Natural Resources Canada | Ressources naturelles Canada

GEOLOGICAL SURVEY OF CANADA
OPEN FILE 8730

Provenance and diagenesis of sandstones in the deep wells Annapolis G-24, Balvenie B-79, Crimson F-81, Weymouth A-45, and Newburn H-23, Scotian Basin, offshore Nova Scotia

G. Pe-Piper, C. Sangster, D.J.W. Piper, and D.P. Opra

2020

Canada



GEOLOGICAL SURVEY OF CANADA
OPEN FILE 8730

Provenance and diagenesis of sandstones in the deep wells Annapolis G-24, Balvenie B-79, Crimson F-81, Weymouth A-45, and Newburn H-23, Scotian Basin, offshore Nova Scotia

G. Pe-Piper[1], C. Sangster[1], D.J.W. Piper[2], and D.P. Opra[1]

[1]Department of Geology, Saint Mary's University, 933 Robie Street, Halifax, Nova Scotia
[2]Geological Survey of Canada, 1 Challenger Drive, Dartmouth, Nova Scotia

2020

© Her Majesty the Queen in Right of Canada, as represented by the Minister of Natural Resources, 2020

Information contained in this publication or product may be reproduced, in part or in whole, and by any means, for personal or public non-commercial purposes, without charge or further permission, unless otherwise specified.
You are asked to:
- exercise due diligence in ensuring the accuracy of the materials reproduced;
- indicate the complete title of the materials reproduced, and the name of the author organization; and
- indicate that the reproduction is a copy of an official work that is published by Natural Resources Canada (NRCan) and that the reproduction has not been produced in affiliation with, or with the endorsement of, NRCan.

Commercial reproduction and distribution is prohibited except with written permission from NRCan. For more information, contact NRCan at nrcan.copyrightdroitdauteur.rncan@canada.ca.

Permanent link: https://doi.org/10.4095/326861

This publication is available for free download through GEOSCAN (https://geoscan.nrcan.gc.ca/).

Recommended citation

Pe-Piper, G., Sangster, C., Piper, D.J.W., and Opra, D.P., 2020. Provenance and diagenesis of sandstones in the deep wells Annapolis G-24, Balvenie B-79, Crimson F-81, Weymouth A-45, and Newburn H-23, Scotian Basin, offshore Nova Scotia; Geological Survey of Canada, Open File 8730, 1 .zip file. https://doi.org/10.4095/326861

Publications in this series have not been edited; they are released as submitted by the author.

Abstract

Deep-water sandstones have been a target for oil and gas exploration in the Scotian Basin for many decades. Little is known about the sedimentary petrography of these sandstones, both as indicators of provenance and for evaluation of the effects of diagenesis on reservoir quality. The purpose of this study was to determine how the sandstones present in deep water wells differ in sedimentary petrography, both detrital and diagenetic, from those on the Scotian Shelf.

Sparse side wall cores and heavy mineral separates from cuttings samples have been studied using petrographic and scanning electron microscopes (SEM) to identify the minerals present. Heavy mineral samples from cuttings were mostly swamped by diagenetic siderite and drilling mud contaminants, but the petrography of lithic clasts and the mineral chemistry of tourmaline, chromite/spinel, feldspar and micas are of value in determining provenance. These are similar to the mineralogy of sandstones in the Glenelg field, and indicate a predominant source from the Sable River draining southern Labrador and the northern Appalachians. Lithic clasts suggest some supply from the Meguma terrane. High abundance of sodic trachyte clasts in Newburn H-23 and to a lesser extent Weymouth A-25 may indicate supply from a cryptic Cretaceous volcanic source on the inner La Have Platform.

Diagenetic paragenesis is generally similar to that in wells on the Scotian Shelf. There is no evidence for chlorite rims on framework quartz grains that are important for preserving primary porosity in many deltaic sandstone reservoirs on the Shelf. Cementation by ferroan calcite and siderite is widespread, but the presence of late ankerite, dolomite, sphalerite and barite is evidence of persistent fairways for fluids similar to those found in the Onondaga and Glenelg fields.

This Open File provides backscattered electron (BSE) images, the mineralogy of the studied rocks, energy dispersive spectroscopy (EDS) analyses of minerals, and an explanatory text and figures that summarize mineral chemistry and diagenetic paragenesis.

Contents

Abstract 3

1. INTRODUCTION 5

2. METHODS 5

2.1 Sampling 5

2.2 Heavy mineral separation 6

2.3 Scanning Electron Microscope (SEM) 7

3. RESULTS 7

3.1 Introduction 7

3.2 Annapolis G-24 well 8

3.3 Balvenie B-79 well 16

3.4 Crimson F-81 well 17

3.5 Weymouth A-45 well 22

3.6 Newburn H-23 well (summaries from Sangster 2016) 25

4. DISCUSSION 33

4.1 Lithologies of lithic clasts (Table 3) 33

4.2 Detrital Minerals 34

4.3 Diagenesis 41

5. CONCLUSIONS 43

References 44

Figures 48

Tables 60

Appendix A: Annapolis G-24 68

Appendix B: Balvenie B-79 279

Appendix C: Crimson F-81 318

Appendix D: Weymouth A-45 468

Appendix E: Tables of mineral analyses 532

1. INTRODUCTION

The Scotian Basin (Fig. 1), offshore eastern Canada, formed on a passive continental margin that rifted in the Late Triassic (McIver, 1972; Given, 1977; Wade and MacLean, 1990). The sandstones of this basin (especially those of the Missisauga Formation) are known to be potential oil and gas reservoirs. Seven deep-water wells were drilled on the Scotian Slope between 2002 and 2004. These wells are: Annapolis B24 and G24, Newburn H-23, Torbrook C-15, Balvenie B-79, Weymouth A-45 and Crimson F-81. This drilling activity was a follow up of drilling five wells on the slope between 1978 and 1986, and was prompted by the success in other Atlantic passive margins such as Gulf of Mexico, Brazil and West Africa. All these deep wells are located within the same sub-basin (central Scotian Basin) and are thought to have been sourced by the Sable paleo-river (Pe-Piper and Piper, 2012). No cores have been taken from any of these wells, and while sidewall cores were taken from all the wells, few are available for sampling. Thus, samples analyzed in this study consist principally of cuttings where sidewall cores were absent. The Newburn H-23 well is the only one of these deep wells with sidewall cores available from all stratigraphic levels of interest, and so it has been selected as the first of these wells to be studied in detail (Sangster, 2016). Of the other wells, we elected to work on four wells: Annapolis G24, Balvenie, B-79, Crimson F-81 and Weymouth A-45 (Table 1). For all these wells we have worked almost entirely with cuttings samples, together with one sidewall core from Annapolis G24 and two from Weymouth A-45 (Table 2).

The objective of this study was to determine the provenance and diagenesis of the lower Cretaceous sandstones in these deep wells, to identify changes with increasing depth, and too make comparisons between the deep-water wells, mostly on the paleo-slope, and the age-equivalent sandstones on the shelf.

2. METHODS

2.1 Sampling

Washed cutting samples and well history reports were studied in order to sample intervals with maximum sand content. Some target depths had been depleted by previous sampling. A total of 19 samples were taken from the four selected deep wells at the Canada-Nova Scotia Offshore Petroleum Board (CNSOPB) Geoscience Research Centre, and have been analyzed for this study (Figs. 1 and 2). Of these

samples, 16 were taken from cuttings, and three from sidewall cores. Where more than one sample was taken at a specific depth, they are indicated as A and B (Table 2). Where multiple polished thin sections were made, they are indicated as 1, 2 etc. in the same table. We have also incorporated in this report important provenance and diagenesis information from 12 studied sidewall cores from Newburn H-23 well reported previously (Sangster, 2016). The weight of each cuttings sample provided by the CNSOPB was not permitted to be more than 30 g. Rock slices were taken from intact sidewall cores; samples of rubble were taken from more fragile cores.

2.2 Heavy mineral separation

Many cuttings samples had compacted into aggregates. In order to break up aggregates, the samples were placed in graduated glass beakers together with dishwasher liquid detergent diluted with tap water, in the Clean Lab at the Department of Geology, Saint Mary's University. The samples were left for at least 3 days so that the mud, which was the main component of the cement that kept together the individual sand particles, was disaggregated. Then the cutting samples were washed with de-ionized water, sieved with 53 μm sieve to remove the mud fraction, and allowed to dry with aid of methanol for a few days.

Heavy mineral separation was carried out at the Sedimentology Laboratory of the Geological Survey of Canada Atlantic (GSCA) at Bedford Institute of Oceanography (BIO) in Dartmouth. The cutting samples were first passed through a sieve with a diameter of 250 μm to remove rock fragments and enhance the proportion of distinctive mineral grains. The material with diameter less than 250 μm was placed in Fisherbrand 50 ml conical base centrifuge plastic tubes along with sodium polytungstate, which has a density of 2.9 g/cm^3. Sodium polytungstate was used because it is not toxic and it is more efficient in the process of heavy mineral separation, compared with other liquids that have the same density.

The tubes were placed in a Thermo Fisher SorvalXR Floor model centrifuge that used 750 ml swinging buckets with inserts for 50 ml conical base centrifuge tubes and rotated for 30 minutes. To separate the heavy minerals on the bottom of the tube from the light minerals on the surface of polytungstate liquid, liquid nitrogen was used to freeze the lower part of the centrifuge tubes. De-ionized water was used to clean excess sodium polytungstate from the samples, which were then placed in a 60ºC oven for at least 3 days to remove any water.

Thin sections were made from the heavy mineral separates. Because of the limitations on sample size, the heavy fraction from several samples was sometimes not enough for making a polished thin section. In this case, samples from adjacent depths were combined and labelled with the depth of the shallowest sample (Table 1).

2.3 Scanning Electron Microscope (SEM)

Scanning Electron Microscope (SEM) analysis was completed in the Regional Analytical Centre at Saint Mary's University. The purpose of this work was to acquire back-scattered electron (BSE) images and energy dispersive spectroscopy (EDS) chemical analyses of minerals. The SEM used is a LEO 1450 VP SEM with a maximum resolution of up to 3.5 nm at 30 kV; and a TESCAN MIRA 3 LMU Variable Pressure Schottky Field Emission Scanning Electron Microscope, with a maximum resolution up to 1.2 nm at 30 kV. Both devices were equipped with an INCA X-max 80 mm^2 silicon-drift detector (SDD) EDS system that has a detection limit > 0.1%. A tungsten filament produces a 10 µm beam, and is calibrated with a cobalt standard.

All EDS mineral analyses (Appendices 1-4) were screened before plotting in various diagrams. The screened data (Appendix 5) includes only analyses with <2% non-stoichiometric oxides. Specifically, for carbonate minerals SiO_2 <2%, for feldspars FeO or MgO <2%, for muscovite and tourmaline <2% TiO_2 and for biotite SiO_2 >42%. The term "Feohy" is used for iron oxide and hydroxide minerals that are difficult to differentiate from EDS chemical analyses alone. Likewise, "Mnohy" is used for manganese oxides and hydroxides. "TiO_2" is used for undifferentiated titania minerals rutile (mostly detrital), anatase and brookite (mostly diagenetic).

3. RESULTS

3.1 Introduction

The goal of this study was to understand: a) the provenance and b) the diagenesis of the Lower Cretaceous sandstones from the sampled deep wells. For the first objective we focused on defining the lithologies of detrital lithic clasts, which provide direct evidence of the potential source rocks, and on the chemical compositions of informative detrital heavy minerals, for chemical fingerprinting the

potential source rocks. For the second objective the focus was on the cement minerals and the diagenetic paragenesis.

Each samples was studied in detail using both petrographic microscope and SEM. In the section below we describe petrographic characteristics, that also include identification of both detrital and diagenetic minerals, for each sample. We also tried to identify: the potential source lithology of lithic clasts; grains that are probably contaminants from the drilling mud and/or accidental additives during the drilling process; and provide a few final notes to highlight petrographic observations that may help us to better define the provenance and diagenesis of each sample and all together.

All references to figures in this part of the Open File are references to figures in the corresponding Appendix.

3.2 Annapolis G-24 well

3.2.1 Sample G-24 4401.5A(1) (Appendix 1A)

Sample type: Sidewall core rubble, polished thin section

Grain size: Very fine-grained sandstone

Detrital minerals: albite, oligoclase, biotite, ?chlorite, K-feldspar, muscovite, quartz, ?TiO_2

Diagenetic minerals: ?Albite, anhydrite, barite, calcite, chlorite, ?halite, hematite/limonite, kaolinite, pyrite, siderite, TiO_2 (v. rare)

Lithic clasts: Composite grains that appear to be lithic clasts consist of either, albite and quartz (App. Fig. 1A.4, spots 1,2; App. Fig. 1A.20, spot 10), or muscovite and quartz (App. Fig. 1A.6, spots 8,9; App. Fig. 1A.10, spots 2,3,5). The potential source for rocks for such lithic clasts are igneous (granitoid) or metamorphic rocks.

Contaminants: This sample was produced from the rubble of sidewall core. Similar to sidewall core, the infiltration of drilling mud into these samples is largely limited to fractures and the exterior of the core. As such, contaminants are rare in this sample, and typical drilling mud contaminants such as barite are considered to be diagenetic in origin. Halite appears to be on top of the thin section similar to dust (App. Fig. 1A. 19). As such, it is likely a contaminant developed during drying out of the archived sidewall core.

Additional notes: No detrital chromite has been analysed. Biotite is rare, muscovite is the most abundant mica and almost always is partly replaced by chlorite. Only relics of K-feldspar in calcite have been analysed (App. Fig. 1A.21). Some of the analysed albite appears to be diagenetic (App. Fig. 1A.13). Detrital quartz grains again appear to be associated with hematite/limonite (App. Fig. 1A.13). Diagenetic TiO_2 minerals are present, but not at all common and a couple of TiO_2 mineral grains appear to be detrital (App. Fig, 1A.7). Chlorite is a common diagenetic mineral, although some grains may be detrital (App. Fig. 1A.4). It is not clear if the chlorite replacement of muscovite occurred during burial, transport, or even in the source rock. Its size and habit (fibrous) suggest that at least some of it is diagenetic (formed during burial). Calcite postdates chlorite (App. Fig. 1A.19). Feohy (likely limonite), has been seen only in two sites, 12 and 13, is fine-grained and appears to be associated with quartz, and is of diagenetic origin.

3.2.2 Sample G-24 4401.5A(2) (Appendix 1B)

Sample type: Sidewall core rubble, polished thin section

Grain size: Very fine-grained sandstone

Detrital minerals: Albite, biotite, ?chlorite, K-feldspar, muscovite, quartz, oligoclase

Diagenetic minerals: Apatite, barite, calcite, chlorite, fluorite, kaolinite, magnetite, pyrite, siderite, TiO_2

Lithic clast: Probable felsic lithic clast made up of quartz and mica (App. Fig. 1B.21).

Contaminants: This sample was produced from the rubble of sidewall core, so that as happens with an intact sidewall core, the infiltration of drilling mud into these samples is largely limited to fractures and the exterior of the core. As such, contaminants are rare in this sample, and typical drilling mud contaminants such as barite are considered to be diagenetic in origin. Halite (App. Fig. 1B.4) appears to be of the same origin as in sample 4401.5A(1)

Additional notes: (1) Other detrital minerals identified chemically are the same as in 4401.5A(1): muscovite that is partly replaced by chlorite or calcite or both; albite or rarely oligoclase partly replaced by calcite; few grains of K-feldspar partly replaced by chlorite or calcite, and partly altered biotite.

(2) Diagenetic minerals identified include: kaolinite, calcite, chlorite, pyrite, rare late siderite prisms, rare apatite, TiO_2, common late barite, and large grains of chlorite that may have been detrital (App. Fig. 1B.15). The only new diagenetic minerals seen in this section are well formed crystals of magnetite (App. Figs. 1B.38, 43). A few grains of diagenetic apatite and fluorite have also been analysed. The chloritization of muscovite (e.g. App. Fig. 1B.37) might have started at the source rock.

(3) The mineralogical composition of the fragments in this polished thin section is very similar among the various analysed sites. The mineral combinations we see are often quartz ± calcite ± chlorite ± kaolinite, or kaolinite + calcite or calcite + chlorite etc. These fragments are probably just pieces of the cement.

(4) In this polished thin section again we cannot know how much of the analyzed albite is detrital and how much is the product of albitization of K-feldspar or even of plagioclase (i.e. recrystallization of detrital albite).

3.2. 3 Sample G-24 4401.5B (Appendix 1C)

Sample type: Sidewall core rubble, polished thin section

Grain size: Very fine-grained sandstone

Detrital minerals: Albite, oligoclase, biotite, chromite (rare), K-feldspar (+perthite), muscovite, quartz

Diagenetic minerals: Albite (App. Fig. 1C.27), barite (App. Fig. 1C.19), calcite (postdating kaolinite App. Fig. 1C.28), chlorite (more associated with feldspars or pores), ? halite, kaolinite (more associated with feldspars or pores), limonite (late; App. Fig. 1C.30), pyrite (App. Fig. 1C.25), siderite, sphalerite (App. Fig. 1C.21), TiO_2 (App. Fig. 1C.28)

Lithic clasts: Felsic igneous rocks (K-feldspar and quartz; App. Fig. 1C. 19). Felsic igneous rocks or metapelite (Quartz and muscovite or chlorite; App. Fig. 1C.30).

Contaminants: This thin section was produced from the rubble of sidewall core, so that as with an intact sidewall core, the infiltration of drilling mud into these samples is largely limited to fractures and the exterior of the core. As such, contaminants are rare in this sample, and typical drilling mud contaminants such as barite are considered to be diagenetic in origin. The origin of halite appears to be the same as in the previous two polished thin sections.

Additional notes: (1) Apart from the quartz, other detrital minerals identified chemically are the following: muscovite is partly replaced by chlorite (e.g. App. Fig. 1C.11); K-feldspar often is associated with calcite and occasionally shows perthite texture (App. Fig. 1C.27); plagioclase, mostly albite, but also oligoclase grains have been analyzed. Often it is difficult to know how much of the albite has been affected by diagenesis during burial. When albite is associated with K-feldspar (e.g. App. Fig. 1C.27) it appears that some of the albite patches are not associated with the perthitic lamellae but are rather the result of K-feldspar albitization. A few grains of biotite have also been found in this polished thin section. In one of them (App. Fig. 1C.21), sphalerite has precipitated along the biotite cleavage planes. One grain of chromite has also been analysed.

(2) The sandstone in this sample shows better the effects of burial diagenesis. It appears that kaolinite was the first diagenetic mineral to precipitate, and in some spots is found associated with feldspar relics, but mostly appears to fill primary pores (App. Fig. 1C.19). Kaolinite has been postdated by calcite (App. Fig. 1C.28) and probably some siderite, and chlorite. Other later diagenetic minerals include TiO_2 that in some analysed spots appear to postdate kaolinite (App. Fig. 1C.28). Pyrite appears to postdate calcite (App. Fig. 1C.25). The latest diagenetic minerals, based on textures, include sphalerite, barite, and limonite. Barite appears to be replacing biotite partly altered to chlorite (App. Fig. 1C.13). In other cases barite veinlets cut through sandstone (App. Fig. 1C.19). The sphalerite has been seen precipitated along cleavage planes of biotite (App. Fig. 1C.21). Finally limonite, with a colloidal texture, is associated with the common detrital minerals, quartz and albite of this sandstone and both of them, mostly the albite, are invaded by and partially replaced by limonite.

3.2.4 Sample G-24 5505 (Appendix 1D)

Sample type: Heavy mineral separate, grain mount

Grain size: Very fine-grained sandstone

Detrital minerals: Apatite, ?Feohy, ilmenite, K-feldspar, muscovite, quartz

Diagenetic minerals: Ankerite, barite, chlorite, Feohy, fluorite, pyrite, siderite

Contaminants: Barite, calcite, dolomite, Feohy, psilomelane, pyrite, pyrolusite, zincite

Lithic clasts: none analysed

Additional notes: (1) Cuttings are made up of: siderite, kaolinite, and muscovite (App. Fig. 1D.2); quartz and siderite (App. Fig. 1D.5); muscovite, chlorite, and biotite (App. Fig. 1D.6); K-feldspar, chlorite, and quartz (App. Fig. 1D.7); feldspar, chlorite, kaolinite, and pyrite (App. Fig. 1D.7); Feohy and calcite (App. Fig. 1D.8); K-feldspar and Feohy (App. Fig. 1D.9); K-feldspar, quartz, Feohy, and barite (App. Fig. 1D.11); siderite and chlorite (App. Fig. 1D.13); siderite and kaolinite (App. Fig. 1D.13). Pyrite (App. Fig. 1D.7) and siderite (App. Fig. 1D.13) appear to postdate chlorite and kaolinite.

(2) Barite is present in large quantities in this sample. The majority of the grains present were probably introduced as a component of the drilling mud during sample collection. However, grains which are observed in association with quartz (App. Figs. 1D.5, 6, 9, 14) are suggested to be of diagenetic origin.

(3) Feohy is another common mineral in this sample. It is common in cuttings and as individual grains, appearing to be either detrital or diagenetic in most cases. Feohy with a streaky habit (App. Fig. 1D.1), is likely a contaminant introduced in the drilling mud, or from the drill bit itself.

3.2.5 Sample G-24 5510 (Appendix 1E)

Sample type: Heavy mineral separate, grain mount

Grain size: Sieved

Detrital minerals: Albite, ?Feohy, K-feldspar, muscovite, ?Ti-magnetite, tourmaline, quartz

Diagenetic minerals: Ankerite, barite, calcite, chlorite, dolomite, Feohy, fluorite, hematite, ?magnetite, pyrite, siderite, TiO_2

Contaminants: Barite, Feohy

Lithic clast: Felsic igneous lithic clast made up of quartz and K-feldspar (App. Fig. 1E.3).

Additional notes: (1) Cuttings are made up of: siderite, Feohy, ankerite and fluorite, and calcite (App. Fig. 1E.4, 5); chlorite, kaolinite, calcite, and Feohy (App. Fig. 1E.8); pyrite and barite (App. Fig. 1E.10).

(2) Feohy appears to be cut by a vein of ankerite and calcite, and also by veinlets of siderite (App. Fig. 1E.5) and as such it may be detrital. Chlorite appears to postdate kaolinite, calcite possibly postdates chlorite, and Feohy/hematite postdates both (App. Fig. 1E.8). Barite postdates pyrite (App. Fig. 1E.10).

3.2.6. Sample G-24 5520 (Appendix 1F)

Sample type: Heavy mineral separate, grain mount

Grain size: sieved

Detrital minerals: Albite, ?Feohy, K-feldspar, muscovite, quartz, TiO_2, tourmaline, zircon

Diagenetic minerals: Ankerite, barite, calcite, chlorite, Feohy, fluorite, magnetite, pyrite, siderite

Contaminants: Anglesite, barite, Feohy, psilomelane, wulfenite (App. Fig. 1F.8,9)

Lithic clast: One lithic clast was observed in this sample, a felsic igneous rock clast made up of quartz and K-feldspar (App. Fig. 1F.8).

Additional notes: (1) It is very difficult in this slide to decide if all Feohy is contaminant, diagenetic mineral, or both. At some positions (e.g. App. Fig. 1F.13 position 3) it is associated with chlorite, in others (e.g. App. Fig. 1F.13 position 16) morphology suggests contaminant origin, whereas in others (e.g. App. Fig. 1F.13 position 10,11) it could be either, although it is associated with quartz, and thus probably diagenetic.

(2) TiO_2 appears to be detrital in this sample, whereas Feohy (magnetite) is possibly diagenetic (App. Fig. 1F.2).

(3) A cutting made up of quartz, albite, and ankerite, shows ankerite replacing albite (App. Fig, 1F.2).

3.2.7 Sample G-24 5530 (Appendix 1G)

Sample type: Heavy mineral separate, grain mount

Grain size: sieved

Detrital minerals: Albite, ?chlorite, ilmenite, K-feldspar, muscovite, oligoclase, quartz, spinel, TiO_2, zircon

Diagenetic minerals: Ankerite, apatite, barite, chlorite, fluorite, kaolinite, pyrite, siderite, TiO_2

Contaminants: Barite, ?dolomite, hematite, limonite, ?magnetite, Mn-oxide

Lithic clast: Felsic igneous rock (quartz and K-feldspar (App. Fig. 1G.27), quartz and TiO_2 (App. Fig. 1G.2, 11), and TiO_2 and kaolinite (App. Fig. 1G.25))

Additional notes: (1) Fluorite appears to be post-dated by ankerite and chlorite (App. Fig. 1G.36), TiO_2 appears to be diagenetic and postdates kaolinite (App. Fig.

1G.38), Ankerite appears to have been replaced by TiO_2 (App. Fig. 1G.5, 20) and fibrous chlorite appears to cut ankerite (App. Fig. 1G.33).

3.2.8 Sample G-24 5535(1) (Appendix 1H)

Sample type: Heavy mineral separate, grain mount

Grain size: sieved

Detrital minerals: Albite, muscovite, quartz, TiO_2, tourmaline, zircon

Diagenetic minerals: Ankerite, barite, chlorite, Feohy, fluorite, pyrite, siderite, TiO_2

Contaminants: Anglesite, amphibole, barite, clinopyroxene (augite), Feohy, ?pyrite, tungsten

Lithic clasts: none

Additional notes: (1) A good number of analyses from this thin section show low actual totals and are bad. The informative analyses suggest that we do not have any more information from this thin section than what we have got later from thin section 5535(2).

(2) The timing of the formation of the diagenetic minerals in this sample is difficult to determine, however calcite appears to surround pyrite (App. Fig. 1H.8), and Feohy cuts siderite (App. Fig. 1H. 7).

3.2.9 Sample G-24 5535(2) (Appendix 1I)

Sample type: Heavy mineral separate, grain mount

Grain size: sieved

Detrital minerals: Albite, ?magnetite, muscovite, quartz, tourmaline

Diagenetic minerals: Ankerite, apatite (mixed with ankerite and chlorite), chlorite, Feohy, magnetite, pyrite, siderite, TiO_2

Contaminants: Amphibole, barite, ?calcite, clinopyroxene, epidote, Feohy, hornblende, magnetite, Mo + Pb, ?pyrite

Lithic clast: Either, cutting made up of quartz and TiO_2 in which TiO_2 is diagenetic, or a lithic clast made up of TiO_2 and quartz (App. Fig. 1I.7).

Additional notes: Grains of magnetite present are: altered to Feohy (App. Fig. 1I.2), cut by Feohy (App. Fig. 1I.9), or as unaltered grains, exsolving ilmenite (App. Fig. 1I.11), or as a contaminant (App. Fig. 1I.8).

3.2.10 Sample G-24 6045(1) (Appendix 1J)

Sample type: Heavy mineral separate, grain mount

Grain size: sieved

Detrital minerals: Albite, K-feldspar, muscovite, quartz, tourmaline

Diagenetic minerals: Ankerite, apatite, barite, calcite, chlorite, dolomite, hematite, kaolinite, ?magnetite, pyrite, siderite, TiO_2

Contaminants: Anglesite, ?apatite, barite, Feohy,?fluorite, hematite, psilomelane, pyrolusite, zincite

Lithic clast: Lithic clasts are felsic igneous rocks and are composed of quartz and K-feldspar (App. Fig. 1J.1), and quartz and K-feldspar associated with barite (App. Fig. 1J.5).

Additional notes: (1) Cuttings appear to be: a) rock fragments or dried out drilling mud (e.g. silty mudstone with late barite (App. Fig. 1J.2); b) a combination of drilling mud and rock fragments (e.g. zircon, hematite, Feohy, pyrite, barite, and K-feldspar, App. Fig. 1J.4); or c) drilling contaminants (e.g. Feohy, pyrolusite, psilomelane, and zincite, App. Fig. 1J.7 & 8).

(2) Feohy postdates both kaolinite (App. Fig. 1J.6) and pyrite (App. Fig. 1J.12). Barite is a late diagenetic mineral.

3.2.11 Sample G-24 6045 (2) (Appendix 1K)

Sample type: Heavy mineral separate, grain mount

Grain size: sieved

Detrital minerals: Albite, biotite (v. rare), ?chlorite (App. Fig. 1K.15), K-feldspar, muscovite, quartz, zircon (v. rare, App. Fig. 1K.29),

Diagenetic minerals: ?Albite (App. Fig. 1K.2), Al-phosphate (App. Fig. 1K.17), ankerite, barite (App. Fig. 1K.2,16), kaolinite (v. rare, App. Figs. 1K.8, 27), limonite (App. Fig. 1K.33), magnetite (App. Fig. 1K.39), pyrite (v. rare, App. Fig. 1K.12), siderite + chlorite

Contaminants: Barite, corundum (App. Fig. 1K.15), ?fluorite, ?limonite, Mn+Al (App. Fig. 1K.19), zincite (App. Fig. 1K.25).

Lithic clasts: Lithic clasts in this sample are felsic igneous rocks, and made up of quartz and K-feldspar (App. Figs. 1K.8, 31) and possible albite and muscovite (App. Fig. 1K.26).

Additional notes: Fluorite fragment shows dark patches, no change in chemistry is noted (App. Fig. 1K.19). Fluorite also shows dissolution voids (App. Figs. 1K.13) which are sometimes filled with drilling mud (App. Fig. 1K.22).

3.3 Balvenie B-79 well

3.3.1 Sample B-79 3610 (Appendix 2A)

Sample type: Heavy mineral separate, grain mount

Grain size: sieved

Detrital minerals: Albite, biotite, epidote, K-feldspar, quartz

Diagenetic minerals: Apatite, barite, calcite, chlorite, illite (v. minor), fluorite, Feohy, pyrite, siderite

Contaminants: Barite, dolomite, Feohy, Mnohy

Lithic clast: A single lithic clast was observed in this sample and is made up of albite and epidote (App. Fig. 2A.11).

Additional notes: (1) Mudstone with abundant pyrite, followed by siderite and calcite. Other diagenetic minerals include: chlorite, apatite, minor illite and probably Fe-dolomite. Rare detrital minerals identified: K-feldspar, quartz, and a single lithic clast made up of albite and epidote (App. Fig. 2A.11). Barite appears to be diagenetic as well (App. Figs. 2A.8, 9). The contaminants include free grains of barite and Feohy.

(2) This sample contains several bioclasts, which have been infilled with calcite (App. Figs. 2A.5,7,8)

3.3.2 Sample B-79 3645 (Appendix 2B)

Sample type: Heavy mineral separate, grain mount

Grain size: sieved

Detrital minerals: Albite, apatite, ?Feohy, K-feldspar, muscovite, and quartz

Diagenetic minerals: Ankerite (v. rare), barite, calcite, illite, kaolinite, pyrite, and siderite

Contaminants: Barite, Feohy, and pyrite

Lithic clast: none

Additional notes: (1) There are anomalous quantities of pyrite in this sample, some of which seems to be associated with the drilling mud, but much is definitely diagenetic (App. Figs. 2B.5, 8, 16, 19). The same happens with Feohy (App. Fig. 2B.18), some of the grains appear to be contaminants, however, there are some cuttings made up of quartz + Feohy (App. Fig. 2B.11). In some cases the Feohy

are probably grains of altered detrital minerals (e.g. magnetite). Other detrital minerals identified include quartz, K-feldspar, and muscovite, very rare albite, and some apatite. The diagenetic minerals include mainly calcite, siderite, and pyrite with rare ankerite, chlorite and kaolinite.

(2) There are cuttings made up of quartz + what appears to be diagenetic barite (App. Figs. 2B.15, 22, 24). The detrital K-feldspar grains are partly altered to kaolinite and chlorite (App. Fig. 2B.24). Rare fluorite grains (App. Fig. 2B.22) have also been identified.

(3) The drilling mud consist of pyrite (App. Figs. 2B.18, 20), barite (App. Fig. 2B.3) and grains of Feohy (App. Figs. 2B.9, 10, 12, 17). The Feohy grains considered as contaminants often are large and streaky (e.g. App. Fig. 2B.14).

(4) This sample contains several bioclasts which are filled with calcite (App. Fig. 2B.9, 22).

3.4 Crimson F-81 well

3.4.1 Sample F-81 6415 (Appendix 3A)

Sample type: Heavy mineral separate, grain mount

Grain size: sieved

Detrital minerals: Albite (App. Fig. 3A.12,19,21), biotite (App. Fig. 3A.28), K-Feldspar (App. Fig. 3A.17), muscovite (App. Fig. 3A.26), quartz

Diagenetic minerals: Apatite (mixed with siderite), calcite, chlorite, clay minerals, fluorite, pyrite, siderite

Lithic clasts: Lithic clasts are made up of: muscovite and chlorite; and quartz and Feohy (App. Fig. 3A.20).

Contaminants: Aegirine-augite, augite, barite, diopside, FeCuohy, Feohy, Mnohy, nepheline, smithsonite, sodalite, talc, tremolite

Additional notes: (1) The presence of siderite was confirmed using the optical microscope. In an EDS chemical analysis, siderite can have an actual total up to 84 weight percent, and may be opaque due to high iron hydroxide content. Grains analyzed with high FeO content (usually >80%) are likely to be Feohy if other compositional features were satisfied (e.g. lack of Ca, and Mg).

(2) The analysed muscovite with bright spots, probably of TiO_2, and the muscovite analyses result in high TiO_2 content (App. Fig. 3A.2).

(3) Analyses of siderite yielded high phosphate and calcium content. The analyzed spot and probably the whole grain appear to be a fine-grained mixture of both carbonate (siderite, calcite) and phosphate diagenetic minerals (App. Fig. 3A.10).

(4) Albite grains seem to be cemented by siderite (App. Fig. 3A.12).

(5) In many cuttings, siderite analyses are seen to contain some SiO_2 probably due to quartz. Since the beam size for the EDS analyses is >10µm, the point analyses yield siderite compositions and minor weight percent of SiO_2. Which suggests that the grain is from a very fine-grained rock fragment. A few "zoom ins" were performed in the BSE images, and confirmed that the analyzed cuttings are very fine-grained siderite-cemented mudstone.

(6) Hematite was observed under the optical microscope in reflected light, and strong red internal reflections were seen (App. Fig. 3A.5), but it may be a contaminant as well (App. Fig. 3A.6).

(7) A fragment of contaminant is made up of nepheline, aegirine-augite, K-feldspar, and sodalite (App. Fig. 3A.13).

(8) The slide was checked for Cr and Zr, looking for the presence of the minerals chromite and zircon respectively. Neither mineral was detected using this method.

(9) In a fragment of a contaminant (App. Fig. 3A.48), the elements of the point analyses (Table 3A.3) support the reasoning that this grain must be from a silica under- saturated rock due to the absence of quartz from the grain, and the presence of feldspathoid minerals nepheline and sodalite.

(10) Composition of some analyzed grains usually includes, but is not limited to, the following elements in various combinations: Mn, Fe, Pb, Ba. Some of such analyses closely resemble the minerals Hollandite and Romanechite. However, with consideration and comparison, the minerals were classified as "Mnohy" (Manganese oxides/hydroxides) in the mineral chemical analyses, followed by their respective major elements. This is because the ratios do not correspond to either of the above two minerals, and small amounts of Si, Ca, Mg, and some K were also present in the analyses. Sometimes significant F and Pb were also found. There are no such minerals known from previous studies of core samples in polished thin sections and therefore these "minerals" are considered as contaminants.

(11) Tremolite and diopside may also be contaminants (part of the drilling mud) and they have never been seen in cuttings of sandstones/mudstones, but rather almost always are seen as free grains.

(12) Feohy grains with streaky habit are common and are considered as contaminants in the drilling mud.

3.4.2 Sample F-81 6425 (Appendix 3B)

Sample type: Heavy mineral separate, grain mount

Grain size: sieved

Detrital minerals: Albite (App. Fig. 3B.5,18), K-feldspar (App. Fig. 3B.13), muscovite (App. Fig. 3B.5,18), quartz, tourmaline (App. Fig. 3B.24)

Diagenetic minerals: Apatite (occurs with siderite), barite, calcite, chlorite (occurs with siderite), Feohy, fluorite, hydromuscovite, illite, pyrite, siderite

Lithic clast: none

Contaminants: Barite, diopside, dolomite, Feohy, Mnohy, tremolite

Additional notes: (1) Siderite is usually mixed with quartz. Some siderite analyzed has CaO >10 wt% and $P_2O_5 \geq 5$ wt%. This indicates the presence of calcium phosphate (apatite). After higher zoom in BSE images of such grains we came to the conclusion that these grains were very fine-grained cuttings of mudstone cemented by siderite intermixed with sedimentary apatite (App. Figs. 3B.18, 19).

(2) Apatite and quartz are intermixed.

(3) Some siderite is high in calcium. Solid solution between siderite and calcite only exists at a temperature of >1000 °C (Franzolin et al. 2011). Therefore, this may be either replacement of siderite by calcite or vice versa. There might be a fine intermixture of calcite and siderite in the mudstone.

(4) This sample was also checked for chromite and zircon by looking for the presence of Cr and Zr respectively. Neither element was detected.

(5) This sample also contains Mnohy and free grains of both tremolite and diopside as contaminants. Tremolite in this sample is significantly more abundant than diopside. Out of 17 tremolite grains with BSE images none is associated with barite, main component of the drilling mud. In two images tremolite is associated with calcite or quartz.

(6) Feohy grains with streaky habit are seen but not as abundant as in sample 6415. They are also considered part of the drilling mud.

3.4.3 Sample F-81 6450 (Appendix 3C)

Sample type: Heavy mineral separate, grain mount

Grain size: sieved

Detrital minerals: Albite (grains are be cemented by siderite. Such grains may represent siderite-cemented detrital K-feldspar crystals that have been albitized or detrital albite; App. Fig. 3C.12, 33), biotite (App. Fig. 3C.12), K-feldspar (App. Fig. 3C.13), muscovite (App. Fig. 3C.10,17), oligoclase, quartz, tourmaline (App. Fig. 3C.9), zircon (App. Fig. 3C.33)

Diagenetic minerals: Ankerite, apatite (occurs intermixed with siderite in mudstone cuttings, App. Fig. 3C.23), barite, chlorite, dolomite, F-calcite, pyrite, siderite, clay minerals (e.g. illite) which maybe a product of weathering before deposition and therefore detrital.

Lithic clast: A single felsic lithic clast was observed made up of quartz and probably muscovite (App. Fig. 3C.28).

Contaminants: Barite, corundum, covellite, diopside, Feohy, ?magnetite, Mnohy, smithsonite, tremolite

Additional notes: (1) The presence of siderite was confirmed using the optical microscope. Some of the EDS chemical analyses thought to be Feohy were changed to siderite upon confirmation with microphotographs taken using the optical microscope.

(2) In many cuttings siderite is associated with quartz. Siderite analyses contain some SiO_2 probably due to mixing with quartz. Since the beam size for the EDS analyses is >10μm, the point analyses yield siderite with minor weight percent of SiO_2. This suggests that the grain is from a very fine-grained rock fragment. A few "zoom ins" were performed in the BSE images, and confirmed that the analyzed cuttings are very fine-grained siderite-cemented mudstone.

(3) Tourmaline occurs as a free grain in two sites.

(4) Most Feohy analyses contain SiO_2 because the analysed spots are in a very fine-grained rock.

(5) The slide was checked for Cr and Zr, looking for the presence of the minerals chromite and zircon respectively. Zircon was detected using this method in two sites.

(6) A grain of possible detrital chlorite is present in this sample (App. Fig. 3C.9)

(7) Albite is commonly surrounded and replaced by siderite and Feohy (App. Fig. 3C.12)

(8) Pyrite appears to postdate illite (App. Fig. 3C.13) and F-calcite (App. Fig. 3C.4)/

(9) Barite shows variable composition, with dark zones associated with Sr (~2.5 wt%) (App. Fig. 3C.27)

(10) Mnohy and free grains of diopside and tremolite are also considered as contaminants (part of the drilling mud).

3.4.4 Sample F-81 6470(1) (Appendix 3D)

Sample type: Heavy mineral separate, grain mount

Grain size: sieved

Detrital minerals: Albite (partly replaced by siderite App. Fig. 3D.10), epidote (associated with titanite, App. Fig. 3D.9), Feohy, hornblende (App. Fig. 3D.18), K-Feldspar (App. Fig. 3D.10), muscovite (from a cutting of a siderite cemented silty mudstone with detrital muscovite App. Fig. 3D.17), quartz, titanite (App. Fig. 3D.9), tourmaline (App. Fig. 3D.2)

Diagenetic minerals: Al-phosphate, apatite, barite, chlorite, calcite, pyrite, siderite

Lithic clast: A possible lithic clast made up mostly of titanite and epidote (App. Fig. 3D.9).

Contaminants: Barite, diopside, smithsonite, tremolite and talc.

