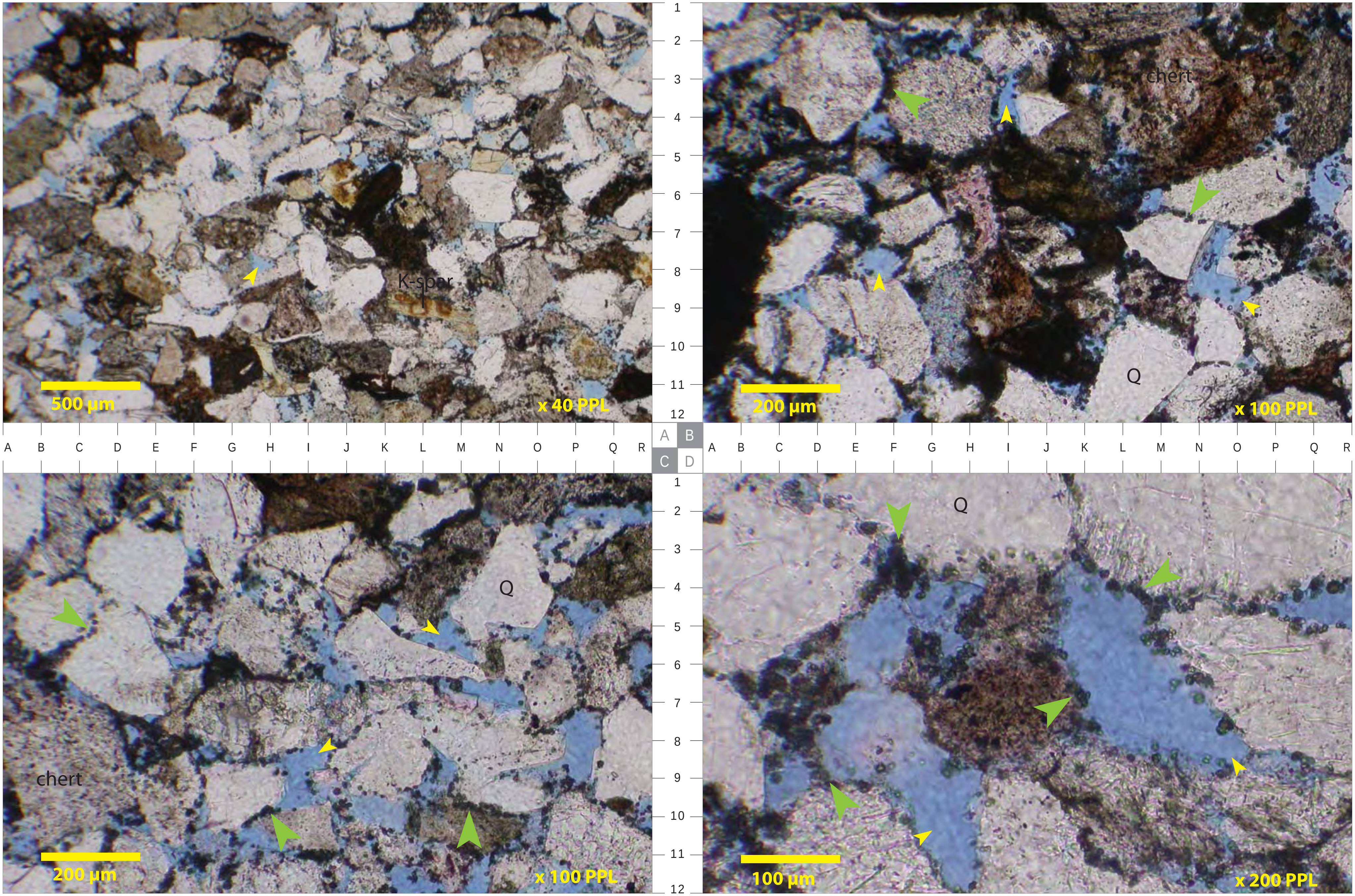


Plate 34
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

9770 feet

2 mm

Taglu

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

10410.5 feet

2 mm

Taglu

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

10417 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 35

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 8%   Core Analysis Permeability: 0.52 md

Sample #: 07-33
Depth: 10417 feet

Poikilotopic coarsely crystalline ferroan calcite commonly occludes effective intergranular pores in this moderately sorted, fine grained litharenite recovered from core at 10417 feet. Grain contacts are mainly tangential. Framework constituents include subangular to subrounded monocrystalline quartz (Q), chert, clay-rich sedimentary grains (CRF) and micas (View C, M:9). Effective macroporosity (small yellow arrows) is very poorly developed resulting from the dissolution of carbonate cement.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42 — 10417 feet

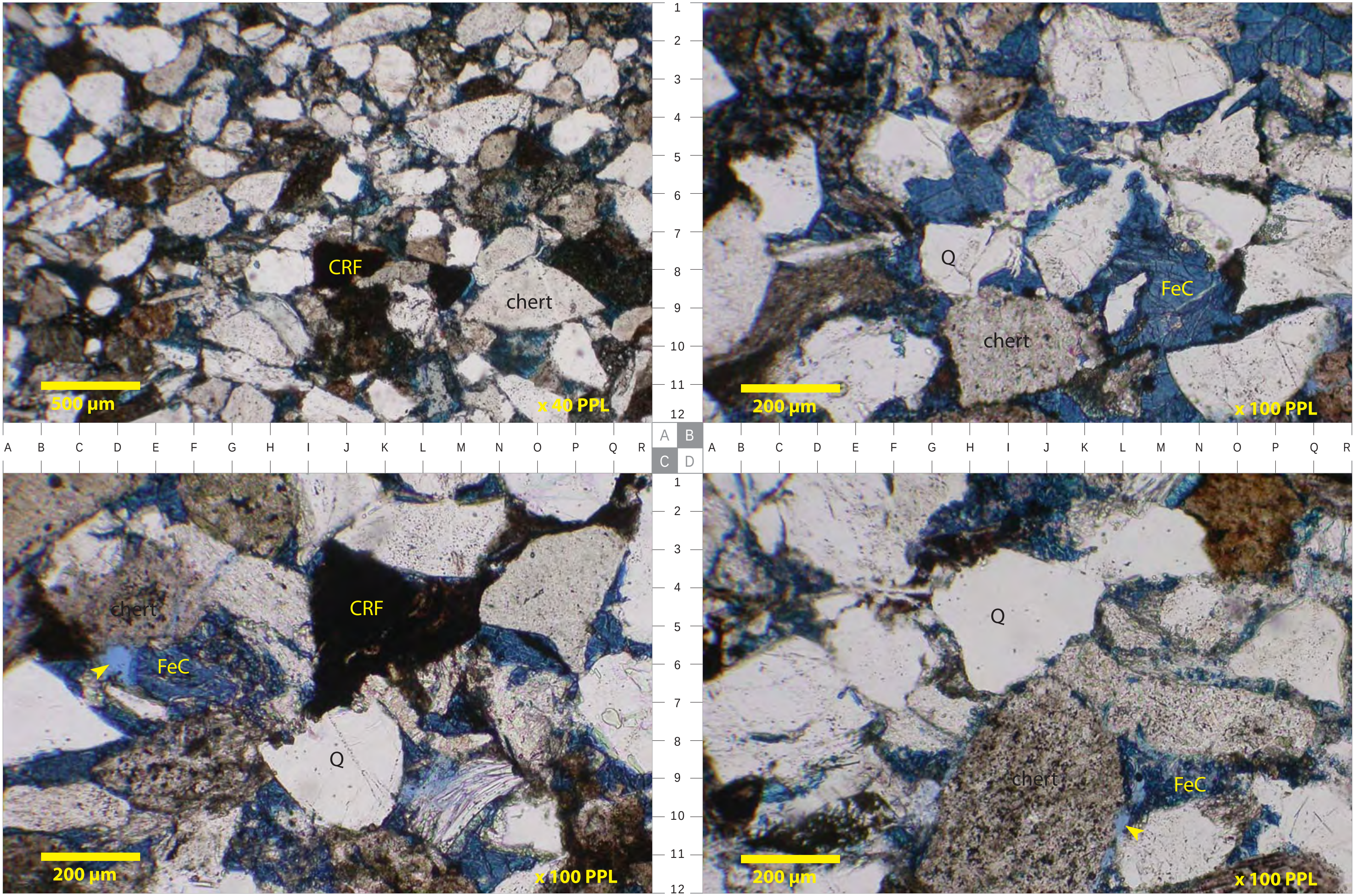


Plate 35
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42 10419.4 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 36

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 13.5% Core Analysis Permeability: 5.85 md

Sample #: 07-34
Depth: 10419.4 feet

Carbonate cemented, faintly laminated, fine to medium grained Taglu Sequence litharenites characterize the clastics recovered from core at 10419.4 feet. Common poikilotopic coarsely crystalline ferroan calcite (FeC) cement is patchily distributed engulfing partially leached framework grains as illustrated in View C, (P:7). Effective macroporosity is unevenly distributed, enhanced by carbonate and feldspar dissolution. Grain contacts are mainly tangential in this section. Rare pyrite has precipitated within chert micropores. Framework grains are comprised mainly of monocrystalline quartz (Q), chert, argillic sedimentary grains (CRF), feldspars and volcanic rock fragments (VRF). Trace kaolinite clays have precipitated within macropores (View B, “K”)

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

Taglu C-42

10419.4 feet

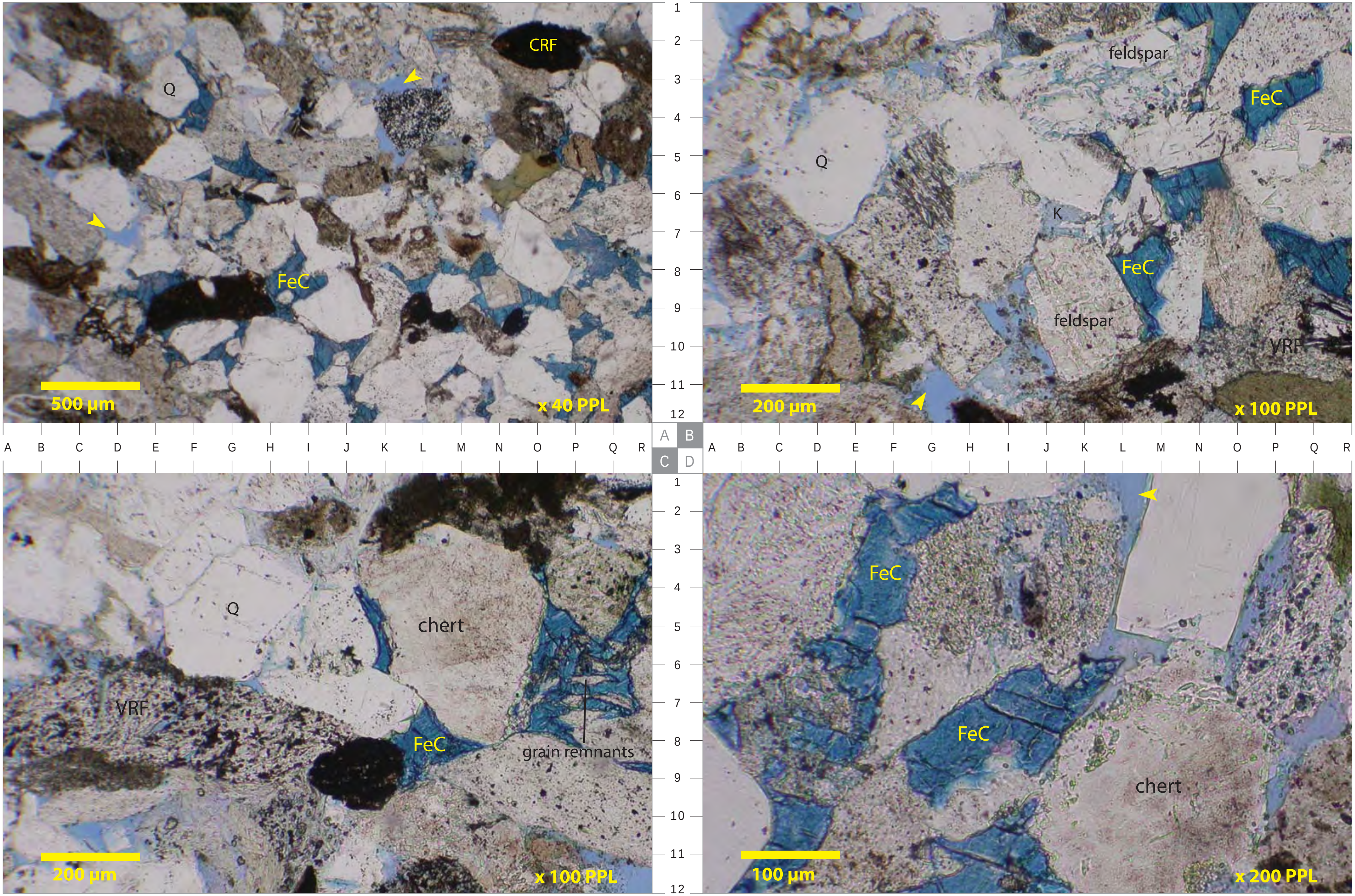


Plate 36
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

10420 feet

2 mm

Taglu

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

10423 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

10424 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42 10430.8 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 37

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 10.3%   Core Analysis Permeability: 0.49 md

Sample #: 07-35
Depth: 10430.8 feet

Laminated, moderately well sorted, very low permeability litharenites with tangential and concavo-convex grain contacts are recognized from core retrieved at 10430.8 feet. Note partial dissolution of feldspar grains (Views B-D) resulting in isolated intragranular porosity. Granule sized chert (View A) shows pyrite precipitated within micropores. Concavo-convex grain contacts with surrounding framework grains indicate considerable mechanical compaction. Loosely packed kaolinite clays (View B, O:3) and leucoxene (View B, Q:10) are found in trace amounts.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42 **10430.8 feet**

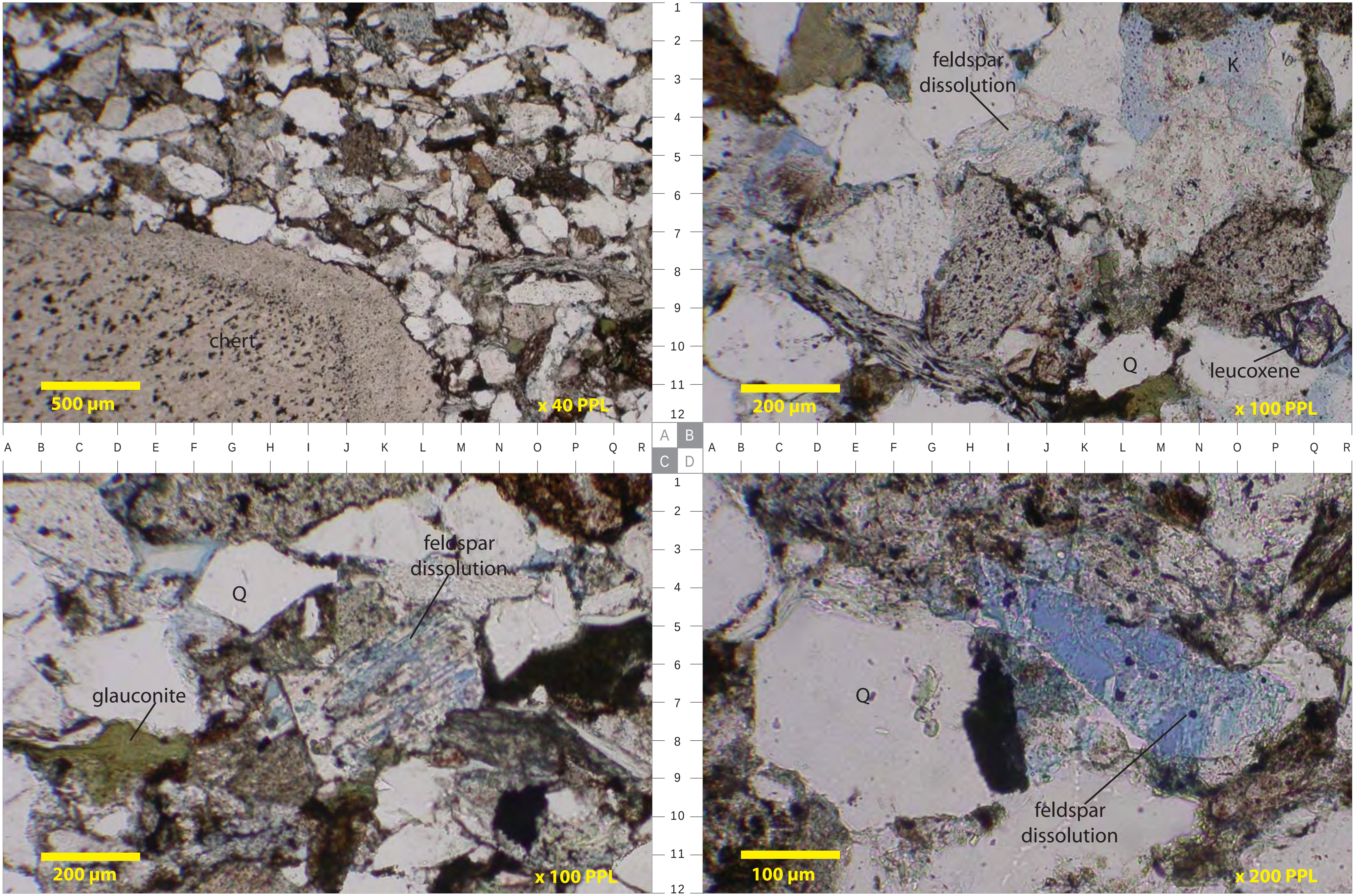


Plate 37
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42 10431 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

10433.4 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 38

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 15.3%   Core Analysis Permeability: 26.5 md

Sample #: 07-36
Depth: 10433.4 feet

Well sorted, fine grained litharenites with tangential and concavo-convex grain contacts are shown in these thin section photomicrographs. Clay-rich sedimentary grains are commonly compacted between more competent framework lithoclasts (View B, O:10). Unevenly distributed, trace to minor quartz overgrowths (small black arrows) have precipitated on host monocrystalline quartz grains. Monocrystalline quartz (Q), chert, clay-rich sedimentary grains are the main framework constituents with lesser amounts of glauconite (View B) and volcanic lithoclasts (VRF). Effective macroporosity is moderately well developed with measured core analysis porosity of 15.3%; measured permeability is 26.5 md.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

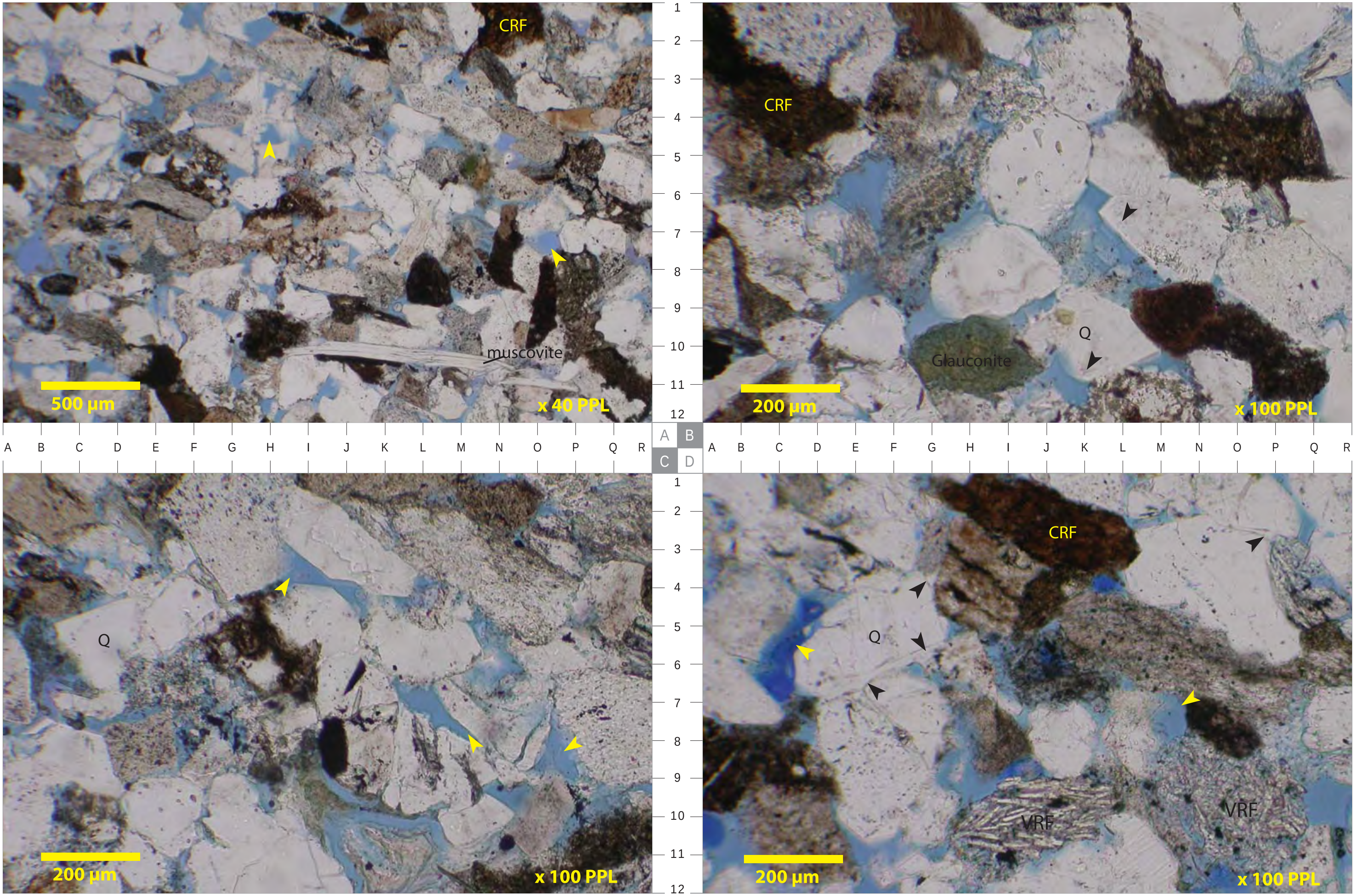


Plate 38
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42 10434 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

10438 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

10442 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

10444.7 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42 10443.5 feet

2 mm

Taglu

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 39

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 14.5% Core Analysis Permeability: 4.15 md

Sample #: 07-38
Depth: 10444.7 feet

Faintly laminated fine grained, moderately well sorted litharenites recovered by core at 10444.7 feet represents the Taglu Sequence. Framework grains, as determined by modal analysis, are comprised mainly of monocrystalline quartz, polycrystalline quartz, chert, clay-rich sedimentary grains, K-feldspar (stained yellow), sideritized micas, metamorphic grains, micas, organic material, rare glauconite and partially leached volcanic rock fragments (VRF). Unevenly distributed, grain rimming microcrystalline to cryptocrystalline siderite is common (large green arrows). Grain contacts are tangential and concavo-convex in this porous sandstone. Trace ferroan calcite (?ankerite) is patchily distributed (View A – FeC). Whole rock X-ray diffraction analysis has yielded quartz (67%), albite (18%), micas (6%), siderite (4%) and clays (chlorite 3%, kaolinite 2%).

Photo A: 100X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

Taglu C-42

10444.7 feet

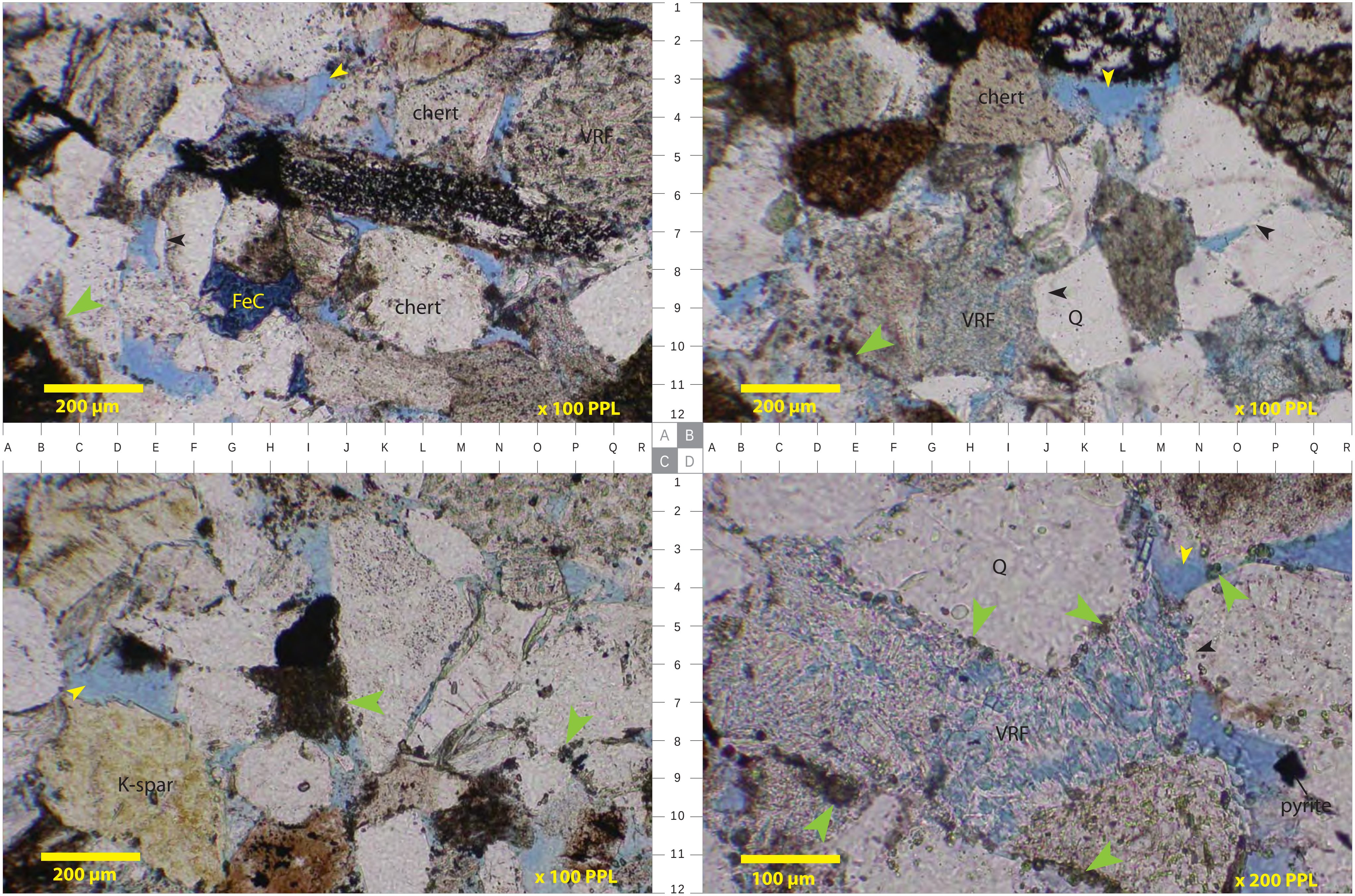


Plate 39
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

10445 feet

Taglu

2 mm

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

10450 feet

2 mm

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

10453 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

10455 feet

2 mm

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

10458 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

10459 feet

Taglu

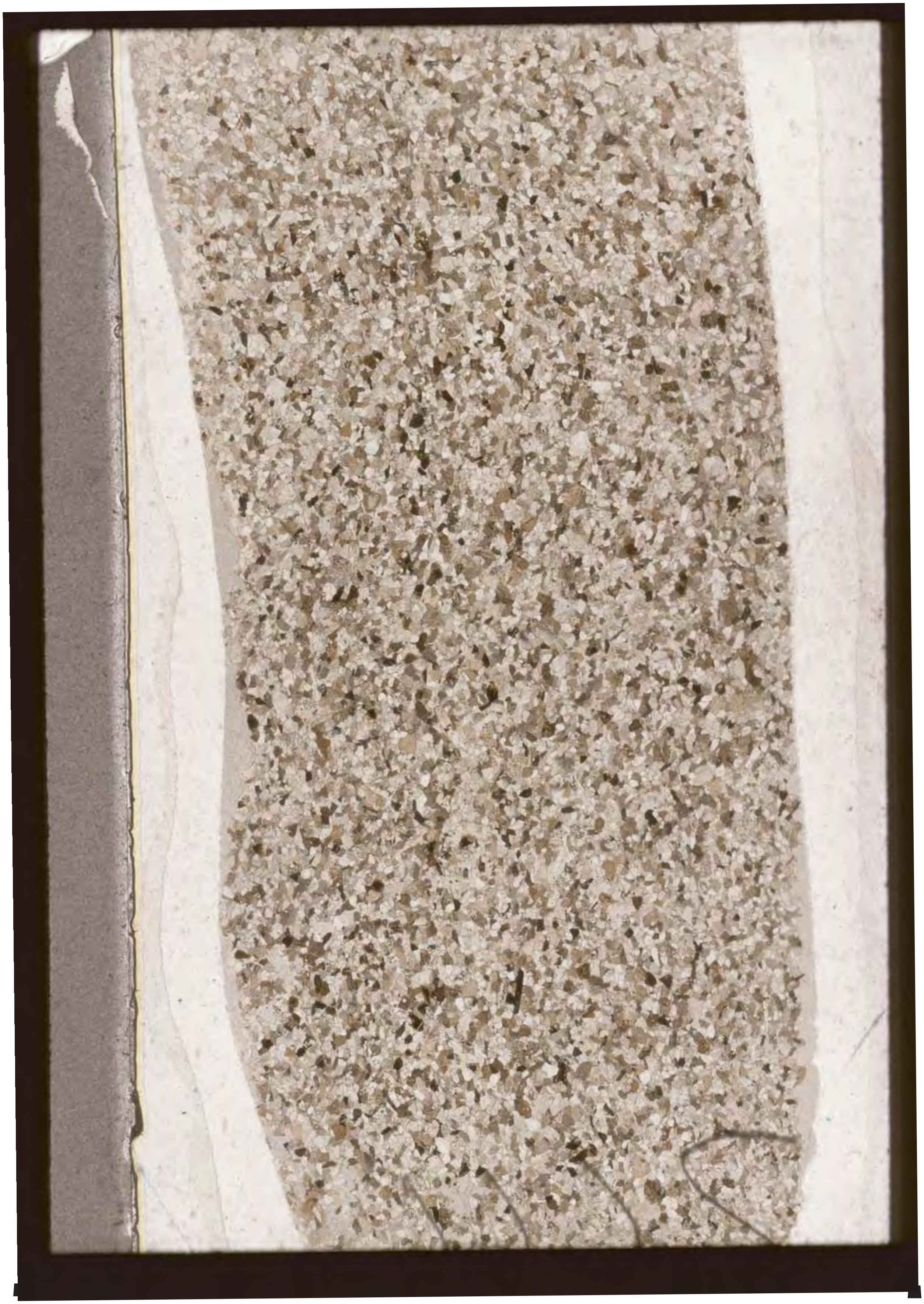
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

10462 feet



Taglu

2 mm

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

10464.4 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 40

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 14.5%   Core Analysis Permeability: 140 md

Sample #: 07-39
Depth: 10464.4 feet

Porous and permeable moderately sorted, fine to very coarse grained litharenites are recognized as Taglu Sequence clastics recovered from core at 10464.4 feet. Grain contacts are mainly tangential and concavo-convex. Authigenic phases are poorly preserved consisting of minor quartz overgrowths (small black arrows) and rare pyrite precipitated within chert micropores. Chert and monocrystalline quartz (Q) are the dominant framework grains with common feldspars, clay-rich sedimentary grains (CRF) and volcanic grains (View B – VRF). Macroporosity (small yellow arrows) is well developed in this very good reservoir quality interval.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42 — 10464.4 feet

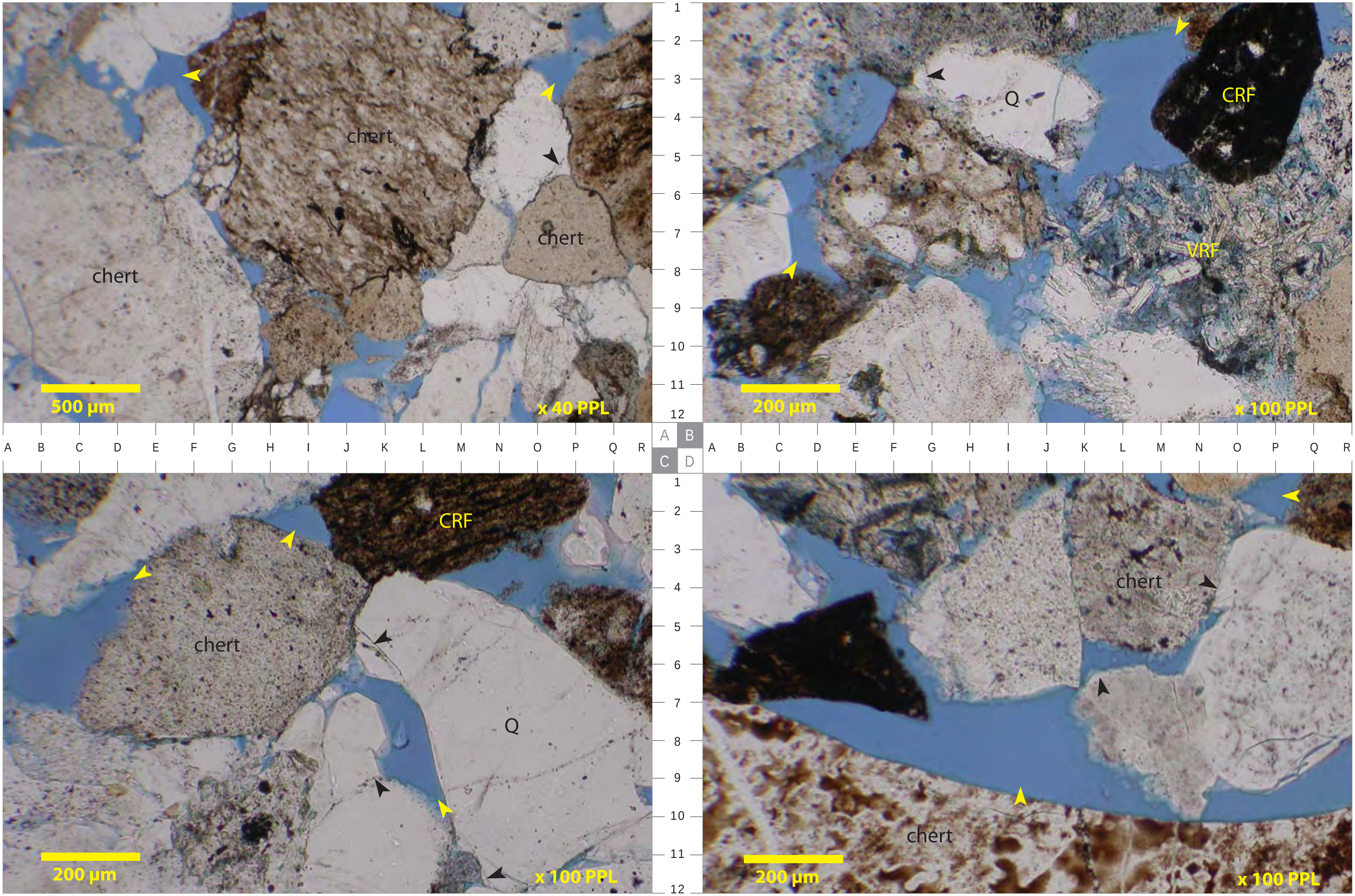


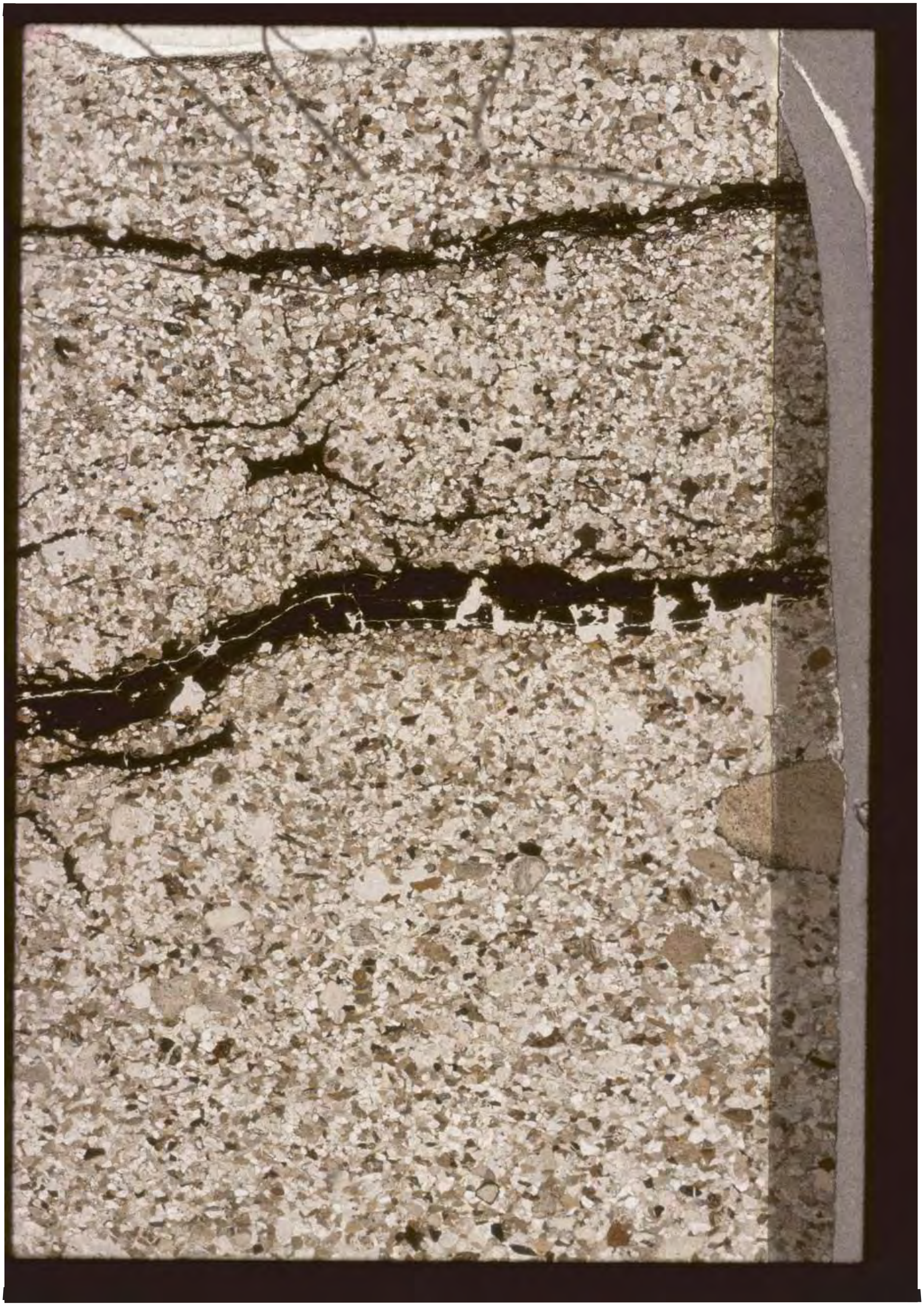
Plate 40
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

10466 feet



Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

10467.7 feet

2 mm

Taglu

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 41

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 17.1%   Core Analysis Permeability: 87.1 md

Sample #: 07-40
Depth: 10467.7 feet

Moderately well sorted, fine grained Taglu Sequence litharenites are recognized from core recovered at 10467.7 feet. Grain contacts are tangential and concavo-convex in this sandstone. Complete dissolution of unstable framework grains (feldspars) has enhanced the effective pore system (small yellow arrows). Mechanical compaction of unstable partially leached grains has resulted in grain fracturing (View C). Monocrystalline quartz, chert, clay-rich sedimentary grains (CRF), feldspars and rare glauconite (View B) are some of the framework constituents.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

10467.7 feet

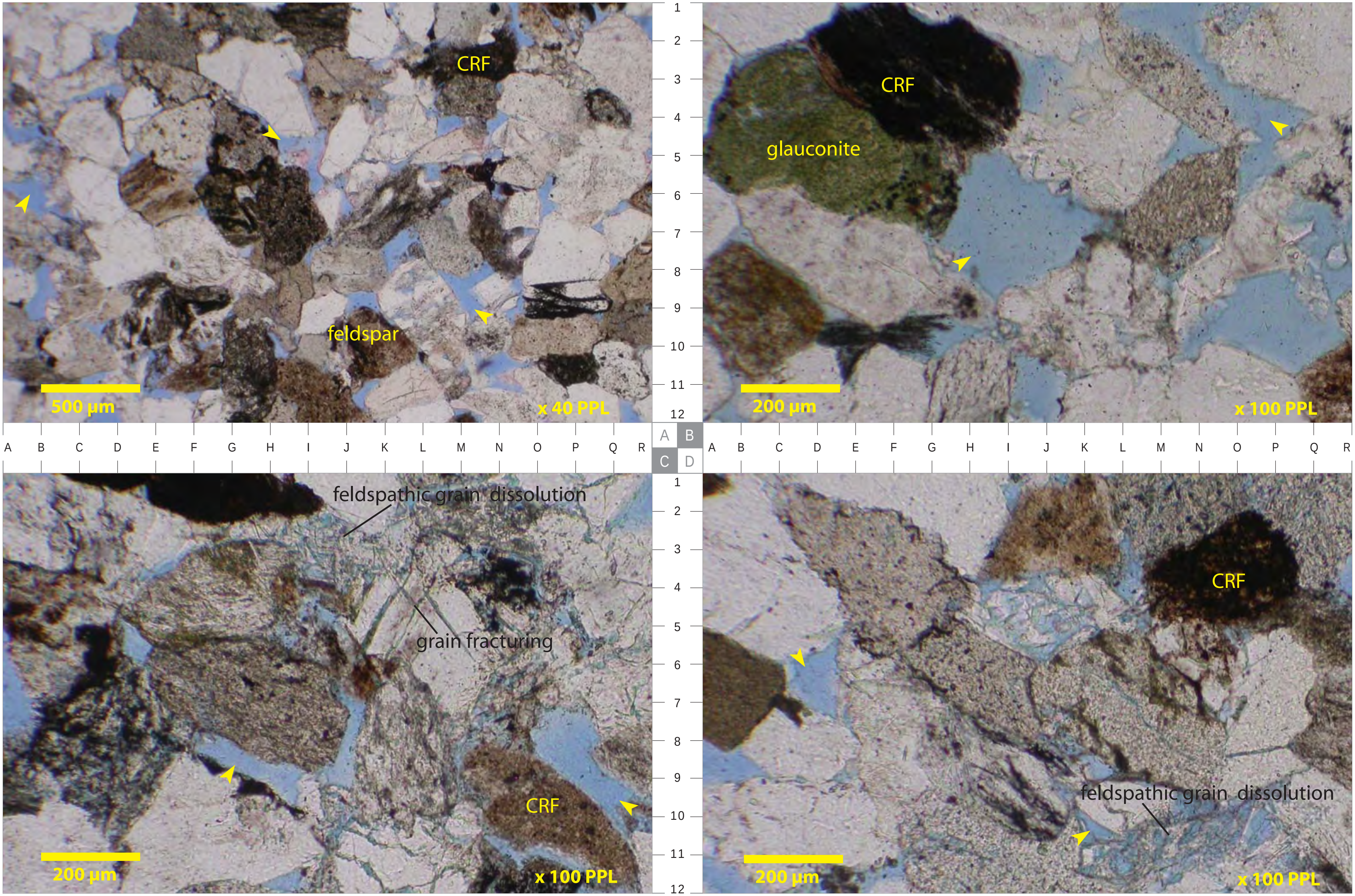


Plate 41
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

10471 feet

Taglu

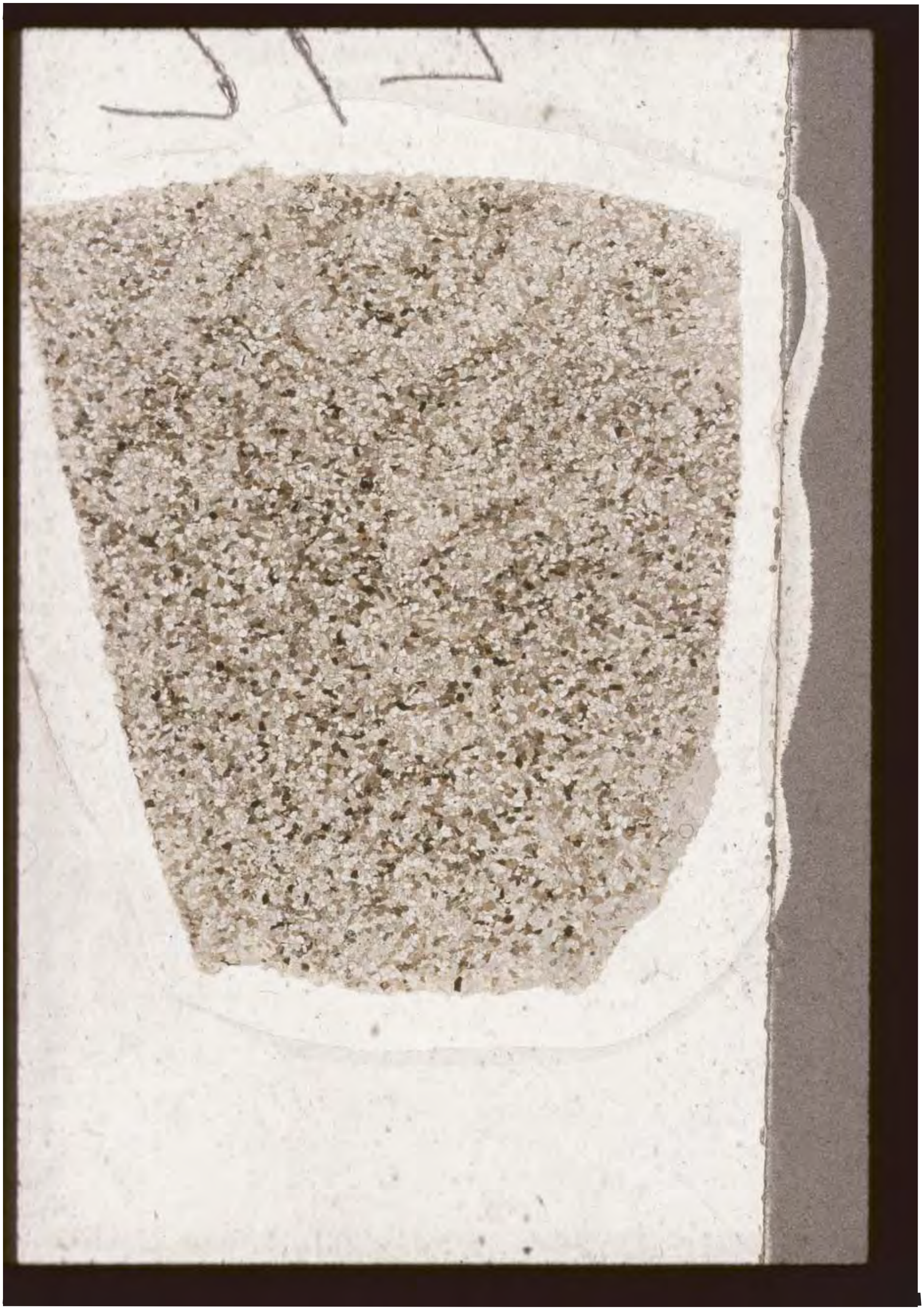
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

10473 feet



Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

10475 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

10476 feet

Taglu

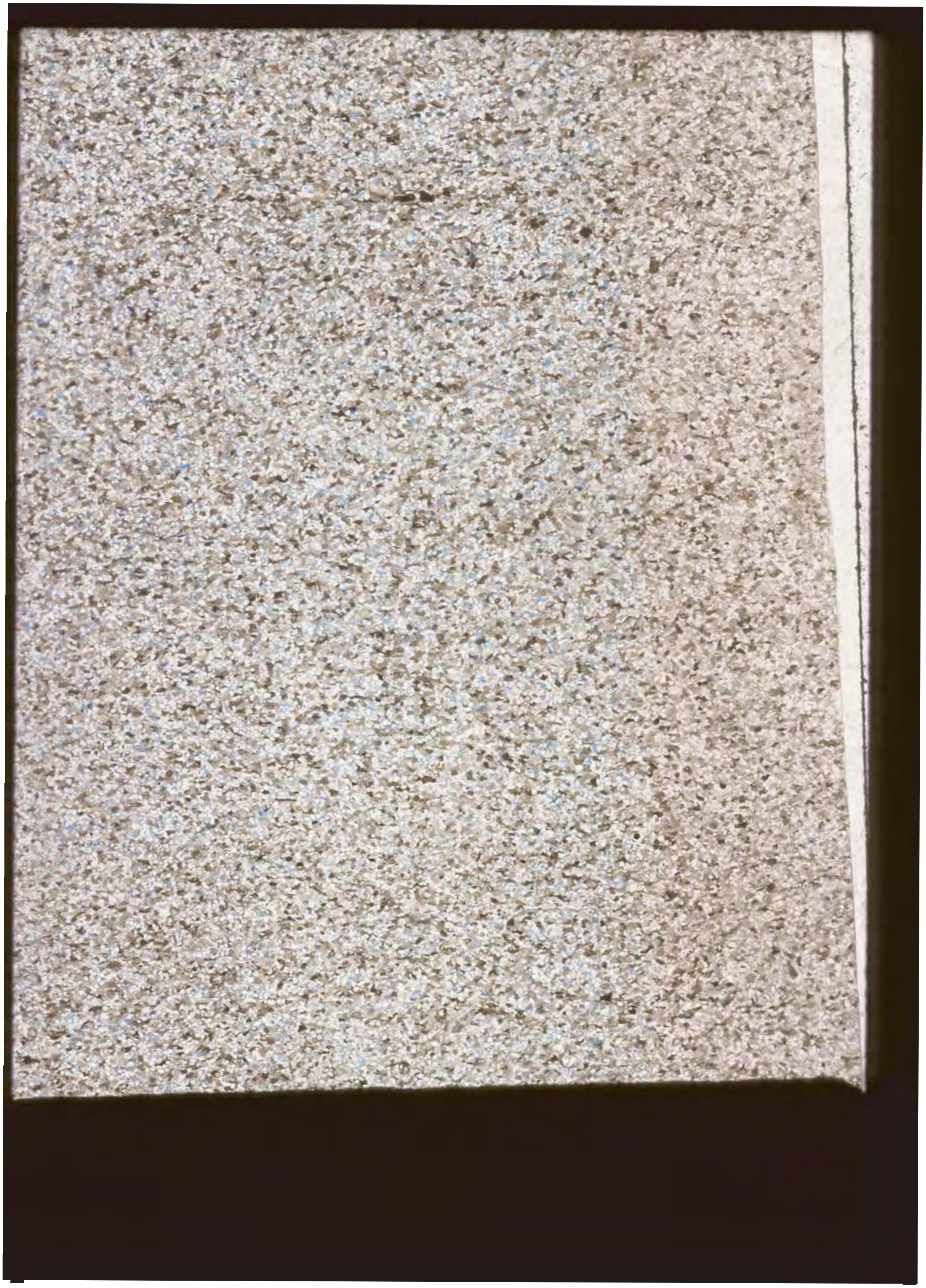
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

10476.1 feet



Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 42

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 15%   Core Analysis Permeability: 27.4 md

Sample #: 07-41
Depth: 10476.1 feet

Well sorted, fine grained Taglu Sequence litharenites characterize the clastics recovered from core at 10476.1 feet. Dissolution of feldspathic grains (View D) has enhanced the effective macropore system (small yellow arrows). Authigenic cements include patchily distributed ferroan calcite (View B), poorly developed quartz overgrowths (small black arrows), rare leucoxene (View C), microcrystalline siderite (large green arrows) and microcrystalline pyrite. Grain contacts are mainly tangential and concavo-convex in this interval suggesting moderate mechanical compaction. Monocrystalline quartz, chert, clay-rich sedimentary grains, feldspathic grains, micas (View C, M:7) and rare glauconite (View A) are some of the framework constituents.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42 **10476.1 feet**

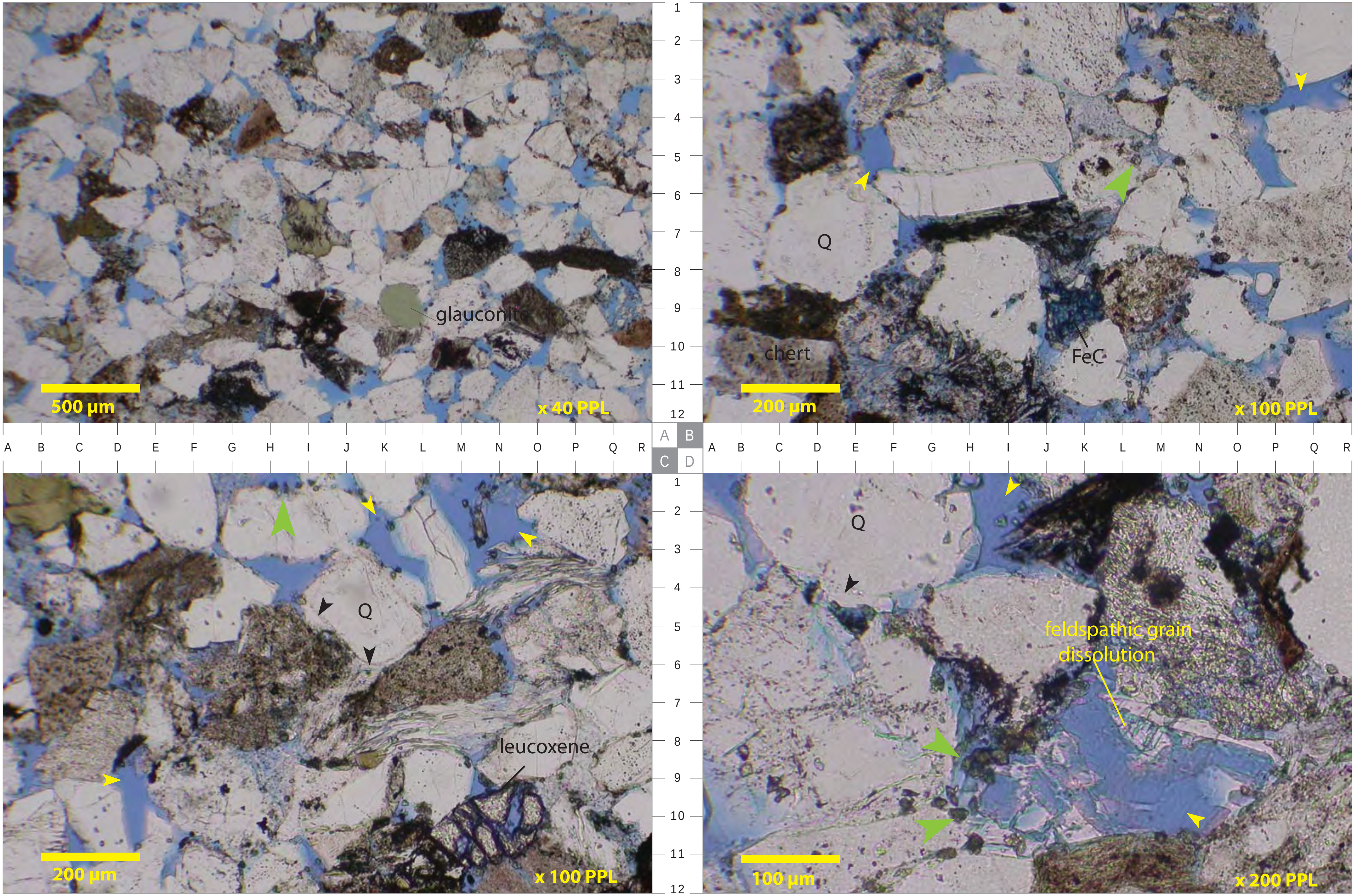


Plate 42
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

10481 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42 10486 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

10492 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

10492.4 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 43

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 12.9% Core Analysis Permeability: 9.89 md

Sample #: 07-42
Depth: 10492.4 feet

Features illustrated in these high magnification thin section photomicrographs include:

- Common unevenly distributed grain rimming siderite (large green arrows) predates quartz overgrowths
- Minor unevenly distributed syntaxial quartz overgrowths (small black arrows) on quartz grains (Q)
- Eogenetic patchily distributed blue stained sparry ferroan calcite cement (FeC)
- Commonly compacted argillic sedimentary clasts (View B, O:6)
- Moderately well developed effective macroporosity (small yellow arrows)

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

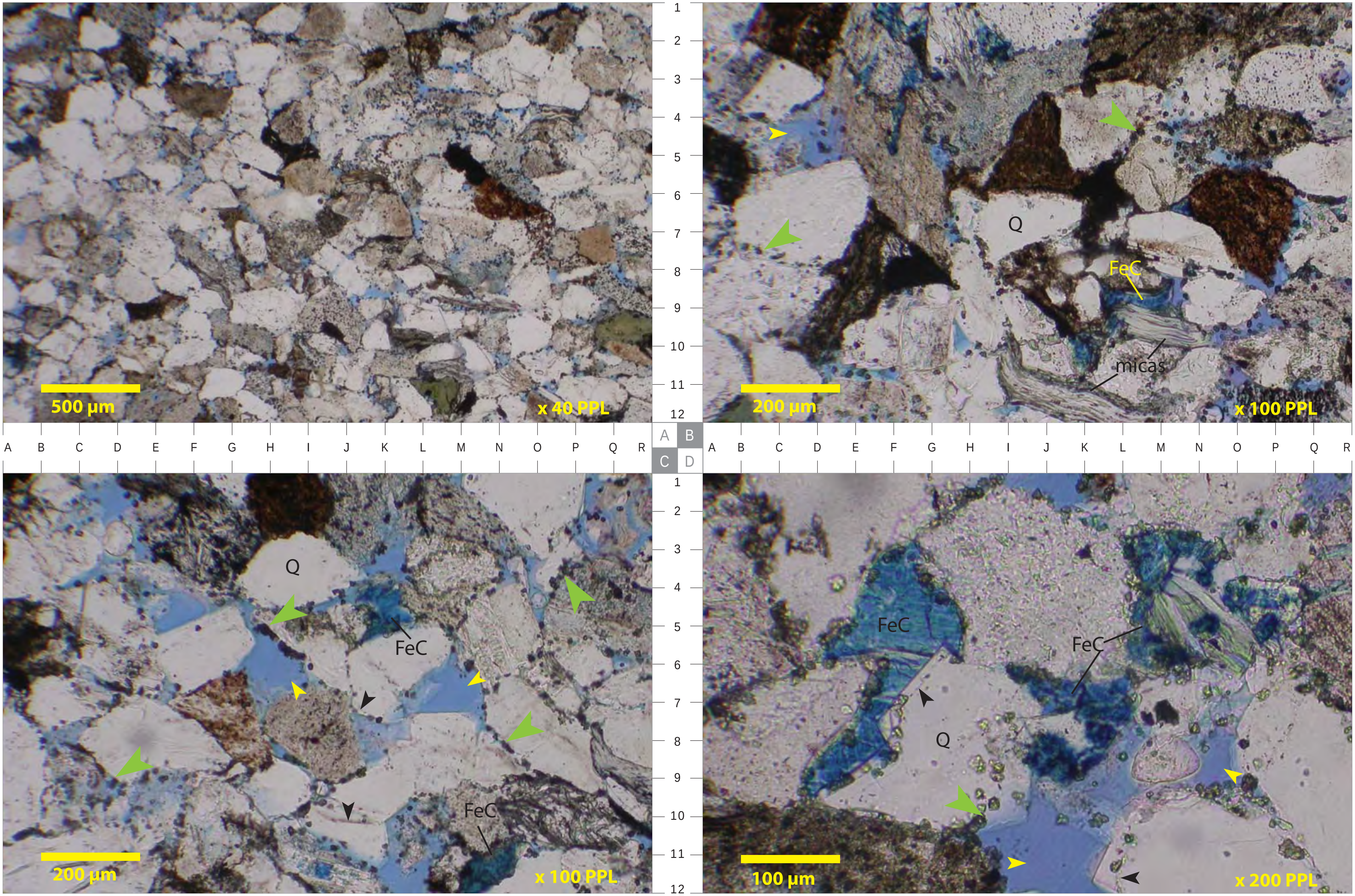


Plate 43
January 2010
CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

10495.1 feet

2 mm

Taglu

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 44

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 11.7%   Core Analysis Permeability: 1.18 md

Sample #: 07-43
Depth: 10495.1 feet

Eogenetic microcrystalline ferroan calcite cemented, fine grained well sorted litharenites characterize the very low permeability sandstones encountered by core at 10495.1 feet. Dissolution of feldspathic grains (View D) and pore filling carbonate cement has enhanced the effective macropore (small yellow arrows) system. Microcrystalline to cryptocrystalline siderite (large green arrows) unevenly rims framework constituents. Grain contacts are tangential and point-point.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

10495.1 feet

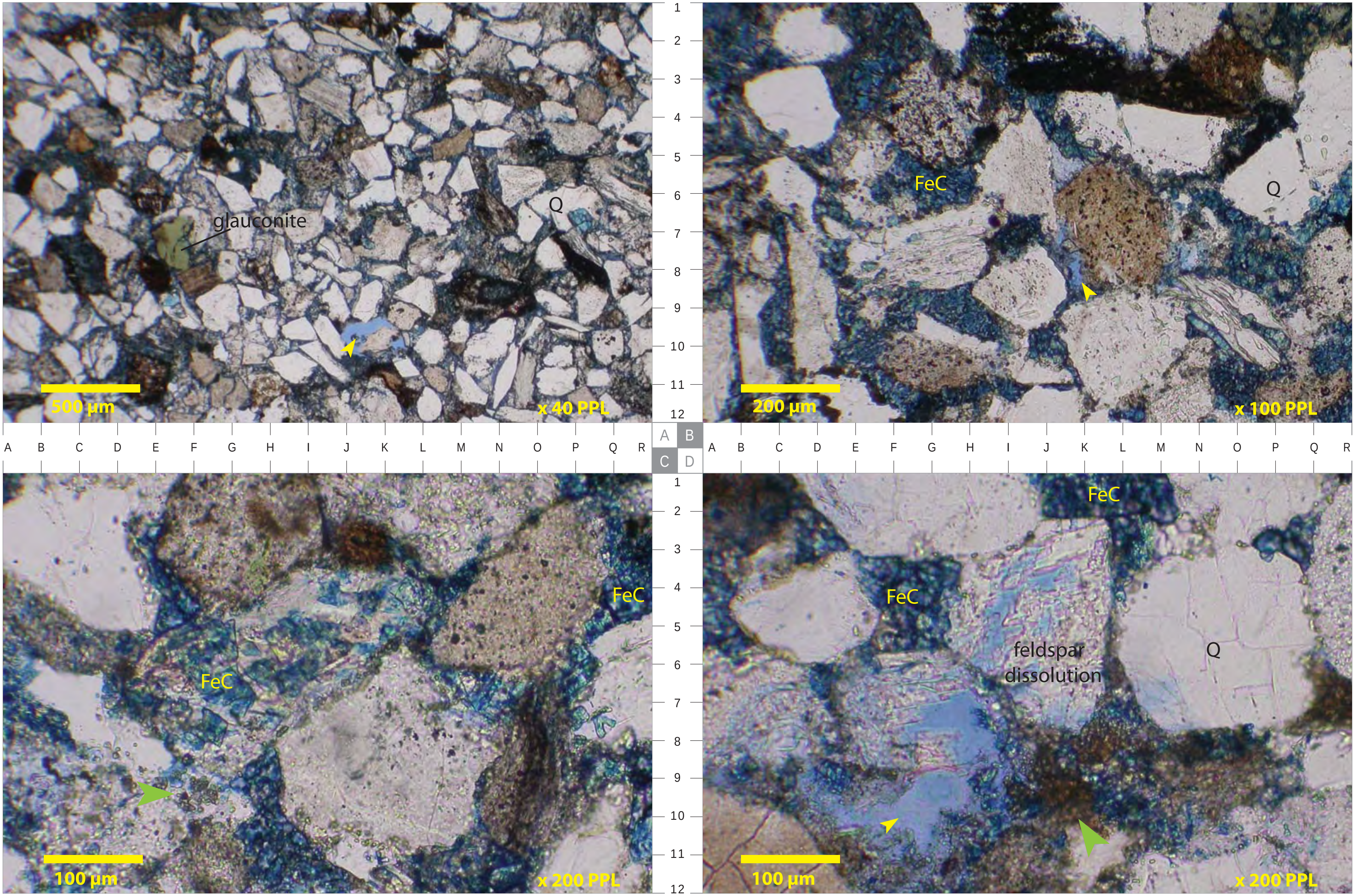


Plate 44

January 2010

CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

10497 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 45

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 2.8% Core Analysis Permeability: 0.02 md

Sample #: 07-44
Depth: 10497 feet

The following salient features are shown in these thin section photomicrographs:

- Abundant poikilotopic ferroan calcite cement (FeC) engulfs partially leached framework grains (View D, L:7-8)
- Rare ferroan dolomite (View B, FeD) encased by ferroan calcite cement (FeC) indicating ferroan dolomite predates ferroan calcite cement
- Trace pyrite precipitated within chert micropores
- Tangential and point-point grain contacts
- Chert, volcanic rock fragments (VRF), monocrystalline quartz, argillic grains comprise some of the framework constituents

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

Taglu C-42 — 10497 feet

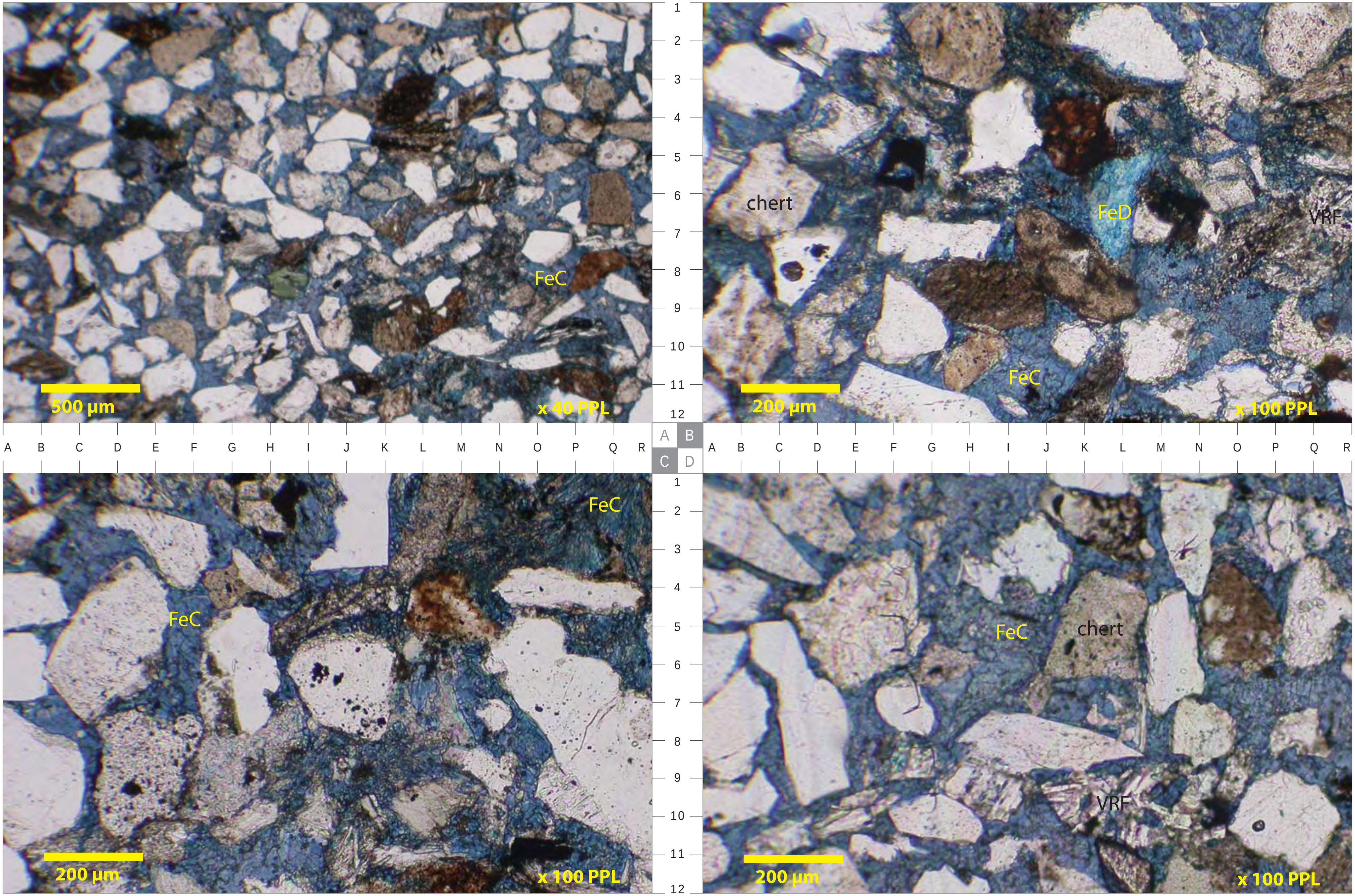


Plate 45
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

10500.5 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 46

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 13.4% Core Analysis Permeability: 5.88 md

Sample #: 07-45
Depth: 10500.5 feet

Authigenic phases shown in these thin section photomicrographs include:

- Cryptocrystalline eogentic siderite
- Moderate mechanical compaction of labile framework grains (View A, M:3-4)
- Poorly developed quartz overgrowths (small black arrows) on host monocrystalline quartz (Q) grains
- Eogentic patchily distributed ferroan calcite (FeC)
- Trace pyrite precipitated within chert micropores
- Clay-rich sedimentary grains (CRF)
- Trace glauconite (View C)
- Moderately developed effective macroporosity (small yellow arrows)

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42 | 10500.5 feet

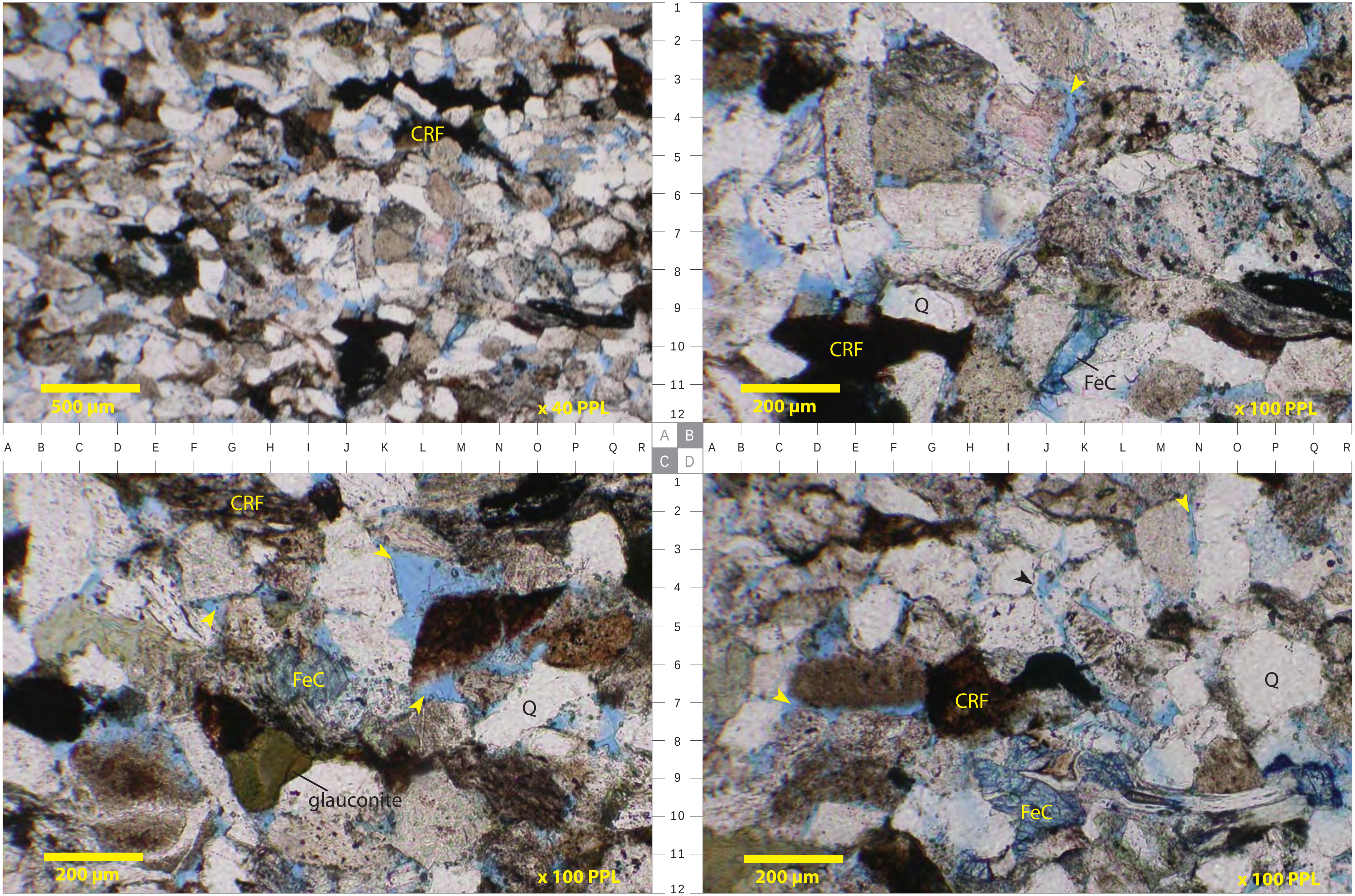


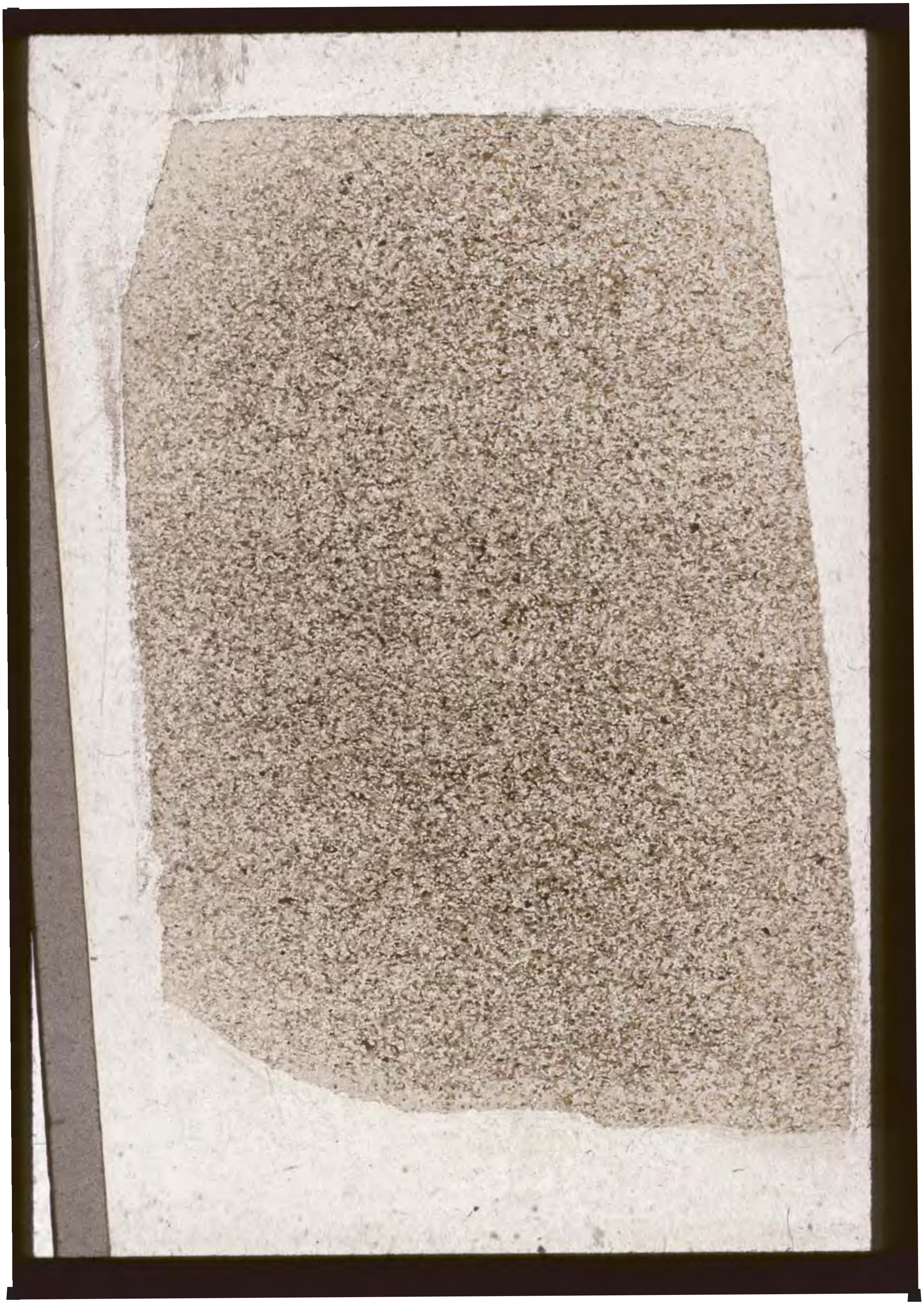
Plate 46
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

10501 feet



Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

10504 feet

2 mm

Taglu

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 47

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 13.6%   Core Analysis Permeability: 5.03 md

Sample #: 07-46
Depth: 10504 feet

Laminated, bioturbated poor to moderately sorted, very fine grained carbonate cemented litharenites were recovered from core at 10504 feet. Sideritic clays with rip-up clasts (wash over deposit) is shown in the Overview. Ferroan calcite cement (FeC) is patchily distributed. Dissolution of carbonate cement and feldspathic grains (View C, J:8) has enhanced the effective pore system(small yellow arrows). Framework grains include monocrystalline quartz (Q), sideritized clay lithoclasts (CRFs), micas, feldspathic grains, chert.