Additional notes: (1) Siderite mixed with quartz.

(2) Most chlorite is diagenetic.

(3) Smithsonite, tremolite and diopside are all considered as contaminants. Tremolite is more common than diopside. A grain of tremolite analysed showed an association with F-calcite and talc. This grain may be a fragment of a contaminant. Feohy grains also with streaky habit are common and they are also considered as contaminants (drilling mud).

3.4.5 Sample F-81 6470(2) (Appendix 3E)

Sample type: Heavy mineral separate, grain mount

Grain size: sieved

Detrital minerals: Albite, biotite, fluorite, ilmenite, K-feldspar, muscovite, oligoclase, quartz, titanite, TiO_2

Diagenetic minerals: Apatite, barite, chlorite, ?dolomite, Feohy, kaolinite, pyrite, siderite

Lithic clast: Lithic clasts were observed in this sample and are made up of quartz, titanite, and siderite (App. Fig. 3E.27) and TiO_2 and quartz (App. Fig. 3E.33).

Contaminants: Actinolite, barite, ?biotite, clinopyroxene (diopside), Feohy, Mnohy, orthopyroxene, zincite, Znohy

Additional notes: (1) Mudstone cuttings are dominantly cemented by siderite and chlorite (App. Fig. 3E.7, 8), chlorite and kaolinite (App. Fig. 3E.12), and rarely Feohy (App. Fig. 3E.28).

(2) A grain of fluorite contained within a cutting of siderite cemented mudstone shows rounded edges and may be detrital and appears to be replaced by siderite (App. Fig. 3E.9).

(3) Barite is observed to be both a contaminant from the drilling mud, as it surrounds cuttings, and as a diagenetic phase showing interlocking textures with a cutting of mudstone (App. Fig. 3E.13).

(4) Diagenetic pyrite appears to be postdated by barite (App. Fig. 3E.4). Diagenetic siderite appears to be postdated by later Feohy (App. Fig. 3E.13).

3.5 Weymouth A-45 well

3.5.1 Sample A-45 5715 (Appendix 4A)

Sample type: Heavy mineral separate, grain mount

Grain size: sieved

Detrital minerals: Albite, K-feldspar (rare), muscovite (partly altered to chlorite), quartz, TiO_2 (App. Figs. 4A.6,11), tourmaline (rare), zircon (rare)

Diagenetic minerals: Ankerite,?barite, chlorite, pyrite, siderite

Contaminants: Barite, ?chlorite (large free grains), Feohy, hornblende, magnetite, olivine, orthopyroxene, pyrolusite, ?sphalerite, tremolite, wulfenite, Mo+Pb, Pb, Ce+W

Lithic clast: none

Additional notes: (1) Siderite cemented siltstone. The heavy mineral fraction of this sample appears to have been enriched in various contaminants used during drilling of this well. App. Figs. 4A.5, 6 each contain an image of the most common contaminant that are of barite, Feohy, magnetite, pyrolusite, and

wolframite. Free or combined, such grains seem to be very common in the studied polished thin section (e.g. App. Fig. 4A.12, grain 6-9). Another common group of contaminants include the silicate minerals olivine, amphibole, orthopyroxene, and probably some large free grains of chlorite may belong to this group of contaminants. We have not seen any combination of these minerals in the studied polished thin sections.

(2) In addition to quartz, we have analysed rare grains of albite, K-feldspar, zircon, and tourmaline. Muscovite partly altered to chlorite appears to be more common and few grains of TiO_2 (App. Figs. 4A.11) morphologically appear to be detrital.

(3) We have seen only a few rock cuttings that texturally seem to be coming from siderite-cemented siltstone. Mineralogically these siderite-cemented siltstone consists of: Ab+Sd (App. Fig. 4A.4); Sd+Qz (App. Fig. 4A.1); Py+Qz (App. Fig. 4A.9); Sd+Brt (App. Fig. 4A.10); Sd+Ms; Sd+Py+Brt+Qz (App. Fig. 4A.14).

3.5.2 Sample A-45 5955 (Appendix 4B)

Sample type: Heavy mineral separate, grain mount

Grain size: Sieved (Fine-grained sandstone)

Detrital minerals: Albite, ?Feohy (some), K-feldspar (App. Fig. 4B.4), muscovite, quartz, TiO_2 (App. Fig. 4B.4)

Diagenetic minerals: Ankerite, apatite, ?barite (App. Fig. 4B.9), calcite, chlorite, dolomite, Feohy, kaolinite, pyrite, siderite

Contaminants: Barite (free grains), Feohy (most), magnetite, Mo+Pb, psilomelane, tremolite

Lithic clast: A lithic clast made up of quartz and TiO_2 (App. Fig. 4B.4).

Additional notes: It is probably a fine-grained sandstone. Many grains seen have been considered as contaminants from the drilling mud. These grains include most of the Feohy, Mo+Pb, magnetite, and the free grains of barite. The only detrital minerals analysed apart from the quartz, include muscovite, K-feldspar, albite, TiO_2 (App. Fig. 4B.4) and maybe a few of the Feohy grains. The diagenetic grains are ones identified in the polished thin sections from sidewall cores. These minerals include: calcite, siderite, ankerite, pyrite, apatite, kaolinite, and probably barite and Feohy. Only rarely have convincing cuttings been observed (App. Figs. 4B.2,5, 11, 13).

3.5.3 Sample A-45 5960 (Appendix 4C)

Sample type: Heavy mineral separate, grain mount

Grain size: Sieved

Detrital minerals: K-feldspar, muscovite, quartz

Diagenetic minerals: Apatite, barite, chlorite, Feohy, fluorite, kaolinite, pyrite, siderite

Contaminants: Barite, calcite, Feohy, psilomelane, pyrolusite, wolframite, zincite

Lithic clast: None

Additional notes: A vein of kaolinite and fluorite cuts Feohy and apatite (App. Fig. 4C.5).

3.5.4 Sample A-45 6182.5 (Appendix 4D)

Sample type: Sidewall core

Grain size: Mudstone

Detrital minerals: Albite, quartz, zircon

Diagenetic minerals: Ankerite, apatite, calcite, chlorite, ferroan calcite, kaolinite, pyrite, sphalerite, ?TiO_2

Lithic clast: None

Contaminants: This thin section was produced from the rubble of a sidewall core. Similar to sidewall core, the infiltration of drilling mud into these samples is largely limited to fractures and the exterior of the core. As such, contaminants are rare in this sample, and typical drilling mud contaminants such as barite are considered to be diagenetic in origin.

Additional notes: This sample is located below the salt. It appears to be mudstone cemented with calcite with probably one original phosphate nodule. Phosphate nodules have sphalerite cores and rims made up of apatite and pyrite (App. Figs. 4D.5–7).

3.5.5 Sample A-45 6213.5 (Appendix 4E)

Sample type: Sidewall core

Grain size: Mudstone

Detrital minerals: Ilmenite, K-feldspar (v. rare, one grain), muscovite, plagioclase (albite, oligoclase, andesine), quartz, spinel, TiO_2, zircon

Diagenetic minerals: ?albite, apatite, barite, chlorite, calcite, illite, kaolinite, pyrite, siderite, sphalerite, TiO_2, ?xenotime

Lithic clast: Felsic igneous lithic clasts made up of albite and oligoclase (App. Fig. 4E.2), quartz and albite (App. Fig. 4E.2), quartz and TiO_2 (App. Fig. 4E.12,15), quartz and muscovite (App. Fig. 4E.11,13). Possible metamorphic rock clast made up of chlorite (App. Fig. 4E.4) and a large grain of muscovite now replaced by illite and chlorite (App. Fig. 4E.4).

Contaminants: None identified

Additional notes: (1) Apart from the quartz, the most common detrital minerals appear to include: plagioclase (albite, oligoclase, and andesine), with albite by far the most common, although some of this, at this depth, may be diagenetic (e.g. App. Fig. 4E.24), especially since only one grain of K-feldspar has been analysed (App. Fig. 4E.15). Muscovite follows in abundance, although often is partly replaced by diagenetic minerals, mostly kaolinite and chlorite (App. Fig. 4E.3). The more rare minerals include spinel, zircon, rutile (TiO_2, App. Fig. 4E.20,22), and ilmenite (App. Fig. 4E.21). Two lithic clasts with albite (App. Fig. 4E.2) are probably equivalent to the common trachyte clasts found in Newburn H-23.

(2) There is a large variety of diagenetic minerals present, which supports continuous change in physiochemical conditions during deep burial. These minerals include: chlorite (very common) and probably in multiple generations, early kaolinite, later calcite, siderite, pyrite, some albitization.

(3) Barite, sphalerite, and some TiO_2 are convincingly very late, often following grain boundaries, filling dissolution voids, or rimming earlier diagenetic minerals (App. Figs. 4E.5 ,6, 9, 10, 13). Apatite also appears to be late, one coated grain (App. Fig. 4E.1) has been seen, made up of calcite, siderite, chlorite, and pyrite. Illite is rare and, where observed, replaces muscovite (App. Fig. 4E.4).

(4) Some small grains appear to be relics of lithic clasts. The mineralogy of such grains is as follows: albite and muscovite (App. Fig. 4E.4); quartz and muscovite (App. Fig. 4E.11,13); TiO_2 and quartz (App. Fig. 4E.12,15). This assemblage suggests felsic igneous and metasedimentary source rocks.

3.6 Newburn H-23 well (summaries from Sangster, 2016)

The polished thin sections from seventeen samples, five from cuttings and twelve from good quality sidewall cores (Table 2), were studied in detail by Sangster

(2016). In this report we present only some generalities and petrographic mineral identifications summaries of these samples. The discrimination of detrital and diagenetic minerals from contaminant grains, for the polished thin sections made from cuttings, in this study was significantly helped by the detailed cuttings description provided by the post drill analysis (Kidston et al., 2007) for this well.

3.6.1 Cutting Samples

3.6.1.1 Cree Member Sample 4300

This sample is made from the combined cuttings from depth intervals 4300 m to 4310 m (Table 1). Detailed cuttings description provided by the post drill analysis (Kidston et al., 2007) for this range suggests that the lithology is a combination of claystone, sandstone and limestone. The claystone is the most dominant lithology and is present from 4300 m–4305 m. It is off-white to grey-white in colour, silty and rarely sandy, becoming locally chalky limestone with occasional dead oil. The sandstone is the second most dominant lithology and is present from 4310m-4315m. It is off-white in colour and fine-grained containing medium grains. The sands are well sorted and sub-rounded with common limestone interbeds. The limestone is off-white to greyish white in colour, argillaceous, contains trace carbonaceous flakes, and silty white clay interbeds.

The detrital minerals in this sample are albite, biotite, spinel, diopside, epidote, hornblende, ilmenite, K-feldspar, muscovite, quartz, TiO_2, tourmaline, and zircon. The diagenetic minerals barite, chlorite, F-apatite, fluorite, Fe-dolomite, goethite, hematite, limonite, pyrite, siderite, and TiO_2. Possible contaminants are chalcopyrite, magnetite, and psilomelane.

3.6.1.2 Cree Member Sample 4315

This sample is made from the combined cuttings from depth intervals 4315 m to 4350 m (Table 1). Detailed cuttings description provided by the post drill analysis (Kidston et al., 2007) for this range suggests that the lithology is sandstone, limestone, claystone, and calcareous marlstone. Limestone is present at the most levels spanning from 4315–4325 m and 4345–4355 m. It is off-white and light-brown in parts. These limestones are sandy and silty grading into calcareous sandstone; they are also argillaceous becoming marly containing trace glauconite and minor grey claystone lamellae. The sandstone is present from 4315–4320 m and is off-white in colour and

fine-grained with rare medium size grains. The sands are sub-rounded and well-rounded with rare limestone interbeds. The claystone is present from 4325–4330 m and from 4350–4355 m. It is grey brown in colour, silty, and shows carbonaceous flakes. The calcareous marlstone is only present from 4325–4330 m. It is light-tan to grey and argillaceous.

The detrital minerals in this sample are albite, spinel, muscovite, quartz, and zircon. The diagenetic minerals are apatite, barite, goethire, kaolinite, limonite, pyrite, and siderite. Psilomelane is a possible contaminant.

3.6.1.3 Middle Missisauga Sample 5930

The detailed cuttings description provided by the post drill analysis (Kidston et al., 2007) for this sample suggests that the lithology is 50% shale and 50% siltstone. The shale is medium-grained, grey in colour, and slightly silty and calcareous with light-grey coarse silt laminae and carbonaceous laminations as well as nodular pyrite. The siltstone component is light-grey to off-white in colour. It grades from coarse silt to very fine-grained sand, is slightly calcareous and arenaceous. It also contains trace carbonaceous laminations.

The detrital minerals in this sample are actinolite, biotite, K-feldspar, labradorite, magnetite, muscovite, quartz, TiO_2, and zircon. The diagenetic minerals are barite, chlorite, dolomite, fluorite, limonite, pyrite, siderite, and TiO_2. Possible contaminants include magnetite and psilomelane.

3.6.1.4 Middle Missisauga Sample 5965

The detailed cuttings description provided by the post drill analysis for this sample suggests that the lithology is medium-brown shale, which is slightly silty and calcareous with traces of pyrite and brown calcareous stringers.

The detrital minerals in this sample are albite, ilmenite, magnetite, muscovite, quartz, TiO_2, and tourmaline. The diagenetic minerals are ankerite, barite, calcite, chlorite, fluorite, hematite, limonite, pyrite, and siderite. Possible contaminants include arsenopyrite, covelite, and psilomelane.

3.6.1.5 Middle Missisauga Sample 5975

The detailed cuttings description provided by the post drill analysis (Kidston et al., 2007) for this sample suggests that the lithology is grey-brown shale, which is slightly silty and calcareous with traces of pyrite and white calcareous lamellae.

The detrital minerals in this sample are albite, hornblende, K-feldspar, muscovite, quartz, TiO_2, and tourmaline. The diagenetic minerals are ankerite, apatite, barite, calcite, chlorite, dolomite, F-apatite, fluorite, limonite, pyrite, and siderite. Possible contaminants include chalcopyrite, magnetite, and psilomelane.

3.6.2 Petrographic changes with stratigraphy: detrital and diagenetic minerals in polished thin sections from sidewall core samples.

There are 12 polished thin sections from the Newburn H-23 well which range from the Cree Member to the Middle Missisauga (Fig. 2). The analyzed polished thin sections from the Middle Missisauga Formation range in sample depths from 5213.5 m to 5962 m, these polished thin sections appear to be in two separate groups of sample depths, one above 5410 m and the other below 5950 m. Since the samples from the Middle Missisauga Formation show such a large distribution in depths they have been separated into two groups, within which the distribution of sample depths is smaller and the samples within the group better relate to one another in terms of mineralogy and diagenetic conditions. Group 1 includes samples 5213.5 m, 5403.6 m, 5406.5 m, 5407 m, and 5408.5 m, and Group 2, includes samples 5957.8 m, 5961.2 m, and 5962 m.

3.6.2.1 Cree Member Sample 4313.5

The sidewall core description provided by the post drill analysis (Kidston et al., 2007) is of a grey, poorly sorted, and very fine to fine-grained sandstone with carbonaceous shale micro-laminations and calcareous cement. Petrographic analysis of this sample suggests that this is a well sorted fine-grained subarkose with an average grain size of 188 μm. Core analysis gives a porosity of 0.175 and a maximum permeability of 0.4 mD.

The detrital minerals in this sample are albite, K-feldspar, muscovite, monazite, oligoclase, quartz, TiO_2, and zircon. Lithic clasts are granitoid rocks composed of either TiO_2 and muscovite, or quartz and muscovite, and trachytes. Mudstone intraclasts are also present. The diagenetic minerals are ankerite, apatite, barite, calcite, chlorite, F-apatite, illite, kaolinite, magnesian siderite, siderite,

sphalerite, TiO_2, and zircon. The paragenetic sequence for this sample is tentatively interpreted as: Quartz overgrowths → Kaolinite + Illite → Calcite → Ankerite → Apatite + Chlorite → Siderite + Mg-Siderite → Pyrite,* TiO_2, Sphalerite, Zircon.

* Note: Minerals separated by a comma (,) indicates that their age relative to one another is unknown.

3.6.2.2 Cree Member Sample 4318.5

The sidewall core description provided by the post drill analysis is of a grey poorly sorted fine to medium-grained sandstone with carbonaceous shale micro-laminations and calcareous cement. Petrographic analysis of this sample suggests that this is a poorly sorted medium-grained subarkose with an average grain size of 395 μm. Core analysis gives porosity of 0.165 and a maximum permeability of 2.65 mD.

The detrital minerals in this sample are albite, spinel, K-feldspar, muscovite, oligoclase, and quartz. Lithic clasts are granitoid rocks and trachytes. The diagenetic minerals include apatite, barite, chlorite, F-apatite, hematite, illite, kaolinite, pyrite, TiO_2, siderite, and zircon. There are also abundant intraclasts. The paragenetic sequence for this sample is tentatively interpreted as: Quartz overgrowths → Kaolinite +Illite → Siderite (cement in intraclasts) → Chlorite + Apatite + Fluorapatite→ TiO_2, Barite, Pyrite, Zircon.

3.6.2.3 Cree Member Sample 4353.5

The sidewall core description provided by the post drill analysis is of a grey, poorly sorted very fine to fine-grained sandstone with calcareous cement. Petrographic analysis of this sample suggests that this is a well sorted fine-grained sublitharenite with an average grain size of 220 μm. Core analysis gives a porosity of 0.121 and a maximum permeability of 0.28 mD.

The detrital minerals in this sample are albite, spinel, K-feldspar, muscovite, and quartz. The lithic clasts are granitoids with apatite, F-apatite, and quartz, and trachytes. The diagenetic minerals are ankerite, calcite, chlorite, F-apatite, F-calcite, Fe-calcite, F-Fe-calcite, glauconite, kaolinite, pyrite, TiO_2, and zircon. The paragenetic sequence for this sample is tentatively interpreted as: Glauconite → Quartz overgrowths? Kaolinite, Illite → Calcite → Ankerite → Fe-Calcite → F-Calcite + F-Fe-Calcite → Chlorite + Fluorapatite → Pyrite, Siderite, TiO_2, Zircon.

3.6.2.4 Upper Mississauga Formation Sample 4913

The sidewall core description provided by the post drill analysis is of a medium-grey siltstone with a shaley fraction. Petrographic analysis of this sample suggests that this is a well sorted fine-grained sublitharenite with an average grain size of 177 µm. Core analysis gives a porosity of 0.094 and a maximum permeability of 0.09 mD.

The detrital minerals in this sample are albite, muscovite, oligoclase, and quartz. The lithic clasts are granitoids and trachytes. There are also mudstone intraclasts. The diagenetic minerals are ankerite, apatite, barite, calcite, chlorite, F-apatite, kaolinite, pyrite, siderite, sphalerite, TiO_2, xenotime, and zircon. The paragenetic sequence for this sample is tentatively interpreted as: Quartz overgrowths → Illite + Kaolinite → Ankerite → Chlorite + Apatite + Fluorapatite → Barite, Sphalerite, TiO_2, Pyrite, Siderite, Xenotime, Zircon.

3.6.2.5 Middle Mississauga formation (Group 1) Sample 5213.5

The sidewall core description provided by the post drill analysis is of a grey-white limestone and shale. Petrographic analysis of this sample suggests that this is a well sorted, fine-grained sublitharenite with an average grain size of 118 µm. No core analysis was performed on this sample.

The detrital minerals in this sample are albite, spinel, muscovite, quartz, and zircon. The lithic clasts are granitoids and trachytes. The diagenetic minerals are ankerite, apatite, barite, calcite, chlorite, F-apatite, F-calcite, Fe-calcite, F-Fe-calcite, kaolinite, pyrite, TiO_2, and zircon. The paragenetic sequence for this sample is tentatively interpreted as: Pyrite (framboidal) → Quartz overgrowth → Fe-Calcite, Calcite, Ankerite → F-Calcite, Calcite, Ankerite → F-Fe-Calcite, Calcite, Ankerite → TiO_2 → Chlorite → Apatite + Fluorapatite → Siderite, Barite, Pyrite, Zircon.

3.6.2.6 Middle Missisauga (Group 1) Sample 5403.6

The sidewall core description provided by the post drill analysis is of a light-brownish-white, fairly well sorted silty to very fine-grained sandstone with siliceous cement. Petrographic analysis of this sample suggests that this is a well sorted fine-grained subarkose with an average grain size of 126 µm. Core analysis gives a porosity of 0.072 and a maximum permeability of less than 0.01 mD.

The detrital minerals in this sample are albite, K-feldspar, muscovite, quartz, TiO_2, and zircon. The lithic clasts are trachytes. There are also mudstone intraclasts. The diagenetic minerals are ankerite, barite, calcite, chlorite, F-apatite, F-calcite, F-Fe-calcite, illite, kaolinite, pyrite, TiO_2, siderite, sphalerite, and zircon. The paragenetic sequence for this sample is tentatively interpreted as: Quartz overgrowth → Fracture → Kaolinite → Chlorite, Siderite, F-Calcite, F-Fe-Calcite, Calcite, Ankerite, Pyrite, Fluorapatite → TiO_2, Barite, Siderite (rims), Zircon

3.6.2.7 Middle Missisauga (Group 1) Sample 5406.5

The sidewall core description provided by the post drill analysis is of a light-brownish-white moderately well sorted very fine-grained sandstone with siliceous cement. Petrographic analysis of this sample suggests that this is a well sorted fine-grained subarkose with an average grain size of 240 µm. Core analysis gives a porosity of 0.091 and a maximum permeability of 0.04 mD.

The detrital minerals in this sample are albite, spinel, muscovite, quartz, TiO_2, tourmaline, and zircon. The lithic clasts are trachytes. The diagenetic minerals are ankerite, apatite, calcite, chlorite, F-apatite, glauconite, illite, kaolinite, pyrite, siderite, TiO_2, and zircon. The paragenetic sequence for this sample is tentatively interpreted as: Siderite (concretion.) + Glauconite → Quartz overgrowth → Kaolinite → Calcite → Chlorite → Apatite → Ankerite → Siderite (rhombohedra), Xenotime, TiO_2, Pyrite, Zircon.

3.6.2.8 Middle Missisauga (Group 1) Sample 5407

The sidewall core description provided by the post drill analysis is of a light-brownish well sorted silty to very fine-grained sandstone with silica cement. Petrographic analysis of this sample suggests that this is a well sorted fine-grained sublitharenite with an average grain size of 96 µm. Core analysis gives a porosity of 0.170 and a maximum permeability of 0.15 mD.

The detrital minerals in this sample are albite, muscovite, and quartz. The lithic clasts are trachytes. The diagenetic minerals are ankerite, apatite, calcite, chlorite, F-apatite, F-calcite, F-Fe-calcite, illite kaolinite, pyrite, siderite, sphalerite, TiO_2, and zircon. The paragenetic sequence for this sample is tentatively interpreted as: Quartz overgrowth → Fracture → Kaolinite → Illite → F-Calcite, Calcite,

Ankerite → F-Fe-Calcite, Calcite, Ankerite → Chlorite → Fluorapatite, TiO_2, Siderite, Sphalerite, Pyrite, Zircon.

3.6.2.9 Middle Missisauga (Group 1) Sample 5408.5

The sidewall core description provided by the post drill analysis is of a light-brownish to off-white moderately well sorted very fine to fine-grained sandstone. Petrographic analysis of this sample suggests that this is a well sorted, fine-grained quartz arenite with an average grain size of 140 μm. Core analysis gives a porosity of 0.179 and a maximum permeability of 6.43 mD.

The detrital minerals in this sample are albite, chromian spinel, oligoclase, quartz, and tourmaline. The lithic clasts are trachytes and schists. The diagenetic minerals in this sample are ankerite, apatite, barite, calcite, chlorite, Fe-calcite, F-Fe-calcite, F-apatite, fluorite, illite, kaolinite, pyrite, siderite, TiO_2, and zircon. The paragenetic sequence for this sample is tentatively interpreted as: Kaolinite + Quartz overgrowths? → Illite → Fe-Calcite (Calcite + Ankerite??) → F-Calcite (Calcite + Ankerite??) → F-Fe-Calcite (Calcite + Ankerite??) → Chlorite → Fluorapatite, Apatite, Fluorite → Siderite, Barite, Pyrite, TiO_2, Zircon.

3.6.2.10 Middle Mississauga (Group 2) Sample 5957.8

The sidewall core description provided by the post drill analysis is of a grey very fine-grained sandstone with calcareous cement interbedded with grey black shale. Petrographic analysis of this sample suggests that this is a well sorted very fine-grained sublitharenite with an average grain size of 84 μm. Core analysis gives a porosity fraction of 0.099 and a maximum permeability value of 0.02 mD.

The detrital minerals in this sample are albite, spinel, muscovite, quartz, TiO_2, and zircon. The lithic clasts are trachytes and schists. The diagenetic minerals in this sample are ankerite, apatite, calcite, chlorite, F-apatite, Fe-calcite, illite, kaolinite, pyrite, siderite, and TiO_2. The paragenetic sequence for this sample is tentatively interpreted as: Fe-Calcite (coated grain) → Illite, Kaolinite → Ankerite, Calcite → Chlorite, Apatite + Fluorapatite → TiO_2, Pyrite, Siderite.

3.6.2.11 Middle Missisauga (Group 2) Sample 5961.7

The sidewall core description provided by the post drill analysis is of a grey sandstone with calcareous cement and shale stringer. Petrographic analysis of this

sample suggests that this is a well sorted fine-grained quartzarenite with an average grain size of 100 μm. Core analysis gives a porosity of 0.127 and a maximum permeability of 0.03 mD.

The detrital minerals in this sample are albite, muscovite, quartz, TiO_2, and zircon. The lithic clasts are mostly trachytes with probable altered pumice clasts. The diagenetic minerals in this sample are Al-phosphate, ankerite, apatite, calcite, chlorite, Fe-calcite, F-apatite, pyrite, siderite, sphalerite, TiO_2, and zircon. The paragenetic sequence for this sample is tentatively interpreted as: Al-phosphate? → Quartz overgrowth → Kaolinite → Chlorite → Apatite + Fluorapatite → Calcite → Ankerite → Fe-Calcite → Siderite, TiO_2, Sphalerite, Pyrite, Zircon.

3.6.2.12 Middle Missisauga (Group 2) Sample 5962

The sidewall core description provided by the post drill analysis is of a grey, very fine to fine-grained sandstone with calcareous and siliceous cement and minor carbonaceous laminations. Petrographic analysis of this sample suggests that this is a well sorted fine -grained sublitharenite with an average grain size of 160 μm. Core analysis gives a porosity of 0.088 and a maximum permeability of less than 0.01 mD.

The detrital minerals in this sample are albite, spinel, K-feldspar, probable monazite, muscovite, quartz, TiO_2, and zircon. The lithic clasts are trachytes, slate, and an altered pumice clast. The diagenetic minerals in this sample are ankerite, apatite, barite, calcite, chlorite, Fe-calcite, F-apatite, fluorite, illite, kaolinite, Mg-calcite, pyrite, siderite, TiO_2, and zircon. The paragenetic sequence for this sample is tentatively interpreted as: Quartz overgrowth + Fracture → Kaolinite, Illite → Chlorite → Fluorapatite + Apatite + Fluorite + Ankerite → Calcite → Fe-Calcite → Barite, TiO_2, Pyrite, Siderite, Calcite (Sparry), Zircon.

4. DISCUSSION

4.1 Lithologies of lithic clasts (Table 3)

Of the deep wells, the well with the best stratigraphic record of variation in lithic clasts is Newburn H-23. This is the well for which we have high quality polished thin sections from relatively wide diameter sidewall cores. Lithic clasts have been identified by Sangster (2016) at all stratigraphic levels of the Lower Cretaceous–Upper Jurassic section in this well. Both the Cree Member and the Upper Member of

the Missisauga Formation sandstones contain mostly granitoid and trachytic lithic clasts. The Middle Member of the Missisauga Formation sandstones in addition contain rare schist and slate. In addition, rare altered pumice clasts support input from a volcanic source. The depositional environment of the studied section in Newburn H-23 was distal pro-delta on the outer shelf, whereas all the other studied wells accumulated on the basin slope (Kidston et al., 2007).

The samples from other wells in this study come from various stratigraphic levels (Fig. 2) and contain a variety of lithic clasts (Table 3). In the Annapolis G-24 well they come mostly from the Middle Member of the Missisauga Formation, but there is also one sample from the Naskapi Member. The latter is a sidewall core sample and appears to contain mostly felsic igneous rocks (granitoid) and rare metamorphic (schist) clasts. The lithic clasts in the Middle Missisauga sandstones are mostly from felsic igneous rocks (granitoids) and rarely from metamorphic rocks (slate). However there is a common group of lithic clasts made up of TiO_2 and quartz that could be either from pegmatites or metapelites. Some of such clasts have a well defined fabric and therefore probably are mostly from pelitic rocks. All the studied samples from Crimson F-81 well come from the Middle Missisauga sandstones. Lithic clasts seen in these sandstones include felsic igneous rocks (granitoid), and the lithic clasts that consist of quartz and TiO_2 that probably come from metapelites. Of the samples from the Weymouth A-45 well, one comes from the Naskapi Member and all the rest from the Upper Missisauga Formation sandstones. No lithic clasts have been seen in the sample from the Naskapi Member, but a variety of clasts have been seen in one sample from the Upper Missisauga Formation sandstone that includes types seen in Newburn H-23, such as clasts from trachyte, granitoid, slate, and metapelite. The two samples from the Balvenie B-79 well are from the Upper Cretaceous Wyandot Formation equivalent and we have seen only one lithic clast, probably from a metamorphic rock (schist).

4.2 Detrital Minerals

4.2.1 Heavy mineral point counting based on BSE images

Important analyzed detrital mineral grains in the analyzed samples other than quartz include K-feldspar, plagioclase, muscovite, biotite, tourmaline, chromite/spinel, ilmenite, TiO_2 and zircon. Point counting was performed using BSE images (Table 4). Sidewall core samples were preferred for point counting, however because of sample limitations some samples from cuttings have also been included. Selected samples by

well and formation are as follows. Annapolis G-24 well: two samples from sidewall cores from Naskapi Member; Crimson F- 81 well: four samples from cuttings from Middle Missisauga; Weymouth well: two samples from Upper Missisauga, from sidewall cores. The modal abundances of the selected minerals from these samples are plotted on pie diagrams (Fig. 3).

In the Annapolis G-24 well the most abundant mineral (excluding quartz) is muscovite followed by plagioclase, although some of it may be diagenetic albite, followed by K-feldspar followed by biotite for both studied stratigraphic levels, Naskapi member and Middle Missisauga (Table 4). In the Crimson F-81 well, where we have samples only from Middle Missisauga, there are significant variations among the six studied samples. The variations are in the relative proportions of the three main detrital minerals (muscovite, plagioclase, K-feldspar) and the presence or absence of tourmaline. Such variations are probably due to local sandstone variations and the small size of sample we were allowed to take. Therefore since all six samples come from the same stratigraphic level, the average of all modal analyses would be the best modal composition of the Middle Missisauga sandstones for this well. The persistent occurrence of detrital K-feldspar in this well is important, because it may suggest lack of pathways and thus limited fluid circulation for K-feldspar dissolution. The two samples from sidewall cores of Upper Missisauga sandstone for Weymouth A-45 well suggest a different detrital mineral assemblage between this well and Annapolis and Crimson. Although plagioclase is the most important detrital mineral, ilmenite, TiO_2, chromite/spinel and zircon are also present. One of the two samples contains only plagioclase and ilmenite. Detrital K-feldspar is extremely rare in the sandstones from this well. No such grains were identified in the three cutting samples from the Naskapi Member and the Upper Missisauga. Out of the large number of analysed grains from the sidewall cores from the Upper Missisauga, only one K-feldspar grain was analysed in sample 6185.5, and in sample 6213.5 there were only three grains out of the 102 detrital grains analysed. In all of these cases, the K-feldspar is in the form of relics (App. Figs. 4E.15, 24) or partly replaced by kaolinite (App. Fig. 4E.19). The Weymouth A-45 well is the closest to the Newburn H-23 well. One Upper Missisauga Formation sample was analyzed from the Newburn H-23 well (Sangster, 2016) and no detrital K-feldspar grain was identified.

Point counting results from the Newburn H-23 using a transmitted light microscope (Table 5) shows that plagioclase is the most abundant detrital mineral, if

quartz is not considered. The next most abundant detrital minerals are muscovite, tourmaline, and zircon. These data suggest that the rarity of detrital K-feldspar in the Newburn well is real and not method related.

The available data for the Upper Missisauga sandstones from the two wells Weymouth A-45 and Newburn H-23 (Fig. 4) suggest rarity of detrital K-feldspar in both wells, which is likely related to their deep burial depths (Pe-Piper et al., 2017; Pe-Piper and Yang, 2014) and availability of pathways so that hot deep formation waters could circulate (Pe-Piper et al., 2017). Detrital zircon also appears to be present in both wells (Figs. 3 and 4). In the Weymouth A-45 well, ilmenite appears to have be partly altered to TiO_2 minerals, but we have not seen such a relationship between ilmenite and TiO_2 in the Newburn H-23 well, although diagenetic TiO_2 phases are present. Both chlorite and tourmaline have been identified only in Newburn H-23, whereas chromite/spinel was found only in Weymouth A-45. The differences in these minor detrital minerals may be mostly due to the small sample size.

4.2.2 Chemical fingerprinting

The chemical analyses for several detrital minerals of all the samples were used for provenance determination. The selected minerals include feldspar (K-feldspar, plagioclase), tourmaline, muscovite, biotite, and chromite/spinel. These are common detrital minerals in these samples and have been plotted to characterize their potential sediment source (cf. Tsikouras et al., 2011). The chemical analyses were screened to ensure only pure mineral analyses were used. Such analyses were then recalculated and plotted using the Minpet software.

4.2.2.1 Muscovite

Muscovite is a common detrital mineral in the studied wells at all stratigraphic levels of interest and is therefore a good mineral to help in identifying a potential source rock lithology. Unfortunately, muscovite is easily altered to chlorite, illite, and hydromuscovite and as a result the analyses of muscovite in the wells had to be chemically screened to ensure that only the freshest grains were plotted for provenance. Analyses containing more than 3% combined FeO, MgO, and F were omitted from provenance diagrams. Analyses were plotted on a total aluminum versus

potassium graph (in atomic formula units (a.f.u.), recalculated using Si = 8) with fields from Reynolds et al., 2010 (Fig. 5).

A good number of the muscovite analyses from these wells plot outside the two fields, igneous and metasedimentary, recognised in the discrimination diagram (Fig. 5. This may reflect some alteration of the plotted analyses or it may be that the fields of Figure 5, based on the Meguma terrane, do not completely represent the chemistry of all potential muscovite sources (a common problem in published discrimination diagrams). Of the analyses that plot in the fields, most plot on the metasedimentay field. The possibly igneous muscovites are a few from Newburn H-23, both Upper Missisauga and Cree Member, and one from each of Annapolis G-24 and Weymouth A-45, both from Naskapi Member.

4.2.2.2 Tourmaline

Tourmaline is a highly stable detrital mineral and is common throughout the Scotian Basin and as a result is widely used as an indicator for potential sediment sources. Tourmaline is plotted on a ternary diagram using Al-Fe^{2+}-Mg (in a.f.u. recalculated using O=23.5) with four distinct fields (Pe-Piper et al., 2009) (Fig. 6). Tourmaline is a very rare detrital minerals in the samples from Weymouth A-45, with only one grain in a sample from the Naskapi Member. Most of the samples, both from the Cree Member and Middle Missisauga, of the other three wells plot in field 4 (Fig 6), indicating a source in metapelite. Only a few analyses from samples from the Middle Missisauga Formation of these wells and one analysis from the Cree Member of the Newburn H-23 well plot in field 1, which is the field for tourmaline derived from Li-poor granites. A few tourmaline analyses from the Middle Missisauga Formation of the Annapolis G-24 well, and the analysis from the Naskapi Member sample of the Weymouth A-45 well plot in or on the boundary of field 3, which is the field for tourmaline from metapelites or other metasedimentary rocks. These data suggest metapelites and granites as the most important potential source rocks.

4.2.2.3 Biotite

Biotite suffers from the same issues as muscovite in terms of alteration, and organized data in regards to potential source rocks for the Scotian basin are scarce. As a result, biotite chemistry is used dominantly to determine the rock type of their source and to further discriminate igneous sources (Fig. 7). Analyses have been

plotted on an aluminium versus iron over iron and magnesium plot (in a.f.u. recalculated using Si=8) to determine the nomenclature of the analyses after Deer et al., 1992 (Fig. 7A); titanium oxide versus aluminum oxide (in wt. %) to determine source rock type after Fleet 2003 (Fig. 7B), and finally on an iron oxide – magnesium oxide – aluminum oxide diagram after Abdel-Rahmen (1994) (Fig. 7C), using only the analyses that plotted within the igneous field in Fig. 7B, to further classify the source rock.

All except two of the identified grains of dark mica chemically classify as biotite (Fig. 7A) and these grains come from Naskapi Member and the Middle Missisauga Formation samples of G-24, F-81 and H23 wells. There is only one grain from a Cree Member sample of H-23 well and that together with one Middle Missisauga Formation sample for G-24 well classify as phlogopite. The majority of identified biotite grains plot in the field for biotite from metamorphic rocks or outside any field and few in the field for biotites from igneous rocks (Fig. 7B) and more specifically in the field for calc-alkaline rocks (Fig. 7C).

4.2.2.4 Spinel/Chromite

Spinel/Chromite is a detrital mineral known for being stable during diagenesis and being easily traced back to its source rock lithology and source area (Figs. 8B, C). However due to its stability, it is prone to be polycyclic, but this can be investigated using certain biplots comparing the abundances of spinel and zircon (polycyclic) and ilmenite (usually first cycle) if available for the same set of samples (e.g. Zhang et al., 2014). Most of the spinel/chromite grains identified come from H-23 well and we believe that it may be due to the large number of sidewall core polished thin sections studied from this well. Few grains also have identified from: the Cree Member sample of G-24 well and the Middle Missisauga samples for both G-24 and A-45 wells. No spinel/chromite grains were identified in the samples from F-81 well.

The spinel analyses from the three deep wells have been classified using biplots of chromium number (100*Cr/Cr+Al) vs magnesium number (100*Mg/Mg+Fe^{2+}) (Fig. 8) and chromium number vs TiO_2 (Fig. 9), to show potential source rock lithologies and thus source areas. The chromium number vs TiO_2 plot (Fig. 9) uses fields defined by EMP data (Pe-Piper et al., 2009), the spinel analyses from the deep wells however, were taken using an SEM. Due to the differences in detection limits between the EMP and SEM, analyses with less than 0.2 wt%TiO_2

have been omitted from the plot, since they are below accurate detection limits for the SEM and therefore do not necessarily represent the sources which the analyses plot as.

Most of the spinel/chromite analyses from the deep wells come from the Newburn H-23 well, because this is the well with the best and most studied sandstone samples. For the rest of the wells, only a few analyses are from Annapolis G-24 and Weymouth A-45, but the overall chemistry of the spinel/chromite grains from all three wells is similar. These analyses are dominantly chromite with lesser Cr-spinel and rare boninitic-type chromites (Fig. 8A). They are almost entirely chromites in the Cree Member and show a greater diversity in the Middle Missisauga Formation. They also plot within the field representing spinel analyses from other wells in the Sable Sub-basin (Figs. 8B, C). Since we did not use analyses with <0.2% TiO_2 we cannot express any comment for their boninitic character, but most of the analyses of the detrital spinel/chromite grains from the deep wells appear to suggest Island-Arc tholeiites and MORB as potential source rocks (Fig. 9A). This supports the Newfoundland Appalachians as a potential sediment source, with sediments being transported to the Scotian Basin by the Sable River (Figs. 9B, C).

4.2.2.5 Feldspars

The feldspars are very informative detrital minerals for potential source rock lithologies. The chemical analyses of all feldspars from the studied wells were plotted on ternary diagrams to show the chemical variations, based on K-Na-Ca compositions, of the various feldspar mineral members. Feldspar are light minerals, and are found only as accidental contaminants in heavy mineral separates. Point counting of thin sections of sidewall cores from Newburn H-23 (Table 5), using a petrographic microscope, shows that the sandstones classify as quartzarenite to subarkose (after Folk, 1968). Both K-felspar and plagioclase are present in these rocks (Table 5), but the abundance of K-feldspar is much reduced in comparison to wells in Sable Sub-Basin and the samples with K-feldspar in Newburn H-23 are only from the Cree Member.