Photo A: 20X PPL,   Photo B: 40X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42 — 10504 feet

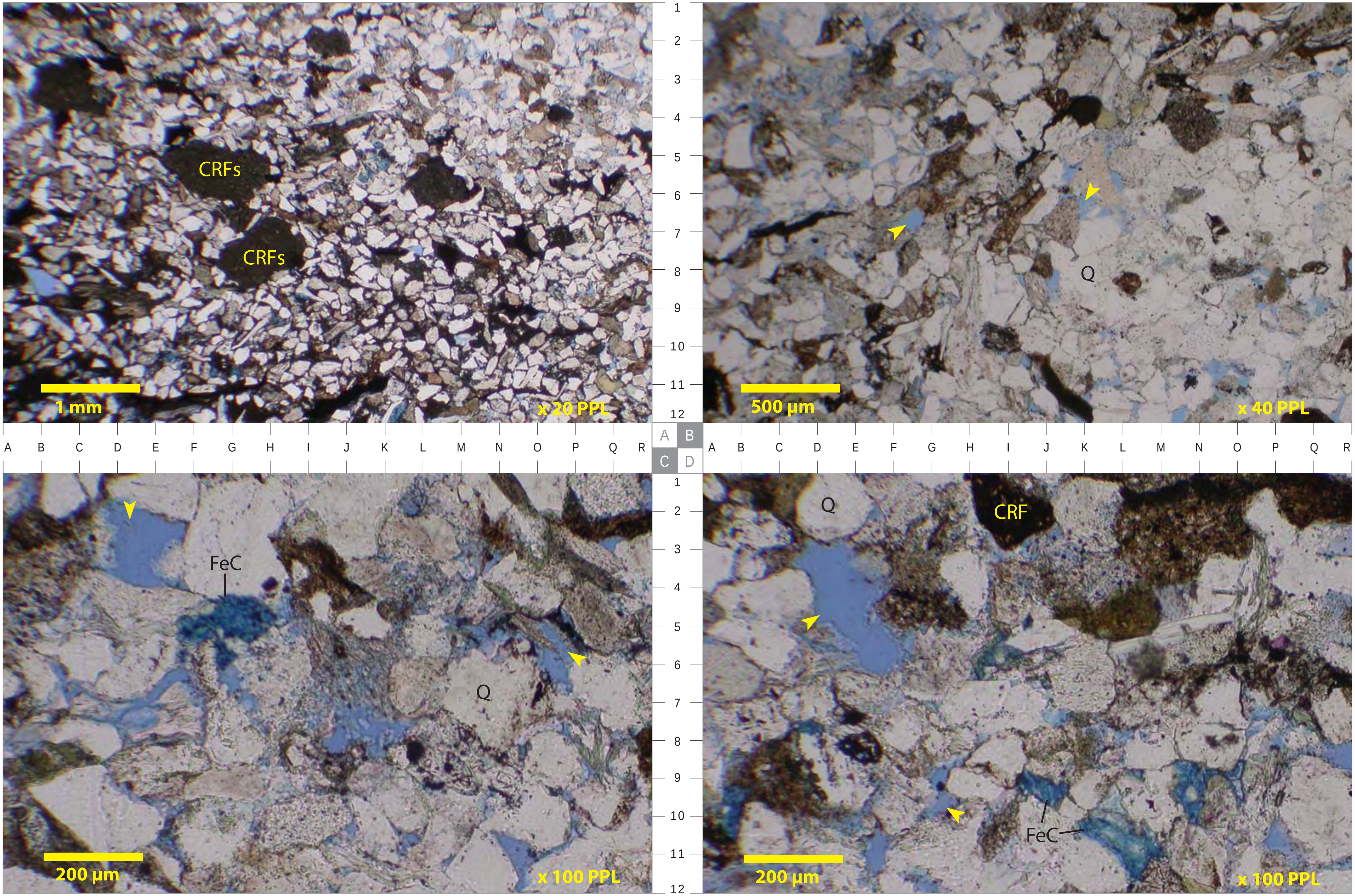


Plate 47
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

10509 feet

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

10513 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42 — 10516 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 48

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 13.2%   Core Analysis Permeability: 1.6 md

Sample #: 07-47
Depth: 10516 feet

Fine grained, moderately well sorted, bioturbated litharenites are recognized from core taken at 10516 feet. Framework grains include monocrystalline quartz (Q), polycrystalline quartz, with lesser volumes of K-feldspar (View A, yellow stained), chert, plagioclase, argillic sedimentary grains (CRF), metamorphic rock fragments, micas, volcanic grains (View D – VRF) and sideritized lithoclasts. Mechanical compaction is considered moderate with labile lithoclasts compacted between the more competent grains. Minor ferroan calcite (FeC) is patchily distributed in this interval. Rare pyrite has precipitated within chert micropores.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

10516 feet

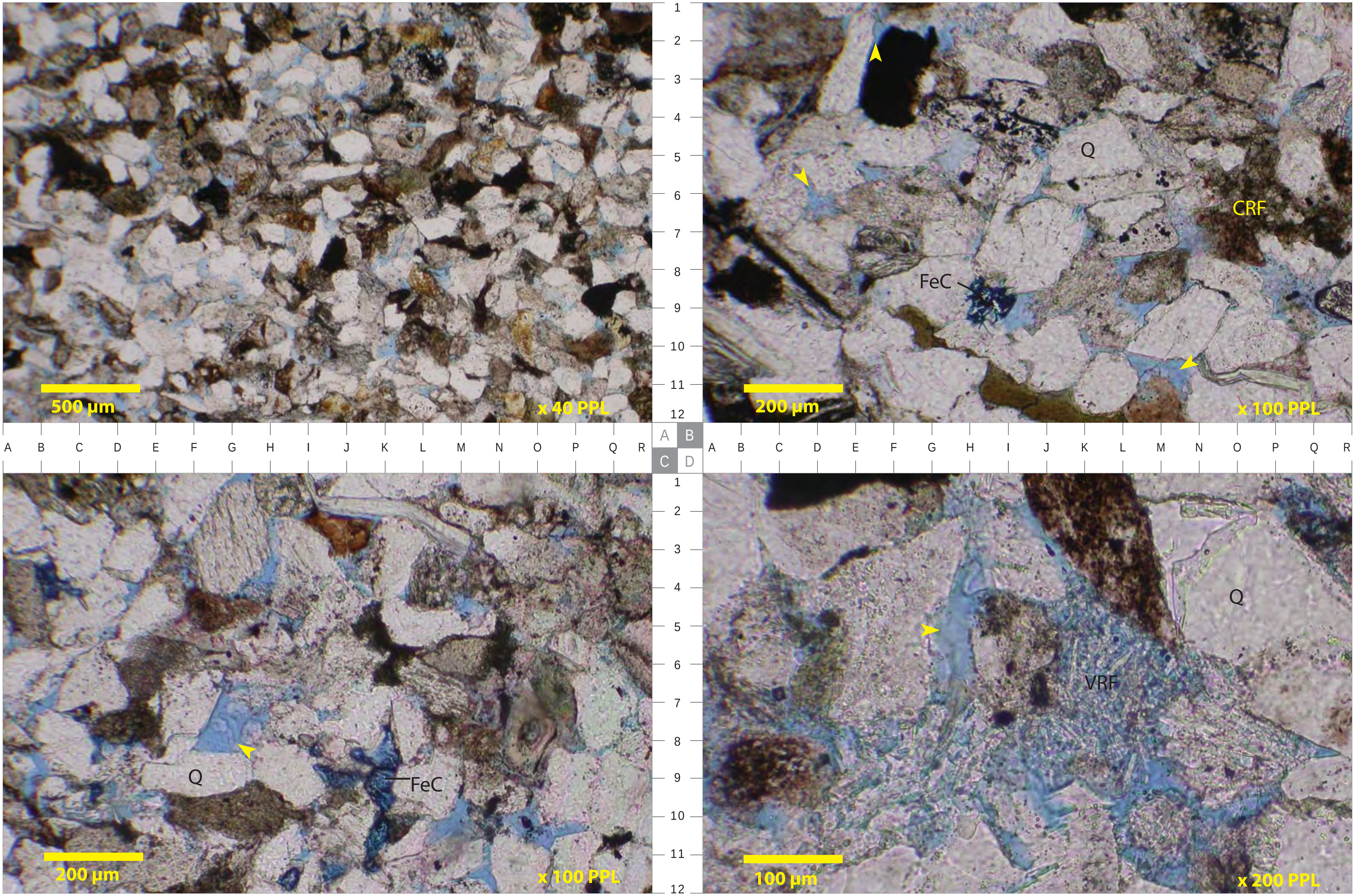


Plate 48
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

10521 feet

2 mm

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

10527 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 49

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: 12.5%   Core Analysis Permeability: 0.43 md

Sample #: 07-48
Depth: 10527 feet

Parallel laminated, very fine to fine grained, well sorted Taglu Sequence litharenites characterize the clastics recovered from core at 10527 feet. Mechanical compaction of brown to black clay-rich sedimentary grains (CRF) is common resulting in very low permeability. Rare ferroan calcite (View D, "FeC") is patchily distributed. Dissolution of feldspathic grains (View D, M:4) has resulted in isolated effective macropores (small yellow arrows).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

10527 feet

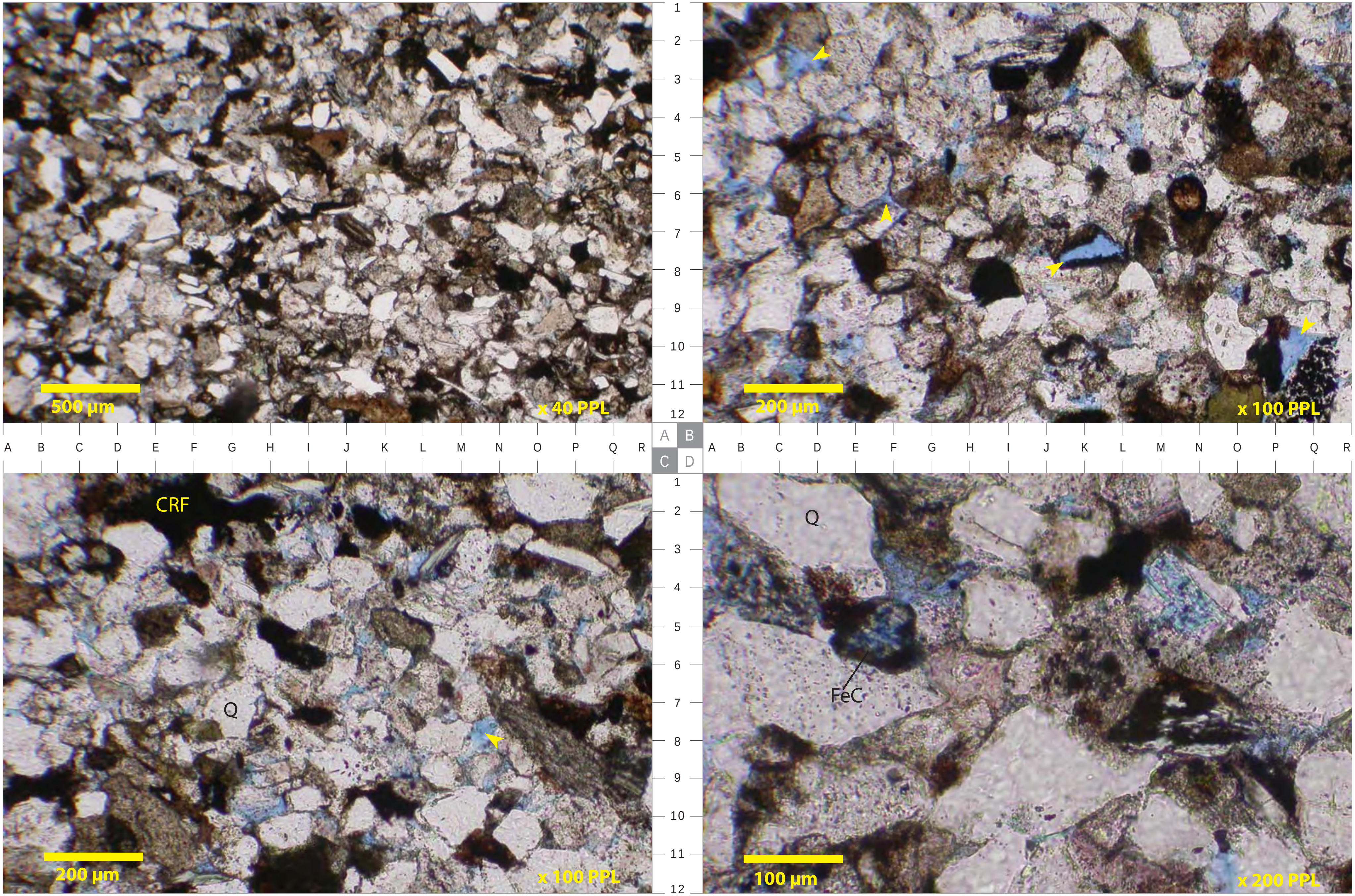


Plate 49
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42 10528 feet

Taglu

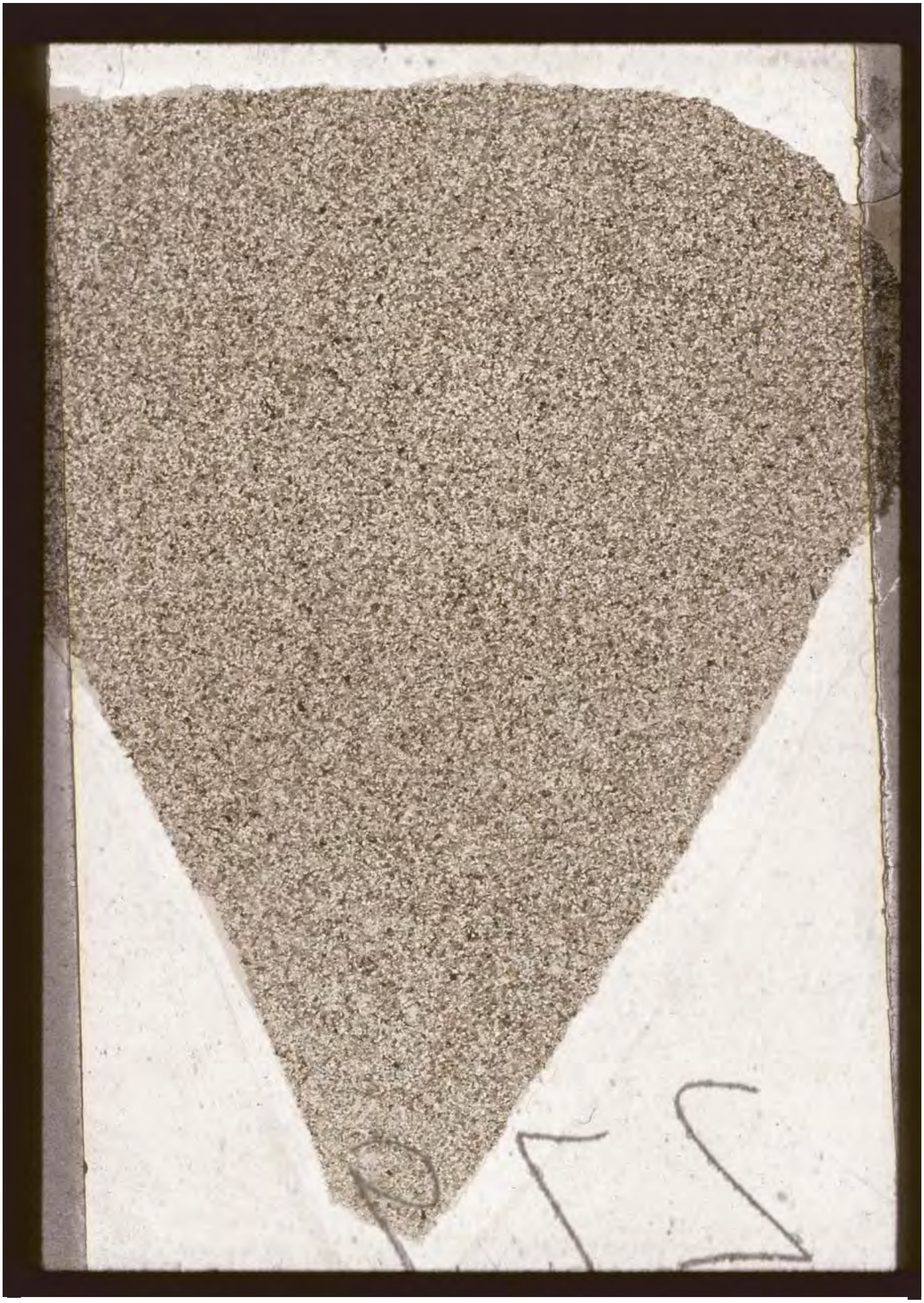
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Taglu C-42

10532 feet



2 mm

Taglu

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Taglu C-42

11508.5 feet

2 mm

Taglu

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 50

Taglu C-42
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 07-49
Depth: 11508.5 feet

Well sorted, fine grained bioturbated litharenites are recognized from core recovered at 11508.5 feet. Macroporosity (small yellow arrows) is poorly developed in this interval. Concavo-convex to tangential grain contacts suggest moderate mechanical compaction of labile framework constituents. Rare patched of ferroan calcite is shown in View D. Dissolution of feldspathic grains (View C) has slightly enhanced the macropore system. Whole rock X-ray diffraction analysis generated quartz (57%), albite (25%), K-feldspar (6%), micas (6%) and kaolinite clays (6%).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

Taglu C-42 — 11508.5 feet

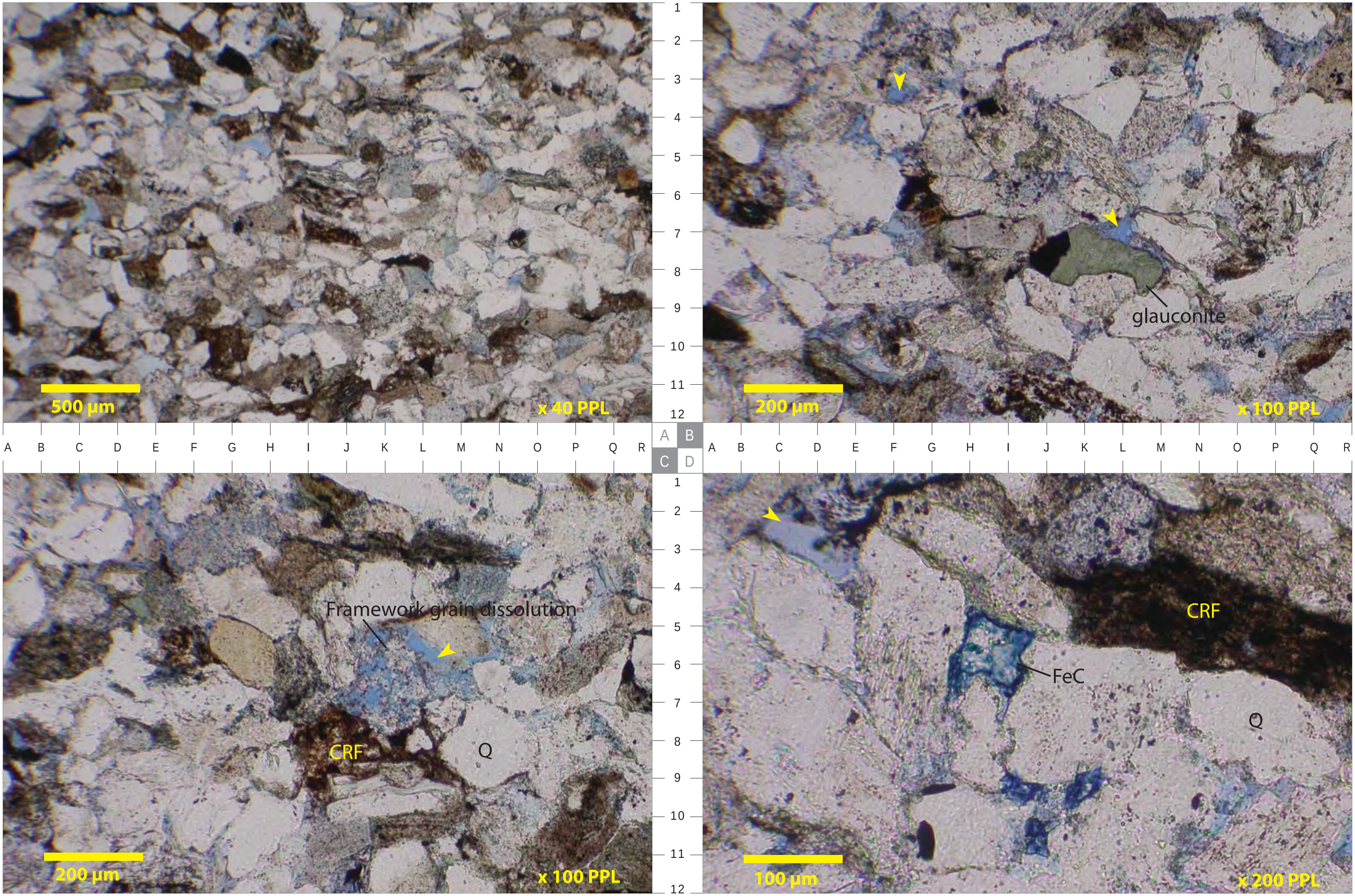


Plate 50
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglintgak M-19

Thin Section Overviews

And

Select Described Photomicrographs

Niglintgak M-19

3187 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Niglintgak M-19 3190.2 feet

2 mm

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 01

Niglintgak M-19
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 06-01
Depth: 3190.2 feet

Compacted, silt to very fine grained litharenite characterizes the Taglu Sequence sandstones recovered from sidewall core at 3190.2 feet. Framework grains are comprised mainly of clay-rich sedimentary grains, monocrystalline quartz and chert with lesser volumes of micas, sideritic lithoclasts, feldspar and organic material. Macropores are occluded by ferroan dolomite. Siderite and pyrite are considered trace to minor authigenic cements. Note expanded micas (Views C and D) filled with ferroan carbonate cement.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

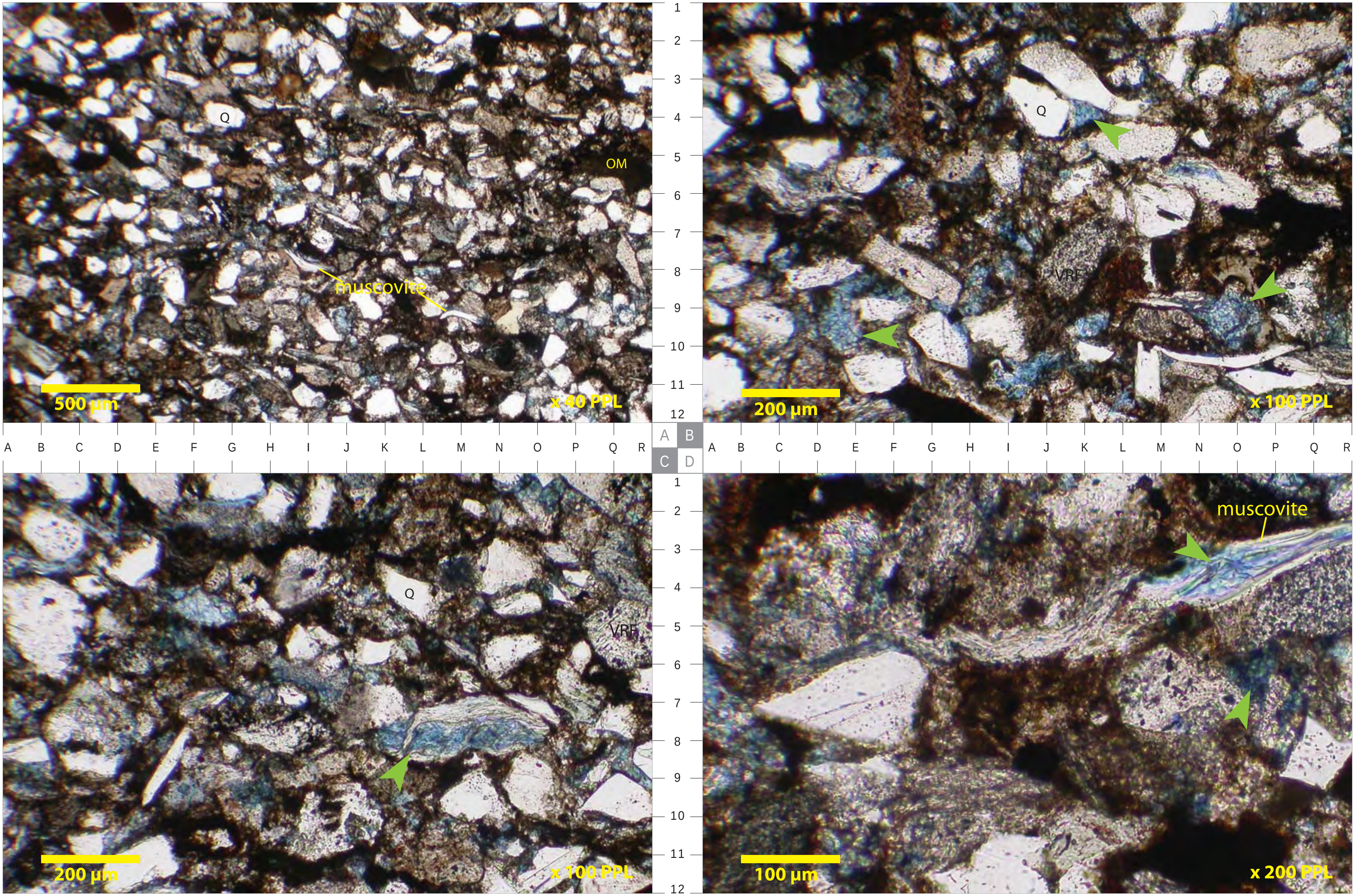


Plate 01
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglintgak M-19

3272 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Niglintgak M-19

3273 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 02

Niglintgak M-19
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 06-03
Depth: 3273 feet

Well sorted, medium grained porous and permeable Taglu Sequence litharenites are recognized from sidewall core recovered at 3273 feet. Chert, monocrystalline quartz and argillic sedimentary clasts are the main framework constituents. Feldspars, sideritic clasts and rare organic material are considered subordinate framework components. Grain contacts are floating suggesting a precursor pore filling cement has preserved the primary pore system. Subsequent dissolution of this early cement has resulted in an excellent reservoir quality interval. Authigenic cements are minor consisting of siderite (large green arrows in View D) plus loosely packed kaolinite clays (View A, "K"). Fractured grains, in View A indicate mechanical stresses following the dissolution of the precursor pore preserving authigenic cement.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

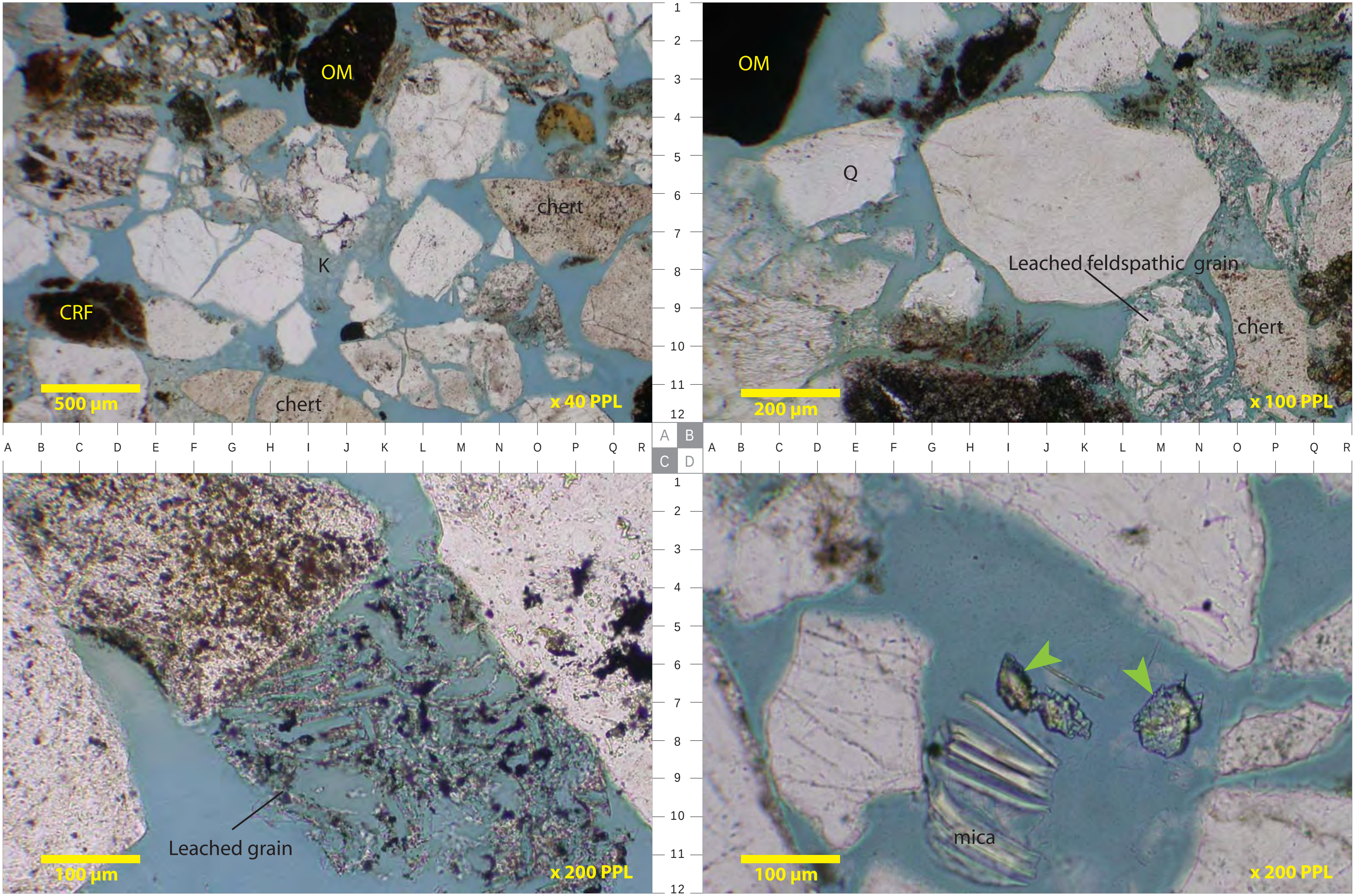


Plate 02
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglintgak M-19

3284 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 03a

Niglintgak M-19
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #:
Depth: 3284 feet

Moderately well sorted, medium to coarse grained litharenites were recovered at 3284 feet. Effective macroporosity is well preserved in this interval reflecting the dissolution of a precursor pore preserving cement. Fractured grains suggest mechanical compactional stresses happened after the dissolution of a pore preserving cement. Loosely packed kaolinite clays are common within the macropores (View A, “K”). Dissolution of feldspathic grains has enhanced the pore system.

Photo A: 40X PPL,   Photo B: 40X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglantgak M-19

3284 feet

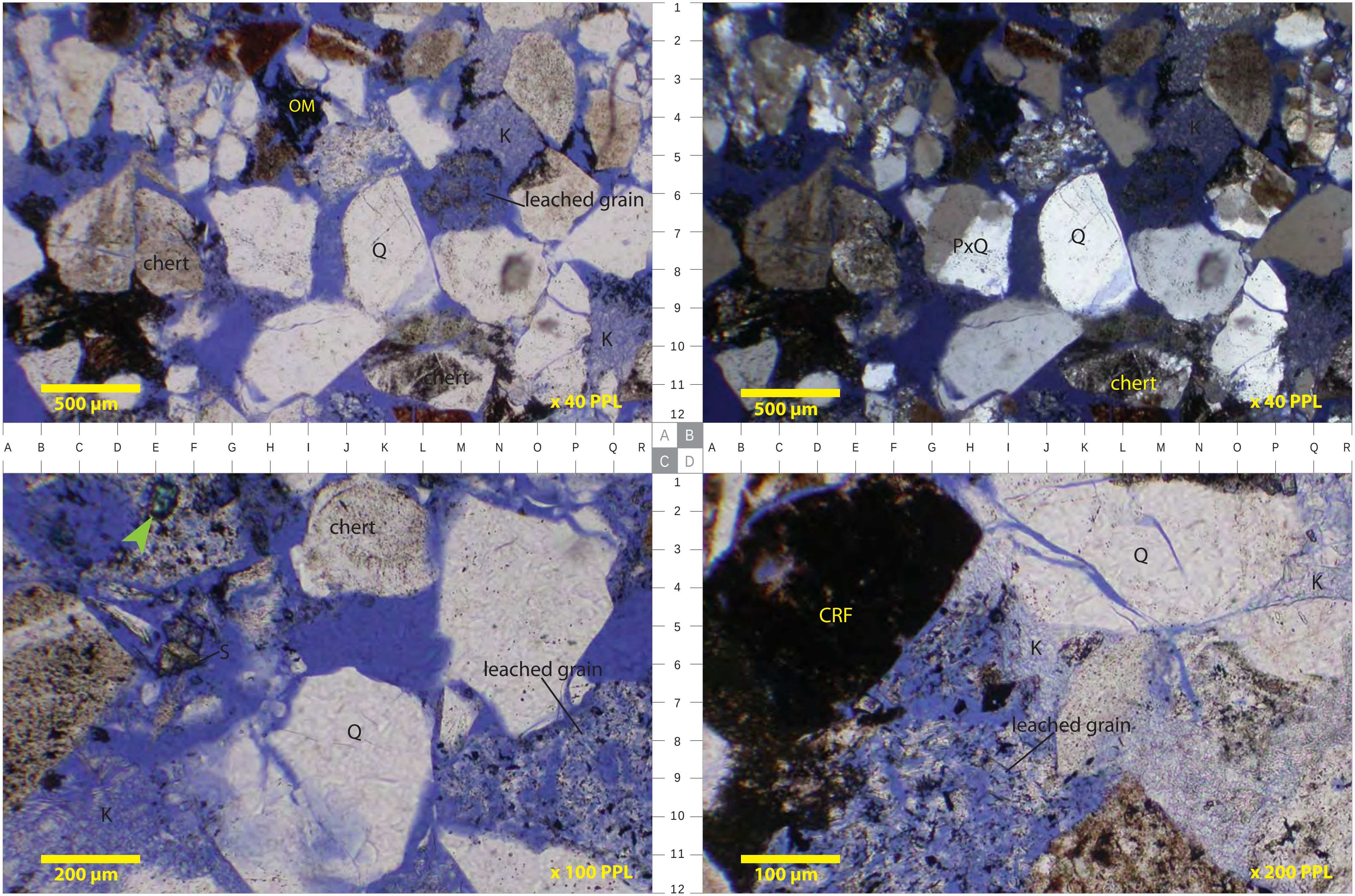


Plate 03a

January 2010

CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 03b

Niglintgak M-19
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #:
Depth: 3284 feet

High magnification views show the following salient features:

- Loosely packed kaolinite clays (“K”)
- Leached feldspathic framework grains
- Remnants of ferroan dolomite cement (large green arrows)
- Rare siderite
- Floating grain contacts

Photo A: 100X PPL,   Photo B: 200X PPL,   Photo C: 200X PPL,   Photo D: 400X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglantgak M-19 **3284 feet**

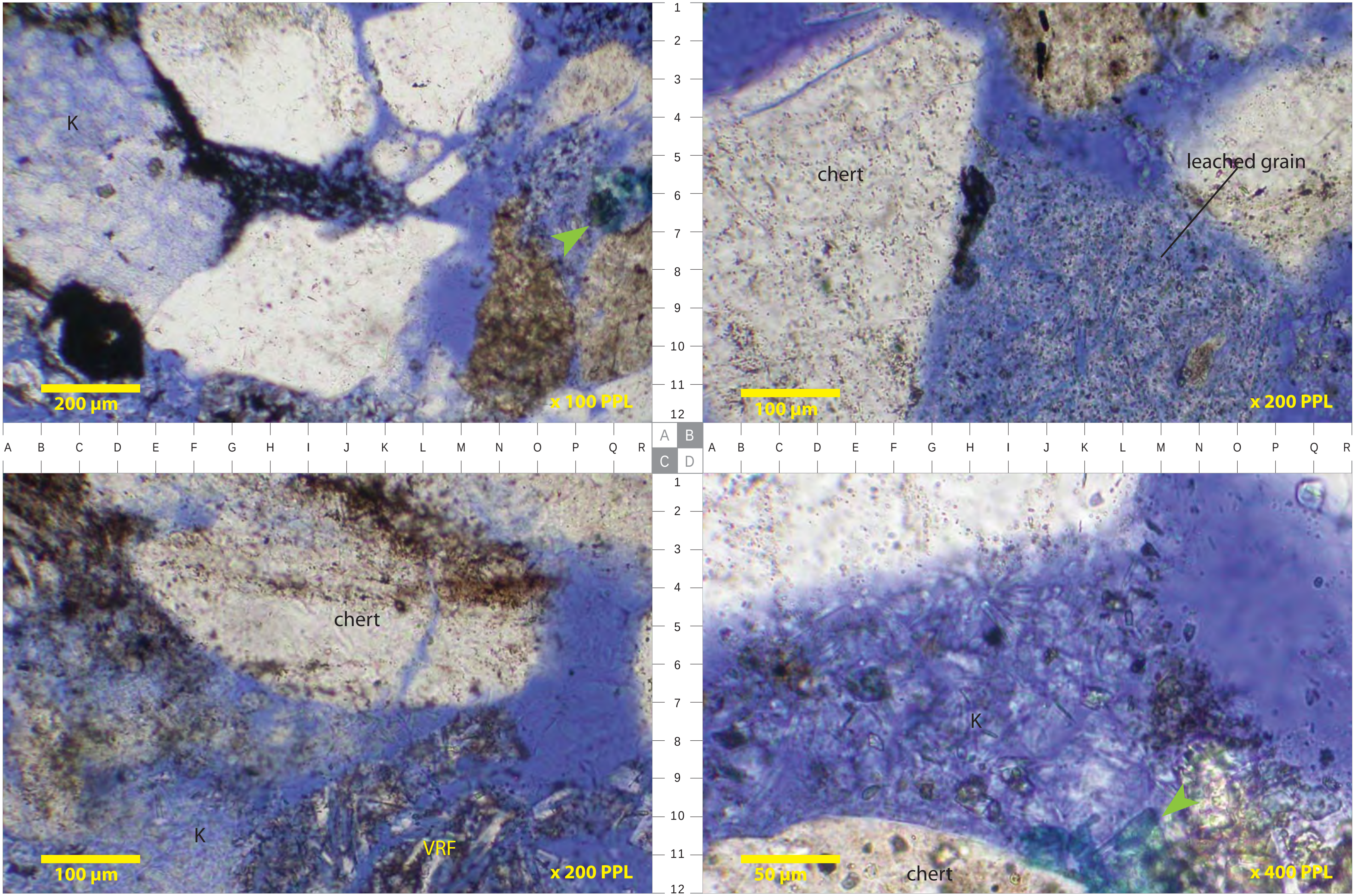


Plate 03b
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglintgak M-19

3285.1 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Niglintgak M-19

3299 feet

Taglu

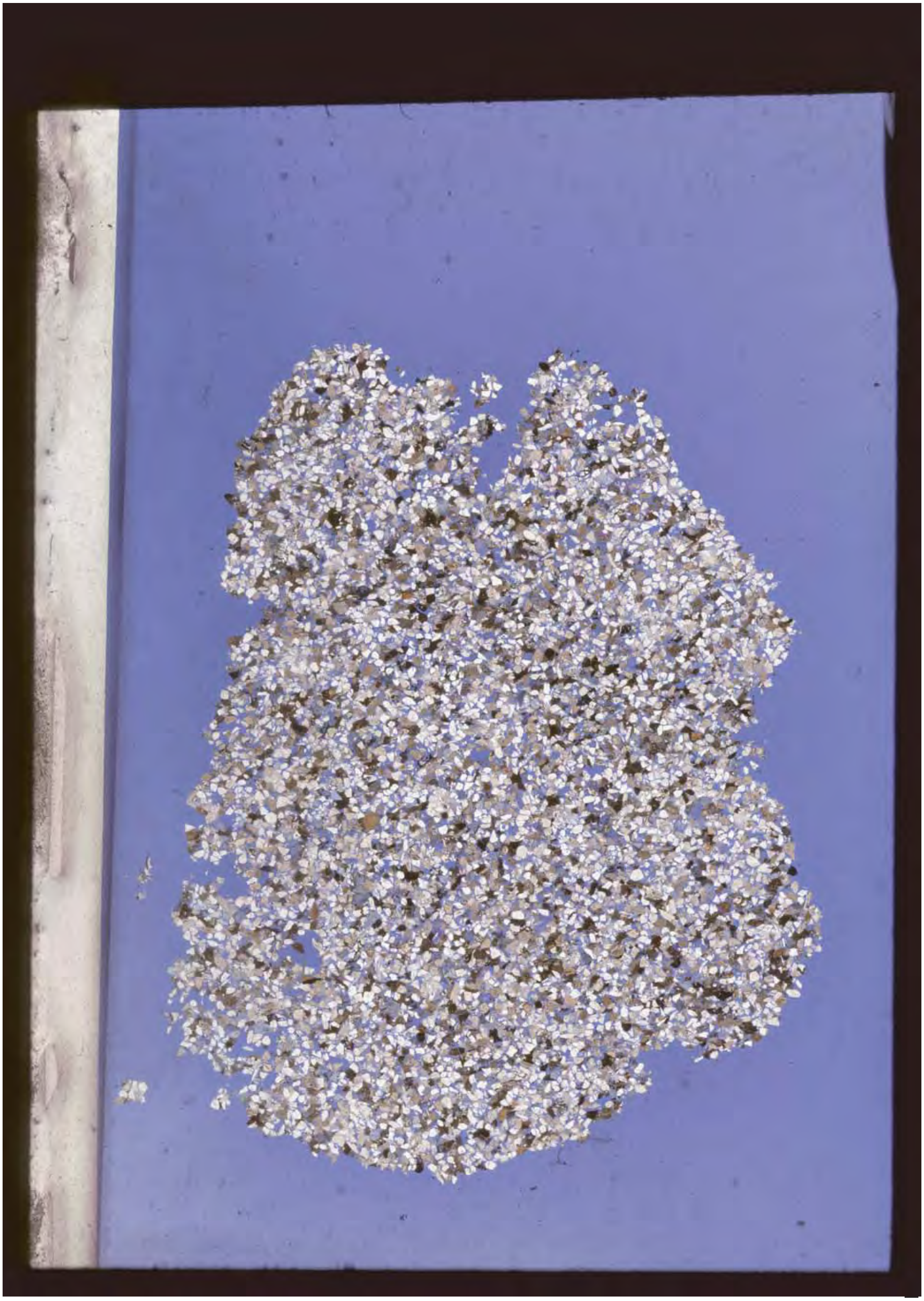
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Niglintgak M-19

3301 feet



Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Niglintgak M-19 3306.5 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 04

Niglintgak M-19
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 06-05
Depth: 3306.5 feet

Moderately sorted, fine to coarse grained, faintly laminated litharenites are recognized from sidewall core retrieved at 3306.5 feet. Early mechanical compaction of framework components has reduced primary porosity in this interval. Grain contacts are concavo-convex and tangential. Ductile framework lithoclasts are commonly squeezed between more competent grains. Loosely packed kaolinite clays are common with minor replacive siderite, rare ferroan dolomite and pyrite. Partial dissolution of feldspathic grains (Volcanic rock fragments – VRF) contributes to non-effective intragranular porosity.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 400X PPL

Niglintgak M-19 — 3306.5 feet

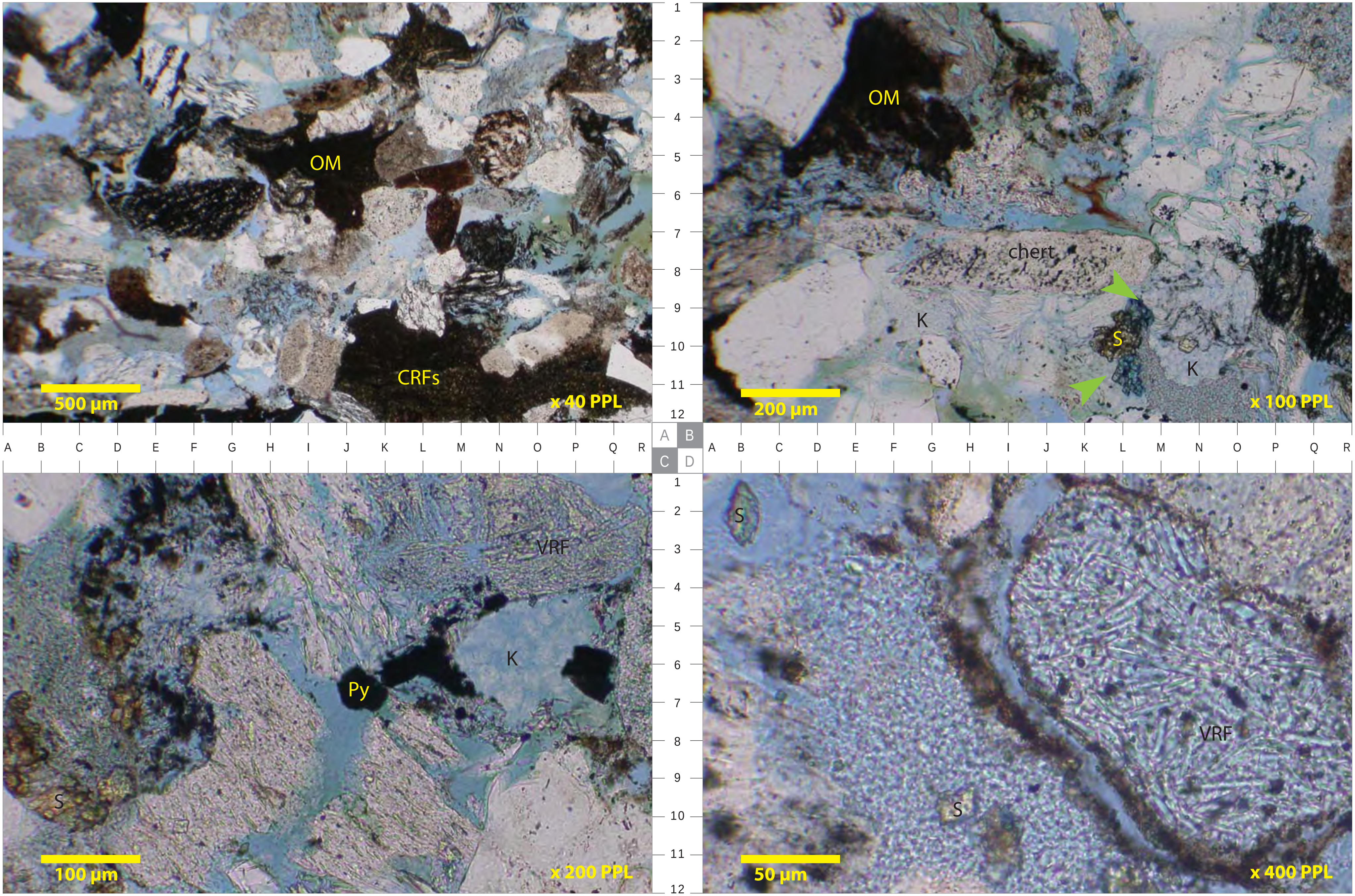


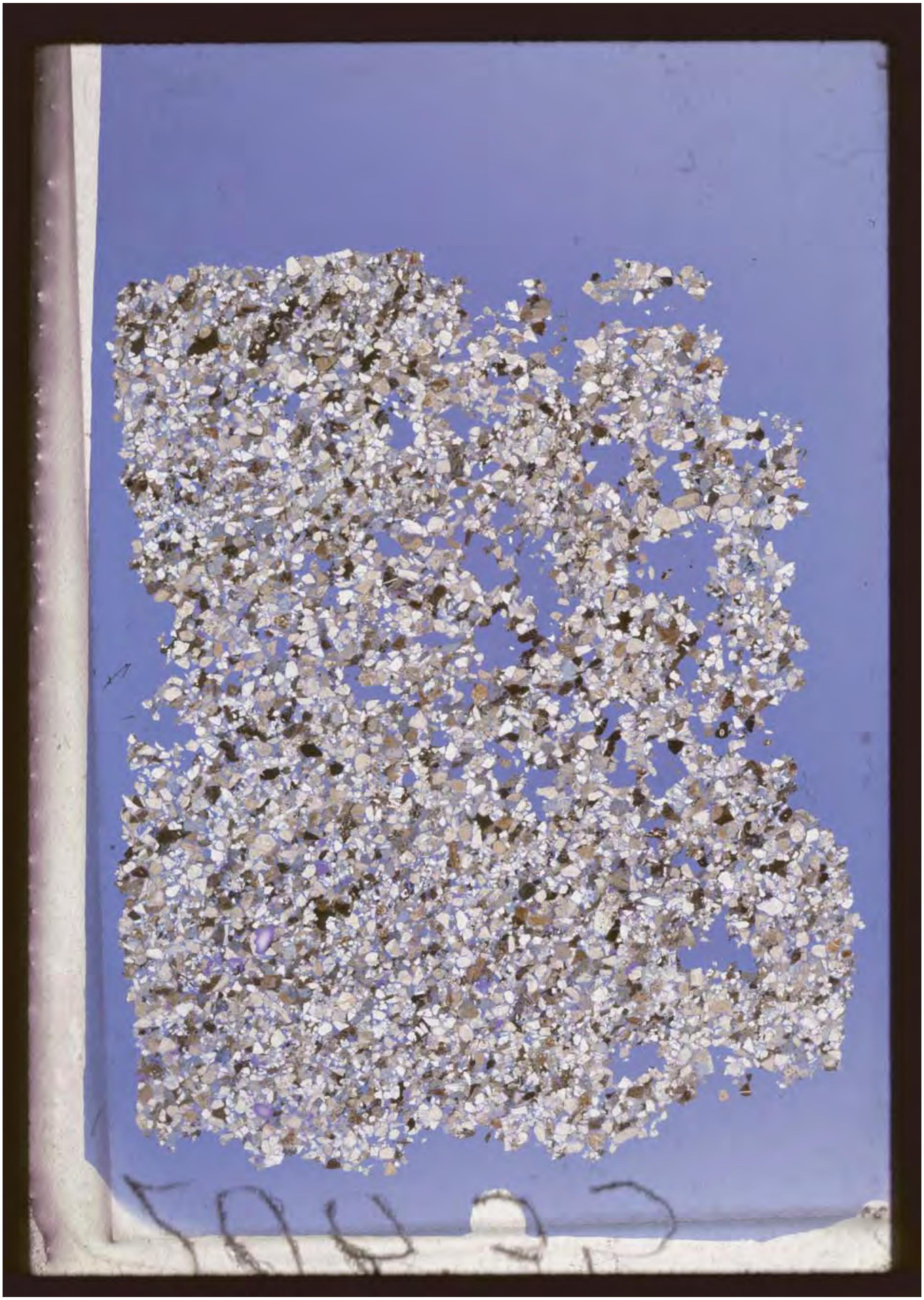
Plate 04
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglintgak M-19

3313 feet



Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Niglintgak M-19

3317 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 05

Niglintgak M-19
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 06-06
Depth: 3589.5 feet

Grain compaction is common in this moderately sorted, very fine to fine grained litharenite. Unevenly distributed pore filling ferroan dolomite (large green arrows) is found in minor volumes. Note hydrocarbons in the form of bitumen, found within the carbonate crystal lattice (View B, G:3) suggesting that hydrocarbon emplacement was contemporaneous with carbonate precipitation. Minor kaolinite clays have precipitated within the open macropores. Chert, monocrystalline quartz and clay-rich sedimentary grains are the main framework constituents with accessory muscovite.

Photo A: 100X PPL,   Photo B: 200X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

Niglintgak M-19 3589.5 feet

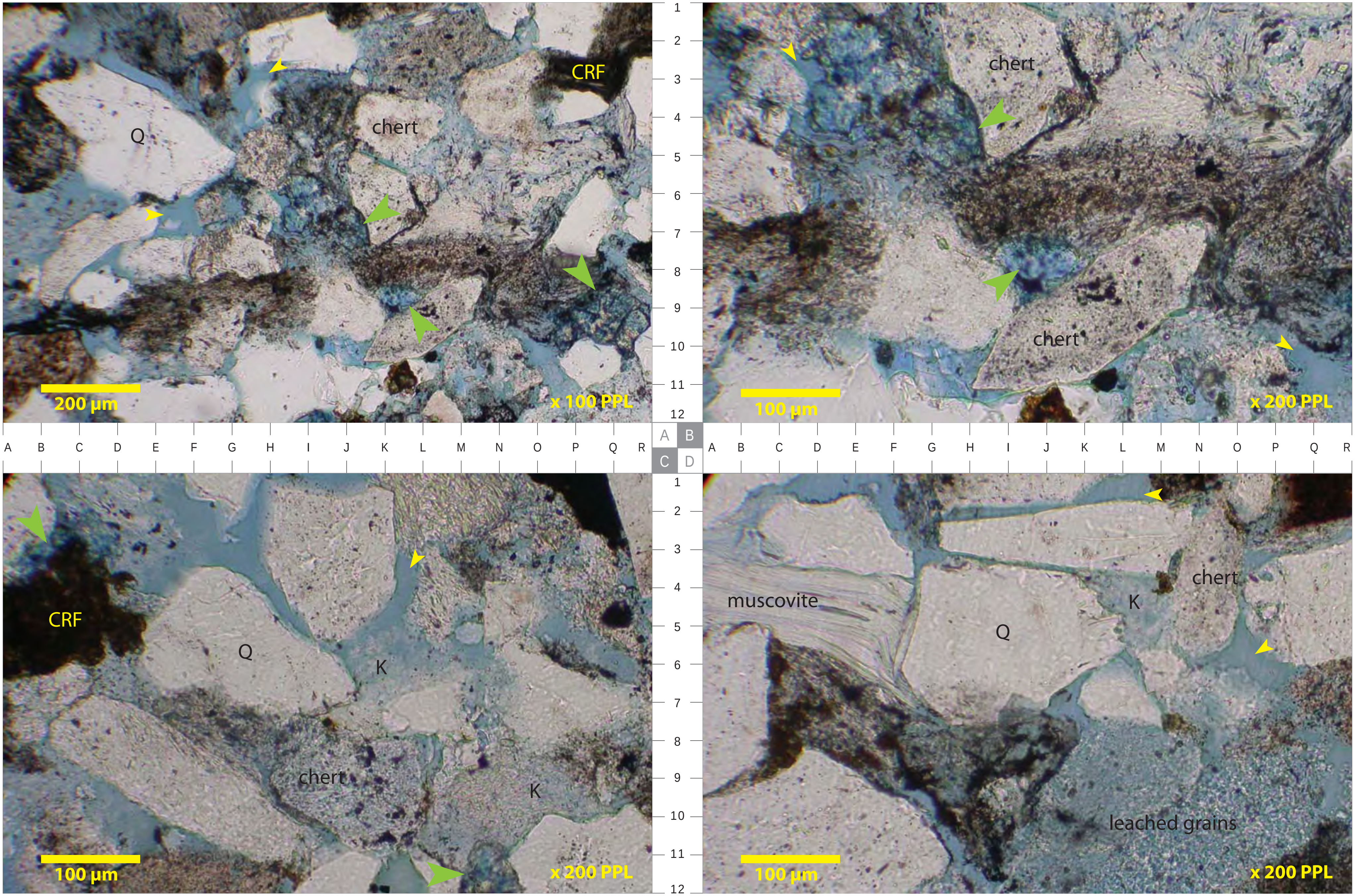


Plate 05
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglintgak M-19

3897 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 06

Niglintgak M-19
Taglu
Litharenite

Core Analysis Porosity: 9.9% Core Analysis Permeability: 0.07 md

Sample #: 06-07
Depth: 3901.7 feet

Two types of carbonate cement are illustrated in these thin section photomicrographs. Lightly purple stained ferroan calcite is well developed pore filling finely crystalline. Pore filling and replacive ferroan dolomite (large green arrows) is the most abundant of these two types of carbonate cement. Note replacive ferroan dolomite in View D. Hydrocarbons, in the form of dead oil is incorporated within the ferroan dolomite crystal lattice (View B, O:9). Framework lithoclasts include monocrystalline quartz (Q), chert, clay-rich sedimentary grains (CRF), feldspars and volcanic rock fragments.

Photo A: 200X PPL,   Photo B: 200X PPL,   Photo C: 200X PPL,   Photo D: 400X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

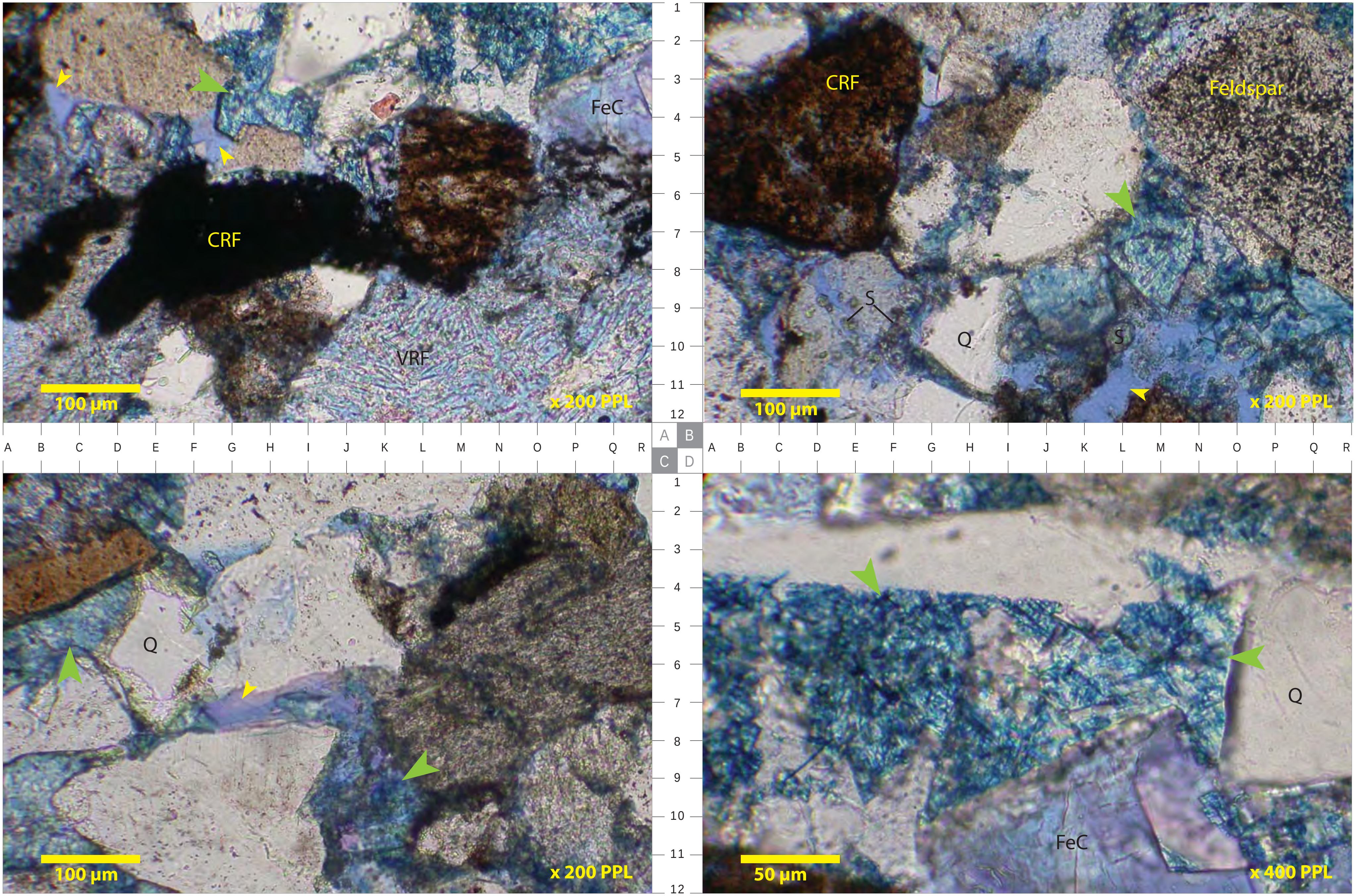


Plate 06

January 2010

CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglintgak M-19

3914 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 07

Niglintgak M-19
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 06-08
Depth: 3907 feet

Patchily distributed trace volumes of ferroan dolomite cement (large green arrows) are shown in these thin section photomicrographs. Framework grains include monocrystalline quartz, chert, argillic sedimentary rock fragments, with lesser volumes of feldspar, micas, sideritic grains and organic material. Dissolution of ferroan dolomite cement has resulted in a slight increase in mechanical compaction resulting in fractured grains. Note framework grain dissolution of feldspathic grains. Loosely packed kaolinite clays (View D, "K") have precipitated within macropores.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglantgak M-19 3907 feet

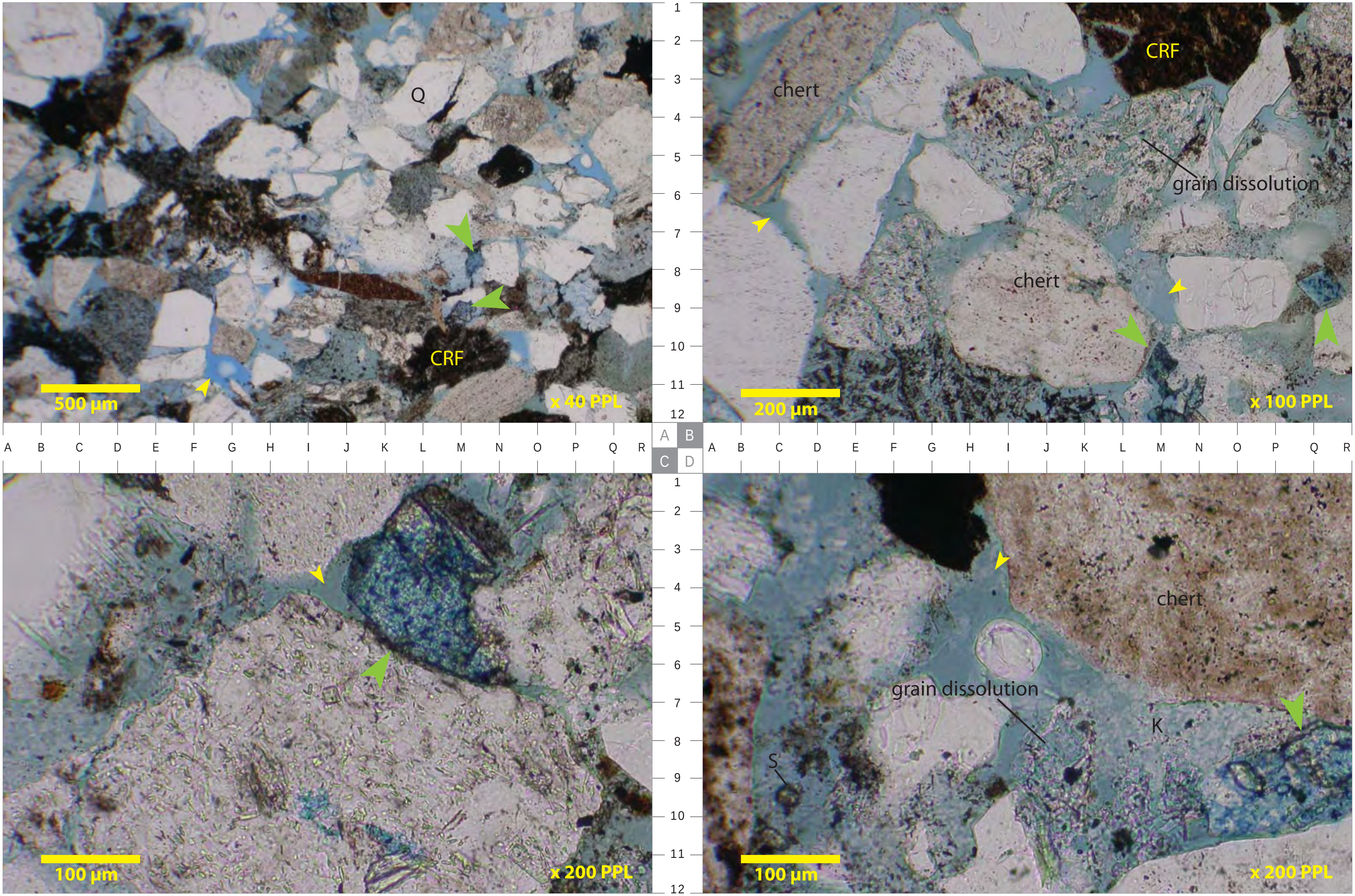


Plate 07
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglintgak M-19

3914 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 08

Niglintgak M-19
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 3914 feet

Poikilotopic carbonate (non-stained) cement occludes intergranular macropores in this Taglu Sequence litharenite. Framework grains are fractured (View C, large black arrow) indicating that the cement is replacive, precipitated after the dissolution of a precursor cement and brittle deformation. Trace pyrite has precipitated within chert micropores. Monocrystalline quartz, chert, argillic sedimentary grains and polycrystalline quartz are some of the framework components.

Photo A: 40X PPL,   Photo B: 40X XPL,   Photo C: 100X PPL,   Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglintgak M-19

3914 feet

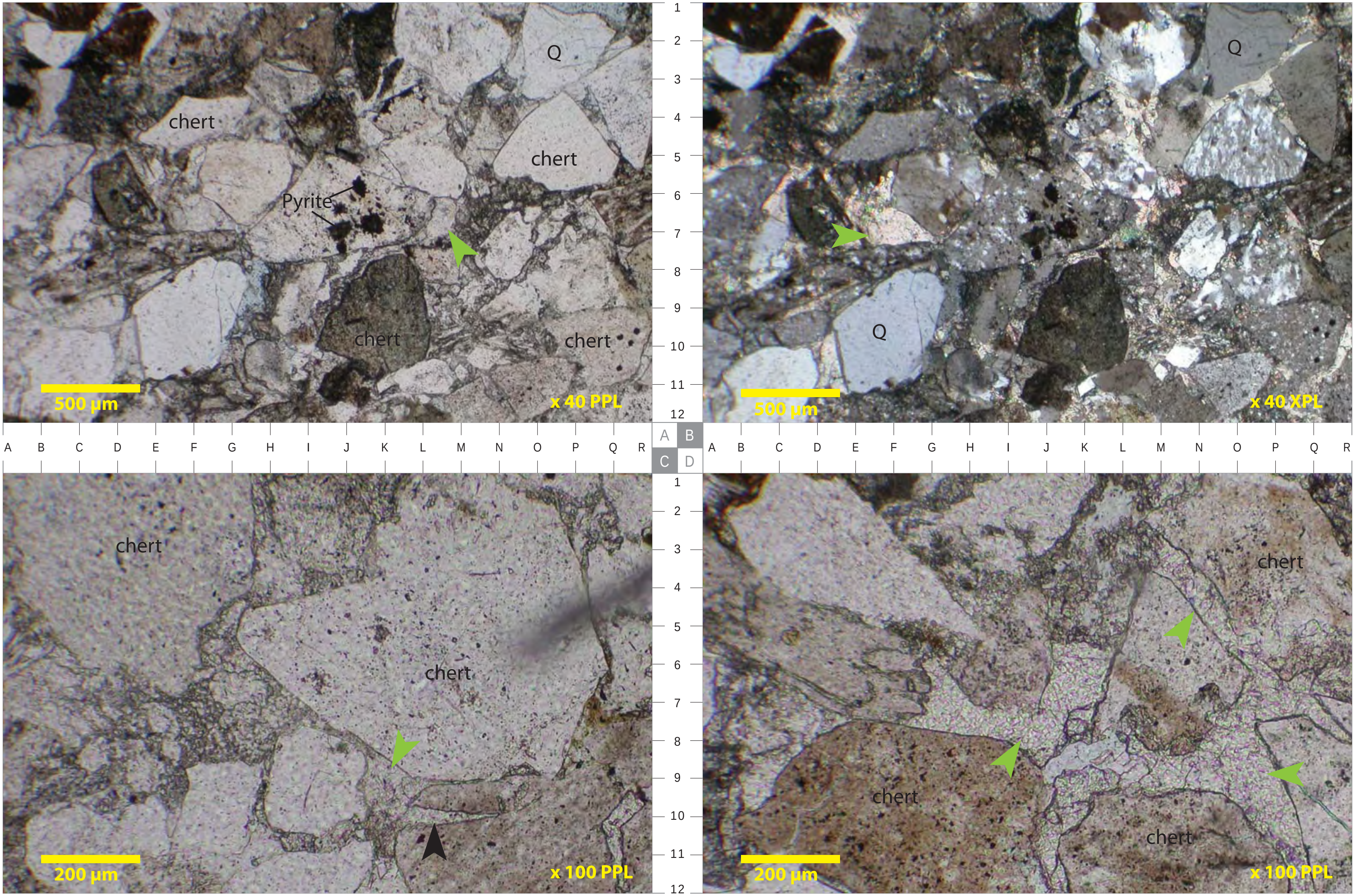


Plate 08
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglintgak M-19

3918 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 09

Niglintgak M-19
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 3918 feet

Laminated well sorted litharenites characterize the Taglu Sequence recovered from sidewall core at 3918 feet. Grain contacts are tangential and concavo-convex. Mechanical compaction of framework lithoclasts is considered moderate. Rare ferroan dolomite (View B, large green arrow) is patchily distributed. Microcrystalline siderite is replacive ("S"). Rare quartz overgrowths are uneven and poorly developed on host quartz grains (View B, small black arrow). Kaolinite clays are loosely packed within macropores (View B, "K"). Dissolution of unstable feldspathic grains has enhanced the effective (small yellow arrows) pore system.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

Niglintgak M-19 3918 feet

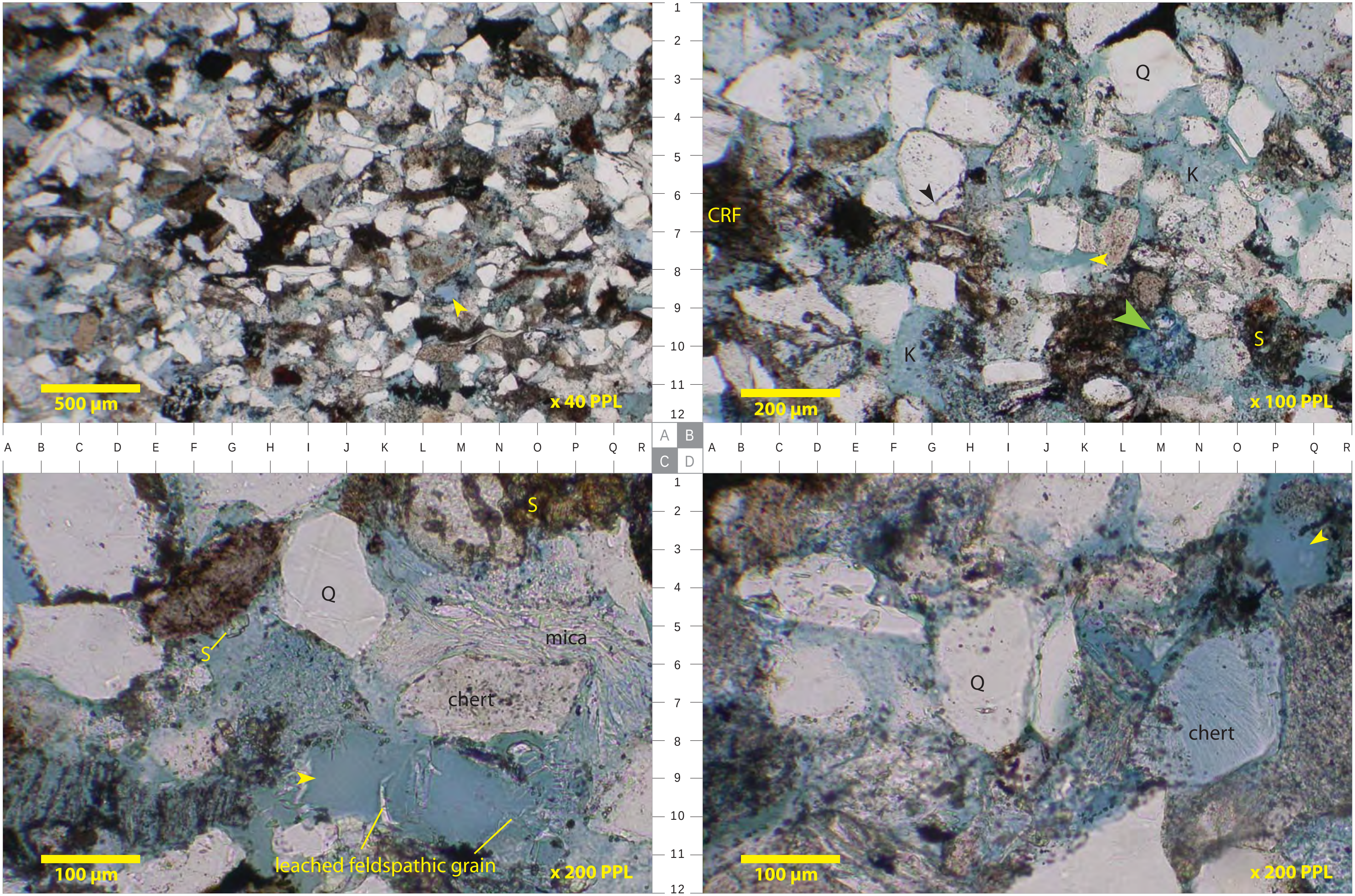


Plate 09
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglintgak M-19

3940 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Niglintgak M-19

3941 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 10

Niglintgak M-19
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 3941 feet

Faintly laminated, slightly bioturbated, non-reservoir quality Taglu Sequence litharenites are recognized from sidewall core recovered at 3941 feet. Framework grains include monocrystalline quartz, chert, argillic sedimentary grains, organic material, micas, glauconite and feldspars. Selective dissolution of unstable feldspathic grains has yielded isolated intragranular pores.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

Niglintgak M-19 3941 feet

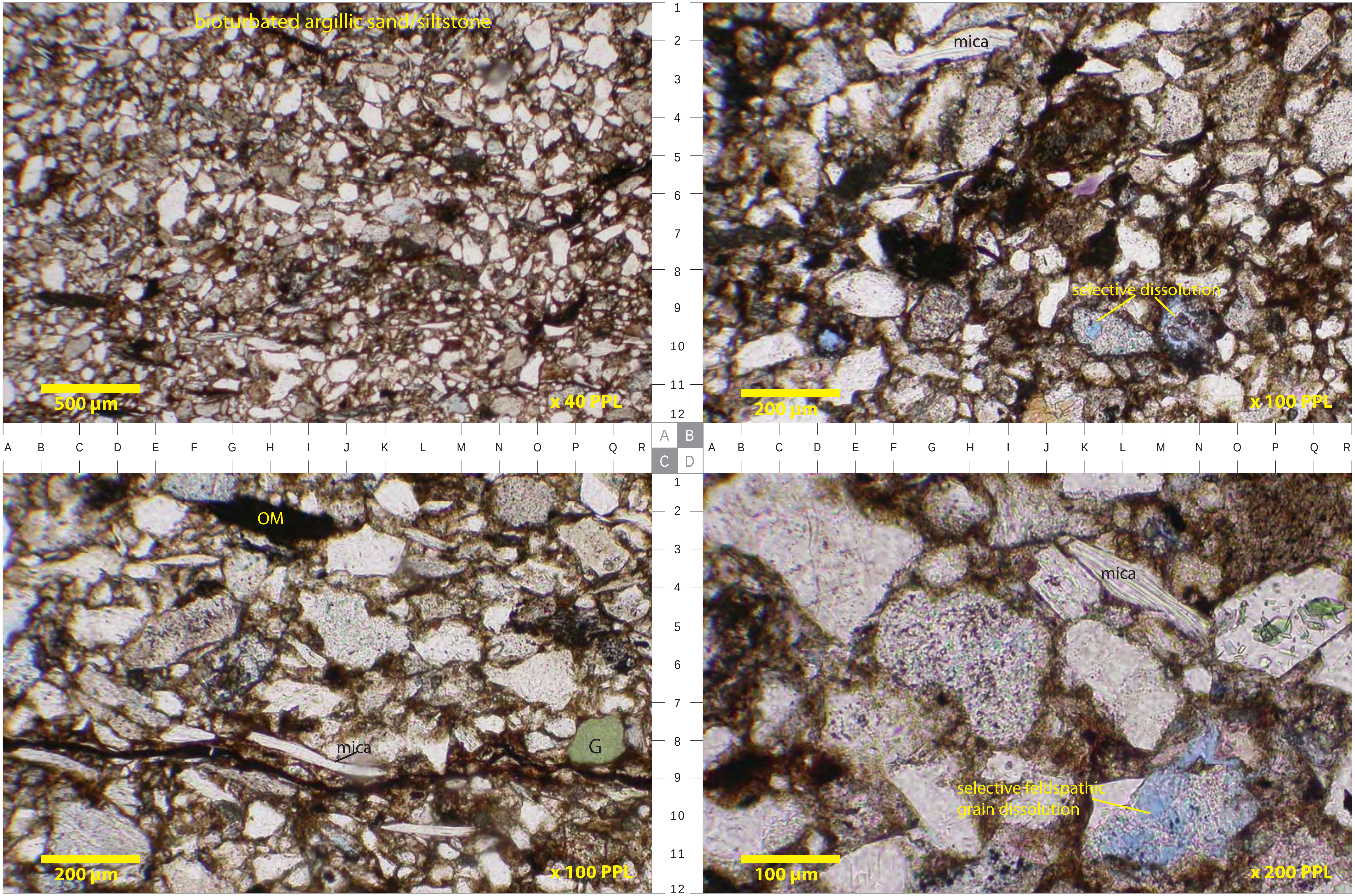


Plate 10
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglintgak M-19

4246 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Niglintgak M-19

4290.6 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 11

Niglintgak M-19
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 4308.5 feet

Authigenic cements are poorly preserved in this fine grained, moderately well sorted litharenite. Ferroan dolomite (View C, large green arrow) is found in trace amounts. Microcrystalline siderite ("S") is replacive. Clay-rich sedimentary grains (CRF) are commonly compacted between more competent framework lithoclasts. Note dissolution of unstable feldspathic grains (View B and D) has enhanced the effective pore system (small yellow arrows).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglintgak M-19 **4308.5 feet**

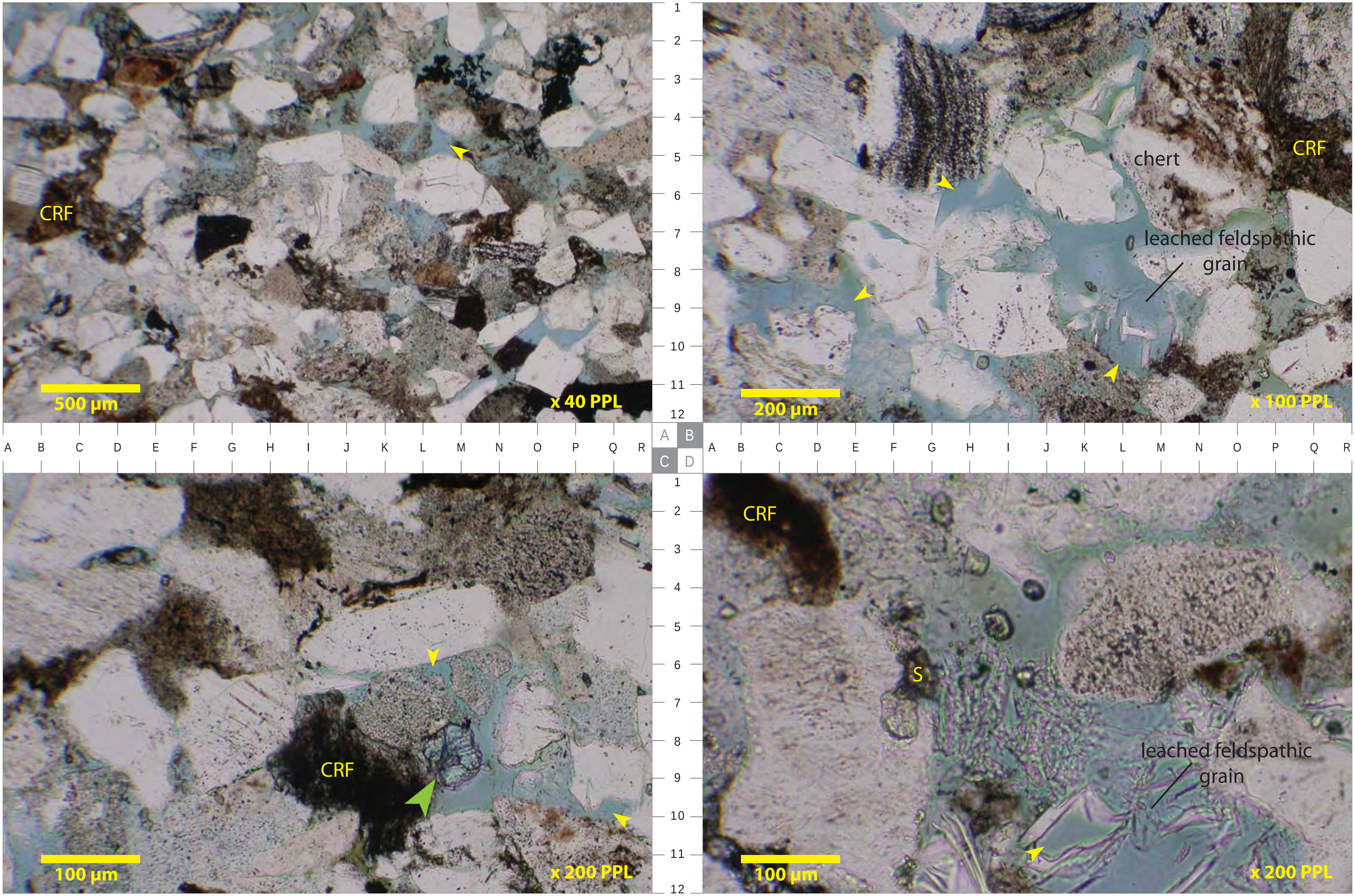


Plate 11
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglintgak M-19

4368.5 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 12

Niglintgak M-19
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 4368.5 feet

Well sorted, fine grained Taglu Sequnce litharenites are recognized from sidewall core retrieved at 4368.5 feet. Trace ferroan dolomite cement remnants (large green arrows) are unevenly distributed in this interval. Mechanical compaction of ductile lithoclasts is considered moderate, reflected by concavo-convex and tangential grain contacts. Monocrystalline quartz (Q), chert, clay-rich sedimentary grains (CRF) are the main framework grains. Note partial dissolution of feldspathic grains (View D, L:7).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglintgak M-19 **4368.5 feet**

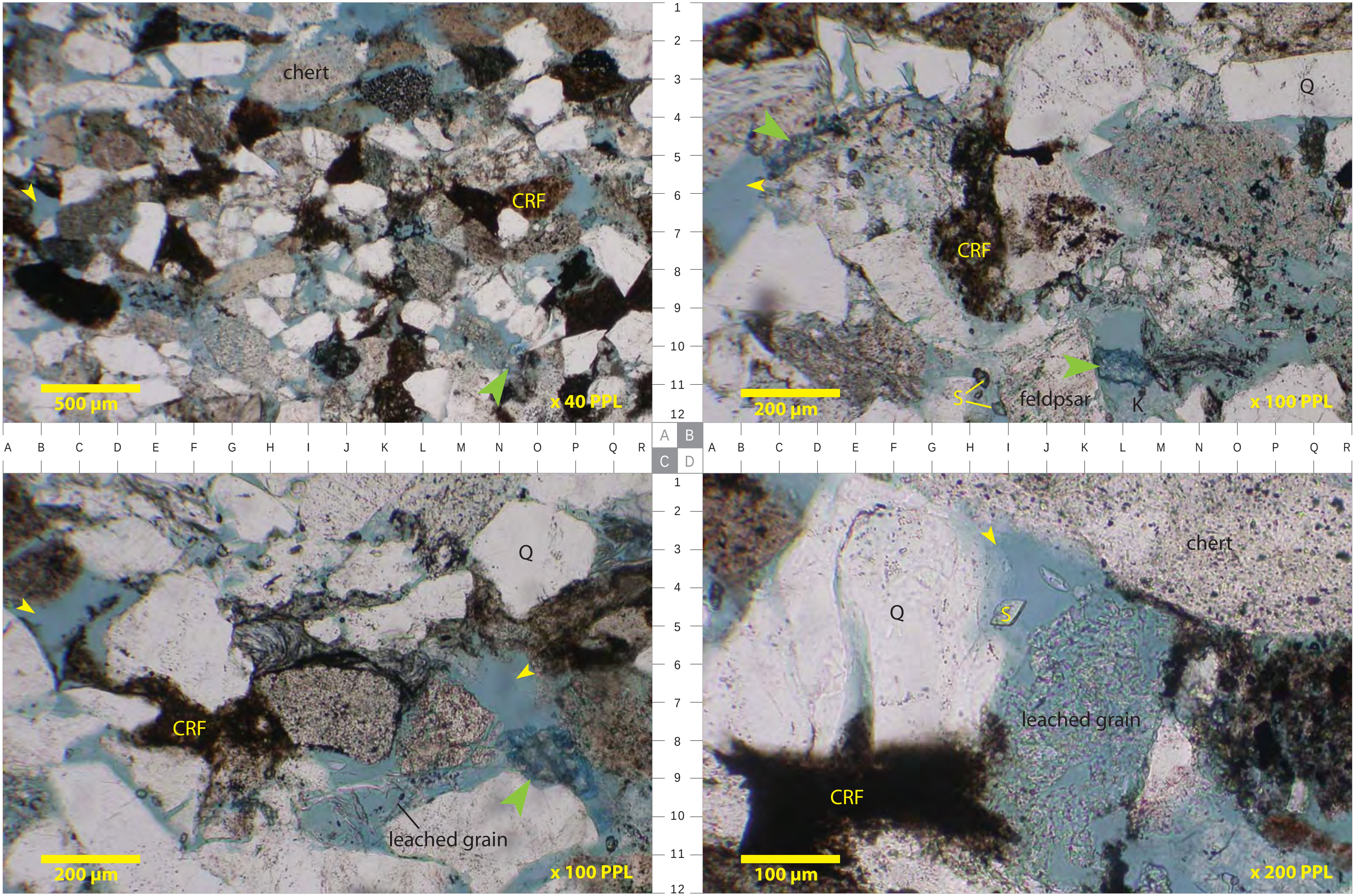


Plate 12
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglintgak M-19

4375.5 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 13

Niglintgak M-19
Taglu
Litharenite

Core Analysis Porosity: 17.4% Core Analysis Permeability: 2.47 md

Sample #: 06-16
Depth: 4375.5 feet

Low reservoir quality, well sorted, fine grained litharenites characterize the Taglu Sequence sediments encountered by sidewall core at 4375.5 feet. Abundant cryptocrystalline siderite ("S") rims framework grains. Isolated effective macropores (View C, small yellow arrow) are created from preferential dissolution of unstable framework lithoclasts (View D, M:9).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglintgak M-19 **4375.5 feet**

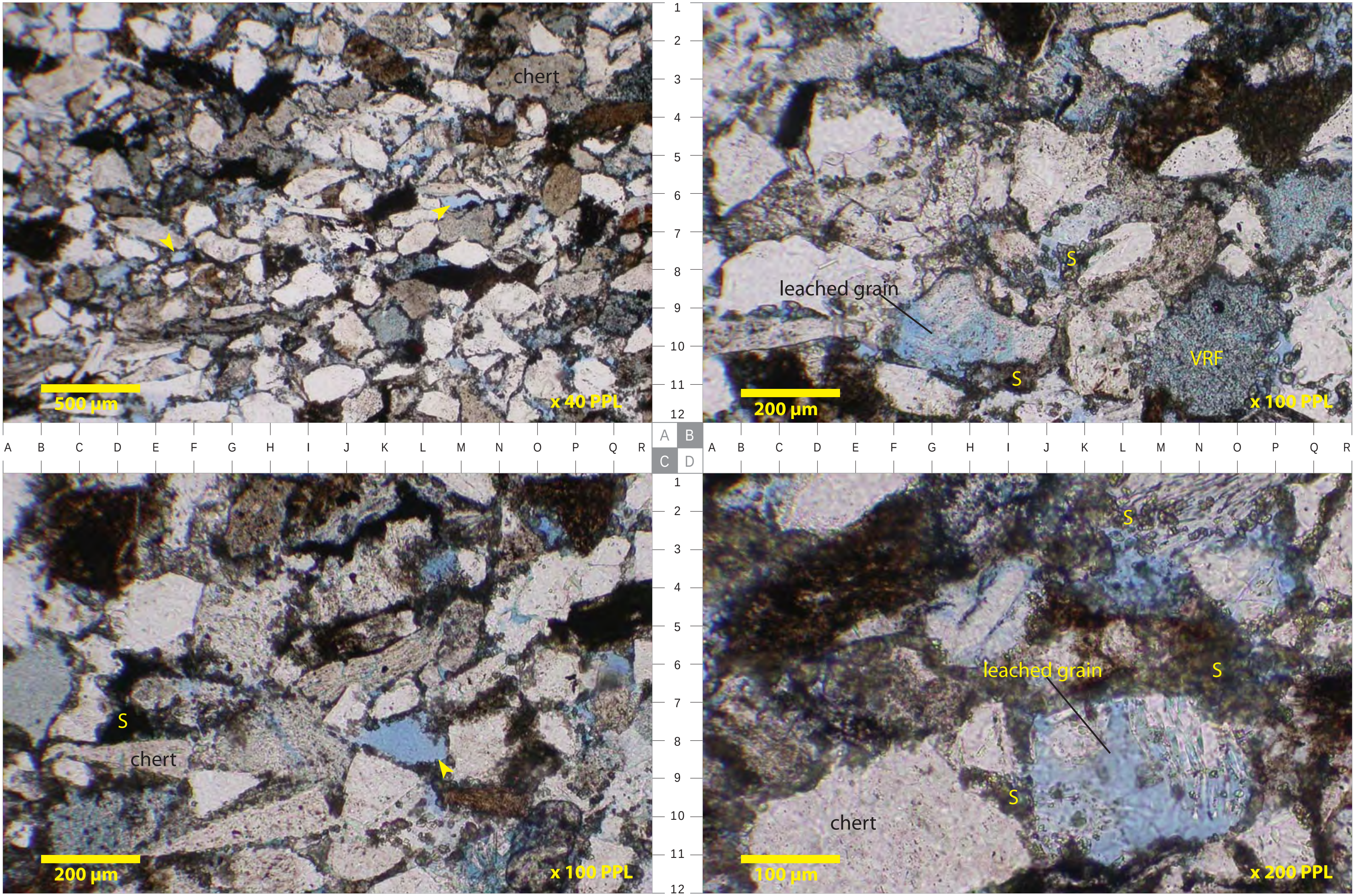


Plate 13
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglintgak M-19

4376.2 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Niglintgak M-19

4417.3 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 14

Niglintgak M-19
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 4417.3 feet

Well sorted, very fine to fine grained litharenites are recognized from core recovered at 4417.3 feet. Compaction of ductile grains, such as clay-rich sedimentary grains, is common. Grain contacts are concavo-convex and tangential. Patchily distributed ferroan dolomite (large green arrows) partially occludes macropores (small yellow arrows).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglintgak M-19

4417.3 feet

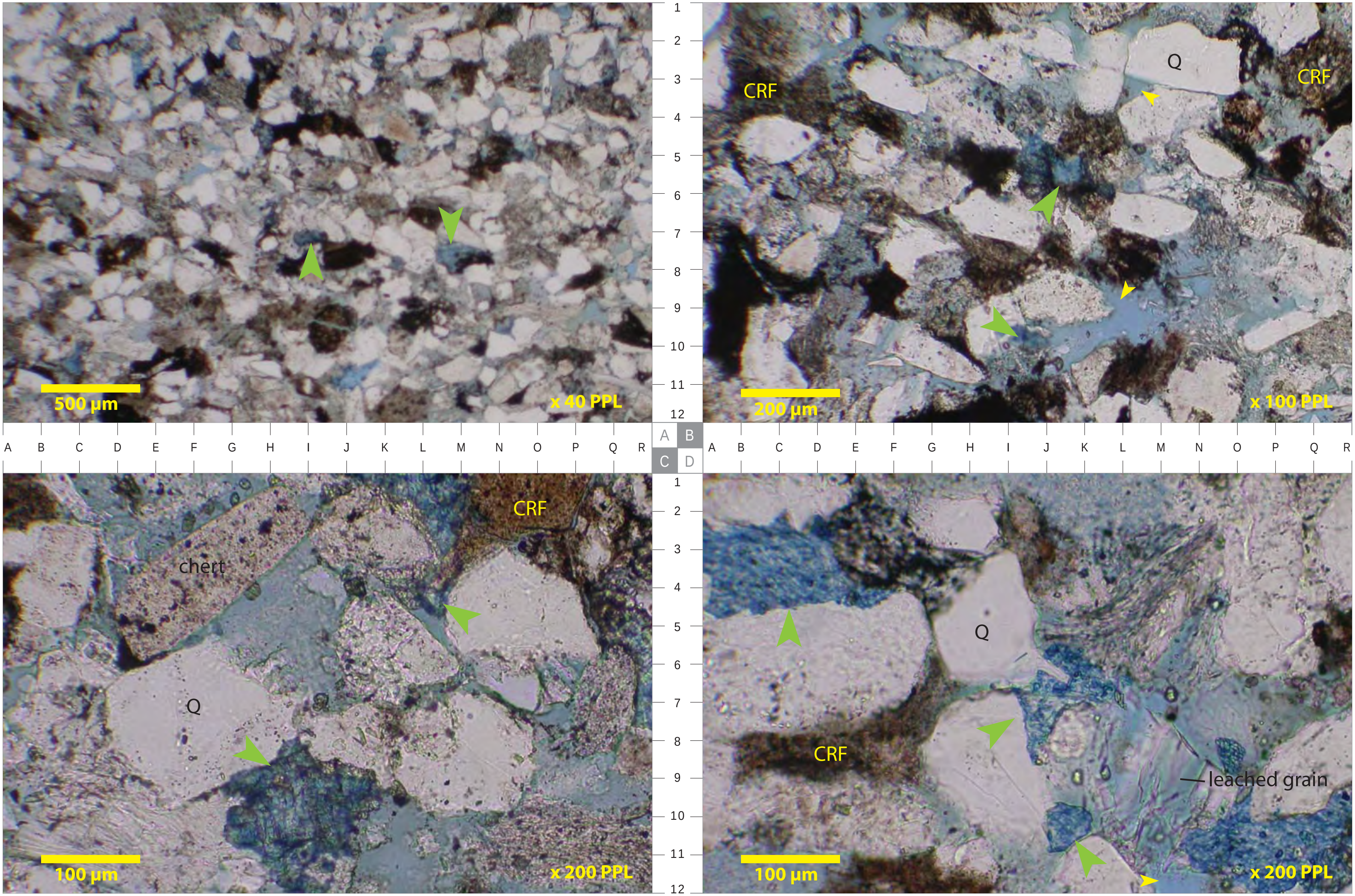


Plate 14
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglintgak M-19

8908 feet

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 15a

Niglintgak M-19
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 8908 feet

Burial brittle mechanical compaction resulting in fractured framework grains (View A, P:5; View C, large black arrow) is illustrated in these thin section photomicrographs. Ductile framework lithoclasts are compacted between the more competent framework grains (View B, E:10).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X XPL

Niglintgak M-19 — 8908 feet

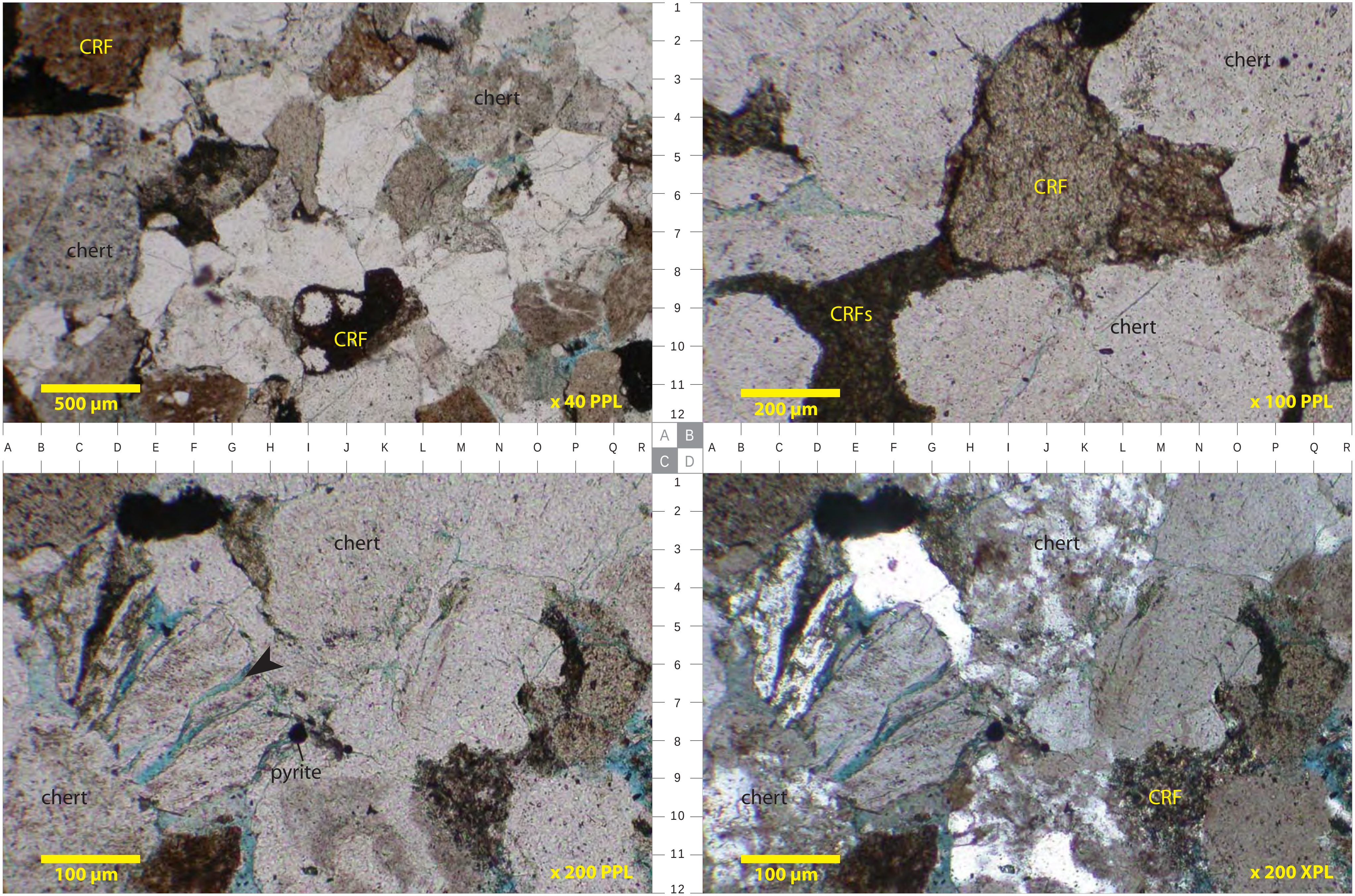


Plate 15a
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 15b

Niglintgak M-19
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 8908 feet

High magnification thin section micrographs show non-stained carbonate cement (large green arrows) is patchily distributed occluding macropores in this Taglu Sequence litharenite. Partial dissolution of unstable framework grains (View B) yields intragranular porosity. Mechanical compaction is considered moderate to high in this interval. Note fractured grains (View A, J:10; View B, J:11) due to brittle mechanical compaction.

Photo A: 100X PPL,   Photo B: 400X PPL,   Photo C: 100X XPL,   Photo D: 100X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglintgak M-19 **8908 feet**

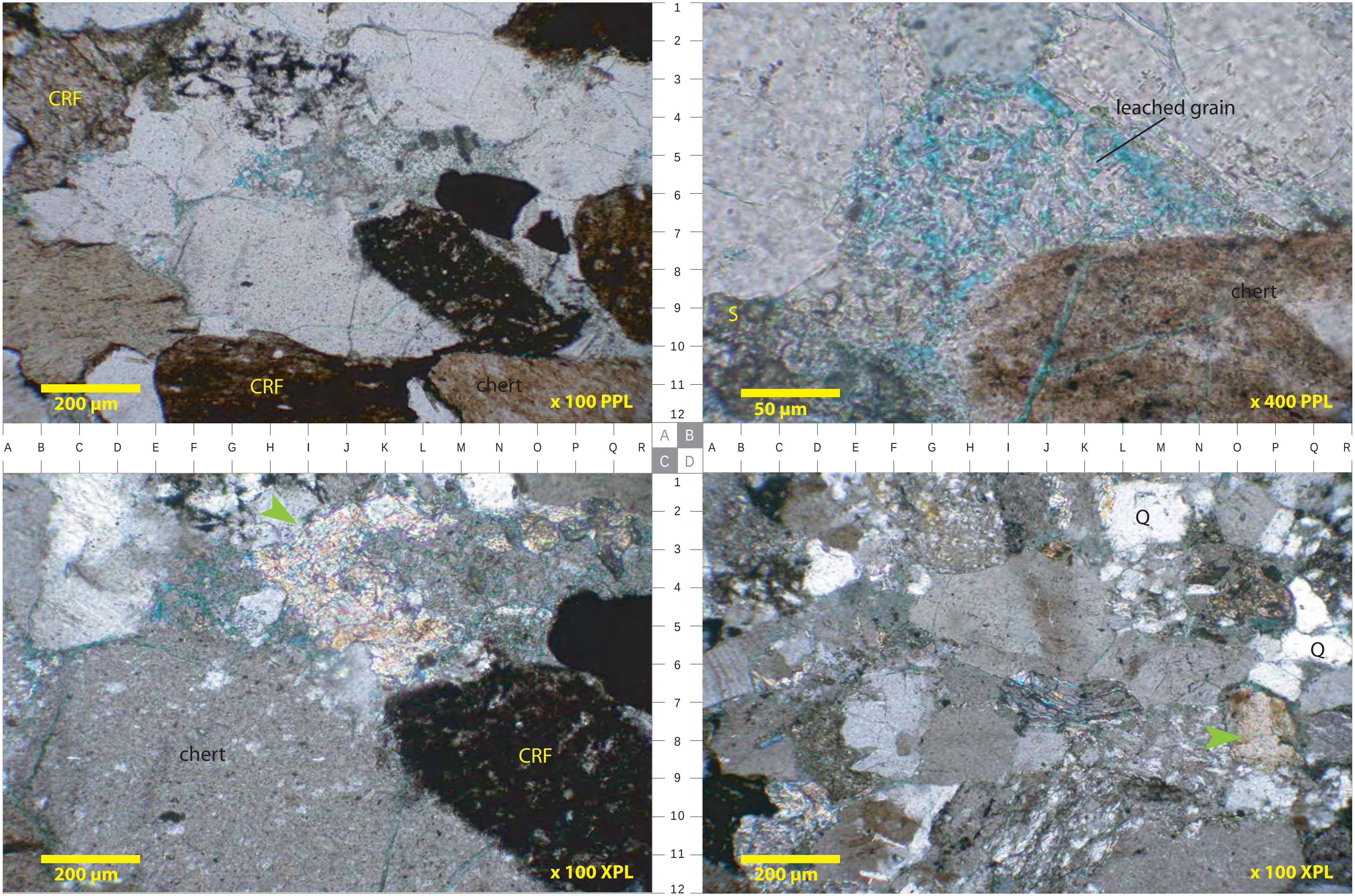


Plate 15b
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglintgak M-19

9042.5 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 16

Niglintgak M-19
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 9042.5 feet

Laminated, moderately sorted, non-reservoir quality Taglu Sequence litharenites are recognized from sidewall core taken at 9042.5 feet. Mechanical compaction is the main pore occluding mechanism, with ductile framework constituents compacted between more competent grains. Trace carbonate cement (large green arrows) is found in trace volumes.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglintgak M-19 — 9042.5 feet

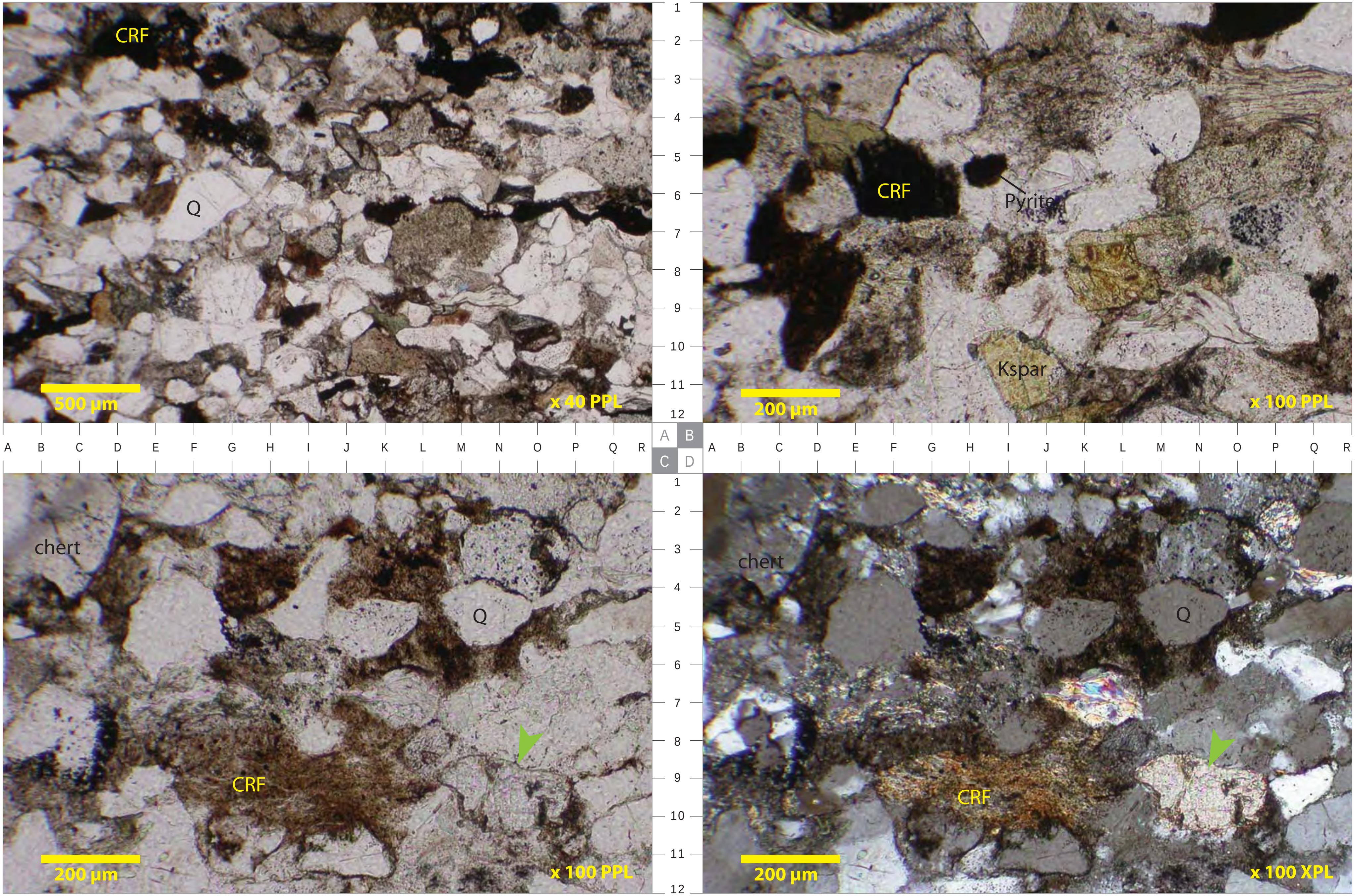


Plate 16
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Niglintgak M-19

9056.6 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Niglintgak M-19

9065.5 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ellice O-14

Thin Section Overviews

And

Select Described Photomicrographs

Ellice O-14 788 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ellice O-14 800 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 01

Ellice O-14
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 05-03
Depth: 800 feet

Laminated, moderately well sorted litharenites characterize the Taglu Sequence recovered from core at 800 feet. The Overview illustrates coarse to pebble sized clay-rich sedimentary lithoclasts floating in a very fine to fine grained sand matrix. Mechanical compaction of ductile grains has reduced macroporosity (small yellow arrows) in this interval. Authigenic phases are poorly developed with minor loosely packed kaolinite clays (View D, “K”) within macropores. Partial dissolution of feldspars (View C, N:11) yields intragranular porosity. Framework grains include monocrystalline quartz, clay-rich sedimentary grains (CRF), organic material (OM), feldspars and micas.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ellice O-14

800 feet

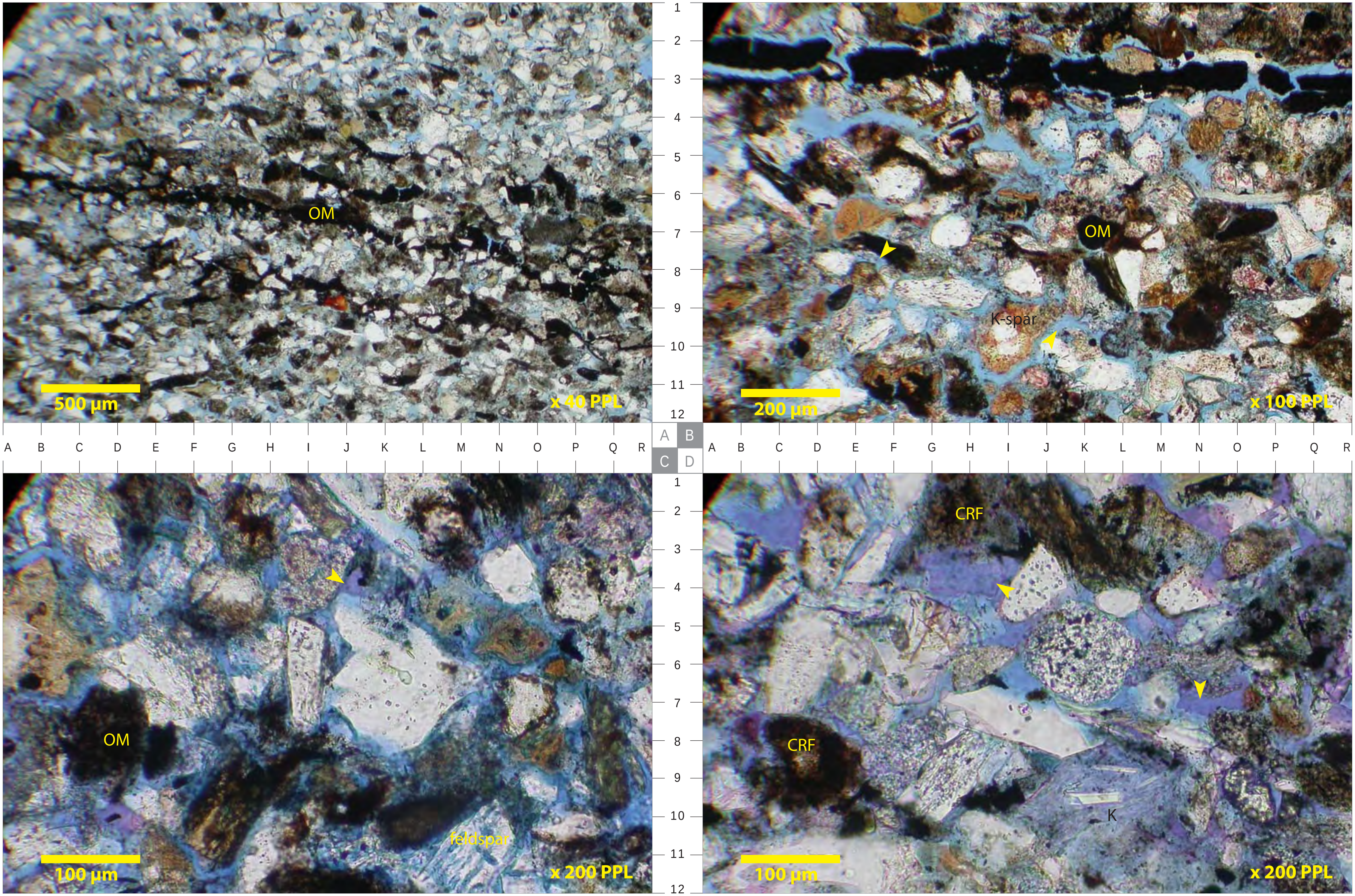


Plate 01
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ellice O-14 1792 feet (a)

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ellice O-14 1792 feet (b)

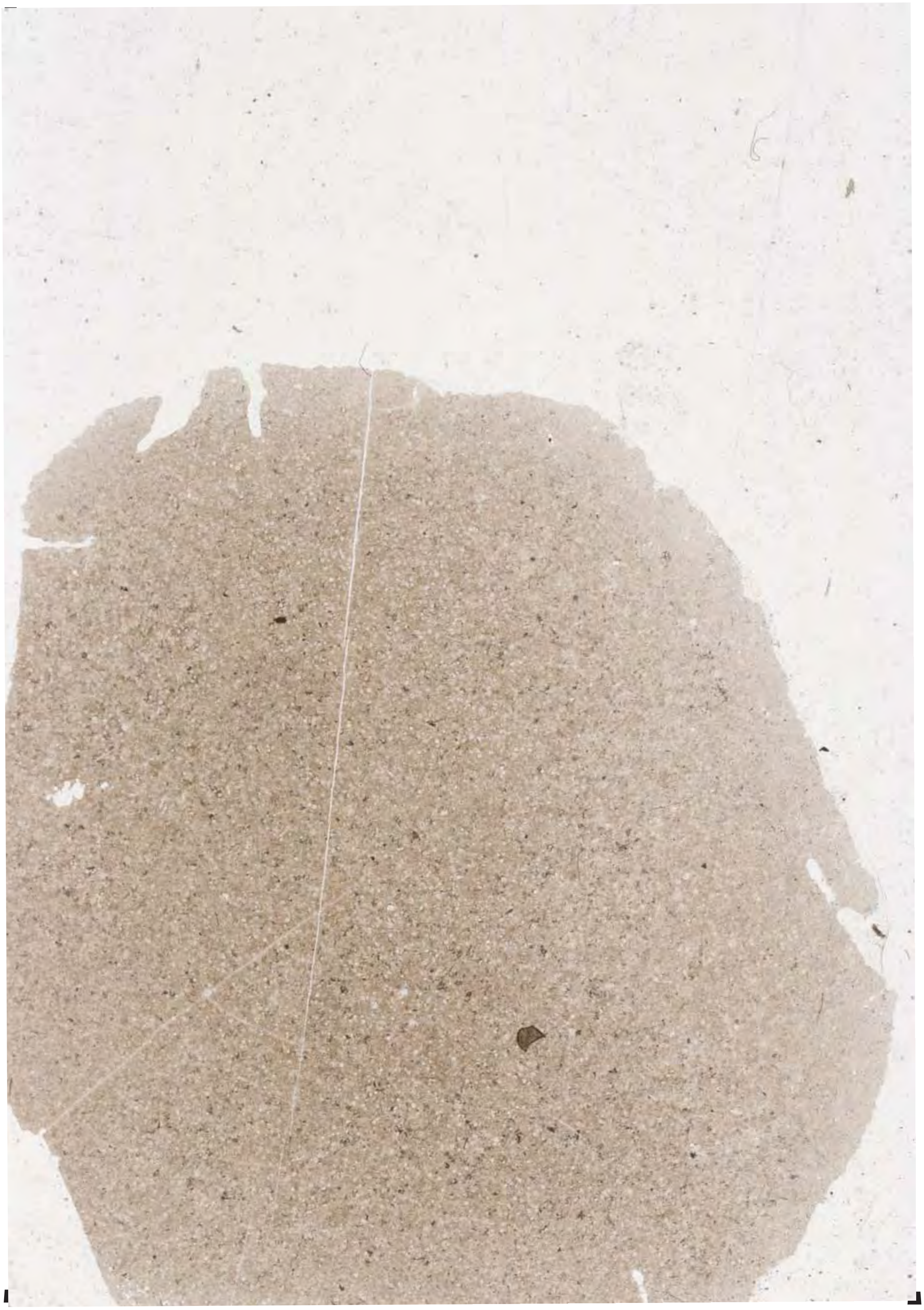
Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ellice O-14 1792 feet (c)



Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ellice O-14 1793 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 02

Ellice O-14
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 1793 feet

Silt to fine grained, poorly sorted sideritized argillic and organic rich litharenites are recognized from core recovered at 1793 feet. Commonly bioturbated, sideritized matrix clays are abundant with subangular to subrounded framework grains floating in the matrix. Framework lithoclasts include monocrystalline quartz, chert, partially leached feldspars (View D, M:10) and organic material (View A, N:10). Effective macroporosity is isolated and poorly developed suggesting very low permeability and reservoir quality in this interval.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ellice O-14 **1793 feet**

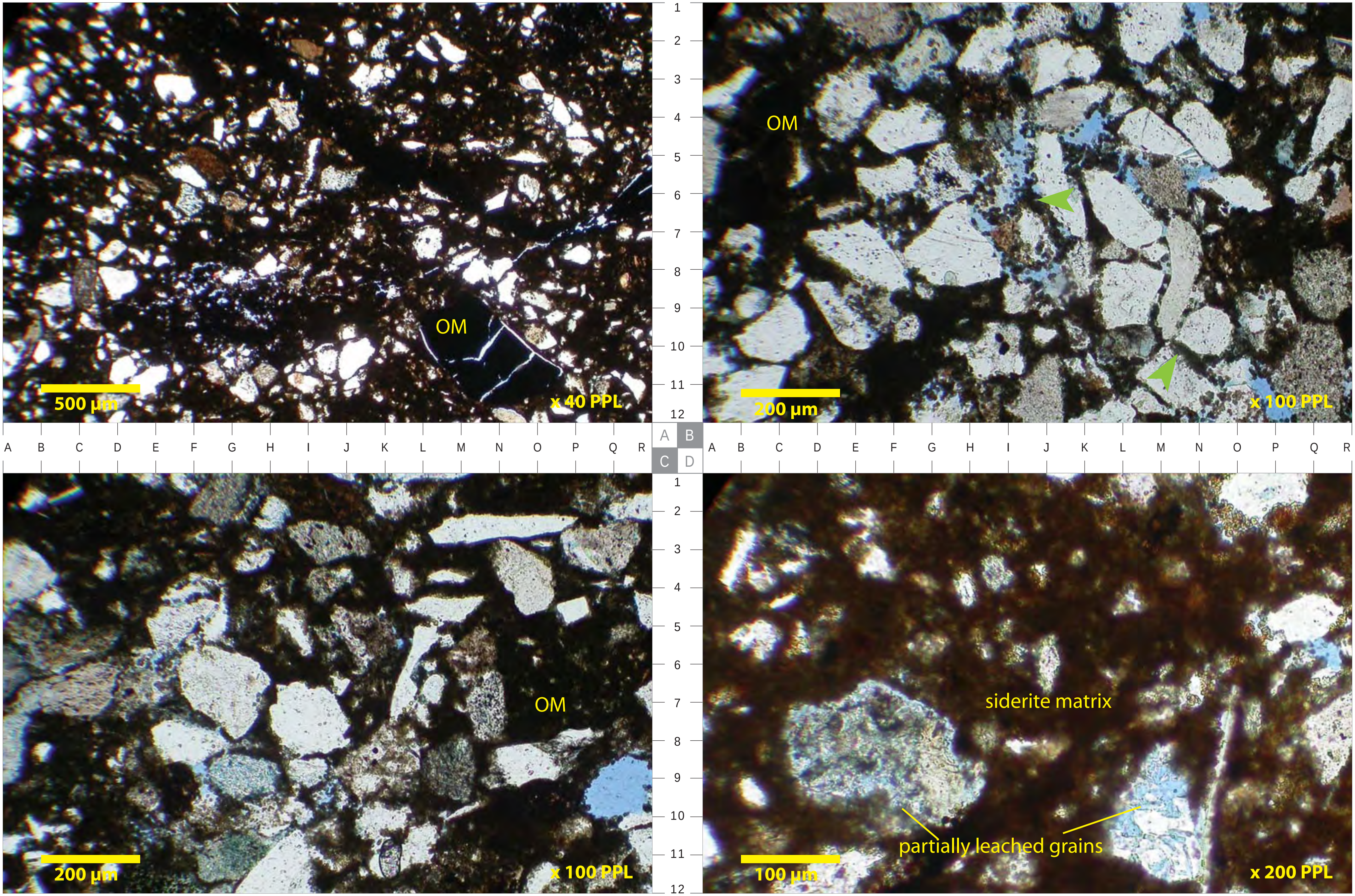


Plate 02
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ellice O-14 1809 feet

2 mm

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ellice O-14 2890.5 feet

2 mm

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ellice O-14

3928 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ellice O-14 3929.5 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 03

Ellice O-14
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 3929.5 feet

Ferroan carbonate cemented, non-reservoir quality, moderately well sorted, fine grained litharenites were encountered by core recovered at 3929.5 feet. Grain contacts are tangential and point-point in this interval. Poikilotopic ferroan carbonate cement (FeD) occludes macroporosity and fills partially leached feldspars (View C, N:10). Rare pyrite has precipitated within chert micropores. Framework constituents include monocrystalline quartz (Q), chert, clay-rich sedimentary grains, yellow stained K-feldspar (View B, K:9) and feldspars.

Photo A: 40X PPL,   Photo B: 200X PPL,   Photo C: 100X PPL,   Photo D: 100X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ellice O-14

3929.5 feet

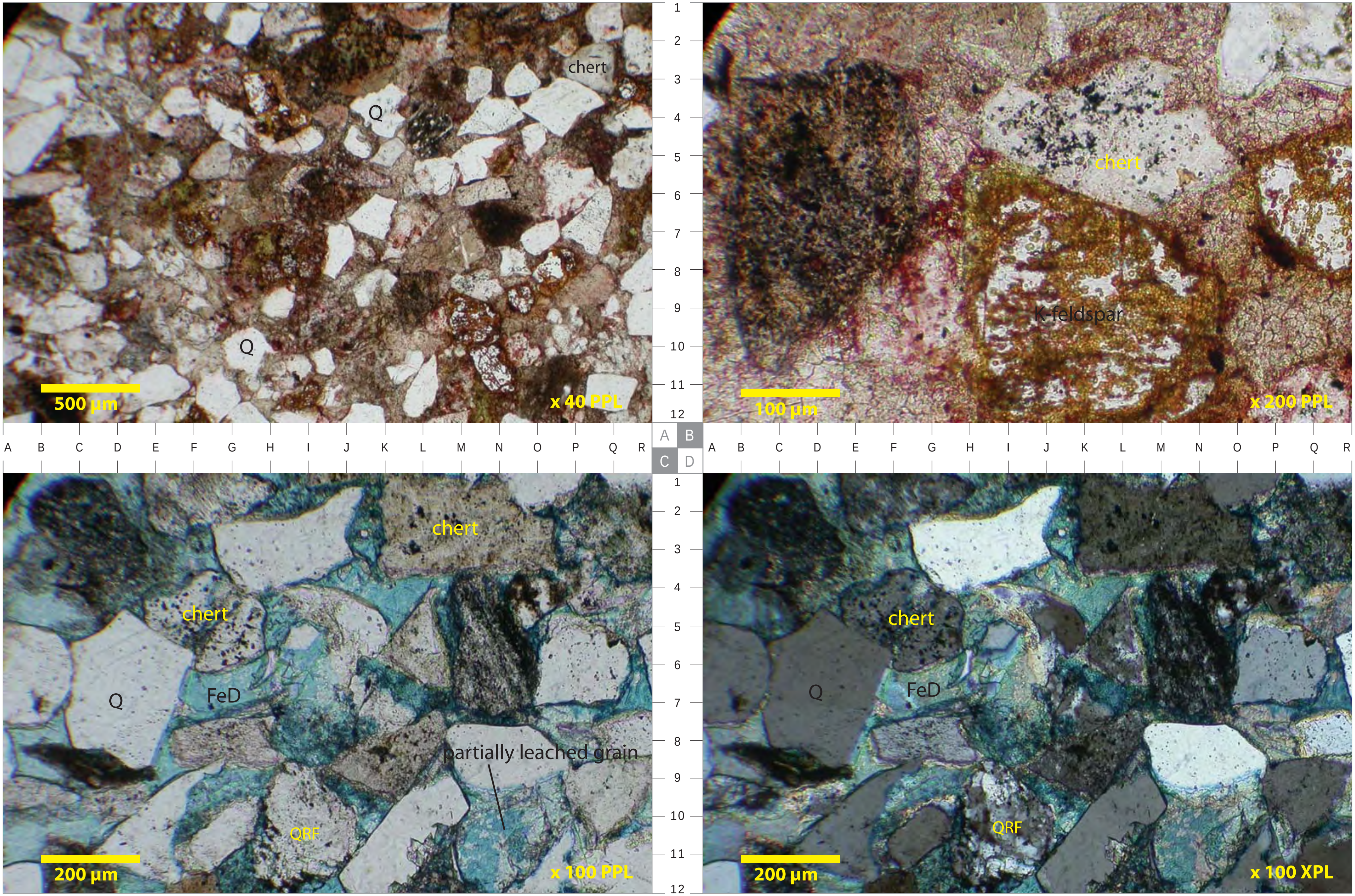
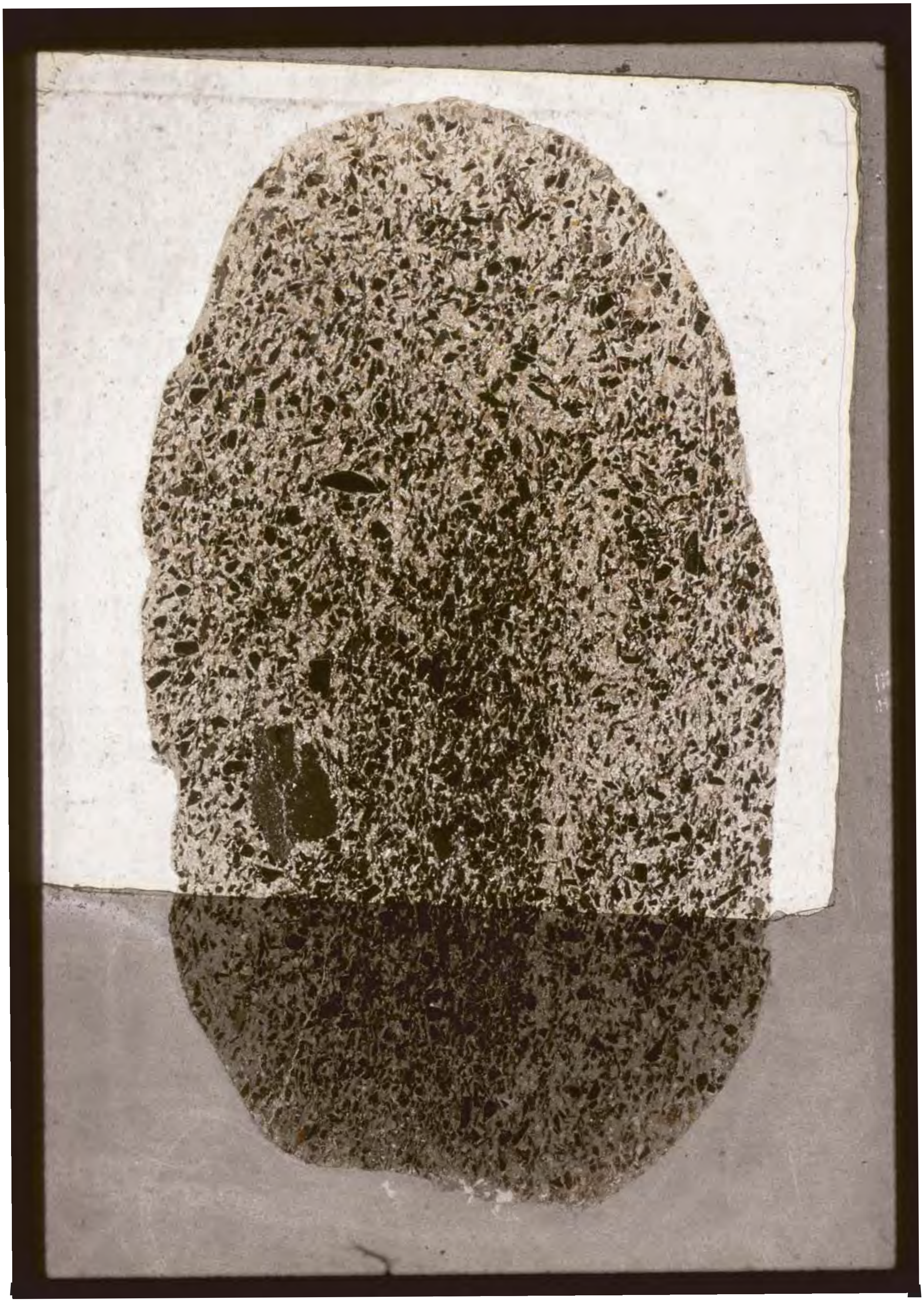


Plate 03
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ellice O-14 3942 feet



Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 04

Ellice O-14
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 3942 feet

Poorly sorted, tight, organic-rich litharenites are recognized from core retrieved at 3942 feet. Common microfractured very fine to coarse grained organic material (OM) is floating in a very fine grained litharenite matrix. Macroporosity is lacking in this interval. Sideritized clay clasts (View B, CRFs) are commonly compacted between the more competent framework grains. Note yellow stained K-feldspar (View C, K:10).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ellice O-14 **3942 feet**

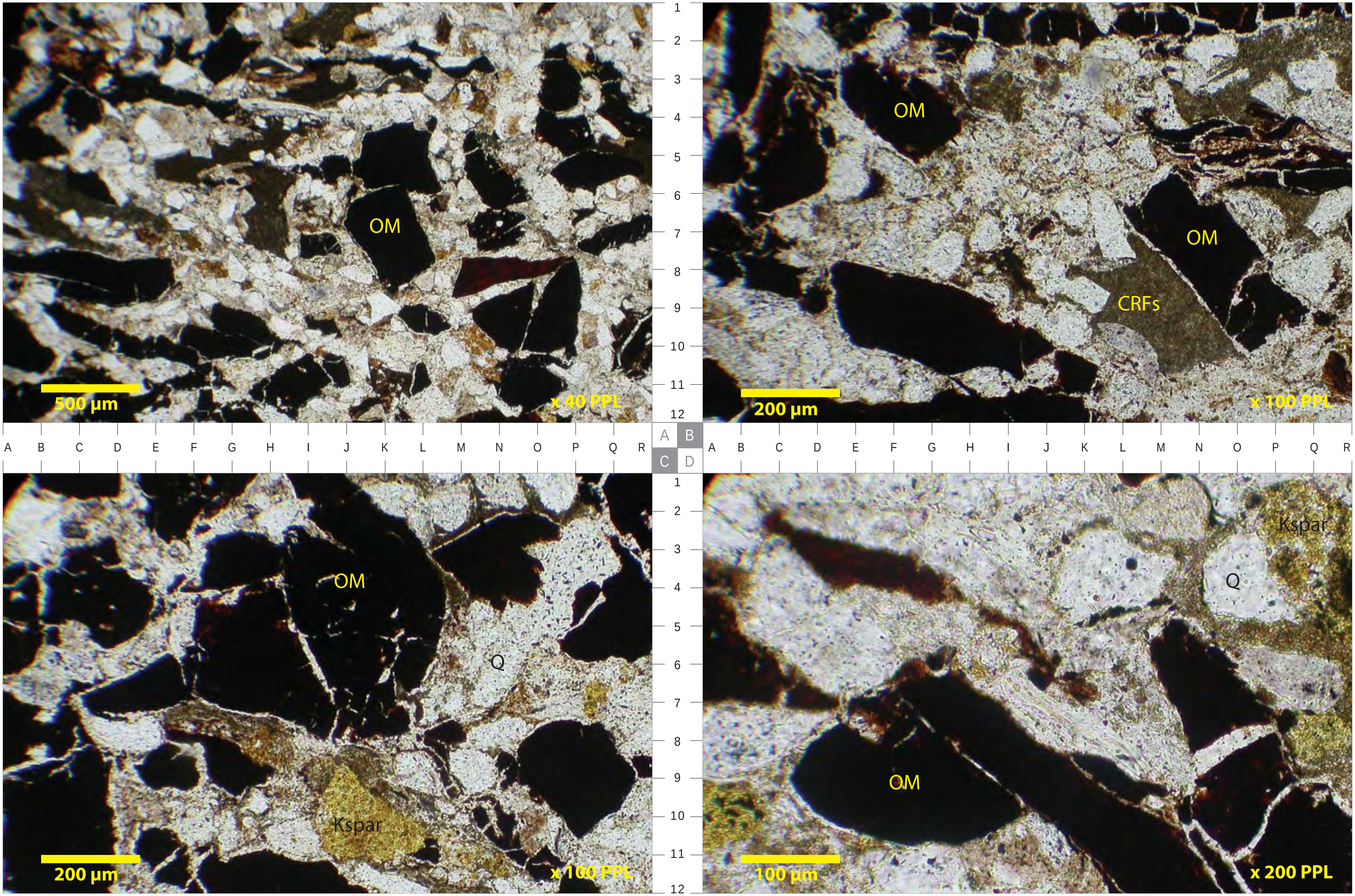


Plate 04
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ellice O-14 4855 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ellice O-14

5279.8 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 05

Ellice O-14
Taglu
Litharenite

Core Analysis Porosity: 15.8% Core Analysis Permeability: 2.08 md

Sample #: 05-15
Depth: 5279.8 feet

Well sorted, bioturbated, faintly laminated low permeability fine to medium grained litharenites were encountered by core recovered at 5279.8 feet. Effective macroporosity (small yellow arrows) is poorly developed, resulting from the dissolution of unstable framework grains such as feldspars (Views B-D). Labile framework grains are commonly compacted between the more competent framework lithoclasts. Grain contacts are concavo-convex and tangential. Clay-rich sedimentary grains (CRF), monocrystalline quartz (Q), chert, feldspathic grains and rare glauconite are the main framework constituents.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

Ellice O-14

5279.8 feet

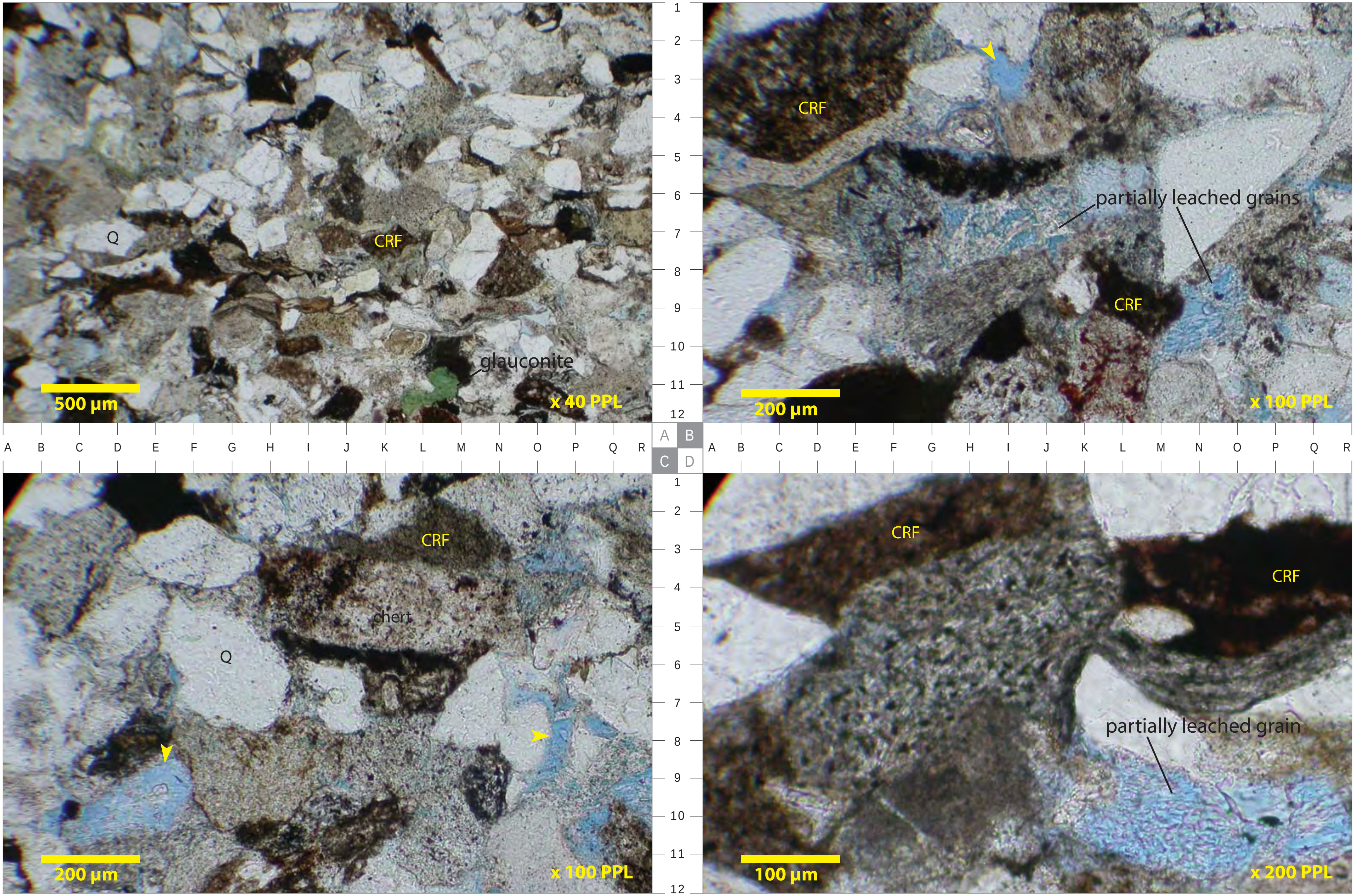


Plate 05
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ellice O-14 6282 feet

2 mm

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ellice O-14 6298 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ellice O-14 6795 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ellice O-14 6830.7 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 06

Ellice O-14
Aklak
Litharenite

Core Analysis Porosity: 12.3% Core Analysis Permeability: 1.90 md

Sample #: 05-21
Depth: 6830.7 feet

Moderately well sorted, fine grained litharenites characterize the Aklak Sequence recovered from core at 6830.7 feet. Mechanical compaction is considered moderate with tangential and concavo-convex grain contacts. Eogenetic ferroan calcite cement is patchily distributed. Framework grains include monocrystalline quartz, chert, clay-rich sedimentary grains (CRF), feldspars, K-feldspar (yellow stain), organic material (OM), micas and volcanic rock fragments. Rare siderite and pyrite have precipitated within chert micropores. Effective macroporosity (small yellow arrows) is poorly developed and isolated resulting in low measured permeability (1.90 md).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

Ellice O-14

6830.7 feet

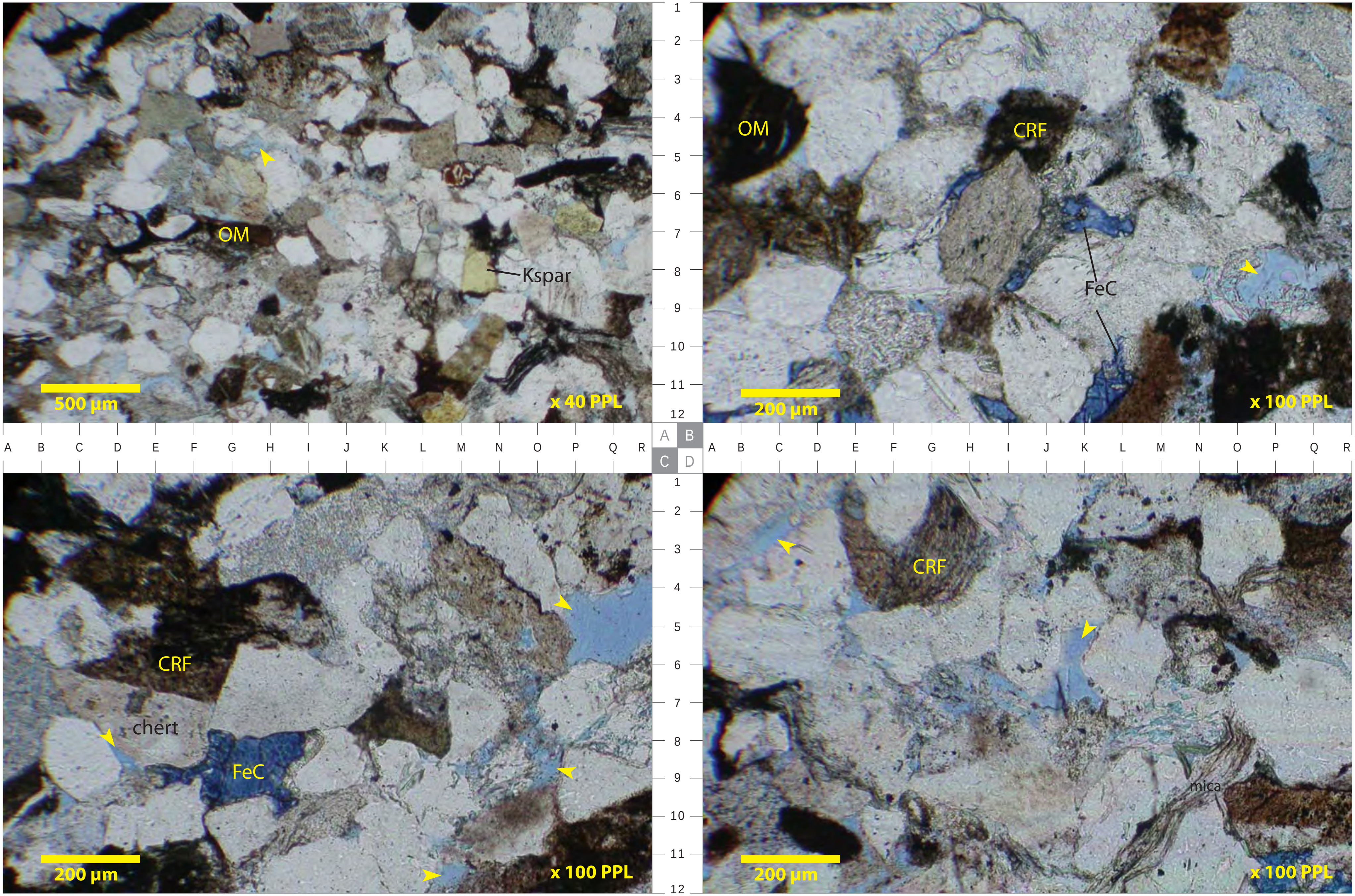


Plate 06
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ellice O-14 7875 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ellice O-14 7881 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ellice O-14 7883.6 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 07

Ellice O-14
Aklak
Argillic Litharenite

Core Analysis Porosity: 8.2% Core Analysis Permeability: 0.26 md

Sample #: 05-23
Depth: 7883.6 feet

Bioturbated, laminated, non-reservoir quality argillaceous silt to fine grained litharenites are shown in these thin section photomicrographs. Angular to subrounded framework constituents include monocrystalline quartz, organic material (OM), K-feldspar (View B) and micas. Effective macroporosity is generally lacking in this interval. Bioturbation and mechanical compaction have obliterated primary porosity in this thin section.

Photo A: 20X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

Ellice O-14 7883.6 feet

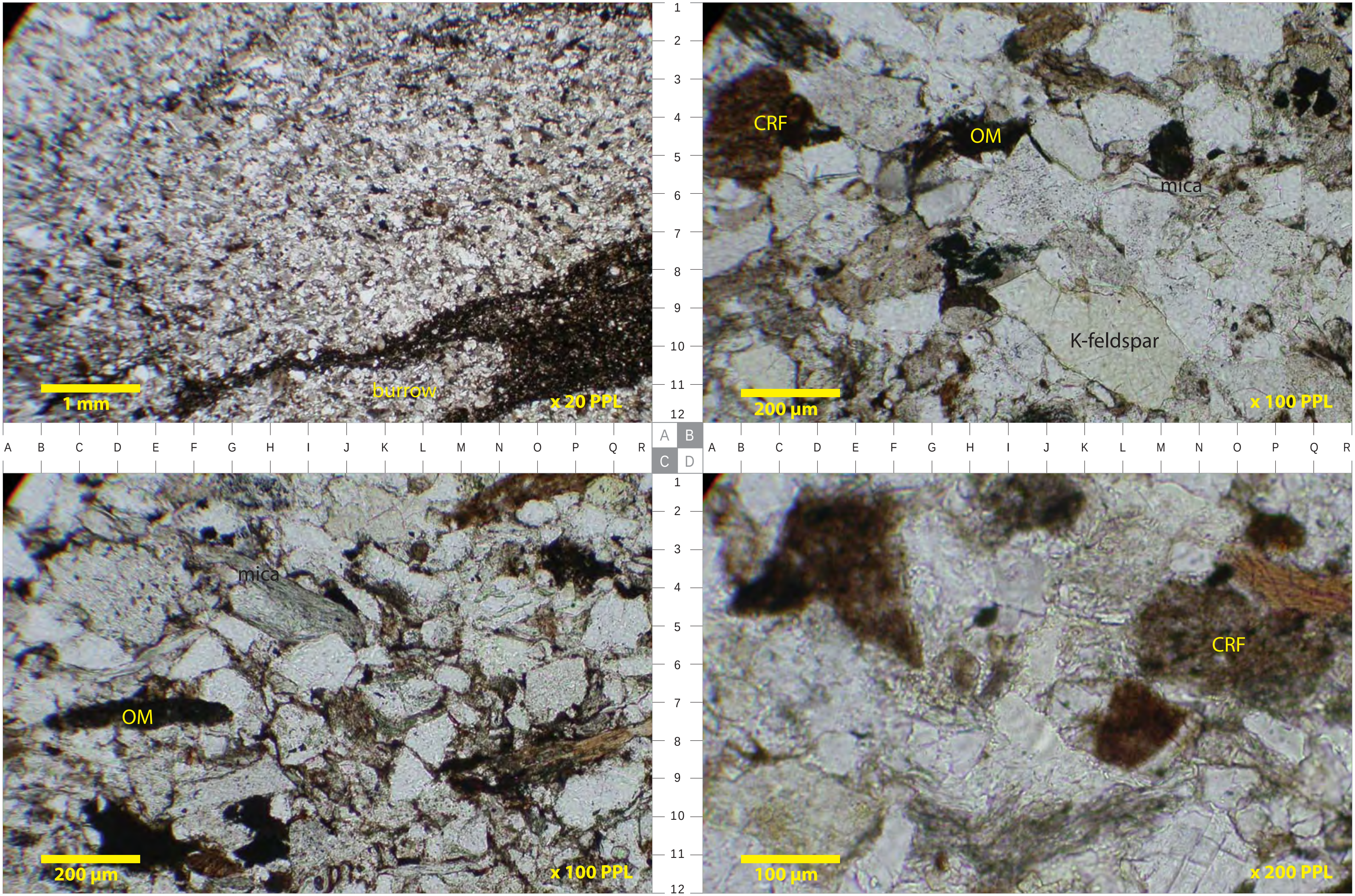


Plate 07
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ellice O-14 7910 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ellice O-14 7915.5 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 08

Ellice O-14
Aklak
Litharenite

Core Analysis Porosity: 3.9% Core Analysis Permeability: 0.10 md

Sample #: 05-25
Depth: 7915.5 feet

The Aklak Sequence recovered from core at 7915.5 feet consists of carbonate cemented, fine to medium grained poorly sorted litharenite. Replacive cryptocrystalline siderite (large green arrows) commonly rim framework grains. Grain contacts are concavo-convex and tangential indicating considerable mechanical compaction. Ferroan calcite (?ankerite) is patchily distributed, occludes macropores and fills partially dissolved framework constituents (View B, O:10). Monocrystalline quartz, chert, argillic sedimentary grains plus organic material are the main framework components in this non-reservoir quality interval.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ellice O-14 7915.5 feet

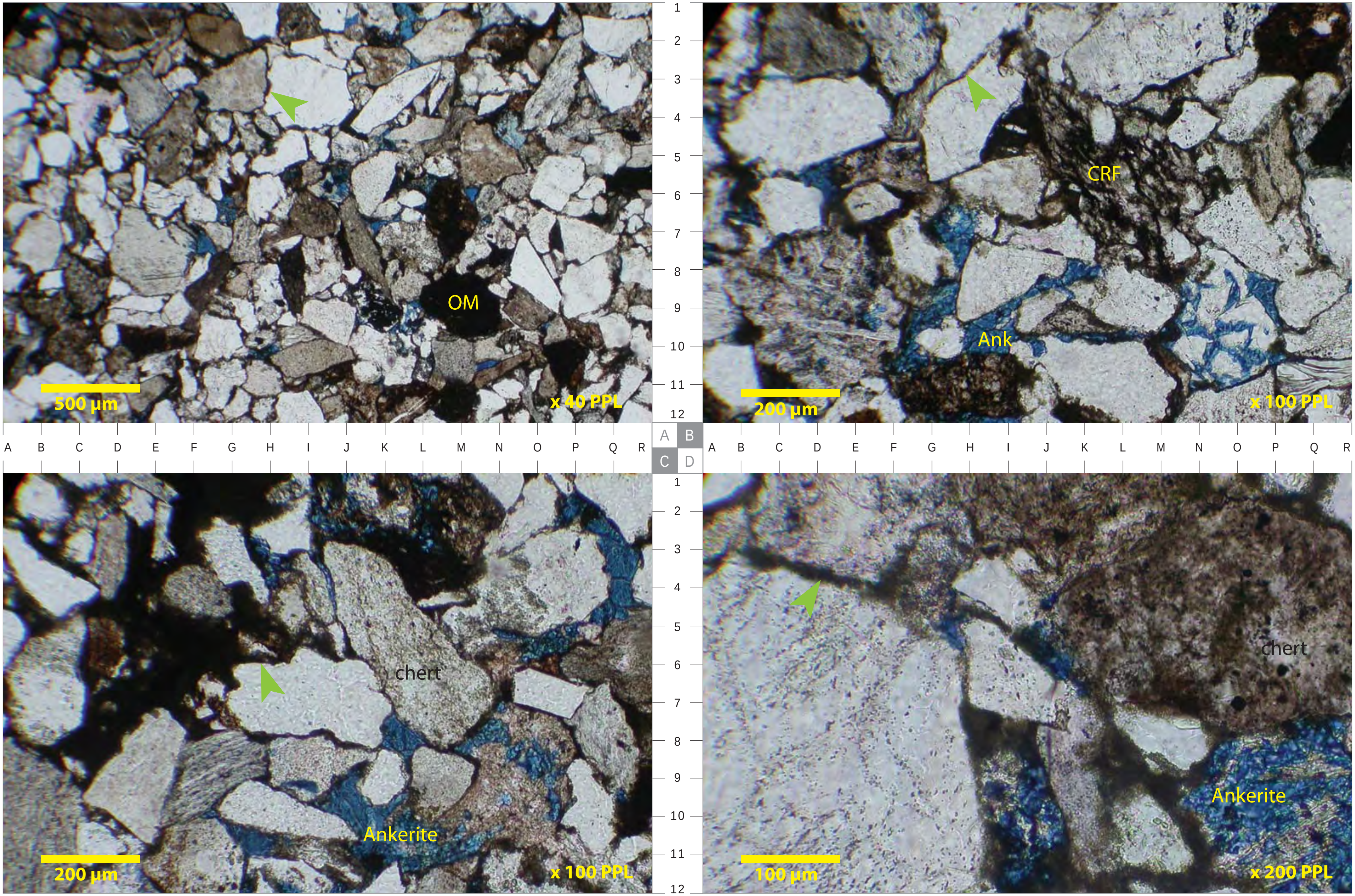


Plate 08
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ellice O-14 7983.8 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ellice O-14 8818 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ellice O-14 8840 feet

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ellice O-14

8844.1 feet

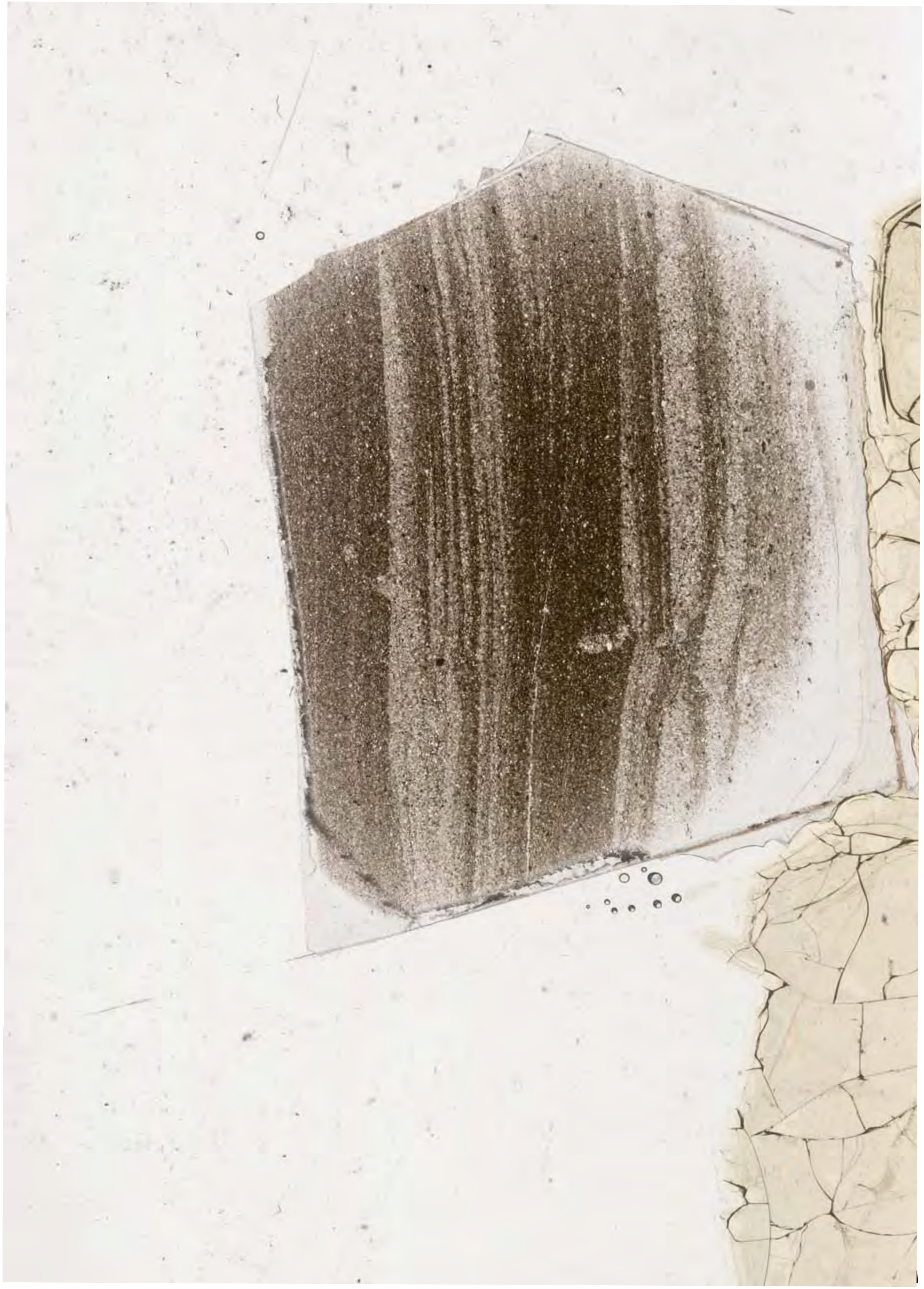
Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ellice O-14 8867.1 feet



Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ellice O-14 8869.11 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ellice O-14 8869.9 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ellice O-14 9470 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 09

Ellice O-14
Aklak
Conglomeratic Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 9470 feet

Very poorly sorted, silt to pebble sized framework grains comprise the polymictic conglomeratic litharenite recovered from core at 9470 feet. Chert and polycrystalline quartz are the main framework components with subordinate amounts of K-feldspar, clay-rich sedimentary grains (CRF) and micas. Note chert grains are commonly microfractured (large white arrows) with grain slippage and compaction. Pore filling carbonate cement (large green arrows) is non-stained.