The polished thin sections used for EDS analyses of feldspars were both from heavy grain separates but also from sidewall cores, mostly from Newburn H-23 but also from Annapolis G-24 and Weymouth A-45. All the analyses of K-feldspar plot in the sanidine field, which includes orthoclase. Many of these analyses plot at the apex

for orthoclase. K-feldspar analyses come only from the Cree Member in Newburn H-23, from the Naskapi Member and Middle Missisauga for Annapolis G-24 and Crimson F-81, Middle Missisauga for Weymouth A-45 and Wyandot for Balvenie B-79 (Fig. 10). Plagioclase appears to be very common in all deep wells, with reasonably good analytical data and range in composition from albite to oligoclase. Some of the albite is diagenetic in origin and has probably replaced some of the K-feldspar.

4.2.3 Provenance Highlights

The new data for deep wells Annapolis G-24, Crimson F-81 and Weymouth A-45 generally support and extend the earlier suggestion by Sangster (2016) that the deep well Newburn H-23 has a similar provenance to Glenelg Field sandstones in the Sable Sub-Basin. All these wells must have sourced principally by the Sable River, which carried sediments sourced from the Northern Appalachians and Labrador (Zhang et al., 2014), augmented by local rivers draining Meguma Group metasedimentary rocks and granites.

The western wells, Newburn H-23 and Weymouth A-45 (Group A) are slightly different from the eastern wells, Annapolis G-24 and Crimson F-81 (Group B) in two respects. First, trachyte clasts are more common in Group A. They are abundant in Newburn H-23 and rare in Weymouth A-25, but their recognition is strongly dependant on having suitable sidewall cores. The source of such sodic volcanic clasts may be Scatarie Bank (Bowman et al., 2012), or might be an unknown trachyte occurrence farther west on the Scotian Shelf. Previous studies on the shelf have found higher abundance of trachyte clasts and Cretaceous zircons at Peskowesk A-99 compared to the Glenelg field and even lower abundances at the Alma field in the western Sable sub-basin (Bowman et al., 2012; Piper et al., 2012). The Alma field is upslope from the Group A wells, whereas the Group B wells, are a little to the east of the Glenelg field (Fig. 2). This may indicate that sorting processes other than source availability may also have been involved, or that there was a cryptic volcanic centre on the La Have Platform. Cretaceous volcanic centres in the Laurentian sub-basin and the SW Grand Banks are marked by prominent magnetic anomalies. A prominent magnetic anomaly northwest of the Ojibwa E-07 and Naskapi N-30 wells, just landward of the erosional Jurassic edge, was regarded as likely due to Paleozoic magnetite granites by Pe-Piper and Jansa (1999), but a Cretaceous volcanic origin

cannot be excluded (Fig. 12). Detrital zircons from wells from Dauntless D-35 to Alma K-85 correspond in age to the Upper Missisauga Formation and Naskapi Member (Piper etal., 2012), whereas trachyte clasts are most abundant in the Middle Missisauga Formation at Newburn H-23 and Weymouth A-45.

Second, detrital K-feldspars, even as relics, are definitely very rare in both the Newburn H-23 and Weymouth A-45 wells, and if present are in the Cree Member sandstones (Fig. 10D). The Group B wells have more common detrital K-feldspars, despite having burial depths similar to or greater than the Group A wells (Fig. 2). This may suggest different hydraulic system in these two groups of wells. Paleo-temperatures were higher in the mid Cretaceous in the area of the Thebaud and Glenelg fields than farther east. Whether this was related to Aptian magmatism along faults (Jansa and Pe-Piper 1985), in this case the structurally controlled margin of the La Have Platform, or whether it was related to more efficient advection of hot brines (Pe-Piper et al., 2015, 2017) is unclear.

4.3 Diagenesis

4.3.1 Generalities

During burial, basinal fluids interact with sediments. Such fluids have variable origins, temperature, salinities, pH, and dissolved species. During the interaction of such fluids and the sediments, unstable framework minerals will dissolve, creating in this way secondary porosity. At the same time, diagenetic minerals will precipitate and will become the cement. At a later time, conditions may change and the cement minerals may also dissolve and new diagenetic minerals may again precipitate and so on. The order in which the diagenetic minerals form is called paragenetic sequence. Establishing the paragenetic sequence of sedimentary rocks is a very important process, because it gives insight into the conditions present during the burial of studied sedimentary rocks, since it records changes in temperature, chemical composition, and pH of circulating fluids.

4.3.2 Carbonate cements and paragenetic sequence

We have a reasonable number of EDS analyses of the carbonate cement seen in all four wells with Lower Cretaceous rocks. The main carbonate cements are siderite and ferroan calcite, with only very minor Mg-calcite (Fig. 11). Both Newburn

H-23 and Annapolis G-24 have abundant ankerite in the Middle Missisauga, and dolomite is also common in Annapolis G-24.

The paragenetic sequence of minerals for each sample for each of the five studied wells is given in Table 6. Paragenetic sequences are identified with most confidence from sidewall cores with many chemical mineral analyses. Such samples are 4401.5A, B for Annapolis G-24, 6182.5 and 6113.5 for Weymouth A-45 and all twelve sidewall core samples for Newburn H-23.

The earliest recorded diagenesis in the Naskapi Member sandstone of the Annapolis G-24 well started with the precipitation of kaolinite, followed by chlorite, calcite, siderite, and TiO_2. The last diagenetic minerals to form were the assemblage barite, sphalerite and Feohy. This sequence of cement precipitation is very similar to that described by other wells in the Sable sub-basin (Pe-Piper et al., 2015). A similar diagenetic paragenesis is found in Upper Missisauga sandstones of the Weymouth A-45 well in sample 6213.5 (Table 6), which is the sample with the most analytical data.

A detailed paragenetic sequence has been generated by Sangster (2016), his figure 4.24) for H-23 well. This paragenetic sequence starts with glauconite, a mineral that forms during sea floor diagenesis. Glauconite is followed by kaolinite, calcite, ferroan calcite, siderite, quartz overgrowths, and TiO_2 which are the minerals formed at eodiagenesis. The mesodiagenesis in this well is represented by illite, Fe- and Fe-F-calcite, siderite, apatite, barite, pyrite, sphalerite, TiO_2, and zircon. As discussed in Pe-Piper et al. (2017), the diagenesis of the Cretaceous sandstones in this well is very important and informative for the thermal evolution of Scotian Basin.

The diagenetic paragenesis has implications for reservoir quality in deep-water sandstones. There is no evidence of chlorite rims on the quartz, which elsewhere have been observed to inhibit the formation of silica cements, preserving primary porosity in wells on the Scotian shelf (Gould et al., 2010). Ferroan calcite and siderite are widespread: on the Scotian Shelf, carbonate cementation is an important risk element in reservoir quality. However, the widespread occurrence of ankerite and dolomite is indicative of late fluid flow (Pe-Piper et al., 2015; Pe-Piper and Piper, 2019) and the presence of fairways for deep basin fluids which also precipitated barite and sphalerite. These fairways are associated with hydrocarbon reservoirs in the Glenelg and Onondaga fields (Pe-Piper et al., 2015).

5. CONCLUSIONS

Sandstone reservoirs in deep-water wells drilled between 2002 and 2004 have a detrital petrology similar to that in the western Sable Delta on the Scotian Shelf, for example in the Glenelg field. The chemistry of chromite/spinel is characteristic of Sable River supply, but some lithic clasts may be derived from the Meguma terrane. High abundance of sodic trachyte clasts in Newburn H-23 and to a lesser extent Weymouth A-25 in the Middle Missisauga Formation may indicate supply from a cryptic Cretaceous volcanic source on the inner La Have Platform.

Diagenetic paragenesis is generally similar to that in wells on the Scotian Shelf. There is no evidence for chlorite rims on framework quartz grains that are important for preserving primary porosity in many deltaic sandstone reservoirs on the Shelf. Cementation by ferroan calcite and siderite is widespread, but the presence of late ankerite, dolomite, sphalerite and barite is evidence of persistent fairways for fluids similar to those found in the Onondaga and Glenelg fields.

Detrital K-feldspars have been destroyed by diagenetic processes more efficiently in both the Newburn H-23 and Weymouth A-45 wells than at equivalent burial depths in the Annapolis G-24 and Crimson F-81 wells to the east. This may be related to higher paleo-temperatures in the mid Cretaceous in the area of the Thebaud and Glenelg fields than farther east.

References

Abdel-Rahmen, A.F.M. 1994. Nature of biotites from alkaline, calc-alkaline and peraluminous magmas. Journal of Petrology, 35, 525-541.

Albertz, M., Beaumont, C., Shimeld, J. W., Ings, S. J., and Gradmann, S. 2010. An investigation of salt tectonic structural styles in the Scotian Basin, offshore Atlantic Canada: 1. Comparison of observations with geometrically simple numerical models. Tectonics, v. 29, TC4017.

Bowman, S.J., Pe-Piper, G., Piper, D.J., Fensome, R.A. and King, E.L. 2012. Early Cretaceous volcanism in the Scotian Basin. Canadian Journal of Earth Sciences, 49(12), 1523-1539.

Cameron, W.E., Nisbet, E.G., and Dietrich, V.J. 1979. Boninites, komatiites and ophiolitic basalts. Nature 280, 550–553.

Chang, L.L.Y., Howie, R.A., and Zussman, J. 1996. Non-silicates: sulphates, carbonates, phosphates, halides Rock-Forming Minerals, 5B, Longman Group, London, UK, 383 p.

Deer, W.A., Howie, R.A., and Zussman, J. 1992. An Introduction to the Rock-Forming Minerals, 2nd edition. Longman Scientific & Technical, Hong Kong, 696 p.

Dick, H.J.B., and Bryan, W.B. 1979. Variation of basalt phenocryst mineralogy and rock composition in DSDP hole 396B. Initial Reports DSDP, 46, 215-225.

Dick, H.J.B., and Bullen, T. 1984. Chromian spinel as a petrogenetic indicator in abyssal and alpine-type peridotites and spatially associated lavas. Contributions to Mineralogy and Petrology, 86, 54-76.

Fleet, M.E. 2003. Rock-forming minerals, vol. 3A, Micas, 2nd ed. The Geological Society, London, England, 758 pp.

Folk, R. L., 1968. Petrology of Sedimentary Rocks. Austin, University of Texas Publication, 170 p.

Franzolin, E., Schmidt, M.W. and Poli, S., 2011. Ternary Ca–Fe–Mg carbonates: subsolidus phase relations at 3.5 GPa and a thermodynamic solid solution model including order/disorder. Contributions to Mineralogy and Petrology, 161(2), 213-227.

Given, M.M. 1977. Mesozoic and early Cenozoic geology of offshore Nova Scotia. Bulletin of Canadian Petroleum Geology, 25(1), 63-91.

Gould, K., Pe-Piper, G., and Piper, D. J. W., 2010. Relationship of diagenetic chlorite rims to depositional facies in Lower Cretaceous reservoir sandstones of the Scotian Basin. Sedimentology, 57, 587-610.

Henry, D. J., and Guidotti, C.V. 1985. Tourmaline as a petrogenetic indicator mineral: an example from the staurolite-grade metapelites of NW Maine. American Mineralogist, 70, 1-15.

Jansa, L. F., and Pe-Piper, G. 1985. Early Cretaceous volcanism on the northeastern American margin and implications for plate tectonics. Geological Society of America Bulletin, 96, 83-91.

Kassoli-Fournaraki, A., and Michailidis, K. 1994. Chemical composition of tourmaline in quartz veins from Nea Roda and Thasos areas in Macedonia, Northern Greece. Canadian Mineralogist, 32, 607-615.

Kendell, K.L. 2012. Variations in salt expulsion style within the Sable Canopy Complex, central Scotian margin. Canadian Journal of Earth Sciences, 49(12), 1504-1522.

Kidston, A.G., Smith, B., Brown, D.E., Makrides, C. and Altheim, B. 2007. Nova Scotia Deep Water Offshore Post-Drill Analysis – 1982-2004. Canada-Nova Scotia Offshore Petroleum Board, Halifax, Nova Scotia, 181p.

McIver, N.L. 1972. Cenozoic and Mesozoic stratigraphy of the Nova Scotia shelf. Canadian Journal of Earth Sciences, 9(1), 54-70.

Pearce, J.A., Barker, P.F., Edwards, S.J., Parkinson, I.J., and Leat, P.T. 2000. Geochemistry and tectonic significance of peridotites from the South Sandwich arc–basin system, South Atlantic. Contributions to Mineralogy and Petrology, 139(1), 36-53.

Pe Piper, G. and Jansa, L.F. 1999. Pre-Mesozoic basement rocks offshore Nova Scotia, Canada: New constraints on the accretion history of the Meguma terrane. Geological Society of America Bulletin, 111(12), 1773-1791.

Pe-Piper, G., and Piper, D.J.W. 2012. The impact of early Cretaceous deformation on deposition in the passive-margin Scotian Basin, offshore Eastern Canada. In C. Busby (Ed.), Tectonics of sedimentary basins: recent advances, Chapter 13 (pp. 270–287). Chichester, West Sussex, UK: Blackwell-Wiley.

Pe-Piper, G., and Piper, D. J. W. 2019. Significance of the chemistry and morphology of diagenetic siderite in clastic rocks of the Mesozoic Scotian Basin. Sedimentology, 67, 782–809.

Pe-Piper, G., and Yang, X. 2014. Albitisation of detrital feldspars in the Scotian Basin: implications for the thermal evolution of the basin. Open file report 7117, 496 pp.

Pe-Piper, G., Tsikouras, B., Piper, D.J.W., and Triantaphyllidis, S. 2009. Chemical fingerprinting of detrital minerals in the Upper Jurassic-Lower Cretaceous sandstones, Scotian Basin. Geological Survey of Canada open file 6288, 150 pp.

Pe-Piper, G., Piper, D.J.W., Zhang, Y. and Chavez, I., 2015. Diagenetic barite and sphalerite in middle Mesozoic sandstones, Scotian Basin, as tracers for basin hydrology. AAPG Bulletin, 99(7), 1281–1313.

Pe-Piper, G., Sangster, C., and Zhang, Y. 2017. Diagenetic F-rich ferroan calcite and zircon in the offshore Scotian Basin, eastern Canada: Significance for understanding thermal evolution of the basin. American Mineralogist: Journal of Earth and Planetary Materials, 102, 1542-1555.

Piper, D. J. W., Pe-Piper, G., Tubrett, M., Triantafyllidis, S., and Strathdee, G. 2012. Detrital zircon geochronology and polycyclic sediment sources, Upper Jurassic – Lower Cretaceous of the Scotian Basin, southeastern Canada. Canadian Journal of Earth Sciences, 49, 1540–1557.

Reynolds, P.H., Pe-Piper, G., and Piper, D. J.W. 2010. Sediment sources and dispersion as revealed by single-grain 40Ar/39Ar ages of detrital muscovite from Carboniferous and Cretaceous rocks in mainland Nova Scotia. Canadian Journal of Earth Sciences, 47(7), 957-970.

Sangster, C. 2016. Provenance and Diagenesis of the Lower Cretaceous to Middle Jurassic Sandstones in the Slope Well Newburn H-23, Scotian Slope. B.Sc. Hon. Thesis, Saint Mary's University, Halifax, Nova Scotia, 472 pp.

Tsikouras, B., Pe-Piper, G., Piper, D.J.W., and Schaffer, M. 2011. Varietal heavy mineral analysis of sediment provenance, Lower Cretaceous Scotian Basin, eastern Canada, Sedimentary Geology, 237, 150-165.

Wade, J.A. and MacLean, B.C. 1990. Aspects of the geology of the Scotian Basin from recent seismic and well data. Geology of Canada, 2, 190-238.

Zhang, Y., Pe-Piper, G., and Piper, D.J.W. 2014. Sediment geochemistry as a provenance indicator: unravelling the cryptic signatures of polycyclic sources, climate change, tectonism and volcanism. Sedimentology, 61(2), 383-410.

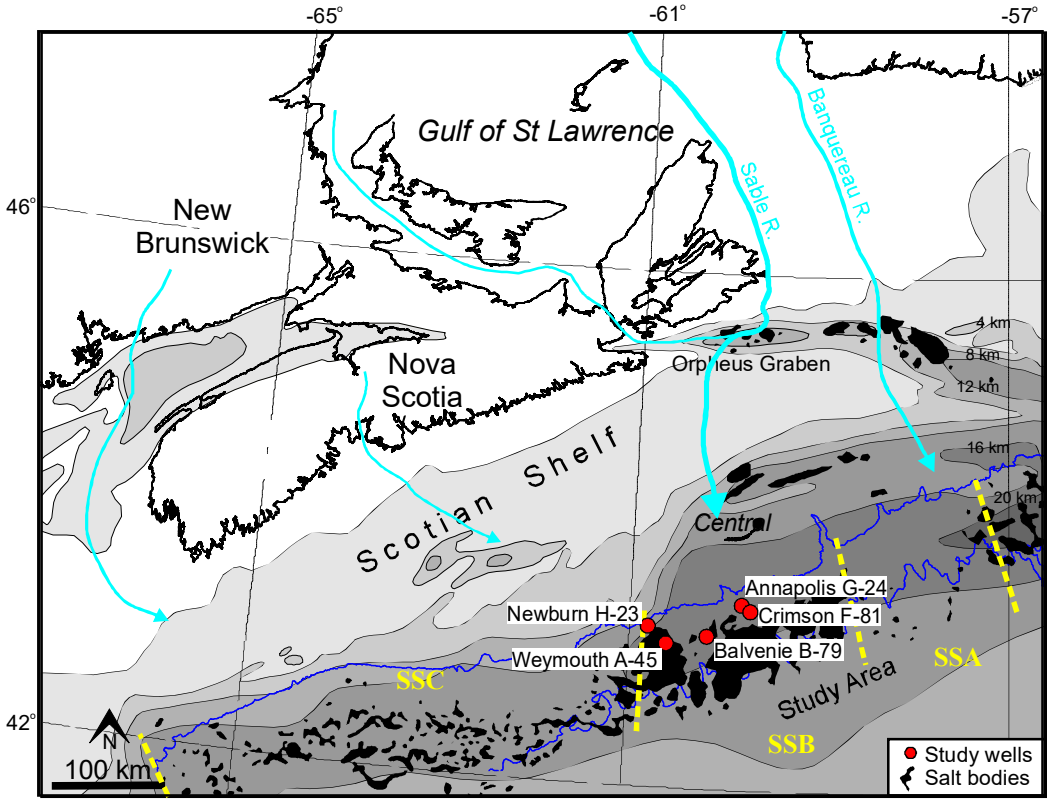


Fig. 1a: Map of study area with study wells. Grey tones show basin isopachs (in km: Wade and Maclean 1990). Present 500 m and 3000 m isobaths are shown. Salt tectonic structural styles (SSA, SSB, and SSC) after Albertz et al. (2010). Salt bodies are after Kidston et al. (2007).

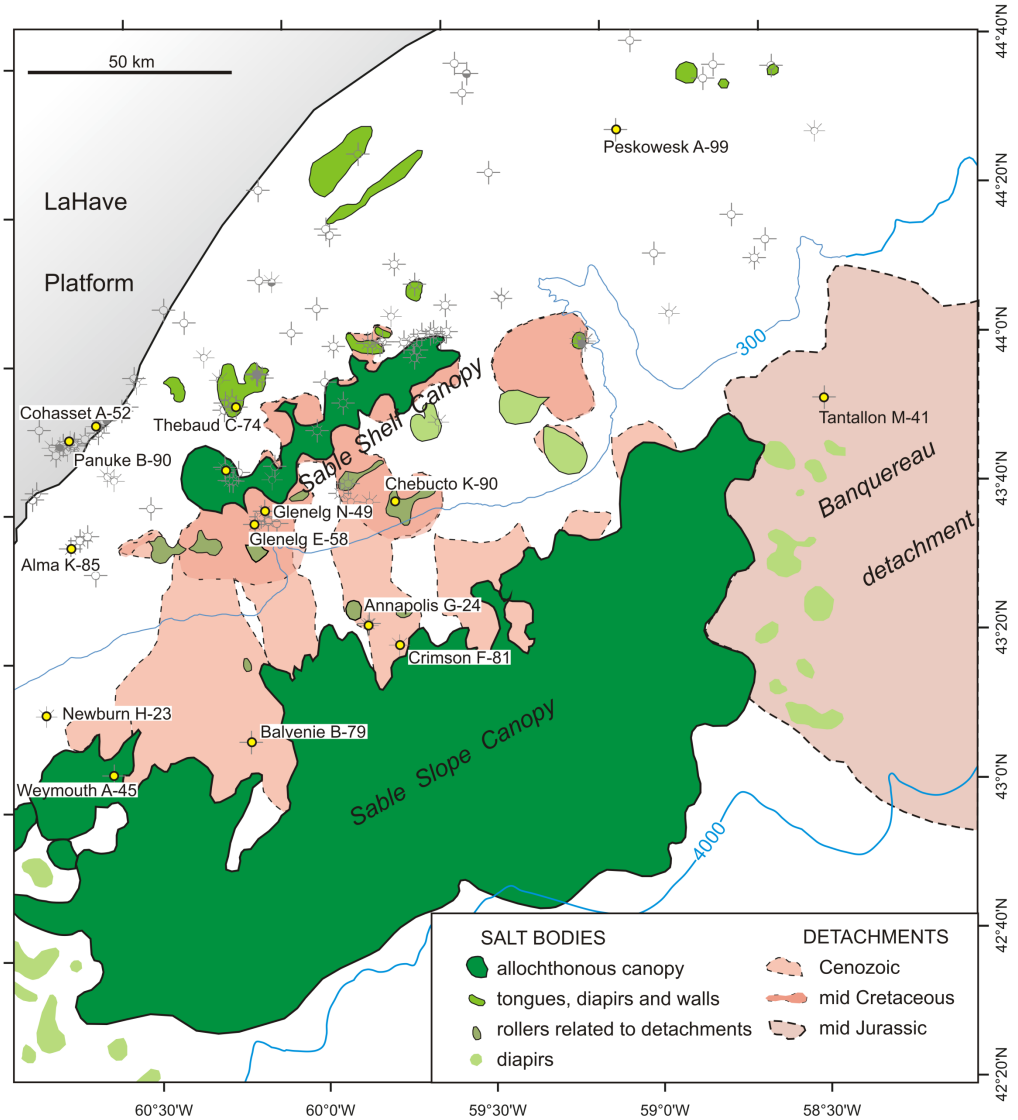
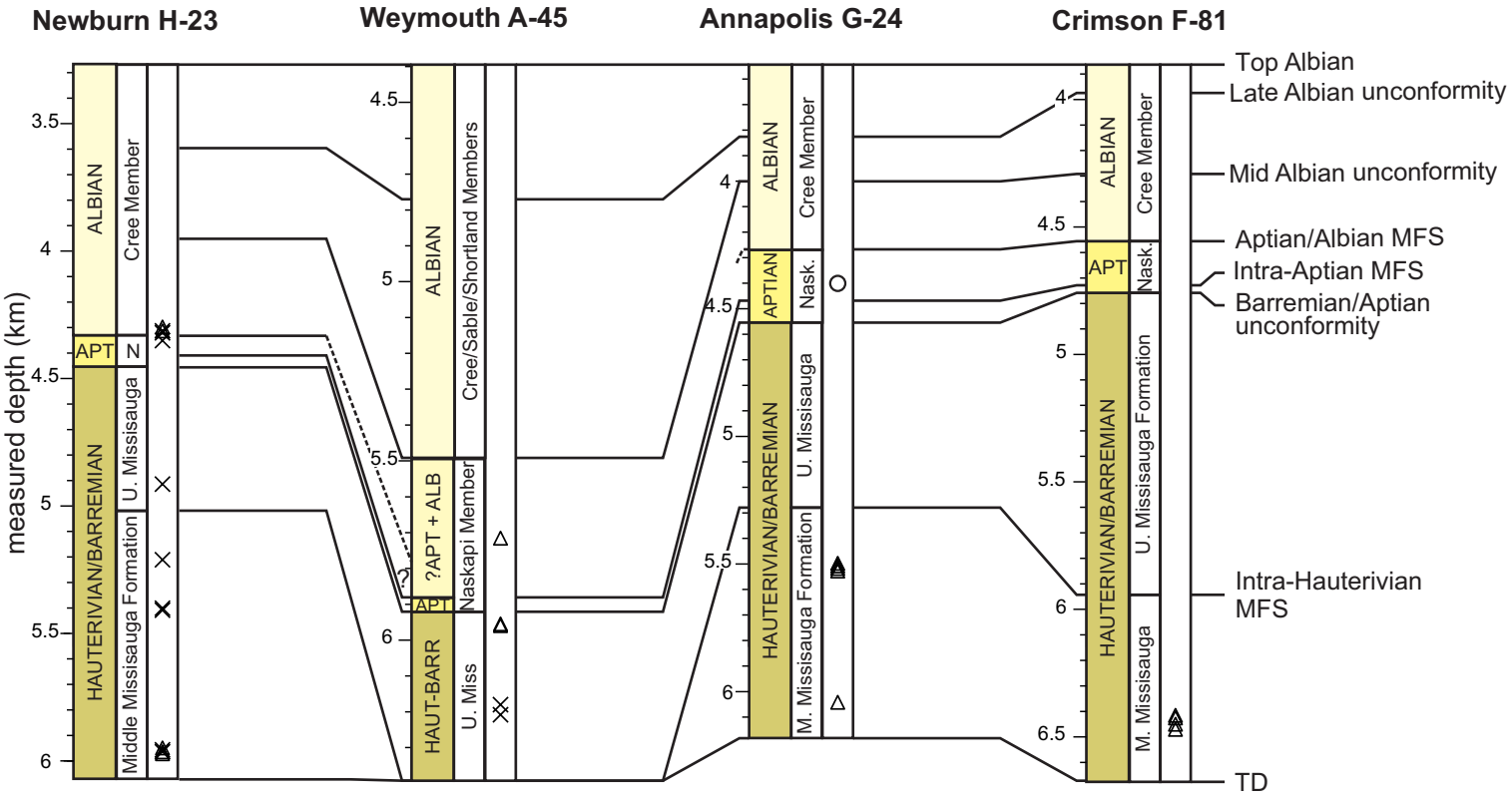


Fig. 1b: Map of the Sable sub-basin showing the study wells in relationship to salt tectonic features mapped by Kendell (2012).



△ Heavy mineral separate sample from cuttings
× Sidewall core sample
○ Loose material sample from sidewall core
MFS = maximum flooding surface

Fig. 2: Stratigraphic columns and locations of studied samples.

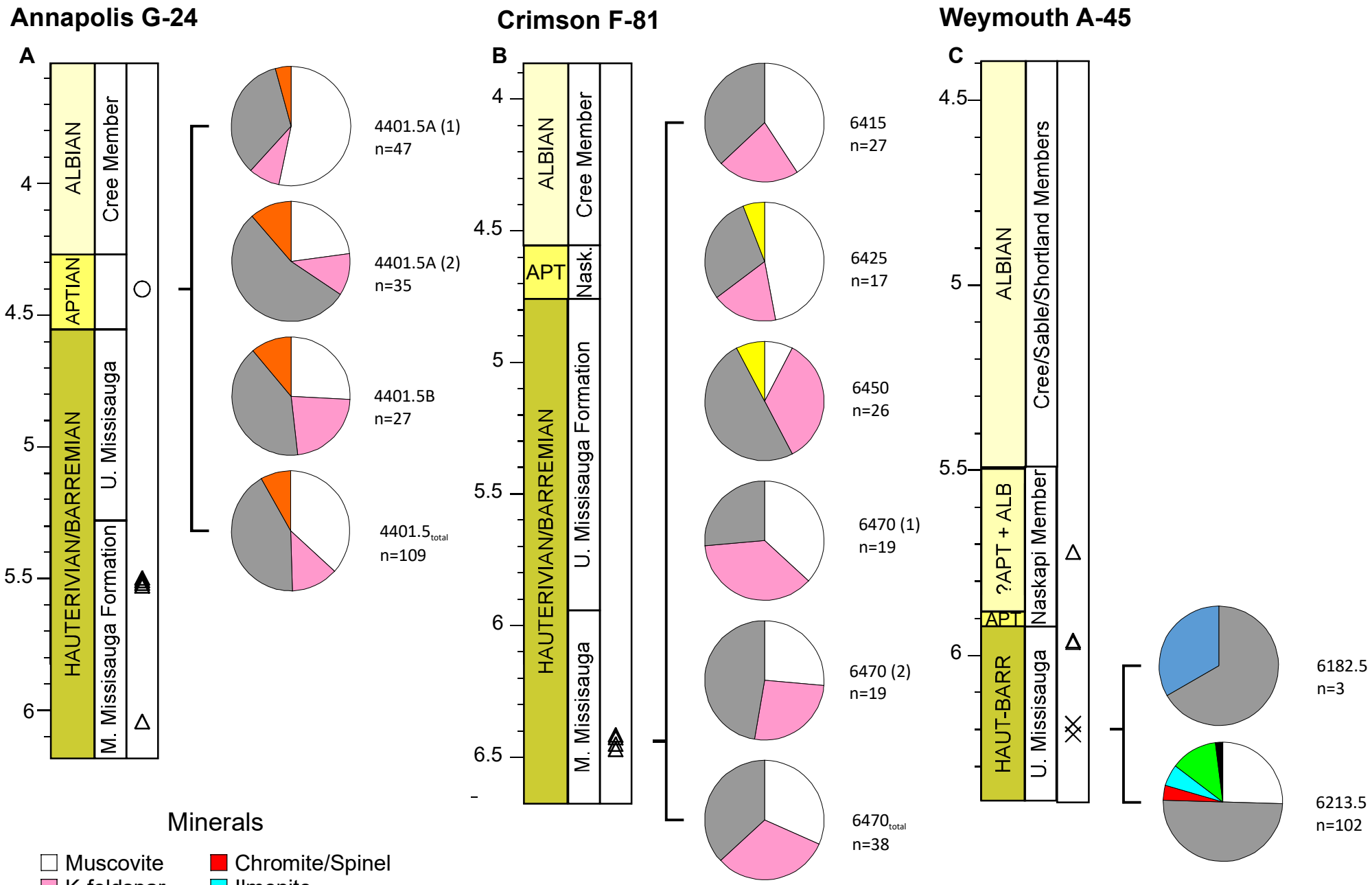


Fig. 3: Summary of point counting results from BSE images of: A) loose material from sidewall core sample from the Naskapi Member at the Annapolis G-24 well; B) heavy mineral separates from cuttings samples from the Middle Missisauga Formation at the Crimson F-81 well; and C) sidewall core samples from the Upper Missisuaga Formation at the Weymouth A-45 well.

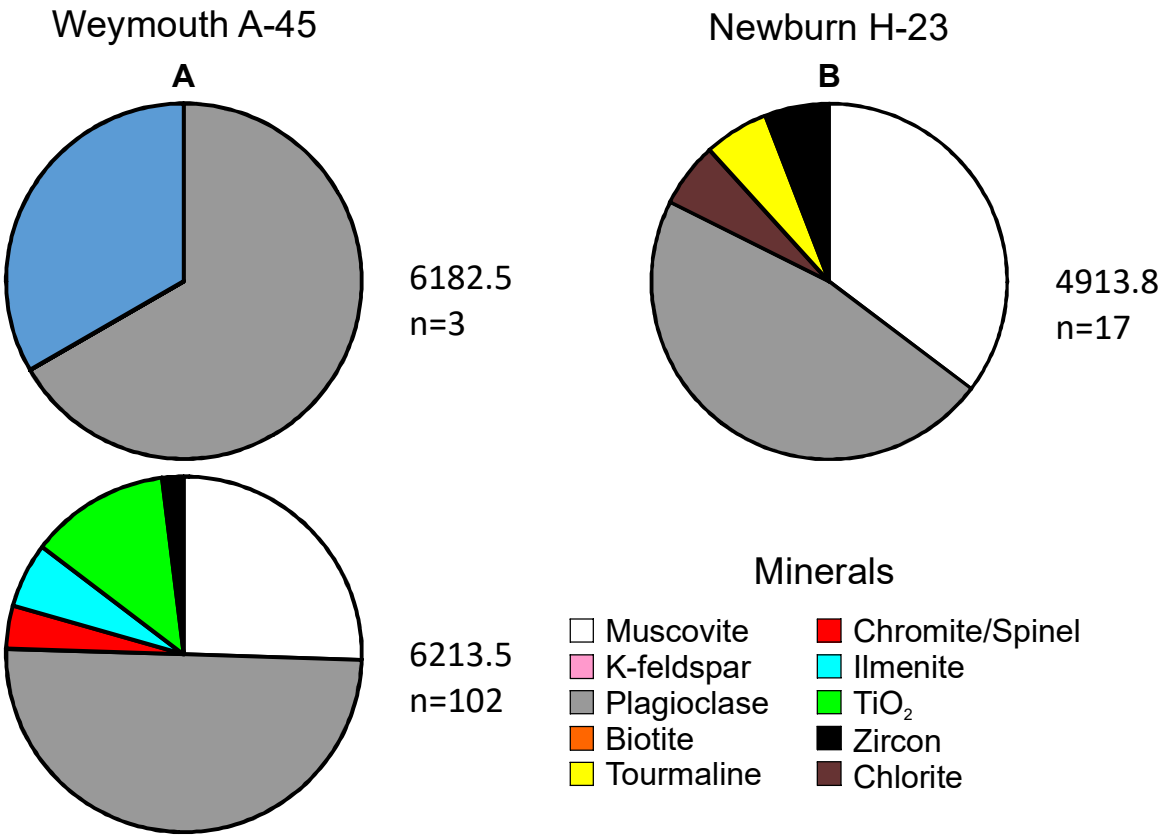


Fig. 4: Point counting results of sidewall core samples from the Upper Missisauga Formation for the A) Weymouth A-45 well; and B) Newburn H-23 well.

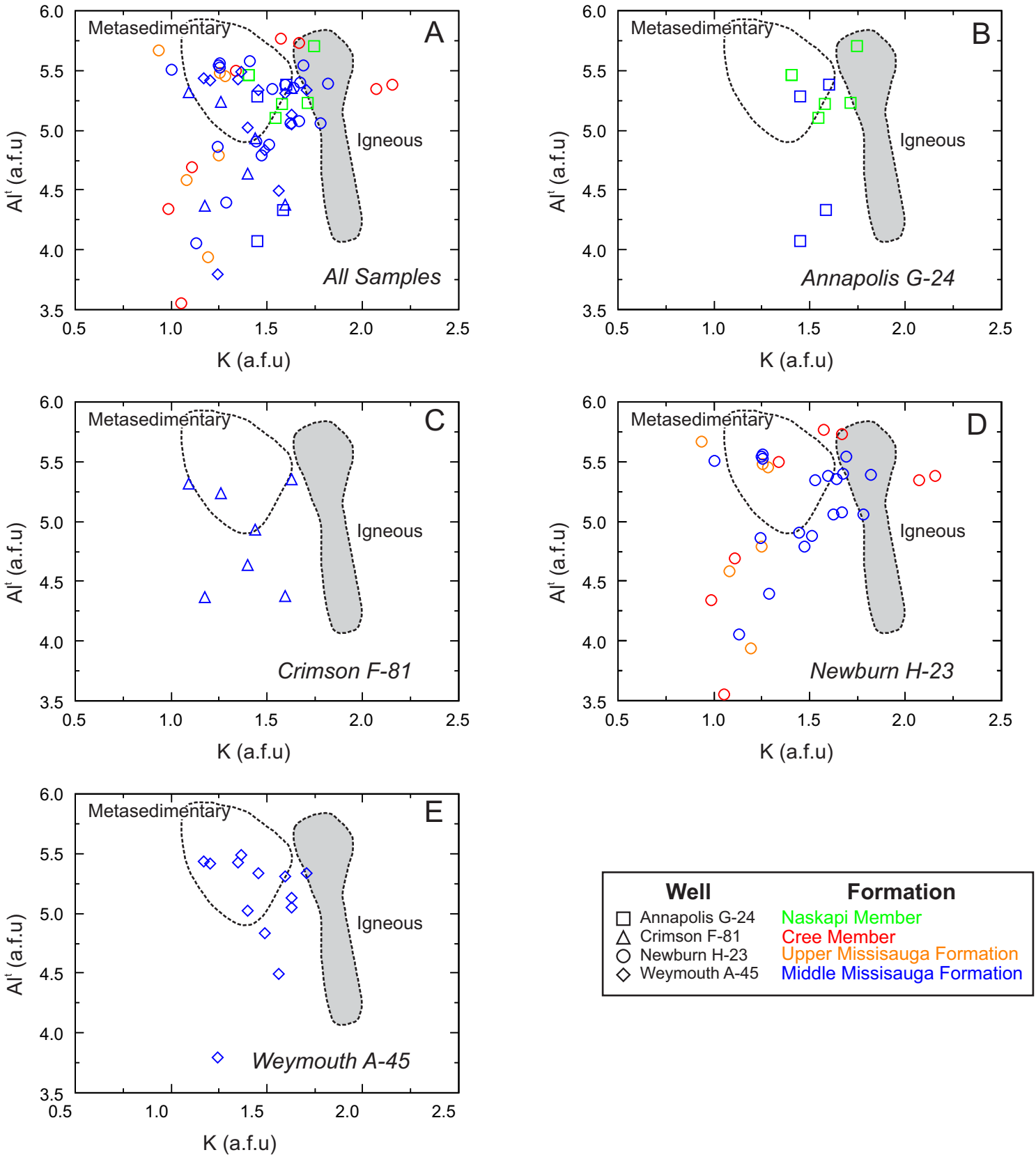
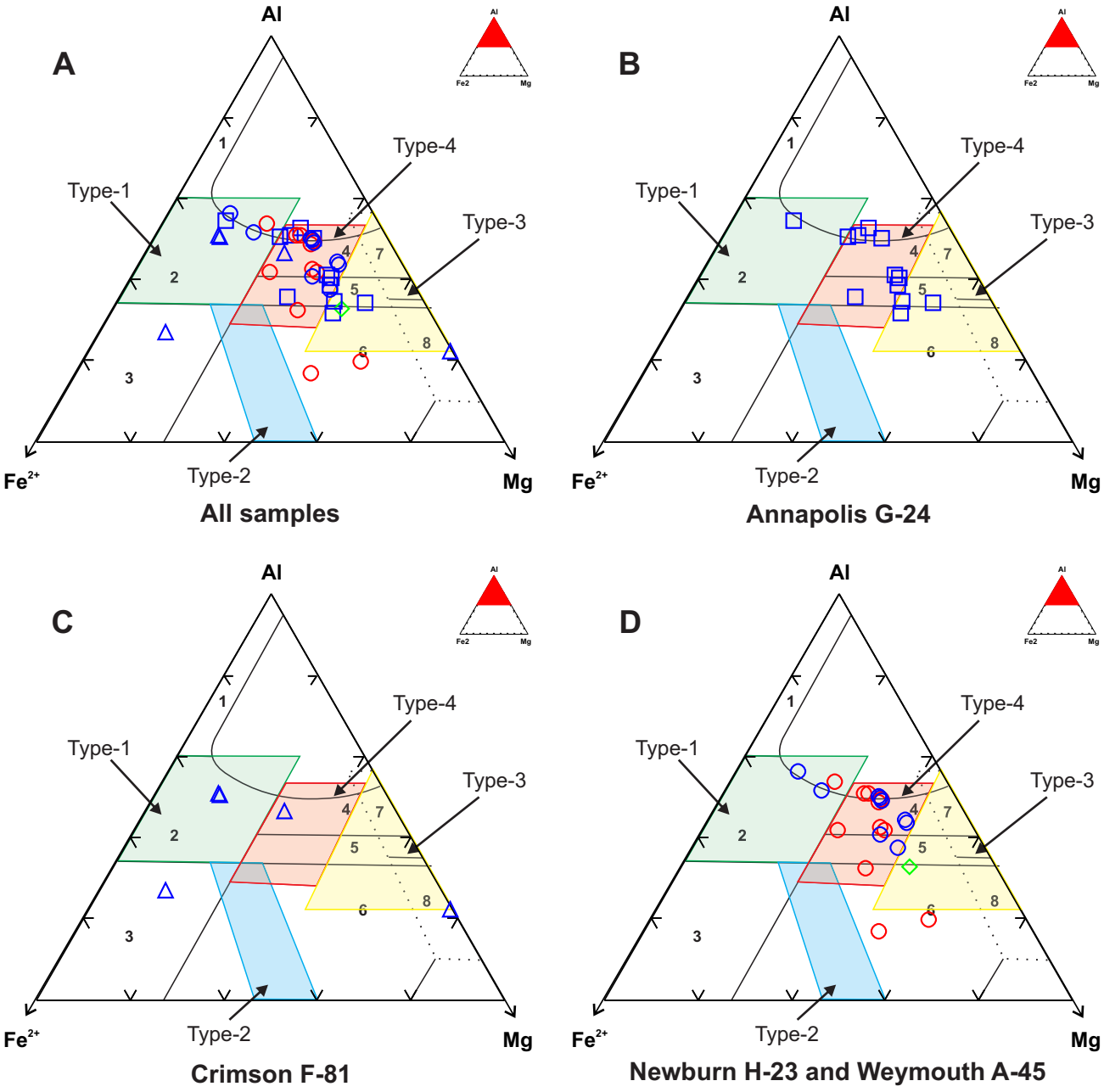


Fig. 5: Al^t a.f.u. vs K a.f.u. variation in muscovite. Fields generated from electron microprobe analyses of muscovites. Grey field shows Meguma terrane igneous muscovites, the dashed field includes 85% of the Meguma Group metasedimentary muscovite analyses. Data from Reynolds et al. 2010. **A:** All the analyses of muscovite. **B:** Analyses of muscovite grains from the Annapolis G-24 well. **C:** Analyses of muscovite grains from the Crimson F-81 well. **D:** Analyses of muscovite grains from the Newburn H-23 well. **E:** Analyses of muscovite grains from the Weymouth A-45 well.