Photo A: 20X PPL,   Photo B: 20X XPL,   Photo C: 40X PPL,   Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ellice O-14 **9470 feet**

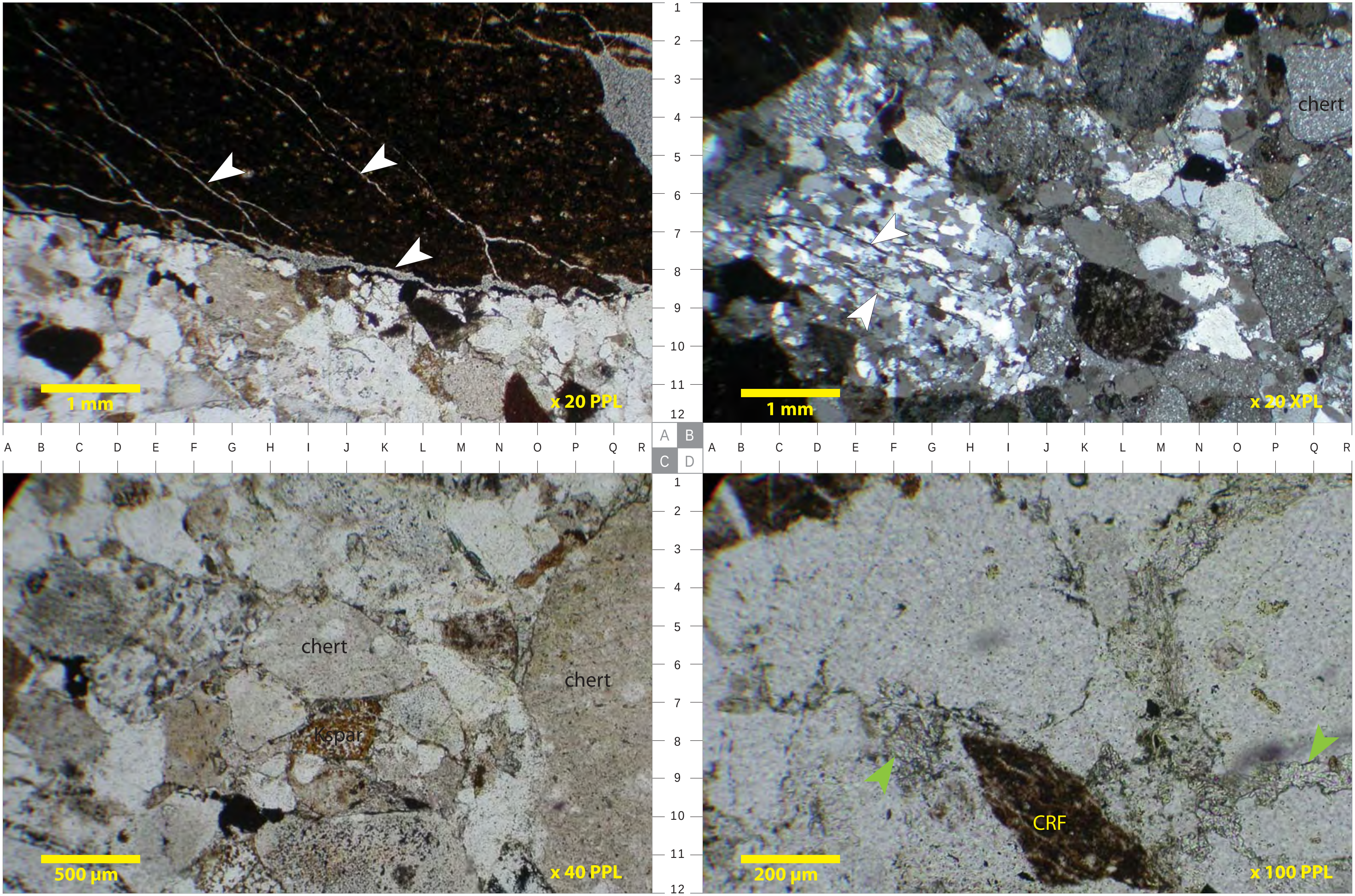


Plate 09
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ellice O-14 9471 feet

2 mm

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 10

Ellice O-14
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 05-31
Depth: 9471 feet

Moderately sorted, medium to very coarse grained litharenites were encountered by core recovered at 9471 feet. Two types of carbonate cement are shown in these thin section photomicrographs. Quartz overgrowths are minor, unevenly precipitated on host quartz grains. Two types of carbonate have precipitated. The first is a poorly developed patchily distributed ankerite; the second consists of rare coarsely crystalline well developed ferroan dolomite (View B, FeD). Dissolution of ankerite and unstable framework grains has enhanced the effective pore system (small yellow arrows).

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ellice O-14 **9471 feet**

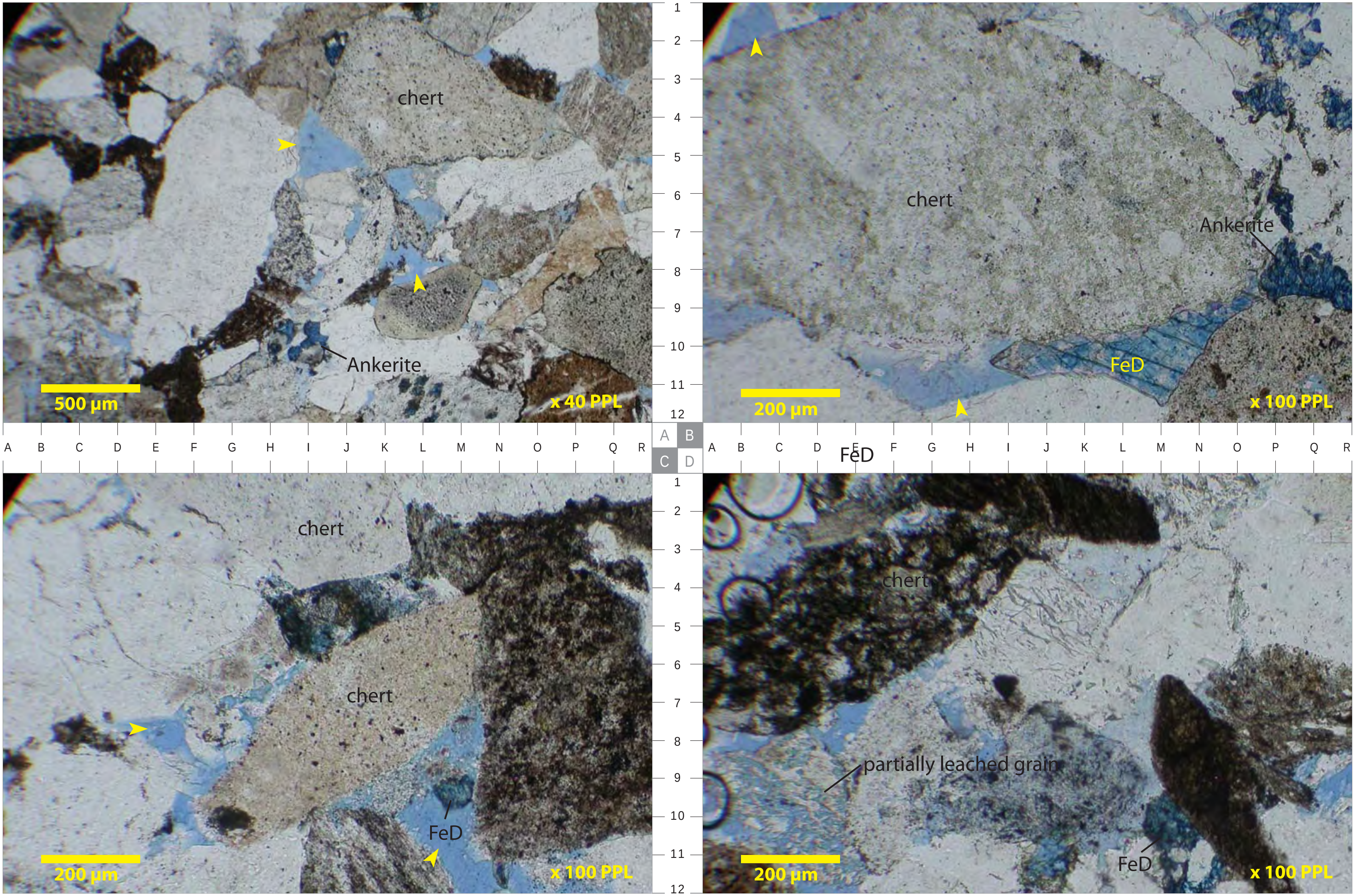


Plate 10
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ellice O-14 9475.5 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ellice O-14 9476 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ellice O-14 9483 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ellice O-14 9483.5 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 11

Ellice O-14
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Sample #: 05-33
Depth: 9483.5 feet

Microfractured, non-reservoir quality, laminated very fine to fine grained litharenites are recognized from core taken at 9483.5 feet. Silica cement lines the subparallel and apparent conjugate microfractures which have been subsequently filled by coarsely crystalline ferroan dolomite (blue stain) cement. Silica filled microfractures in View D (K:8) pre-date the ferroan dolomite microfractures (View D, B:3).

Photo A: 20X PPL,   Photo B: 20X XPL,   Photo C: 20X PPL,   Photo D: 100X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ellice O-14 9483.5 feet

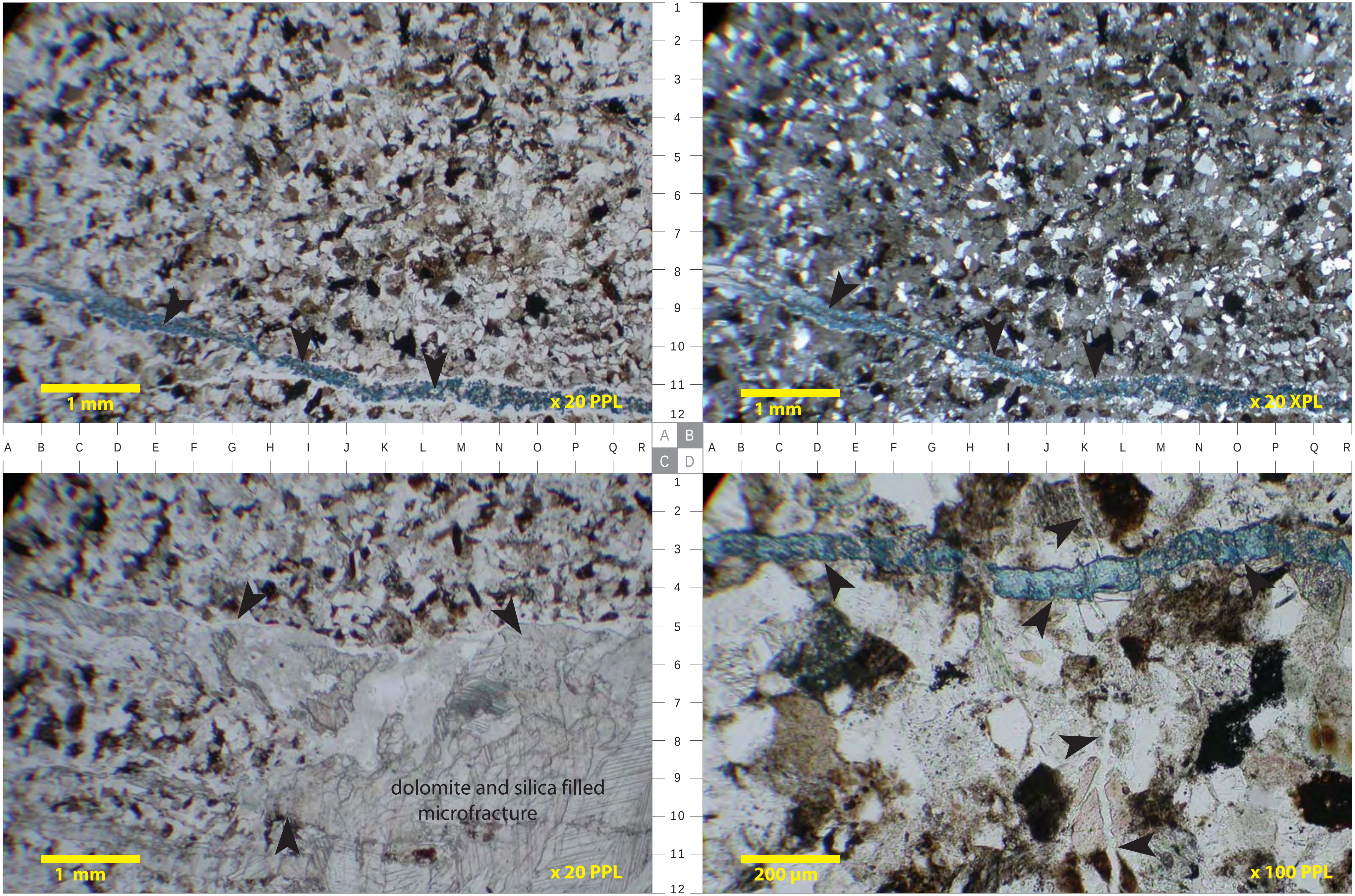
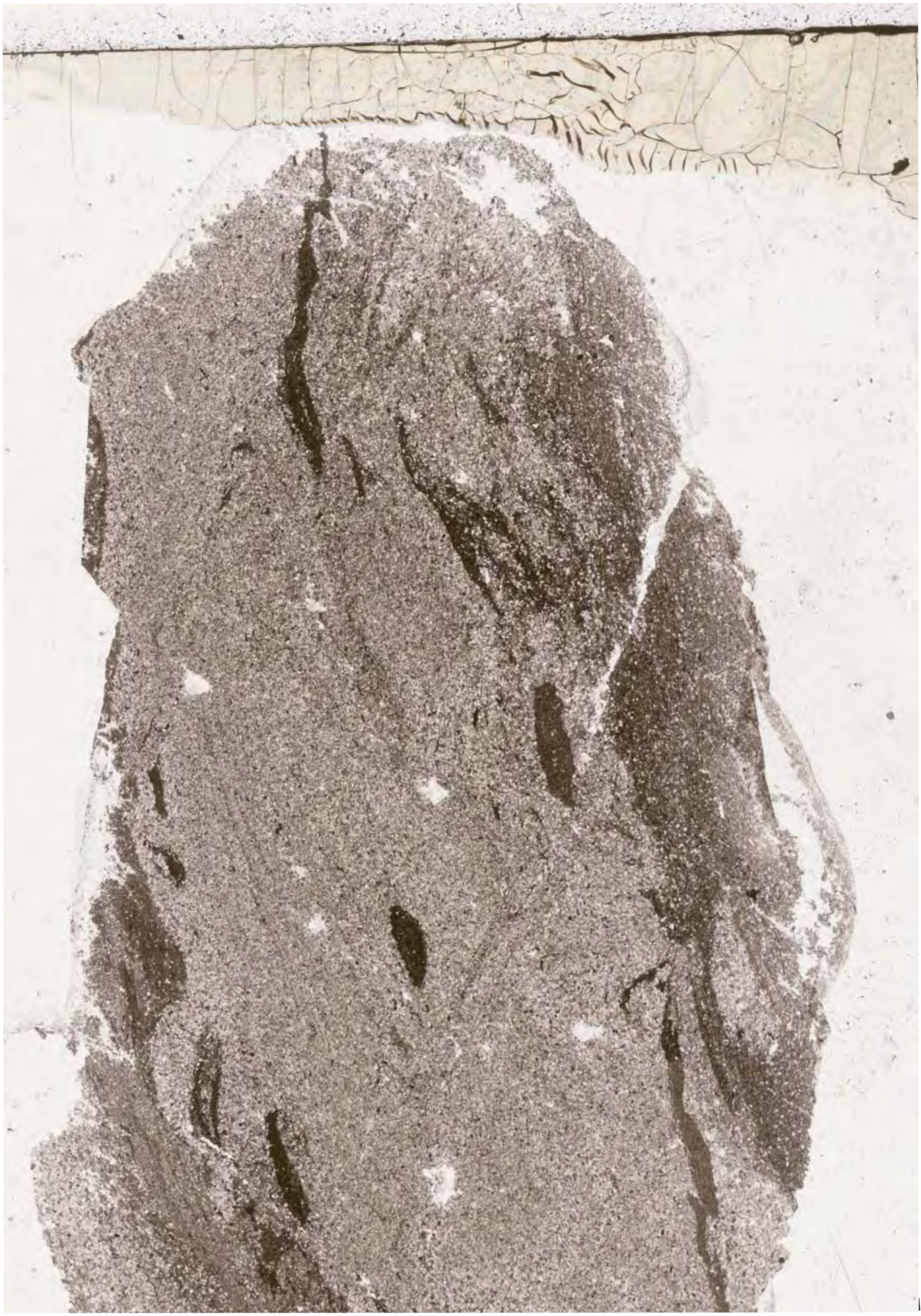


Plate 11
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ellice O-14 9513 feet



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ellice O-14 9527 feet (a)

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Ellice O-14 9527 feet (b)

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ellice O-14 9529.5 feet

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 12

Ellice O-14
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

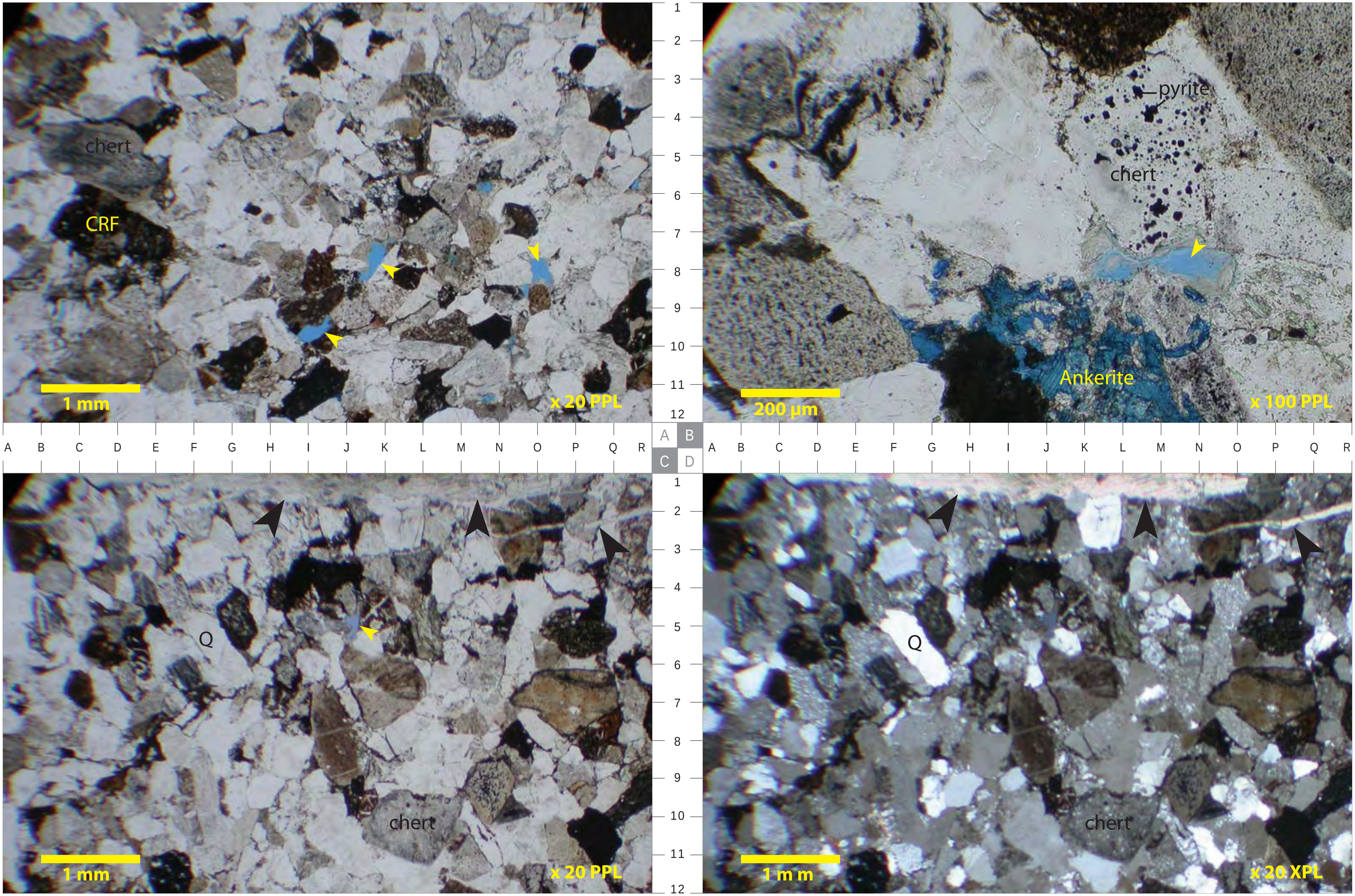
Depth: 9529.5 feet

Rare carbonate (non-stained) filled microfractures (Views C and D, large black arrows) crosscut the moderately sorted, fine to coarse grained litharenites encountered by core at 9529.5 feet. Effective macroporosity (small yellow arrows) is very poorly developed and isolated suggesting very low permeability. Rare ankerite (View B) is patchily distributed. Pyrite has precipitated in chert micropores (View B). Monocrystalline quartz (Q), chert and clay-rich sedimentary grains (CRF) are the main framework constituents in this very low reservoir quality interval.

Photo A: 20X PPL,   Photo B: 100X PPL,   Photo C: 20X PPL,   Photo D: 20X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ellice O-14 9529.5 feet



CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Reindeer D-27

Thin Section Overviews

Reindeer D-27

2908 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

2937.1 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 3697 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

3700 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

4043 feet

Taglu

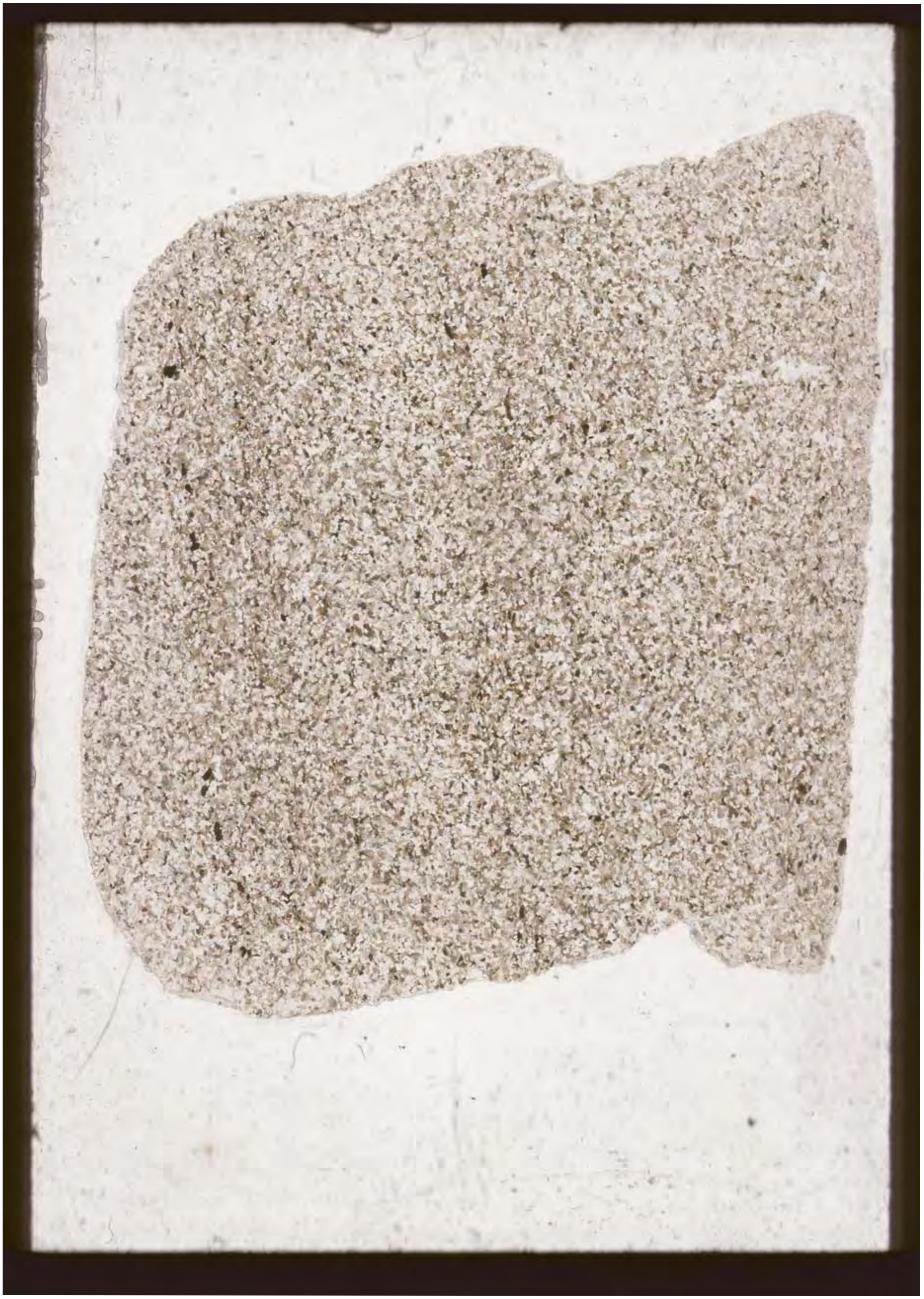
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

4058 feet



Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 | 4068 feet

Taglu

2 mm

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Reindeer D-27

4764 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

4769 feet

2 mm

Taglu

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Reindeer D-27

4773 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

4792 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

4793 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

4802 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

4805 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Reindeer D-27

4811 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

4815 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

4819 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

4820 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 5314 feet

2 mm

Taglu

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Reindeer D-27

5316 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

5320 feet

Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

5328 feet

Taglu

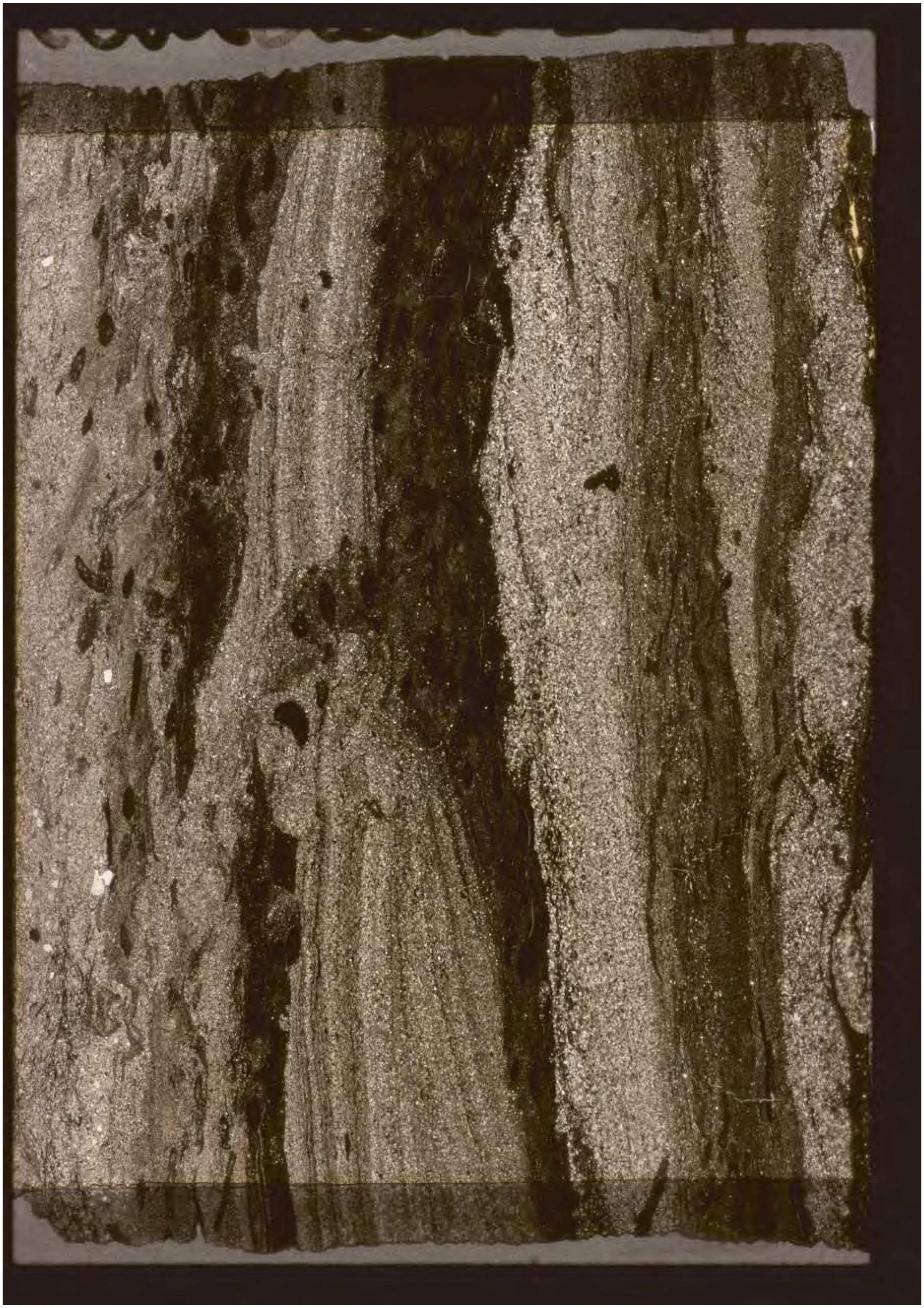
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

5330 feet



Taglu

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 5333 feet

Aklak

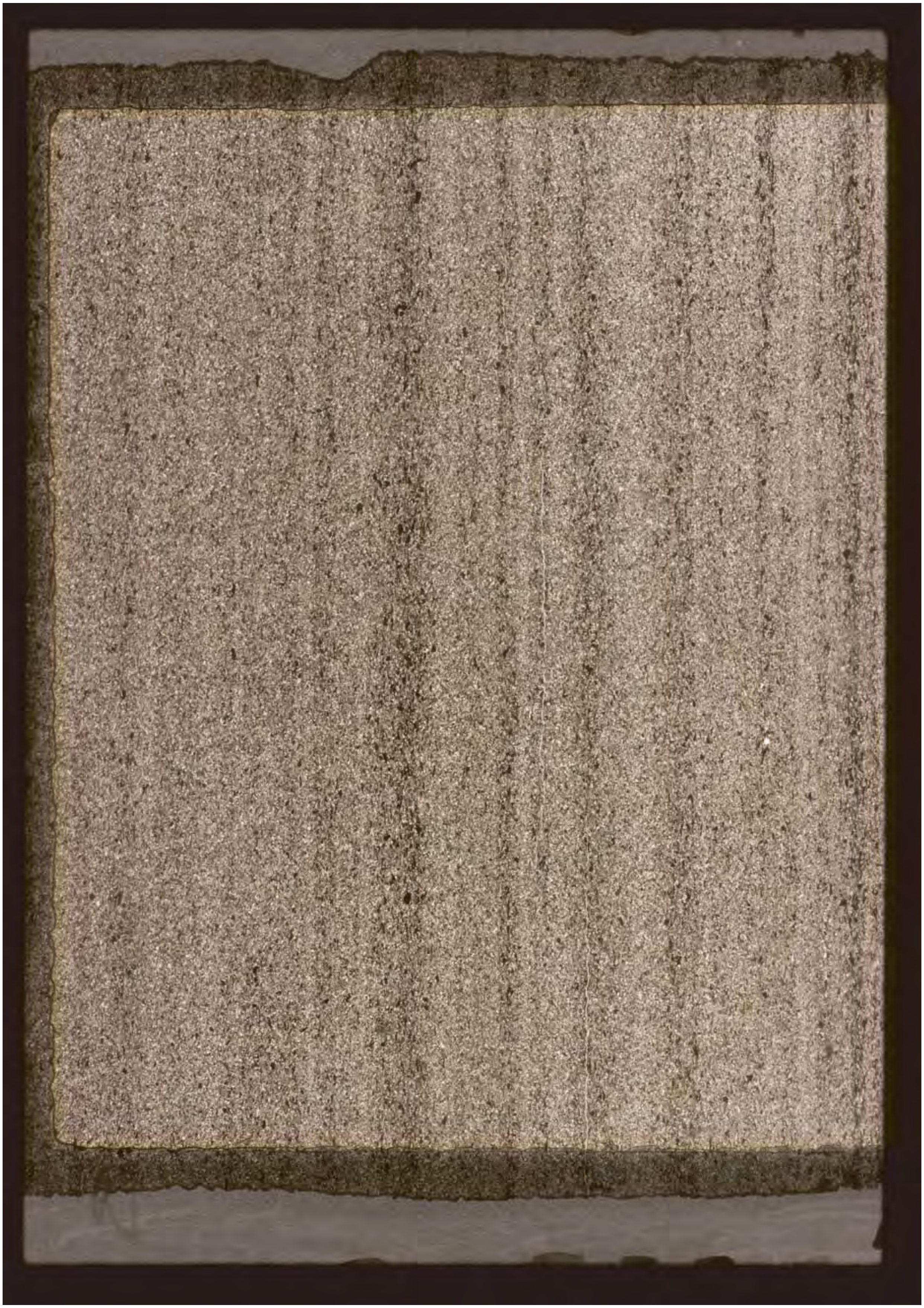
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

5336 feet



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

5344 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

5348 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 5354 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 5357 feet

2 mm

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

5358 feet

2 mm

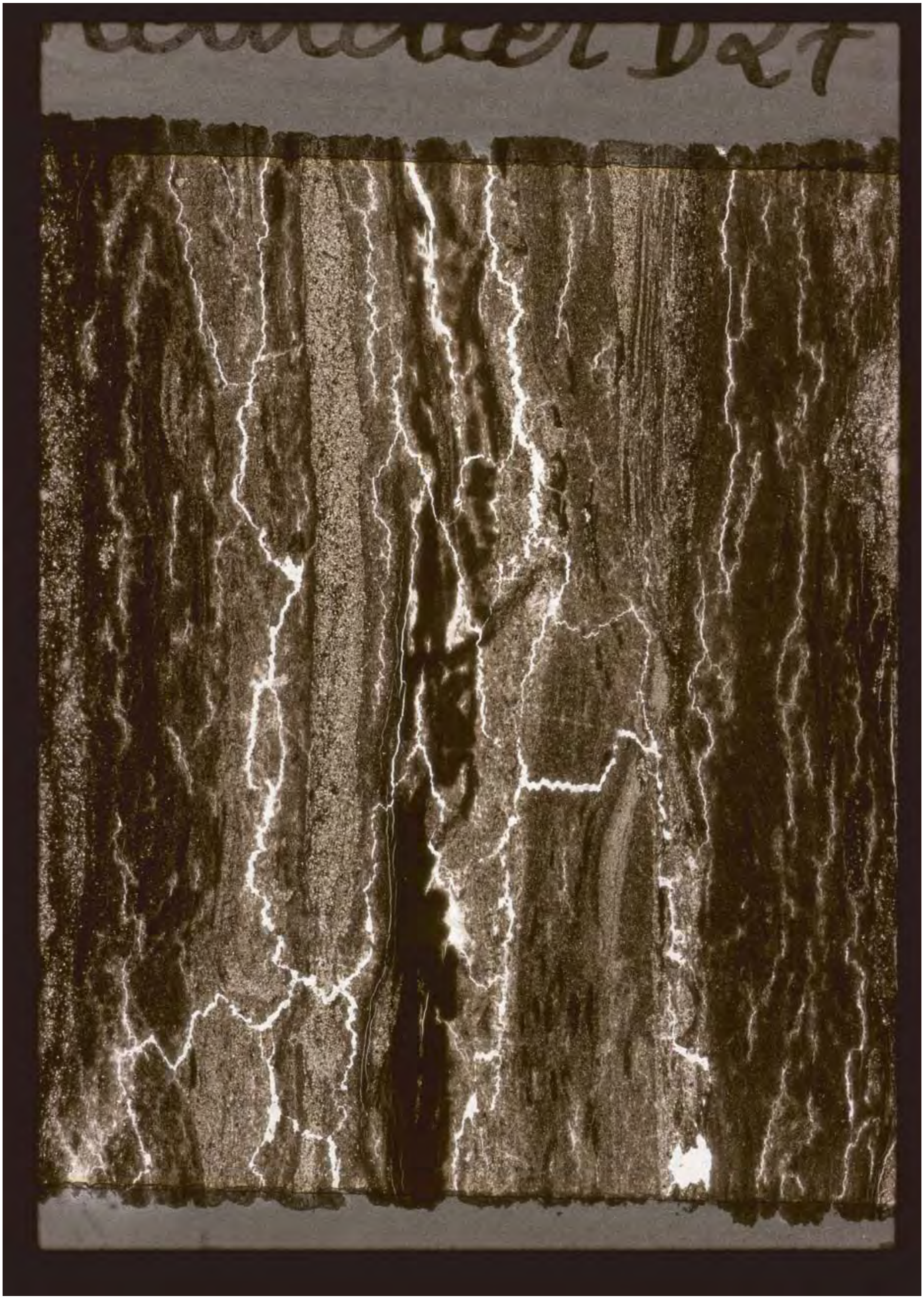
Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

5364 feet



2 mm

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

5368 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

5511 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

5516 feet

Aklak

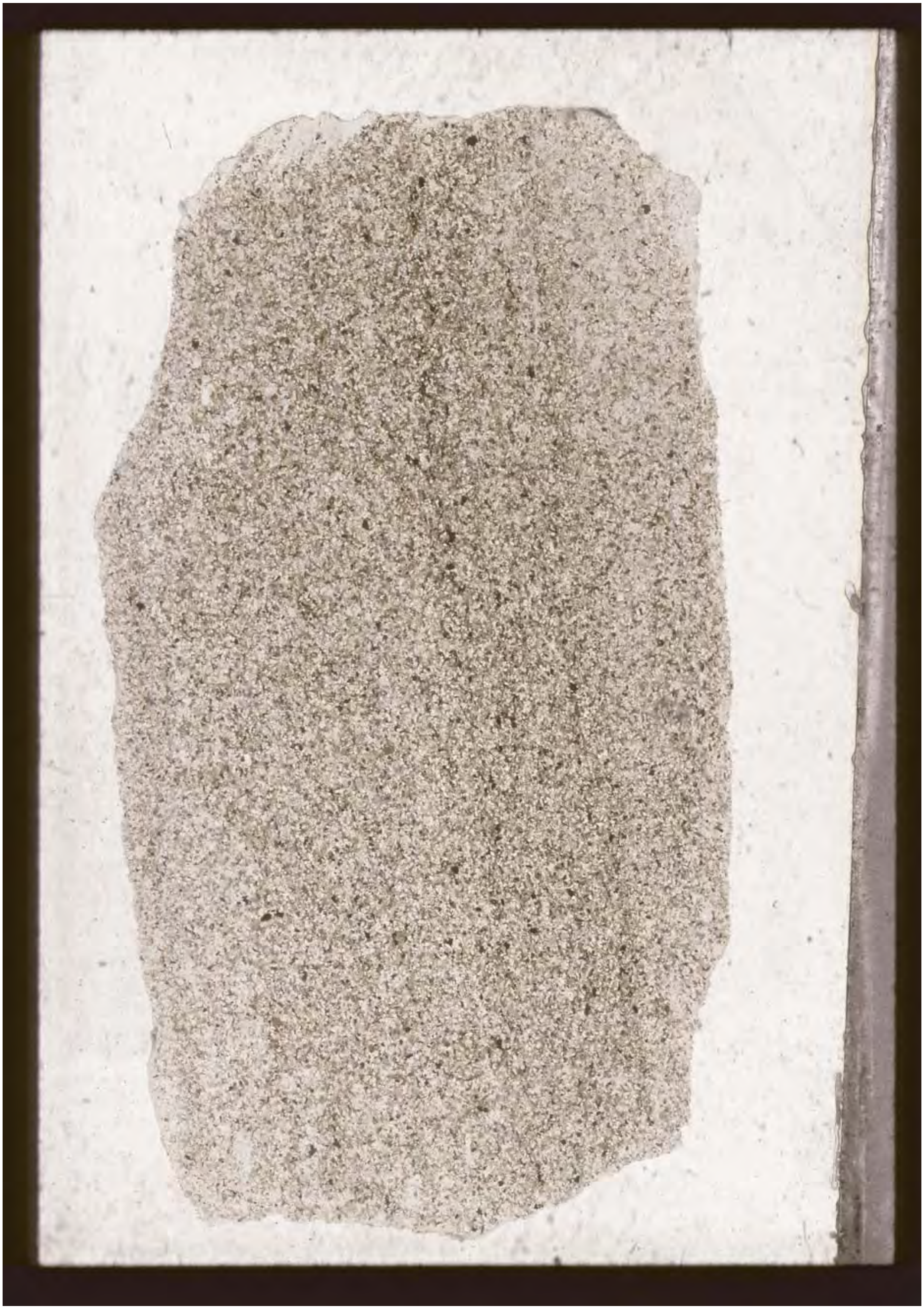
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

5520 feet



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Reindeer D-27

5934 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 6101 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Reindeer D-27

6102 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

6103 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

6106 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

6112 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 6614 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

6620 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

6622 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 6627 feet

Aklak

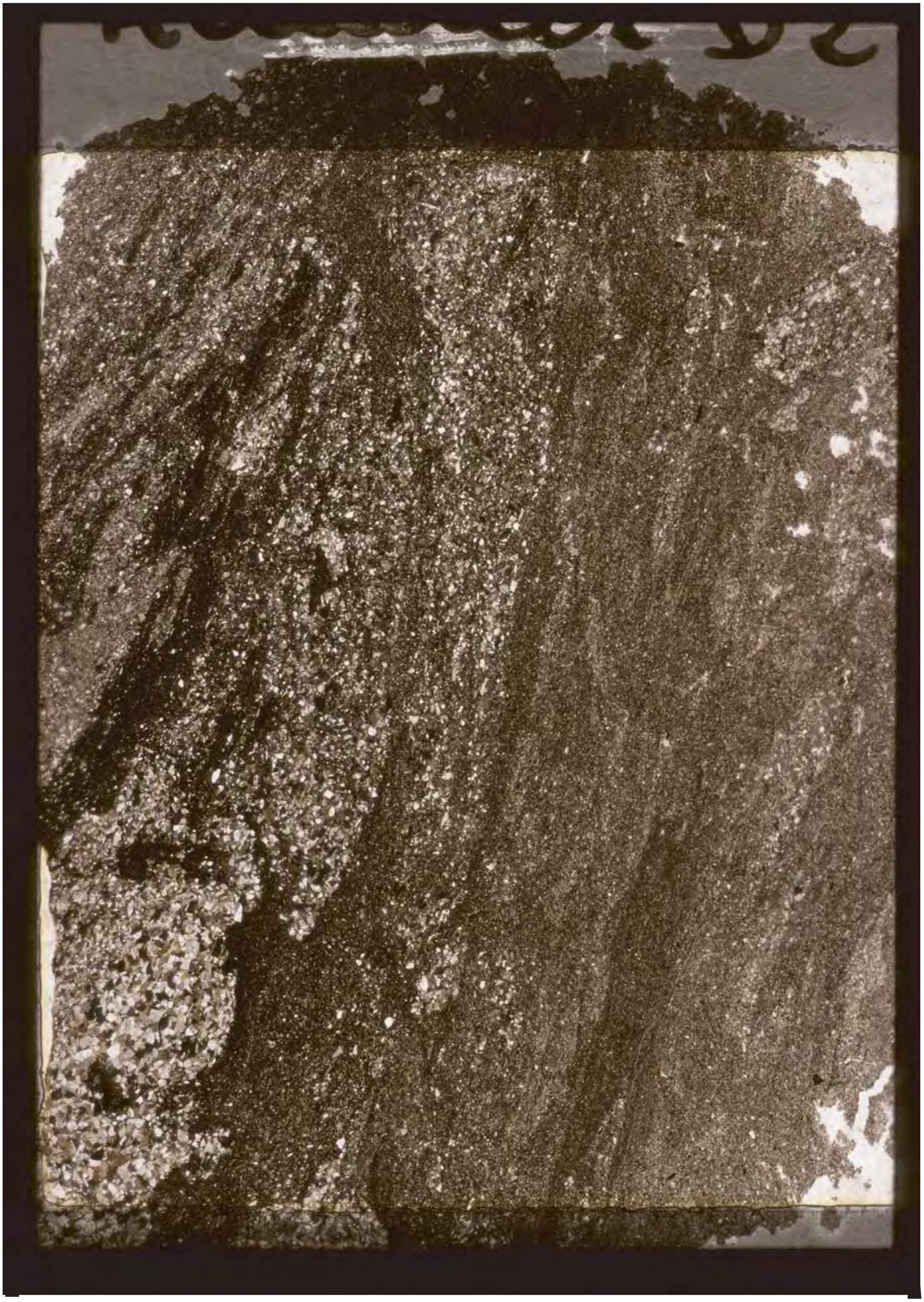
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

6640 feet



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

6642 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 6644 feet

Aklak

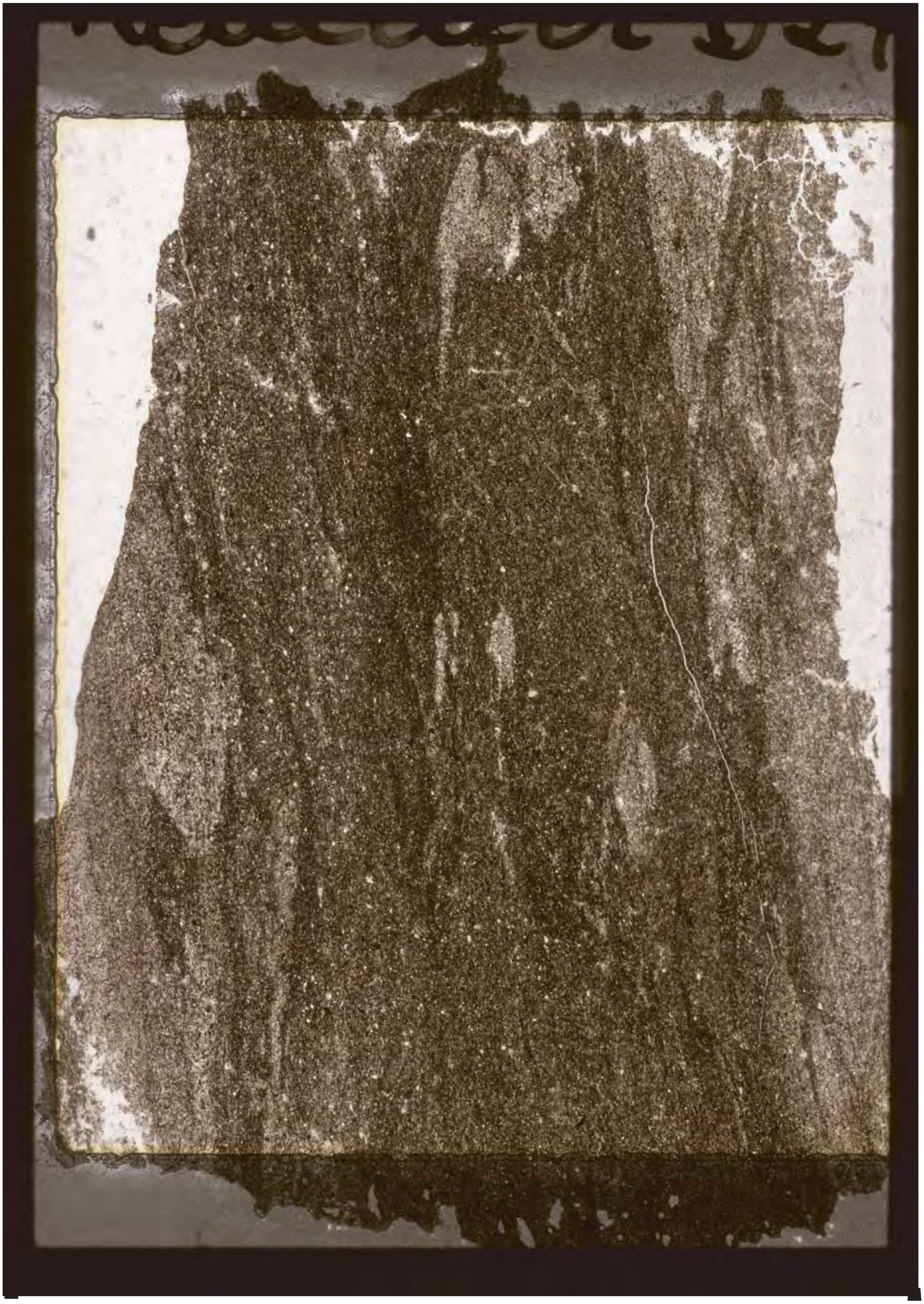
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

6646 feet



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 6869 feet

2 mm

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

6872 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

6876 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

6880 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

6886 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 6892 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

6896 feet

Aklak

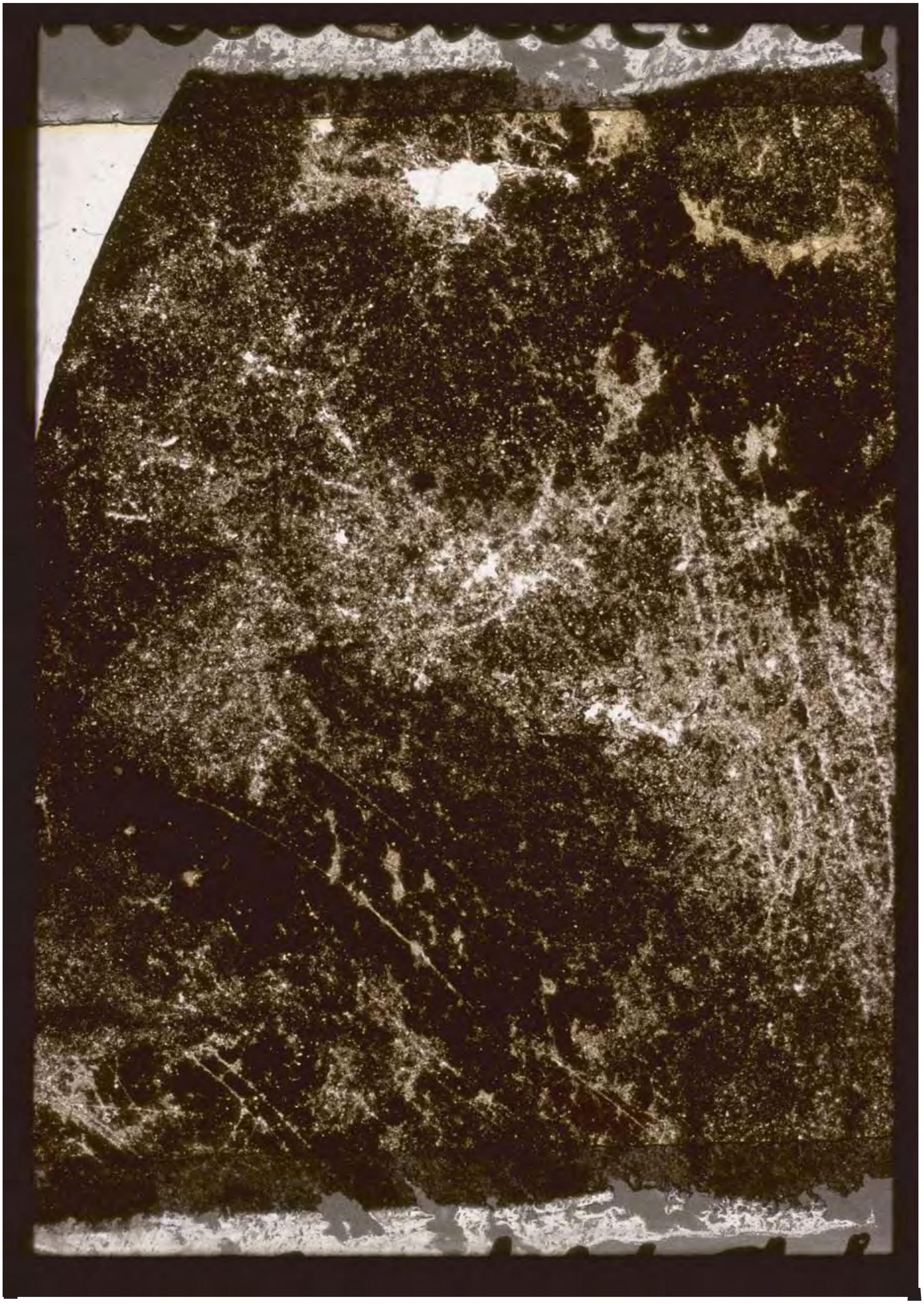
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

7248 feet



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

7252 feet

Aklak

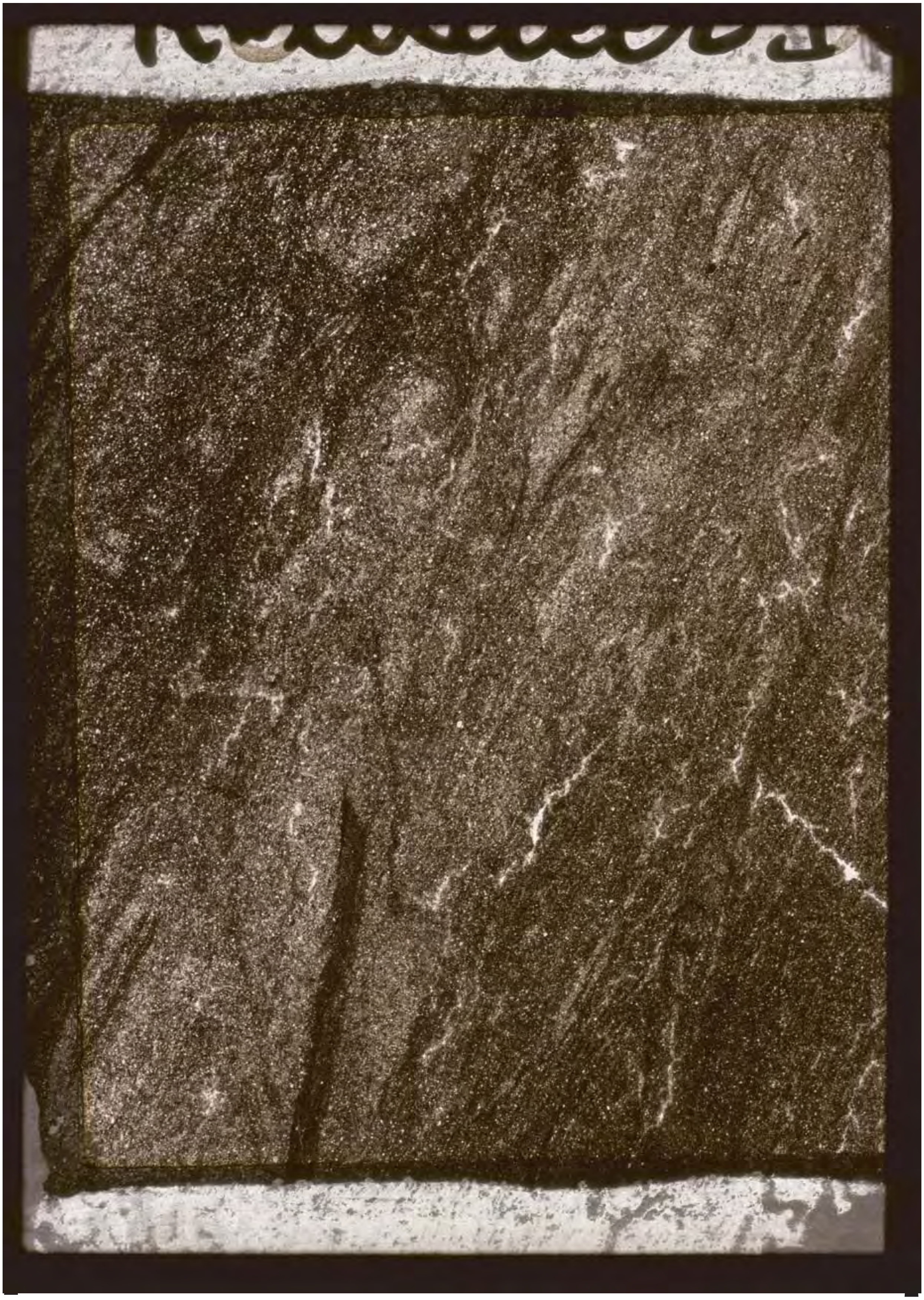
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

7264 feet



Aklak

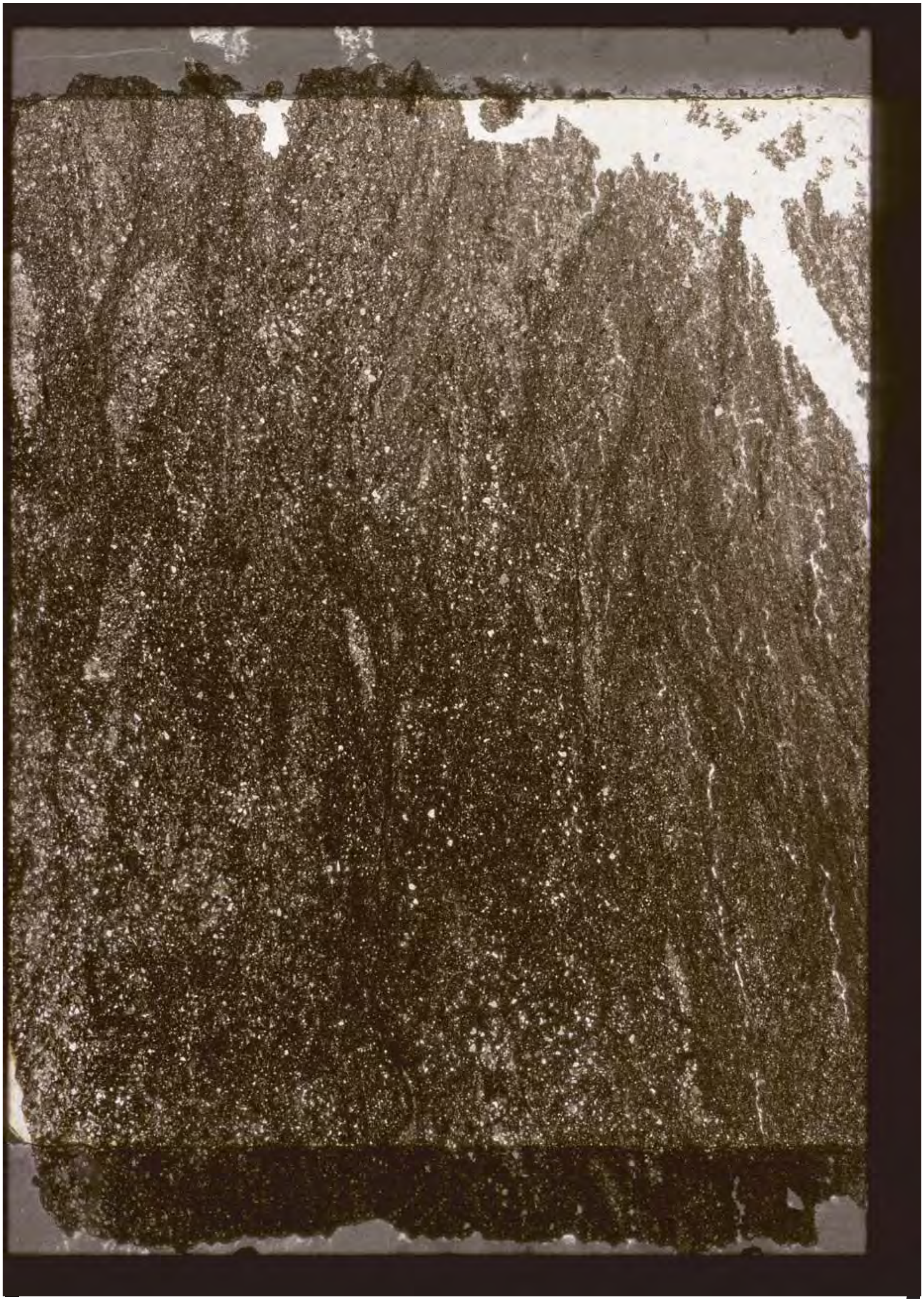
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

7272 feet



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Reindeer D-27

7275 feet (a)

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

7275 feet (b)

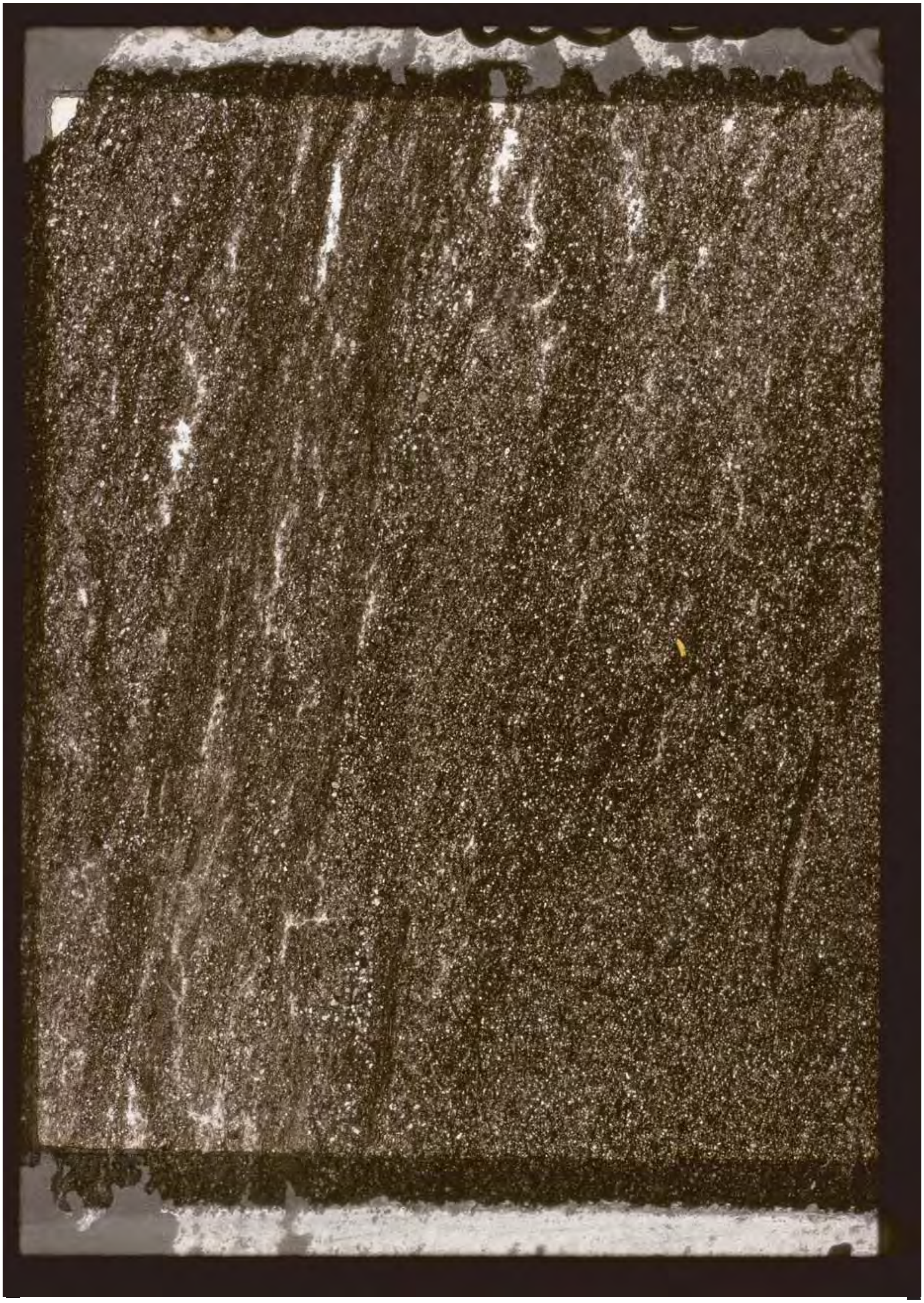
Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 7277 feet



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 7820 feet

Aklak

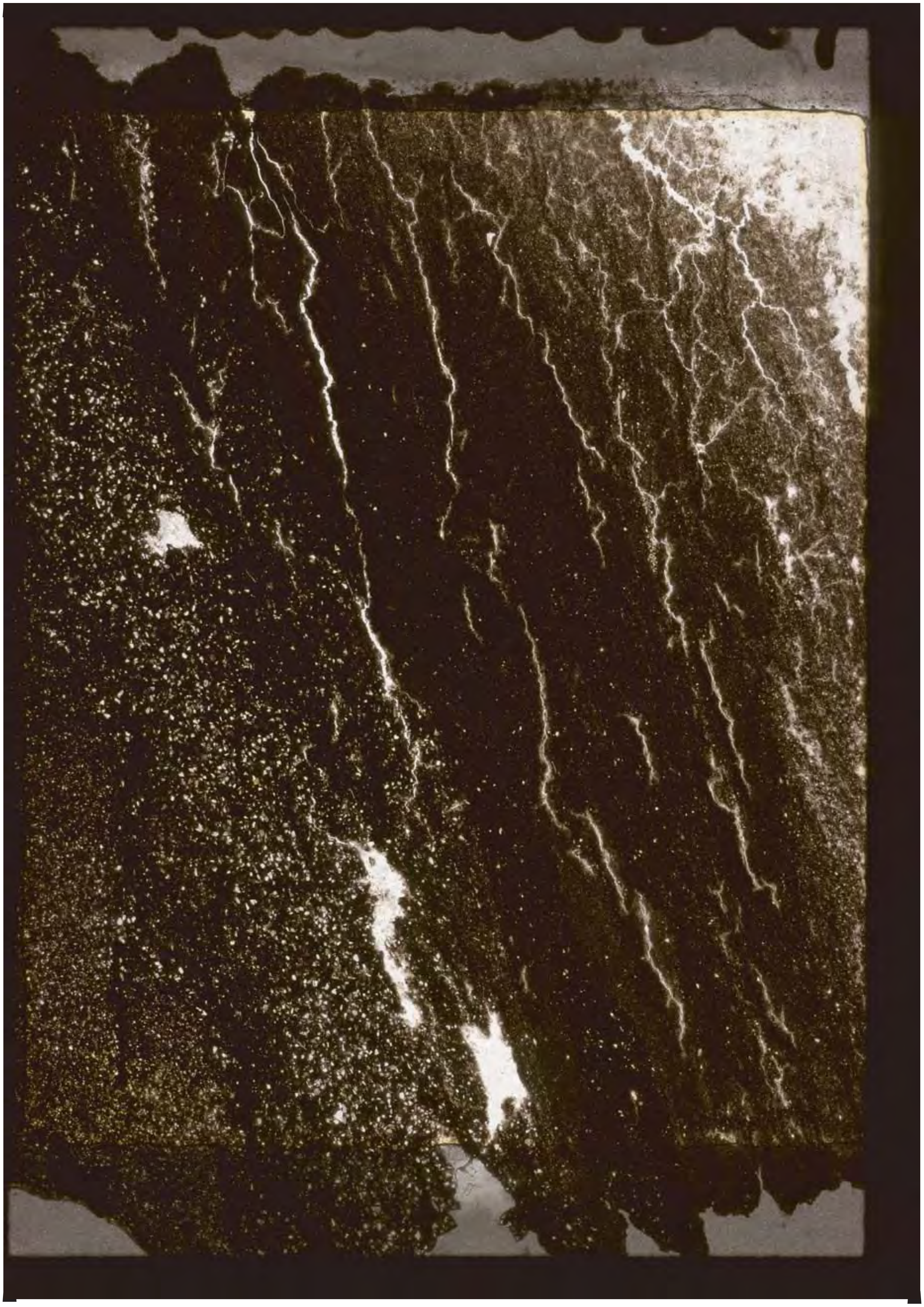
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

7829 feet



Aklak

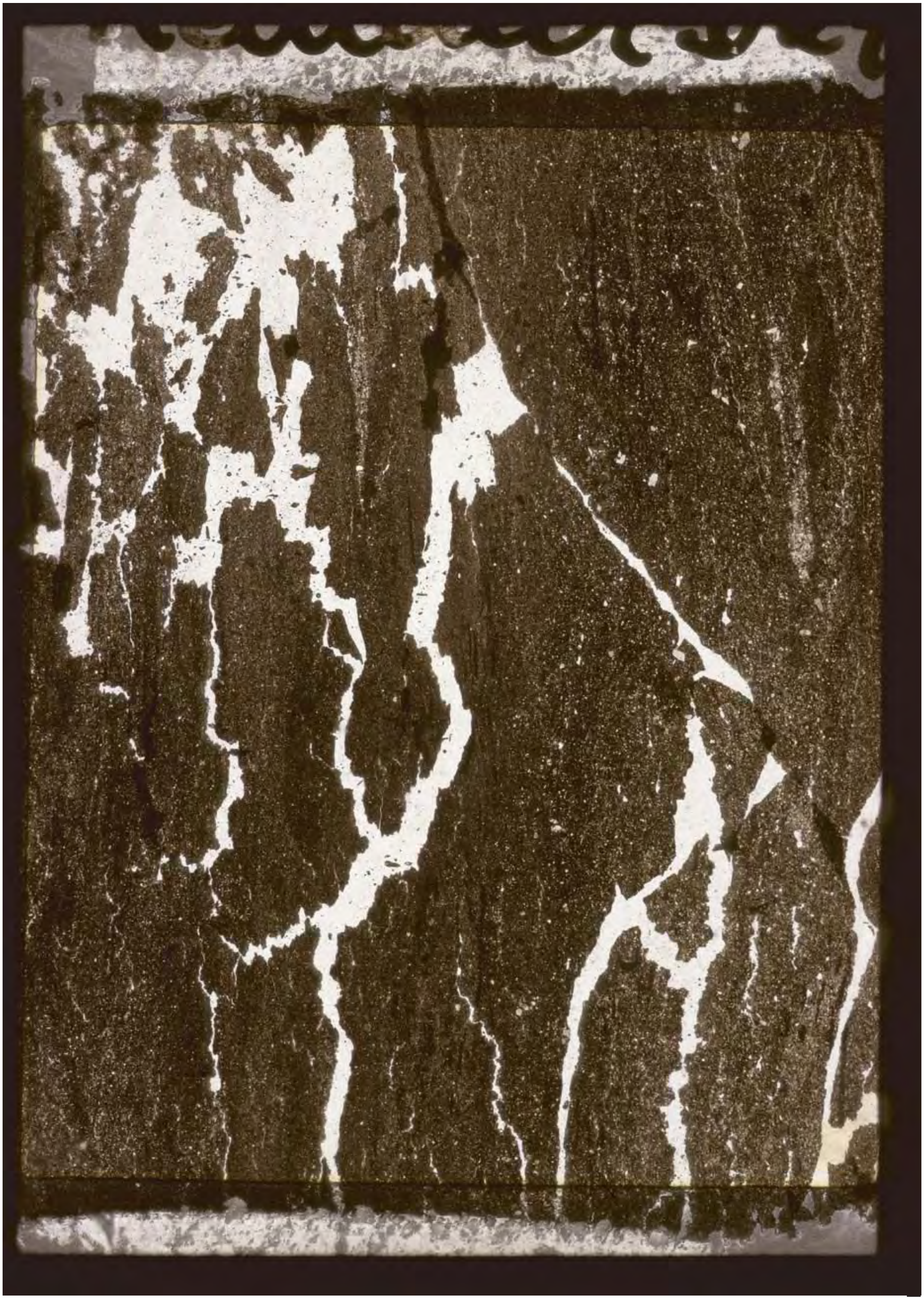
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

7833 feet



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

7836 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

7846 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 7849 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