KEY TO FIELDS (Kassoli-Fournaraki & Michailidis 1994, after Henry & Guidotti 1985)
1. Li-rich pegmatite, aplite
2. Li-poor granite
3. Fe-rich qz-tourmaline rock
4. Metapelite, -psammite with Al saturating phase
5. Metapelite, -psammite lacking Al saturating phase
6. Metapelite, calc-silicate rock, or type 3
7. Meta-ultramafic rock; Cr, V-rich metasedimentary rock
8. Metacarbonate and metapyroxenite
9. Ca-rich metapelite
10. Ca-poor metapelite, -psammite, or type 3
(Pe-Piper et al. 2009)
Type 1. Granitic source
Type 2. Metapelitic and calc-silicate rock sources
Type 3. Meta-ultramafic source
Type 4. Metapelitic and psammitic source

Well	Formation
□ Annapolis G-24	Naskapi Member
△ Crimson F-81	Cree Member
○ Newburn H-23	Middle Missisauga Formation
◇ Weymouth A-45	

Fig. 6: Chemical variation in tourmaline based on Al - Mg - Fe^{2+} showing fields from Henry and Guidotti (1994), Kassoli-Fournaki and Michalidas (1994), and Pe-Piper et al. (2009). **A:** All the analyses of tourmaline. **B:** Analyses of tourmaline grains from the Annapolis G-24 well. **C:** Analyses of tourmaline grains from the Crimson F-81 well. **D:** Analyses of tourmaline grains from the Newburn H-23 and Weymouth A-45 wells.

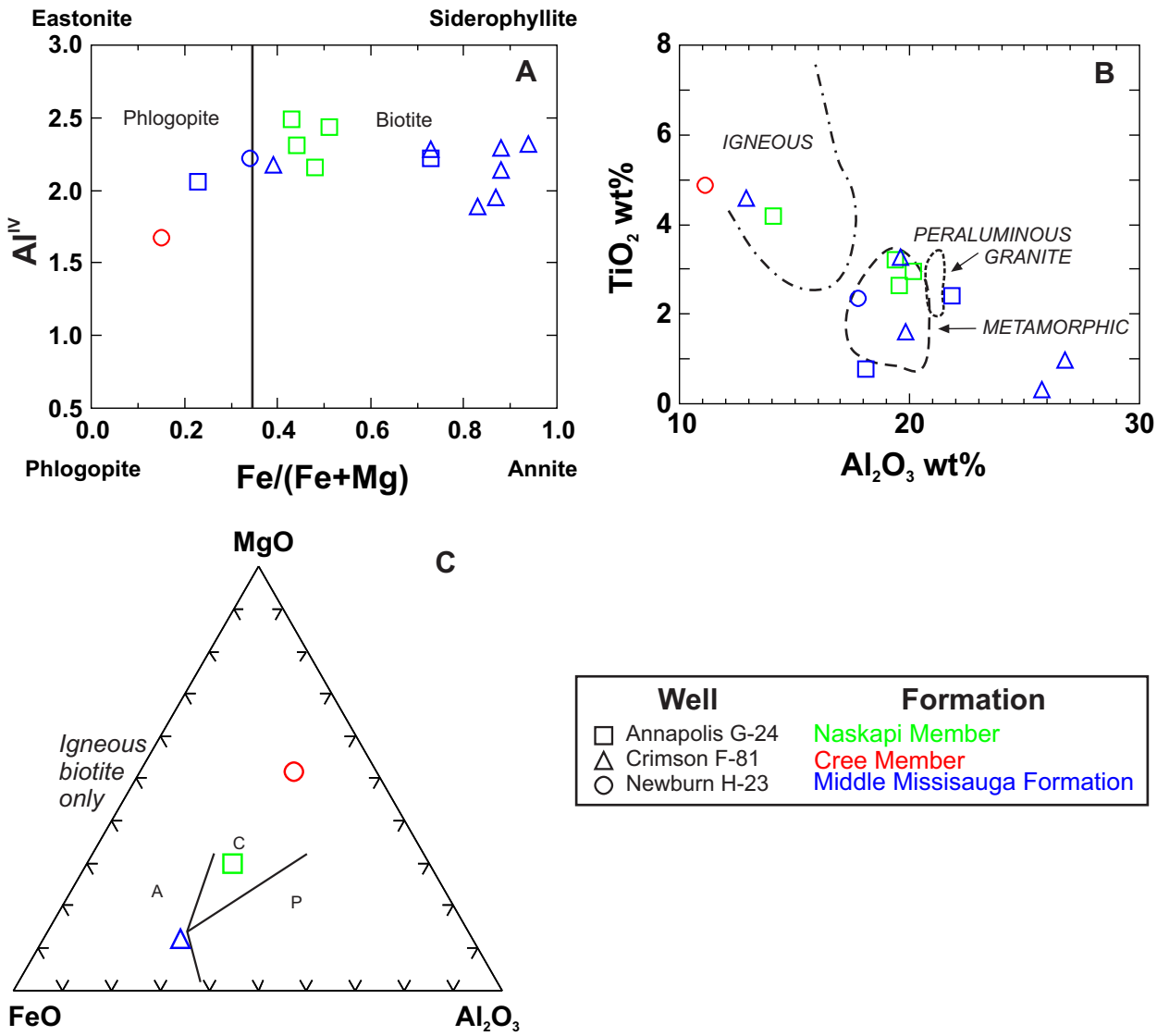


Fig. 7: Chemical variation in biotite and phlogopite. Nomenclature in A) from Deer et al. (1992). Fields in B) from Fleet (2003). Fields in C) apply to igneous biotite only (from Abdel Rahmen, 1994): A = alkali, C = calcalkali, P = peraluminous.

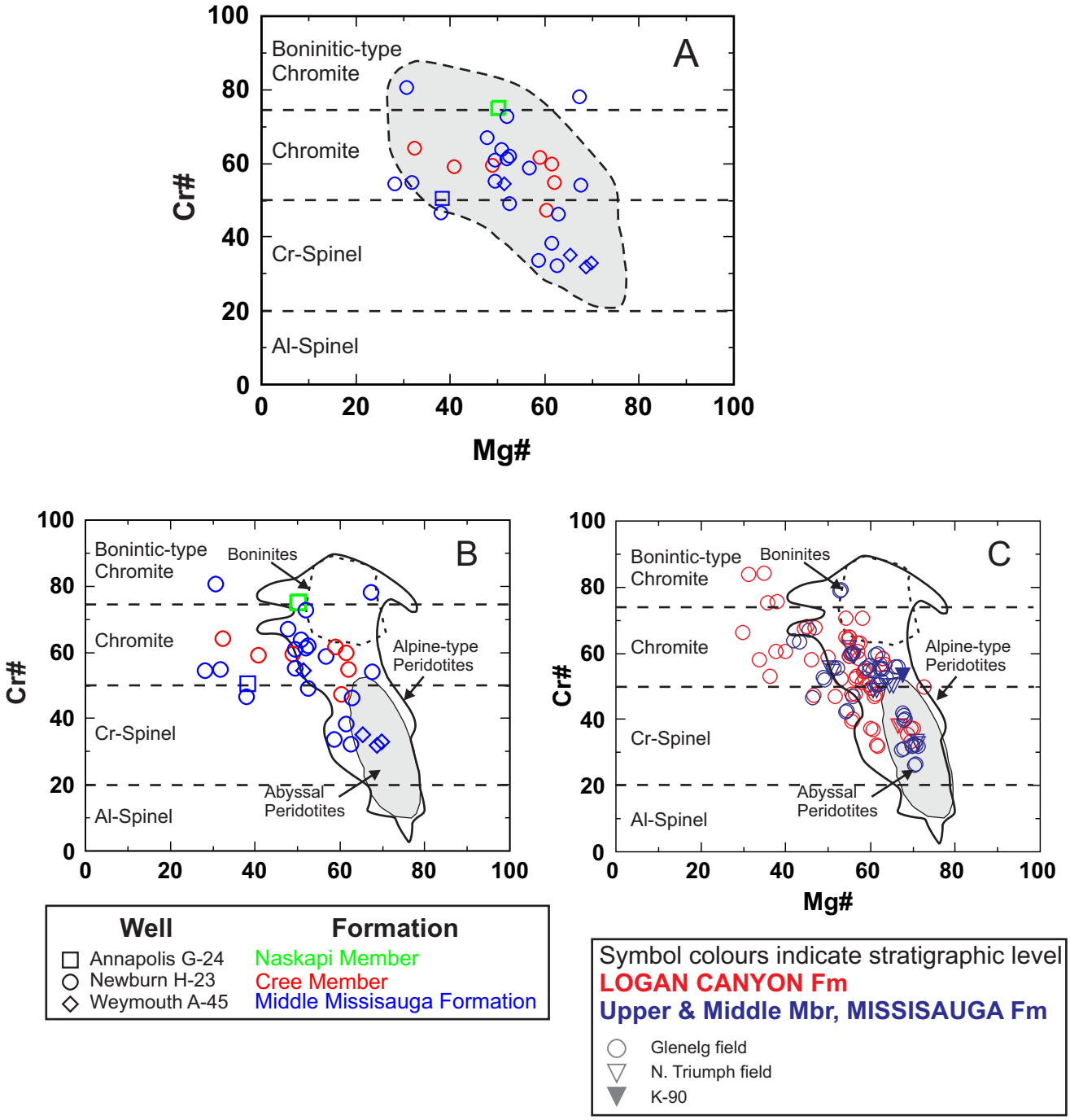


Fig. 8: Chemical variation in spinel/chromite analyses of **A)** studied samples and fields from Tsikouras et al. (2011), the grey field shows analyses from Glenelg, N.Triumph, and Alma K-90 (Pe-Piper et al. 2009); **B)** studied samples with fields after Cameron et al. (1979), Dick and Bryan (1979) and Dick and Bullen (1984); and **C)** spinel analyses from Glenelg, N.Triumph, and Alma K-90 (Pe-Piper et al. 2009) with fields after Cameron et al. (1979), Dick and Bryan (1979) and Dick and Bullen (1984).

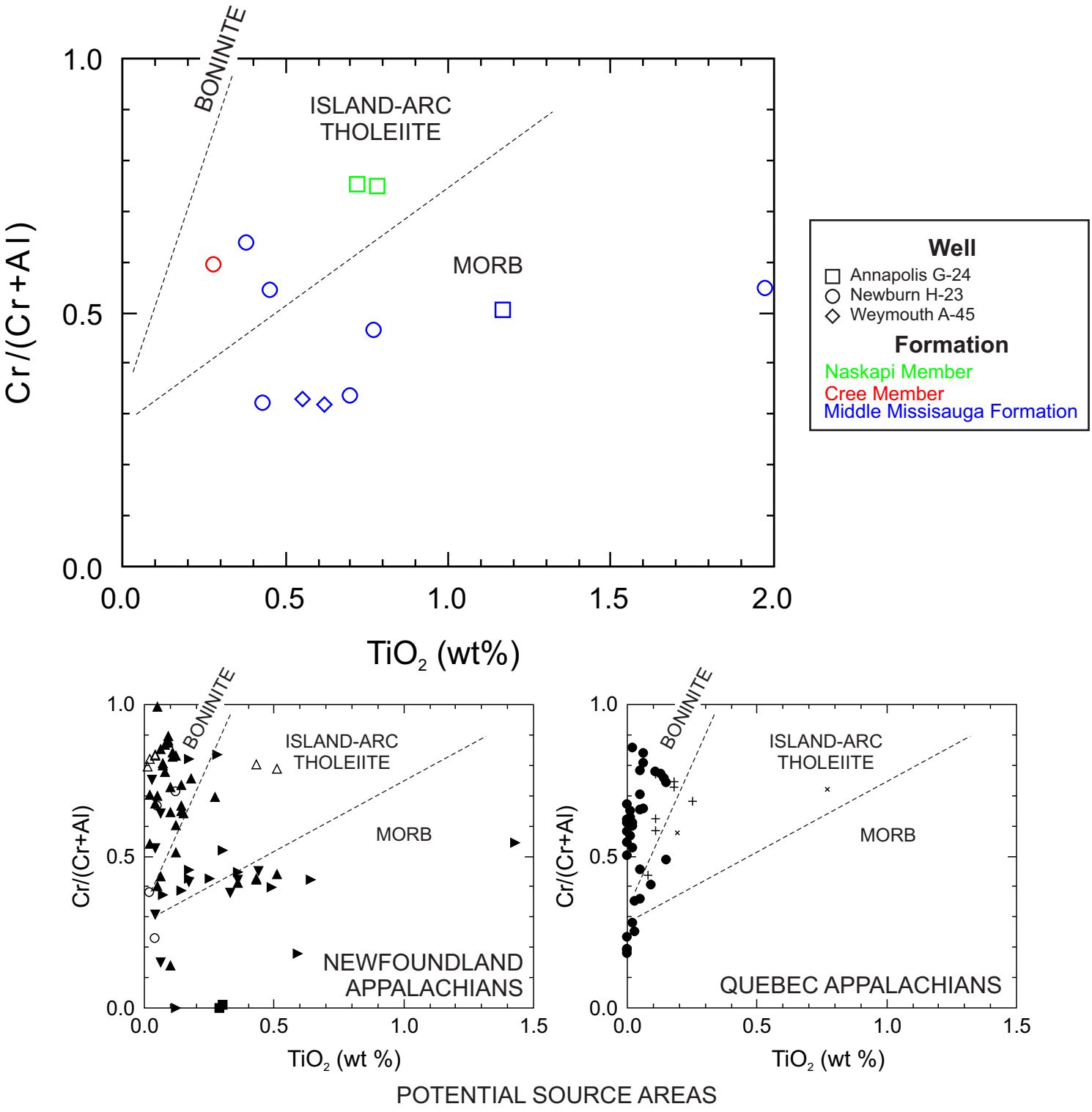


Fig. 9: Chemical variation in spinel in studied samples (above) and potential source rocks (below). Fields after Pearce et al. (2000).

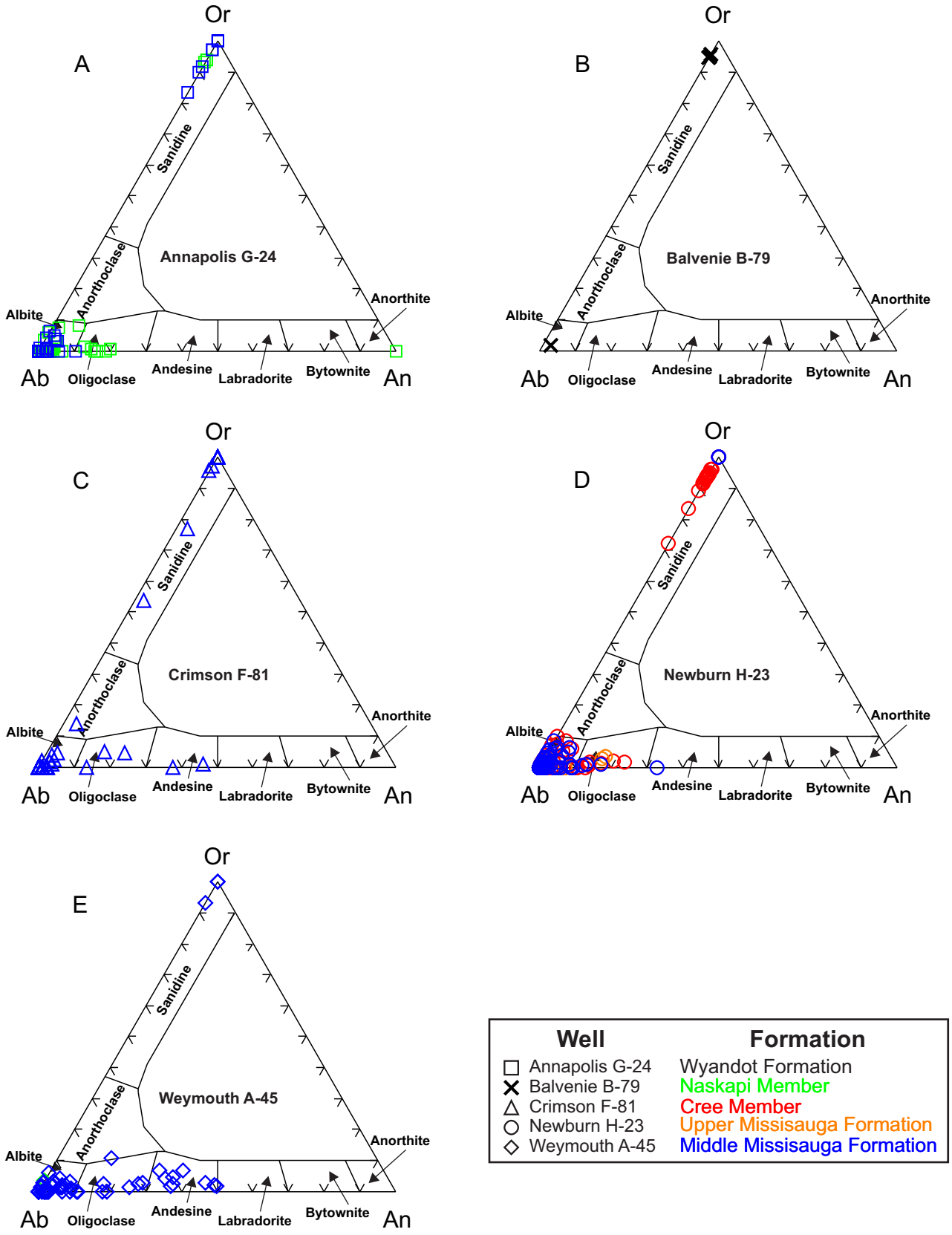


Fig. 10: Feldspar classification diagrams showing: **A:** Analyses of feldspar grains from the Annapolis G-24 well**; B:** Analyses of feldspar grains from the Balvenie B-79; **C:** Analyses of feldspar grains from the Crimson F-81 well. **D:** Analyses of feldspar grains from the Newburn H-23 well. **E:** Analyses of feldspar grains from the Weymouth A-45 well.

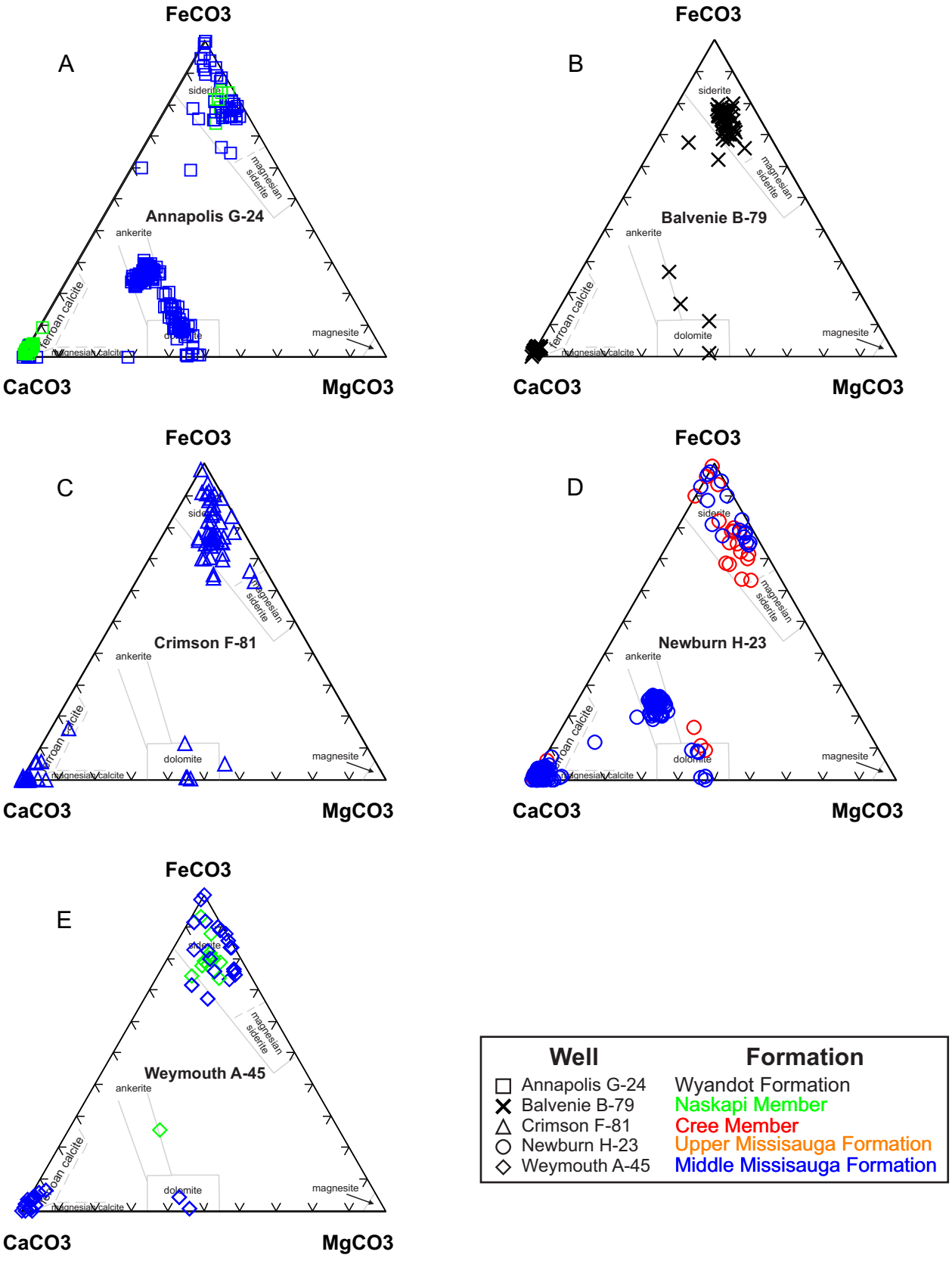


Fig. 11: Diagrams of carbonates analyses plotted on fields after carbonate analyses from Chang et al. (1996) for the: **A:** Annapolis G-24 well; **B:** Balvenie B-79 well; **C:** Crimson F-81 well; **D:** Newburn H-23 well; and **E:** Weymouth A-45 well.

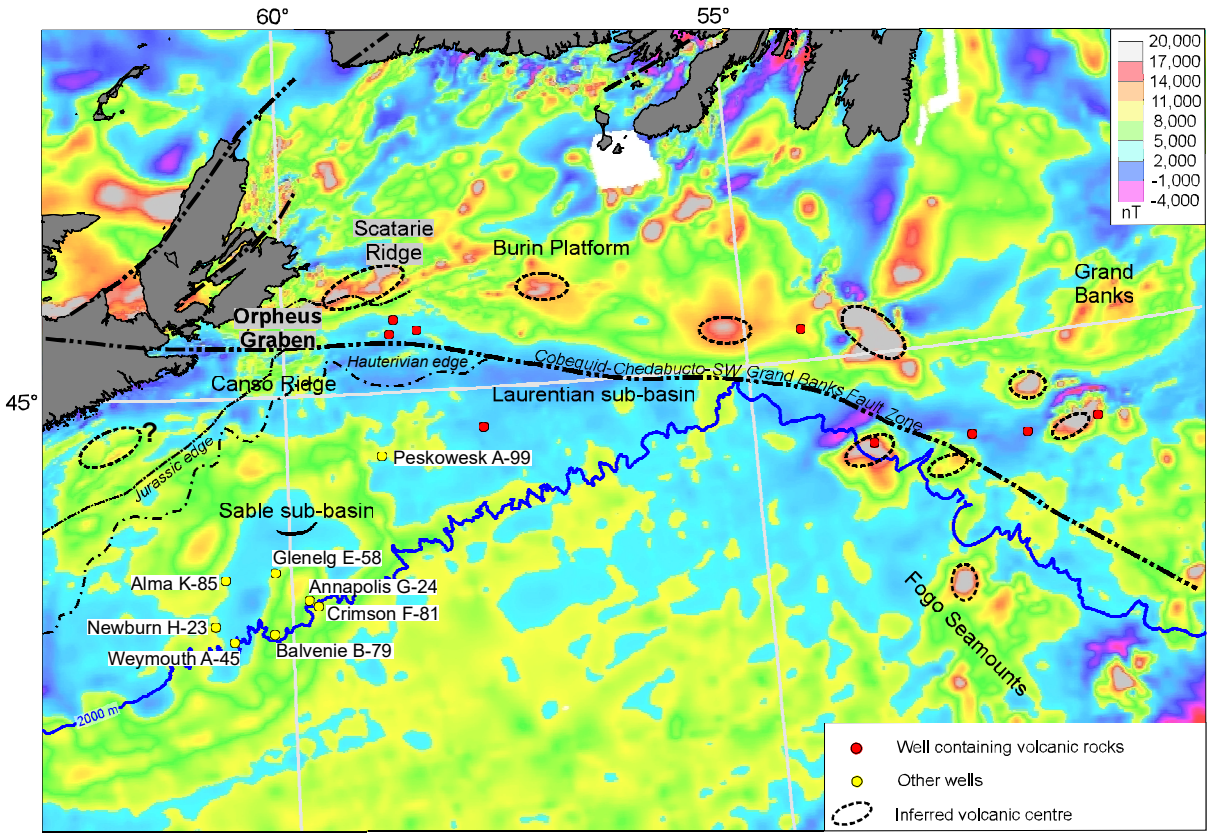


Fig. 12: Magnetic anomaly map of the eastern Scotian Basin showing volcanic centres identified by Bowman et al. (2012) and the location of a possible volcanic centre inboard from the La Have platform. Base map modified from Bowman et al. (2012).

Table 1: Summary of heavy mineral separate samples from deep water wells

Well	Depth (m)	Mixture	Weight (g)
Balvenie B-79 (HMS)	3610	3610+3615+3620	0.48
Balvenie B-79 (HMS)	3625	3625+3630+3635+3640	0.54
Balvenie B-79 (HMS)	3645	3645+3650+3655	0.04
Balvenie B-79 (HMS)	3660	3660+3665+3670+3675+3680	0.29
Crimson F-81 (HMS)	6400	-	1.03
Crimson F-81 (HMS)	6405	-	1.17
Crimson F-81 (HMS)	6410	-	1.66
Crimson F-81 (HMS)	6415	-	0.87
Crimson F-81 (HMS)	6420	-	1.6
Crimson F-81 (HMS)	6425	-	1.21
Crimson F-81 (HMS)	6430	-	1.59
Crimson F-81 (HMS)	6435	-	1.95
Crimson F-81 (HMS)	6440	-	0.55
Crimson F-81 (HMS)	6445	-	0.48
Crimson F-81 (HMS)	6450	-	0.26
Crimson F-81 (HMS)	6455	-	0.47
Crimson F-81 (HMS)	6460	-	0.59
Crimson F-81 (HMS)	6463.2	-	1.32
Crimson F-81 (HMS)	6470	-	0.92
Annapolis G-24 (HMS)	4865	4565+4870+4875+4880+4885+4890	0.18
Annapolis G-24 (HMS)	5055	5055+5060+5065	0.57
Annapolis G-24 (HMS)	5070	5070+5075	1.07
Annapolis G-24 (HMS)	5500	-	2.17
Annapolis G-24 (HMS)	5505	-	1.05
Annapolis G-24 (HMS)	5510	5510+5515	0.85
Annapolis G-24 (HMS)	5520	5520+5525+5530	0.5
Annapolis G-24 (HMS)	5535	5535+5540+6025+6030+6035+6040	0.24
Annapolis G-24 (HMS)	6045	6045+6050	2.45
Newburn H-23 (HMS)	4300	4300+4305+4310	0.39
Newburn H-23 (HMS)	4315	4315+4320+4325+4345+4350	0.71
Newburn H-23 (HMS)	5950	-	1.55
Newburn H-23 (HMS)	5955	-	1.34
Newburn H-23 (HMS)	5960	-	1.82
Newburn H-23 (HMS)	5965	-	1.5
Newburn H-23 (HMS)	5970	-	1.71
Newburn H-23 (HMS)	5975	-	1.56
Weymouth A-45 (HMS)	5715	5715+5720+5725+5730+5735+5740+5745	0.4
Weymouth A-45 (HMS)	5955	-	1.67
Weymouth A-45 (HMS)	5960	-	0.46

Table 2: Summary of analyzed samples

Well	Sample	Depth	Type	Formation	Appendix
Annapolis G-24	4401.5 A	4401.5	SWC[1]	Naskapi	1A,1B
Annapolis G-24	4401.5 B	4401.5	SWC[1]	Naskapi	1C
Annapolis G-24	5505	5505	HMS	M.Miss	1D
Annapolis G-24	5510	5510	HMS	M.Miss	1E
Annapolis G-24	5520	5520	HMS	M.Miss	1F
Annapolis G-24	5530	5530	HMS	M.Miss	1G
Annapolis G-24	5535	5535	HMS	M.Miss	1H,1I
Annapolis G-24	6045	6045	HMS	M.Miss	1J,1K
Balvenie B-79	3610	3610	HMS	Wyandot	2A
Balvenie B-79	3645	3645	HMS	Wyandot	2B
Crimson F-81	6415	6415	HMS	M.Miss	3A
Crimson F-81	6425	6425	HMS	M.Miss	3B
Crimson F-81	6450	6450	HMS	M.Miss	3C
Crimson F-81	6470	6470	HMS	M.Miss	3D,3E
Weymouth A-45	5715	5715	HMS	Naskapi	4A
Weymouth A-45	5955	5955	HMS	U.Miss	4B
Weymouth A-45	5960	5960	HMS	U.Miss	4C
Weymouth A-45	6182.5	6182.5	SWC[2]	U.Miss	4D
Weymouth A-45	6213.5	6213.5	SWC[2]	U.Miss	4E
Newburn H-23	4300	4300	HMS	Cree	Sangster, 2016
Newburn H-23	4315	4315	HMS	Cree	Sangster, 2016
Newburn H-23	5950	5950	HMS	M.Miss	Sangster, 2016
Newburn H-23	5965	5965	HMS	M.Miss	Sangster, 2016
Newburn H-23	5975	5975	HMS	M.Miss	Sangster, 2016
Newburn H-23	4313.5	4313.5	SWC[2]	Cree	Sangster, 2016
Newburn H-23	4318.5	4318.5	SWC[2]	Cree	Sangster, 2016
Newburn H-23	4353.5	4353.5	SWC[2]	Cree	Sangster, 2016
Newburn H-23	4913.8	4913.8	SWC[2]	U.Miss	Sangster, 2016
Newburn H-23	5213.5	5213.5	SWC[2]	M.Miss	Sangster, 2016
Newburn H-23	5403.6	5403.6	SWC[2]	M.Miss	Sangster, 2016
Newburn H-23	5406.5	5406.5	SWC[2]	M.Miss	Sangster, 2016
Newburn H-23	5407	5407	SWC[2]	M.Miss	Sangster, 2016
Newburn H-23	5408.5	5408.5	SWC[2]	M.Miss	Sangster, 2016
Newburn H-23	5957.8	5957.8	SWC[2]	M.Miss	Sangster, 2016
Newburn H-23	5961.7	5961.7	SWC[2]	M.Miss	Sangster, 2016
Newburn H-23	5962.8	5962.8	SWC[2]	M.Miss	Sangster, 2016

SWC[1]=Sidewall core sample taken from rubble; SWC[2]=Traditional sidewall core;
HMS=Heavy mineral separate from cutting sample.

Table 3: Summary of observed lithic clasts

Well	Sample	Appendix	Lithic Clast			Lithic Clast Contents *Figure references are to Appendices*		
			Felsic Igneous	Metamorphic	Volcanic	Felsic	Metamorphic	Volcanic
Annapolis G-24	4401.5A(1)	1A	√	√		Ab+Qz (Fig. 1A.4,20)	Ms+Qz (Fig. 1A.6,10)	
Annapolis G-24	4401.5A(2)	1B	√			Qz+mica (Fig. 1B.21)		
Annapolis G-24	4401.5B	1C	√			Kfs+Qz (Fig. 1C. 19)	Qz+Ms/Chl (Fig. 1C.30)	
Annapolis G-24	5505	1D						
Annapolis G-24	5510	1E	√			Qz+Kfs (Fig. 1E.3)		
Annapolis G-24	5520	1F	√			Qz+Kfs (Fig. 1F.8)		
Annapolis G-24	5530	1G	√			Qz+Kfs (Fig. 1G.27); Qz+TiO2 (Fig. 1G.2,11); TiO_2+Kln (Fig. 1G.25)		
Annapolis G-24	5535(1)	1H						
Annapolis G-24	5535(2)	1I	√			TiO_2+Qz (Fig. 1I.7)		
Annapolis G-24	6045(1)	1J	√			Qz+Kfs (Fig. 1J.1) with Brt (Fig. 1J.5)		
Annapolis G-24	6045(2)	1K	√			Qz+Kfs (Fig. 1K.8 & 31); Ab+Ms (Fig. 1K.26)		
Balvenie B-79	3610	2A		√			Ab+Ep (Fig. 2A.11)	
Balvenie B-79	3645	2B						
Crimson F-81	6415	3A	√			Qz+Feohy (Fig. 3A.20)		
Crimson F-81	6425	3B						
Crimson F-81	6450	3C	√			Qz+Ms(?) (Fig. 3C.28)		
Crimson F-81	6470(1)	3D						
Crimson F-81	6470(2)	3E	√			Qz, Ttn,+Sd (Fig. 3E.27); TiO_2+Qz (Fig. 3E.33)		
Weymouth A-45	5715	4A						
Weymouth A-45	5955	4B	√			Qz+TiO2 (Fig. 4B.4)		
Weymouth A-45	5960	4C						
Weymouth A-45	6182.5	4D						
Weymouth A-45	6213.5	4E	√	√		Ab+Olig (Fig. 4E.2); Qz+Ab (Fig. 4E.2); Qz+TiO_2 (Fig. 4E.12,15); Qz+Ms (Fig. 4E.11,13)	Chl (Fig. 4E.4)	

Table 3: Summary of observed lithic clasts (cont.)

Well	Sample	Appendix	Lithic Clast			Lithic Clast Contents *Newburn figure references are to Sangster (2016)*		
			Felsic Igneous	Metamorphic	Volcanic	Felsic	Metamorphic	Volcanic
Newburn H-23	4313.5	Sangster, 2016	√		√	TiO_2, Qz,+Ms (Fig. 3.5A)		Ab (Fig., 3.5D)
Newburn H-23	4318.5	Sangster, 2016	√		√	Kfs, Qz, Ab,+Ms (Fig. 3.7A)		Ab
Newburn H-23	4353.5	Sangster, 2016	√		√	Fap,Ap,+Qz (Fig. 3.7D)		Ab
Newburn H-23	4913.5	Sangster, 2016	√		√	Ab+Ms (Fig. 3.9D)		Ab
Newburn H-23	5213.5	Sangster, 2016	√			Qz, Ab,+Ms (Fig. 3.10E)		
Newburn H-23	5403.6	Sangster, 2016			√			Ab
Newburn H-23	5406.5	Sangster, 2016			√			Ab
Newburn H-23	5407	Sangster, 2016			√			Ab
Newburn H-23	5408.5	Sangster, 2016		√	√		Qz, Ab,+Chl (Fig. 3.15F)	Ab
Newburn H-23	5957.8	Sangster, 2016	√	√	√	Qz+Chl laths (Fig. 3.16D)	chloritized Ms+Ab (Fig. 3.16E)	Ab
Newburn H-23	5961.7	Sangster, 2016			√			Ab
Newburn H-23	5962	Sangster, 2016	√	√	√	TiO_2+Qz (Fig. 3.19D)	Qz+Ms (Fig. 3.19F)	Ab; Chlorite (Fig. 3.22A-C)

Table 4: Summary of point counting results.

			Number of grains counted										Percent								
Well	**Sample**	**Appendix**	**Kfs**	**Plag**	**Bt**	**Ms**	**Tur**	**Chr**	**Zrn**	**Ilm**	**TiO_2**	**Total**	**Kfs**	**Plag**	**Bt**	**Ms**	**Tur**	**Chr**	**Zrn**	**Ilm**	**TiO_2**
Annapolis G-24	4401.5A(1)	1A	4	16	2	25						47	9	34	4	53					
Annapolis G-24	4401.5A(2)	1B	4	19	4	8						35	11	54	11	23					
Annapolis G-24	4401.5B	1C	6	11	3	7						27	22	41	11	26					
Annapolis G-24	4401.5t[1]	-	14	46	9	40						109	13	42	8	37					
Crimson F-81	6415	3A	6	10		11						27	22	37		41					
Crimson F-81	6425	3B	3	5		8	1					17	18	29		47	6				
Crimson F-81	6450	3C	9	13		2	2					26	35	50		8	8				
Crimson F-81	6470 (1)	3D	7	5		7						19	37	26		37					
Crimson F-81	6470 (2)	3E	5	9		5						19	26	47		26					
Crimson F-81	6470t[1]	-	12	14		12						38	32	37		32					
Weymouth A-45	6182.5	4D		2							1[2]	3		67							33[2]
Weymouth A-45	6213.5	4E		51		26		4	2	6	13[2]	102		50		25		4	2	6	13[2]

[1]t=total; [2]counts in red include grains which are possibly diagenetic

Table 5: Point counting results for the Newburn H-23 well from sidewall core samples using a petrographic microscope

Sample	Formation	Quartz	K-Feldspar	Plagioclase	Muscovite	Biotite	Chlorite Group	Rutile	Spinel	Tourmaline	Zircon
4313.5	Cree	89		9.4	0.8						0.3
4318.5	Cree	86	10.1	3.2		0.2					
4353.5	Cree	90	2.8	7.2							
4353.5 Repeat	Cree	92		7.5	0.2						
4913.8	U. Miss	97		1.4	1.1		0.2			0.2	0.2
5213.5	M. Miss	97		2.4	0.5						
5213.5 Repeat	M. Miss	97		2.5	0.3			0.2			0.3
5403.6	M. Miss	96	0.3	2.3	0.7						0.2
5406.5	M. Miss	94		4.5	0.2			0.5	0.3		0.3
5407	M. Miss	97		1.6	0.7					0.2	
5408.5	M. Miss	99		1.2	0.2						
5408.5 Repeat	M. Miss	96		4.0				0.2			
5957.8	M. Miss	97		3.0							
5961.7	M. Miss	96		2.9	1.5						
5961.7 Repeat	M. Miss	95		3.5	0.9			0.2			
5962	M. Miss	95		4.0	0.5			0.3			

U. Miss=Upper Missisauga Formation; M.Miss=Middle Missisauga Formation

Table 6: Paragenetic sequences of analyzed samples

Well	Sample	Formation	Appendix	Paragenetic sequence
Annapolis G-24	4401.5A (1)	Naskapi	1A	Kln→Chl→Cal→Sd,TiO_2
Annapolis G-24	4401.5A (2)	Naskapi	1B	Kln→Cal→Chl→Mag,Py,Sd,TiO_2
Annapolis G-24	4401.5B	Naskapi	1C	Kln→Cal,Chl,Py,Sd,TiO2→Brt,Lim,Sp
Annapolis G-24	5505	M.Miss	1D	Kln→Chl,Cal,→Feohy,Fl,Py
Annapolis G-24	5510	M.Miss	1E	Kln→Chl→Feohy→Ank,Fl,Cal,Dol→Sd,TiO2,Py→Brt
Annapolis G-24	5520	M.Miss	1F	Ank,Py→TiO_2,Sd,Ap,Chl
Annapolis G-24	5530	M.Miss	1G	Kln→Fl→Ank→Chl,TiO2
Annapolis G-24	5535 (1)	M.Miss	1H	Cal→Py,Sd→Feohy
Annapolis G-24	5535 (2)	M.Miss	1I	
Annapolis G-24	6045 (1)	M.Miss	1J	Kln,Py→Feohy→Brt
Annapolis G-24	6045 (2)	M.Miss	1K	Kln→Ab,Chl,TiO_2→Brt,Sd
Balvenie B-79	3610	Wyandot	2A	Cal,Chl,Sd→Brt
Balvenie B-79	3645	Wyandot	2B	
Crimson F-81	6415	M.Miss	3A	Fl→Sd→Brt
Crimson F-81	6425	M.Miss	3B	Ilt,Feohy→Brt
Crimson F-81	6450	M.Miss	3C	Ilt,Cal→Py
Crimson F-81	6470 (1)	M.Miss	3D	TiO_2→Brt
Crimson F-81	6470 (2)	M.Miss	3E	Py,Sd→Brt,Feohy
Weymouth A-45	5715	Naskapi	4A	Sd,Py→Brt
Weymouth A-45	5955	U.Miss	4B	Kln→Ap,Cal,Chl→Feohy
Weymouth A-45	5960	U.Miss	4C	Kln+Fl→Ap+Feohy
Weymouth A-45	6182.5	U.Miss	4D	Cal→Chl→Py
Weymouth A-45	6213.5	U.Miss	4E	Kln→Cal,Chl,Py,Sd→Ap→Brt,Sp,TiO_2

Table 6: Paragenetic sequences of analyzed samples (cont.)