7854 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

7942 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

7946 feet

Aklak

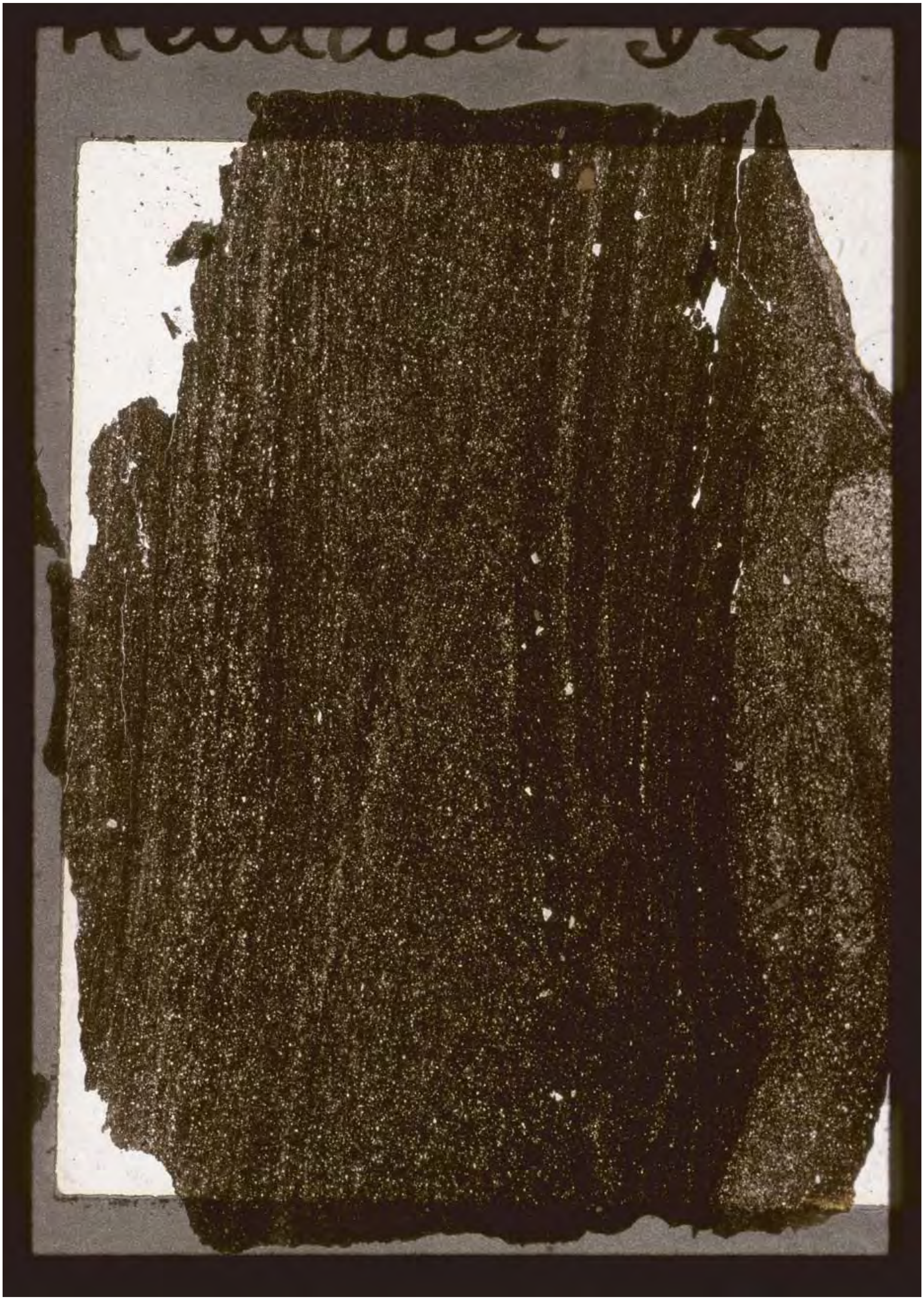
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

8368 feet



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

8372 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

8380 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 8916 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

8917 feet

Aklak

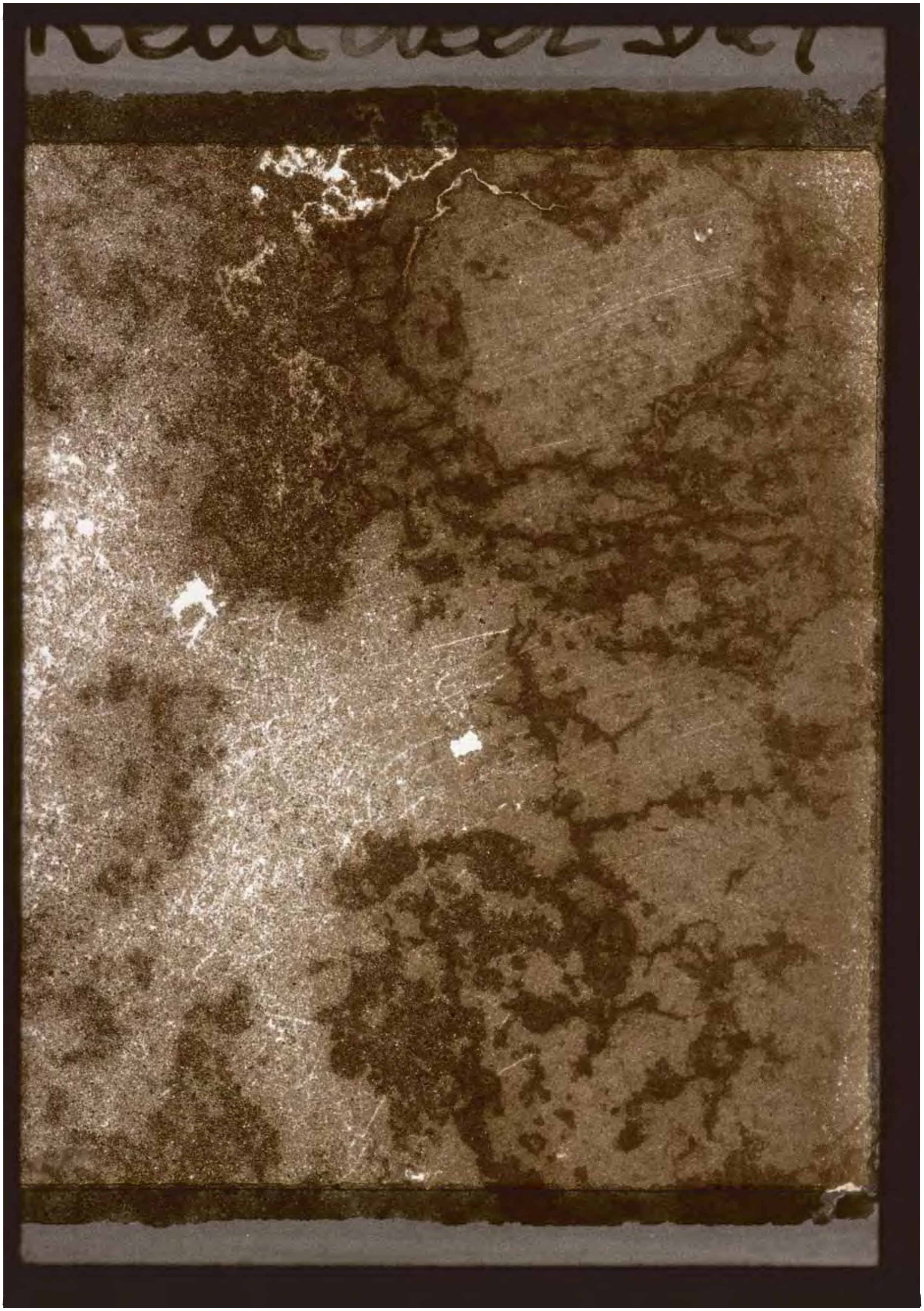
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

8920 feet



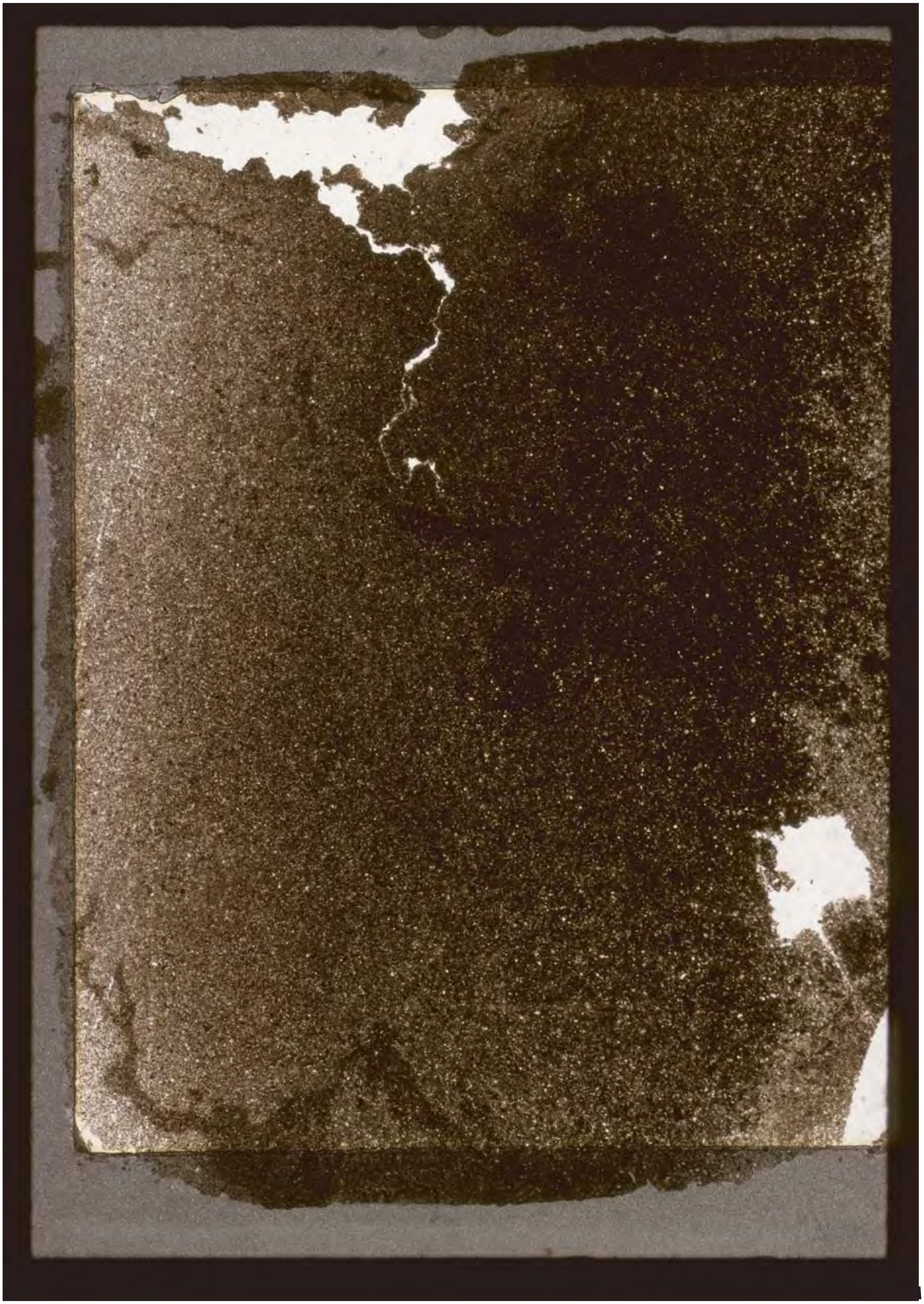
Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 8924 feet



Aklak

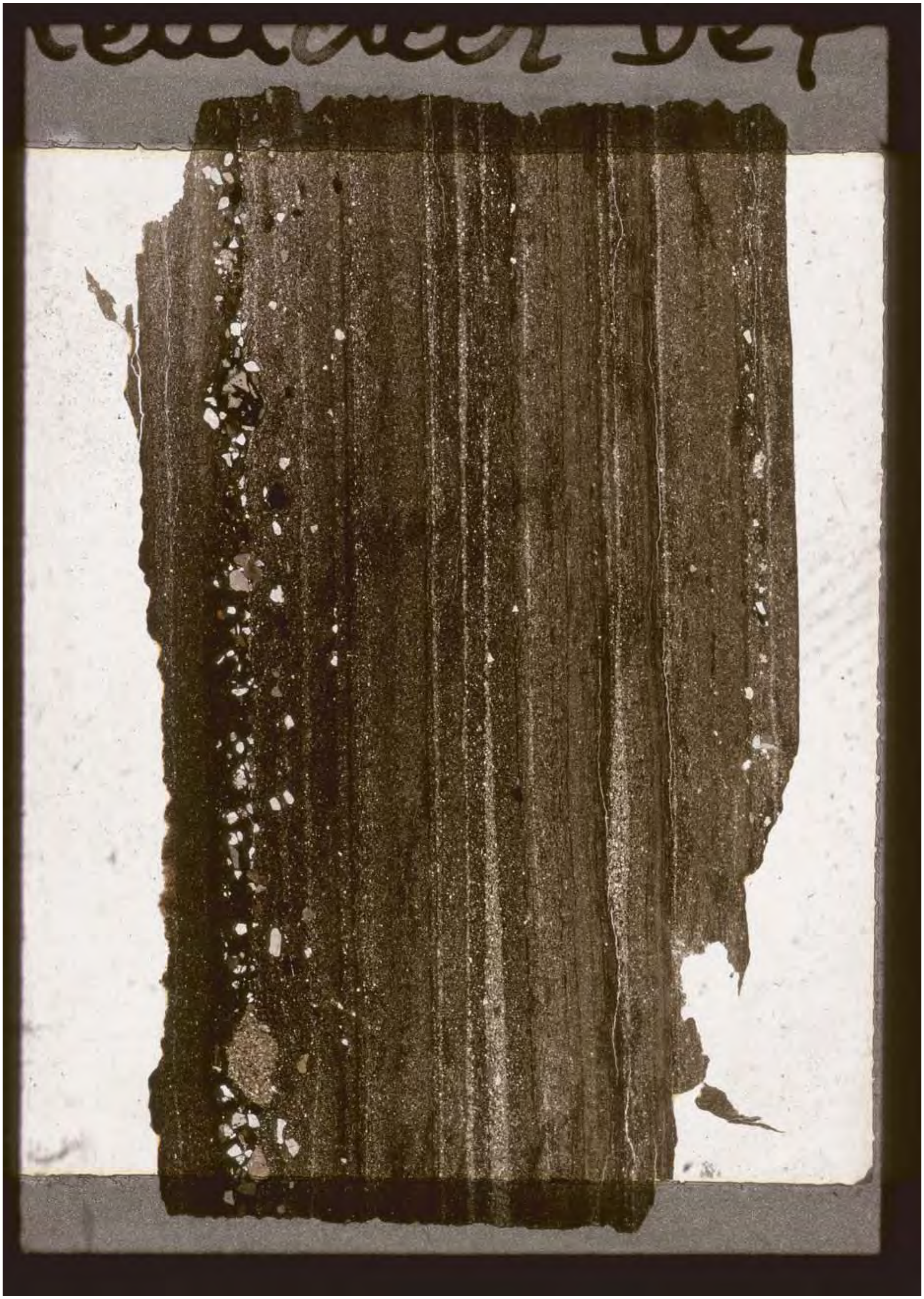
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

8928 feet



2 mm

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Reindeer D-27 8931 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

8935 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

8940 feet

Aklak

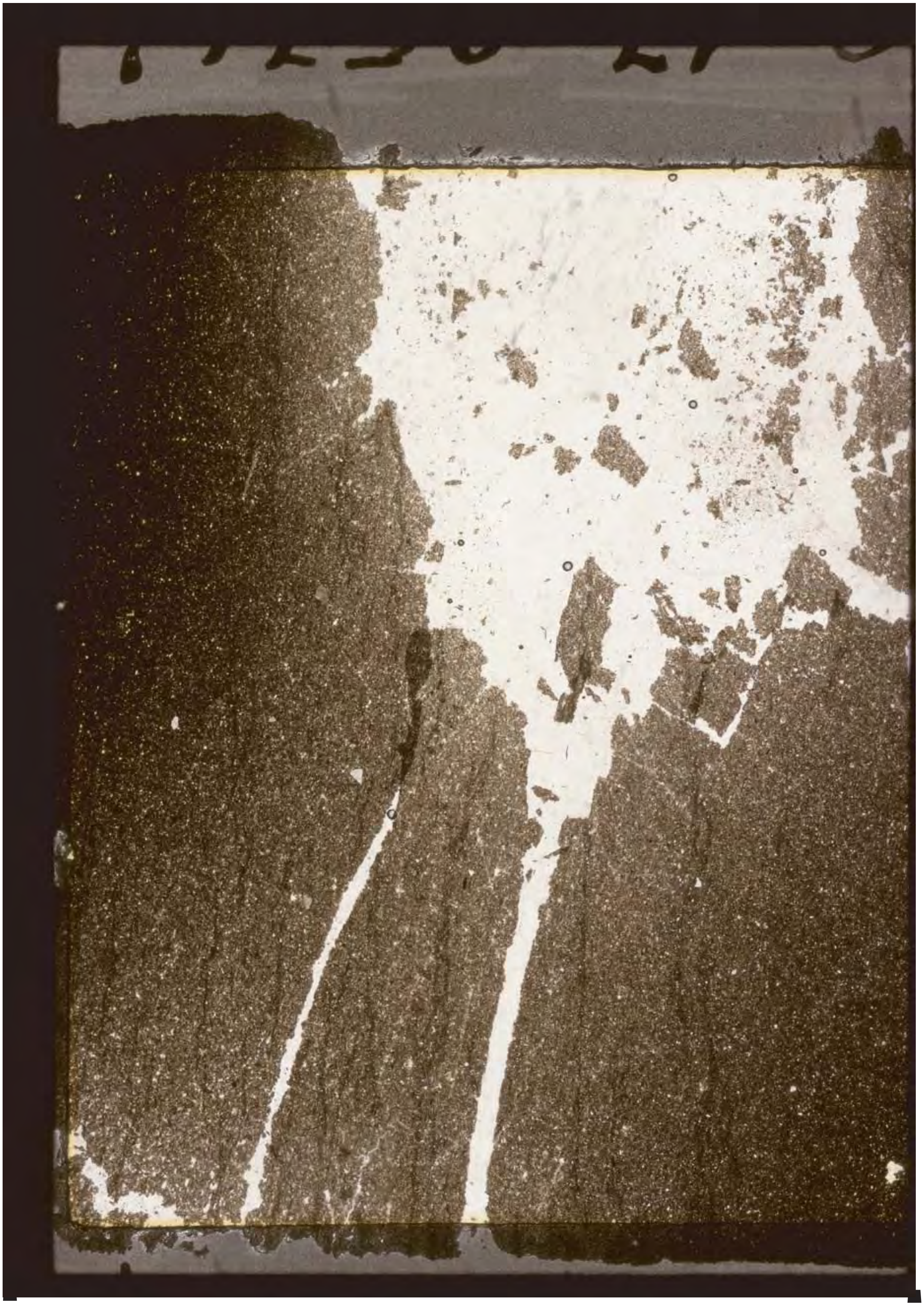
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

9574 feet



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

9578 feet

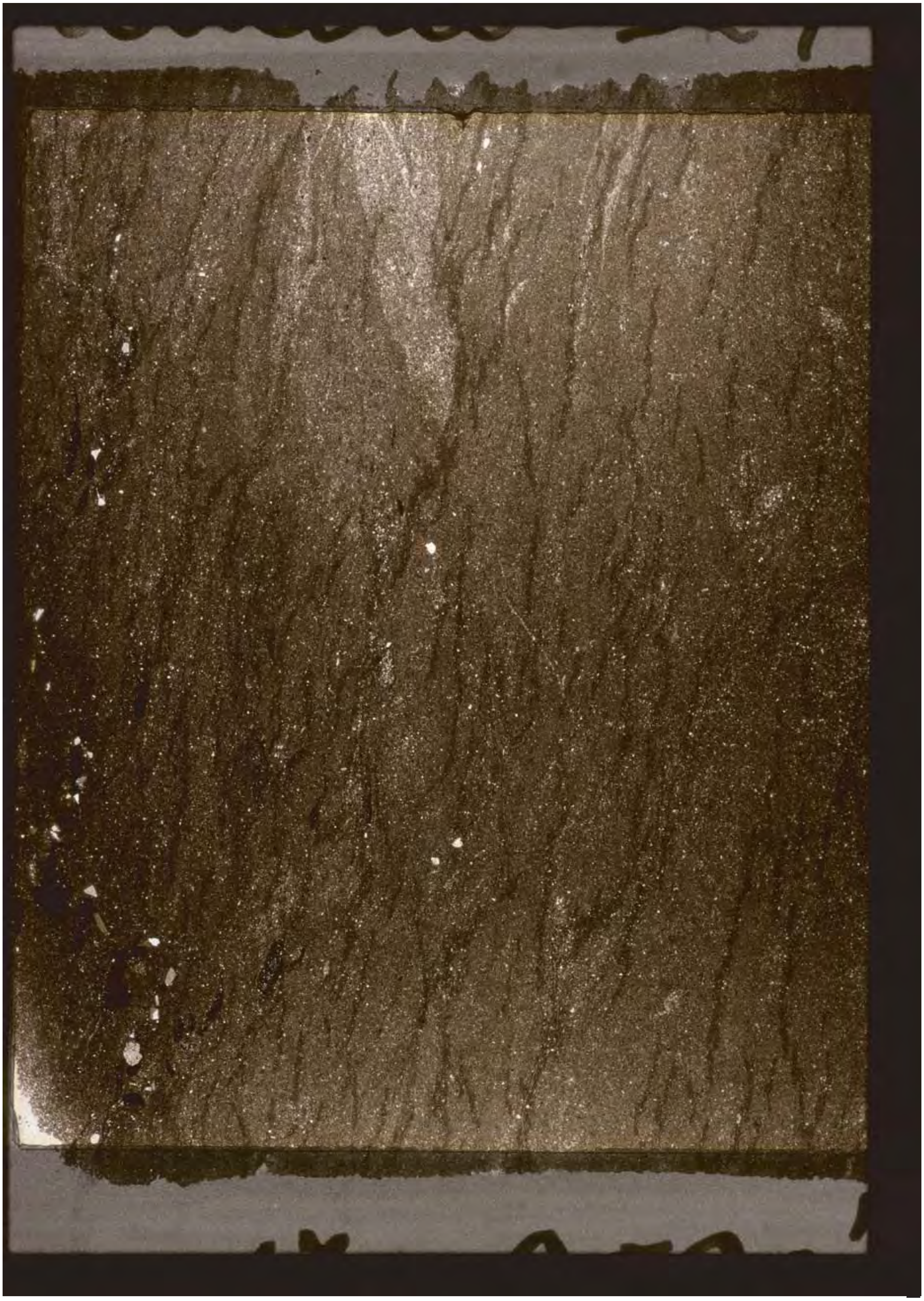
Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Reindeer D-27

9586 feet



2 mm

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 9592 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

9595 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 9597 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

10028 feet

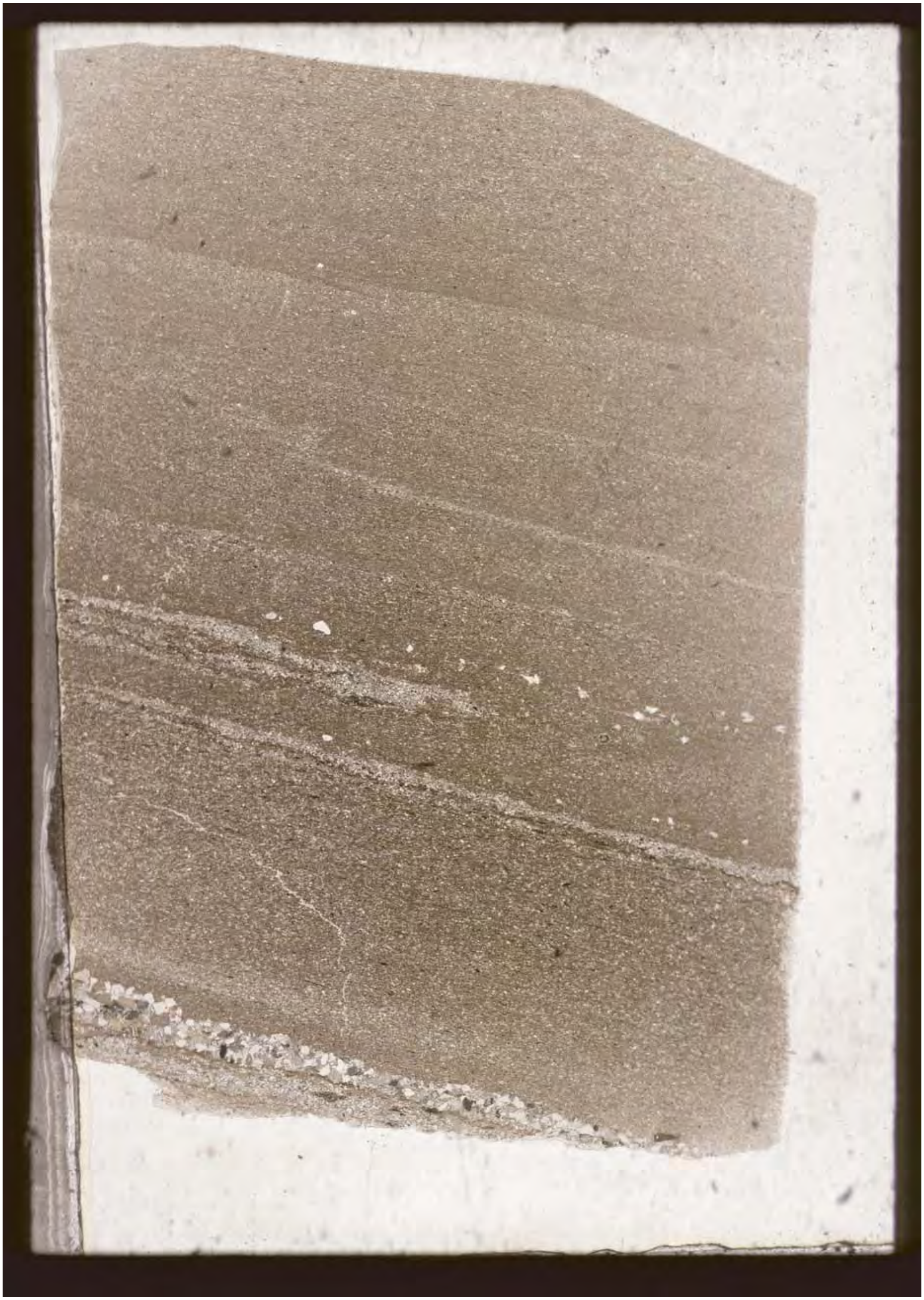
Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 10330 feet



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 10331 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

10338 feet

Aklak

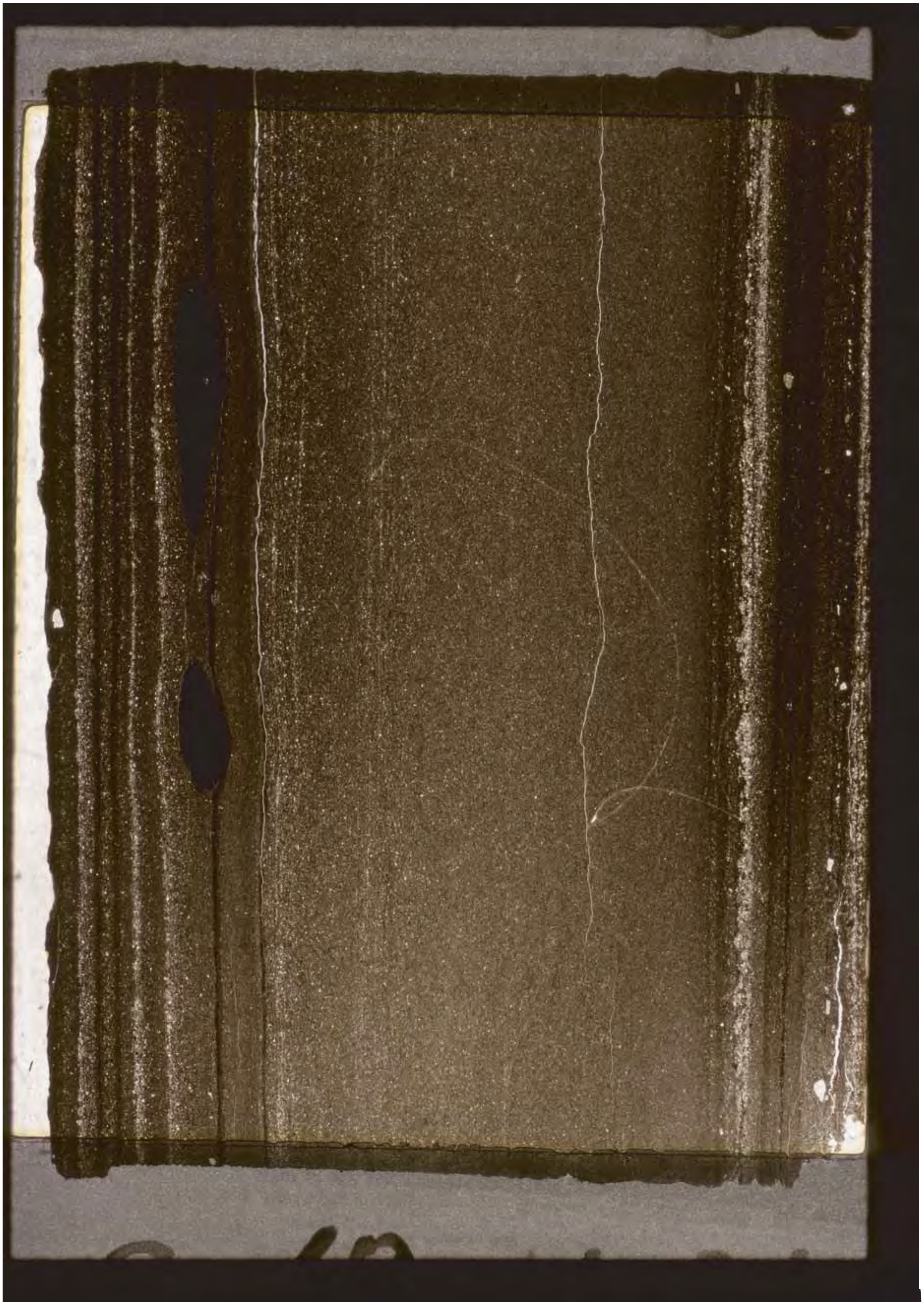
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

10342 feet



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

10351 feet

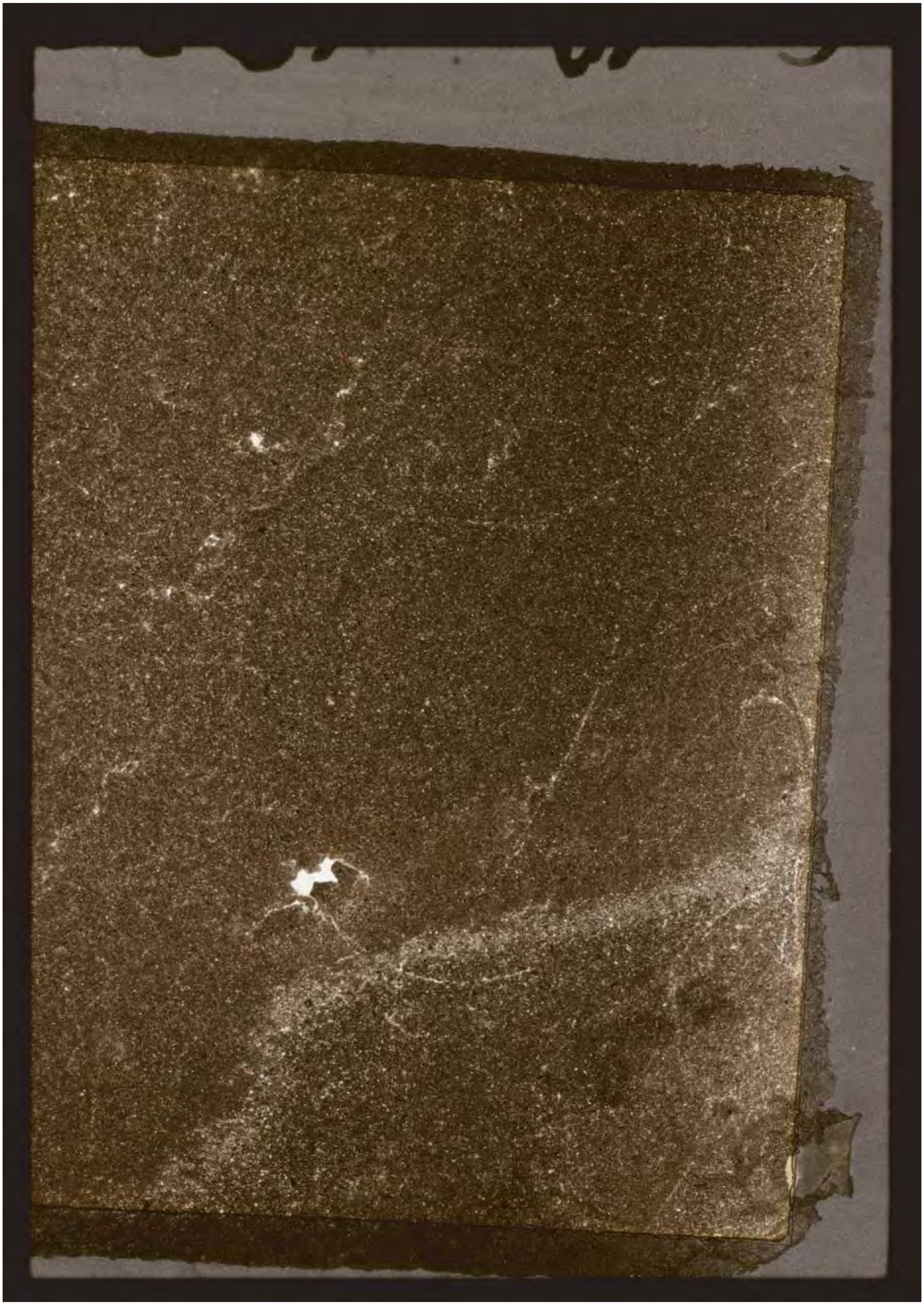
Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 10361 feet



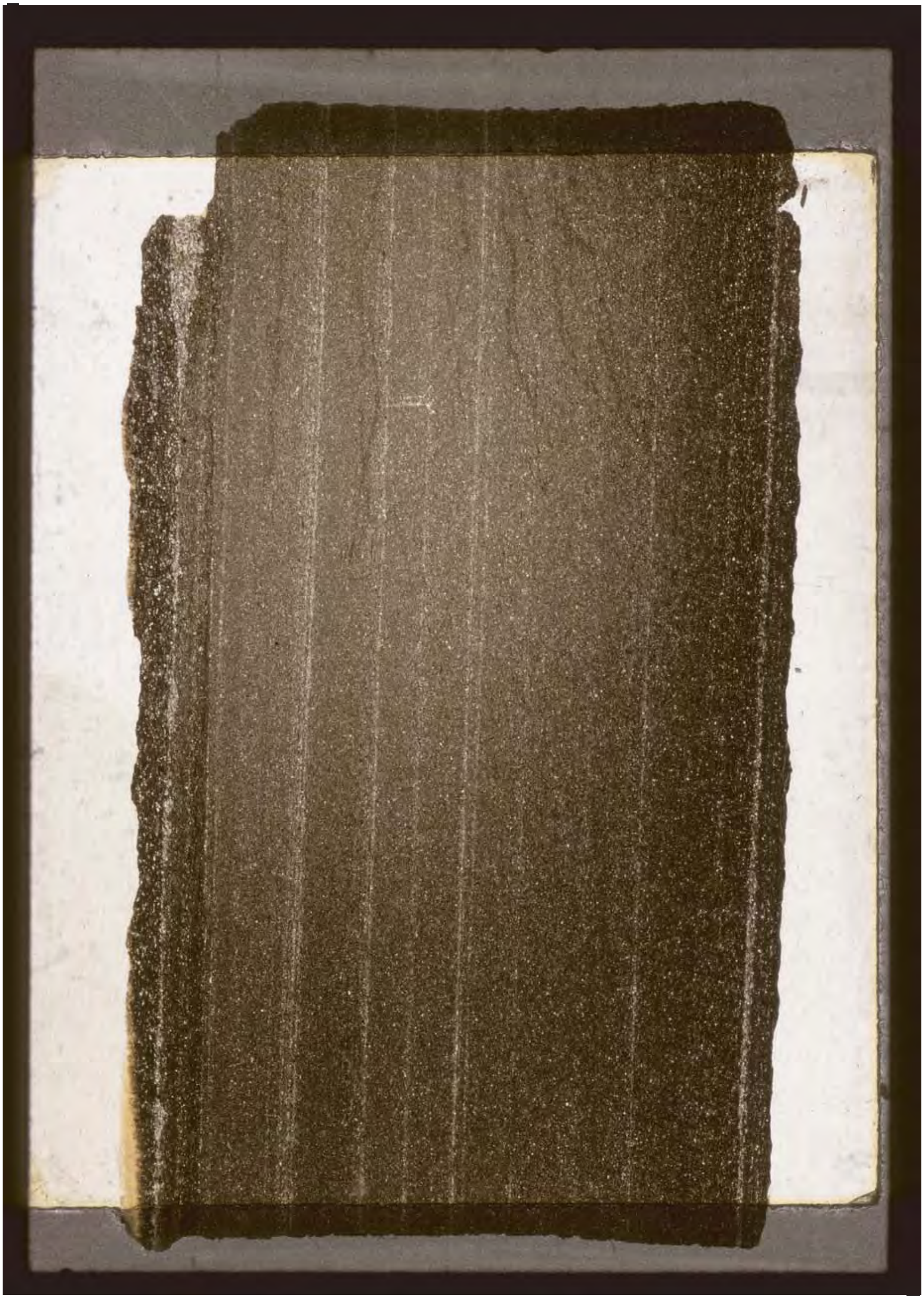
Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 10370 feet



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

10856 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

10866 feet

Aklak

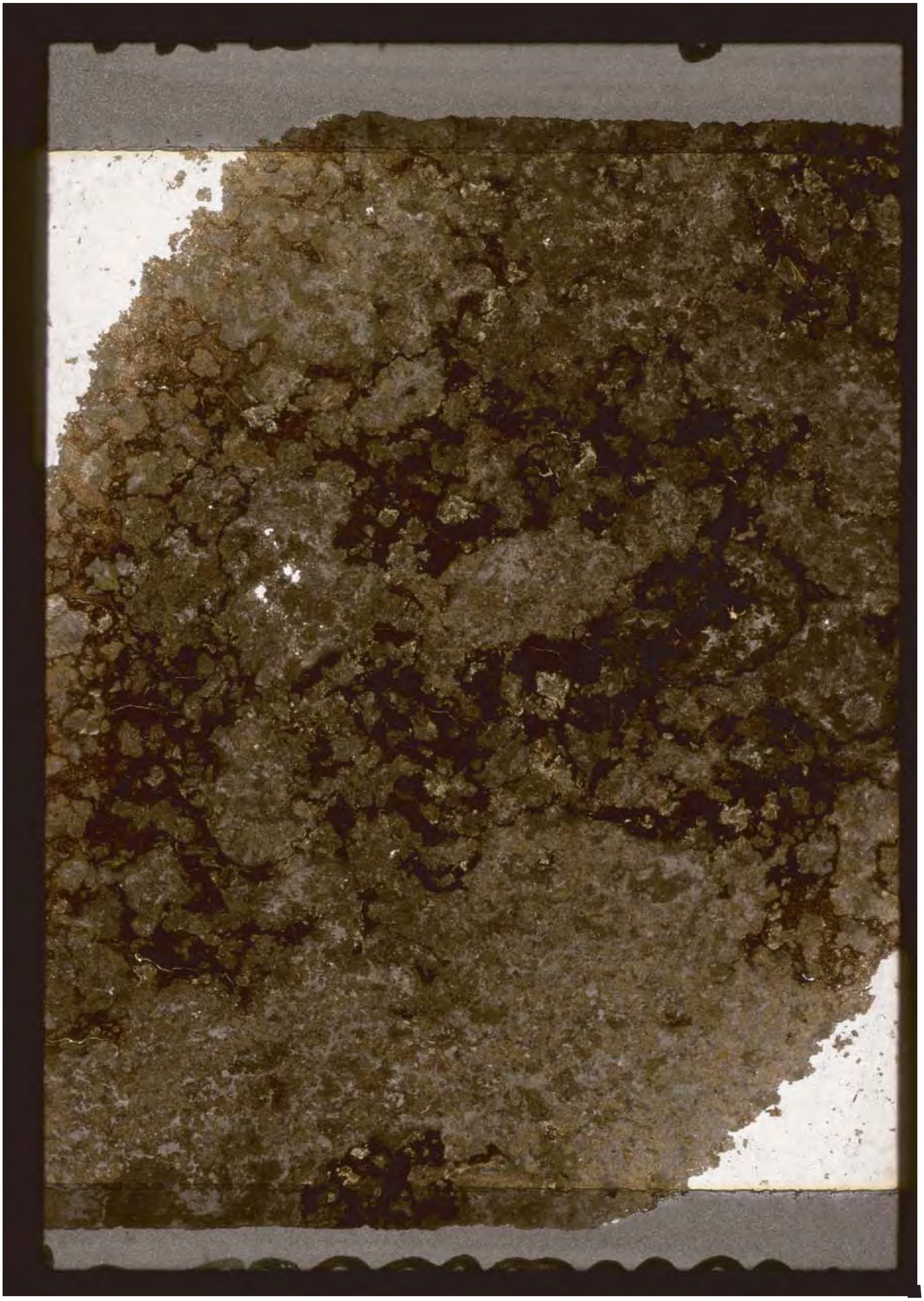
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

10872 feet



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

10876 feet

Aklak

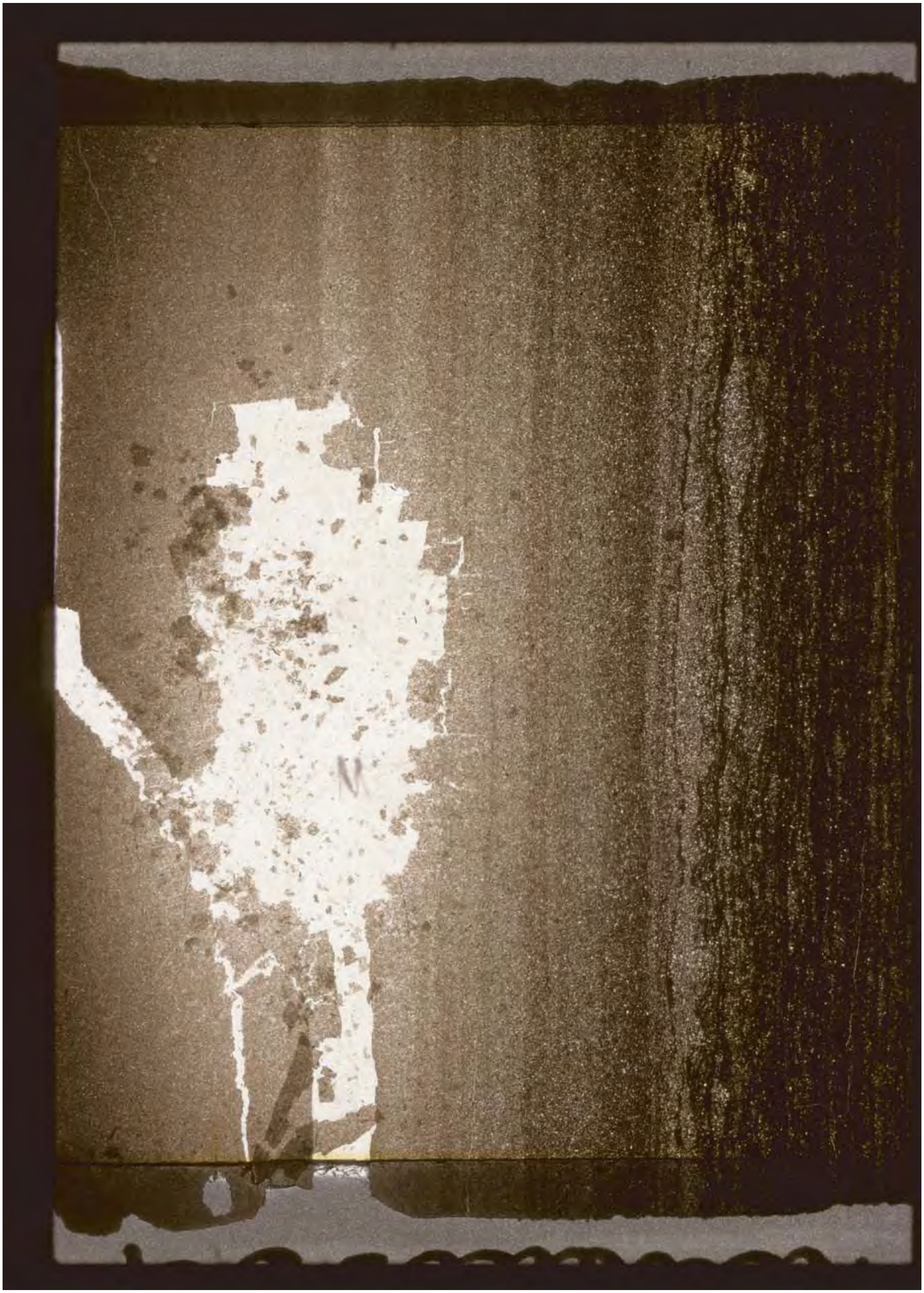
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

11416 feet



Aklak

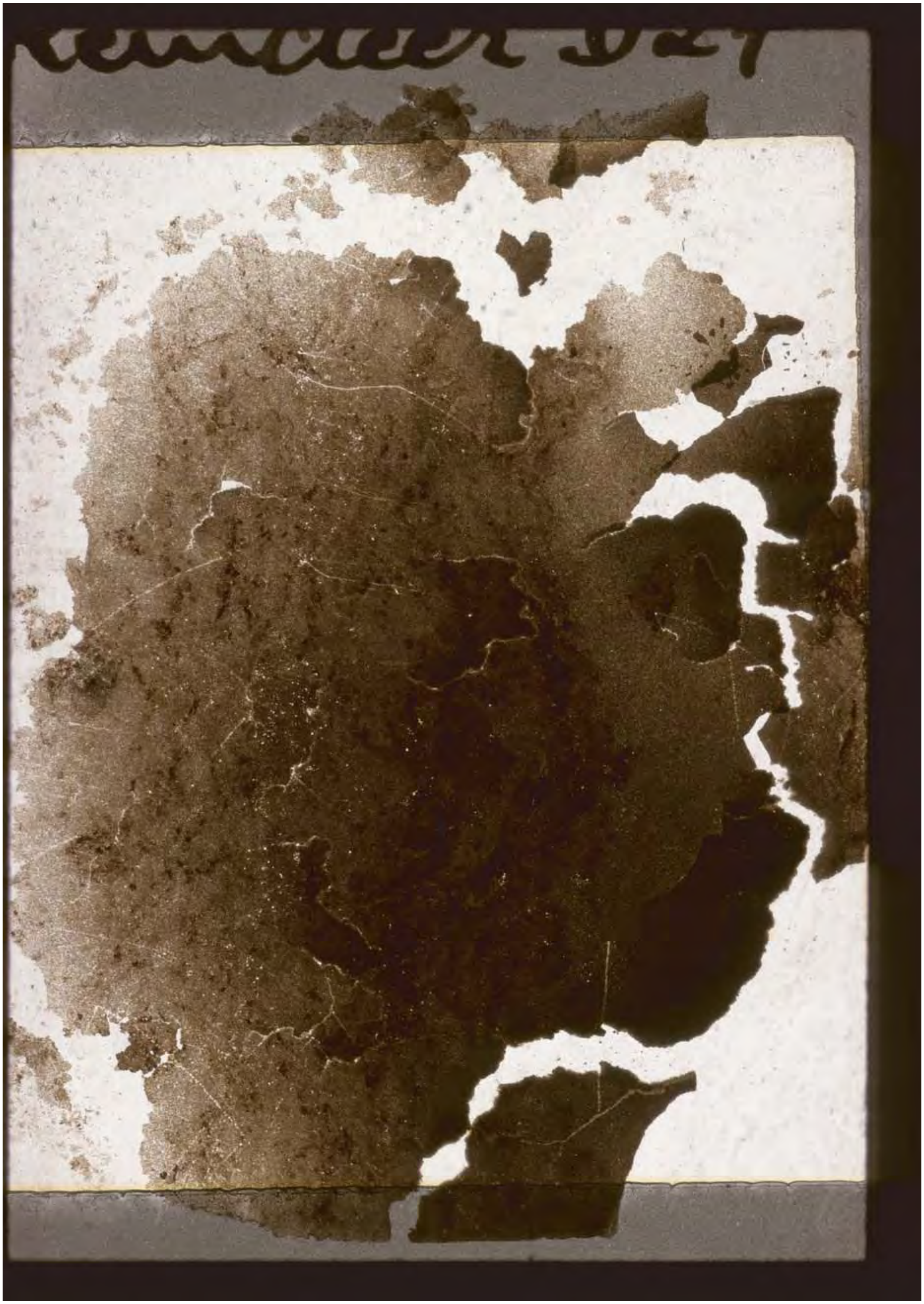
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

11422 feet



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 11430 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 11436 feet

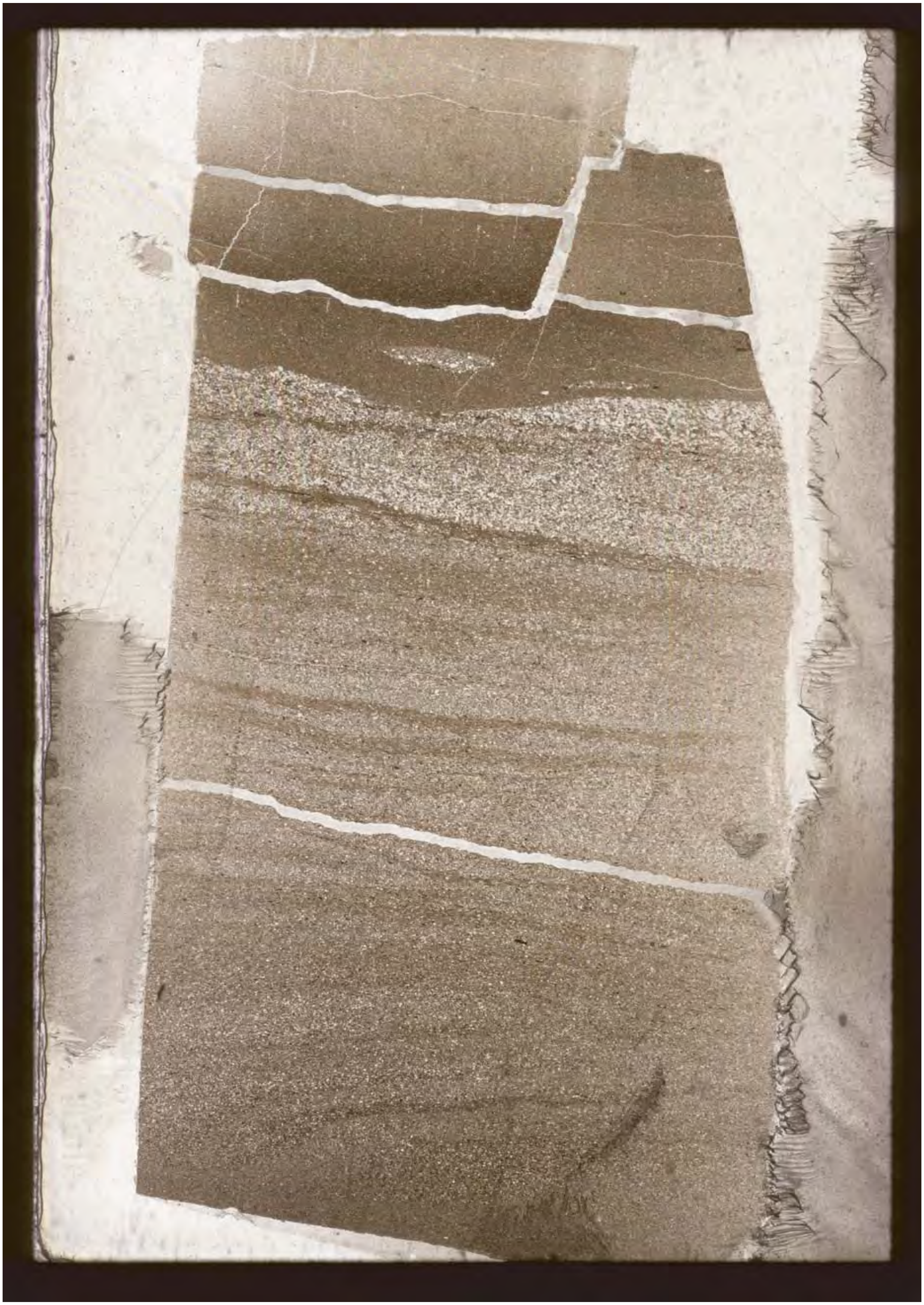
Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 11440 feet



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 11885 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27 11890 feet

Aklak

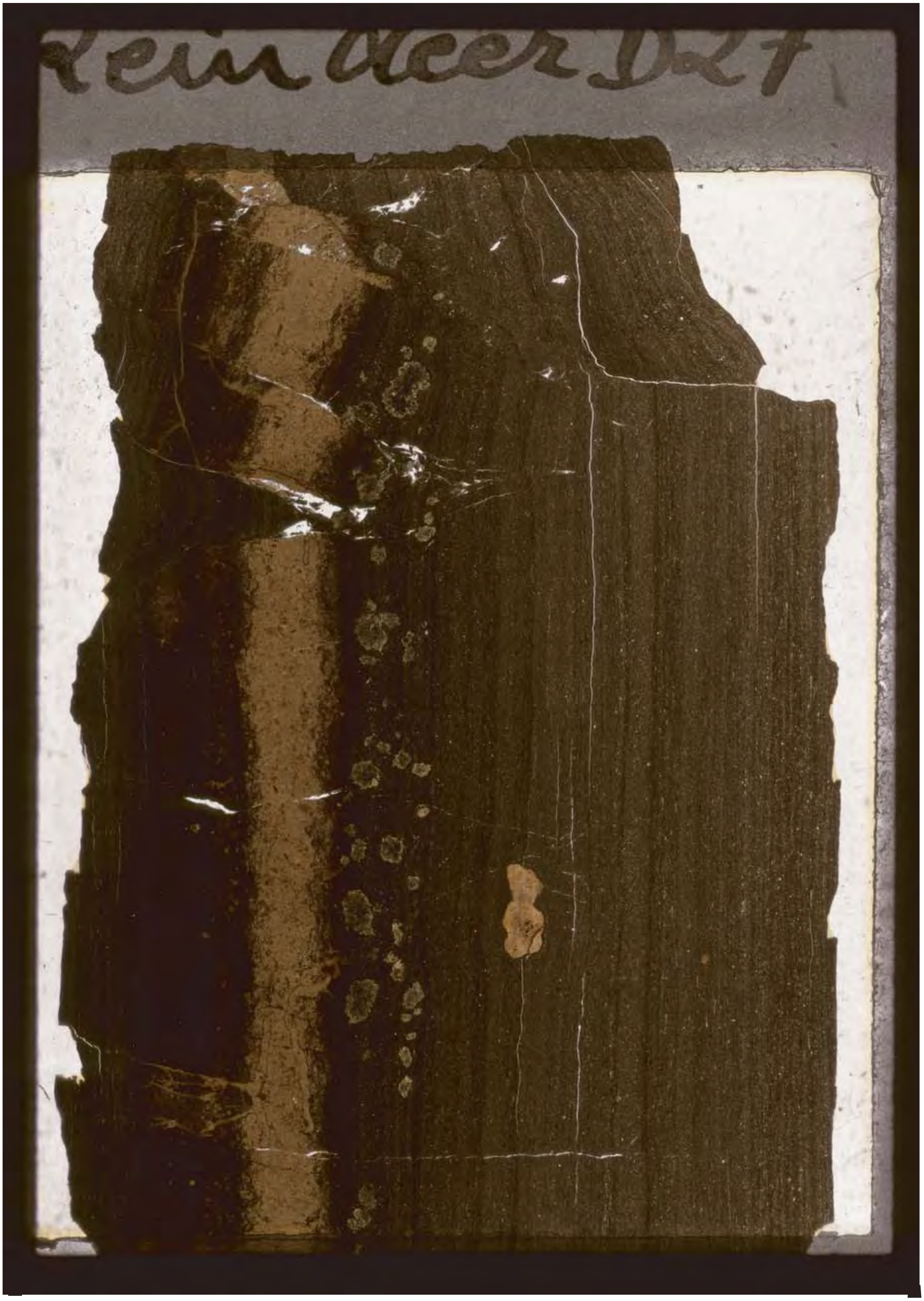
2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

11894 feet



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Reindeer D-27 11900 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

11902 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Reindeer D-27

12462 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Unipkat I-22

Described Thin Section Photomicrographs

Thin Section Photomicrograph Descriptions – Plate 01

Unipkat I-22
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 4804 feet

Ferroan calcite (FeC) cemented, poorly sorted fine to coarse grained litharenites are recognized from drill cuttings taken at 4804 feet. Loosely packed kaolinite clays are found in minor volumes. Grain contacts are concavo-convex and tangential. The former indicates common early mechanical compaction of ductile grains between more competent lithoclasts. Framework constituents include monocrystalline quartz, chert, clay-rich sedimentary grains (CRF), organic material (OM), micas, plagioclase and rare glauconite. Quartz overgrowths (small black arrows) are very poorly developed on host monocrystalline quartz grains.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

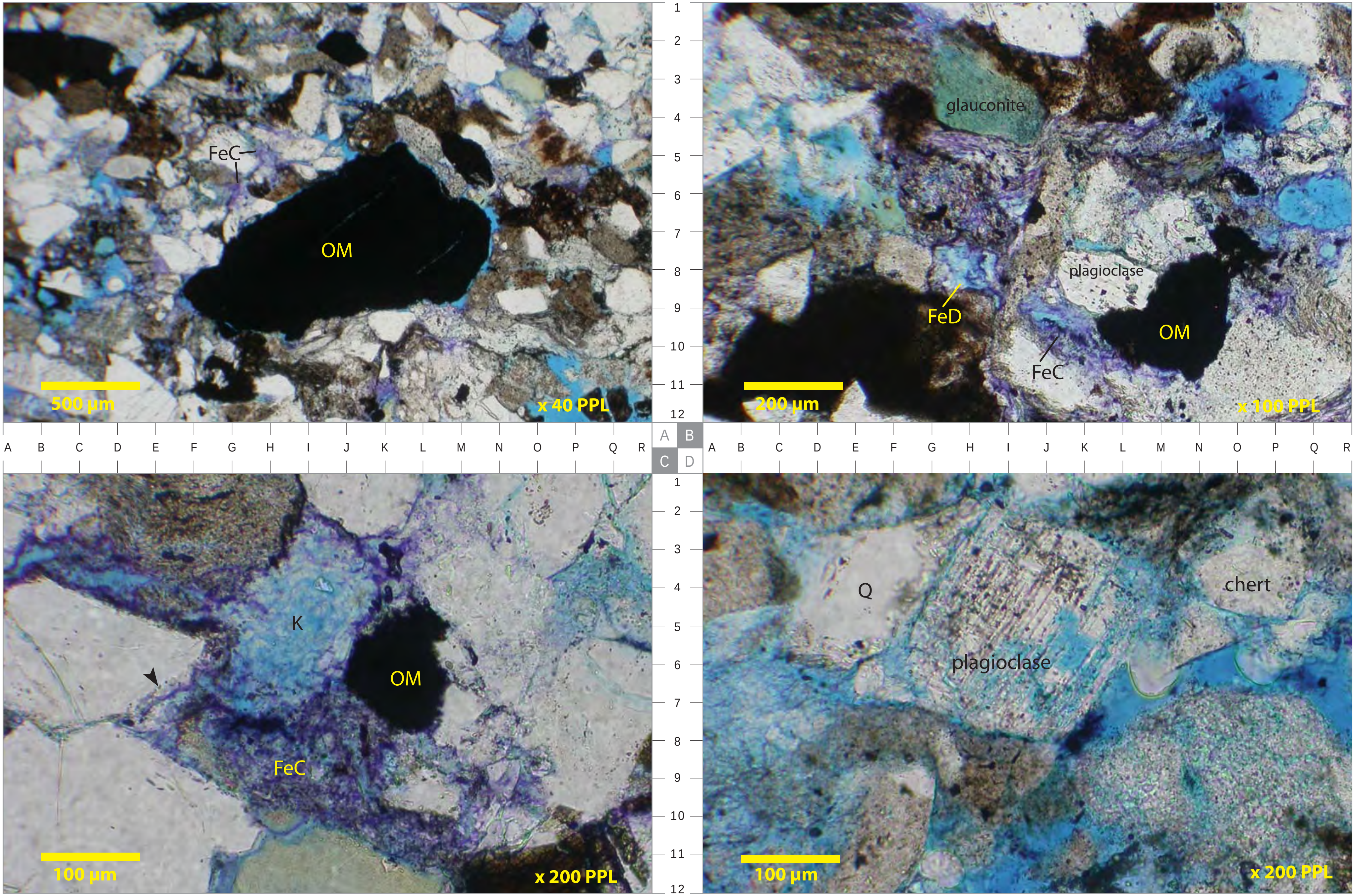


Plate 01
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 02

Unipkat I-22
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 5050-5080 feet

Drill cuttings taken between 5050 to 5080 feet consist of moderately well sorted, fine grained litharenites. Monocrystalline quartz (Q), sideritized clay-rich sedimentary grains (CRFs) and minor K-feldspar are some of the framework constituents. Authigenic cements are poorly developed consisting of quartz overgrowths (small black arrows), siderite and pyrite. Effective macropores (small yellow arrows) are isolated.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 200X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Unipkat I-22 **5050-5080 feet**

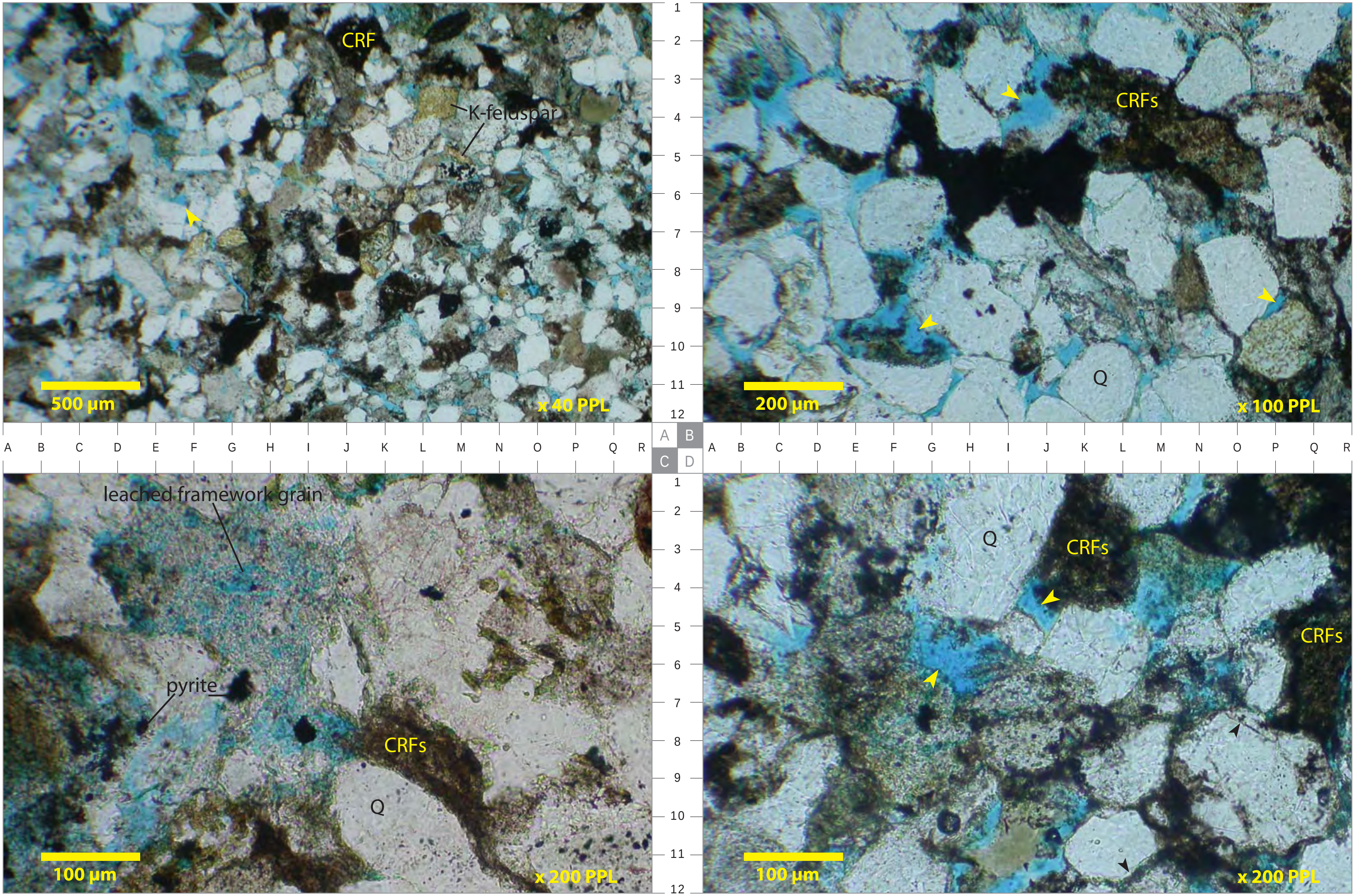


Plate 02
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 03

Unipkat I-22
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 5922 feet

Poorly sorted, fine to coarse grained litharenites characterize the drill cuttings recovered at 5922 feet. Chert, monocrystalline quartz (Q), quartz-rich sedimentary grains (QRF) and argillic grains comprise some of the framework constituents. Grain rimming cryptocrystalline siderite (large green arrows) is found in common volumes.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X XPL

Unipkat I-22 **5922 feet**

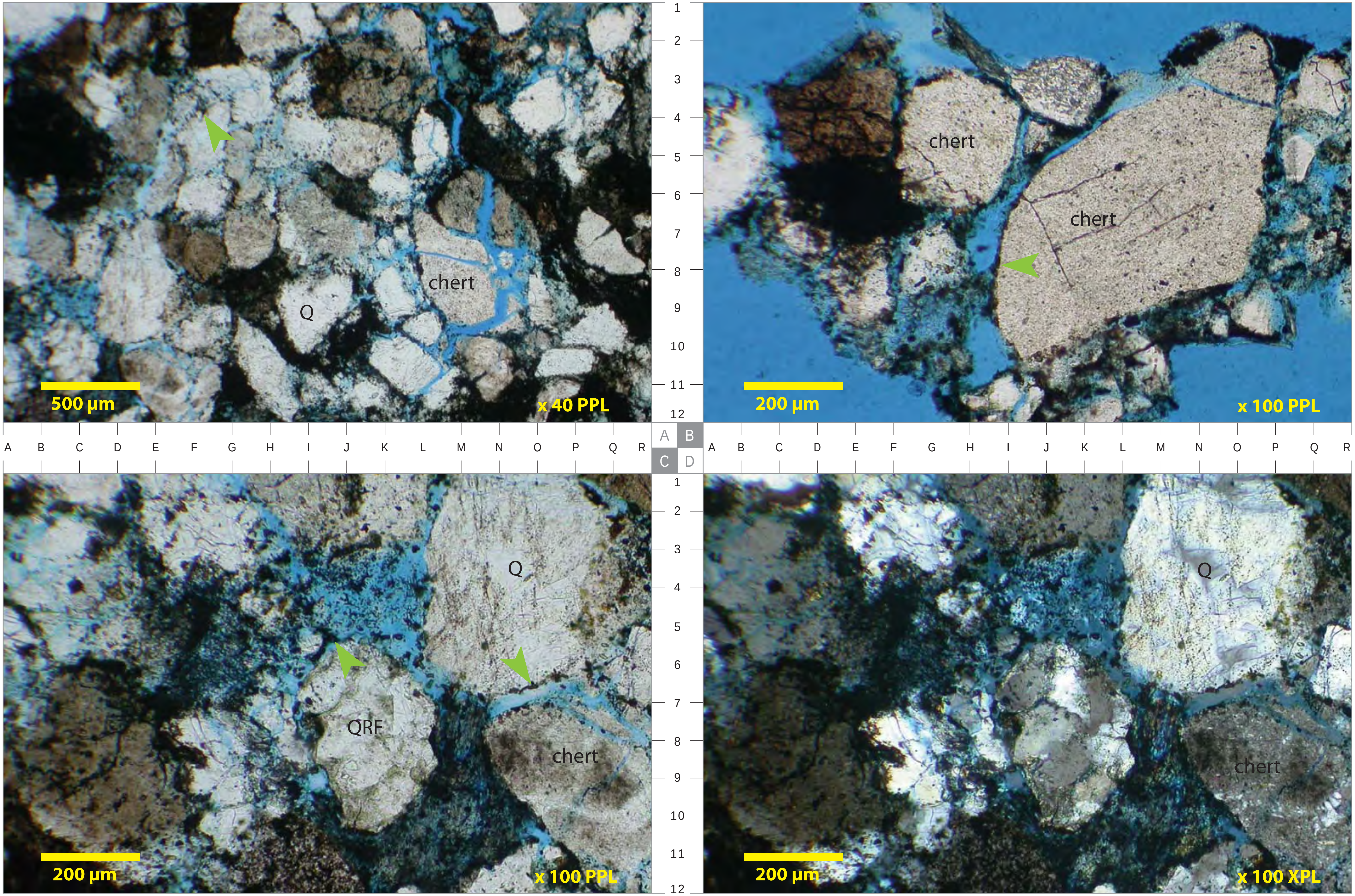


Plate 03
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 04

Unipkat I-22
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 5990-6010 feet

- Moderately sorted fine grained litharenites were recovered from drill chips between 5990 to 6010 feet
- Grain contacts are tangential and concavo-convex with ductile grains squeezed between more rigid clasts
- Monocrystalline quartz (Q), sideritized clay-rich sedimentary grains (CRFs), chert and K-feldpsar comprise the main framework constituents
- Moderately developed effective macropores (small yellow arrows0
- Common replacive siderite (large green arrows)

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Unipkat I-22 5990-6010 feet

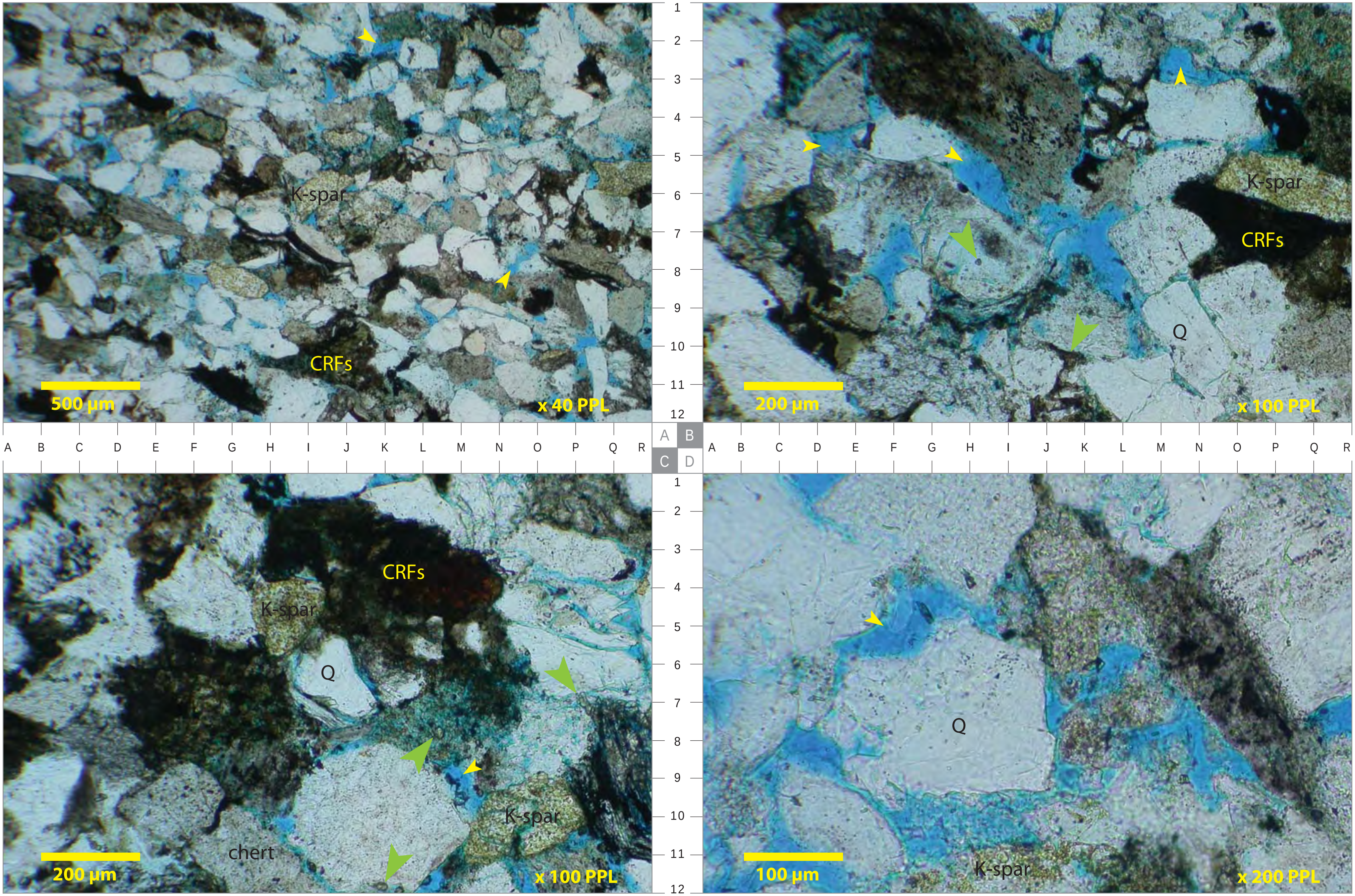


Plate 04
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 05

Unipkat I-22
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 6150 feet

Poorly sorted, very fine to medium grained organic-rich litharenites were recovered from drill cuttings at 6150 feet. Concavo-convex grain contacts are common indicating moderate mechanical compaction. Framework lithoclasts include monocrystalline quartz, chert, clay-rich sedimentary grains (CRF), organic material (OM) and minor muscovite. Authigenic cements are very poorly developed consisting of replacive siderite (large green arrows).