Well	Sample	Formation	Appendix	Paragenetic sequence
Newburn H-23	4313.5	Cree	Sangster, 2016	Qz overgrowths→Kln+Ilt→Cal→Ank→Ap+Chl→Sd+Mg-Sd→Py,*TiO_2,Sp,Zrn
Newburn H-24	4318.5	Cree	Sangster, 2016	Qz overgrowths→Kln+Ilt→Sd (cement in intraclasts)→Chl+Ap+Fap→TiO_2,Brt,Py,Zrn
Newburn H-25	4353.5	Cree	Sangster, 2016	Gln→Qz overgrowths?Kln,Ilt→Cal→Ank→Fe-Cal→F-Cal+F-Fe-Cal→Chl+Fap→Py,Sd,TiO_2,Zrn
Newburn H-26	4913.5	U.Miss	Sangster, 2016	Qz overgrowths→Ilt+Kln→AnkChl+Ap+Fap→Brt,Sp,TiO_2,Py,Sd,Xtm,Zrn
Newburn H-27	5213.5	M.Miss	Sangster, 2016	Py (framboidal)→Qz overgrowth→Fe-Cal,Cal,Ank→F-Cal,Cal,Ank→F-Fe-Cal,Cal,Ank→TiO_2→Chl→Ap+Fap→Sd,Brt,Py,Zrn
Newburn H-28	5403.6	M.Miss	Sangster, 2016	Qz overgrowth→Fracture→Kln→Chl,Sd,F-Cal,F-Fe-Cal,Cal,Ank,Py,Fap→TiO_2,Brt,Sd (rims),Zrn
Newburn H-29	5406.5	M.Miss	Sangster, 2016	Sd (concretion)+Gln→Qz overgrowth→Kln→Cal→Chl→Ap→Ank→Sd (rhombohedra),Xtm,TiO_2,Py,Zrn
Newburn H-30	5407	M.Miss	Sangster, 2016	Qz overgrowth→Fracture→Kln→Ilt→F-Cal,Cal,Ank→F-Fe-Cal,Cal,Ank→Chl→Fap,TiO_2,Sd,Sp,Py,Zrn
Newburn H-31	5408.5	M.Miss	Sangster, 2016	Kln+Qz overgrowths?→Ilt→Fe-Cal (Cal+Ank??)→F-Cal (Cal+Ank??)→F-Fe-Cal (Cal+Ank??)→Chl→Fap,Ap,Fl→Sd,Brt,Py,TiO_2,Zrn
Newburn H-32	5957.8	M.Miss	Sangster, 2016	Fe-Cal (coated grain)→Ilt,Kln→Ank,Cal→Chl,Ap+Fap→TiO_2,Py,Sd
Newburn H-33	5961.7	M.Miss	Sangster, 2016	Al-phosphate?→Qz overgrowth→Kln→Chl→Ap+Fap→Cal→Ank→Fe-Cal→Sd,TiO_2,Sp,Py,Zrn
Newburn H-34	5962	M.Miss	Sangster, 2016	Qz overgrowth+Fracture→Kln,Ilt→Chl→Fap+Ap+Fl+Ank→Cal→Fe-Cal→Brt,TiO_2,Py,Sd,Cal (Sparry),Zrn

Annapolis G-24 well

Scanning Electron Microscope (SEM) Backscattered Electron (BSE) images and Energy Dispersive Spectroscopy (EDS) mineral analyses from Annapolis G-24 well

Appendix 1A: SEM-BSE images and EDS mineral analyses for sample G-24 4401.5A(1), from sidewall core

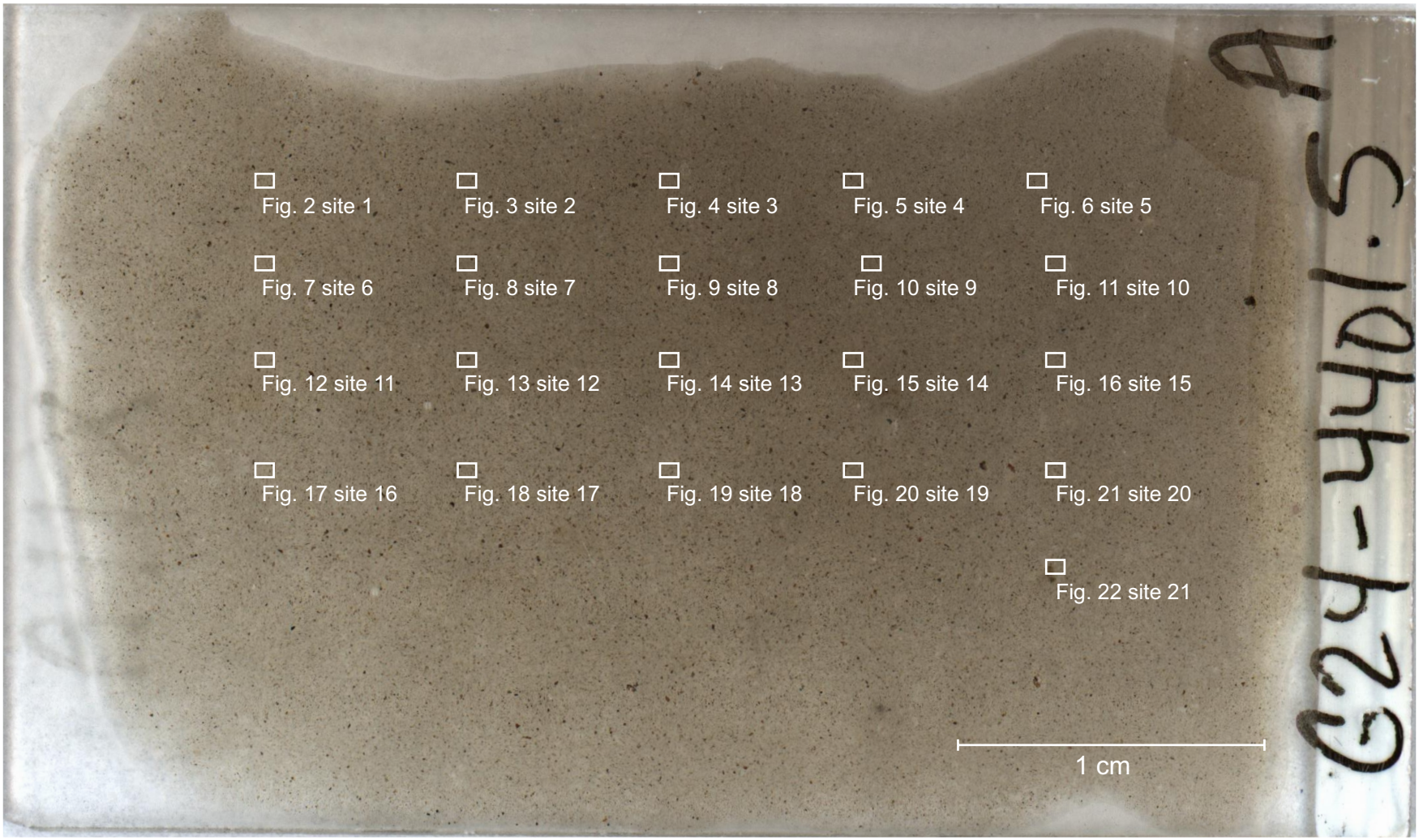
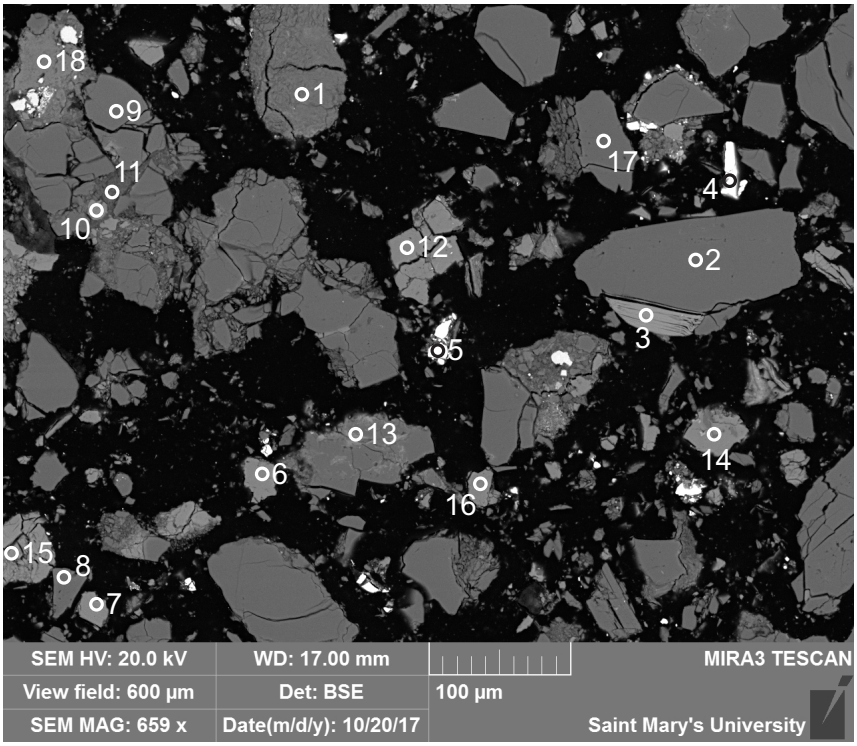
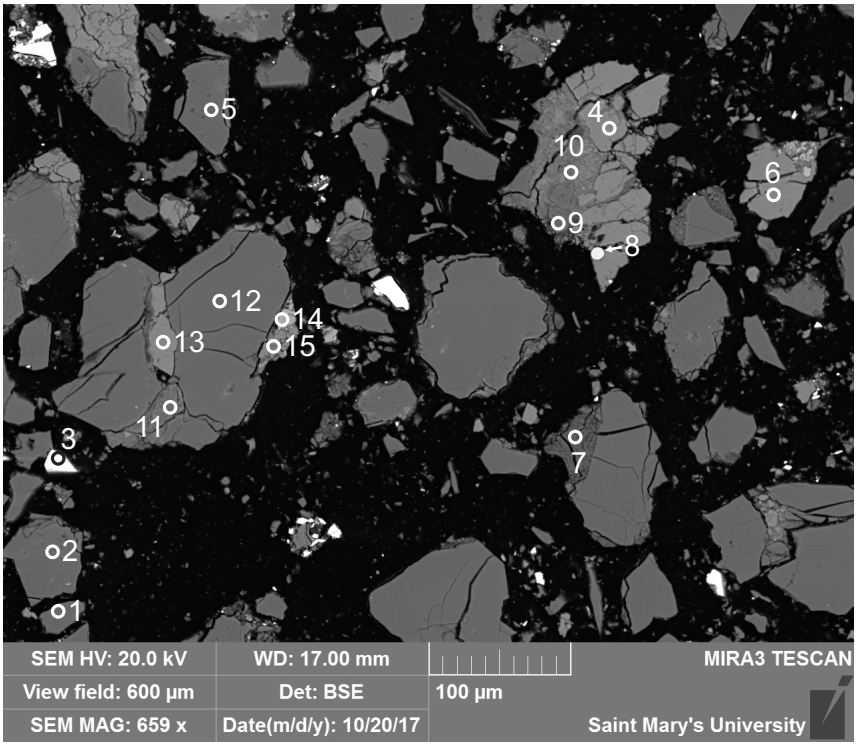


Figure 1A.1: Scanned thin section of sample G-24 4401.5A(1) showing locations of analyzed sites:



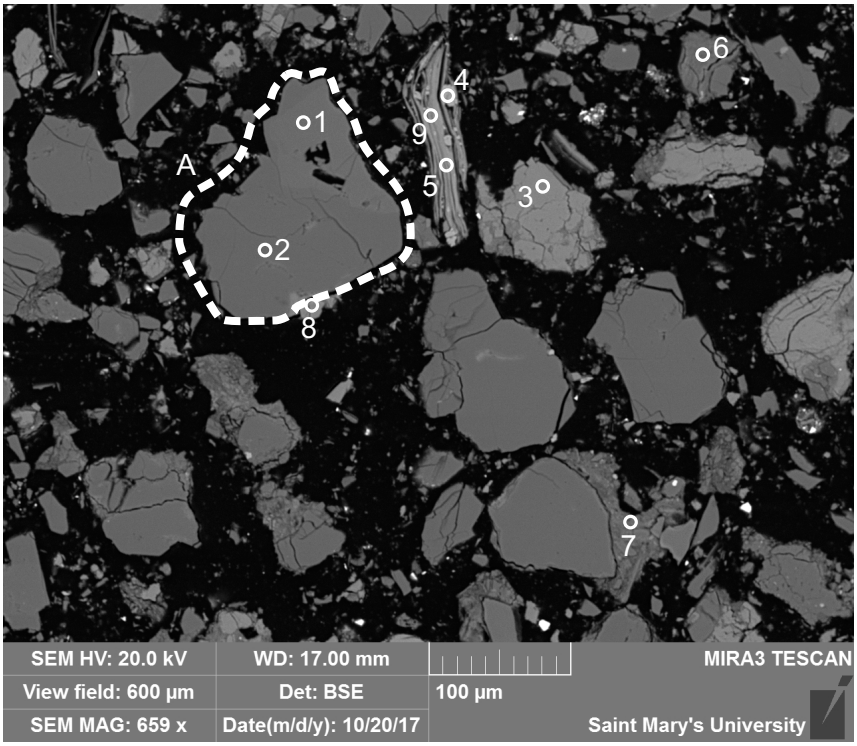
1:Albite (D)*
2:Quartz (D)
3:Biotite (D)
4:Barite (G)*
5:Barite (G)
6:Calcite (G)
7:Calcite (G)
8:Albite (D)
9:Albite (D)
10:Calcite (G) +
11:Kaolinite (G)
12:Calcite (G)
13:Chlorite (G)
14:Albite + Calcite
15:Calcite (G) +
16:Calcite (G)
17:Quartz (D)
18:Anhydrite (G) +

Figure 1A.2: Sample G-24 4401.5A(1) (SEM) site 1. Detrital minerals: Ab, Bt, Qz. Diagenetic minerals: Anh, Brt, Cal, Kln. A fragment made up of albite (9), calcite (10), kaolinite (11), and anhydrite (18) filling a void.



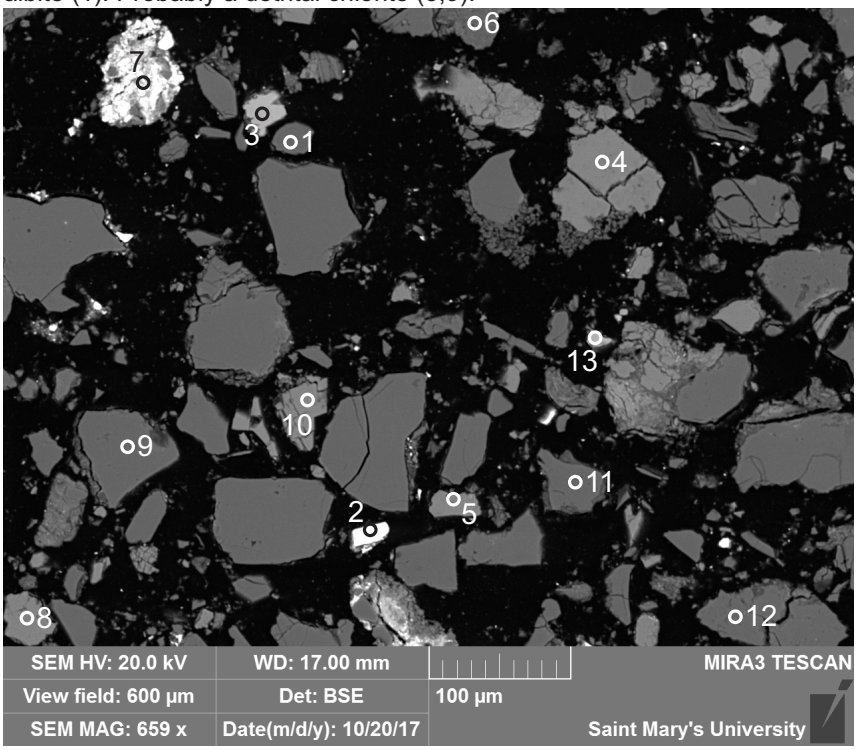
1:Albite
2:Quartz
3:Barite
4:Calcite
5:Quartz
6:Calcite
7:Kaolinite
8:Pyrite
9:Quartz
10:Mixture
11:Quartz
12:Quartz
13:Calcite
14:Siderite
15:Calcite +

Figure 1A.3: Sample G-24 4401.5A(1) (SEM) site 2. *D=detrital; G=diagenetic. Detrital minerals: Ab, Qz. Diagenetic minerals: Brt, Cal, Kln, Sd.



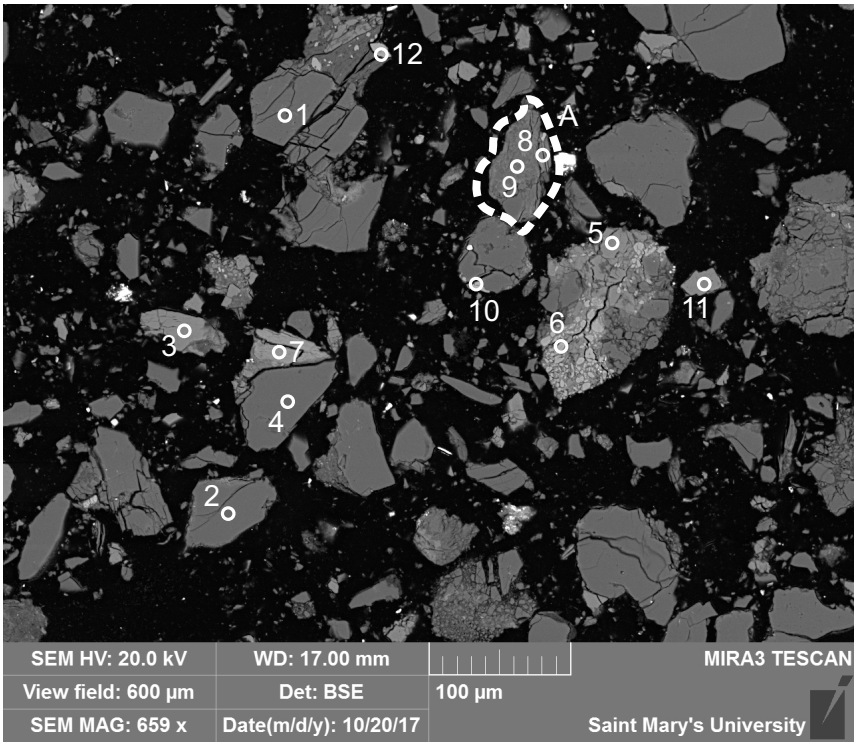
1:Albite
2:Quartz
3:Calcite
4:Siderite
5:Chlorite (D) +
6:Kaolinite
7:"Muscovite" (D)
8:Calcite
9:Chlorite (D) +

Figure 1A.4: Sample G-24 4401.5A(1) (SEM) site 3. “Muscovite”=chloritzed muscovite (detrital). Detrital minerals: Ab, Chl Ms, Qz. Diagenetic minerals: Cal, Kln, Sd. A fragment probable lithic clast (A) made up of quartz (2) and albite (1). Probably a detrital chlorite (5,9).



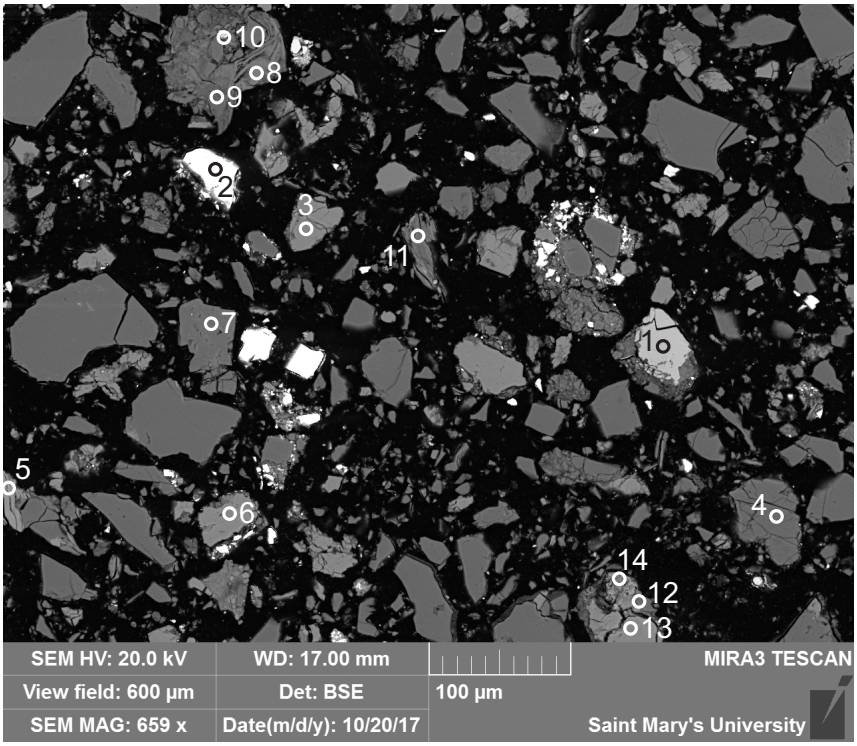
1:Quartz
2:Barite
3:TiO_2 (G?)
4:Mixture
5:Calcite +
6:Muscovite (D)+ Chlorite
7:Barite +
8:Calcite +
9:Quartz
10:Calcite
11:Quartz
12:Kaolinite + Quartz
13:TiO_2

Figure 1A.5: Sample G-24 4401.5A(1) (SEM) site 4. Detrital minerals: Ms, Qz. Diagenetic minerals: Brt, Cal, Chl, TiO_2.



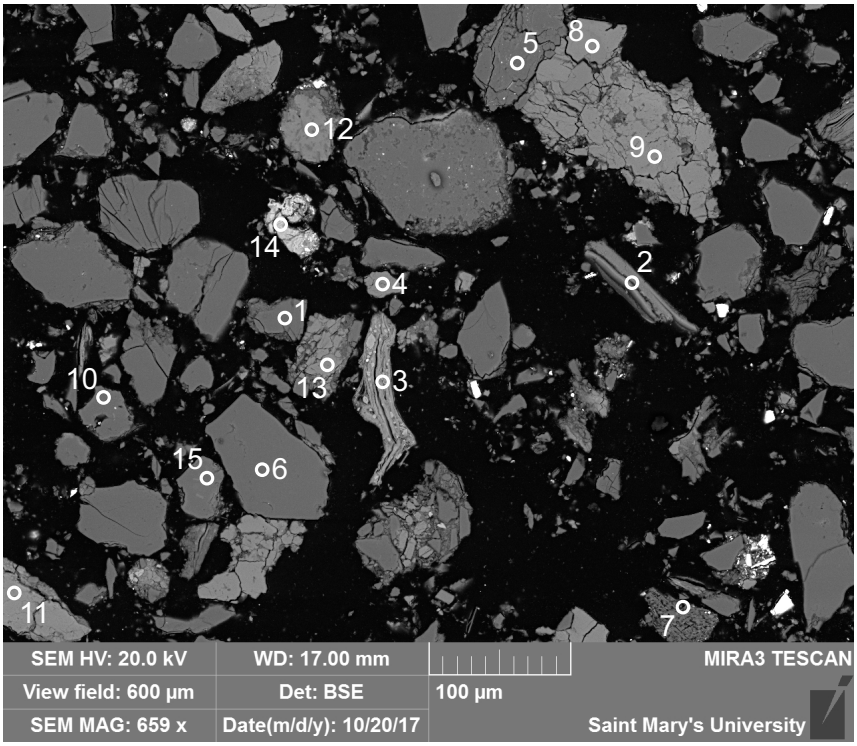
1:Albite
2:Quartz
3:Calcite
4:Quartz
5:Calcite
6:Siderite + Chlorite
7:Chlorite +
8:Muscovite
9:Quartz +
10:TiO_2 +
11:Calcite
12:Siderite

Figure 1A.6: Sample G-24 4401.5A(1) (SEM) site 5. Detrital minerals: Ab, Ms, Qz. Diagenetic minerals: Cal, Chl, Sd, TiO_2. A fragment and probable lithic clast (A) made up of quartz (9) and muscovite (8). Another fragment made up of quartz (4) and chlorite (7) and another with albite (1) and siderite (12).



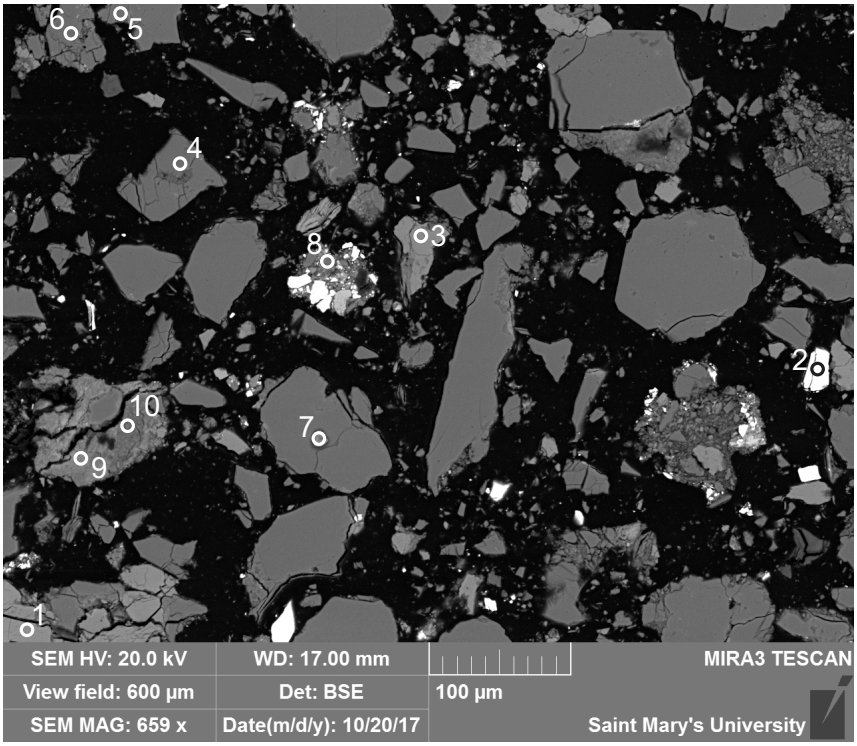
1:TiO_2
2:Barite
3:Calcite
4:Albite
5:Chlorite
6:Calcite + Chlorite
7:Albite
8:Muscovite
9:Kaolinite
10:Pyrite
11:Muscovite +
12:Quartz +
13:Calcite
14:Halite + Calcite

Figure 1A.7: Sample G-24 4401.5A(1) (SEM) site 6. Detrital minerals: Ab, Ms, Qz. Diagenetic minerals: Brt, Cal, Chl, ?Hl, Kln, Py. A fragment made up of muscovite (8), kaolinite (9), and pyrite (10).



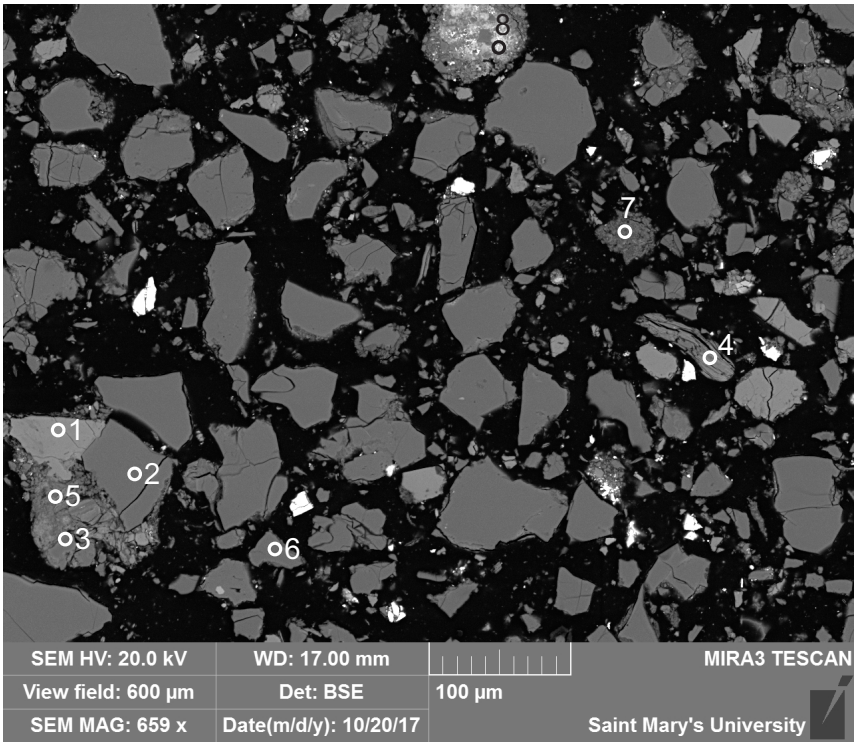
1:Quartz
2:Muscovite
3:Siderite + Chlorite
4:Calcite
5:Quartz
6:Quartz
7:Muscovite + Kaolinite
8:Calcite +
9:Calcite
10:Albite
11:Calcite +
12:Calcite +
13:Calcite
14:Hematite +
15:Albite

Figure 1A.8: Sample G-24 4401.5A(1) (SEM) site 7. Detrital minerals: Ab, Ms, Qz. Diagenetic minerals: Cal, Chl, Hem, Kln, Sd.



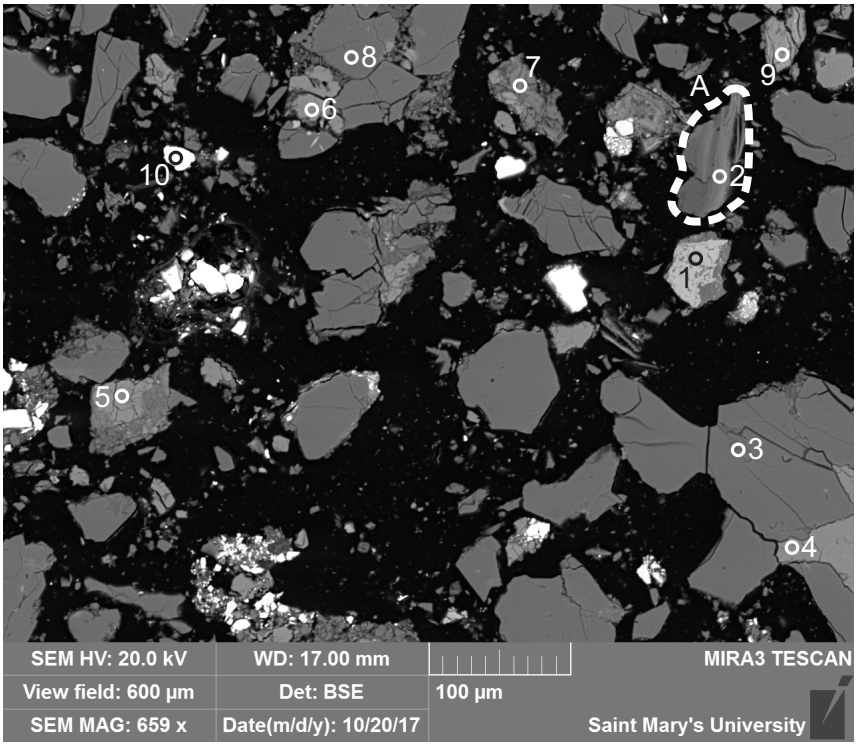
1:Calcite
2:Barite
3:Calcite +
4:Quartz
5:Albite
6:Albite
7:Calcite +
8:Quartz
9:Chlorite + Muscovite
10:Muscovite +

Figure 1A.9: Sample G-24 4401.5A(1) (SEM) site 8. Detrital minerals: Ab, Ms, Qz. Diagenetic minerals: Cal, Chl.



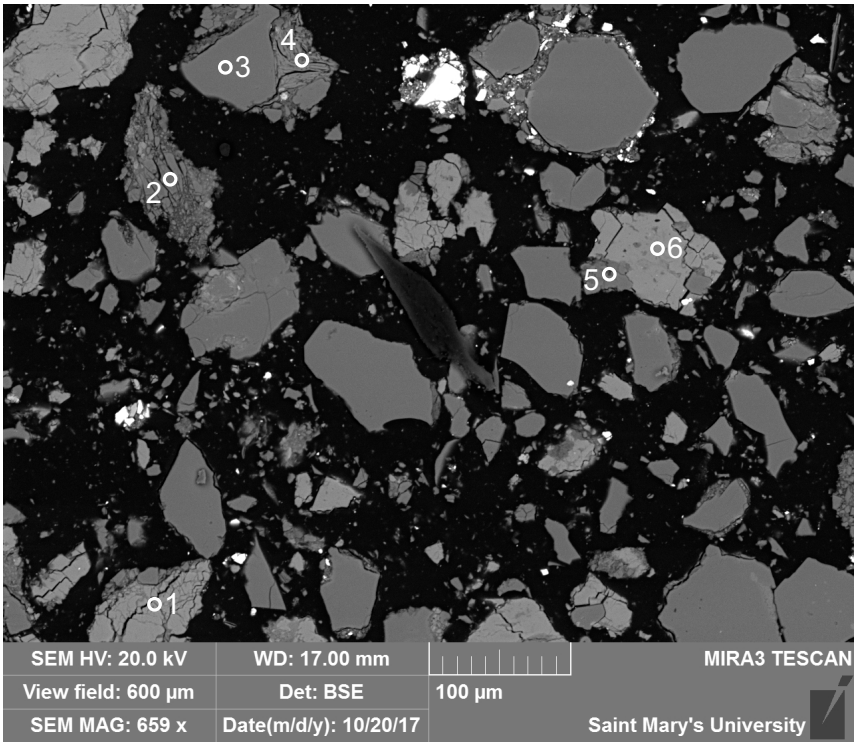
1:Calcite
2:Quartz
3:Quartz
4:Muscovite + Chlorite
5:Muscovite + Chlorite
6:Quartz
7:Muscovite + Chlorite
8:Limonite +

Figure 1A.10: Sample G-24 4401.5A(1) (SEM) site 9. Detrital minerals: Ms, Qz. Diagenetic minerals: Cal, Chl, Lim. A fragment made up of quartz (2,3), calcite (1), and muscovite altering to chlorite (5).



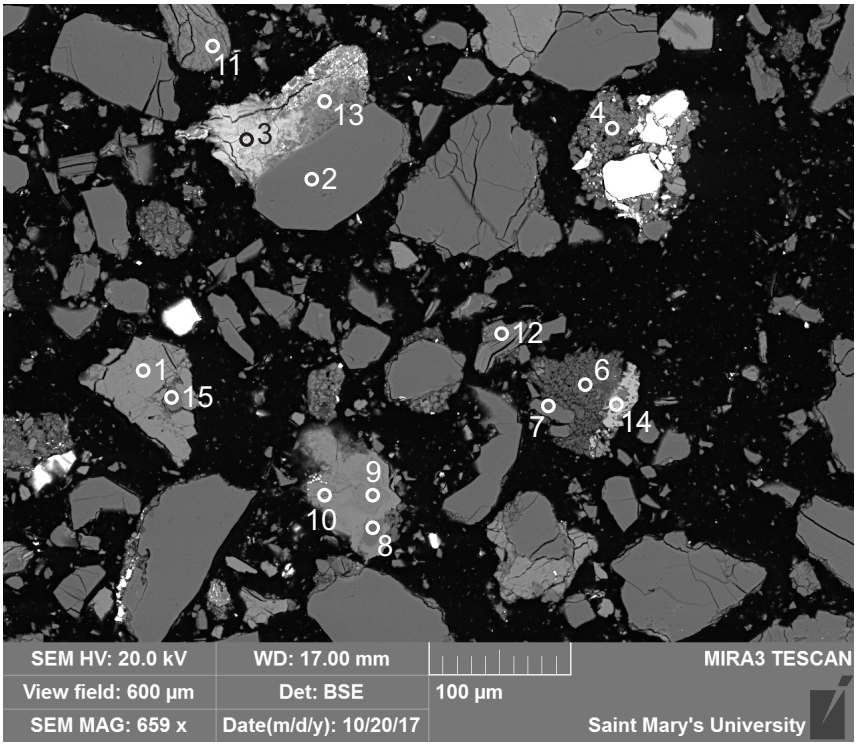
1:TiO_2 +
2:Muscovite
3:Quartz
4:Calcite
5:Calcite +
6:Calcite +
7:Muscovite +
8:Quartz
9:Chlorite +
10:Barite

Figure 1A.11: Sample G-24 4401.5A(1) (SEM) site 10. Detrital minerals: Ms, Qz. Diagenetic minerals: Brt, Cal, Chl, TiO_2. A probable lithic clast (A) made up of muscovite (2) and quartz.



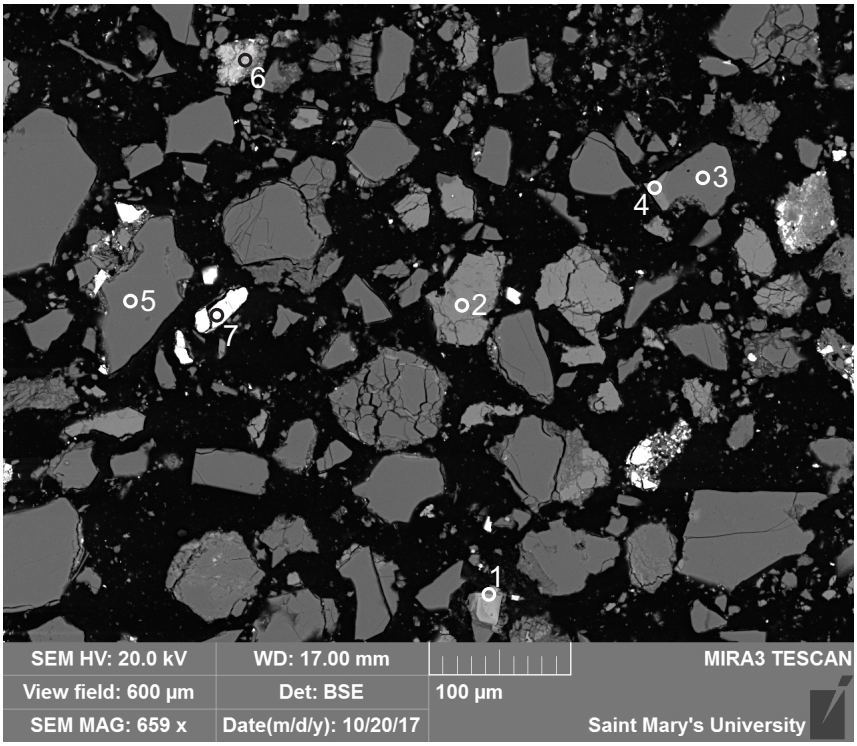
1:Calcite
2:Quartz
3:Quartz
4:Muscovite +
5:Muscovite +
6:Calcite +

Figure 1A.12: Sample G-24 4401.5A(1) (SEM) site 11. Detrital minerals: Ms, Qz. Diagenetic minerals: Cal. A fragment made up of muscovite (5) altering to chlorite and calcite.