Photo A: 40X PPL, Photo B: 40X XPL, Photo C: 100X PPL, Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Unipkat I-22 — 6150 feet

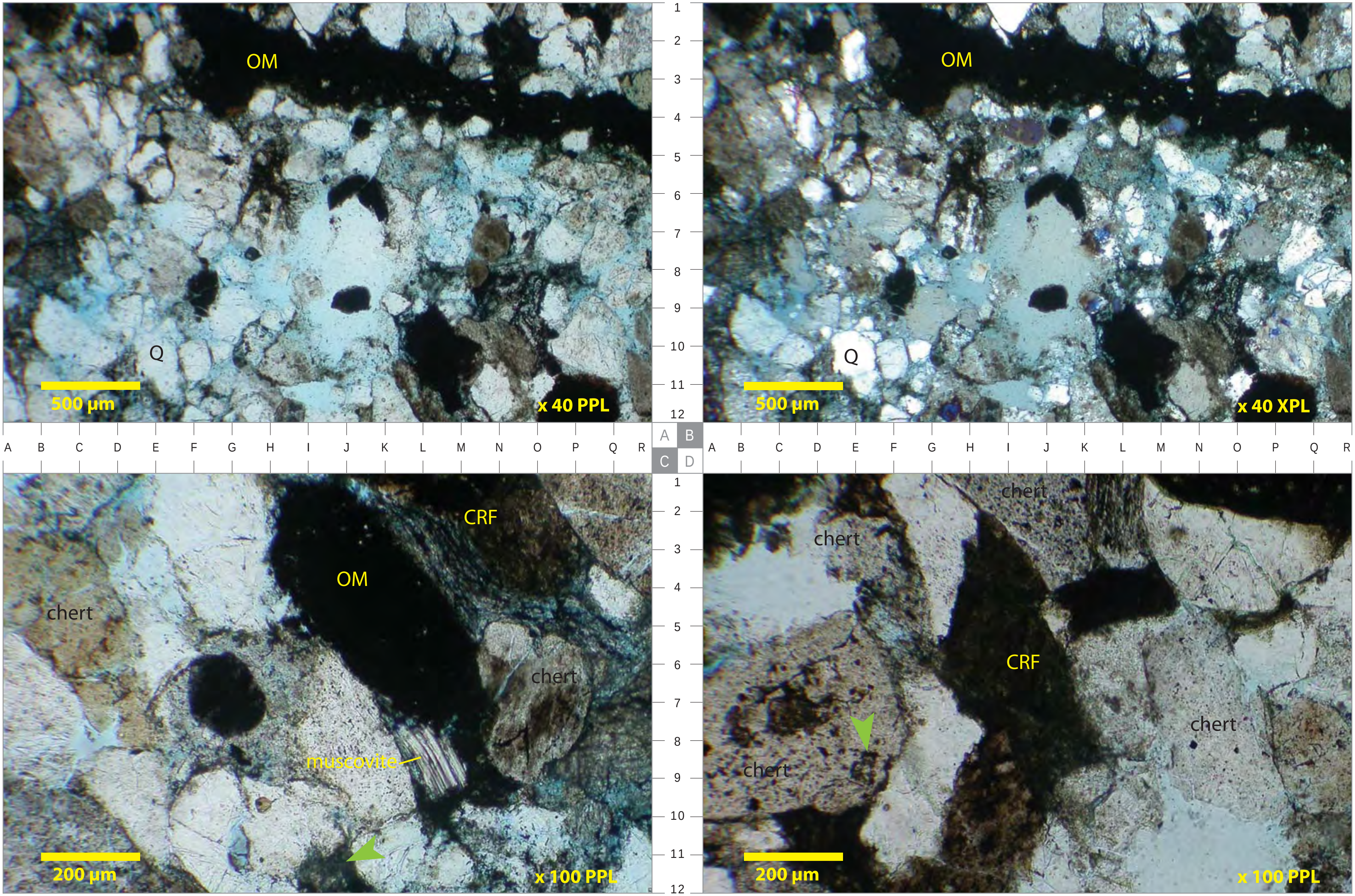


Plate 05
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 06

Unipkat I-22
Taglu
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 6215 feet

Thin section photomicrographs show the following features:

- Moderately sorted, fine grained very low reservoir quality litharenites
- Concavo-convex grain contacts associated with ductile grains compacted between more rigid clasts
- Replacive siderite cement (large green arrows)
- Monocrystalline quartz (Q), chert, polycrystalline quartz (PxQ) and organic material (OM)
- Effective macropores (small yellow arrows) are isolated

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X XPL

Unipkat I-22 **6215 feet**

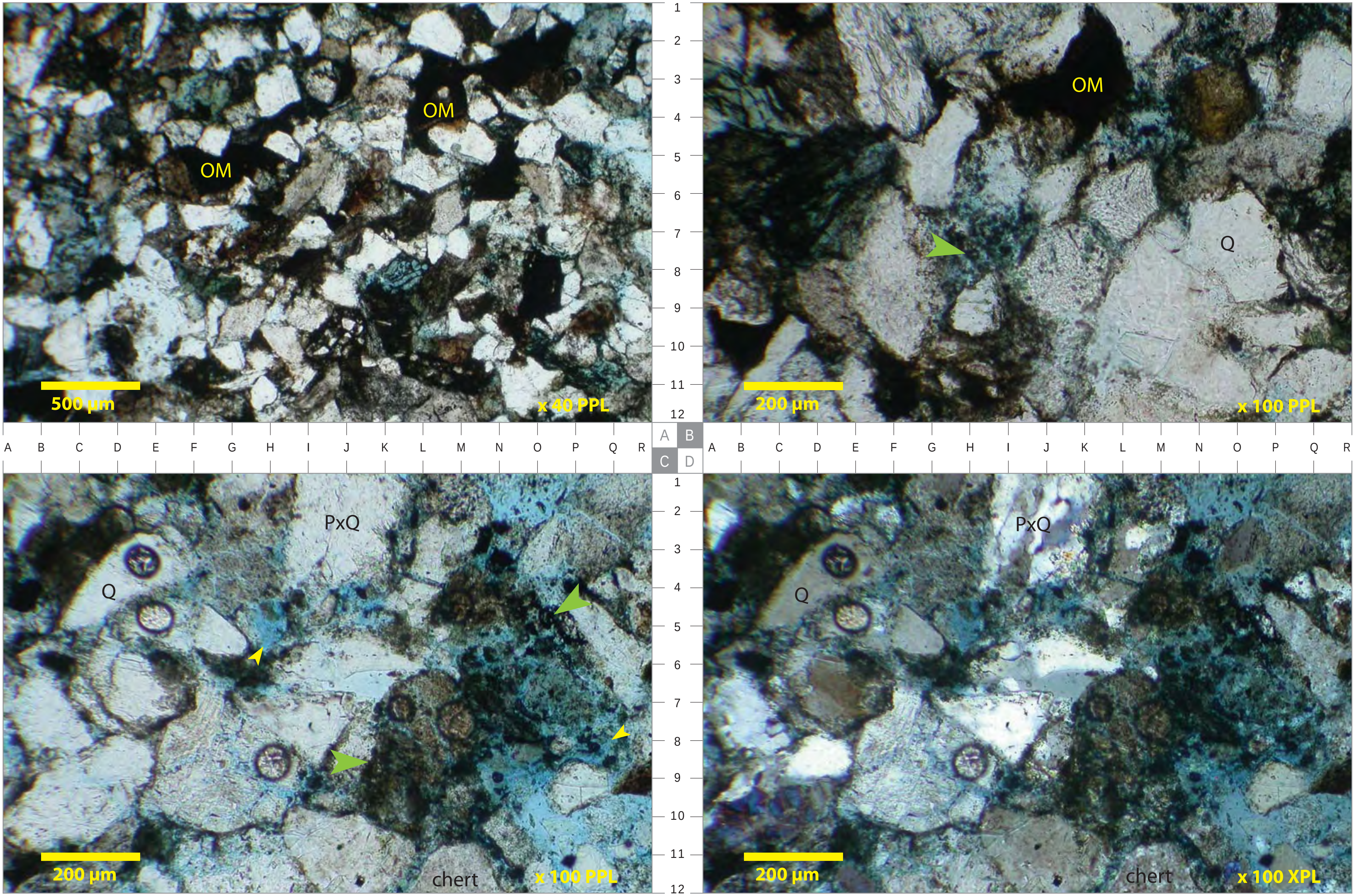


Plate 06
January 2010
CMH 2010-01

Taglu

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 07

Unipkat I-22
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 7030-7050 feet

Drill cuttings taken between 7030 to 7050 feet consist of fine grained, moderately well sorted litharenites. Framework grains include monocrystalline quartz (Q), chert, argillic sedimentary lithoclasts, organic material (OM), polycrystalline quartz (PxQ) and feldspars. Grain rimming siderite (large green arrows) is found in minor volumes.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Unipkat I-22

7030-7050 feet

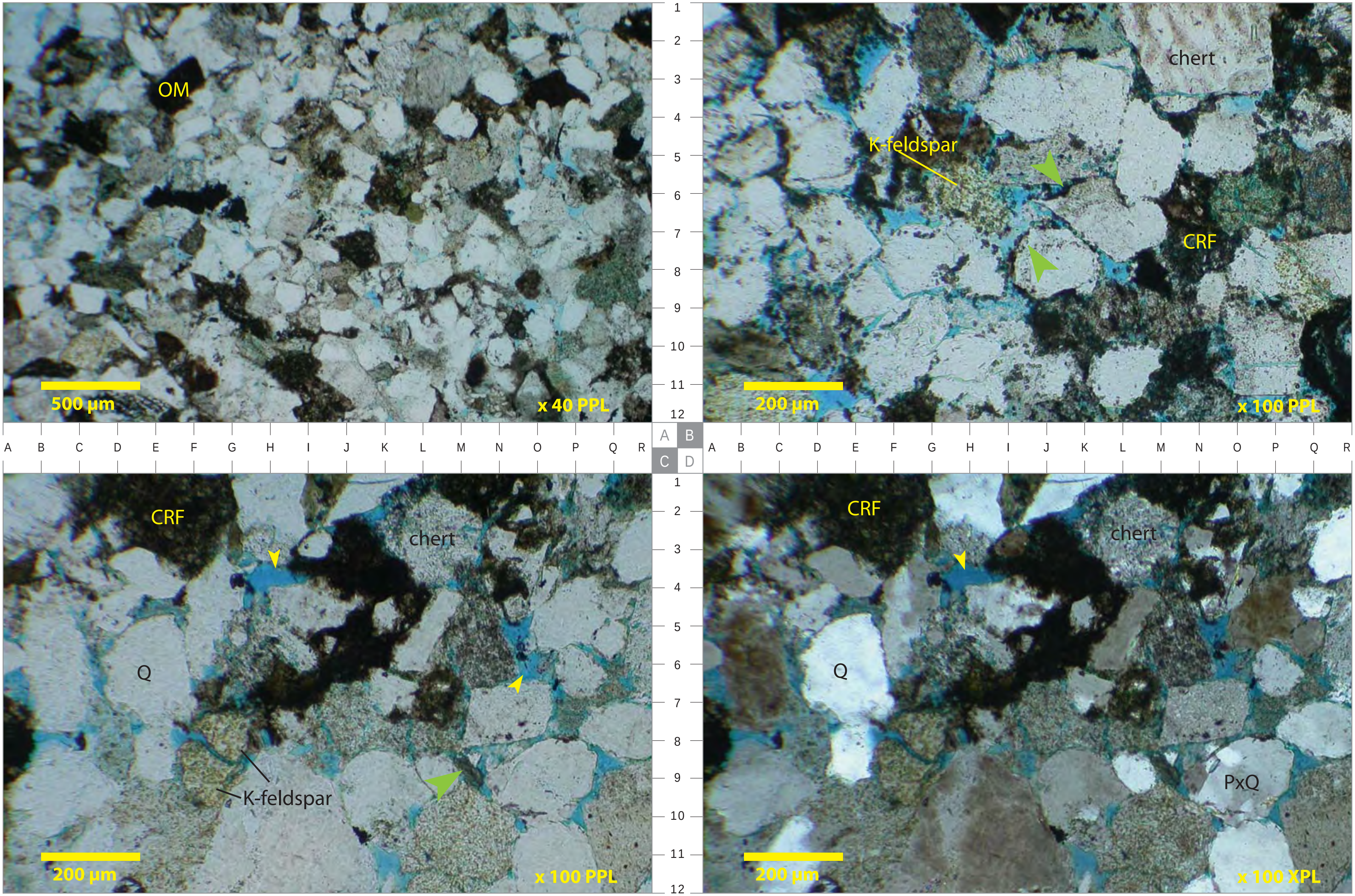


Plate 07
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 08

Unipkat I-22
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 7123 feet

Non-reservoir quality, fine grained, moderately sorted litharenites, with tangential and concavo-convex grain contacts represent the Aklak Sequence recovered at 7123 feet. Monocrystalline quartz, sideritized clay-rich sedimentary grains, chert, organic material, polycrystalline quartz (PxQ) and feldspars comprise the main framework constituents. Macroporosity is very poorly developed in this interval. Replacive siderite (large green arrow) is the main authigenic cement.

Photo A: 40X PPL,   Photo B: 40X XPL,   Photo C: 100X PPL,   Photo D: 100X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Unipkat I-22 **7123 feet**

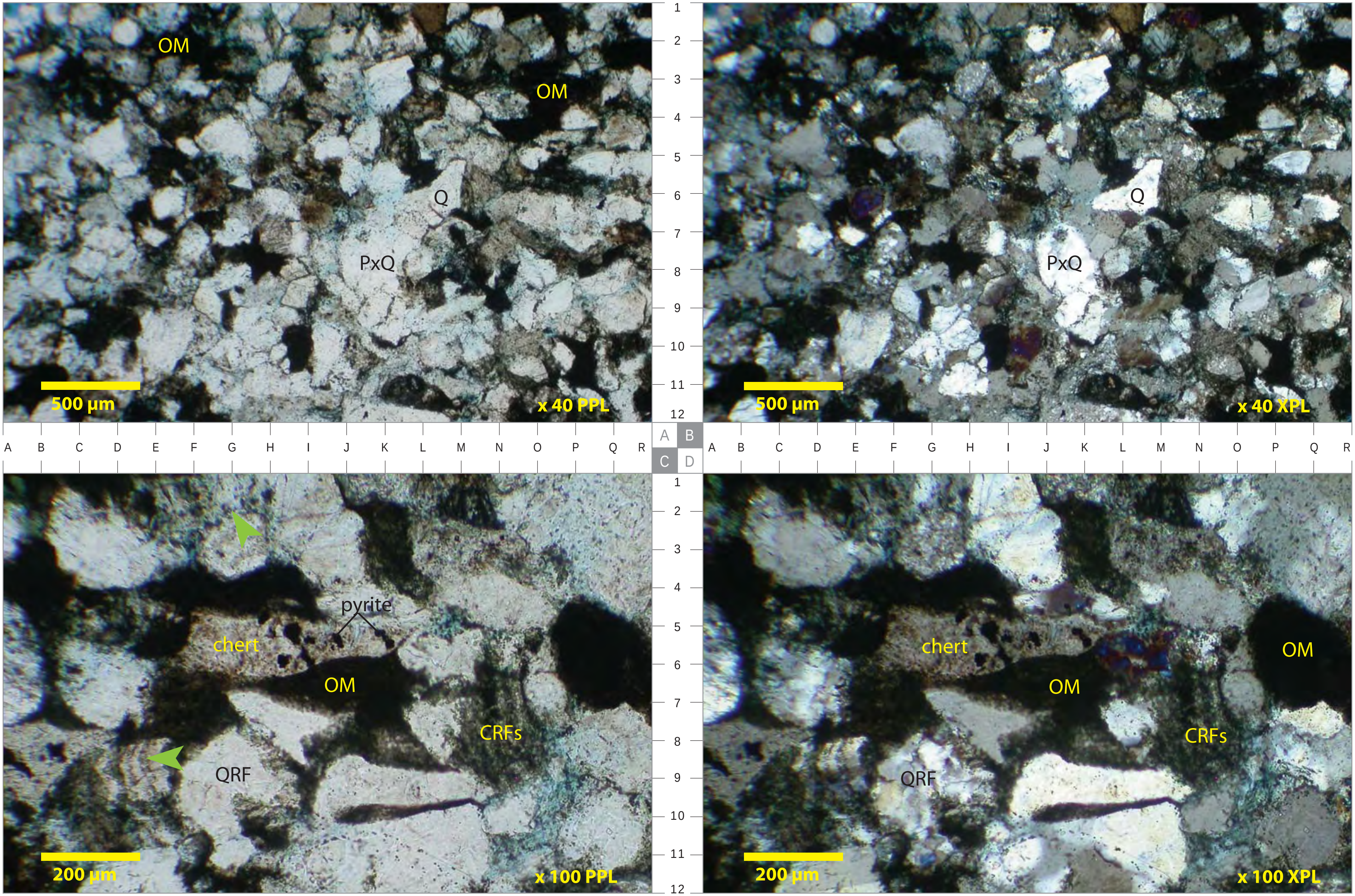


Plate 08
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 09

Unipkat I-22
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 7501 feet

Moderately sorted, very fine to fine grained litharenites are recognized from Aklak Sequnece clastics recovered at 7501 feet. Framework grains include monocrystalline quartz (Q), clay-rich sedimentary grains (CRF), organic material (OM) and chert. Authigenic cements are poorly developed and consist of pyrite precipitated within chert micropores.

Photo A: 40X PPL,   Photo B: 40X XPL,   Photo C: 100X PPL,   Photo D: 100X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Unipkat I-22 — 7501 feet

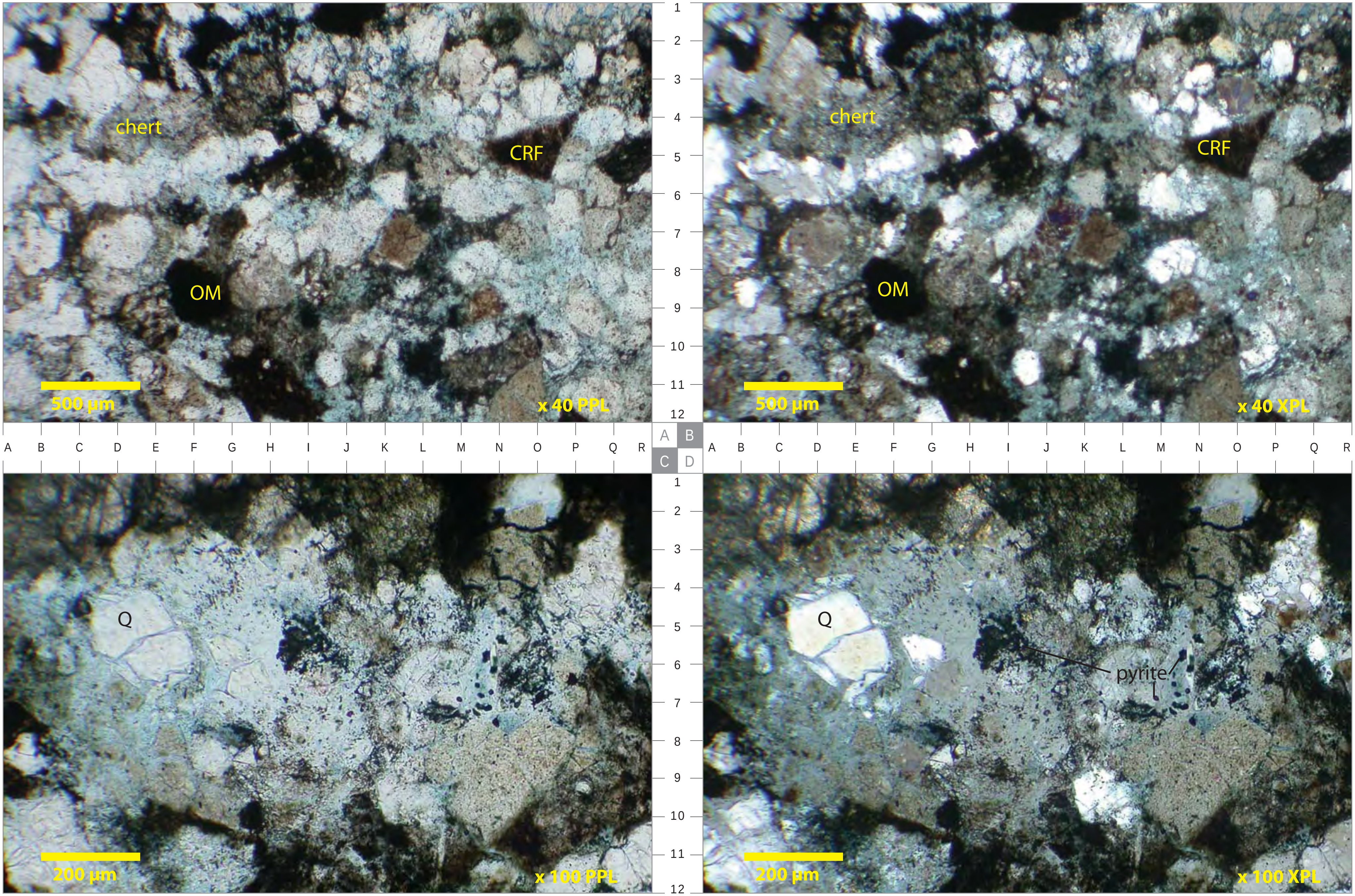


Plate 09
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 10

Unipkat I-22
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 7561 feet

Aklak Sequence litharenites are recognized from clastics retrieved at 7561 feet. Poorly sorted, fine grained litharenites with concavo-convex and tangential grain contacts are illustrated in these thin section photomicrographs. Monocrystalline quartz (Q), chert, clay-rich sedimentary grains (CRF), organic material (OM) and micas comprise the framework constituents.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X XPL

Unipkat I-22 7561 feet

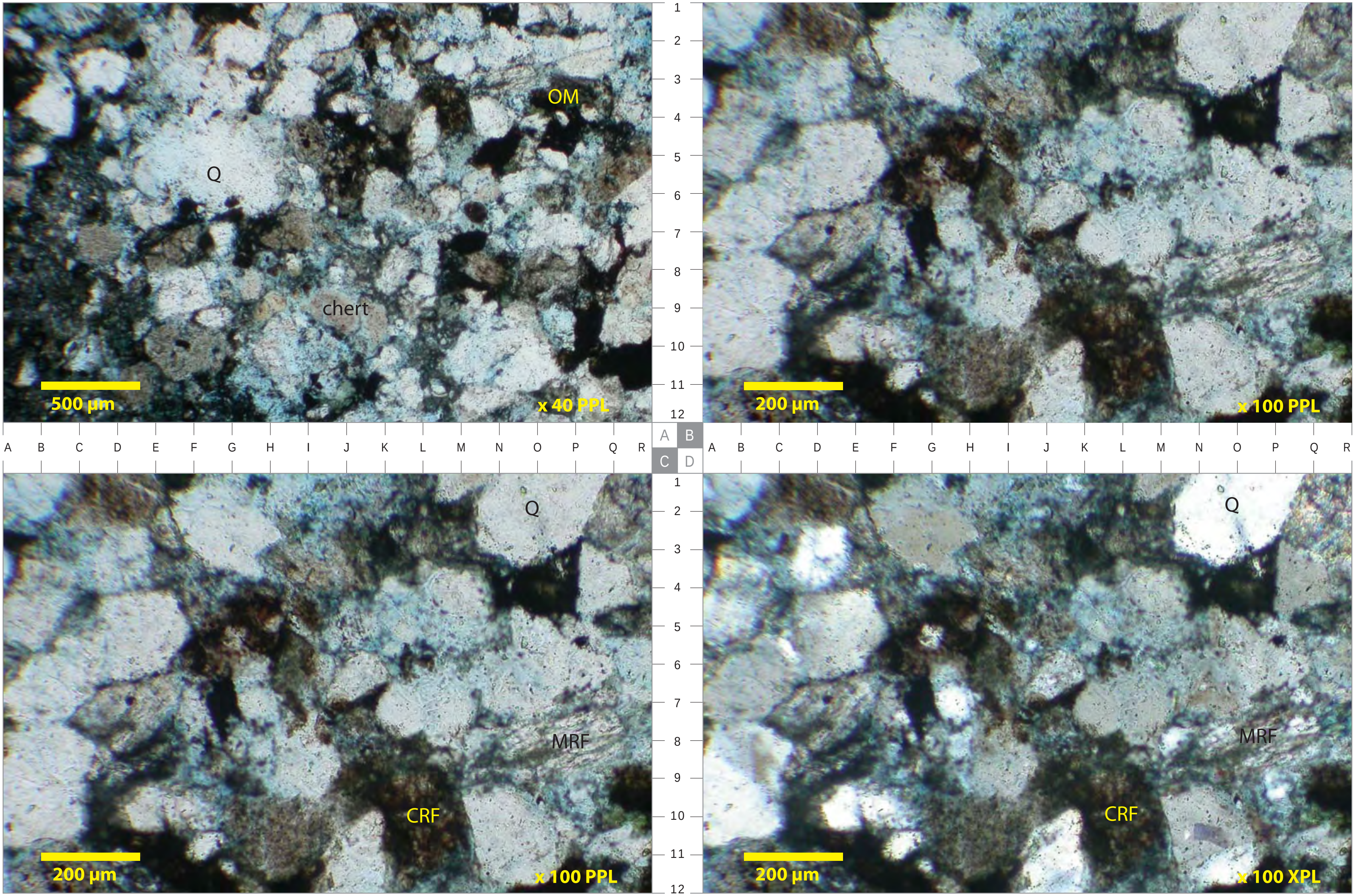


Plate 10
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 11

Unipkat I-22
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 7606 feet

Non-reservoir quality, very fine to fine grained, moderately well sorted litharenites are recognized at 7606 feet. Abundant organic material, monocrystalline quartz (Q), chert and micas are the main framework components. Note angular to subrounded framework grains. Grain contacts are mainly concavo-convex and tangential.

Photo A: 40X PPL,   Photo B: 40X XPL,   Photo C: 100X PPL,   Photo D: 100X XPL

Unipkat I-22

7606 feet

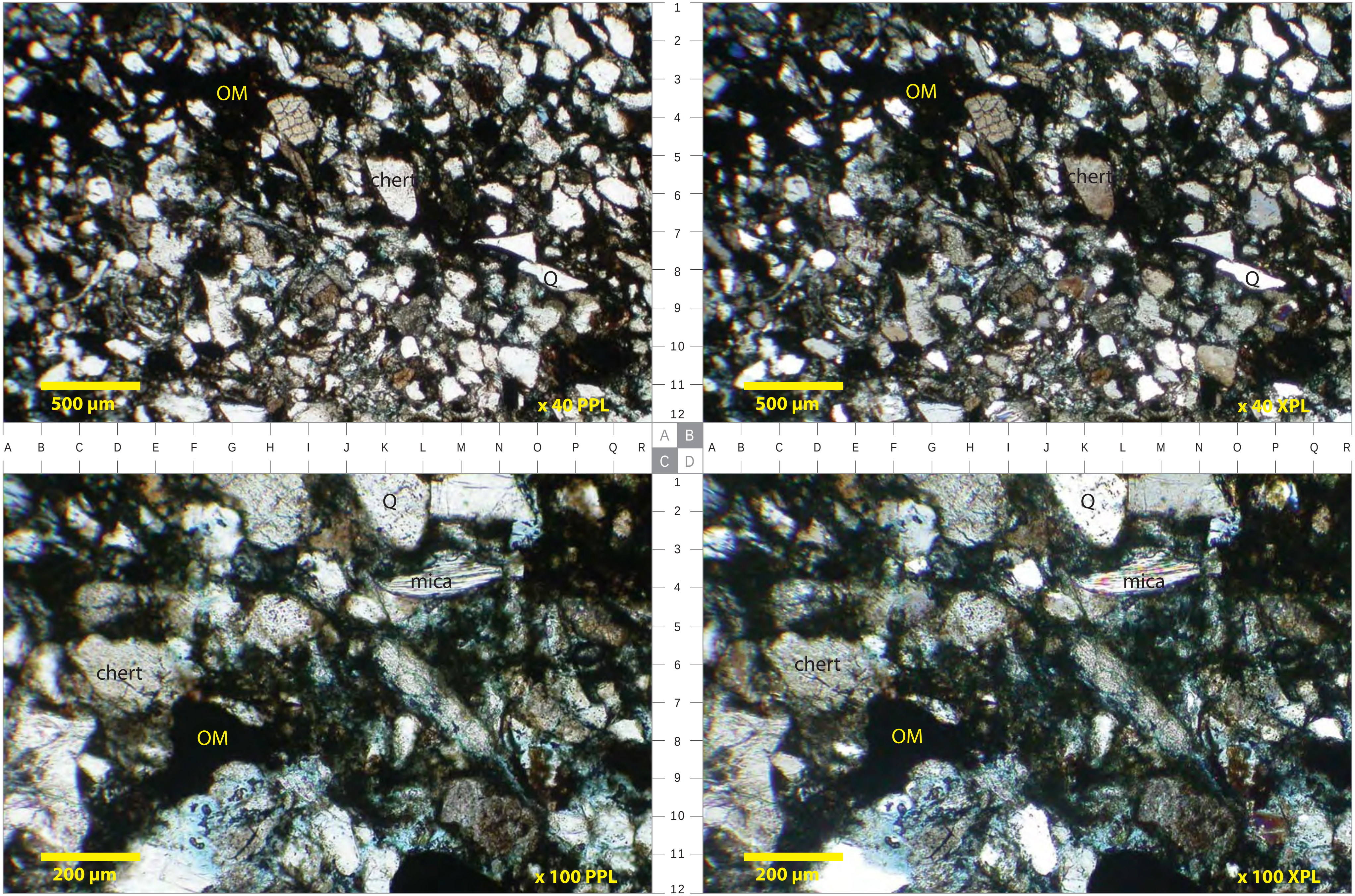


Plate 11
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 12

Unipkat I-22
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 7890 feet

Moderately sorted, very fine to fine grained, non-reservoir quality litharenites are shown in these thin section photomicrographs. Chert, abundant organic material (OM) and monocrystalline quartz (Q) are the main framework grains.

Photo A: 40X PPL,   Photo B: 40X XPL,   Photo C: 100X PPL,   Photo D: 100X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Unipkat I-22

7890 feet

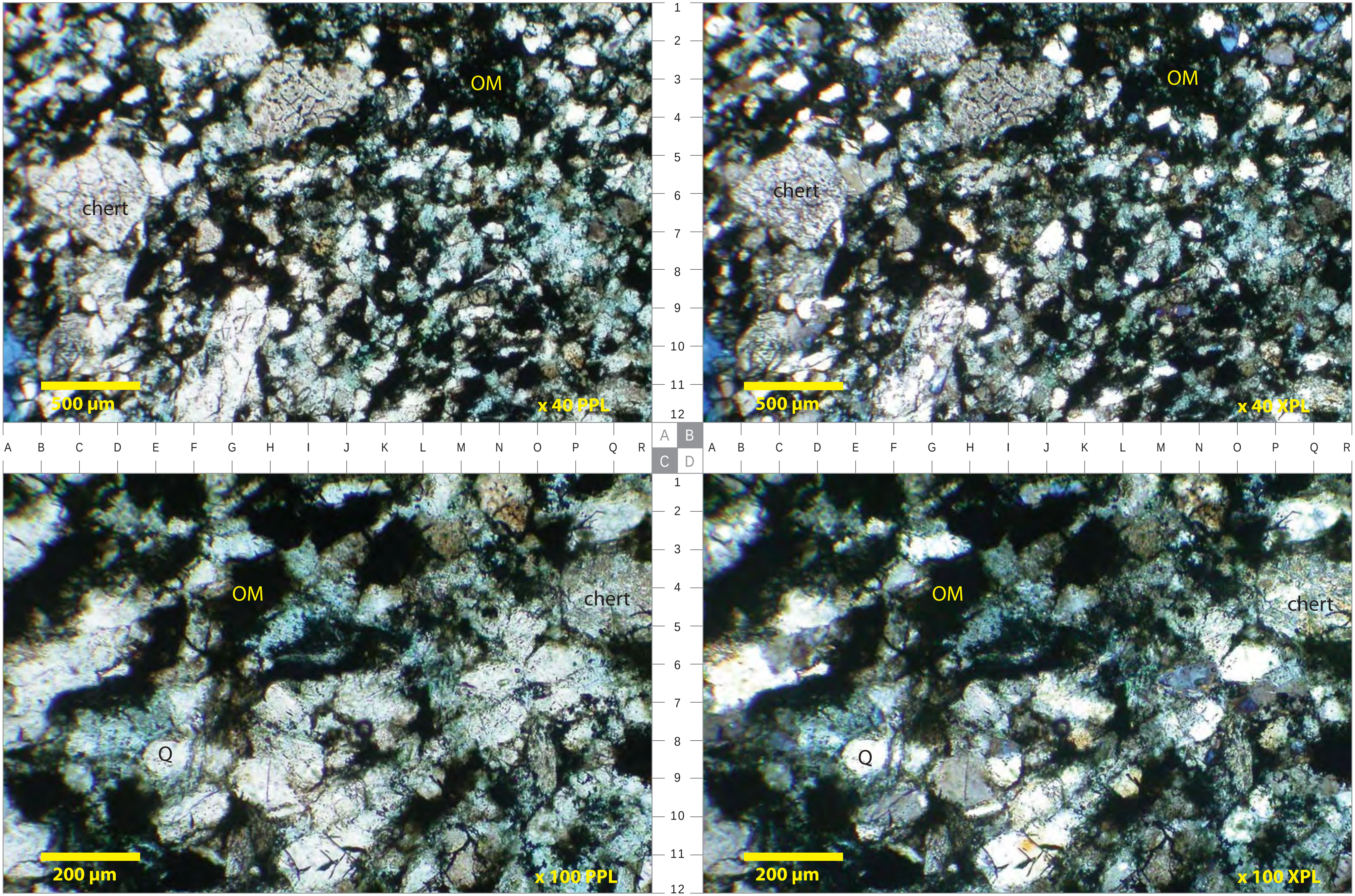


Plate 12
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 13

Unipkat I-22
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 8450 feet

Fine to medium grained, moderately sorted litharenites are recognized as Aklak Sequence clastics recovered at 8450 feet. Macroporosity is generally lacking in this interval. Monocrystalline quartz (Q), chert, organic material (OM) and minor polycrystalline quartz (PxQ) are the main framework constituents.

Photo A: 40X PPL,   Photo B: 40X XPL,   Photo C: 100X PPL,   Photo D: 100X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Unipkat I-22 **8450 feet**

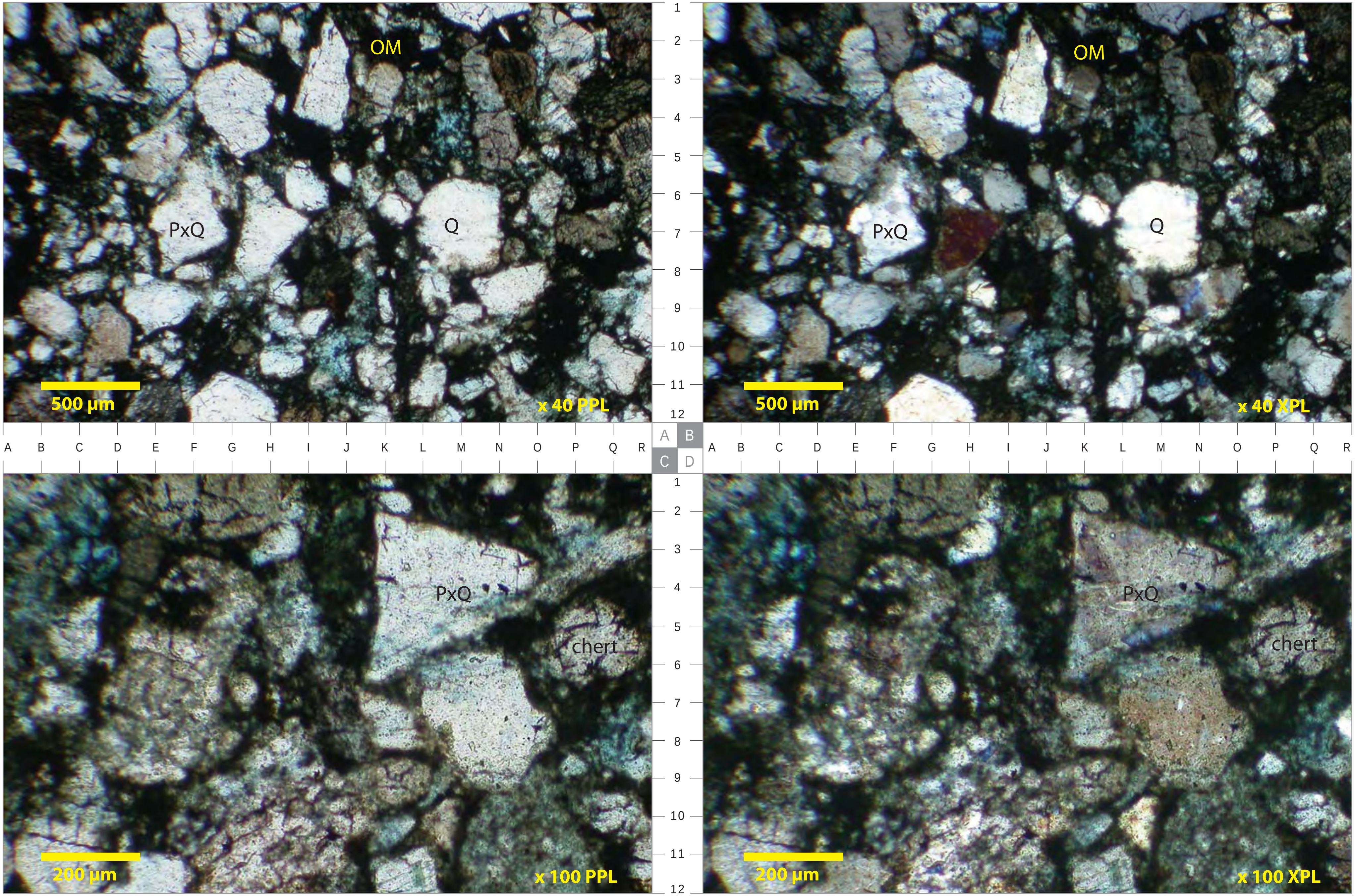


Plate 13
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 14

Unipkat I-22
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 8720 feet

Monocrystalline quartz, organic material (OM), feldspars and polycrystalline quartz are the dominant framework lithoclasts in this fine grained, moderately sorted sandstone taken at 8720 feet. Authigenic cements are poorly developed. Mechanical compaction of ductile grains is the main pore occluding mechanism in this interval.

Photo A: 40X PPL,   Photo B: 40X XPL,   Photo C: 100X PPL,   Photo D: 100X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Unipkat I-22

8720 feet

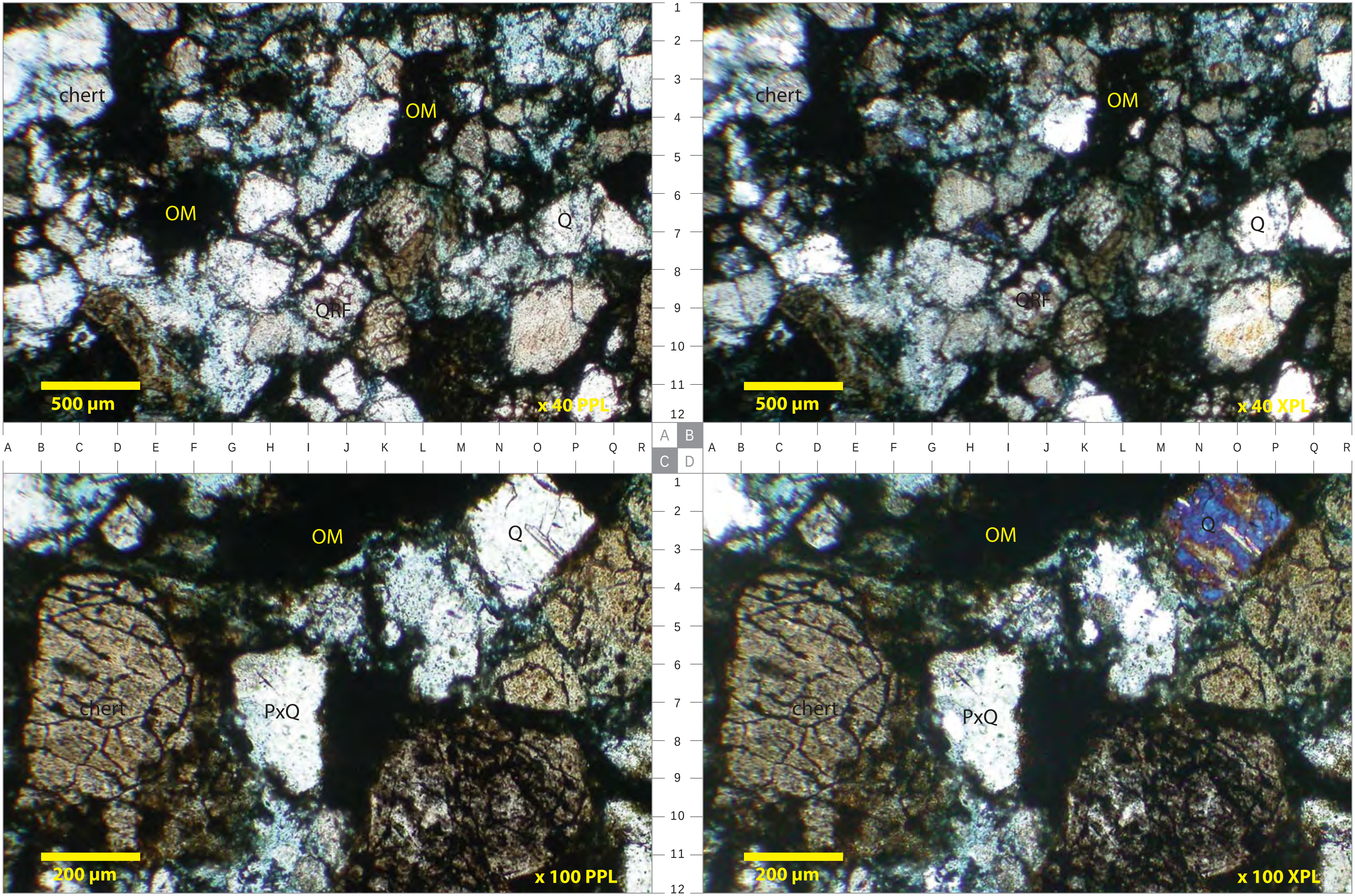


Plate 14

January 2010

CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 15

Unipkat I-22
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 8895 feet

Thin section photomicrographs show the main framework constituents include common organic material (OM), monocrystalline quartz (Q), chert, plagioclase and rare phosphate (fish debris). Effective macroporosity is lacking in this interval.

Photo A: 40X PPL,   Photo B: 40X XPL,   Photo C: 100X PPL,   Photo D: 100X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Unipkat I-22

8895 feet

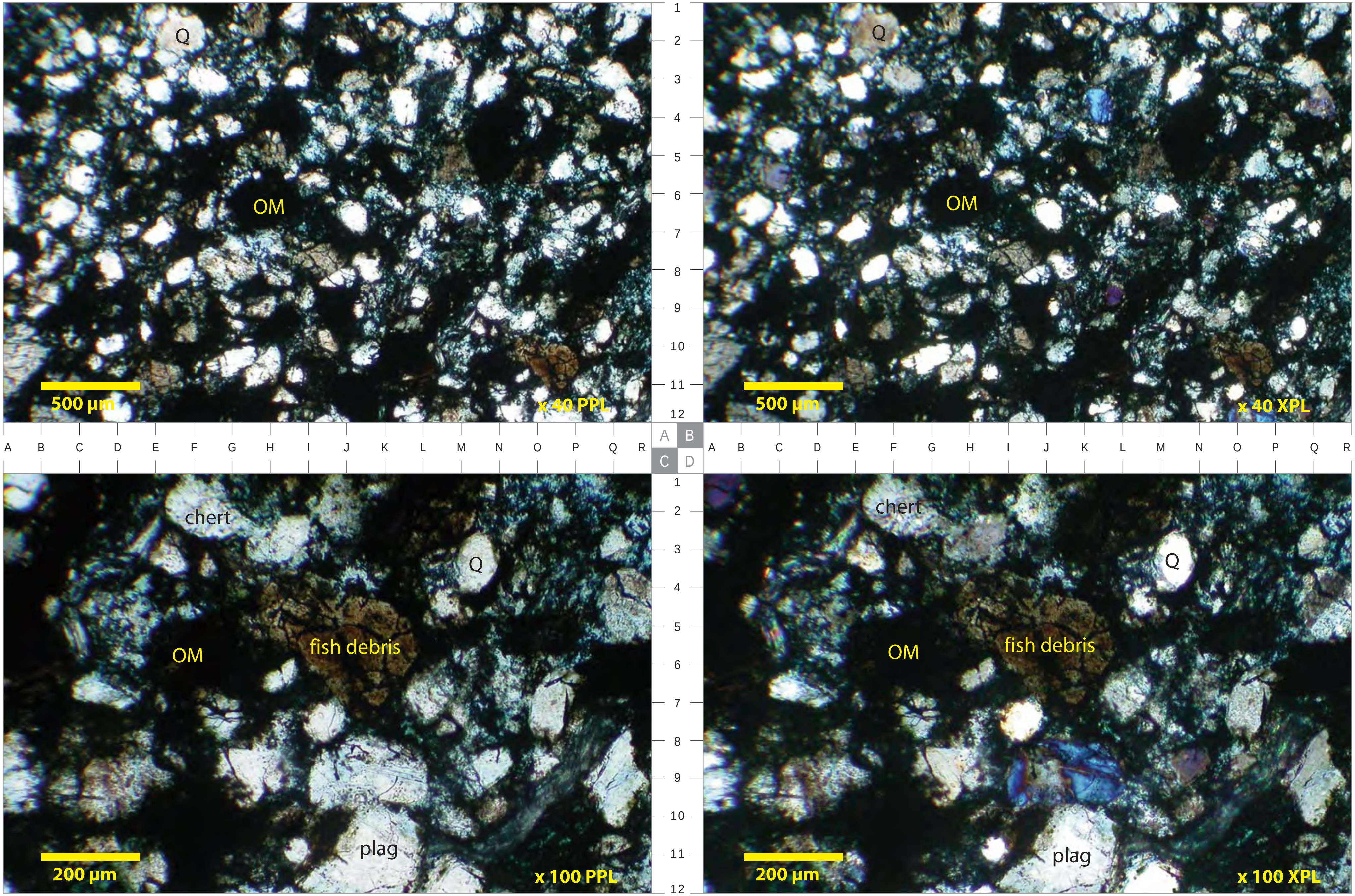


Plate 15
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 16

Unipkat I-22
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 8910 feet

Poorly sorted, very fine to medium grained litharenites were encountered at 8910 feet. Organic material (OM) is abundant with common monocrystalline quartz (Q) and lesser amounts of chert. Authigenic phases are generally lacking in this interval.

Photo A: 40X PPL,   Photo B: 40X XPL,   Photo C: 100X PPL,   Photo D: 100X XPL

Unipkat I-22 **8910 feet**

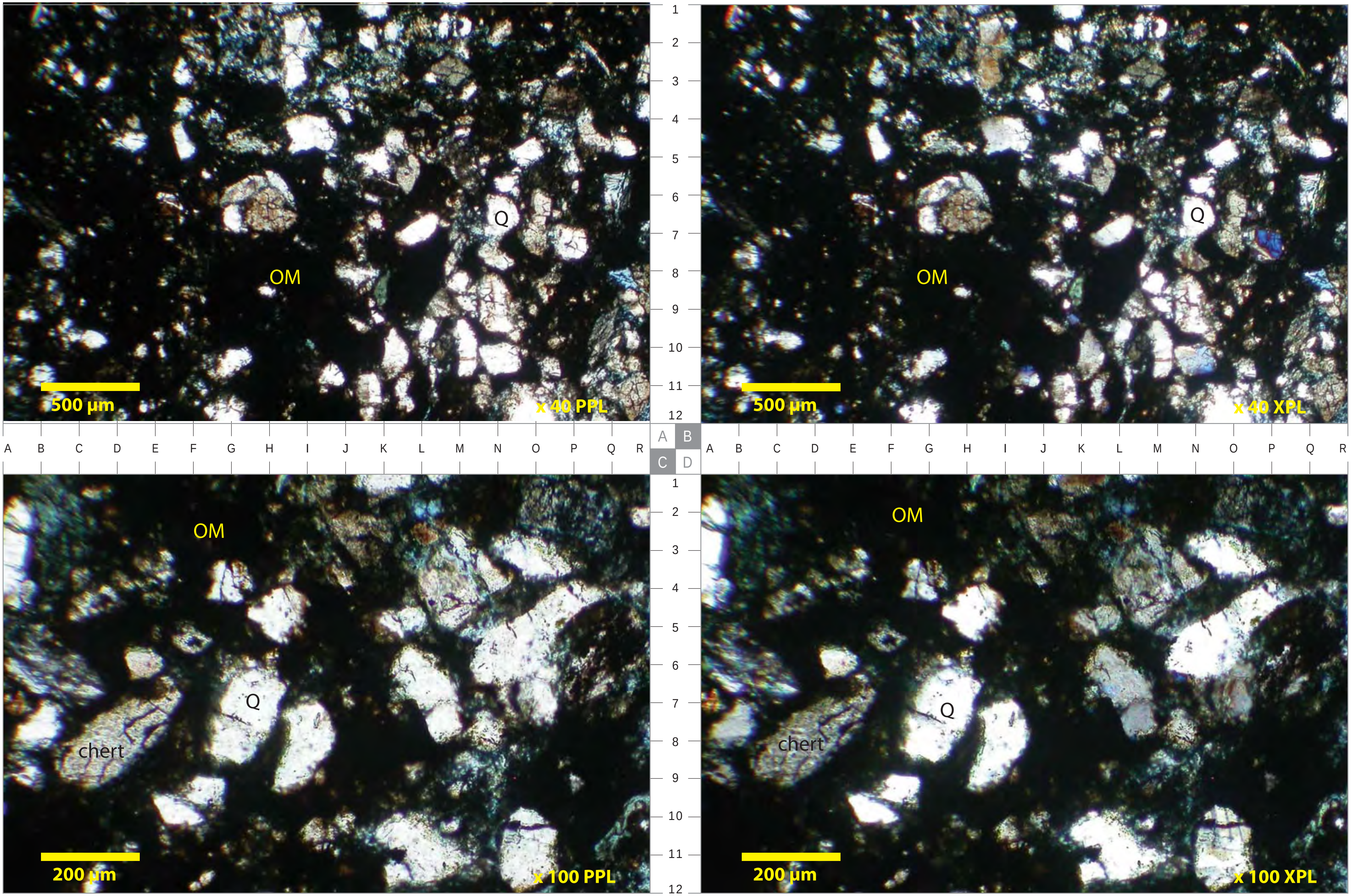


Plate 16
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 17

Unipkat I-22
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 8930-8950 feet

Moderately well sorted, fine grained litharenites characterize the Aklak Sequence clastics recovered between 8930 to 8950 feet. Framework lithoclasts include organic material (OM), monocrystalline quartz (Q), chert, feldspars and polycrystalline quartz (PxQ). Grain contacts are tangential and concavo-convex. The latter indicates moderate mechanical compaction. Effective macroporosity (small yellow arrows) is patchily distributed. Rare siderite is highlighted with large green arrows.

Photo A: 40X PPL,   Photo B: 40X XPL,   Photo C: 100X PPL,   Photo D: 100X XPL

Unipkat I-22 8930-8950 feet

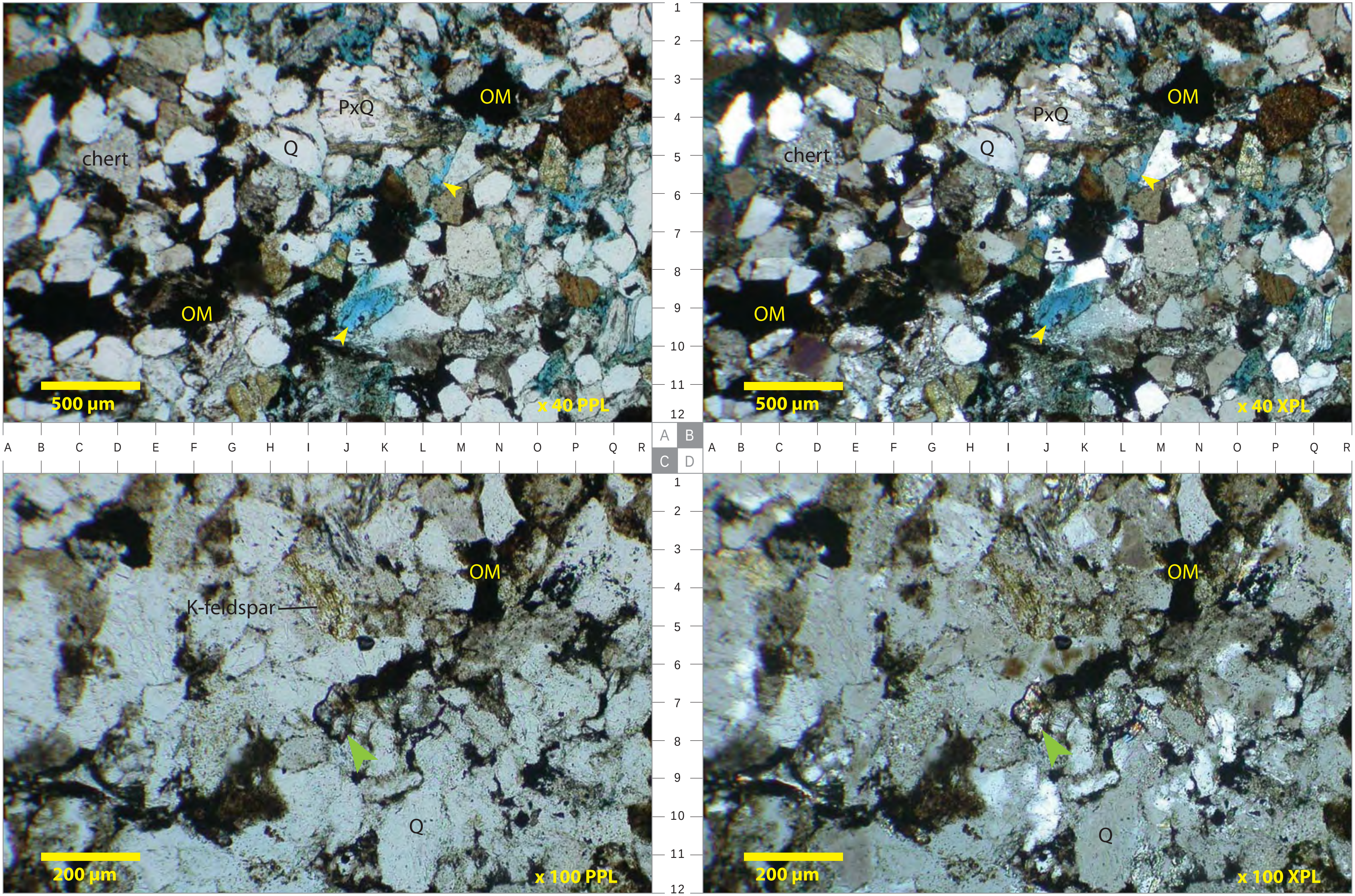


Plate 17
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 18

Unipkat I-22
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 9040 feet

Poorly sorted, fine to coarse grained litharenites were recovered at 9040 feet, representing the Aklak Sequence sandstones. Grain contacts are concavo-convex and tangential. Effective macroporosity is generally lacking in this interval. Framework grains include monocrystalline quartz (Q), chert, organic material (OM), clay-rich sedimentary grains (CRF) and minor polycrystalline quartz (PxQ).

Photo A: 40X PPL,   Photo B: 40X XPL,   Photo C: 100X PPL,   Photo D: 100X XPL

Unipkat I-22 **9040 feet**

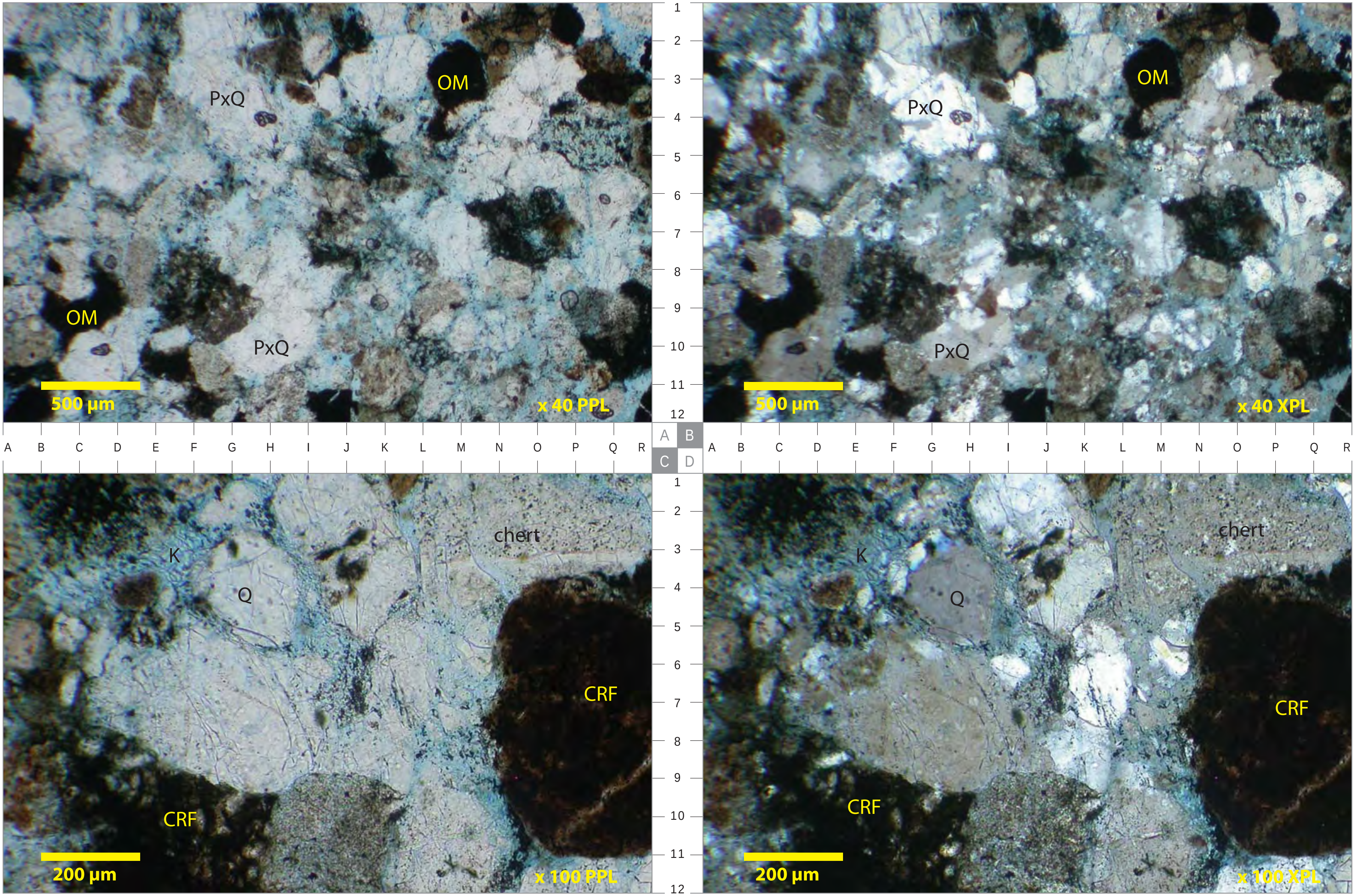


Plate 18
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 19

Unipkat I-22
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 9090-9110 feet

Drill cuttings recovered between 9090 to 9110 feet are recognized as well sorted, very fine to fine grained litharenites. Effective macroporosity (View C, small yellow arrow) is very poorly developed and isolated, suggesting very low permeability. Framework constituents include monocrystalline quartz (Q), organic material (OM), chert, clay-rich sedimentary grains, muscovite and rare glauconite. Siderite cement (large green arrows) is found in trace to minor volumes.

Photo A: 40X PPL, Photo B: 40X XPL, Photo C: 100X PPL, Photo D: 100X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Unipkat I-22

9090-9110 feet

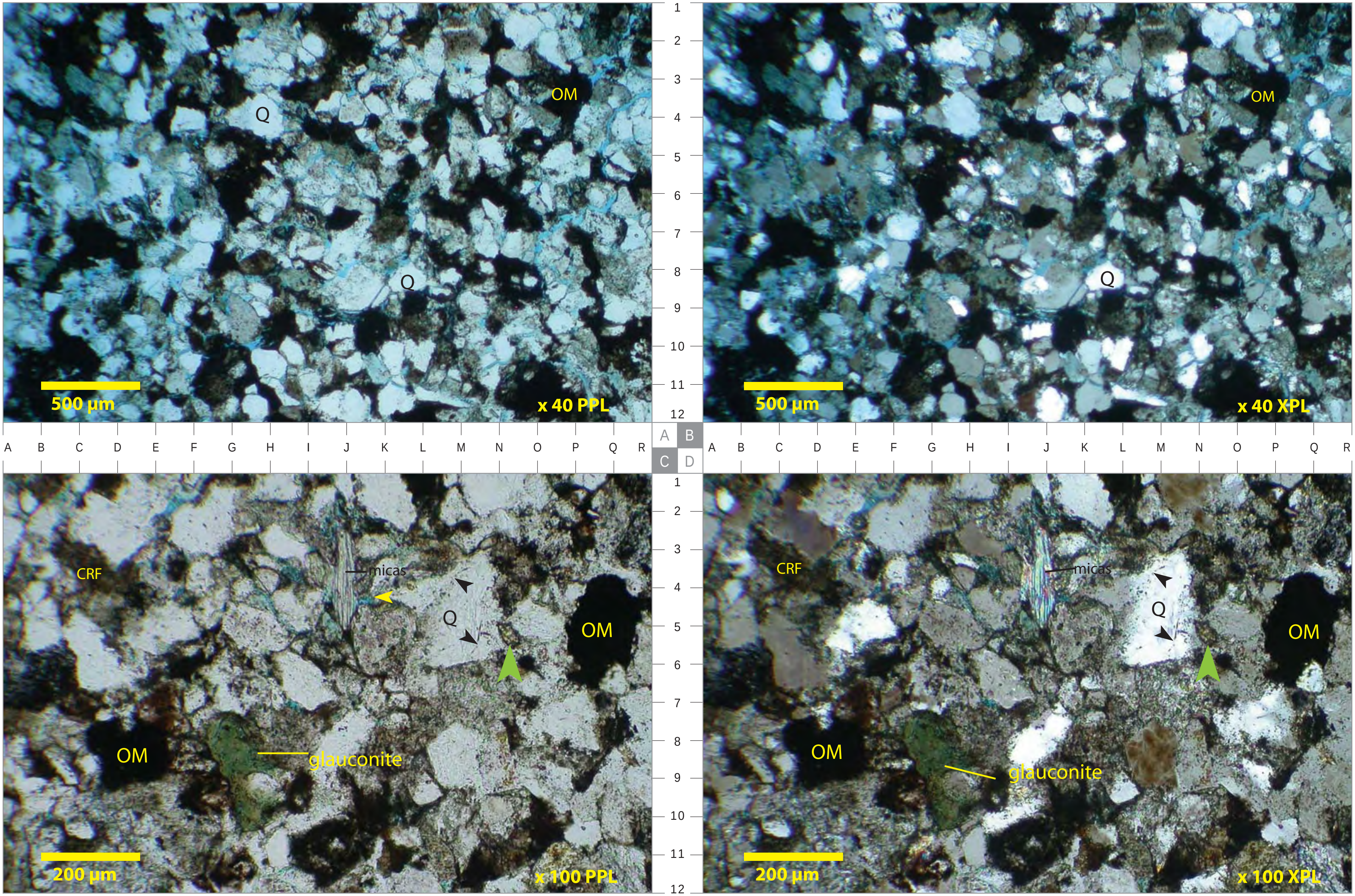


Plate 19
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 20

Unipkat I-22
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 9335 feet

Well sorted, fine grained litharenites are recognized at 9335 feet. Effective macroporosity (Views C and D, small yellow arrows) is isolated resulting in very low permeability. Grain contacts are tangential and concavo-convex; ductile framework lithoclasts are compacted between the more rigid clasts. Framework grains include monocrystalline quartz, organic material (OM) and chert. Note kaolinite clays (Views C and D, "K") loosely packed within macropores. Non-stained carbonate cement (large green arrows) is patchily distributed.

Photo A: 40X PPL,   Photo B: 40X XPL,   Photo C: 100X PPL,   Photo D: 100X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

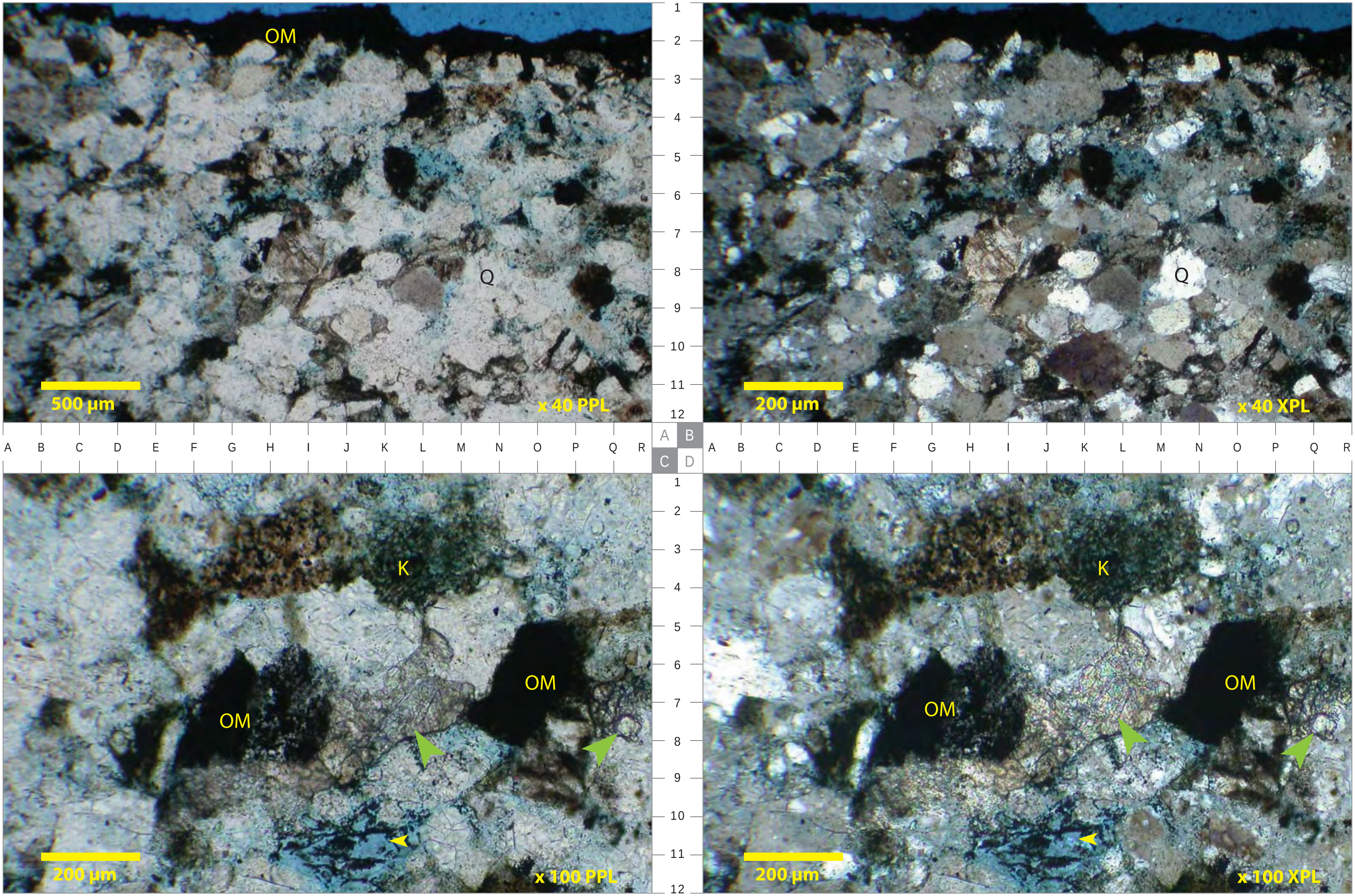


Plate 20
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 21

Unipkat I-22
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 9410-9430 feet

Drill cuttings recovered between 9410 to 9430 feet consist of lower fine grained, well sorted litharenites. Macroporosity (small yellow arrows) is isolated in this interval, resulting in very low permeability. Subrounded monocrystalline quartz (Q), K-feldspar and organic material (OM) are some of the framework constituents.

Photo A: 40X PPL,   Photo B: 40X XPL,   Photo C: 100X PPL,   Photo D: 100X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Unipkat I-22 9410-9430 feet

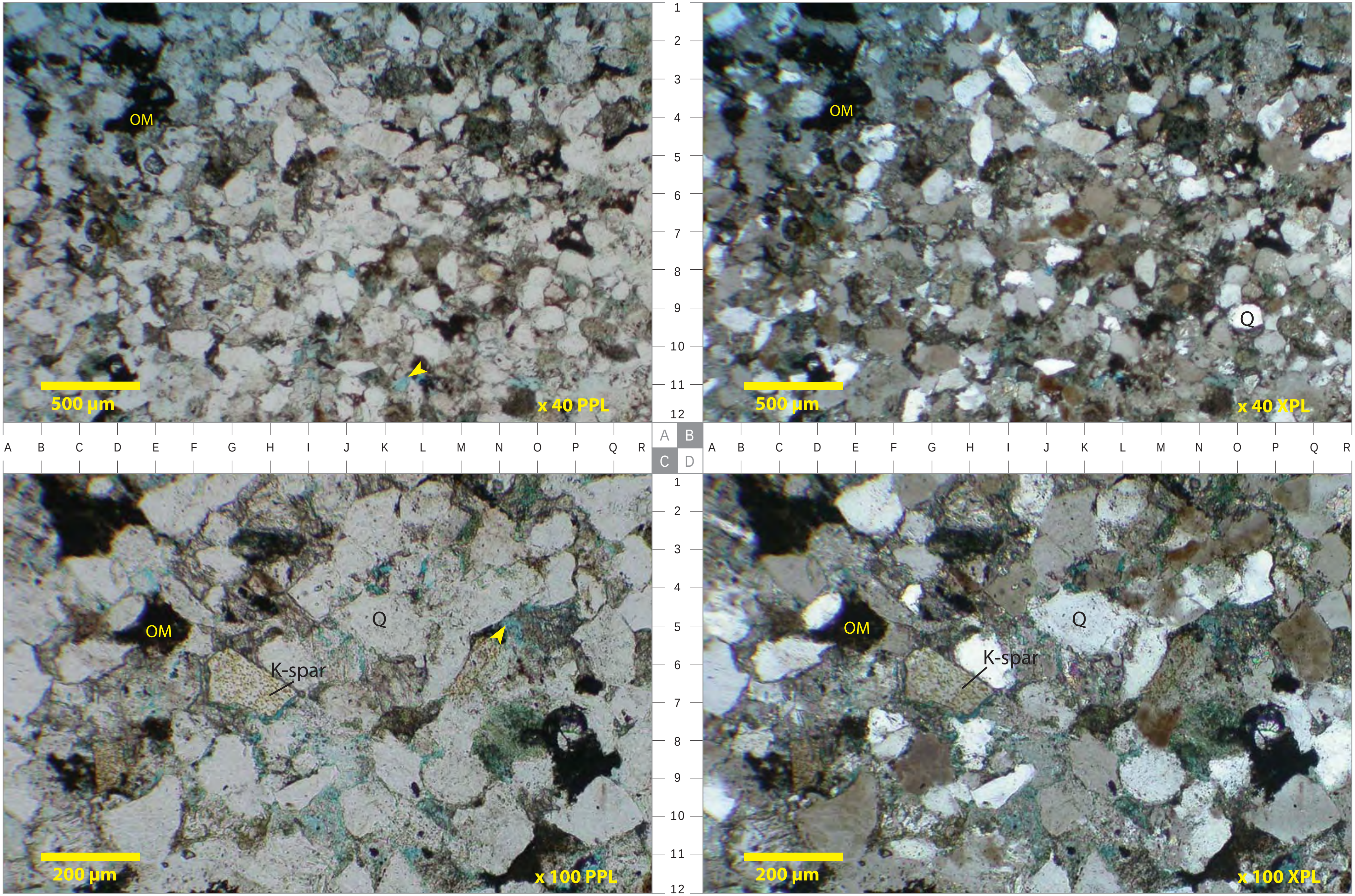


Plate 21
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 22

Unipkat I-22
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 9450 feet

Fine to medium grained, moderately sorted litharenites are recognized as Aklak Sequence sandstones taken at 9450 feet. Framework grains include monocrystalline quartz (Q), commonly compacted organic material (OM) and chert. Effective macropores (small yellow arrows) are isolated resulting in very low permeability.

Photo A: 40X PPL, Photo B: 40X PPL, Photo C: 100X PPL, Photo D: 100X XPL

Unipkat I-22

9450 feet

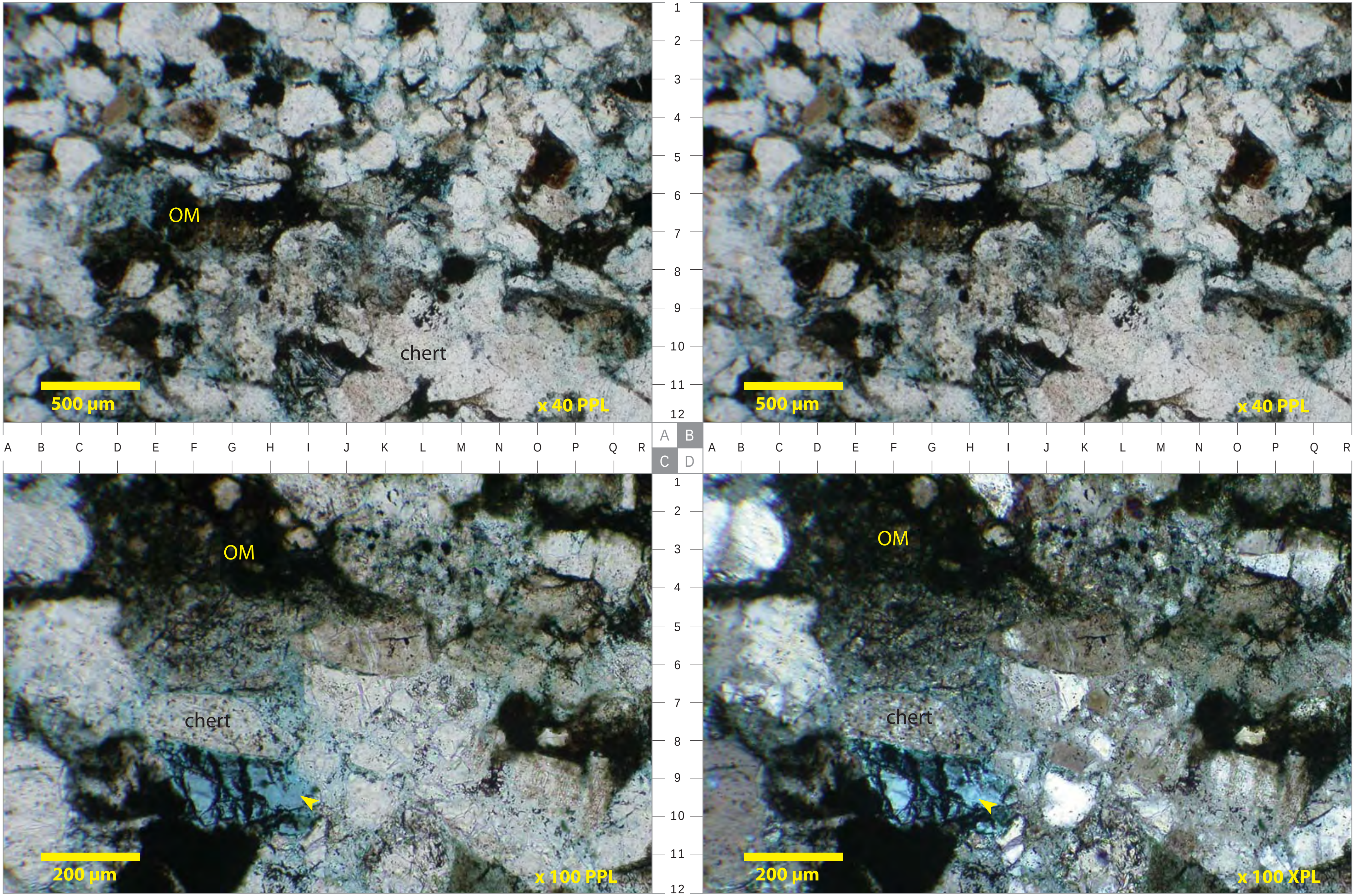


Plate 22
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 23

Unipkat I-22
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 9590 feet

Moderately well sorted, fine grained litharenites are recognized as Aklak Sequence sediments recovered at 9590 feet. Chert, monocrystalline quartz (Q) and organic material (OM) are the main framework lithoclasts. Ductile components are commonly compacted the more competent framework grains. Effective macroporosity is poorly preserved in this interval whereby mechanical compaction of ductile grains occludes porosity.