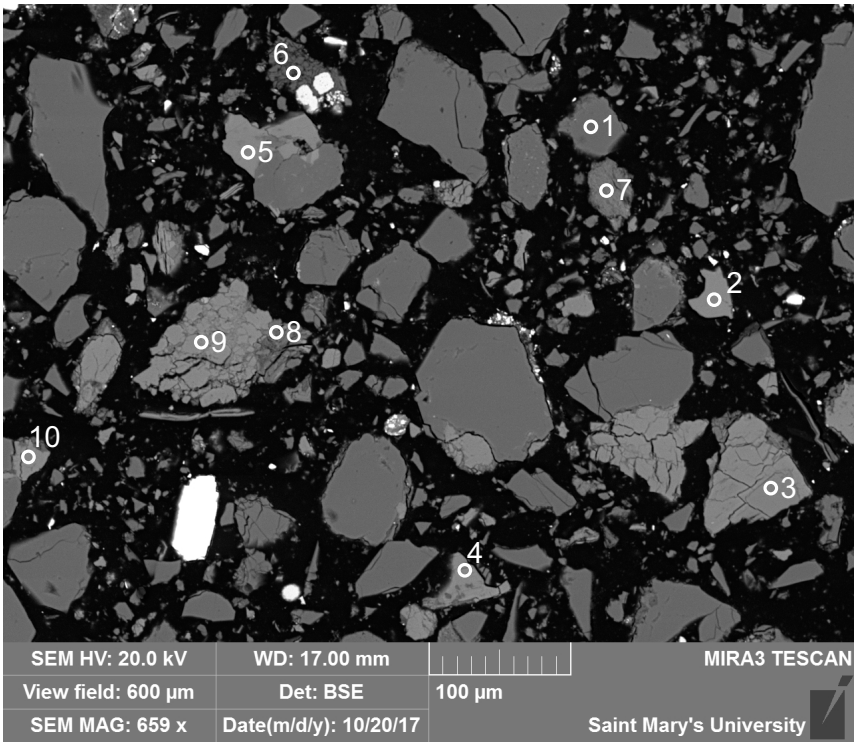
1:Calcite
2:Quartz
3:Limonite +
4:Quartz +
5:Barite
6:Kaolinite
7:Quartz
8:Albite
9:K-feldspar + Calcite
10:Calcite
11:Biotite +
12:Muscovite +
Chlorite
13:Quartz +
14:Kaolinite + TiO_2
15:Quartz

Figure 1A.13: Sample G-24 4401.5A(1) (SEM) site 12. Detrital minerals: Ab, Bt, Kfs, Ms, Qz. Diagenetic minerals: Cal, Chl, Kln, Lim, TiO_2. A fragment made up of quartz (2) and limonite (3), another one of quartz (7), kaolinite (6), and TiO_2 and another one of K-feldspar mixed with calcite (9), albite (8; probably diagenetic), and calcite (10).



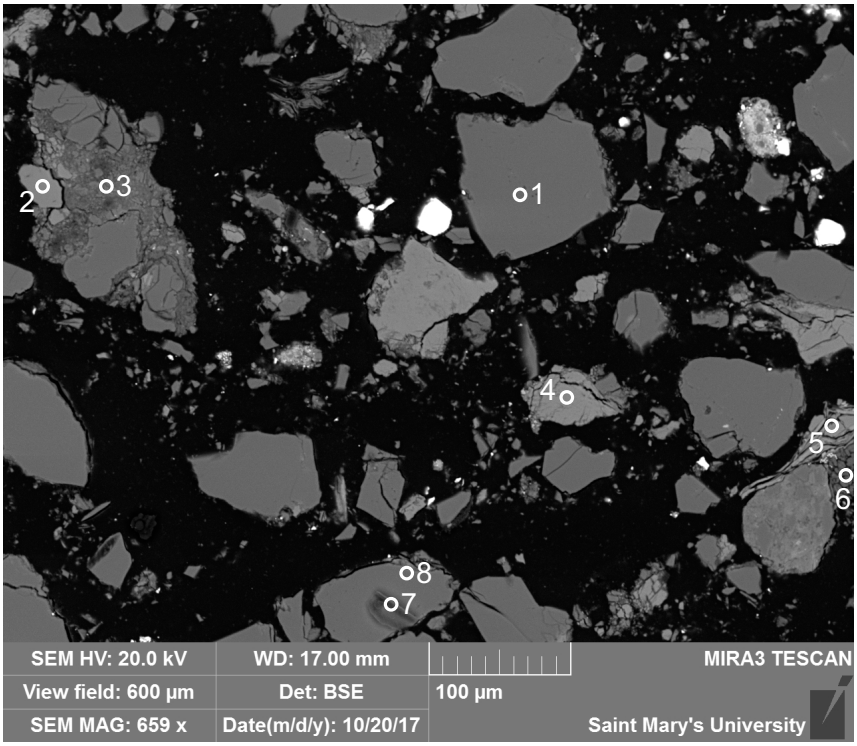
1:Halite
2:Calcite +
3:Quartz
4:Calcite
5:Quartz
6:Limonite +
7:Barite

Figure 1A.14: Sample G-24 4401.5A(1) (SEM) site 13. Detrital minerals: Qz. Diagenetic minerals: Brt, Cal, Lim.



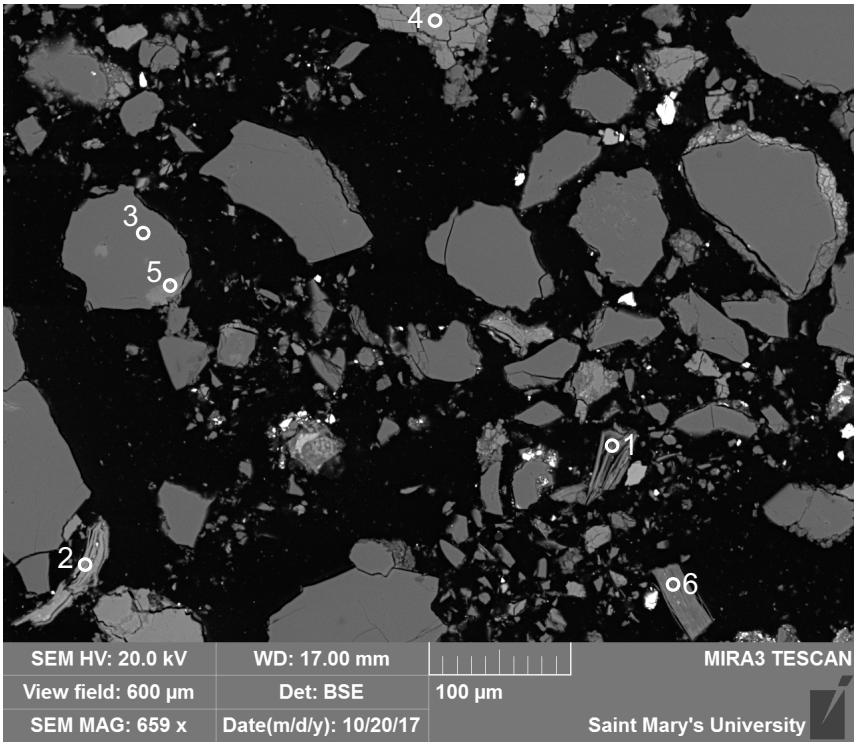
1:Quartz
2:Calcite
3:K-feldspar
4:Calcite
5:Calcite
6:Kaolinite
7:Muscovite +
8:Chlorite +
9:Calcite + Chlorite
10:Calcite

Figure 1A.15: Sample G-24 4401.5A(1) (SEM) site 14. Detrital minerals: Kfs, Ms, Qz. Diagenetic minerals: Cal, Chl, Kln.



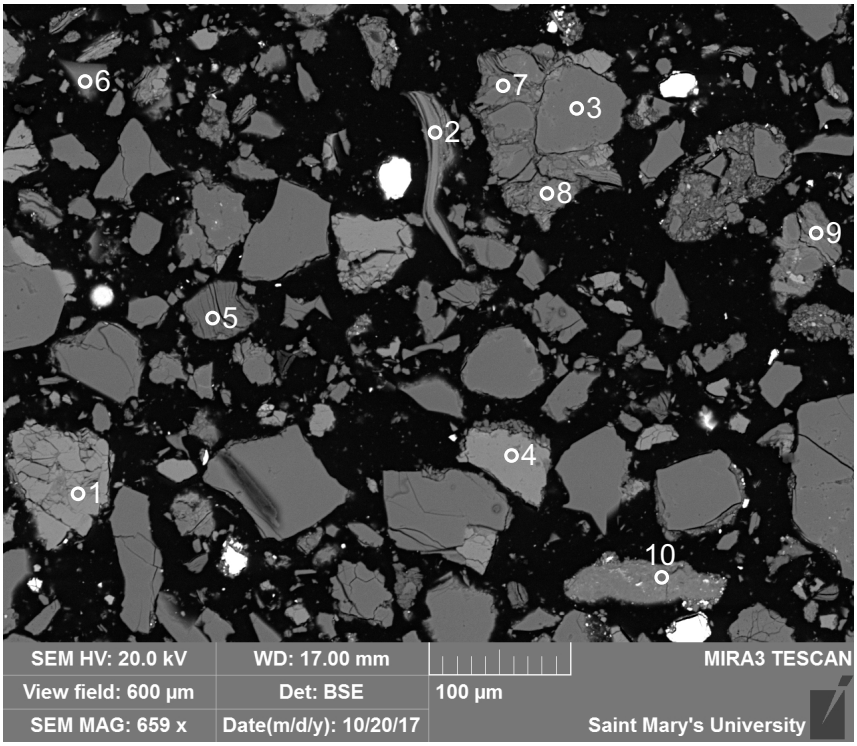
1:Quartz
2:Calcite
3:Albite + Chlorite
4:Calcite +
5:Calcite
6:Kaolinite
7:Quartz
8:Quartz

Figure 1A.16: Sample G-24 4401.5A(1) (SEM) site 15. Detrital minerals: Ab, Qz. Diagenetic minerals: Cal, Chl, Kln.



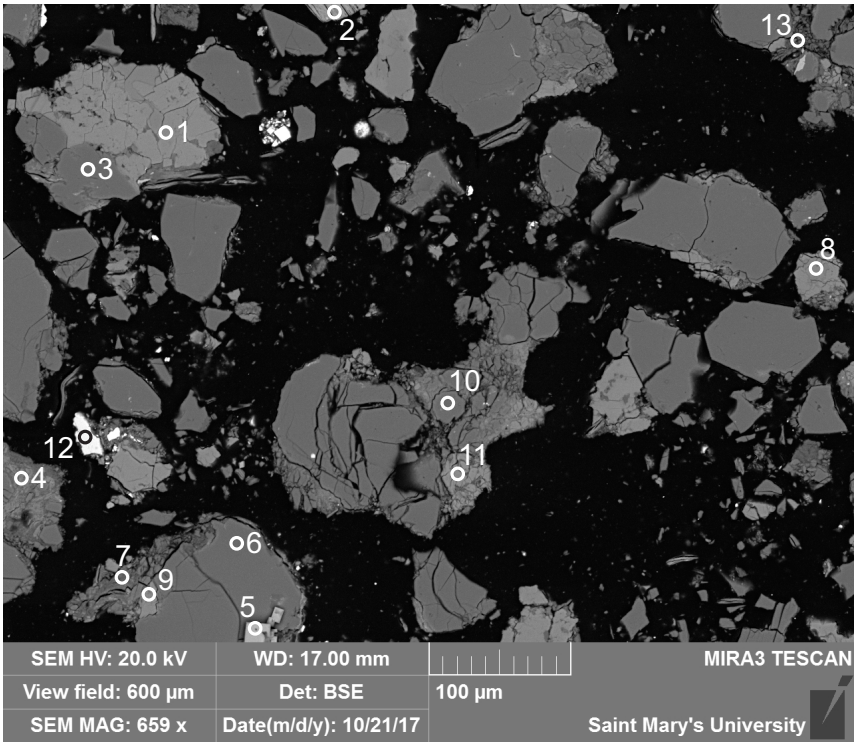
1:Muscovite +
Chlorite
2:Chlorite
3:Quartz
4:Calcite
5:Calcite +
6:Chlorite + Kaolinite

Figure 1A.17: Sample G-24 4401.5A(1) (SEM) site 16. Detrital minerals: Ms, Qz. Diagenetic minerals: Cal, Chl, Kln.



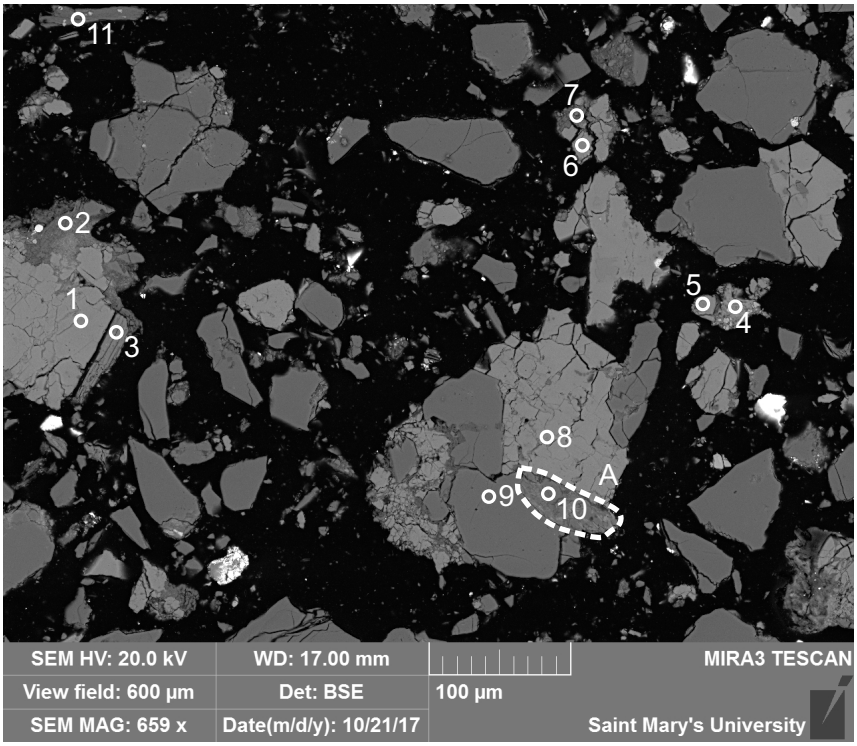
1:Calcite
2:Muscovite + Chlorite
3:Quartz
4:Calcite + Chlorite
5:Kaolinite
6:Quartz
7:Chlorite +
8:Mixture
9:Mixture
10:Feldspar +

Figure 1A.18: Sample G-24 4401.5A(1) (SEM) site 17. Detrital minerals: Feld, Ms, Qz. Diagenetic minerals: Cal, Chl, Kln.



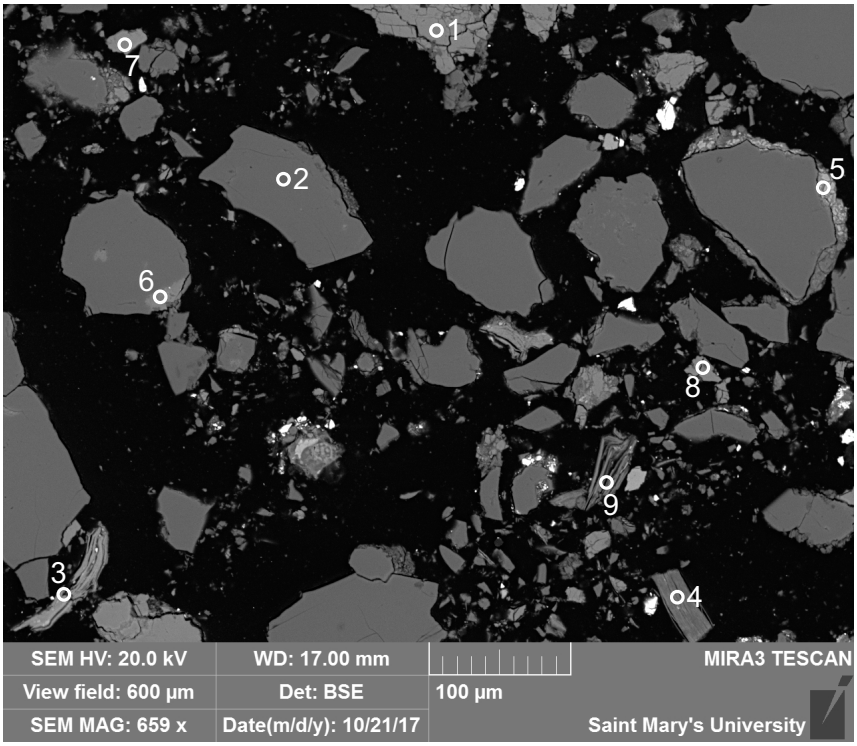
1:Calcite
2:Chlorite
3:Quartz
4:Muscovite
5:Halite
6:Quartz
7:Muscovite +
8:Calcite +
9:Calcite +
10:Quartz +
11:Calcite
12:Pyrite
13:Kaolinite

Figure 1A.19: Sample G-24 4401.5A(1) (SEM) site 18. Detrital minerals: Ms, Qz. Diagenetic minerals: Cal, Kln, Py. A fragment made up of quartz (6), muscovite (7), and calcite (9). calcite (1) postdates chlorite (3).



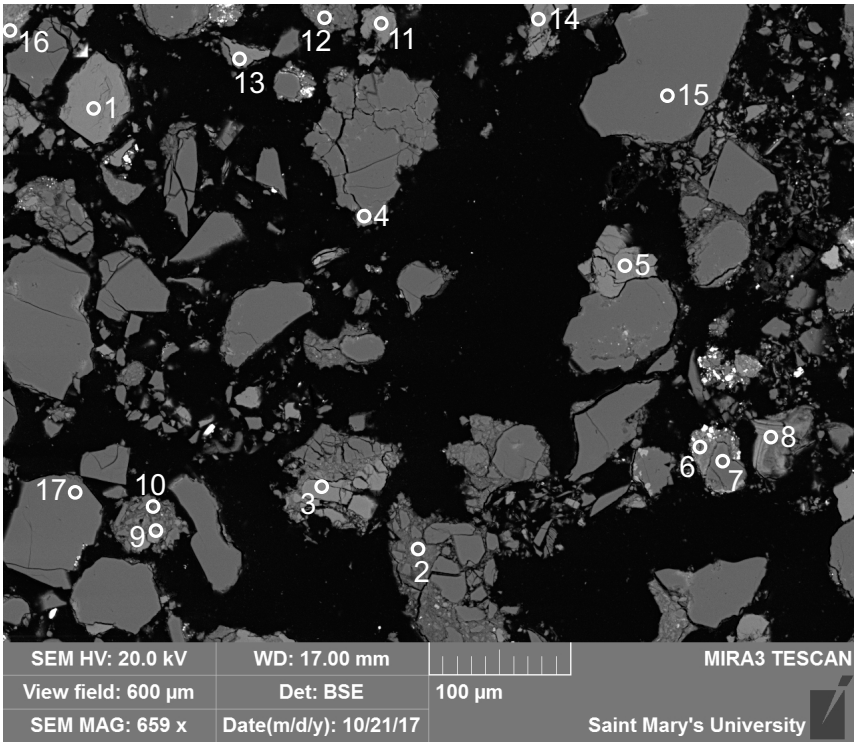
1:Calcite +
2:Kaolinite + Chlorite
3:Muscovite +
4:Chlorite +
5:Calcite
6:Calcite +
7:Oligoclase +
8:Calcite +
9:Quartz
10:Quartz + Albite
11:Kaolinite

Figure 1A.20: Sample G-24 4401.5A(1) (SEM) site 19. Detrital minerals: Ms, Olig, Qz. Diagenetic minerals: Cal, Chl, Kln. A fragment made up of muscovite (3), chlorite and kaolinite (2), and calcite (1). Another fragment is made up of quartz grains (9,10) and calcite (10) probably pseudomorphic silicate detrital grains. Possible lithic clast (A) composed of quartz and albite (10) and mica.



1:Calcite
2:Quartz
3:Chlorite +
4:Kaolinite + Chlorite
5:Siderite +
6:K-feldspar + Calcite
7:Calcite
8:Calcite +
9:Muscovite +
Chlorite + Apatite

Figure 1A.21: Sample G-24 4401.5A(1) (SEM) site 20. Detrital minerals: Kfs, Ms, Qz. Diagenetic minerals: Cal, Chl, Kln, Sd. Relics of K-feldspar in calcite (6).



1:Calcite
2:Kaolinite +
3:Calcite
4:Calcite +
5:Calcite
6:Quartz +
7:Quartz
8:Kaolinite +
9:Calcite +
10:Albite
11:Muscovite +
12:Albite
13:Calcite
14:Calcite +
15:Quartz
16:Chlorite +
Muscovite
17:Quartz

Figure 1A.22: Sample G-24 4401.5A(1) (SEM) site 21. Detrital minerals: Ab, Ms, Qz. Diagenetic minerals: Cal, Chl, Kln. Albite (9) partly altered to calcite (10).

Table 1A.1 SEM-EDS chemical analyses of minerals from sample G-24 4401.5A(1).

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	SrO	MoO_3	BaO	Ce_2O_3	WO_3	Total	Actual Total
1	1	Ab	66.99		20.14	0.88			1.39	9.10	1.32				0.17									100	108
1	2	Qz	100.00																					100	118
1	3	Bt	38.20	4.37	14.68	19.84	1.13	14.64		0.68	6.47													100	102
1	4	Brt											36.82								61.42		1.94	100	108
1	5	Brt											36.67						1.46		61.97			100	110
1	6	Cal	0.60			1.70	0.66		52.93		0.11													56	56
1	7	Cal				1.13			54.87															56	54
1	8	Ab	68.74		19.16				0.70	11.41														100	115
1	9	Ab	68.55		19.26				0.76	11.33	0.10													100	115
1	10	Cal +	1.37		0.63	1.37	0.46		52.16															56	55
1	11	Kln	47.87	0.55	35.97	0.46			0.87	0.28														86	90
1	12	Cal	0.48			1.40	0.38		53.75															56	55
1	13	Chl	36.80		16.80	23.02		7.00	0.77		0.40				0.20									85	92
1	14	Ab + Cal	43.43		14.58	1.15	0.28		30.95	8.90	0.71													100	94
1	15	Cal +	1.95		1.01	1.50	0.46	0.28	47.86					2.93										56	56
1	16	Cal				0.67		0.46	53.82					1.05										56	56
1	17	Qz	100.00																					100	117
1	18	Anh +	6.53		2.53	1.51		0.32	33.82		0.79		54.52											100	95
2	1	Ab	69.72		18.61					11.68														100	116
2	2	Qz	99.12		0.88																			100	115
2	3	Brt											36.67						1.44		62.11			100	109
2	4	Cal	0.79		0.50	1.47	0.68		52.56															56	55
2	5	Qz	99.67		0.32						0.02													100	114
2	6	Cal	1.23		0.74	1.28	0.39		52.36															56	56
2	7	Kln	48.43		35.90	1.00			0.67															86	89
2	8	Py				28.54			0.41				71.05											100	217
2	9	Qz	99.68		0.32																			100	113
2	10	Mix	58.04	1.03	22.63	11.78		2.12	1.88	0.36	1.94				0.23									100	95
2	11	Qz	98.58		1.02	0.37					0.03													100	115
2	12	Qz	100.00																					100	117
2	13	Cal	0.50			1.33	0.50		53.66															56	55
2	14	Sd				47.45	1.13	5.56	1.86															56	58
2	15	Cal +	3.26		2.02	4.96	0.26	0.50	42.27					2.73										56	48
3	1	Ab	65.76		21.34				2.98	9.81	0.11													100	112
3	2	Qz	100.00																					100	115
3	3	Cal				1.29	0.38		54.33															56	53
3	4	Sd				43.11	0.49	7.19	5.21															56	55
3	5	Chl +	24.44	1.44	14.87	35.51	0.31	6.88	1.22		0.33													85	87
3	6	Kln	43.71		31.96	8.44		1.46	0.22		0.20													86	94
3	7	"Ms"	56.61	0.67	28.30	6.16		2.01	1.08	0.41	4.59				0.17									100	96
3	8	Cal				1.76	0.32	0.29	53.64															56	53
3	9	Chl +	31.34	1.27	21.15	25.13		5.03	0.53		0.55													85	91

Table 1A.1 SEM-EDS chemical analyses of minerals from sample G-24 4401.5A(1).

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	SrO	MoO_3	BaO	Ce_2O_3	WO_3	Total	Actual Total
4	1	Qz	100.00																					100	120
4	2	Brt											35.58								64.50			100	106
4	3	TiO_2		99.69		0.31																		100	101
4	4	Mix	34.73		9.30	1.43	0.34		47.17	2.53	4.50													100	76
4	5	Cal +	2.49		2.07	1.26	0.26		47.56					2.23	0.13									56	59
4	6	Ms + Chl	49.17	0.30	21.65	15.71		2.30	4.36	0.53	5.54				0.44									100	75
4	7	Brt +	11.89		2.86	5.83		0.61	4.40	0.69	0.71		27.21		0.41			0.01			45.37			100	95
4	8	Cal +	1.56		0.79	1.67	0.30	0.31	50.13		0.10	1.14												56	57
4	9	Qz	100.00																					100	116
4	10	Cal				1.54	0.27		54.19															56	54
4	11	Qz	100.00																					100	117
4	12	Kln + Qz	83.84		13.88	1.71					0.41				0.15									100	111
4	13	TiO_2		99.63					0.37															100	104
5	1	Ab	66.45		20.82	0.50			0.43	10.48	1.31													100	113
5	2	Qz	100.00																					100	118
5	3	Cal	0.73		0.32	1.37	0.28	0.36	52.94															56	56
5	4	Qz	100.00																					100	118
5	5	Cal				1.56	0.41	0.30	53.73															56	55
5	6	Sd + Chl	6.56		4.29	72.08	0.85	7.70	7.23			1.28												100	64
5	7	Chl +	32.14	1.62	19.44	27.49		2.74	0.59	0.44	0.20				0.35									85	96
5	8	Ms	49.20	1.10	29.83	3.62		1.36			9.89													95	105
5	9	Qz +	89.33		6.12	2.09		0.78		0.69	0.98													100	112
5	10	TiO_2 +	14.35	82.02	2.87	0.43			0.32															100	105
5	11	Cal				1.20	0.26		54.54															56	54
5	12	Sd	0.42			47.26	1.32	5.30	1.69															56	58
6	1	TiO_2	0.68	96.29		3.03																		100	105
6	2	Brt											36.98						2.49		60.66			100	111
6	3	Cal				2.06	0.37	0.39	53.19															56	55
6	4	Ab	69.92		18.60					11.48														100	113
6	5	Chl	25.97		21.83	26.53	0.48	9.73	0.26		0.20													85	91
6	6	Cal + Chl	3.79		2.54	4.98	0.72	0.64	87.33															100	59
6	7	Ab	69.55		18.79	0.26				11.40														100	114
6	8	Ms	46.74	1.00	33.05	2.96		0.61		0.64	10.00													95	98
6	9	Kln	47.90		35.01	1.92			0.66		0.31				0.20									86	86
6	10	Py	0.82		0.25	29.34			0.69	0.25			68.65											100	198
6	11	Ms +	52.61		31.63	3.98		2.13	0.53		3.98				0.14									95	100
6	12	Qz +	97.80						2.20															100	114
6	13	Cal	0.56			1.48	0.69		53.26															56	56
6	14	Hl + Cal	2.96		1.17	1.40	0.24		26.64	37.13	0.21				30.26									100	87
7	1	Qz	100.00																					100	121
7	2	Ms	49.36	0.22	28.65	3.96		2.30			10.51													95	107

Table 1A.1 SEM-EDS chemical analyses of minerals from sample G-24 4401.5A(1).

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	SrO	MoO_3	BaO	Ce_2O_3	WO_3	Total	Actual Total
7	3	Sd + Chl	22.99	1.01	16.80	48.85	0.70	7.01	2.09		0.55													100	82
7	4	Cal				1.32	0.35	0.32	50.14					3.62	0.24									56	57
7	5	Qz	99.80			0.20																		100	117
7	6	Qz	100.00																					100	120
7	7	Ms + Kln	53.89		38.33	0.74					7.05													100	98
7	8	Cal +	15.19		4.49	0.74			32.24		3.34													56	74
7	9	Cal				1.13	0.34		54.53															56	56
7	10	Ab	69.31		18.77				0.27	11.65														100	117
7	11	Cal +	2.76		1.74	2.64	0.45	0.45	47.97															56	60
7	12	Cal +	3.75		1.12	1.25	0.23		48.92	0.72														56	61
7	13	Cal	0.86		0.59	1.71	0.35		52.49															56	57
7	14	Hem +	9.03			81.73			2.44	1.32			0.75		3.04	0.99	0.70							100	76
7	15	Ab	67.91		19.85				1.36	10.88														100	117
8	1	Cal				1.08			54.92															56	56
8	2	Brt											36.73						1.72		61.62			100	116
8	3	Cal +	5.97		4.64	1.02	0.34		41.90		0.57			1.57										56	67
8	4	Qz	99.71		0.29																			100	122
8	5	Ab	69.41		18.73					11.86														100	118
8	6	Ab	69.34		18.67					11.99														100	120
8	7	Cal +	1.76		0.41			0.43	47.10	0.40				5.90										56	66
8	8	Qz	99.87						0.13															100	119
8	9	Chl + Ms	39.98	1.03	26.32	23.31		2.81	3.06	0.59	2.69				0.21									100	90
8	10	Ms +	51.77	0.29	25.88	1.97		2.60	2.04	0.44	6.12			3.59	0.29									95	108
9	1	Cal	0.52			1.72	0.39		53.37															56	57
9	2	Qz	100.00																					100	122
9	3	Qz	98.83		0.77	0.41																		100	123
9	4	Ms + Chl	53.89	0.26	28.14	7.86		2.36	0.49	0.40	6.59													100	105
9	5	Ms + Chl	50.10	0.30	31.17	9.13		1.77	2.46	0.46	4.21				0.39									100	83
9	6	Qz	100.00																					100	121
9	7	Ms + Chl	49.98	0.76	33.33	9.73		1.72	1.43	0.50	2.21				0.35									100	86
9	8	Lim +	24.33		5.35	58.78	0.62		4.66	2.47	0.26		1.29		1.87		0.39							100	99
10	1	TiO_2 +	7.00	92.55		0.45																		100	110
10	2	Ms	47.27		36.72	0.26				0.40	10.36													95	111
10	3	Qz	99.81						0.19															100	124
10	4	Cal	0.57			1.47	0.31		52.04					1.60										56	61
10	5	Cal +	1.15		0.62	1.71	0.34		51.96		0.23													56	58
10	6	Cal +	9.08		2.52	1.05	0.34		42.01	1.00														56	65
10	7	Ms +	42.08	0.31	26.36	6.43		1.76	5.87	0.42	7.02	4.46			0.29									95	82
10	8	Qz	99.80			0.20																		100	121
10	9	Chl +	27.36	6.08	17.73	22.60		5.80	2.97	0.33	1.40	0.73												85	93
10	10	Brt											36.57						1.40		62.19			100	113
11	1	Cal	0.51		0.31	1.72	0.51		52.95															56	58

Table 1A.1 SEM-EDS chemical analyses of minerals from sample G-24 4401.5A(1).

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	SrO	MoO_3	BaO	Ce_2O_3	WO_3	Total	Actual Total
11	2	Qz	100.00																					100	122
11	3	Qz	100.00																					100	121
11	4	Ms +	44.93	0.48	29.63	2.13		1.03	2.33	0.53	8.96			4.79	0.19									95	89
11	5	Ms +	58.88		25.42	2.97		2.56	1.52	0.29	3.12				0.24									95	101
11	6	Cal +	12.27		3.32	0.57	0.18		34.05		2.78			2.82										56	76
12	1	Cal				0.94	0.39		54.68															56	56
12	2	Qz	100.00																					100	121
12	3	Lim +	4.08			90.05			3.23						2.64									100	77
12	4	Qz +	91.98	0.42	2.22	0.80			4.32		0.06				0.21									100	108
12	5	Brt											36.44						1.64		61.99			100	113
12	6	Kln	48.48		36.49	0.22			0.35		0.23				0.21									86	86
12	7	Qz	98.40		1.60																			100	122
12	8	Ab	69.26		18.90				0.26	11.58														100	119
12	9	Kfs + Cal	56.20		15.35	0.41			15.25	0.36	12.43													100	107
12	10	Cal				1.51	0.27		53.89		0.32													56	57
12	11	Bt +	46.68	4.68	24.75	16.31		2.25	0.70		4.40				0.24									100	92
12	12	Ms + Chl	51.39	0.37	22.19	13.47		2.36	3.08	0.42	6.36				0.36									100	90
12	13	Qz +	91.26		0.47	7.17			0.42						0.67									100	117
12	14	TiO_2 + Kln	15.90	71.24	10.54	0.96			0.41		0.94													100	99
12	15	Qz	99.65						0.35															100	120
13	1	Hl	0.45							45.80				0.61	53.14									100	134
13	2	Cal +	0.43			1.52	0.45	0.35	53.26															56	56
13	3	Qz	100.00																					100	118
13	4	Cal	1.19		0.38	1.64	0.58		52.21															56	56
13	5	Qz	100.00																					100	119
13	6	Lim +	16.28		1.04	73.20	0.38		3.99	0.79			0.67		3.11		0.55							100	82
13	7	Brt											36.25						1.14		62.73			100	110
14	1	Qz	100.00																					100	117
14	2	Cal				1.70	0.27	0.46	53.57															56	55
14	3	Kfs	66.22		17.76					0.64	15.38													100	114
14	4	Cal				1.36			54.64															56	55
14	5	Cal	0.72			1.42	0.42	0.31	53.00		0.13													56	55
14	6	Kln	48.51		36.64				0.61						0.24									86	68
14	7	Ms +	46.98	3.94	32.14	2.60		0.67	0.53		8.12													95	100
14	8	Chl +	51.60		16.92	11.13		1.46	2.57		1.06				0.26									85	85
14	9	Cal + Chl	5.35		3.88	6.50	0.71	0.71	82.85															100	58
14	10	Cal	0.99			1.16	0.40		53.45															56	56
15	1	Qz	100.00																					100	117
15	2	Cal				1.78	0.28	0.43	53.51															56	54
15	3	Ab + Chl	63.78		19.62	4.59		0.44	0.82	9.81	0.79				0.15									100	102
15	4	Cal +	1.52		0.96	2.12	0.62	0.32	50.46															56	57
15	5	Cal				1.48		0.35	54.17															56	56

Table 1A.1 SEM-EDS chemical analyses of minerals from sample G-24 4401.5A(1).

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	SrO	MoO_3	BaO	Ce_2O_3	WO_3	Total	Actual Total
15	6	Kln	48.66		37.34																			86	90
15	7	Qz	99.60							0.40														100	106
15	8	Qz	100.00																					100	119
16	1	Ms + Chl	50.37		27.11	9.67		1.74	1.98		7.78	0.89			0.46									100	42
16	2	Chl	26.14	0.89	18.70	31.54	0.32	5.13	0.89		0.20		0.92		0.26									85	56
16	3	Qz	100.00																					100	84
16	4	Cal				1.22	0.45		54.33															56	117
16	5	Cal +	5.36		2.94	2.15	0.31	0.59	44.20		0.44													56	53
16	6	Chl + Kln	47.51	0.75	35.82	14.08		1.48		0.35														100	62
17	1	Cal				1.75	0.30	0.40	53.54															56	96
17	2	Ms + Chl	52.60		35.68	4.23		1.09			6.40													100	100
17	3	Qz	100.00																					100	121
17	4	Cal + Chl	5.02		2.22	3.04	0.65		88.52		0.55													100	63
17	5	Kln	48.38		36.86	0.57			0.20															86	97
17	6	Qz	100.00																					100	123
17	7	Chl +	39.31	1.20	21.73	17.59		2.39	1.22		1.34				0.21									85	90
17	8	Mix	72.16	0.27	16.77	1.49		1.24		5.80	2.27													100	120
17	9	Mix	52.41	0.81	21.68	3.70		1.55	11.77	0.54	4.10			2.94	0.50									100	99
17	10	Feld +	68.40	0.95	20.22	2.42		1.05	1.71	2.10	2.75				0.40									100	113
18	1	Cal				0.69			55.31															56	55
18	2	Chl	29.72		21.25	25.91		2.93	3.75	0.37	0.87				0.20									85	91
18	3	Qz	100.00																					100	118
18	4	Ms	47.86	0.63	31.98	3.04		0.75		0.70	10.04													95	105
18	5	Hl	0.60							48.07					51.33									100	146
18	6	Qz	100.00																					100	121
18	7	Ms +	52.92	1.32	23.70	4.52		2.87	2.95	1.11	4.52				1.07									95	99
18	8	Cal +	1.97		0.74	1.12	0.29		51.55		0.34													56	58
18	9	Cal +	3.47		2.11	2.65	0.34	0.45	46.76						0.22									56	60
18	10	Qz +	97.69		1.53					0.79														100	118
18	11	Cal				1.28	0.25	0.27	54.20															56	56
18	12	Py	0.16			28.48							71.36											100	220
18	13	Kln	45.07	0.42	31.92	5.73		0.94	1.10	0.27	0.27				0.28									86	72
19	1	Cal +	1.41		1.02	1.44	0.40	0.28	51.45															56	56
19	2	Kln + Chl	51.56		36.49	7.25		1.44	2.21	0.40	0.46				0.19									100	87
19	3	Ms	49.69		32.83	2.32		0.99			9.18													95	90
19	4	Chl +	31.77	1.57	16.55	23.13	0.31	7.96	0.93	0.32	2.46													85	84
19	5	Cal				1.09	0.26		54.66															56	54
19	6	Cal +	1.55	0.54	0.66	1.72	0.49	0.30	50.60		0.14													56	57
19	7	Olig +	59.63	2.69	20.89	6.00		0.74	2.21	6.73	0.93				0.18									100	89
19	8	Cal +	2.92		0.88	1.18	0.29		50.23	0.50														56	59
19	9	Qz	100.00																					100	118
19	10	Qz + Ab	90.86		5.76	0.27				2.91	0.20													100	113

Table 1A.1 SEM-EDS chemical analyses of minerals from sample G-24 4401.5A(1).

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	SrO	MoO_3	BaO	Ce_2O_3	WO_3	Total	Actual Total
19	11	Kln	47.13		35.17	2.77		0.49	0.45															86	89
20	1	Cal	0.76		0.31	1.67	0.59	0.31	52.35															56	54
20	2	Qz	100.00																					100	114
20	3	Chl +	28.48	1.54	18.76	26.72	0.22	6.15	0.59		0.25		2.08		0.23									85	90
20	4	Kln + Chl	49.92	0.37	37.89	10.07		1.23		0.33	0.19													100	96
20	5	Sd +	3.30		1.30	43.33	0.91	3.44	3.26				0.45											56	58
20	6	Kfs + Cal	38.86		10.94	0.51			41.17		8.52													100	82
20	7	Cal				1.60	0.39	0.35	53.66															56	53
20	8	Cal +	2.84		2.37	1.51	0.49	0.32	48.46															56	57
20	9	Ms + Chl + Ap	41.02		24.90	11.00		1.91	9.75	0.45	4.27	6.49			0.21									100	95
21	1	Cal				1.37	0.30		54.34															56	53
21	2	Kln +	55.80		22.58	4.64		0.83	1.21		0.79				0.15									86	89
21	3	Cal				1.06	0.55		54.39															56	54
21	4	Cal +	2.44		0.88	1.99	0.50		50.19															56	56
21	5	Cal				0.62			55.38															56	54
21	6	Qz +	81.34		2.29	10.89			1.73	0.40	0.19		0.82		1.13						1.21			100	104
21	7	Qz	100.00																					100	114
21	8	Kln +	45.30	0.50	31.31	7.08		0.99	0.64		0.18													86	90
21	9	Cal +	2.59		1.71	1.61	0.36	0.27	49.35		0.11													56	57
21	10	Ab	66.21		20.01	1.00			0.79	11.30	0.55				0.15									100	114
21	11	Ms +	41.86		27.60	3.26		1.42	13.75		7.13													95	89
21	12	Ab	68.48		18.99	0.77			0.16	11.60														100	115
21	13	Cal	0.81			1.43	0.39		53.36															56	53
21	14	Cal +	5.01		1.64	1.68	0.30	0.31	45.53	1.54														56	60
21	15	Qz	100.00																					100	115
21	16	Chl + Ms	46.08	0.71	24.19	20.06		4.26	1.57		3.13													100	92
21	17	Qz	100.00																					100	117

Notes: Lim = Fe-oxide/hydroxide, "mineral" = altered mineral; Feld=Feldspar

Appendix 1B: SEM-BSE images and EDS mineral analyses for sample G-24 4401.5A(2), from sidewall core

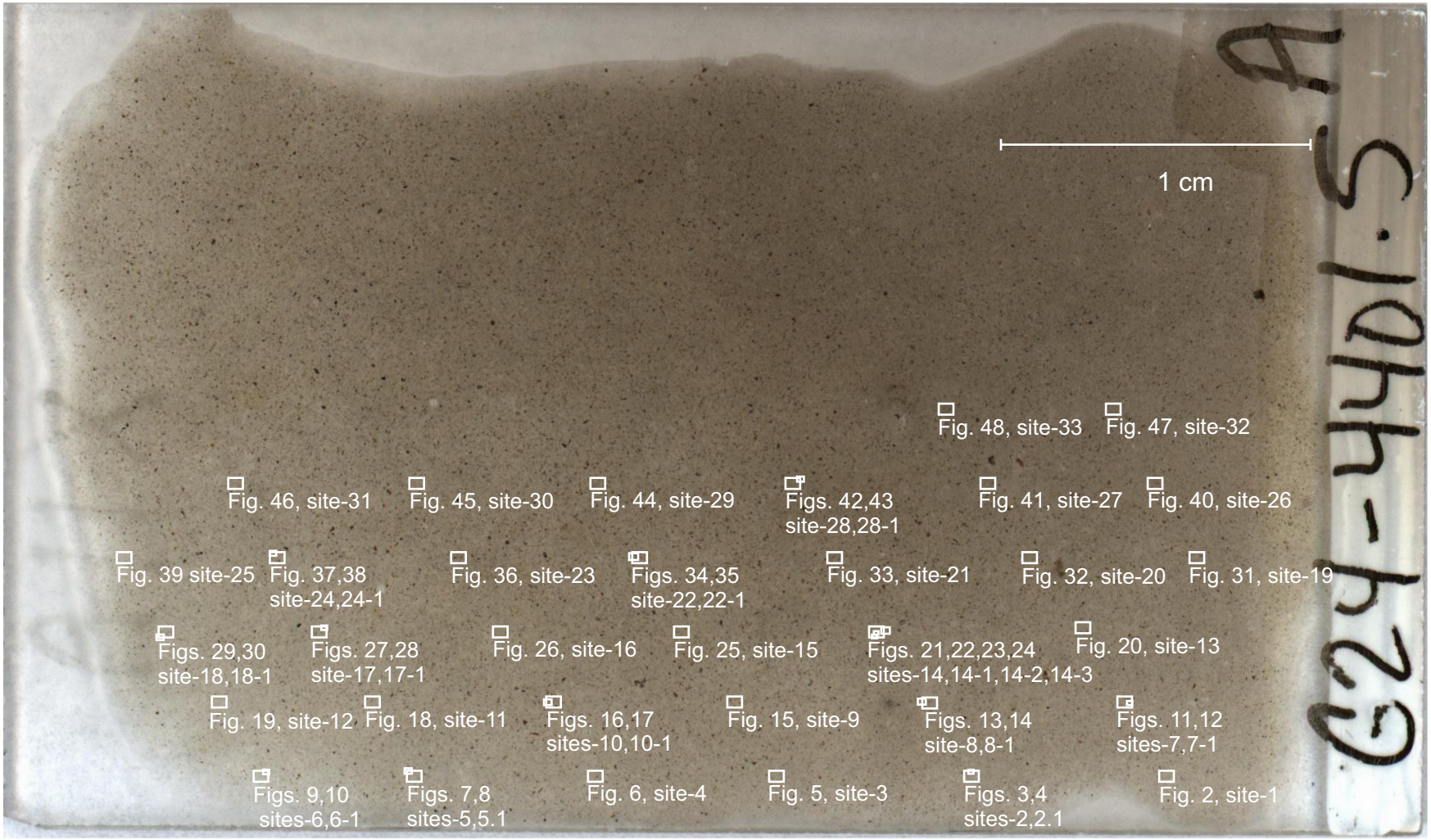
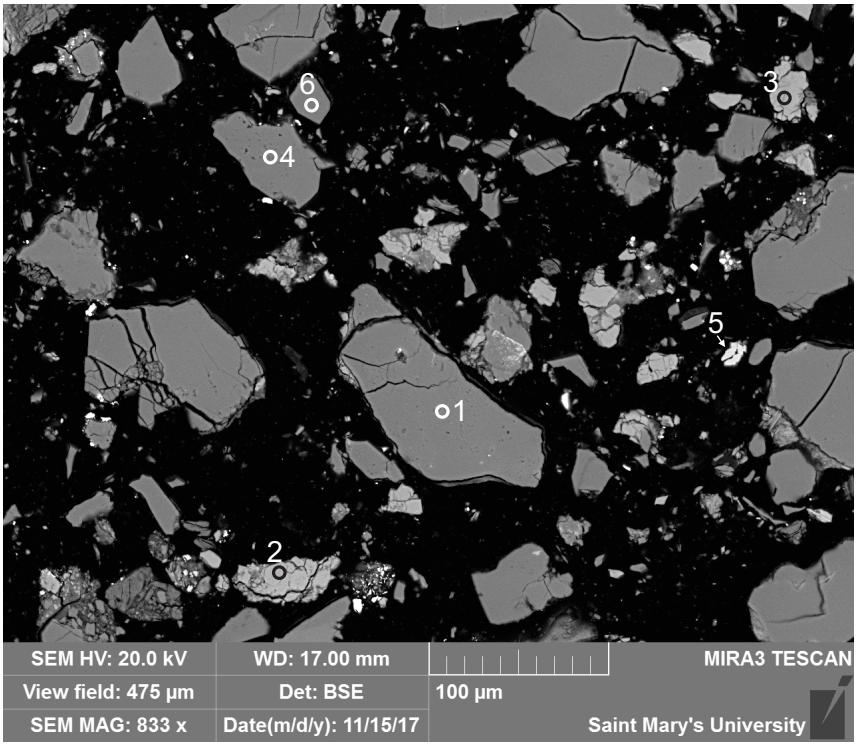
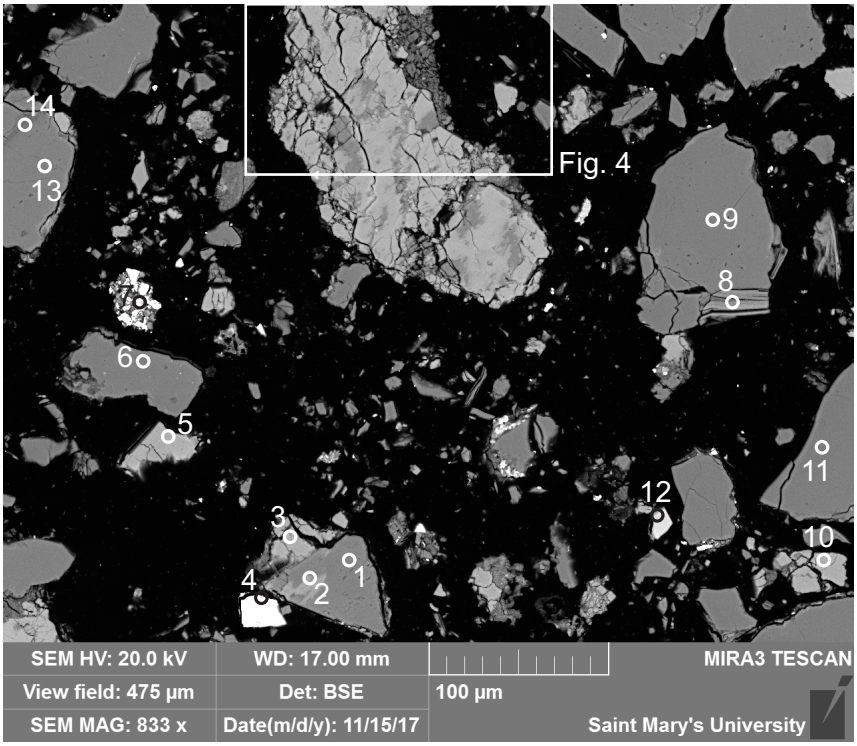


Figure 1B.1: Scanned thin section of sample G-24 4401.5A(2) showing locations of analyzed sites:



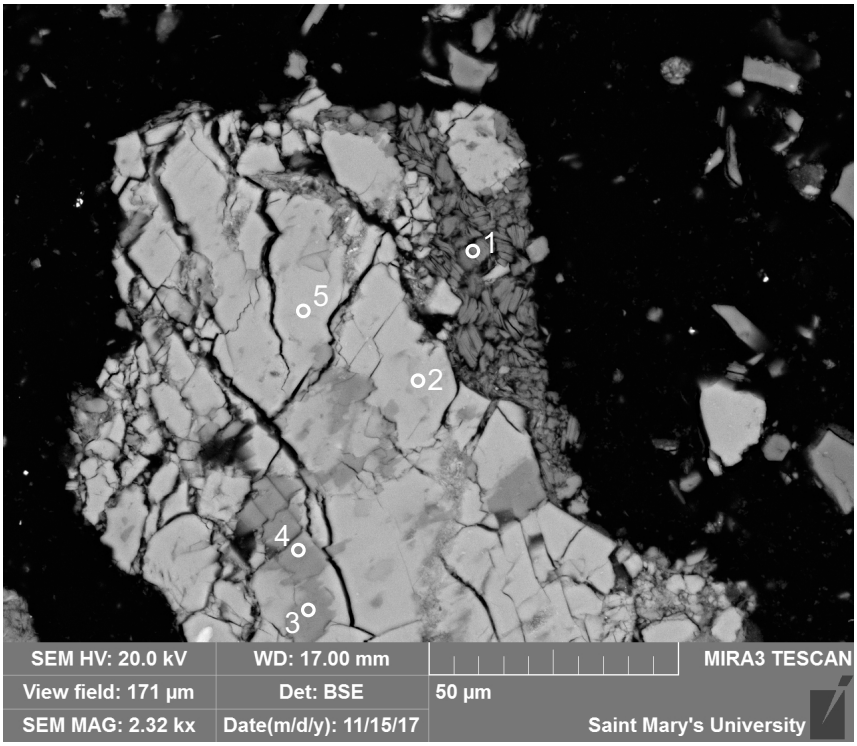
1:Quartz (D)
2:Calcite (G)
3:Calcite
4:Quartz
5:Siderite (G)
6:Quartz

Figure 1B.2: Sample G-24 4401.5A(2) (SEM) site 1*. (Table 1B.1). Detrital minerals: Qz. Diagenetic minerals: Cal, Sd.



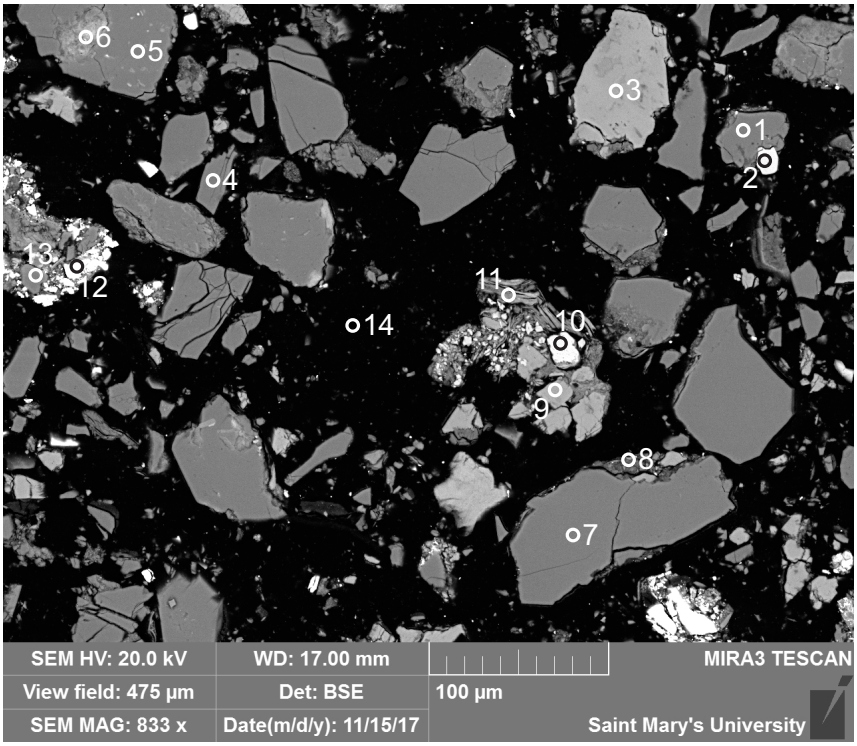
1:Albite (D)
2:Calcite (D) +
3:Calcite +
4:Barite (G)
5:Calcite
6:Quartz
7:Barite +
8:Muscovite
9:Quartz
10:Calcite
11:Quartz
12:Fluorite
13:Quartz
14:Quartz

Figure 1B.3: Sample G-24 4401.5A(2) (SEM) site 2*. (Table 1B.1). Detrital minerals: Ab, Qz, Ms. Diagenetic minerals: Cal, Brt. Alteration: Ab to Cal. Unknown: Fl. A grain of albite (1), altered to calcite (2). A fragment composed of muscovite and quartz (8,9). *sites 1 and 2 were re-analyzed (Table 1B.2).



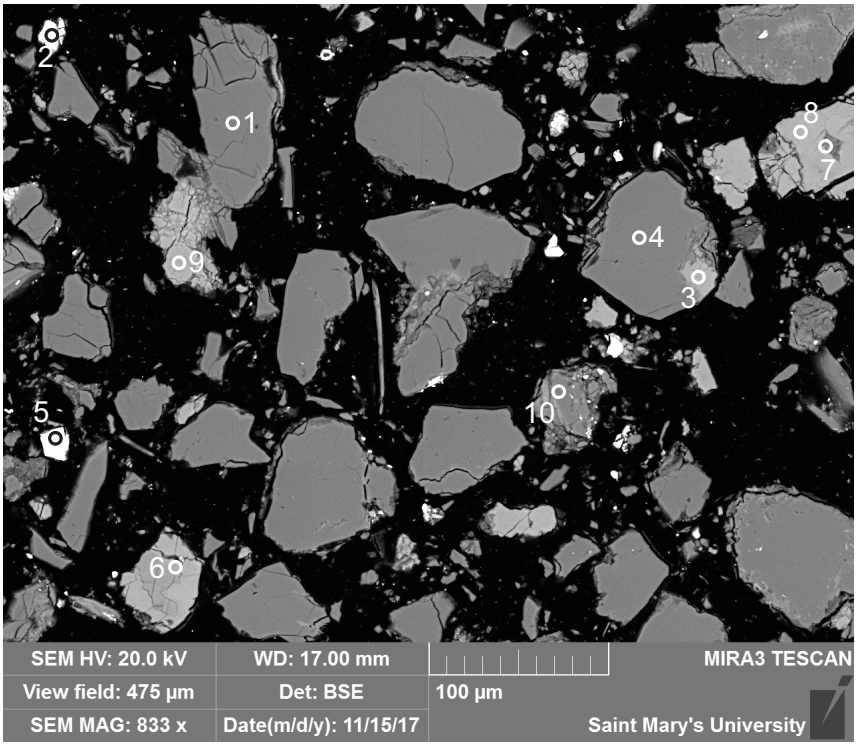
1:Kaolinite
2:Calcite
3:Plagioclase (Oligoclase)
4:Plagioclase (Oligoclase)
5:Calcite

Figure 1B.4: Sample G-24 4401.5A(2) (SEM) site 2.1. (Table 1B.1). Detrital minerals: Olig. Diagenetic minerals: Kln,Cal. A fragment made up of kaolinite (1) and oligoclase (3,4) altering to calcite (2,5). Calcite postdates kaolinite.



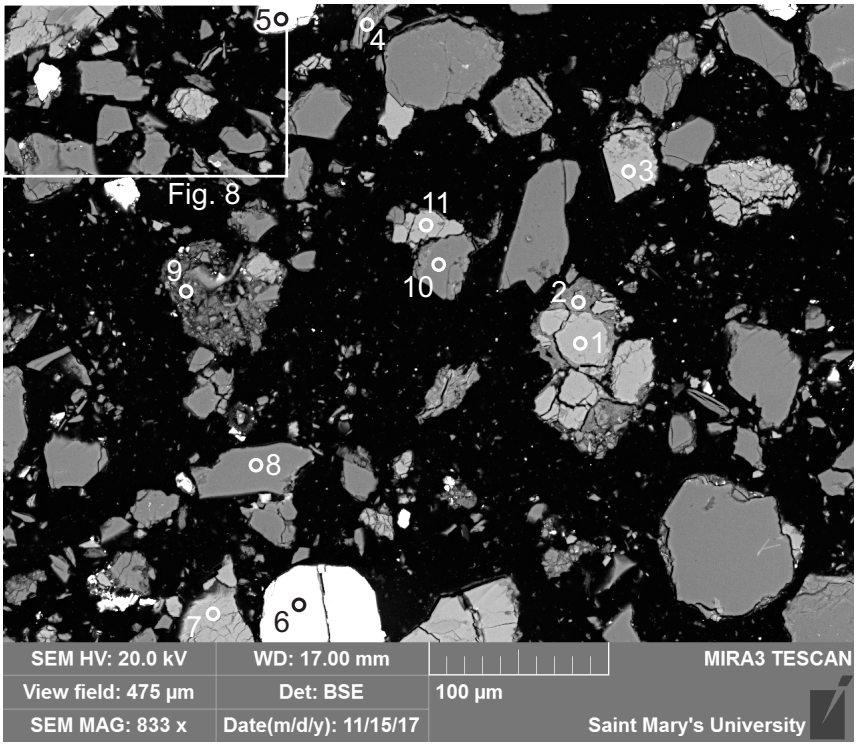
1:Quartz
2:TiO_2
3:K-feldspar + Calcite
4:Quartz
5:Quartz
6:Mix
7:Quartz
8:Muscovite + Kaolinite + Chlorite
9:Calcite
10:TiO_2
11:Chlorite + Kaolinite
12:Barite
13:Quartz
14:Hole

Figure 1B.5: Sample G-24 4401.5A(2) (SEM) site 3. (Table 1B.1). Detrital minerals: Qz, Kfs, Ms. Digenetic minerals: TiO_2,Chl,Kln. A fragment made up of quartz (7) and partly altered muscovite (8). Detrital quartz (13) rimmed with barite (12). A fragment made up of calcite (9), detrital TiO_2 (10) and a mixture of kaolinite and chlorite, with chlorite postdating kaolinite.



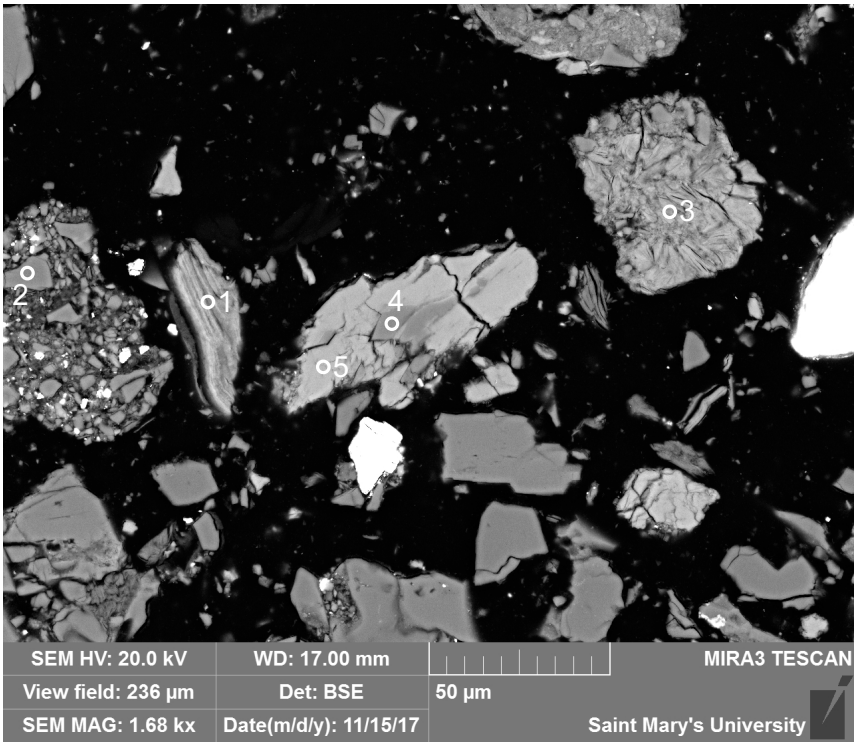
1:Quartz
2:Barite
3:Calcite +
4:Quartz
5:Barite
6:K-feldspar + Calcite
7:Mix
8:Calcite
9:Calcite
10:Albite

Figure 1B.6: Sample G-24 4401.5A(2) (SEM) site 4. (Table 1B.1). Detrital minerals: Ab, Kfs, Qz. Diagenetic minerals: Brt, Cal.



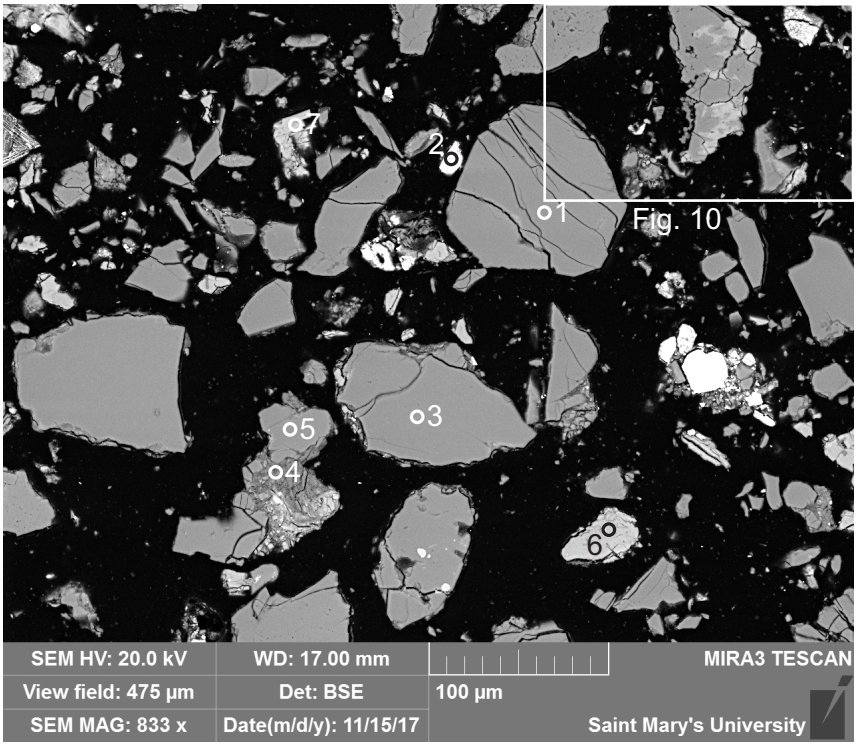
1:Calcite +
2:Muscovite +
3:Calcite +
4:Muscovite
5:Barite
6:Barite
7:Calcite
8:Quartz
9:Chlorite +
Muscovite
10:Quartz
11:Calcite

Figure 1B.7: Sample G-24 4401.5A(2) (SEM) site 5. (Table 1B.1). Detrital minerals: Ms, Qz. Diagenetic minerals: Brt, Cal, Chl.



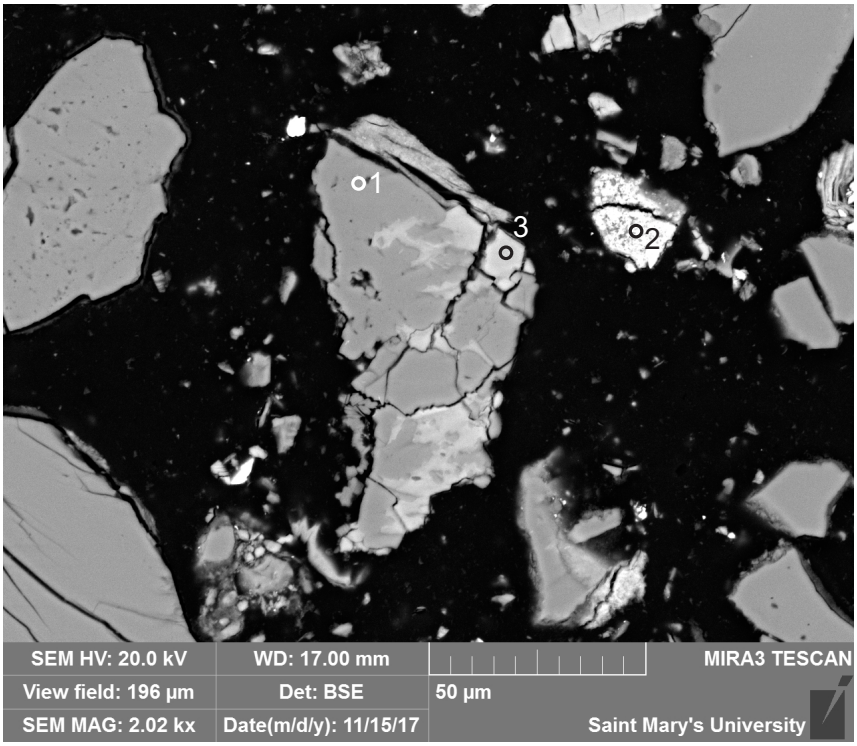
1:Chlorite +
2:Quartz
3:Chlorite +
4:Albite
5:Calcite

Figure 1B.8: Sample G-24 4401.5A(2) (SEM) site 5.1. (Table 1B.1). Detrital minerals: Qz, Ab. Diagenetic minerals: Cal, Chl. Detrital albite (4) is partly replaced by calcite (5).



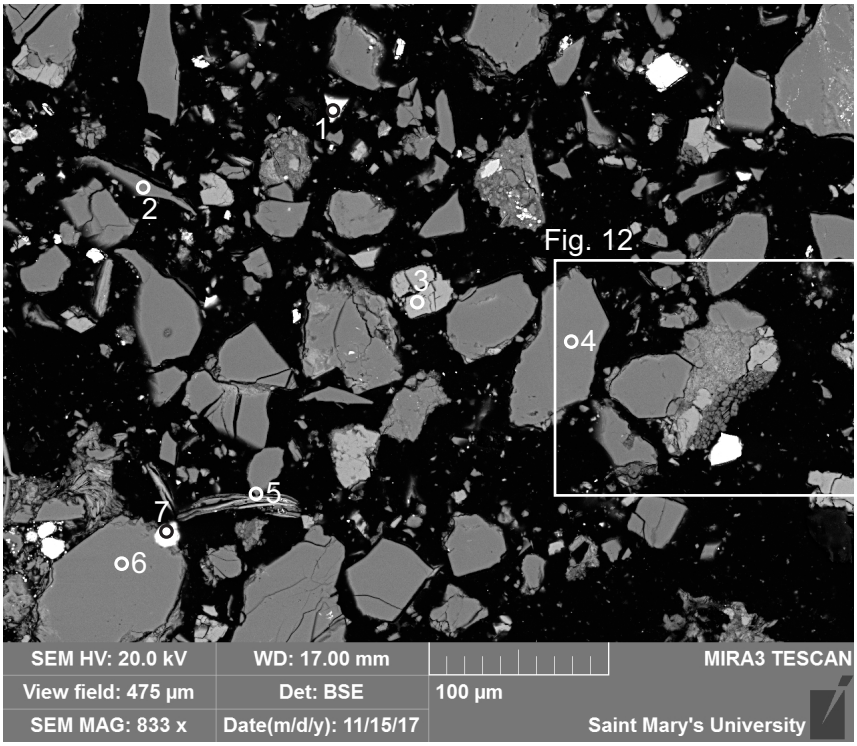
1:Quartz
2:Barite
3:Quartz
4:Kaolinite
5:Quartz
6:Calcite
7:Calcite

Figure 1B.9: Sample G-24 4401.5A(2) (SEM) site 6. (Table 1B.1). Detrital minerals: Qz. Diagenetic minerals: Kln, Cal, Brt. Calcite (5) postdates kaolinite (4).



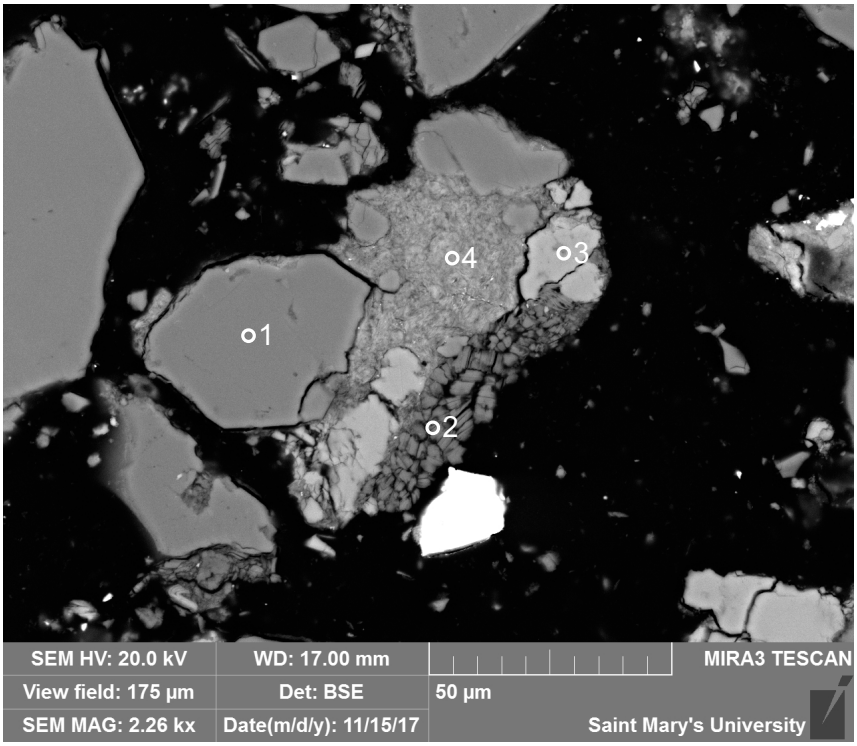
1:Albite
2:"Ilmenite" +
3:Calcite

Figure 1B.10: Sample G-24 4401.5A(2) (SEM) site 6.1. (Table 1B.1). Detrital minerals: Ab. Diagenetic minerals: Cal. Albite (1) is partly replaced by calcite (3).



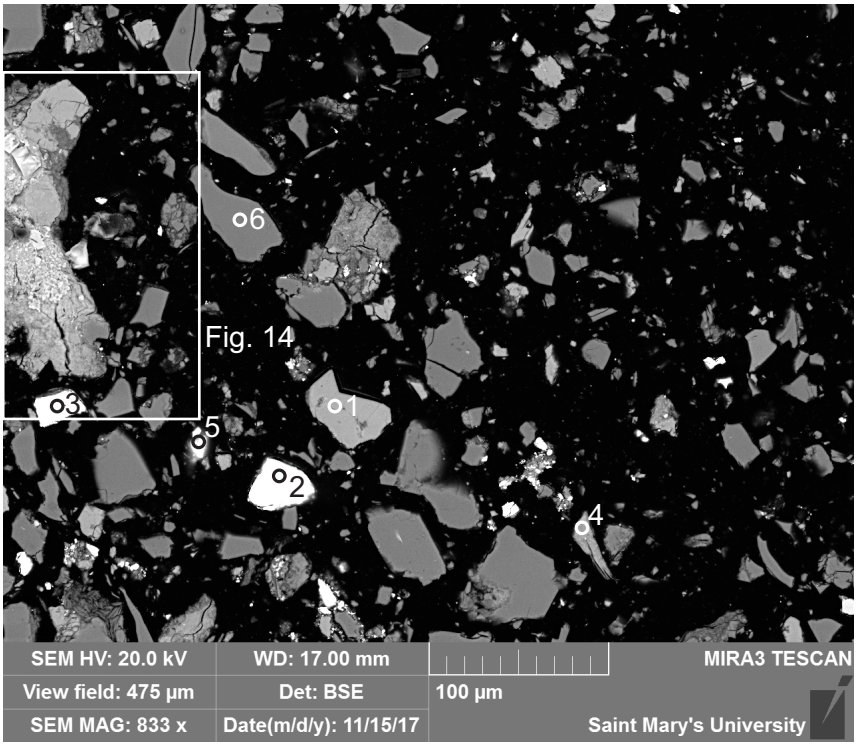
1:Barite
2:Quartz
3:Calcite
4:Albite
5:"Biotite" +
6:Quartz
7:Pyrite

Figure 1B.11: Sample G-24 4401.5A(2) (SEM) site 7. (Table 1B.1). Detrital minerals: Qz, Ab, Bt. Diagenetic minerals: Cal, Py, Brt.



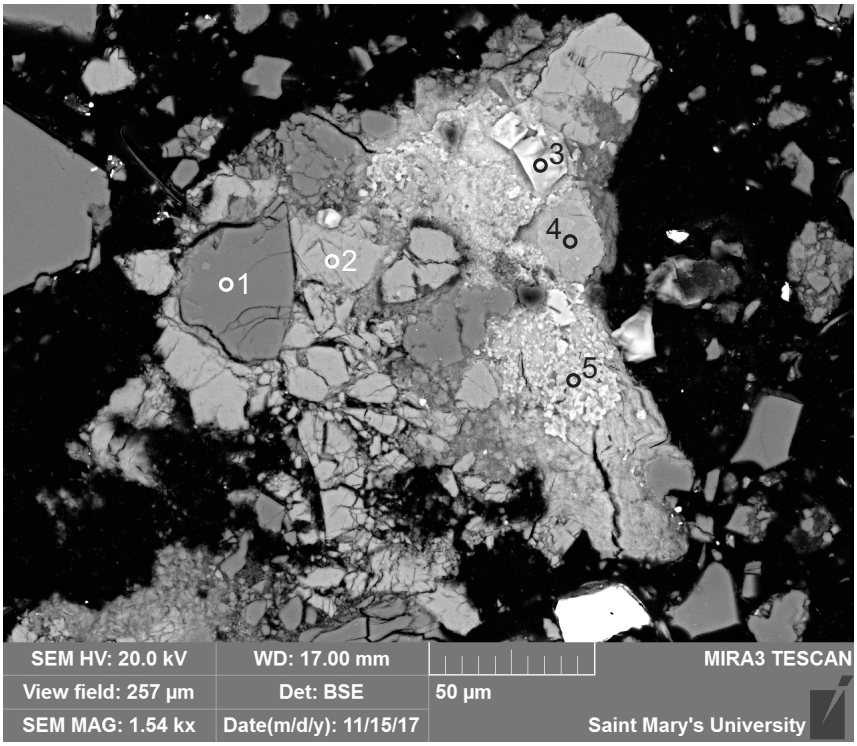
1:Quartz
2:Kaolinite
3:Calcite + Chlorite
4:Chlorite

Figure 1B.12: Sample G-24 4401.5A(2) (SEM) site 7.1. (Table 1B.1). Detrital minerals: Qz. Diagenetic minerals: Cal, Chl, Kln. A fragment made up of quartz (1), with diagenetic chlorite (3,4), calcite (3), and kaolinite (2).



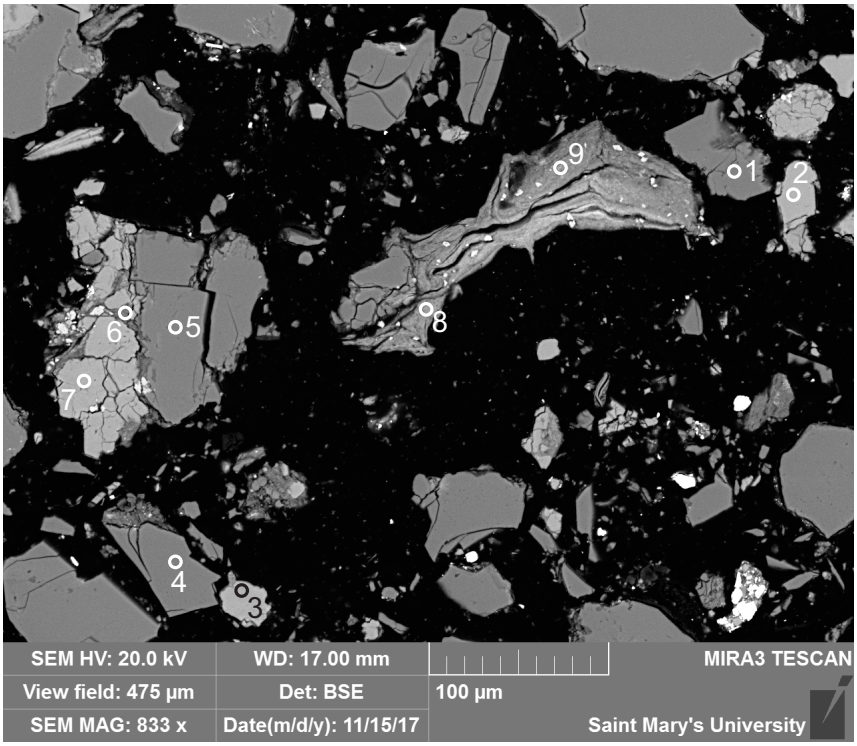
1:Calcite
2:Barite
3:Barite
4:Barite
5:Barite
6:Quartz

Figure 1B.13: Sample G-24 4401.5A(2) (SEM) site 8. (Table 1B.1). Detrital minerals: Qz. Diagenetic minerals: Brt, Cal.



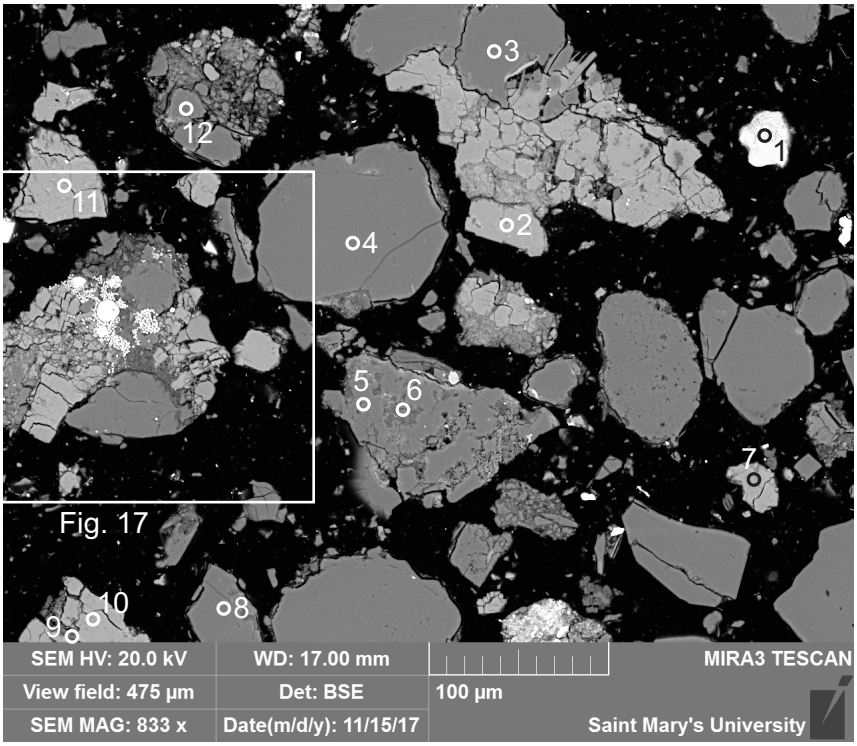
1:Quartz
2:Calcite
3:Halite
4:Calcite
5:Halite + Chlorite

Figure 1B.14: Sample G-24 4401.5A(2) (SEM) site 8.1. (Table 1B.1). Detrital minerals: Qz. Diagenetic minerals: Cal, Chl. Halite is probably the result of precipitation from sea water contamination during drilling.