Photo A: 40X PPL,   Photo B: 40X XPL,   Photo C: 100X PPL,   Photo D: 100X XPL

Unipkat I-22 9590 feet

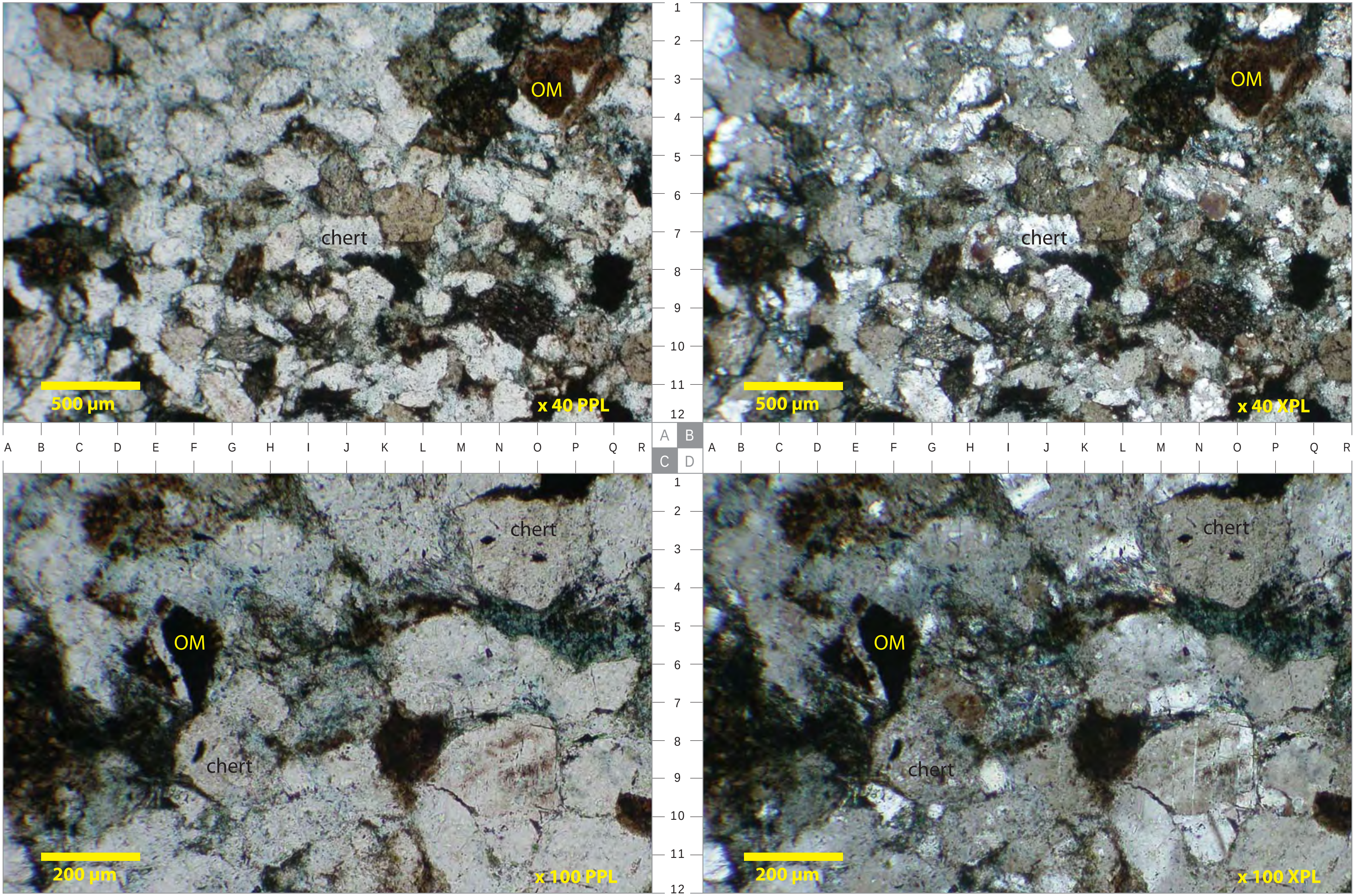


Plate 23
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 24

Unipkat I-22
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 9650-9660 feet

Drill cuttings recovered between 9650 to 9660 feet consist of poorly sorted fine to medium grained litharenites. Monocrystalline quartz (Q), organic material (OM) and chert are the main framework components. Large green arrows show patchily distributed non-stained carbonate cement occluding macroporosity.

Photo A: 40X PPL,   Photo B: 40X XPL,   Photo C: 100X PPL,   Photo D: 100X XPL

Unipkat I-22 — 9650-9660 feet

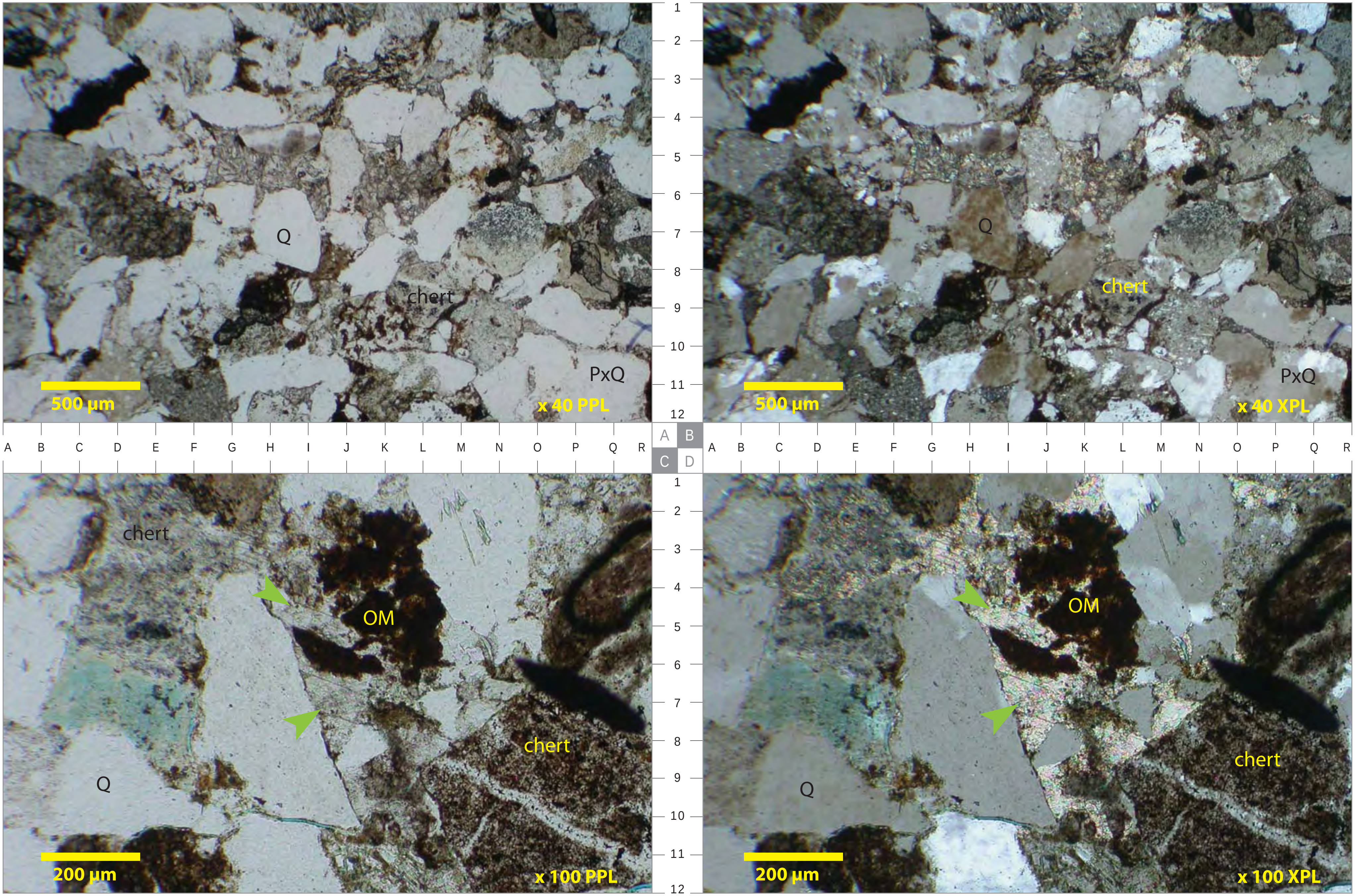


Plate 24
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 25

Unipkat I-22
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 10236 feet

Porous and permeable, medium to coarse grained, moderately well sorted litharenites characterize the Aklak Sequence clastics recovered at 10236 feet. Chert, monocrystalline quartz (Q), clay-rich sedimentary grains and polycrystalline quartz (PxQ) are the main framework grains. Quartz overgrowths (small black arrows) are unevenly precipitated on host monocrystalline quartz grains. Non-stained carbonate cement (large green arrows) is patchily distributed. Effective macropores (small yellow arrows) are well developed in this interval.

Photo A: 40X PPL,   Photo B: 40X XPL,   Photo C: 100X PPL,   Photo D: 100X XPL

Unipkat I-22 10236 feet

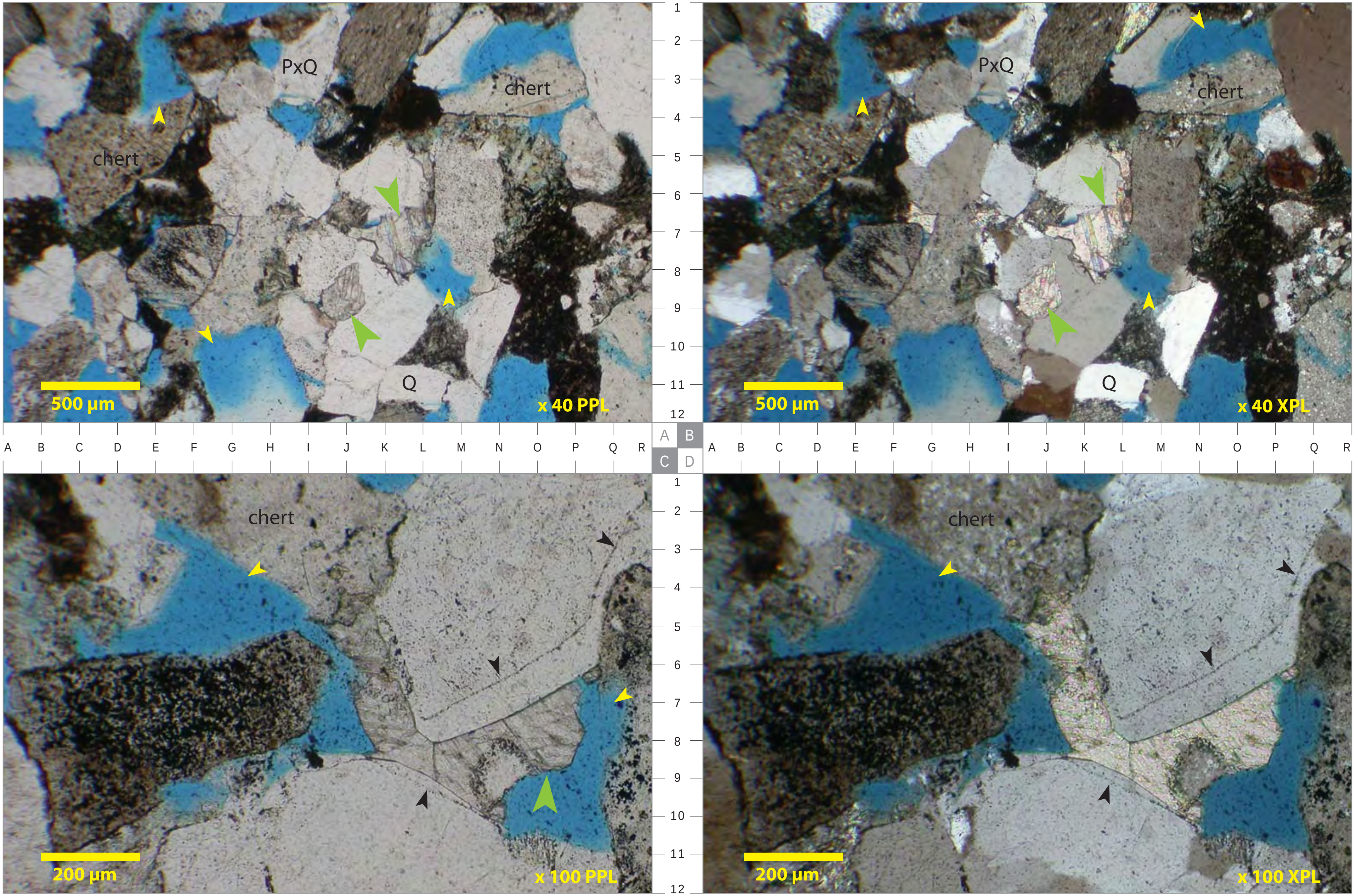


Plate 25
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 26

Unipkat I-22
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 10430-10460 feet

Drill cuttings taken between 10430 to 10460 feet consist of very fine grained, well sorted non-porous litharenites. Monocrystalline quartz (Q) and organic material (OM) are the main framework constituents. Grain contacts are tangential and concavo-convex.

Photo A: 40X PPL,   Photo B: 40X XPL,   Photo C: 100X PPL,   Photo D: 100X XPL

Unipkat I-22

10430-10460 feet

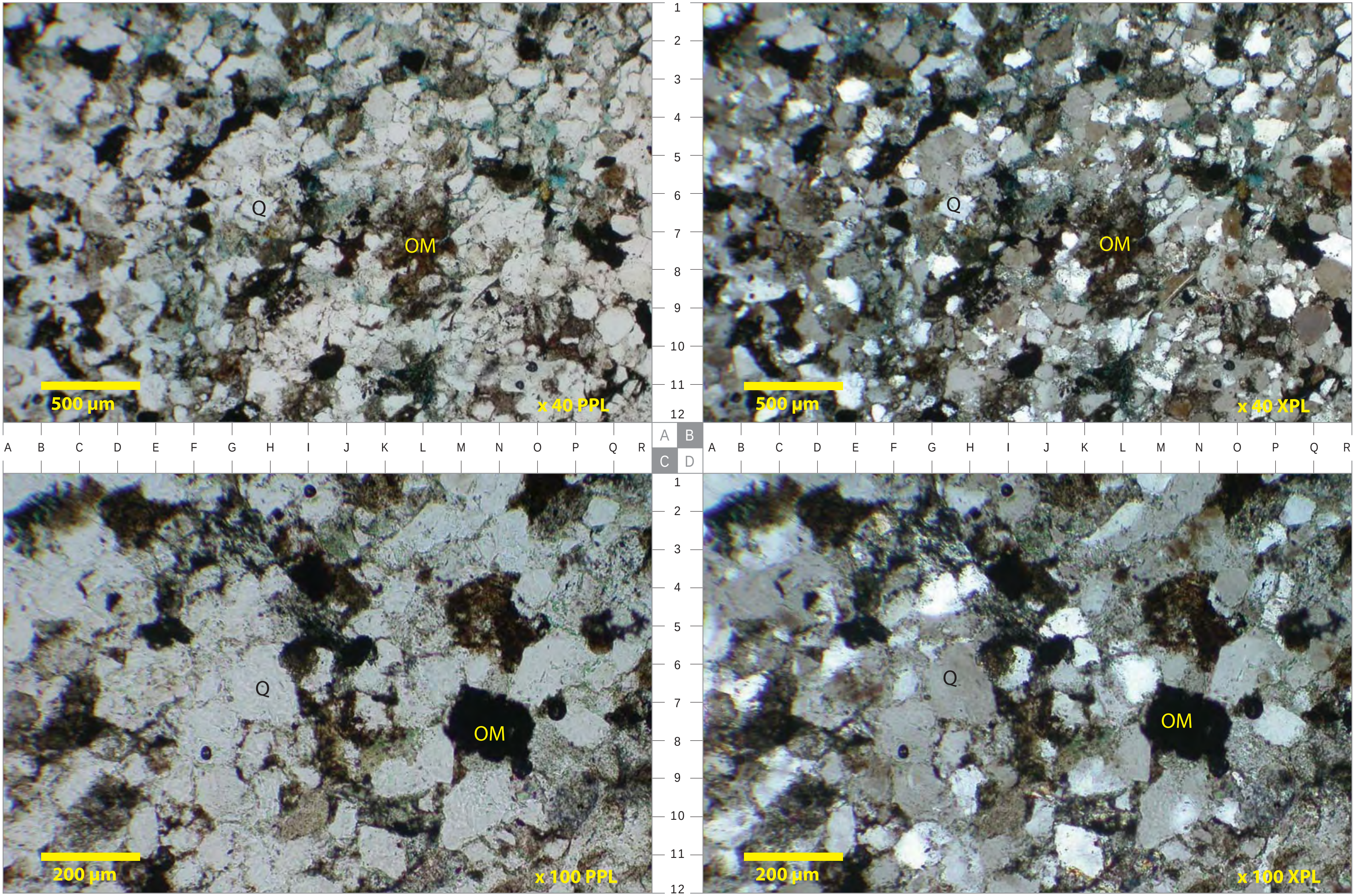


Plate 26

January 2010

CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ikattok J-17

Thin Section Overviews

And

Described Photomicrographs

Ikattok J-17

7235.5 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 01

Ikattok J-17
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 7235.5 feet

Upper fine grained, well sorted litharenites characterize the sandstones recovered from core at 7235.5 feet. Grain contacts are tangential and concavo-convex reflecting moderate mechanical compaction. Compaction of ductile argillaceous grains between the more competent framework grains is common. Dissolution of pink stained plagioclase (intermediate composition) and K-feldspar has enhanced the effective pore system in this interval. Isolated effective macropores (small yellow arrows) suggest low permeability. Framework grains include monocrystalline quartz, clay-rich sedimentary grains (CRF), chert, plagioclase, K-feldspar and organic material (OM).

Photo A: 20X PPL, Photo B: 100X PPL, Photo C: 100X PPL, Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ikattok J-17 **7235.5 feet**

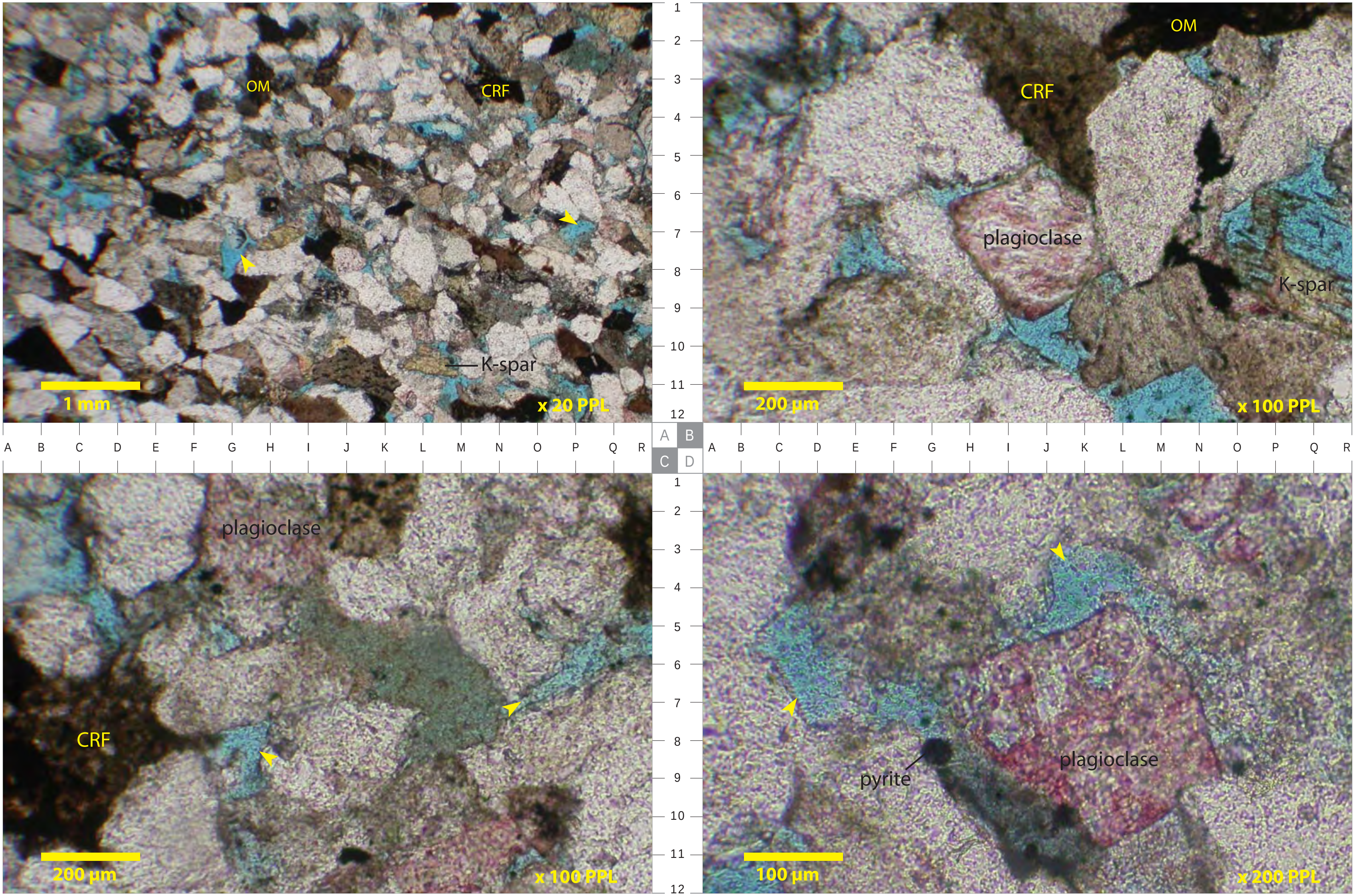


Plate 01
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ikattok J-17

7247.5 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 02

Ikattok J-17
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 7247.5 feet

Effective macropores are very poorly developed in this moderate to poorly sorted, fine grained litharenite recovered from core at 7247.5 feet. Clay-rich sedimentary lithoclasts (CRF) are commonly compacted between more competent framework constituents. Monocrystalline quartz, argillic grains, organic material and plagioclase, are some of the framework grains. Pseudo-matrix is created from the compaction of ductile argillic grains. Authigenic phases are poorly developed consisting of rare pyrite.

Photo A: 20X PPL,   Photo B: 40X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

Ikattok J-17

7247.5 feet

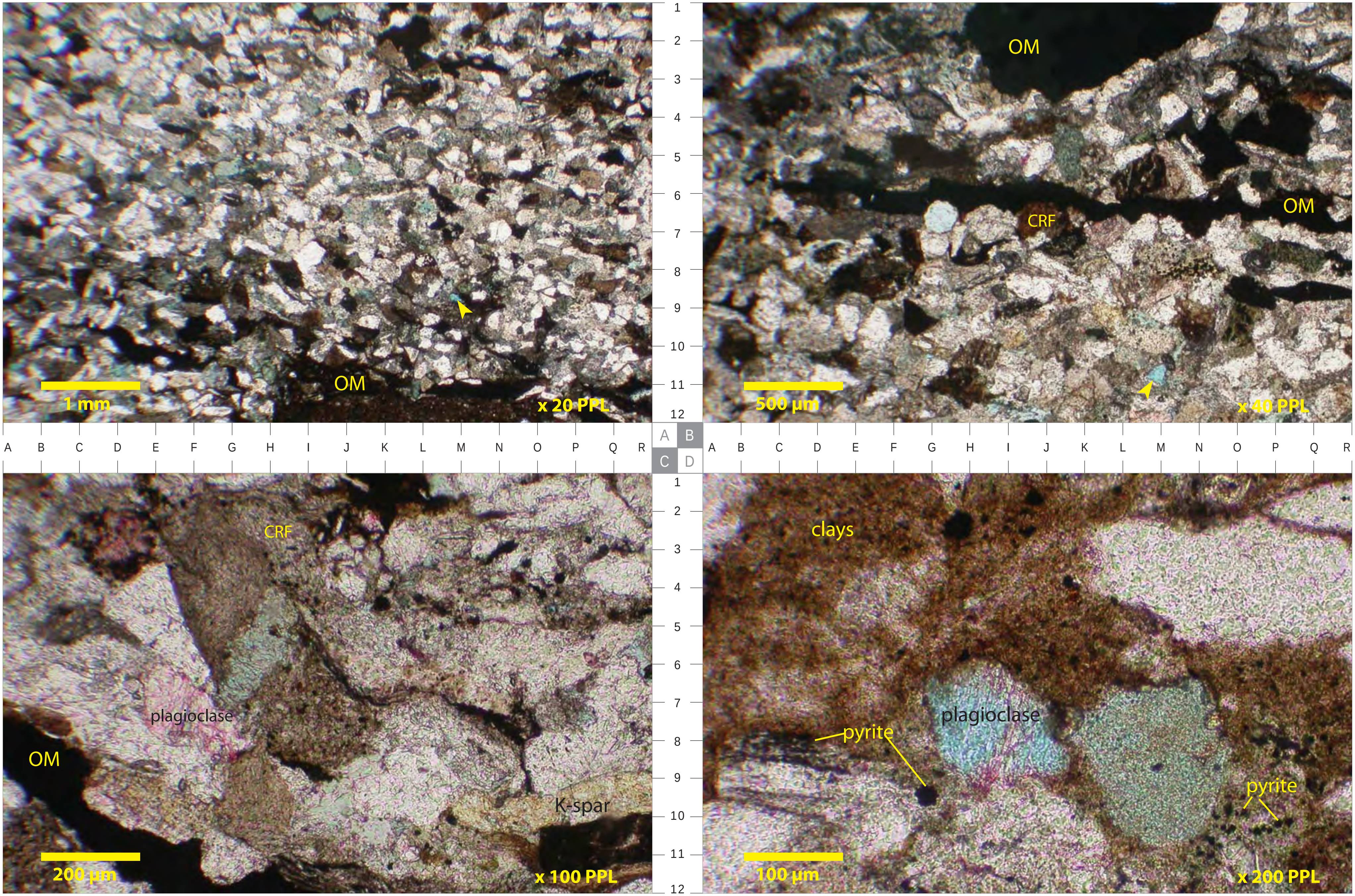


Plate 02

January 2010

CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ikattok J-17

7254.4 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 03

Ikattok J-17
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 7254.4 feet

Well sorted, fine grained litharenites were encountered by core taken at 7254.4 feet. Framework grains include monocrystalline quartz (Q), chert, clay-rich sedimentary grains (CRF), organic material (OM) and plagioclase. Complete to partial dissolution of plagioclase has resulted in isolated effective macropores (small yellow arrows). Diagenetic cements are rare consisting of pyrite framboids and trace siderite (View D, large green arrow).

Photo A: 20X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ikattok J-17 **7254.4 feet**

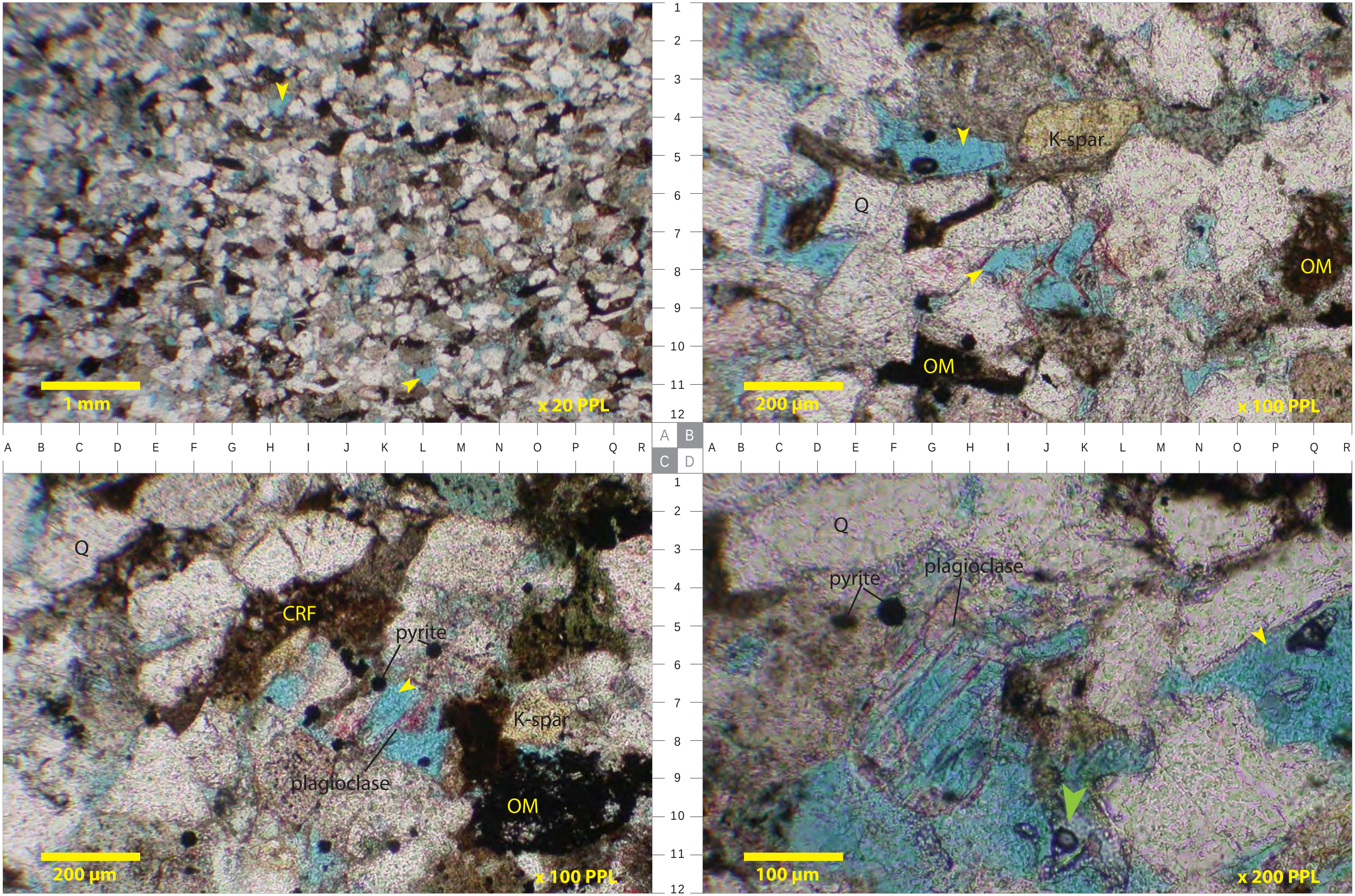


Plate 03
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ikattok J-17

7260.6 feet

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 04

Ikattok J-17
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 7260.6 feet

Non-reservoir quality, fine grained Aklak Sequence litharenites were recovered from core at 7260.6 feet. Macroporosity (small yellow arrows) is very poorly developed and isolated. Grain contacts are mainly tangential. Framework grains include monocrystalline quartz (Q), chert, plagioclase, clay-rich sedimentary grains (CRF), organic material (OM) and trace fish debris. Note partial selective dissolution (View C) of plagioclase grains.

Photo A: 40X PPL, Photo B: 100X PPL, Photo C: 100X PPL, Photo D: 200X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Ikattok J-17 **7260.6 feet**

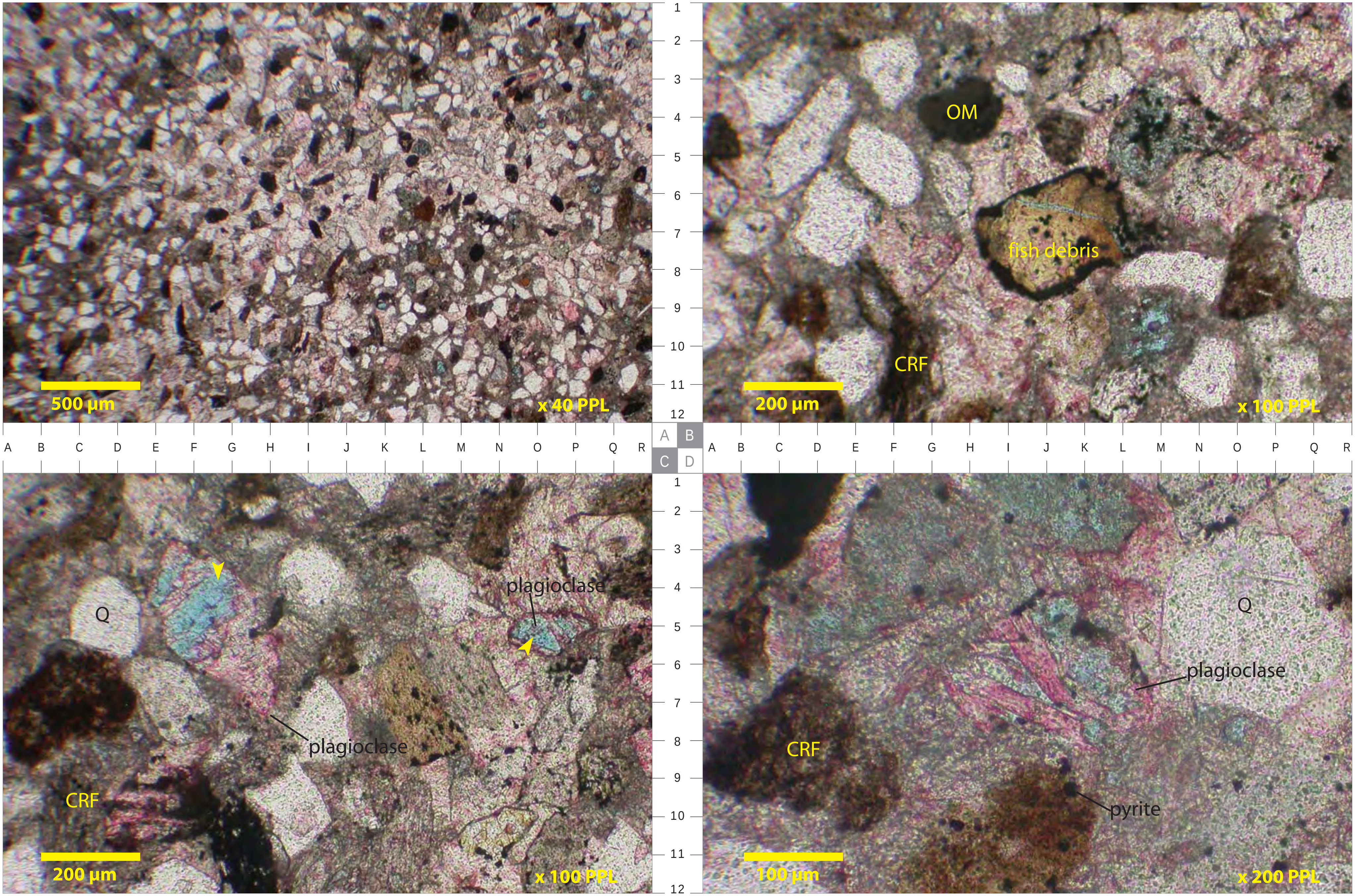


Plate 04
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

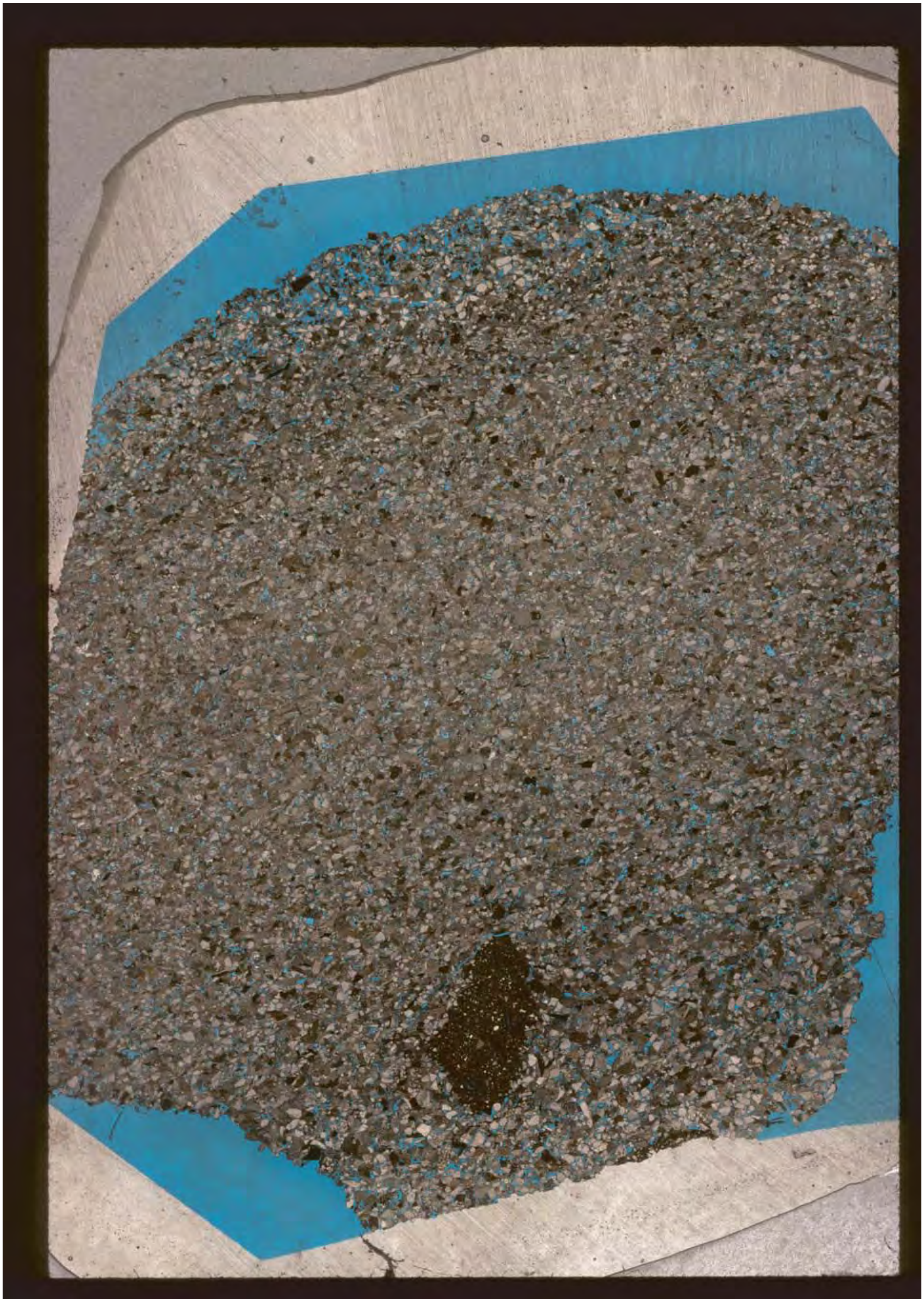
Adlartok P-09

Thin Section Overviews

And

Select Described Photomicrographs

Adlartok P-09 1764.44 meters



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 01

Adlartok P-09
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 1764.44 meters

Porous and permeable well sorted litharenites are recognized from core recovered at 1764.44 meters. Grain contacts are tangential and concavo-convex suggesting moderate mechanical compaction. Authigenic cements are poorly preserved in this interval with rare siderite and pyrite. Non-stained carbonate cement is found in trace volumes as shown in View C (H:8). Framework grain dissolution of unstable grains has enhanced the effective (small yellow arrows) pore system. Monocrystalline quartz (Q), clay-rich sedimentary grains (CRF), chert, volcanic rock fragments and feldspars comprise some of the framework constituents. The Overview shows a granule-sized clay-rich sedimentary clast floating in the sandstone matrix.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Adlartok P-09 **1764.44 meters**

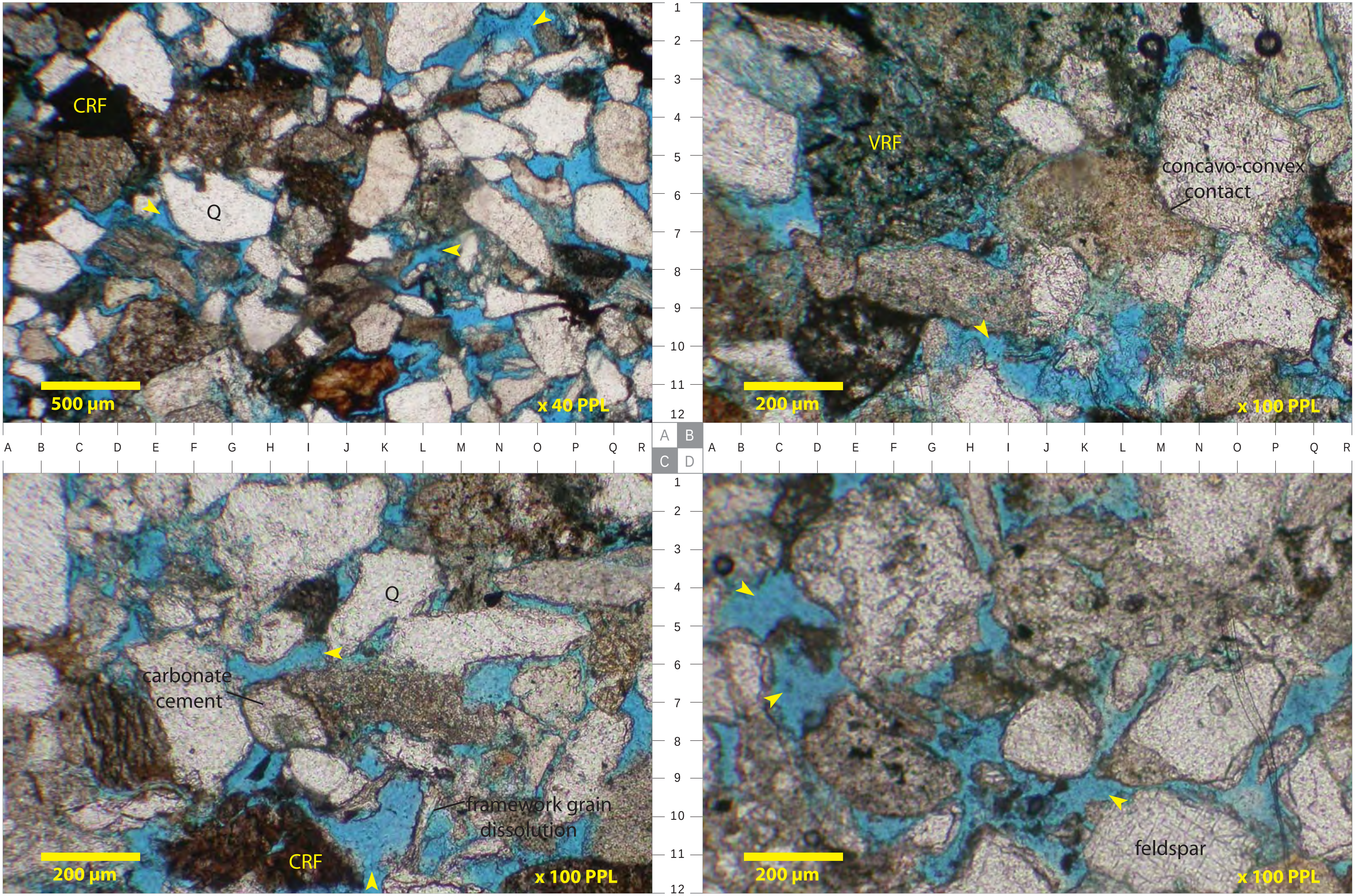


Plate 01
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Adlartok P-09 1768.06 meters

2 mm

Aklak

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 02

Adlartok P-09
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 1768.06 meters

Parallel laminated, well sorted, very fine to fine grained litharenites characterize the Aklak Sequence recovered from core at 1768.06 meters. Mechanical compaction of ductile lithoclasts has reduced primary porosity significantly. Grain contacts are concavo-convex and tangential. Effective macropores (small yellow arrows) have been preserved by a precursor authigenic cement which has been subsequently leached. Monocrystalline quartz, chert, clay-rich sedimentary grains, organic material (OM) and rare glauconite comprise the framework grains.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

Adlartok P-09 **1768.06 meters**

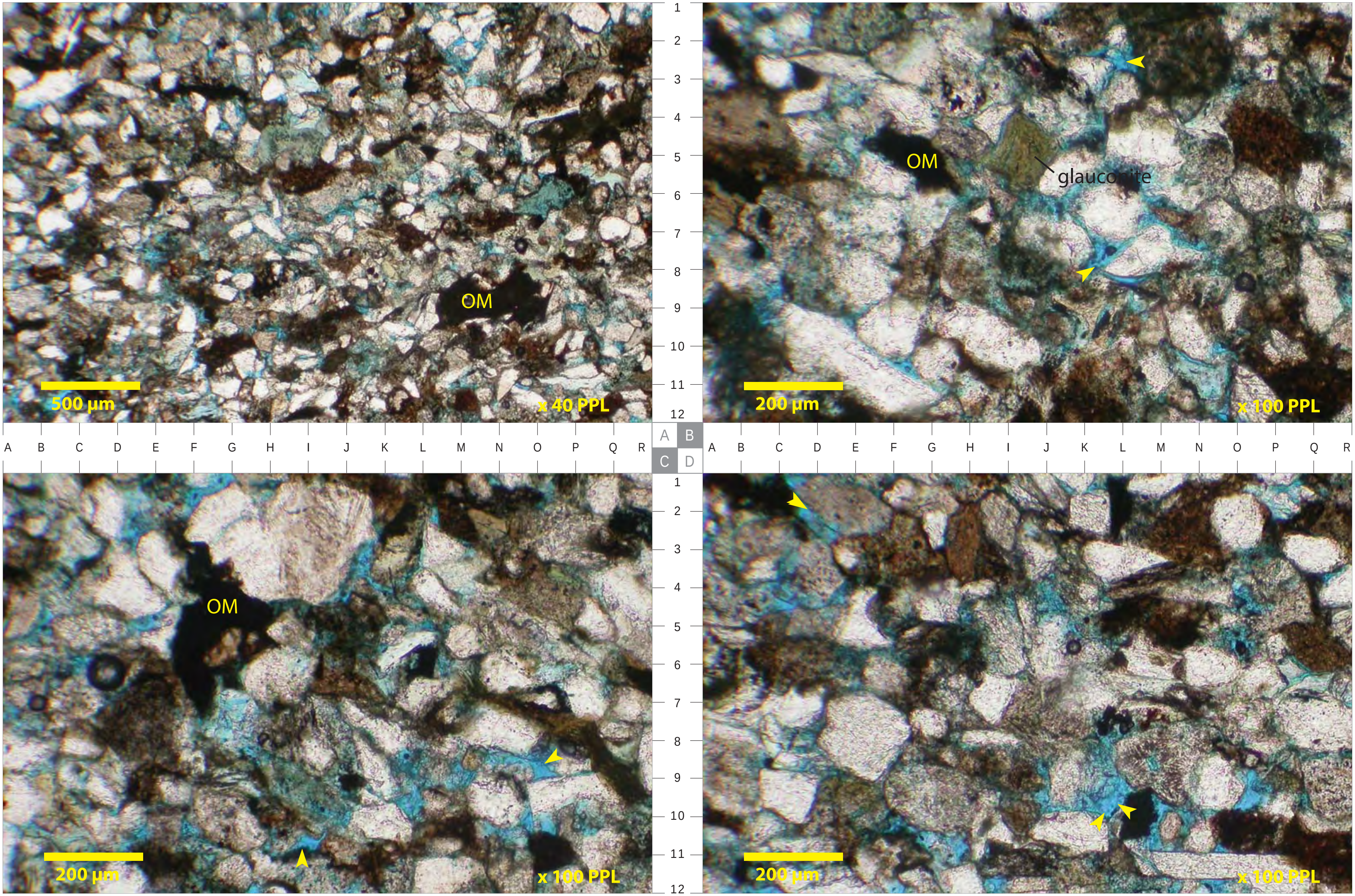


Plate 02
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Adlartok P-09 1768.70 meters

2 mm

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Adlartok P-09 1768.90 meters

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 03

Adlartok P-09
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 1768.9 meters

Well preserved effective macroporosity (small yellow arrows) is shown in this medium grained well sorted litharenite encountered by core at 1768.9 meters. The Overview illustrates well preserved porosity in a sandstone rich in organic matter. Brittle failure of framework grains is illustrated by microfractured framework grains (View D, I:7). Dissolution of the pore preserving cement and dissolution of unstable framework lithoclasts (View B, I:10) has created deep burial mechanical compaction. Chert, monocrystalline quartz (Q), feldspars, organic material (OM) and glauconite are some of the framework lithoclasts. Loosely packed kaolinite clays (View B, "K") are found in trace amounts.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Adlartok P-09 — 1768.9 meters

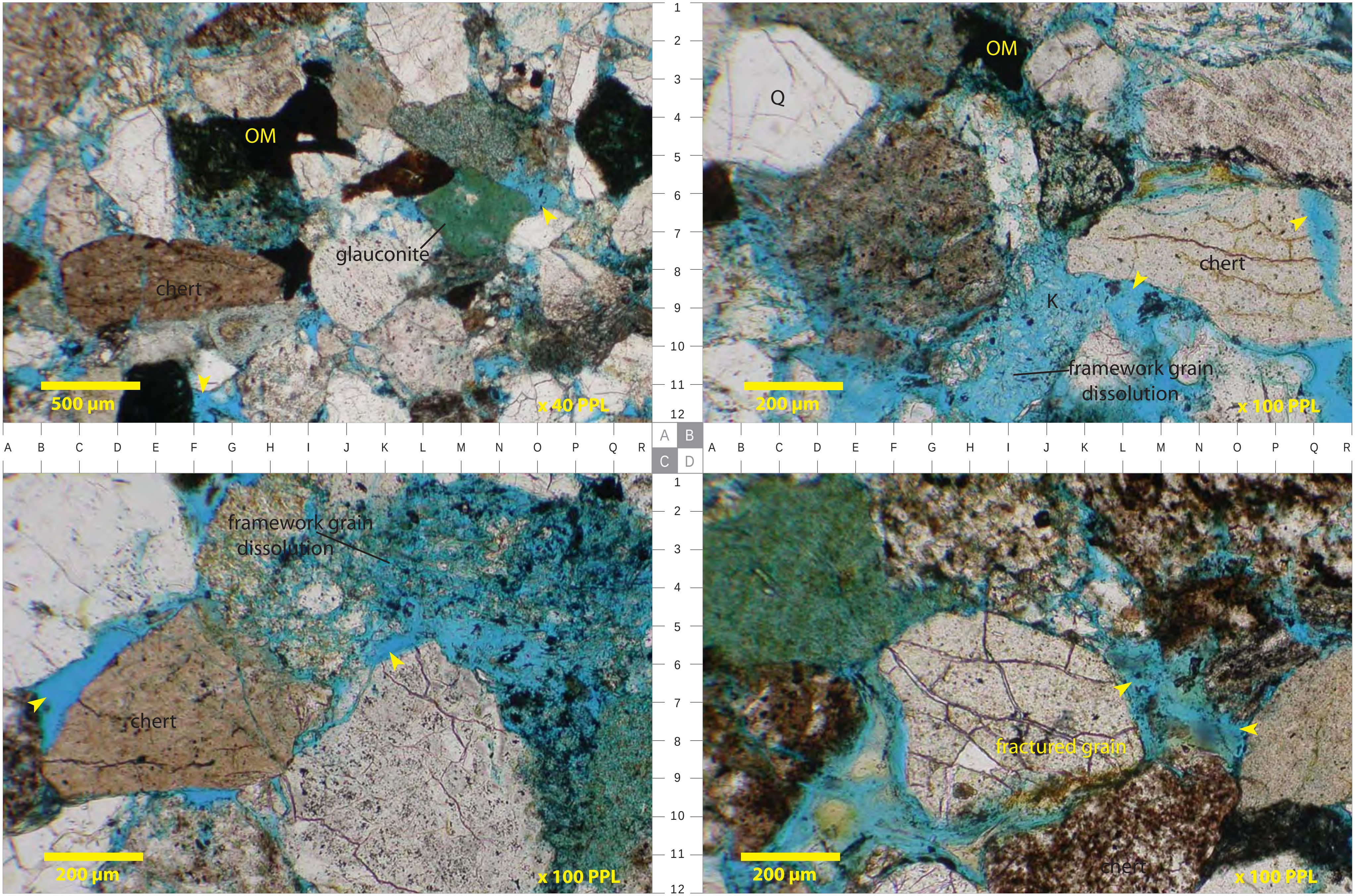
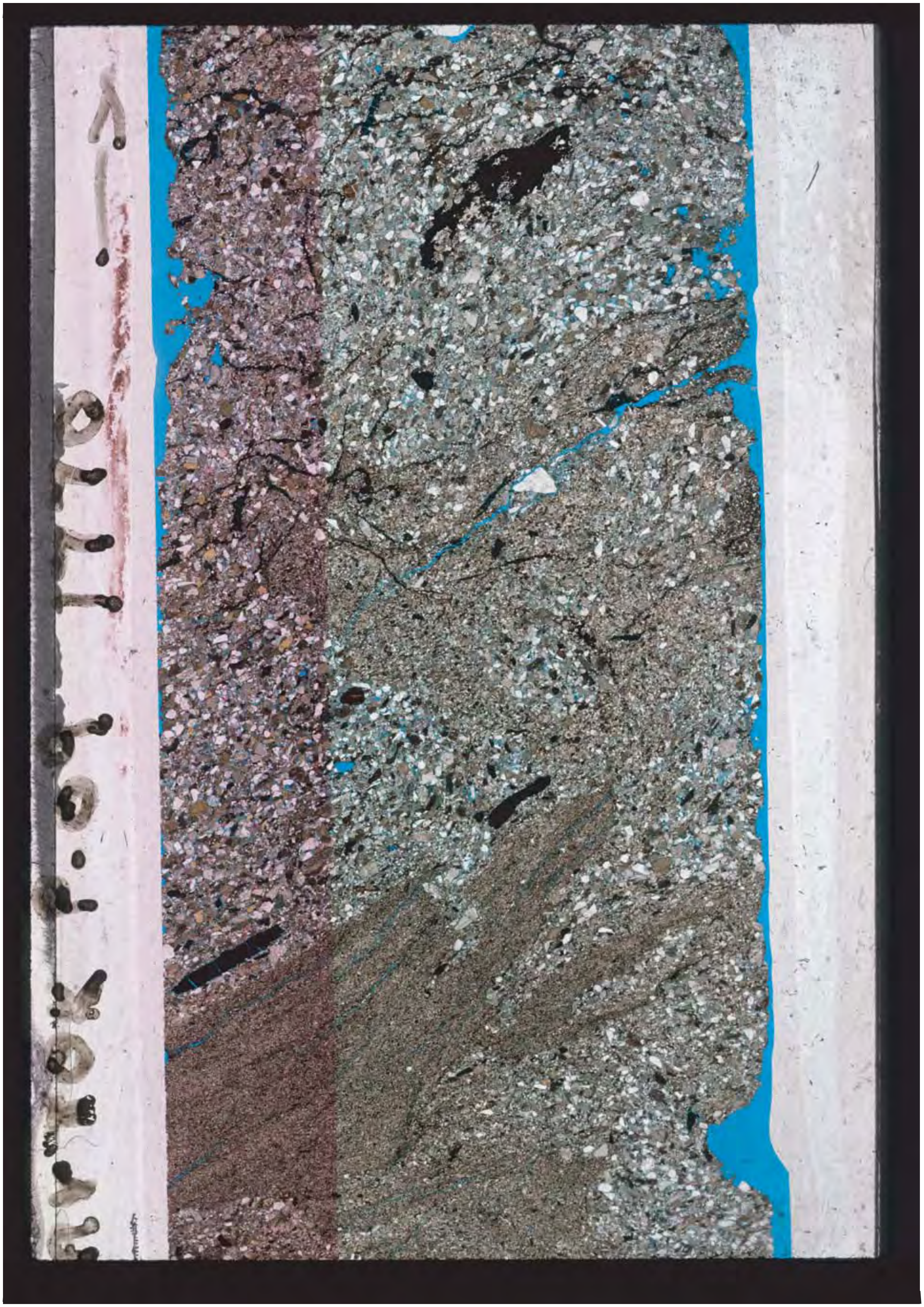


Plate 03a
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Adlartok P-09 1770 meters



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 04

Adlartok P-09
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 1770 meters

The overview of the Aklak Sequence litharenites recovered by core at 1770 meters shows very poorly sorted, silt to granule sized chaotic ?slump features. Textural immaturity has resulted in poorly preserved effective macroporosity (small yellow arrows). Non-ferroan pink stained calcite is the main pore filling authigenic cement. Subangular to subrounded framework components include monocrystalline quartz (Q), chert, yellow stained K-feldspar, micas, organic material (OM) and clay-rich sedimentary grains.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

Adlartok P-09 — 1770 meters

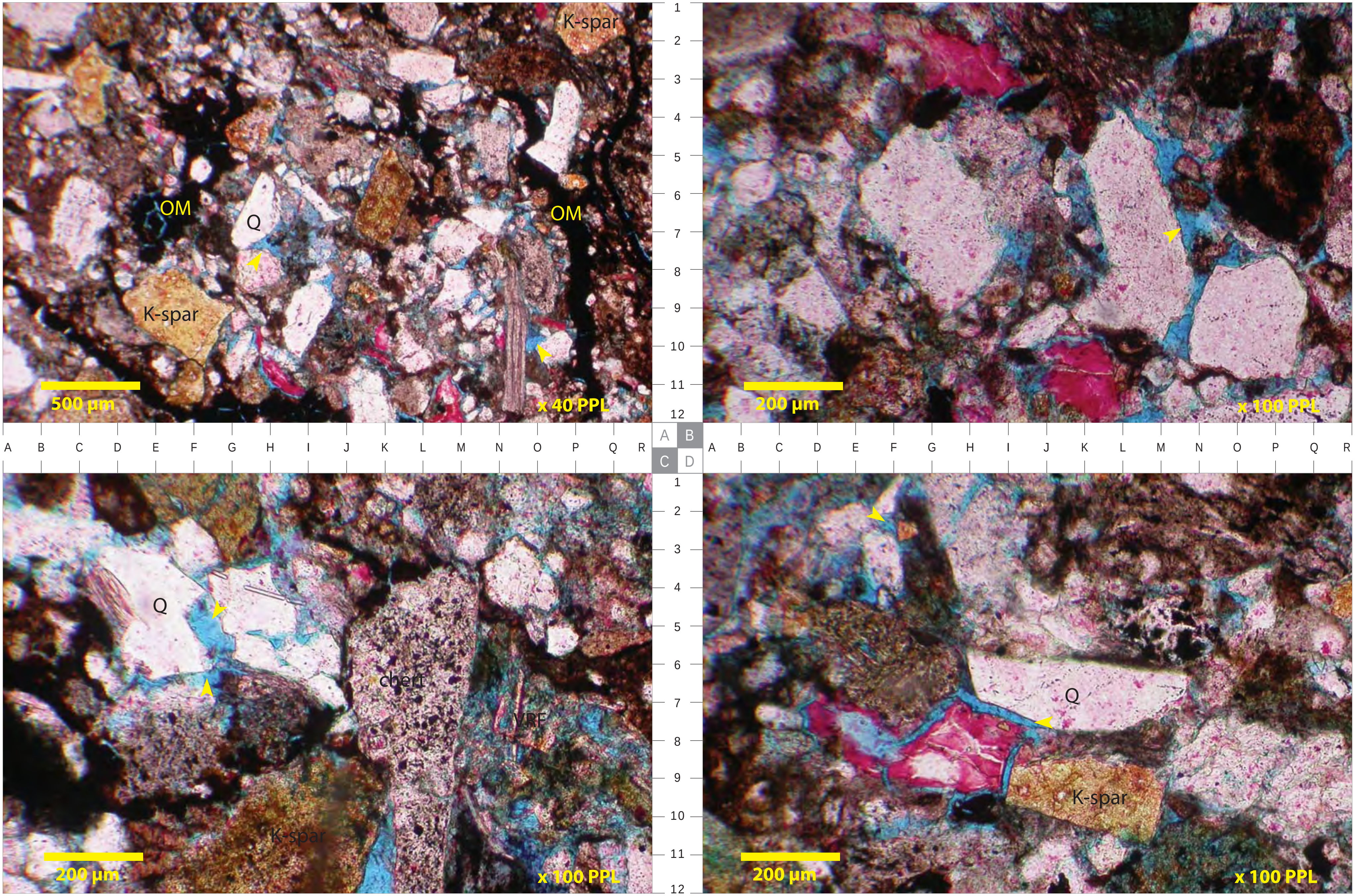


Plate 04
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 05a

Adlartok P-09
Aklak
?Chert Pebble

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 1770.3 meters

Microfractured chert ?pebble with open pores completely to partially filled by microcrystalline quartz and non-ferroan calcite. Note hydrocarbon, in the form of bitumen, highlighted by small red arrows in View A.

Photo A: 20X PPL,   Photo B: 40X PPL,   Photo C: 20X PPL,   Photo D: 20X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Adlartok P-09

1770.3 meters

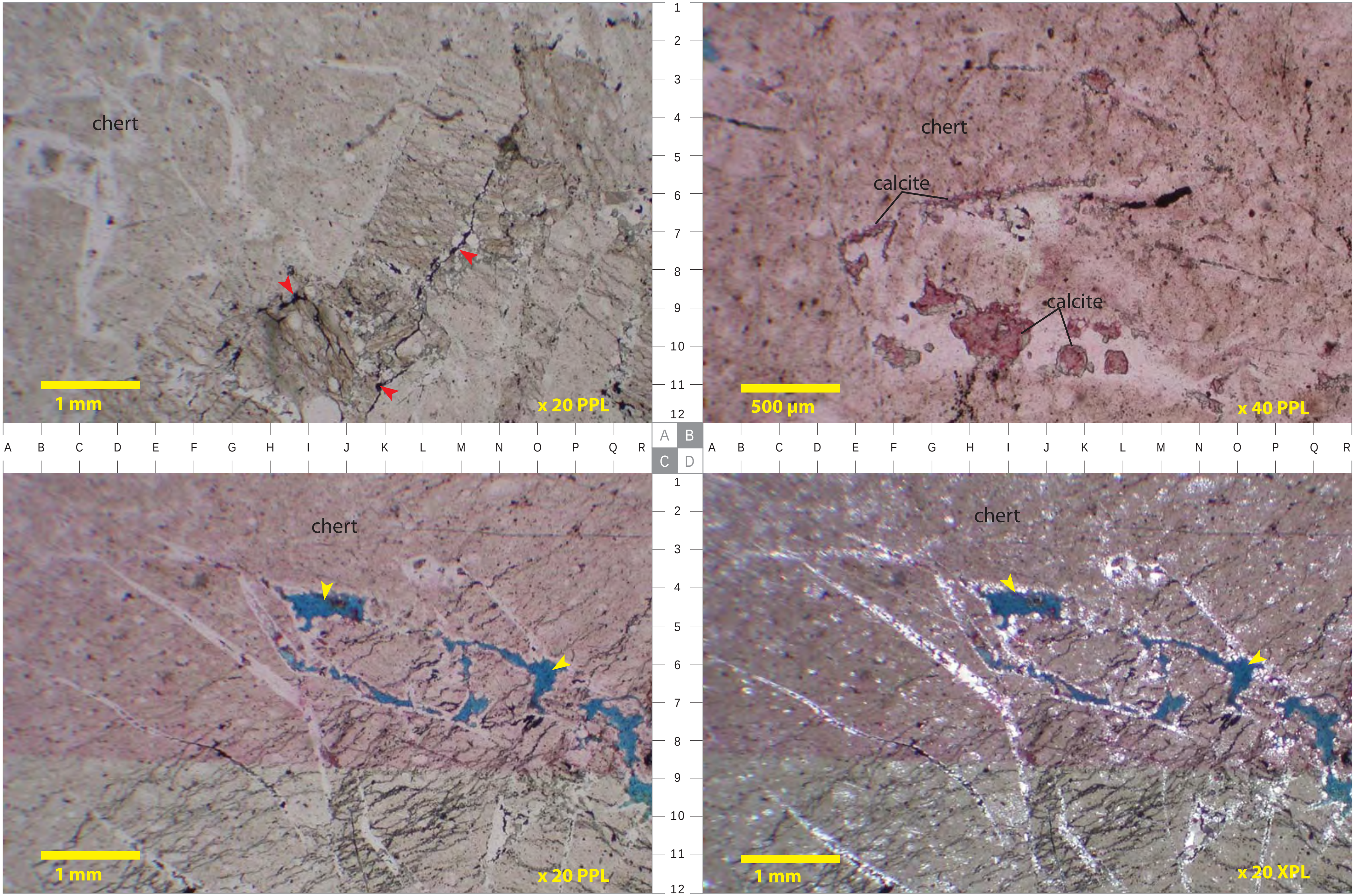


Plate 05a

January 2010

CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Adlartok P-09 1771.5 meters

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 05b

Adlartok P-09
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 1771.5 meters

Well sorted, fine grained porous and permeable litharenites characterize the Aklak sediments recovered from core at 1771.5 meters. Framework grain dissolution of unstable lithoclasts has enhanced the pore system. Tangential with minor concavo-convex grain contacts are prevalent indicating moderate mechanical compaction. Authigenic cements are poorly preserved. Monocrystalline quartz (Q), clay-rich sedimentary grains (CRF), volcanic rock fragments and feldspars are the main framework constituents.

Photo A: 40X PPL, Photo B: 100X PPL, Photo C: 100X PPL, Photo D: 100X PPL

Adlartok P-09

1771.5 meters

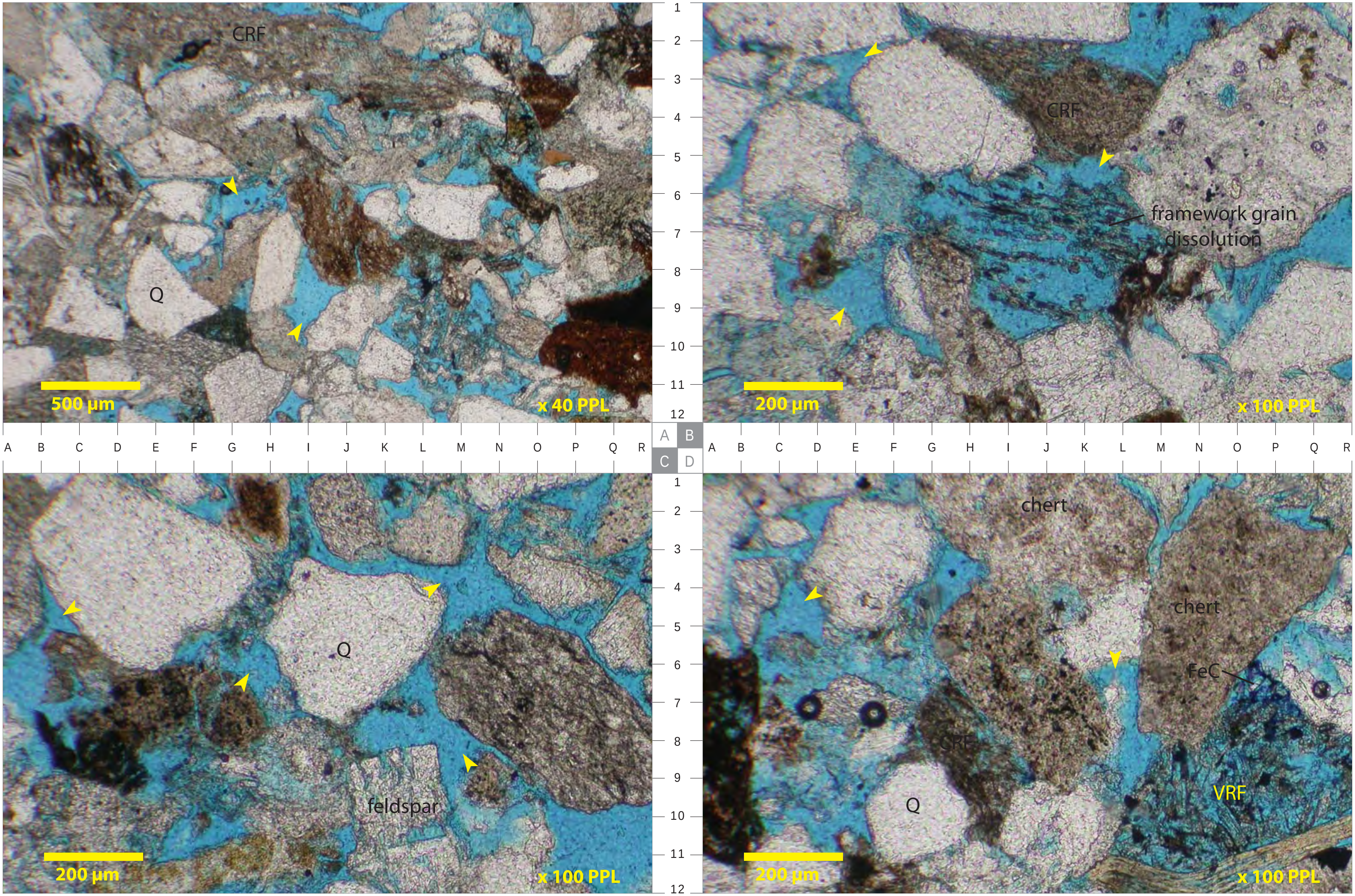


Plate 05b

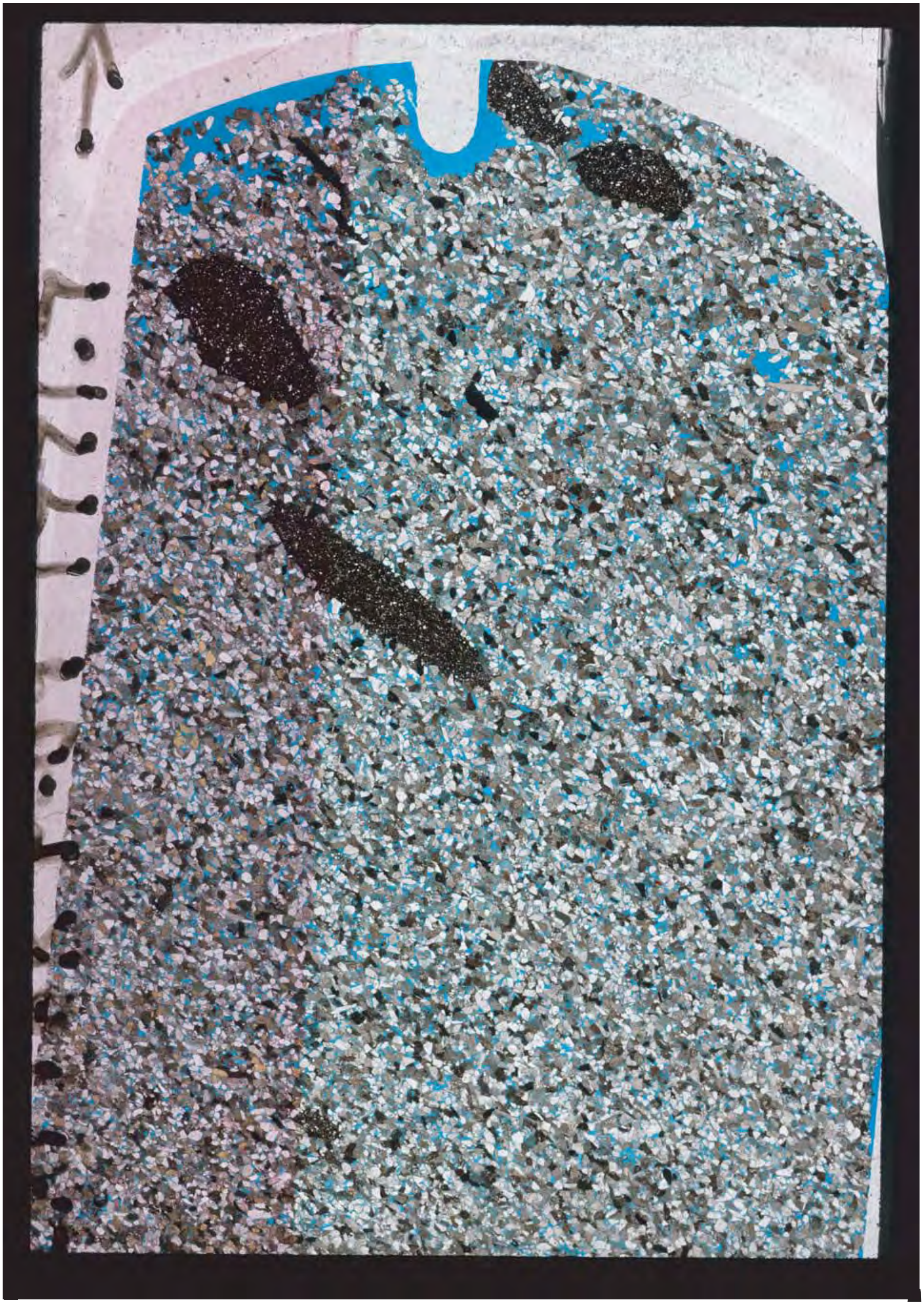
January 2010

CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Adlartok P-09 1771.7 meters



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 06

Adlartok P-09
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 1771.7 meters

Overview of Aklak sandstones taken from core at 1771.7 meters illustrates subrounded granule-sized clay-rich sedimentary clasts floating in a fine grained well sorted sandstone matrix. The granule-sized clay clasts are similar in composition to the clay lithoclasts found at 1764.44 meters, Monocrystalline quartz (Q), chert, clay-rich sedimentary grains (CRF), yellow stained K-feldspar and pink stained calcic plagioclase (View C, J:10) are the main framework constituents. Rare pink stained calcite is found as pore fill (View B, I:8). Dissolution of unstable feldspars has enhanced the effective (small yellow arrows) macropore system.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Adlartok P-09

1771.7 meters

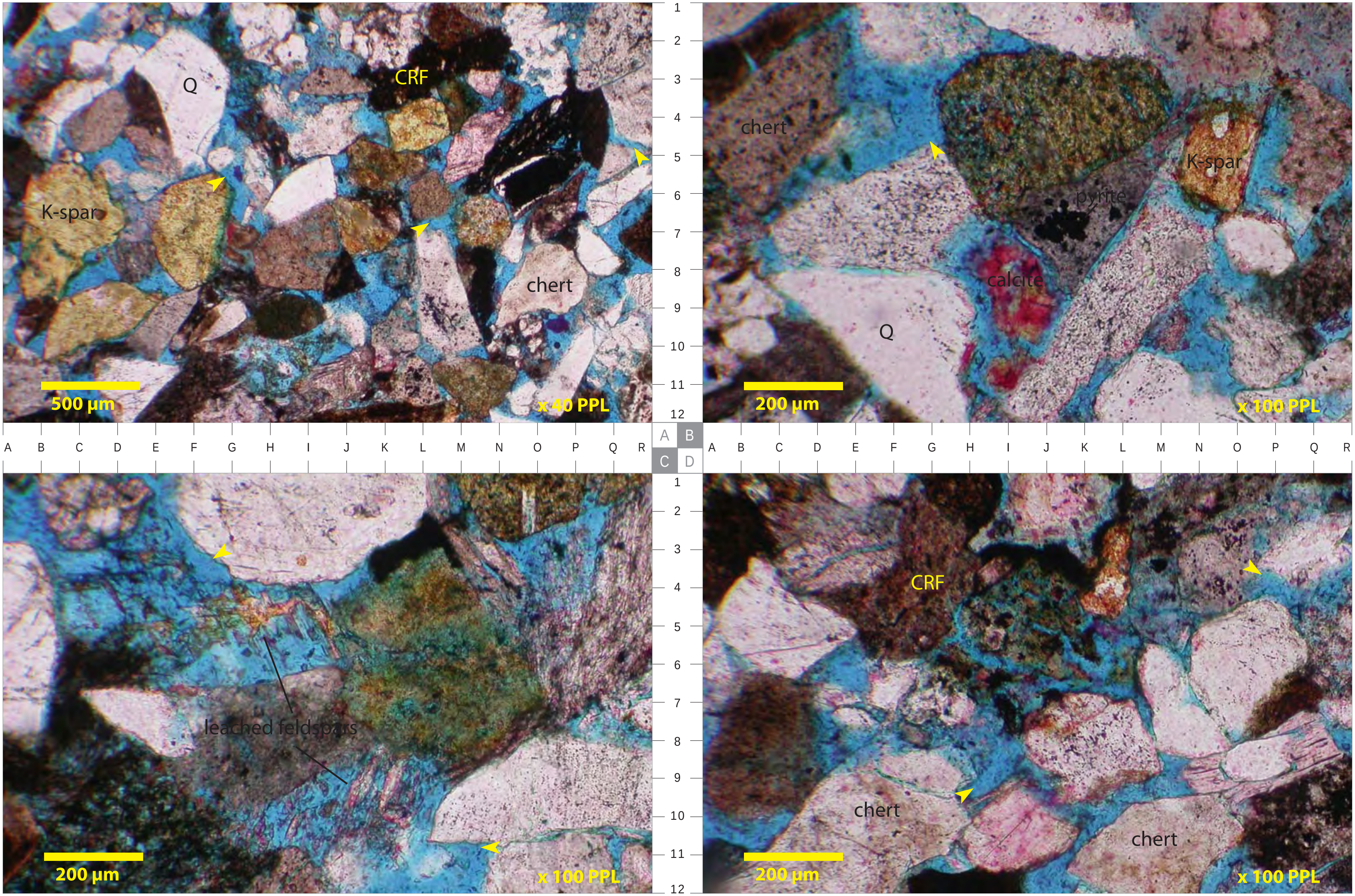


Plate 06

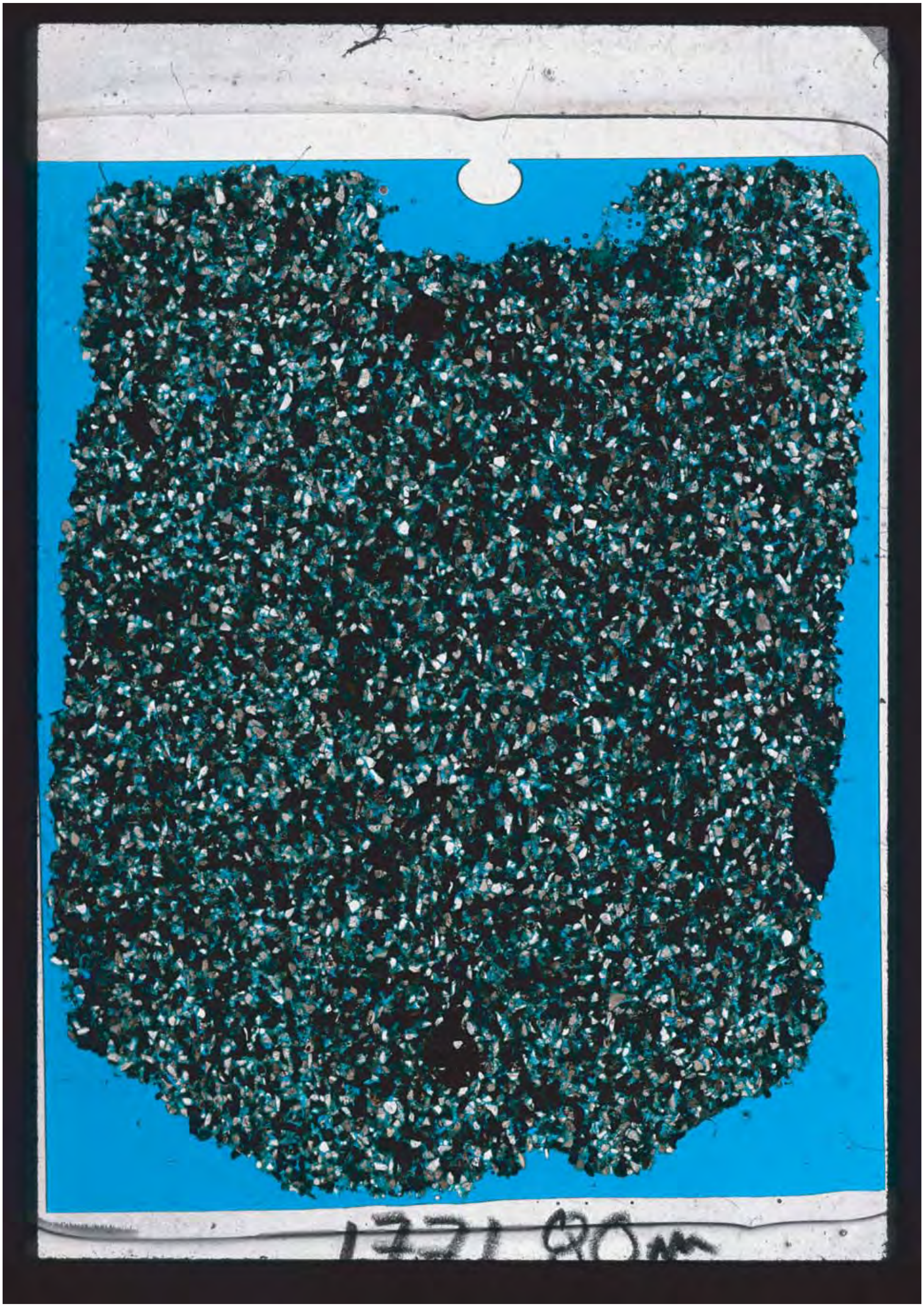
January 2010

CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Adlartok P-09 1771.8 meters



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Adlartok P-09

1771.99 meters

Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 07

Adlartok P-09
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 1771.99 meters

Trace to minor unevenly distributed pink stained non-ferroan calcite is the main pore occluding authigenic cement in this well sorted, fine grained litharenite. Grain contacts are concavo-convex and tangential indicating moderate mechanical compaction of ductile clasts between more competent grains. Dissolution of the calcite cement (View C, J:11) and feldspathic grains has enhanced the effective pore system. Monocrystalline quartz (Q), chert, clay-rich sedimentary grains (CRF) are the dominant framework constituents. Loosely packed kaolinite clays (View D, “K”) are found in trace amounts.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Adlartok P-09 | 1771.99 meters

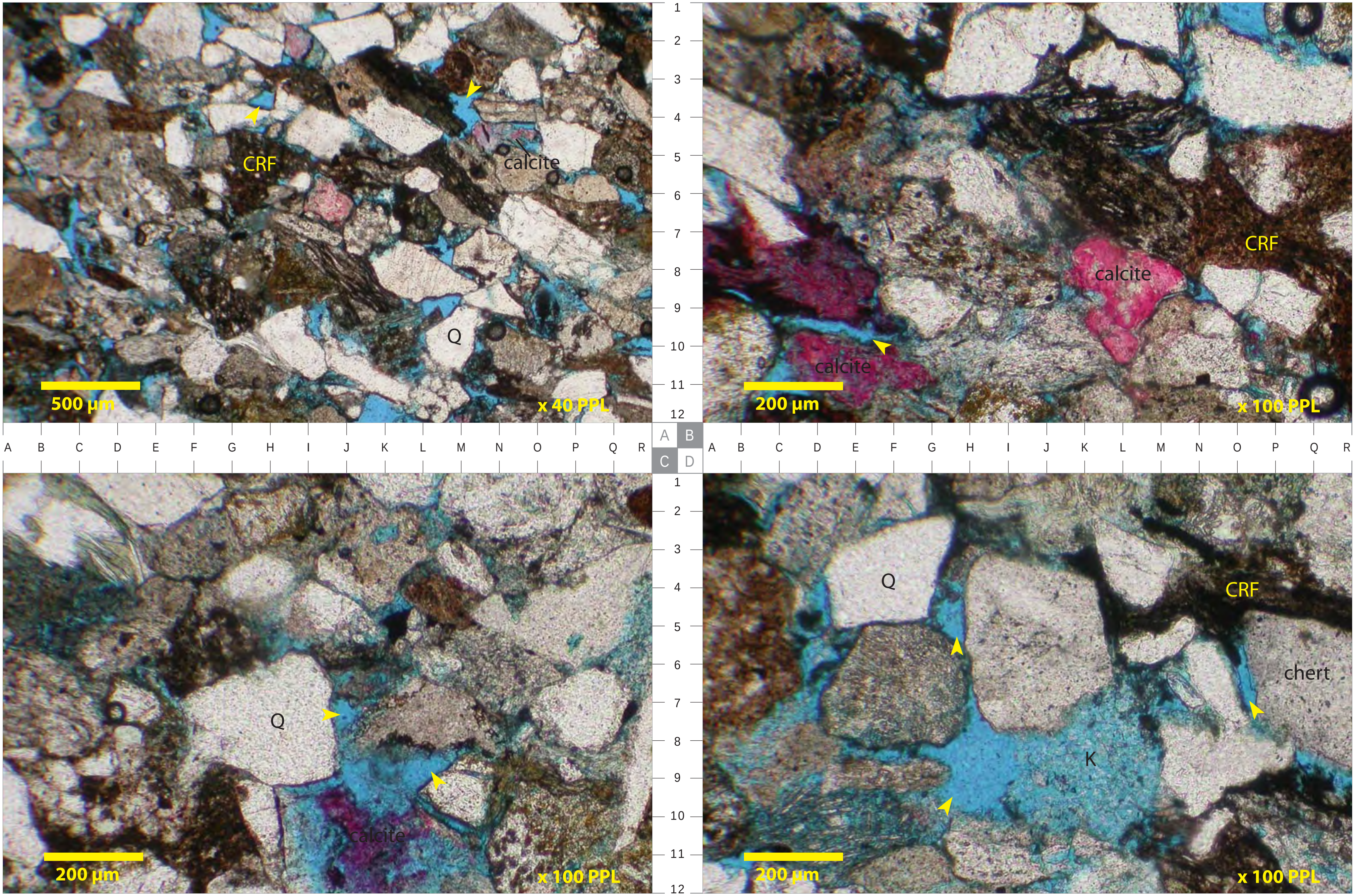
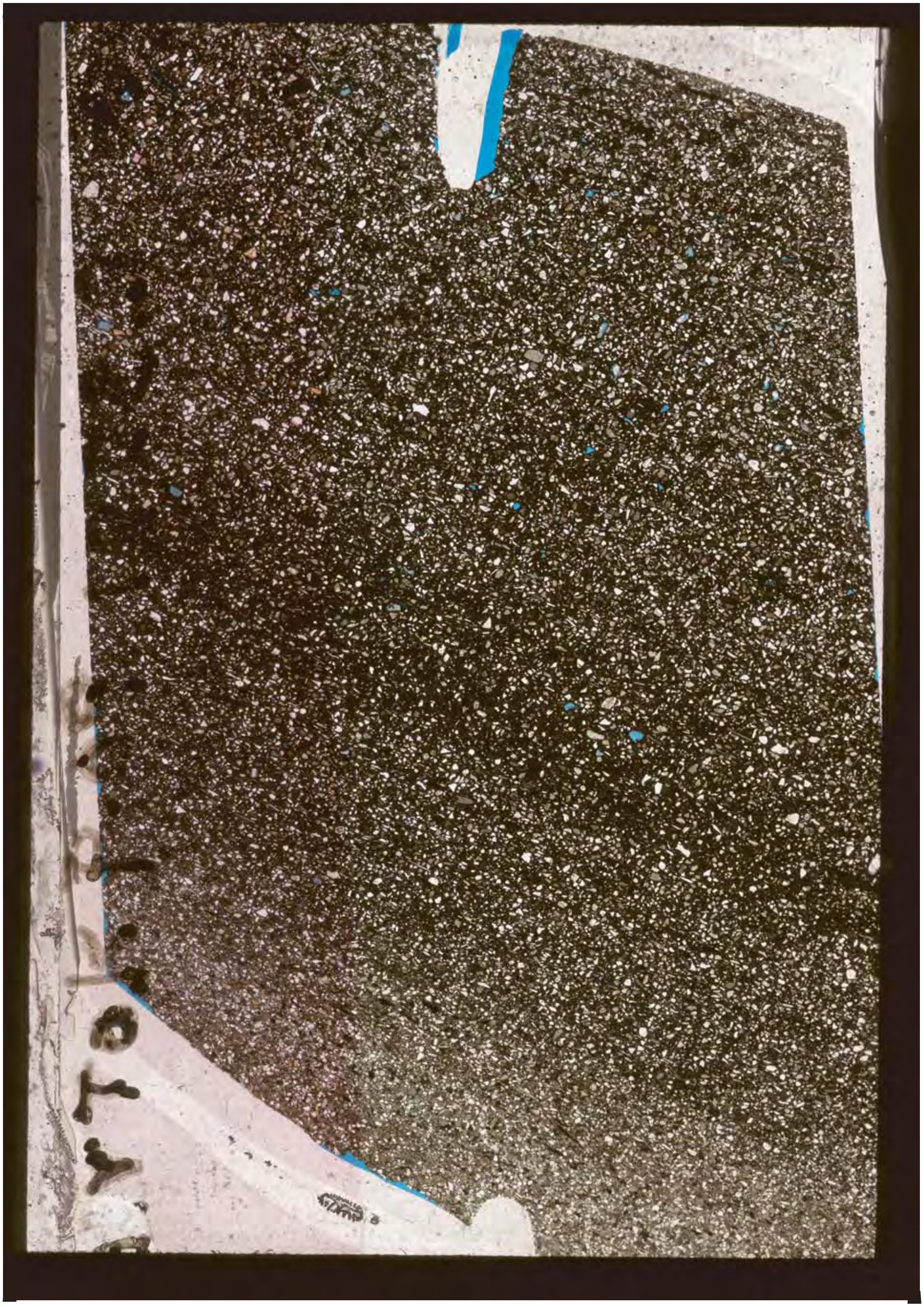


Plate 07
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Adlartok P-09 1772.3 meters



2 mm

Aklak

CMH 2010-01

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 08

Adlartok P-09
Aklak
Sandy Shale

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 1772.3 meters

Core recovered at 1772.3 meters consists of common angular silt to sand-sized clasts scattered in sideritized matrix clays. Effective macroporosity (small yellow arrows) is very poorly developed and isolated, associated with the dissolution of carbonate and unstable sand grains.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Adlartok P-09 1772.3 meters

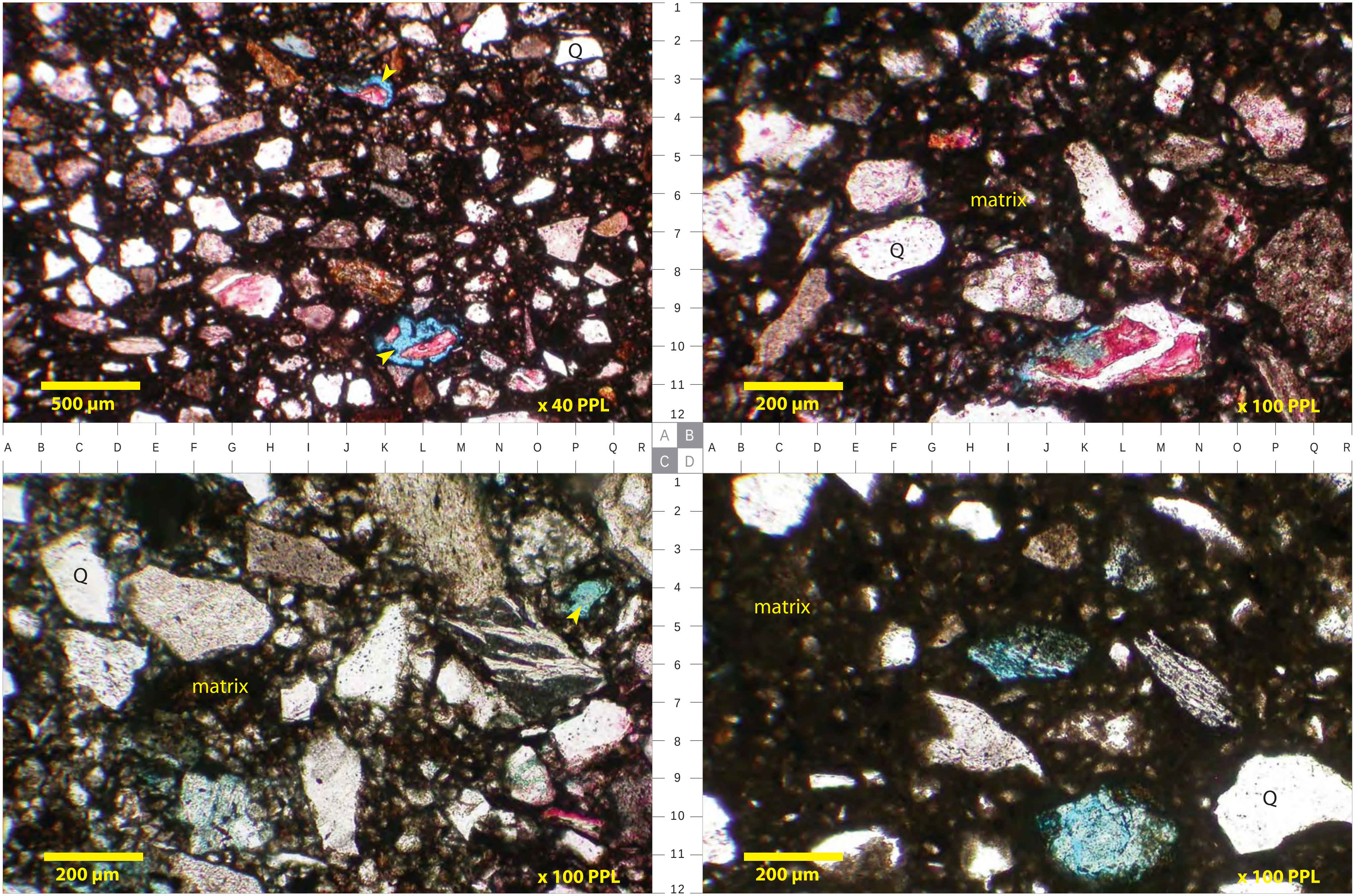
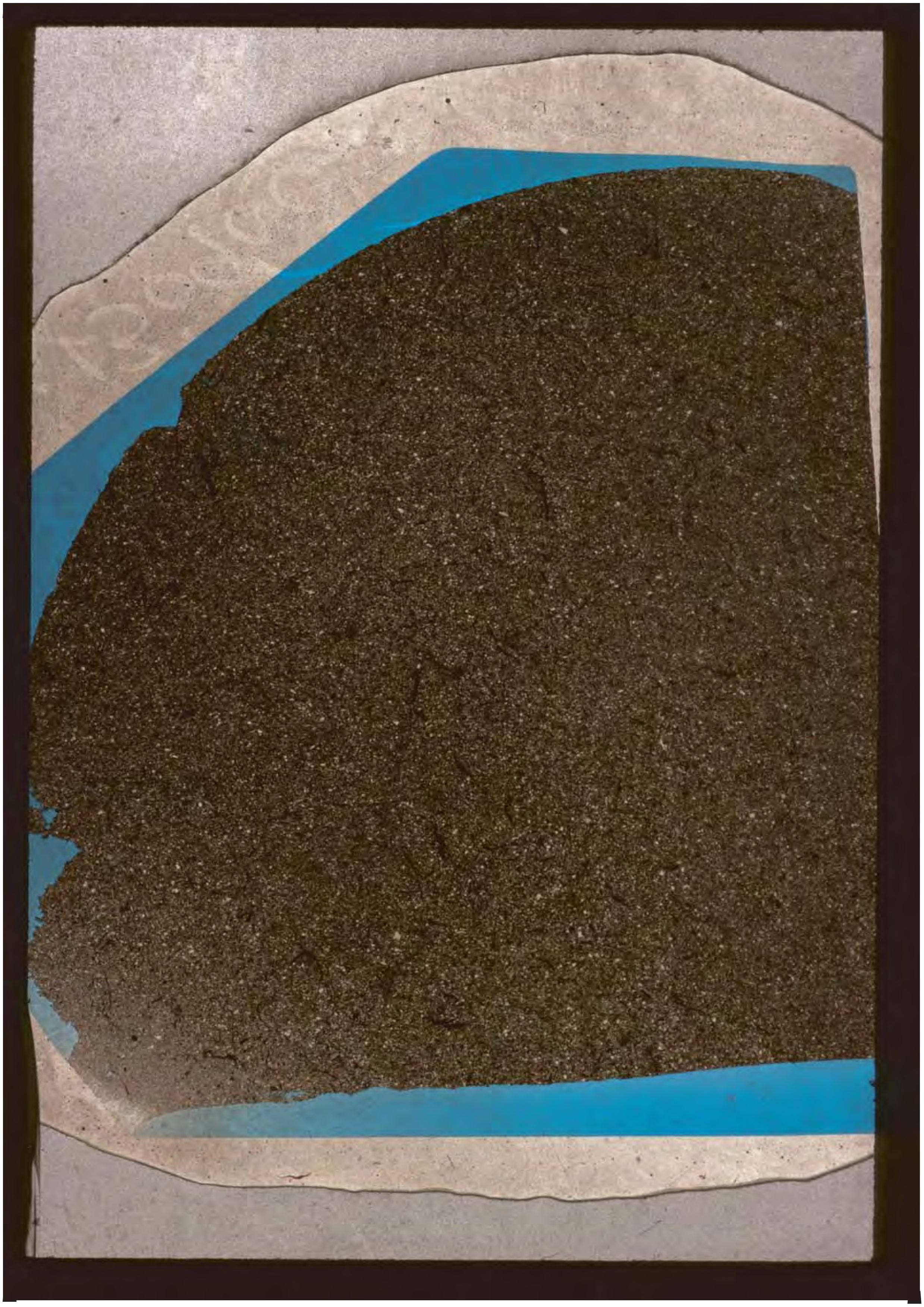


Plate 08
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Adlartok P-09 1775.98 meters

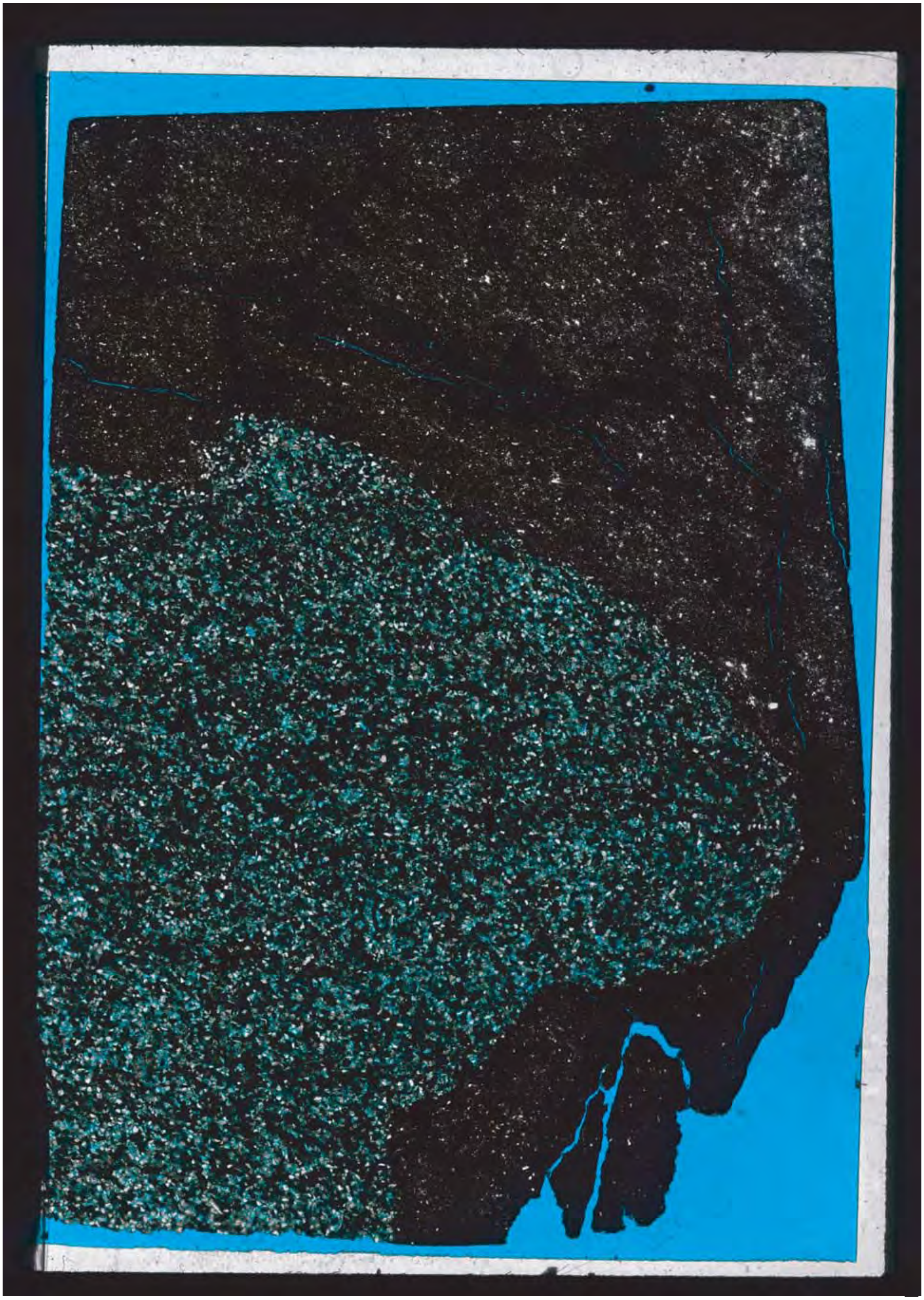


Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Adlartok P-09 1777.70 meters



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Adlartok P-09 1780.74 meters

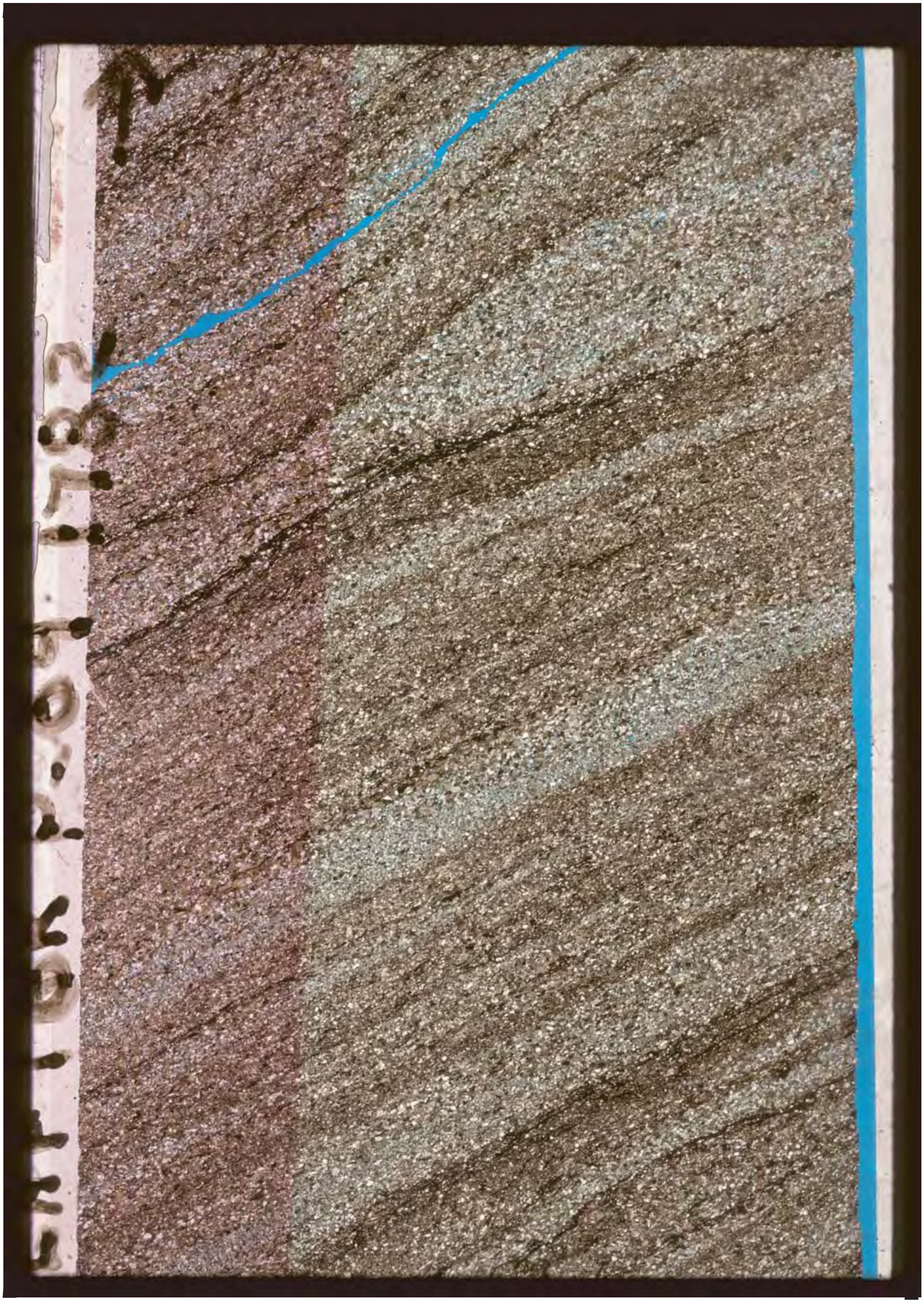
2 mm

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Adlartok P-09 1782 meters



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Thin Section Photomicrograph Descriptions – Plate 09

Adlartok P-09
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 1782 meters

Well sorted, laminated, silt to very fine grained litharenites are recognized from core taken at 1782 meters. Authigenic cements are rare consisting of patchily distributed pink stained non-ferroan calcite cement. Dissolution of the carbonate cement has enhanced the effective pore system (small yellow arrows). Monocrystalline quartz (Q), organic material (OM) and yellow stained K-feldspar are some of the framework grains.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Adlartok P-09 — 1782 meters

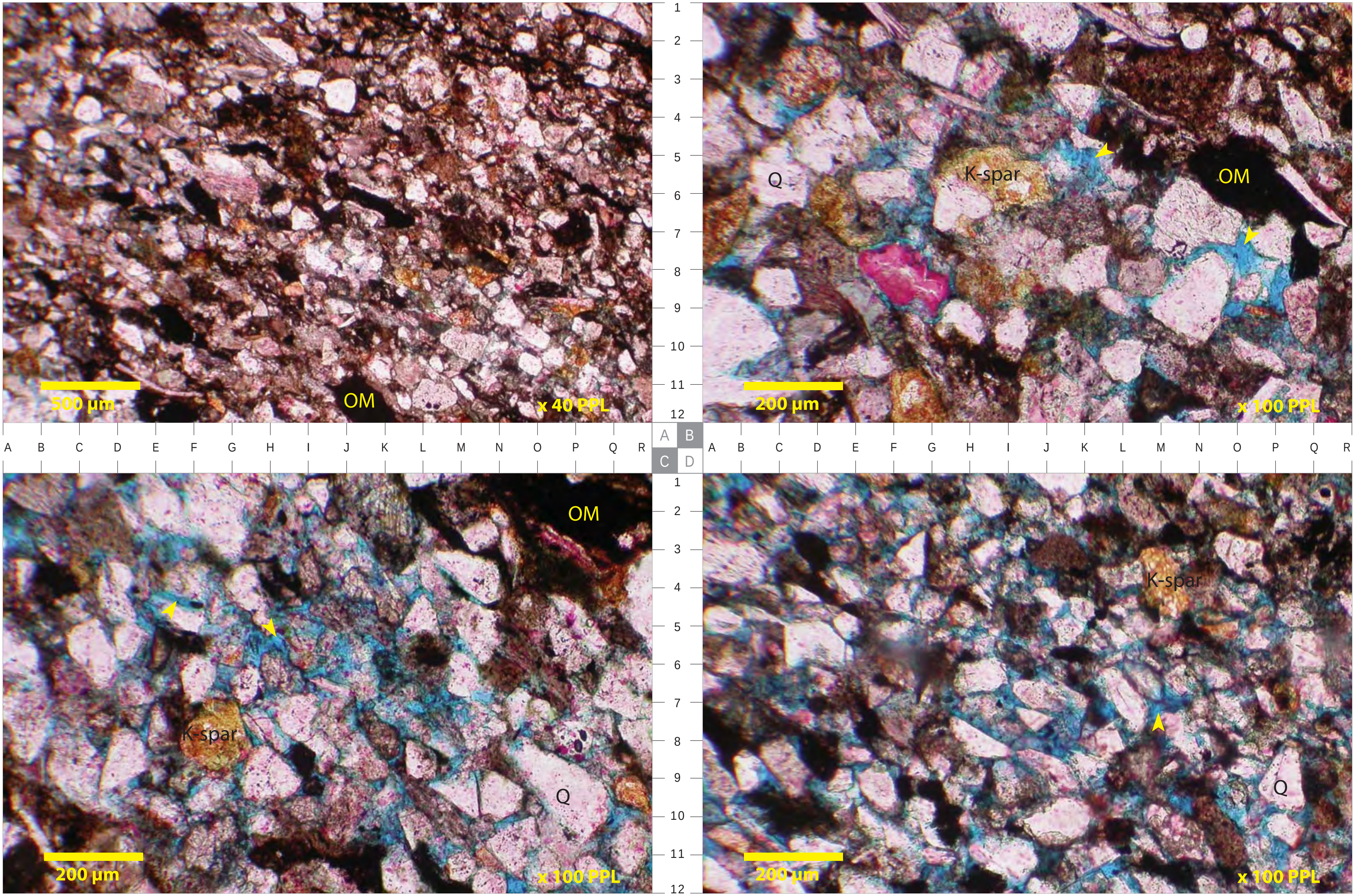


Plate 09
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Adlartok P-09 1784.5 meters

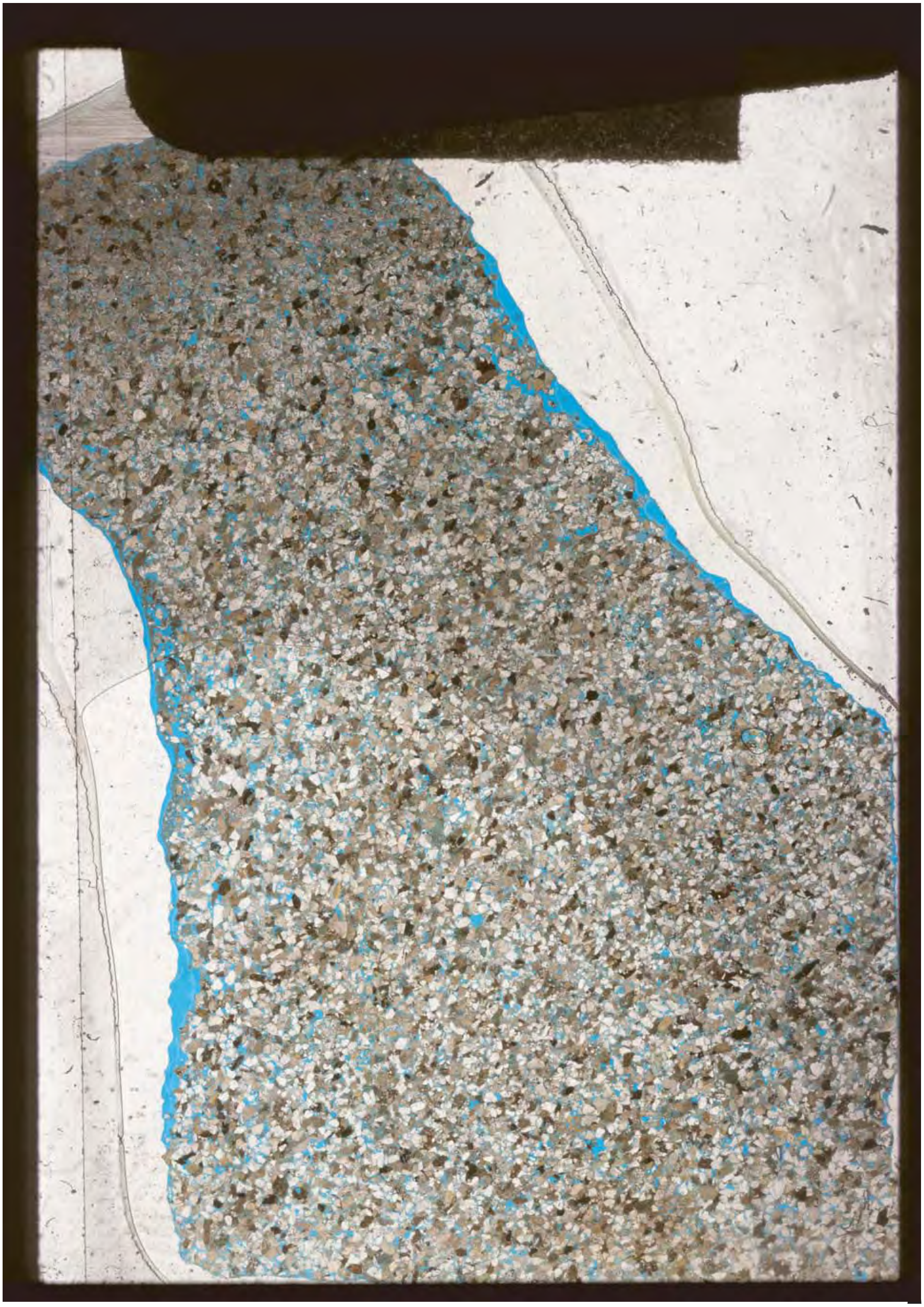
Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Adlartok P-09 1869.5 meters



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 10

Adlartok P-09
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 1869.5 meters

Porous, well sorted, fine to medium grained litharenites are recognized from core taken at 1869.5 meters. Authigenic cements are poorly preserved in this interval. Grain contacts are mainly tangential. Dissolution of unstable feldspathic grains (View B, L:7) has enhanced the effective pore system (small yellow arrows). Monocrystalline quartz (Q), chert, polycrystalline quartz, yellow stained K-feldspar, volcanic rock fragments and clay-rich sedimentary grains are the main framework constituents.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X XPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Adlartok P-09

1869.5 meters

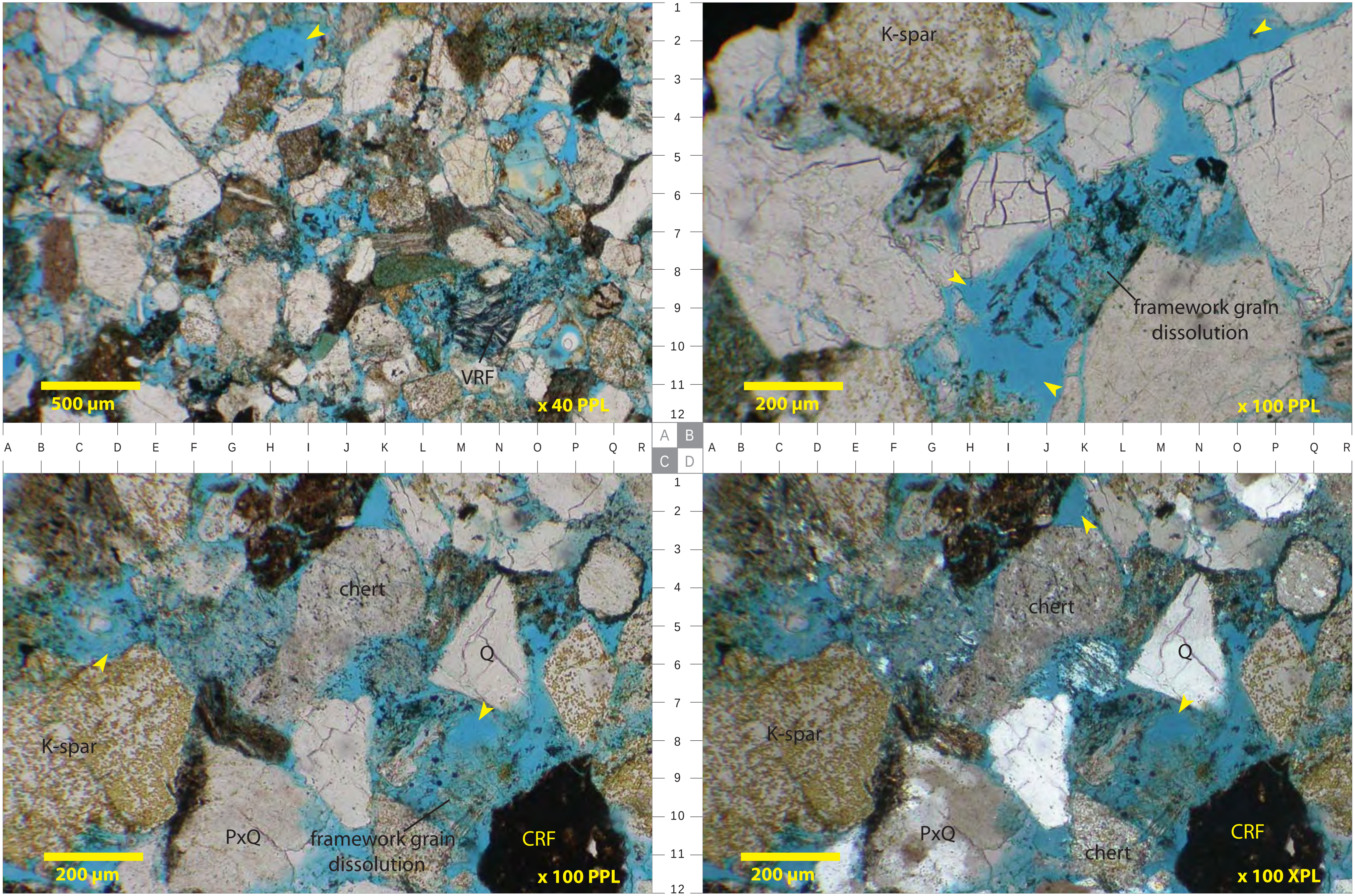


Plate 10

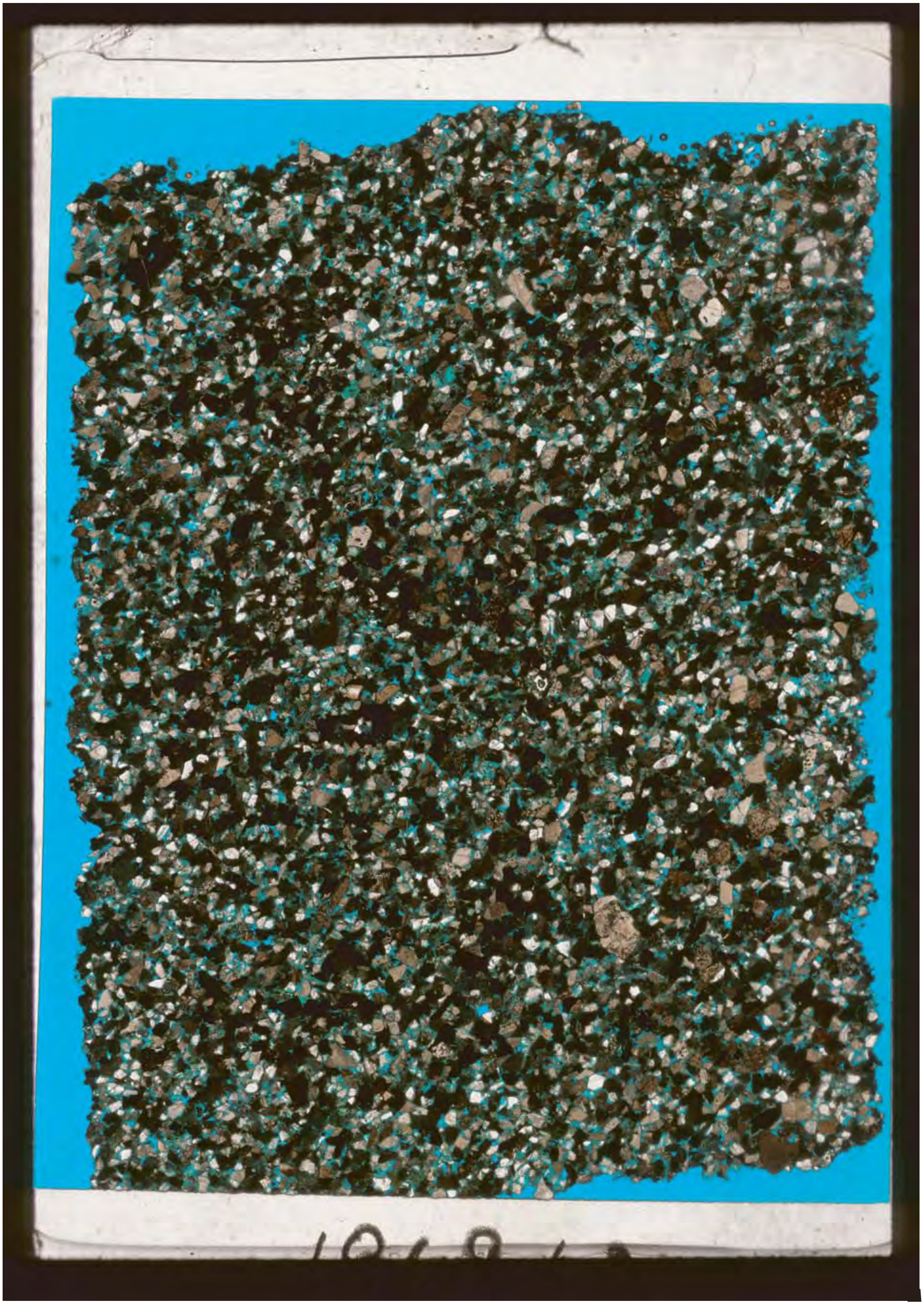
January 2010

CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Adlartok P-09 1869.6 meters



2 mm

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 11

Adlartok P-09
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 1869.6 meters

Overview of Aklak Sequence core taken at 1869.6 meters shows a moderately sorted, porous medium to coarse grained litharenite. Organic material (OM) is abundant with common chert and monocrystalline quartz (Q) grains. Authigenic cements are poorly preserved in this interval. Effective macroporosity (small yellow arrows) is well developed.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Adlartok P-09 **1869.6 meters**

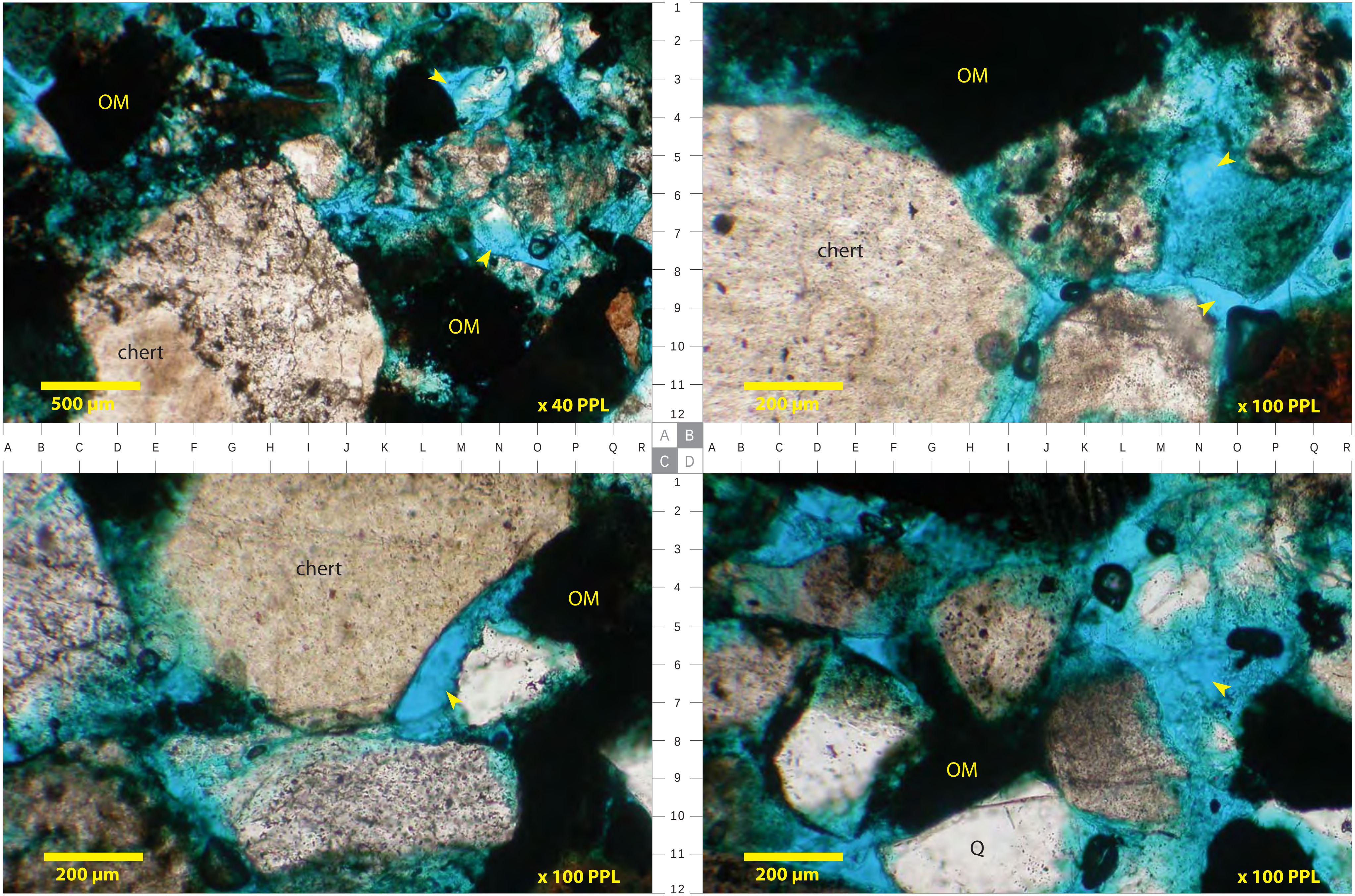


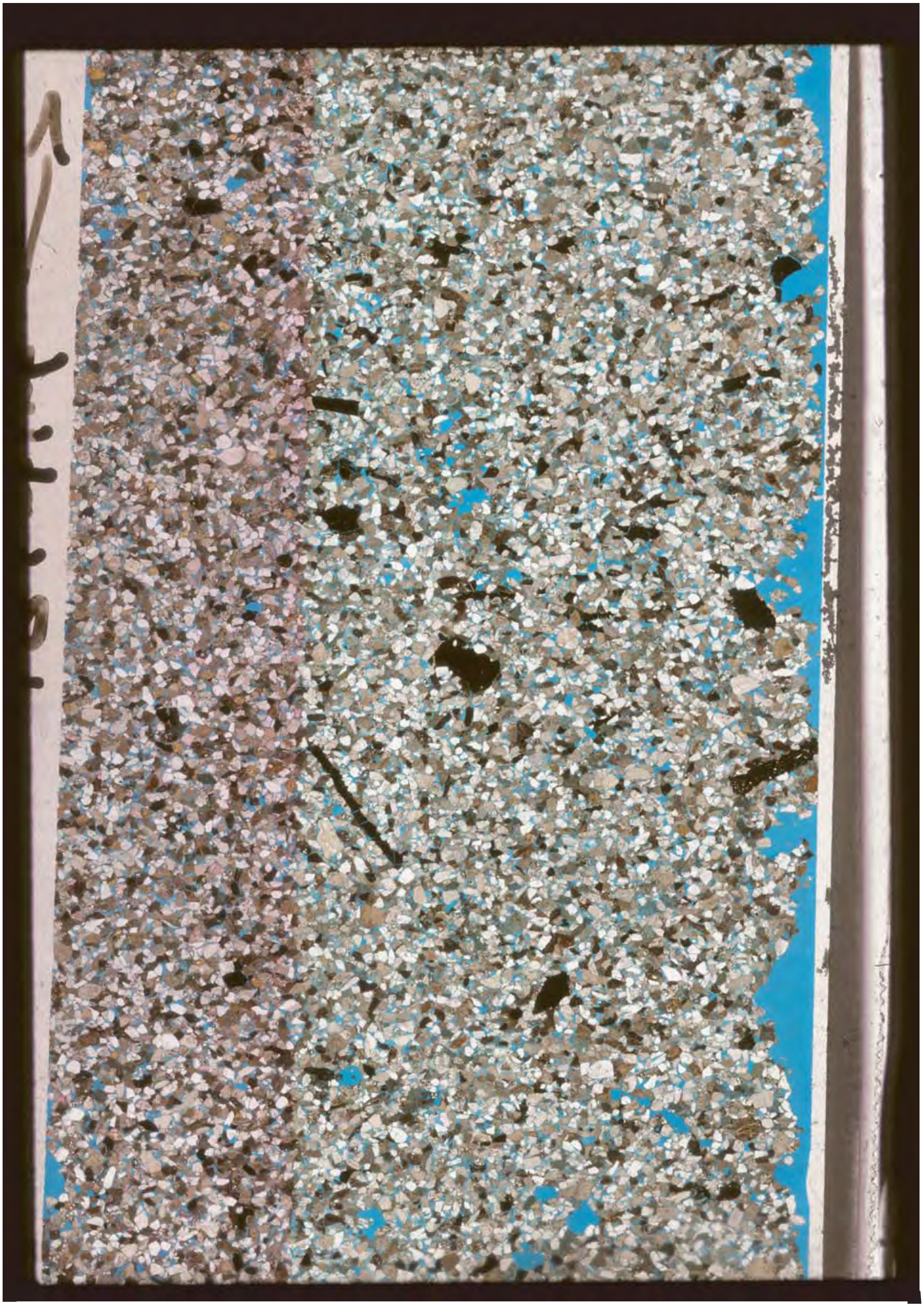
Plate 11
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Adlartok P-09

1874.4 meters



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 12

Adlartok P-09
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 1874.4 meters

Moderately sorted, fine to coarse grained porous and permeable litharenites represent the Aklak Sequence retrieved from core at 1874.4 meters. Dissolution of unstable feldspathic grains has enhanced the effective pore system (small yellow arrows). Grain contacts are mainly tangential in this interval suggesting slightly moderate mechanical compaction. Pink stained grains (View A, K:9) suggest a calcic plagioclase composition.

Photo A: 40X PPL,   Photo B: 100X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

Adlartok P-09

1874.4 meters

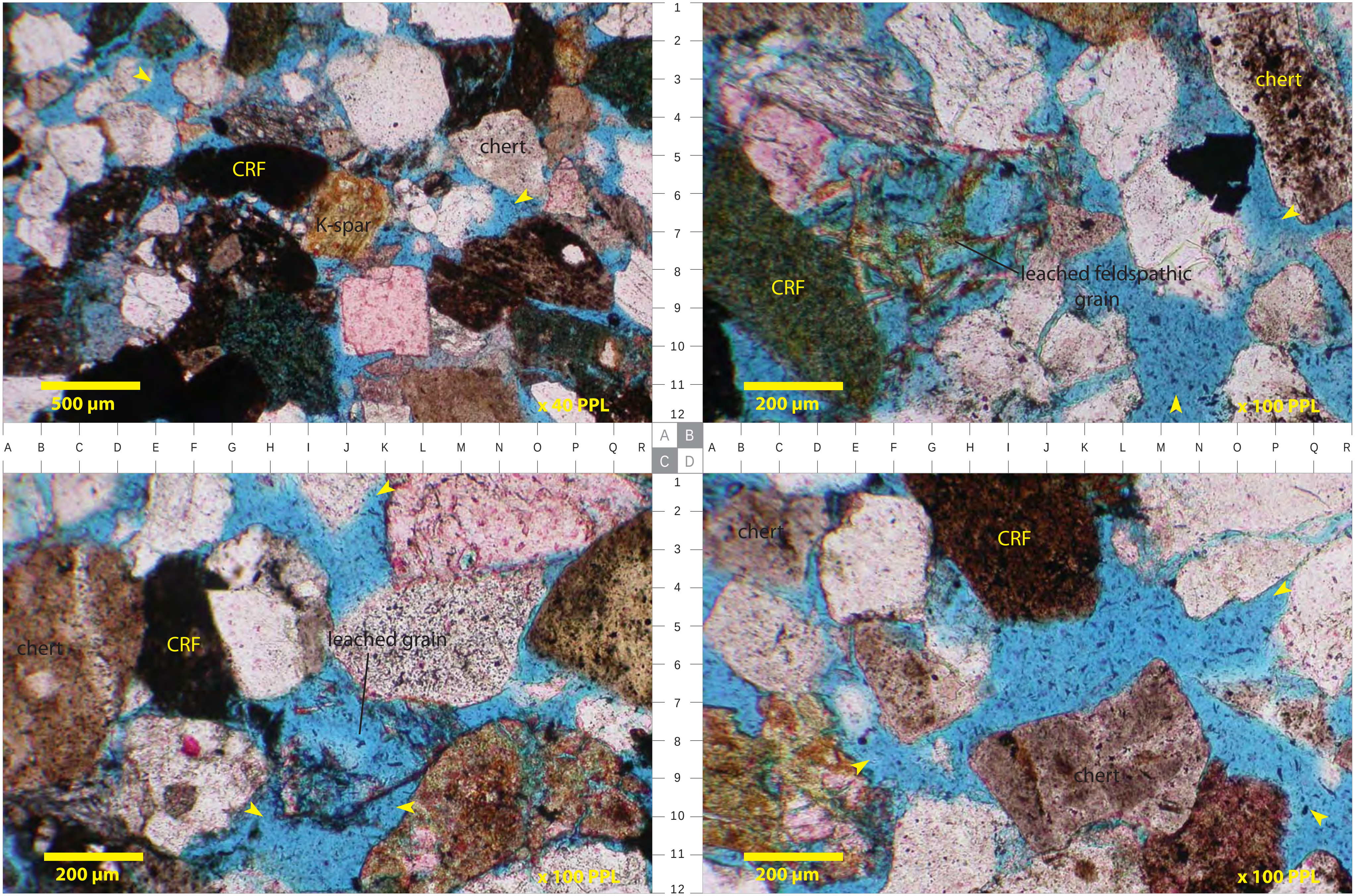
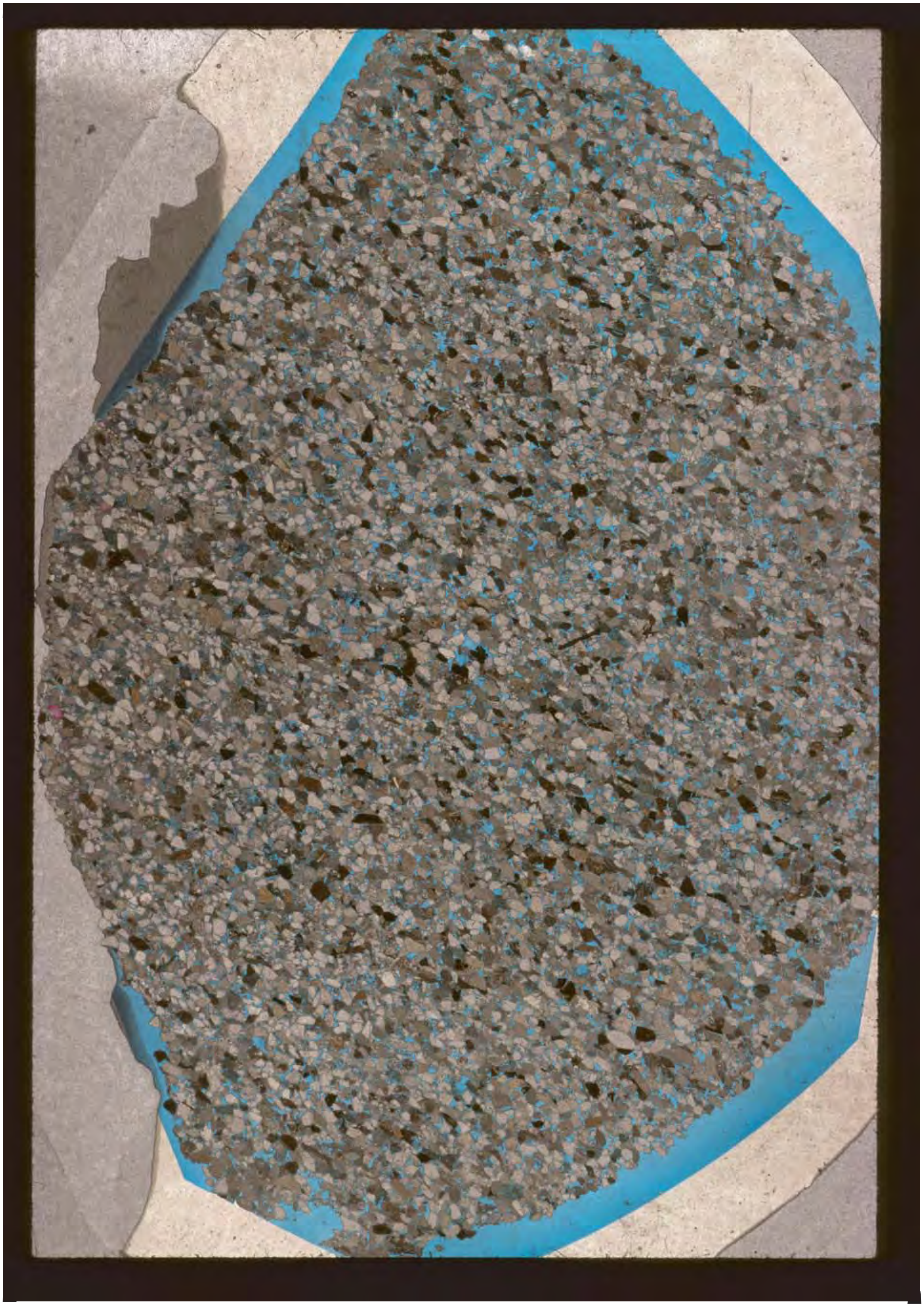


Plate 12
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Adlartok P-09 1875.69 meters



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 13

Adlartok P-09
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 1875.69 meters

Porous and permeable well sorted, medium to coarse grained litharenites are recognized from core recovered at 1875.69 meters. Loosely packed kaolinite clays are found in minor volumes (View B, “K”). Dissolution of framework grains (View D) has enhanced the effective pore system (small yellow arrows). Framework grains include chert, monocrystalline quartz (Q) and clay-rich sedimentary grains (CRF). Grain contacts are mainly tangential.

Photo A: 40X PPL, Photo B: 100X PPL, Photo C: 100X PPL, Photo D: 100X PPL

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Adlartok P-09 | 1875.69 meters

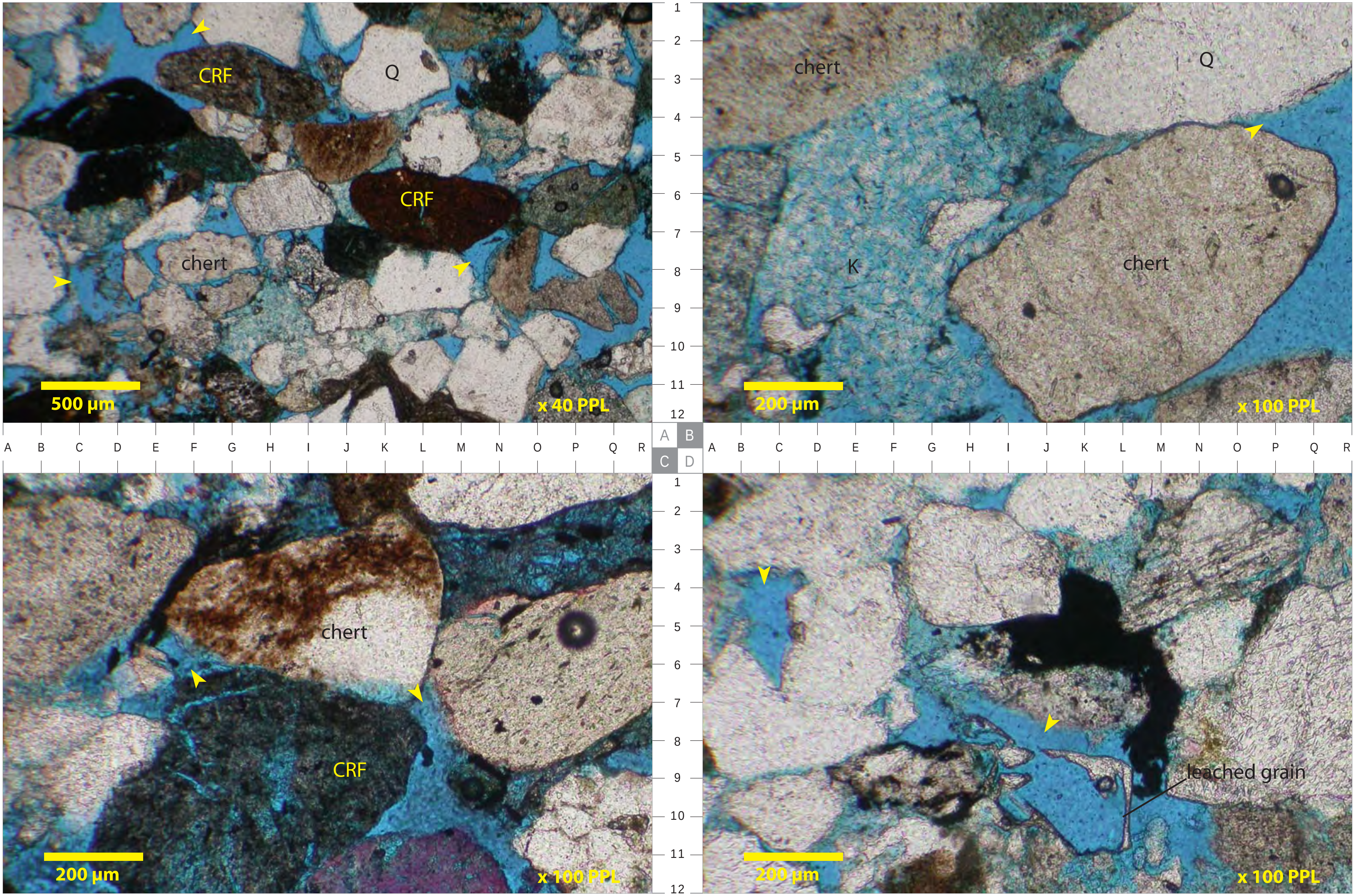


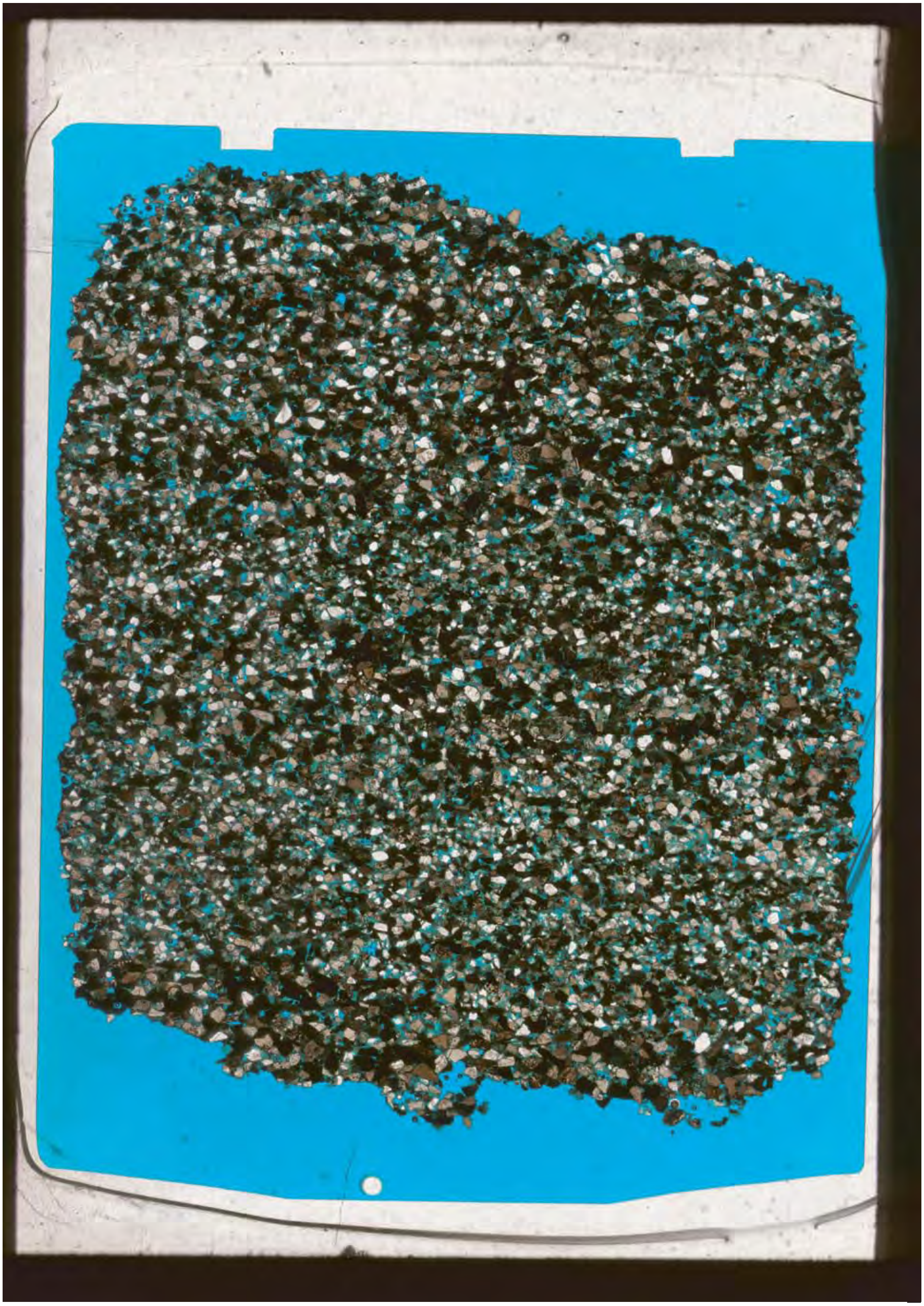
Plate 13
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Adlartok P-09

1875.70 meters



Aklak

2 mm

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 14

Adlartok P-09
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 1875.7 meters

Well sorted, medium grained litharenites rich in organic material (OM) characterize the sandstones recovered at 1875.7 meters. Grain contacts are mainly tangential. Effective macropores (small yellow arrows) are isolated. Framework constituents include organic-material (OM), monocrystalline quartz (Q) and trace phosphatic (fish debris) grains (View A).

Photo A: 40X PPL,   Photo B: 40X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

Adlartok P-09 **1875.7 meters**

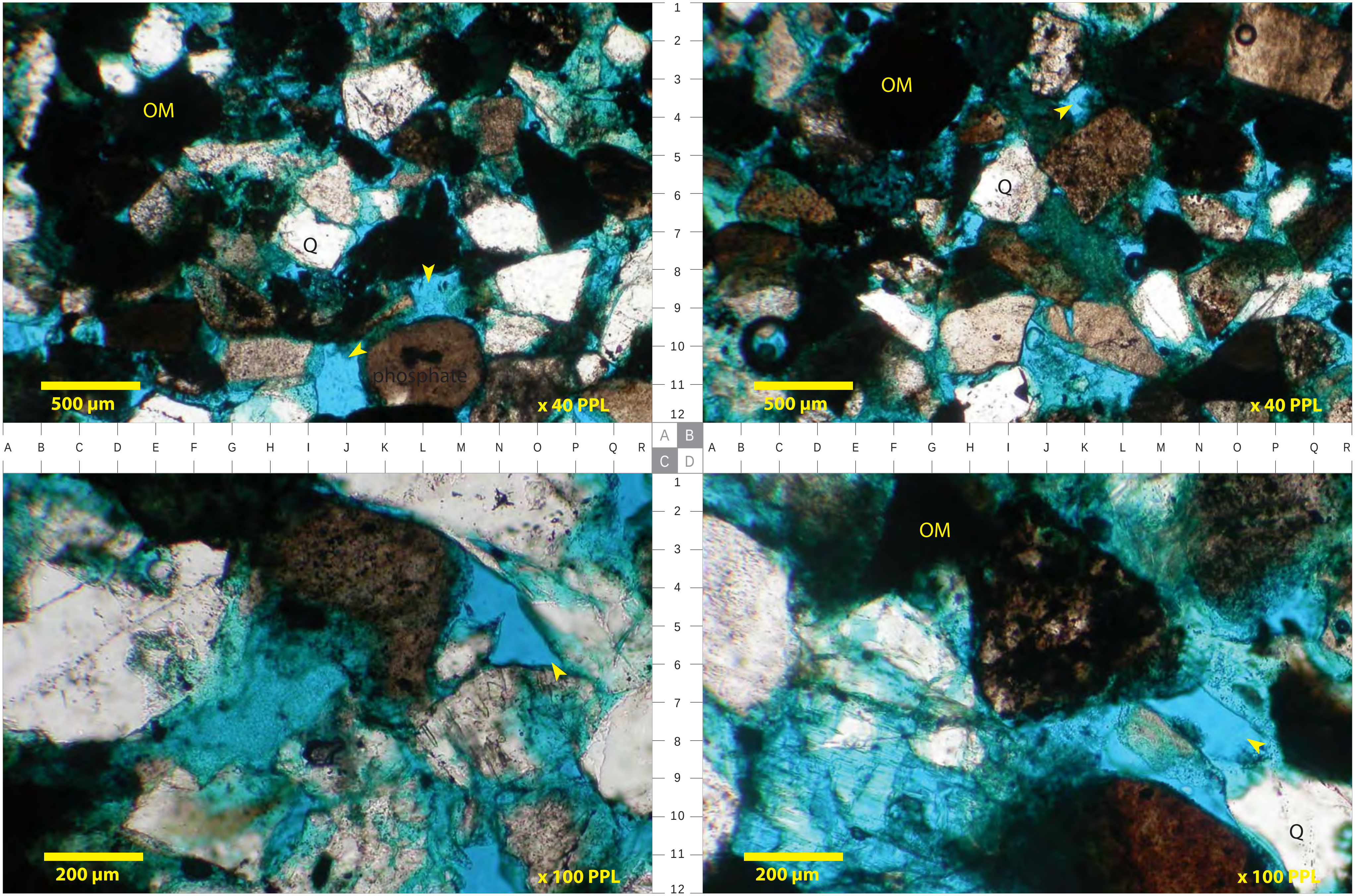


Plate 14
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

Adlartok P-09 1875.84 meters

2 mm

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca

CMH 2010-01

Thin Section Photomicrograph Descriptions – Plate 15

Adlartok P-09
Aklak
Litharenite

Core Analysis Porosity: na Core Analysis Permeability: na

Depth: 1875.84 meters

Moderately sorted, fine to medium grained litharenites are recognized from core recovered at 1875.84 meters. Effective macroporosity (small yellow arrows) is well developed. Authigenic cements are poorly preserved. Rare kaolinite clays are loosely precipitated within open pores (View B, “K”). Dissolution of feldspars (View D) has enhanced the pore system.

Photo A: 40X PPL,   Photo B: 40X PPL,   Photo C: 100X PPL,   Photo D: 100X PPL

Adlartok P-09 **1875.84 meters**

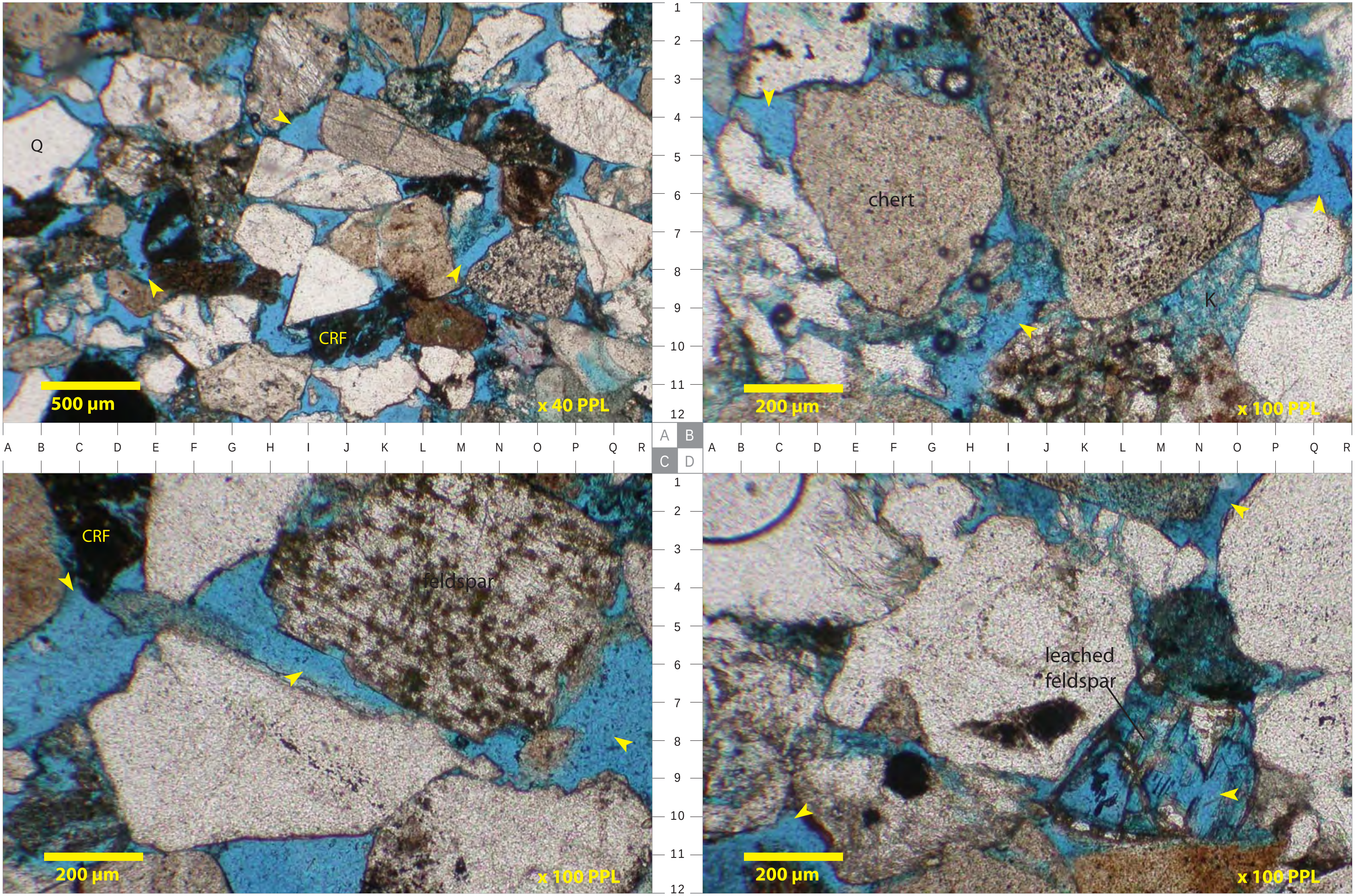


Plate 15
January 2010
CMH 2010-01

Aklak

CMH PETROLOGY
403.243.0917
cmhpetrology@shaw.ca