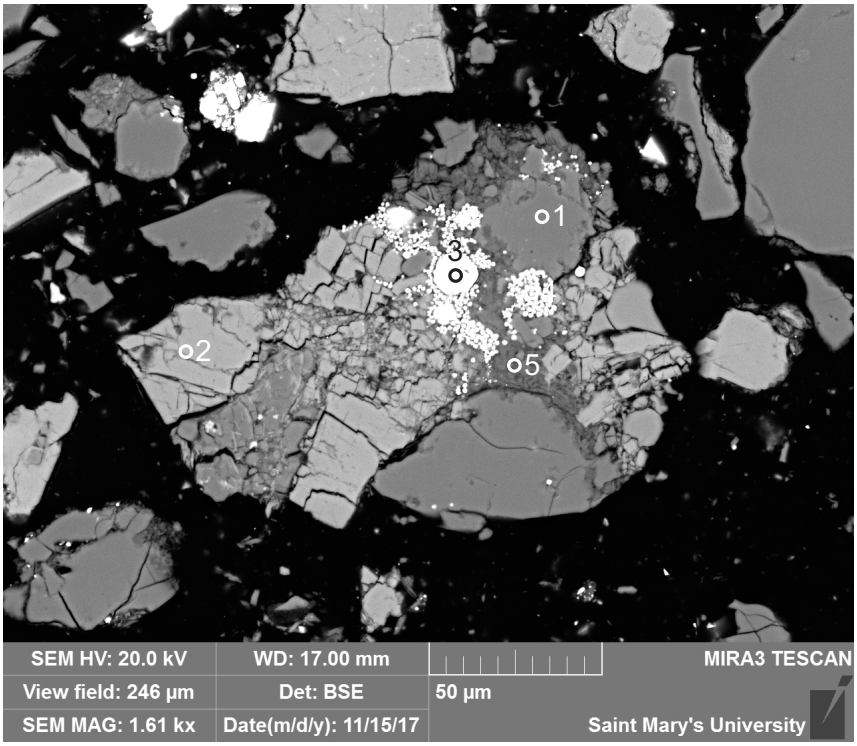
1:Quartz
2:Calcite
3:Calcite
4:Quartz
5:Quartz
6:Kaolinite
7:Calcite
8:Chlorite
9:Chlorite

Figure 1B.15: Sample G-24 4401.5A(2) (SEM) site 9. (Table 1B.1). Detrital minerals: Chl, Qz. Diagenetic minerals: Cal, Chl, Kln. The large grains of chlorite (8,9) may be transported as such, and are therefore detrital.



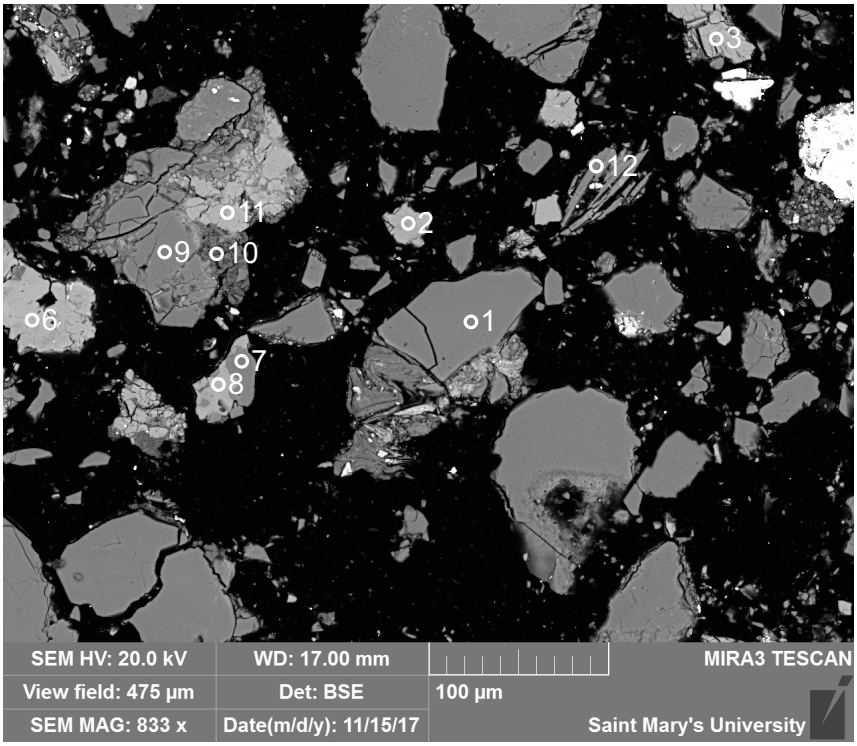
1:TiO_2
2:Calcite
3:Quartz
4:Quartz
5:Quartz
6:Kaolinite +
7:Calcite
8:Quartz
9:Albite
10:Calcite
11:Calcite +
12:Quartz

Figure 1B.16: Sample G-24 4401.5A(2) (SEM) site 10. (Table 1B.1). Detrital minerals: Ab, Qz. Diagenetic minerals: Cal, Kln, TiO_2. Albite (4) partly replaced by calcite (10). Quartz (5) with voids filled by kaolinite (6).



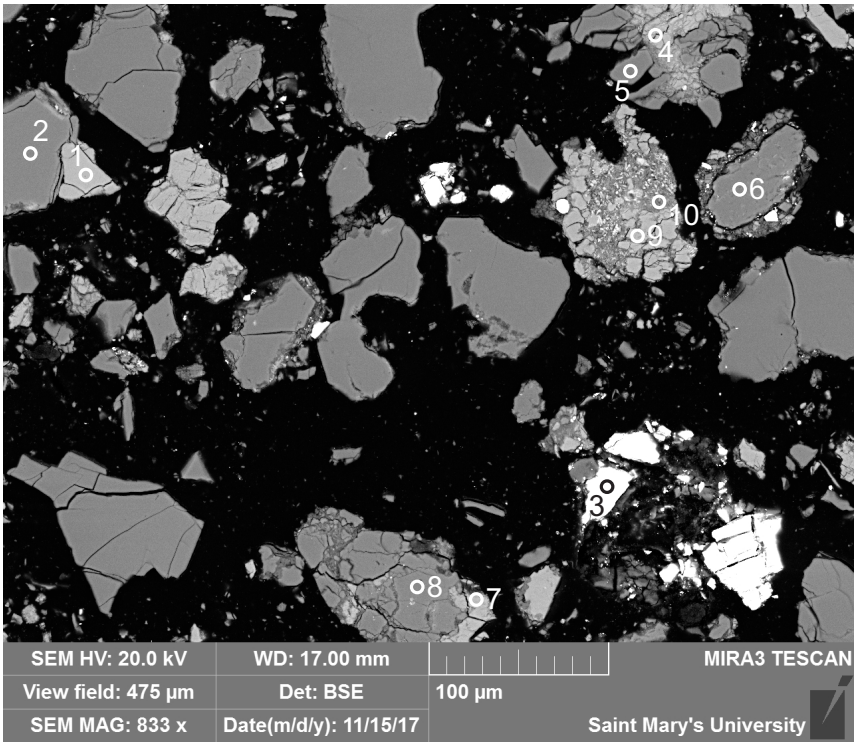
1:Quartz
2:Calcite
3:Pyrite
4:Pyrite
5:Kaolinite

Figure 1B.17: Sample G-24 4401.5A(2) (SEM) site 10.1. (Table 1B.1). Detrital minerals: Qz. Diagenetic minerals: Cal, Kln, Py. A fragment made up of quartz (1), kaolinite (5), calcite (2), and late pyrite (3) framboids.



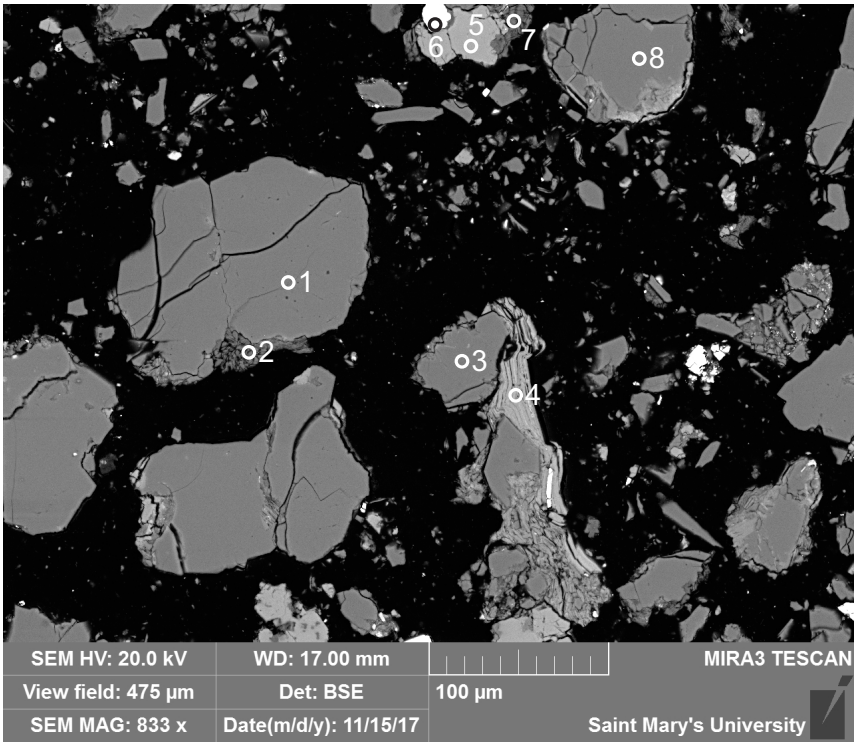
1:Quartz
2:Calcite +
3:Calcite +
4:Barite
5:Barite +
6:Calcite
7:Albite
8:Calcite
9:Quartz
10:Kaolinite
11:Calcite
12:Albite

Figure 1B.18: Sample G-24 4401.5A(2) (SEM) site 11. (Table 1B.1). Detrital minerals: Ab, Qz. Diagenetic minerals: Brt, Cal, Kln. A fragment made up of quartz (9), kaolinite (10), and calcite (11). Albite (7) partly replaced by calcite (8).



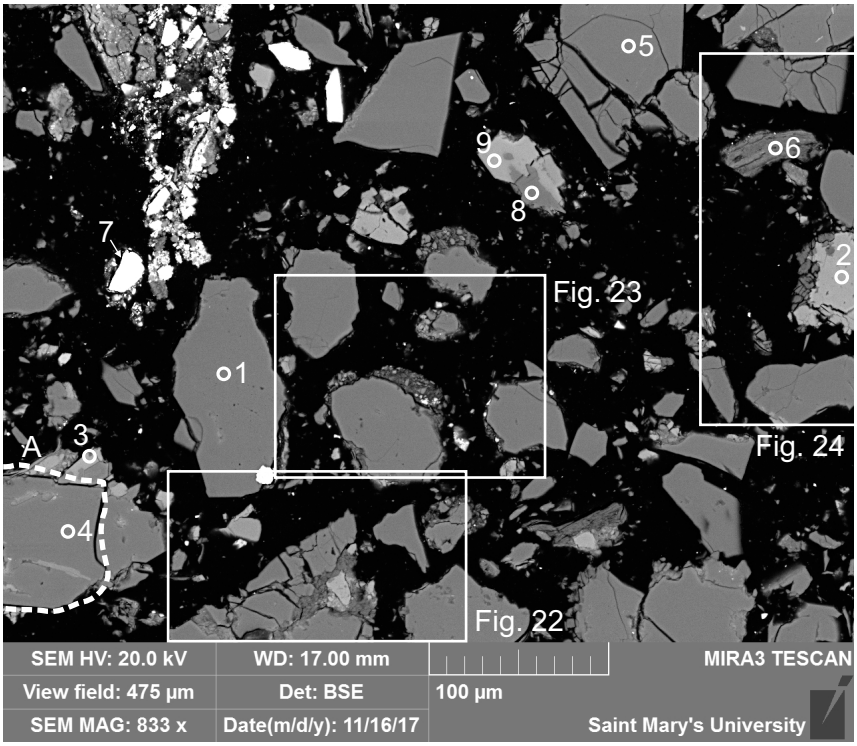
1:Calcite
2:Quartz
3:Barite
4:Calcite +
5:Quartz
6:Albite
7:Calcite
8:Quartz
9:Calcite +
10:Chlorite +

Figure 1B.19: Sample G-24 4401.5A(2) (SEM) site 12. (Table 1B.1). Detrital minerals: Ab, ?Chl, Qz. Diagenetic minerals: Brt, Cal. It appears that calcite (10) postdates chlorite (10), it may be because chlorite is detrital.



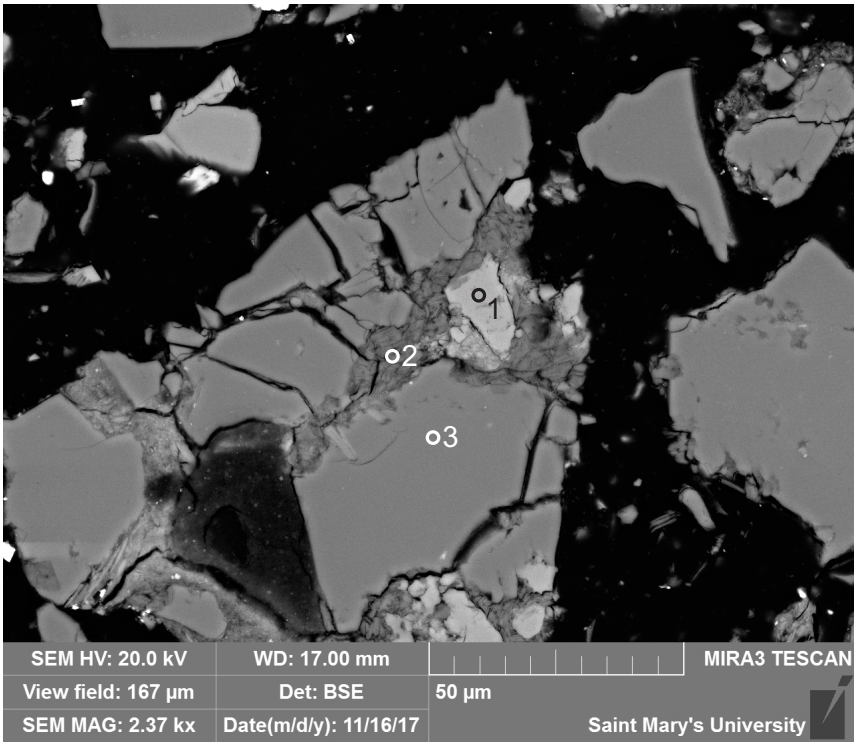
1:Quartz
2:Kaolinite
3:Quartz
4:Biotite
5:Calcite
6:Pyrite
7:Kaolinite
8:Quartz

Figure 1B.20: Sample G-24 4401.5A(2) (SEM) site 13. (Table 1B.1). Detrital minerals: Bt, Qz. Diagenetic minerals: Cal, Kln, Py. A fragment made up of quartz (3) and biotite (4), another one made up of quartz (1) and kaolinite (2).



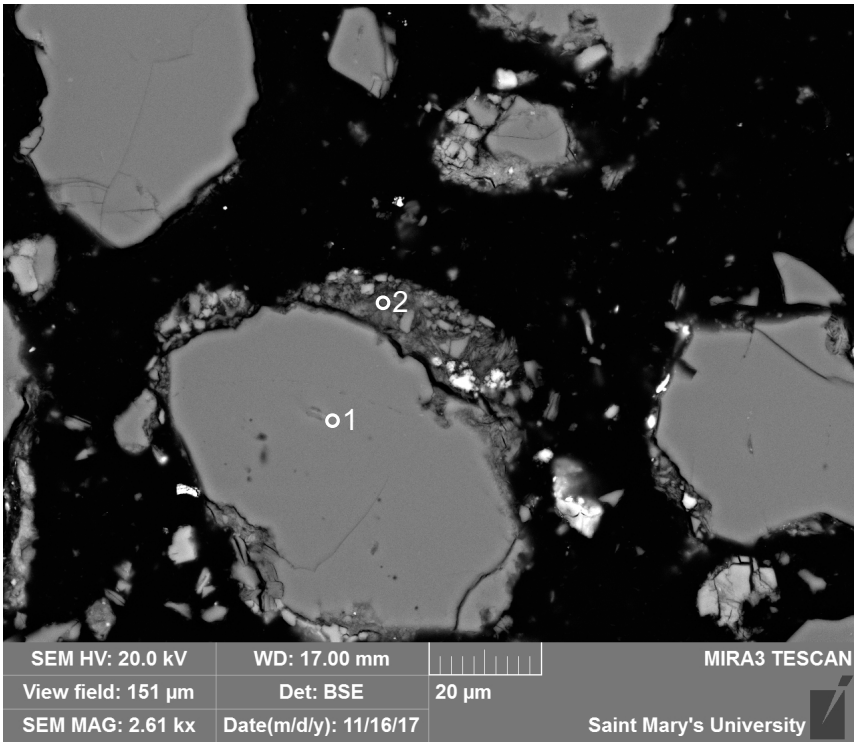
1:Quartz
2:Calcite +
3:Calcite
4:Quartz
5:Quartz
6:Kaolinite
7:Barite
8:Albite
9:Calcite

Figure 1B.21: Sample G-24 4401.5A(2) (SEM) site 14. (Table 1B.1). Detrital minerals: Ab, Qz. Diagenetic minerals: Brt, Cal, Kln. Albite (8) partly replaced by chlorite (9). A probable lithic clast (A) made up of quartz (4) and micas.



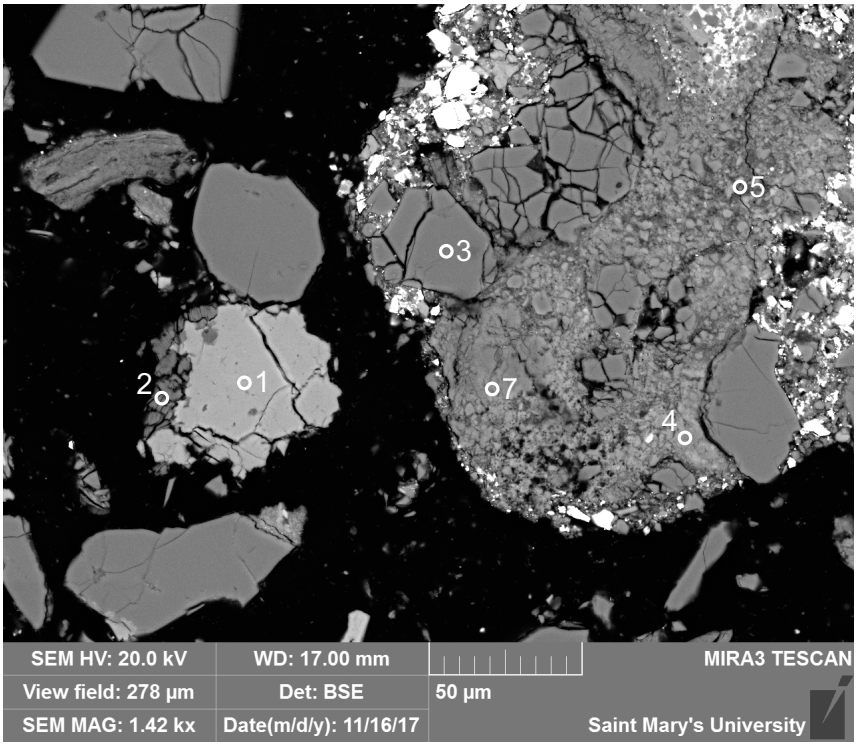
1:Calcite
2:Kaolinite
3:Quartz

Figure 1B.22: Sample G-24 4401.5A(2) (SEM) site 14.1. (Table 1B.1). Detrital minerals: Qz. Diagenetic minerals: Cal, Kln. A fragment made up of quartz (3), kaolinite (2), and calcite (1).



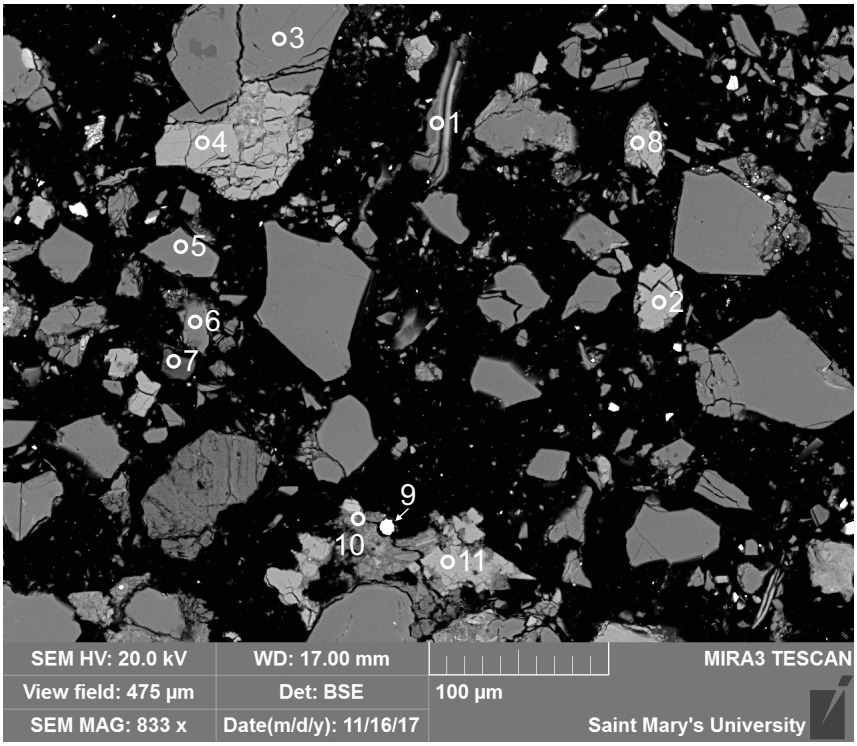
1:Quartz
2:Kaolinite

Figure 1B.23: Sample G-24 4401.5A(2) (SEM) site 14.2. (Table 1B.1). Detrital minerals: Qz. Diagenetic minerals: Kln.



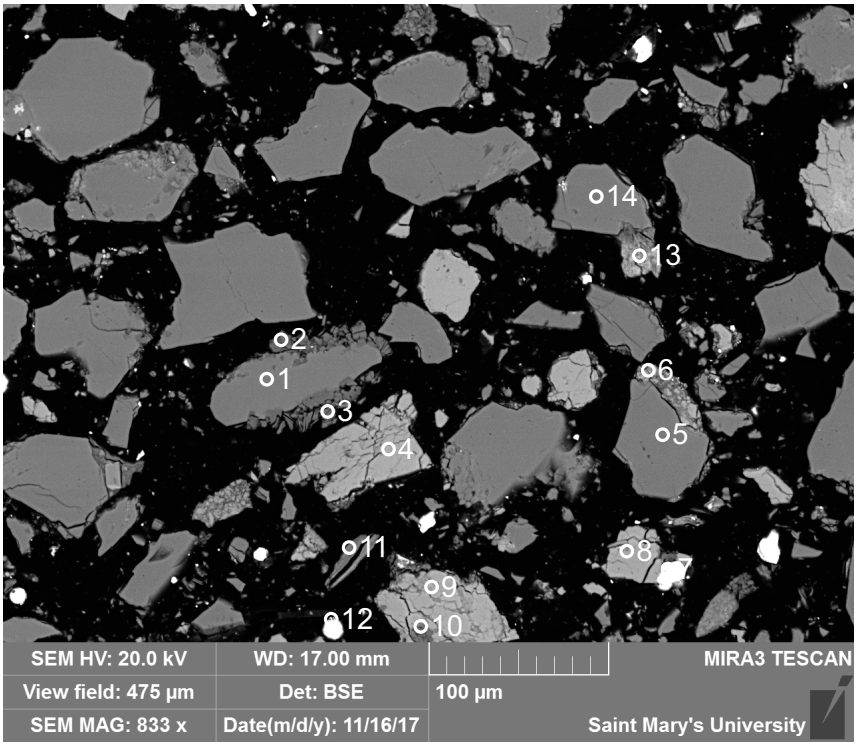
1:Calcite
2:Kaolinite
3:Quartz
4:Quartz +
5:Mix
6:Barite
7:Quartz +

Figure 1B.24: Sample G-24 4401.5A(2) (SEM) site 14.3. (Table 1B.1). Detrital minerals: Qz. Diagenetic minerals: Brt, Cal, Kln.Calcite (1) postdates kaolinite (2).



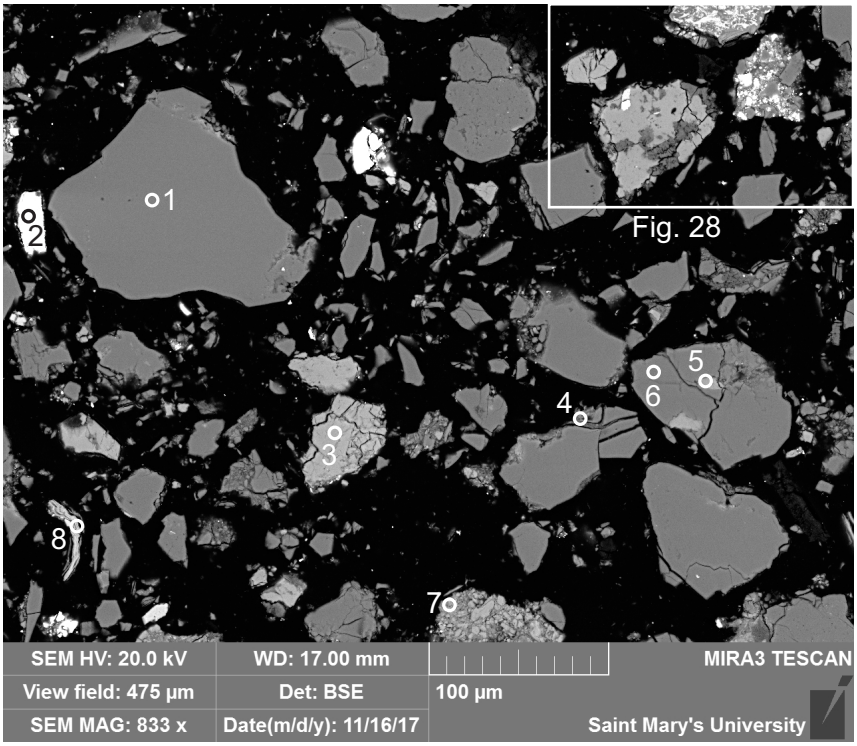
1:Kaolinite
2:Calcite
3:Quartz
4:Calcite +
5:Quartz
6:Quartz +
7:?
8:Calcite
9:Pyrite
10:Kaolinite +
11:Calcite

Figure 1B.25: Sample G-24 4401.5A(2) (SEM) site 15. (Table 1B.1). Detrital minerals: Qz. Diagenetic minerals: Cal, Kln, Py.



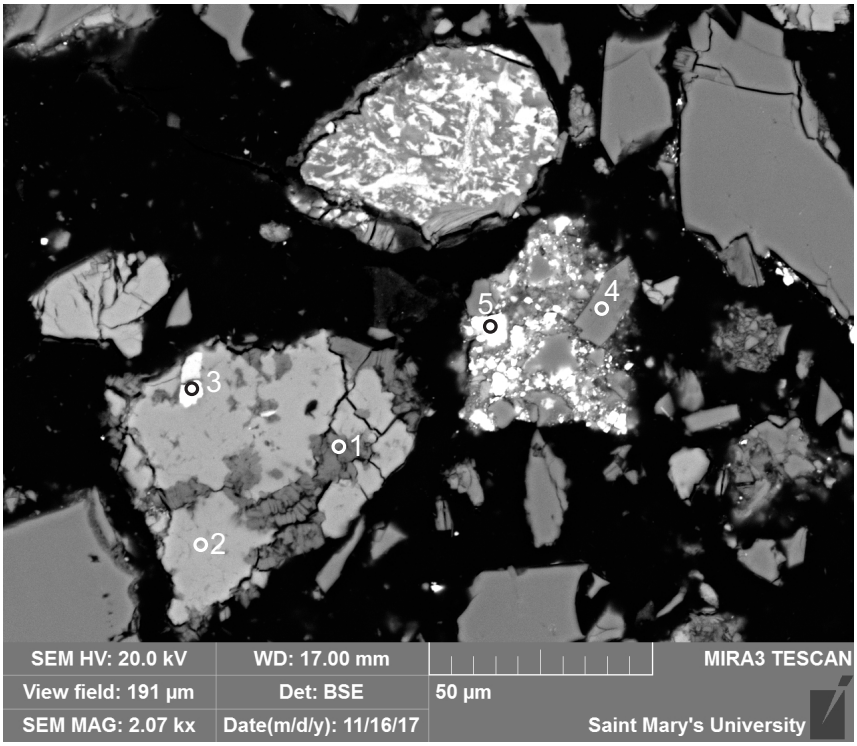
1:Quartz
2:Kaolinite
3:Kaolinite
4:Calcite
5:Quartz
6:Calcite +
7:Pyrite
8:Calcite +
9:Calcite +
10:Kaolinite
11:Kaolinite
12:Pyrite
13:Chlorite +
14:Quartz

Figure 1B.26: Sample G-24 4401.5A(2) (SEM) site 16. (Table 1B.1). Detrital minerals: Qz. Diagenetic minerals: Cal, Chl, Kln, Py. Fragments similar to fragments from other sites (quartz+kaolinite, quartz+calcite, kaolinite+calcite) or quartz (14) and chlorite (13). Calcite (8) appears to predate pyrite (7).



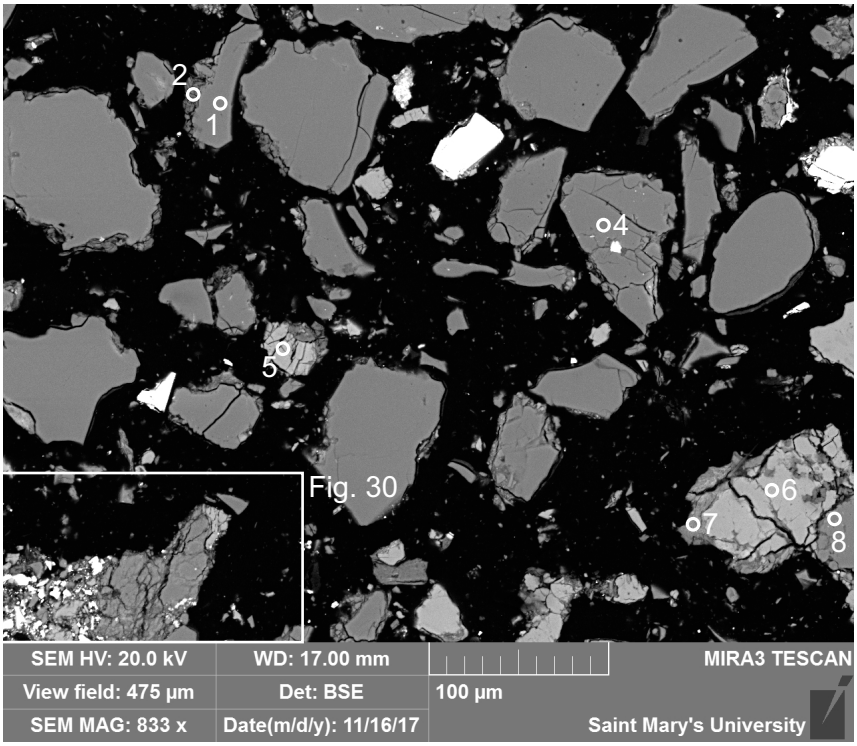
1:Quartz
2:Barite
3:Calcite
4:Mix
5:Calcite +
6:Quartz
7:Calcite + Chlorite
8:"Biotite"

Figure 1B.27: Sample G-24 4401.5A(2) (SEM) site 17. (Table 1B.1). Detrital minerals: Brt, Qz. Diagenetic minerals: Brt, Cal, Chl.



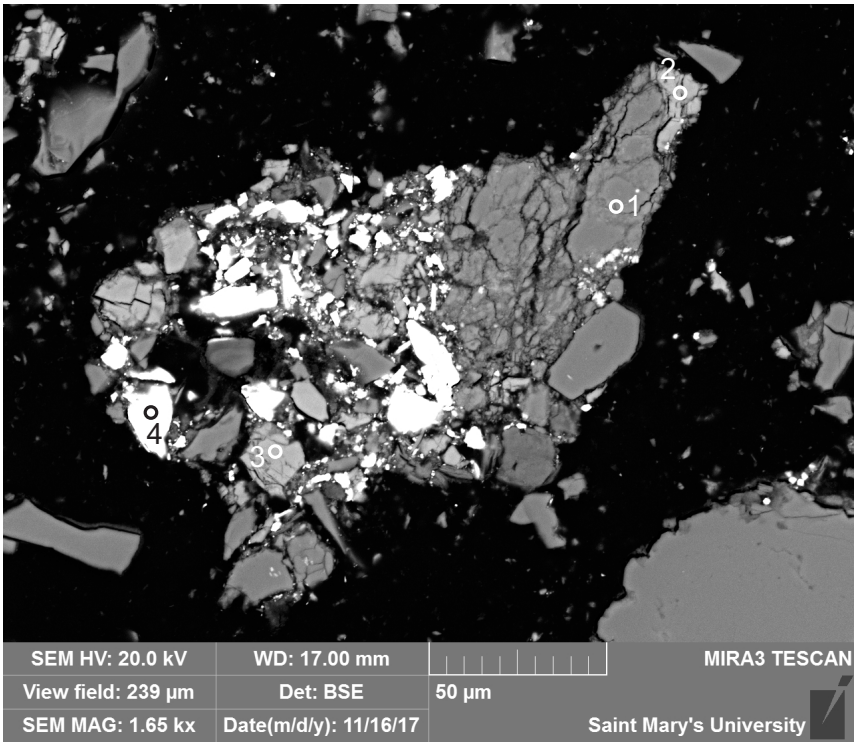
1:Kaolinite
2:Calcite
3:Pyrite
4:Quartz
5:Barite

Figure 1B.28: Sample G-24 4401.5A(2) (SEM) site 17.1. (Table 1B.1). Detrital minerals: Qz. Diagenetic minerals: Brt, Cal, Kln.



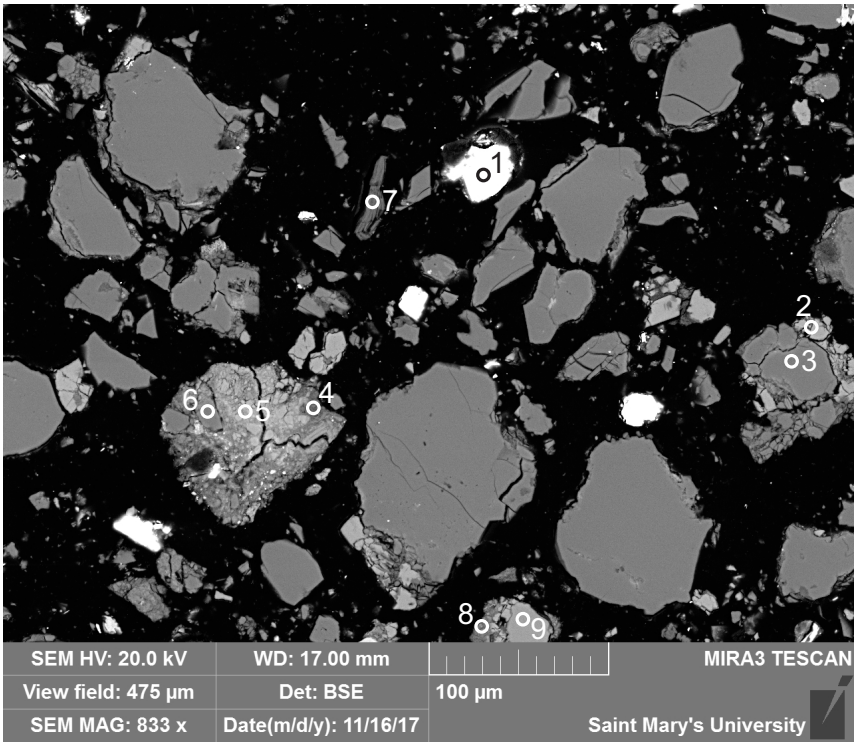
1:Quartz
2:Kaolinite
3:Barite
4:Quartz
5:Calcite
6:Calcite
7:Chlorite +
8:Quartz

Figure 1B.29: Sample G-24 4401.5A(2) (SEM) site 18. (Table 1B.1). Detrital minerals: Qz. Diagenetic minerals: Brt, Cal, Chl, Kln. A fragment made up of quartz (8), chlorite (7), and calcite (6).



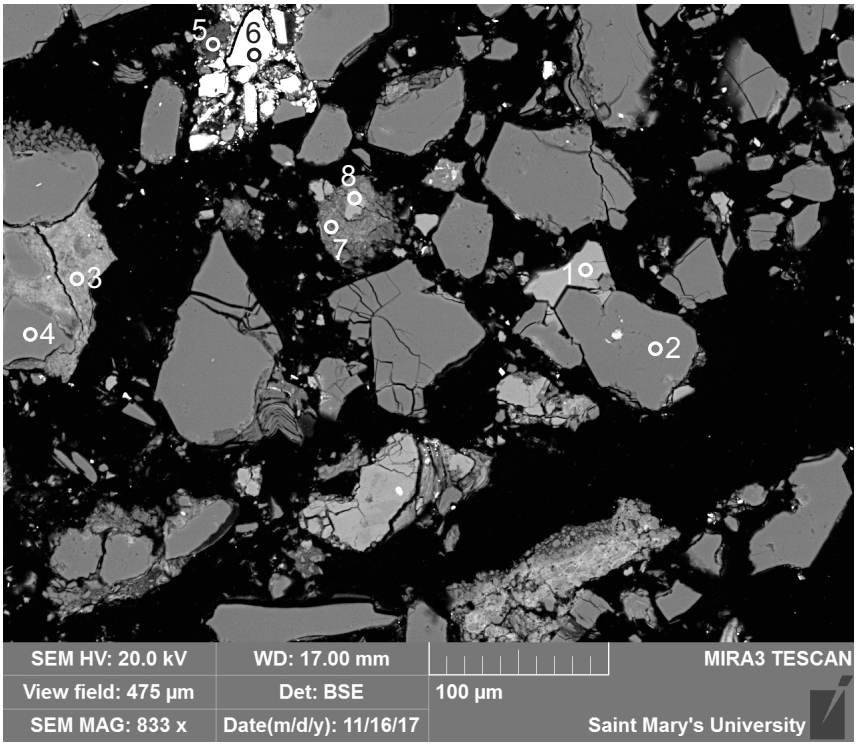
1:Quartz +
2:Calcite + Muscovite
3:Calcite
4:Barite

Figure 1B.30: Sample G-24 4401.5A(2) (SEM) site 18.1. (Table 1B.1). Detrital minerals: Ms, Qz. Diagenetic minerals: Brt, Cal. A fragment made up of quartz (1), muscovite (2), and calcite (3).



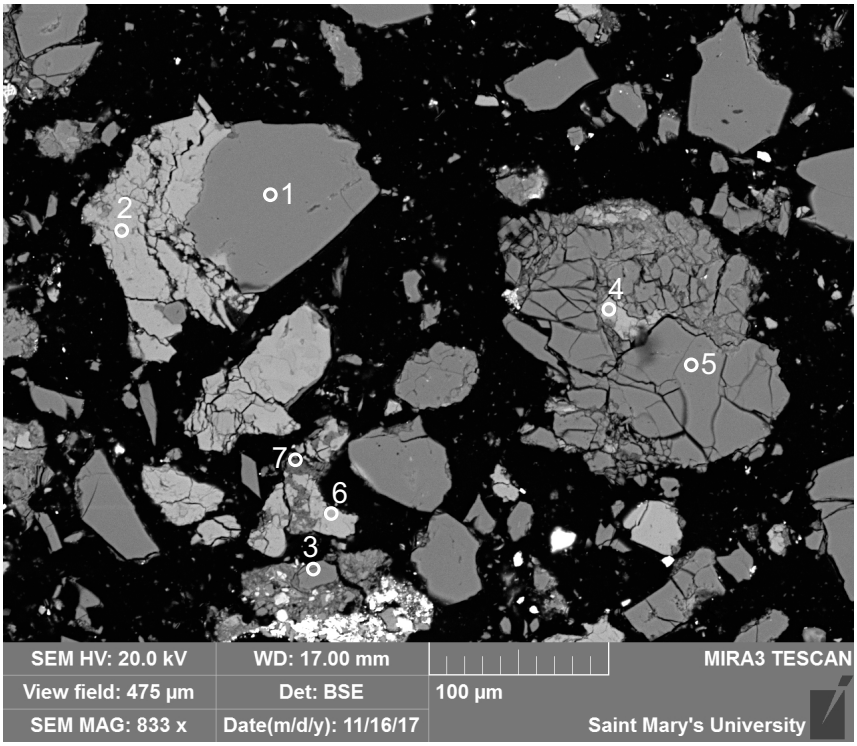
1:Barite
2:Calcite
3:Quartz
4:Kaolinite
5:Calcite +
6:Quartz
7:Kaolinite
8:Chlorite
9:K-feldspar

Figure 1B.31: Sample G-24 4401.5A(2) (SEM) site 19. (Table 1B.1). Detrital minerals: Kfs, Qz. Diagenetic minerals: Brt, Cal, Chl, Kln. K-feldspar (9) partly replaced by chlorite (8). A fragment made up of quartz (6), kaolinite (4), and calcite (5).



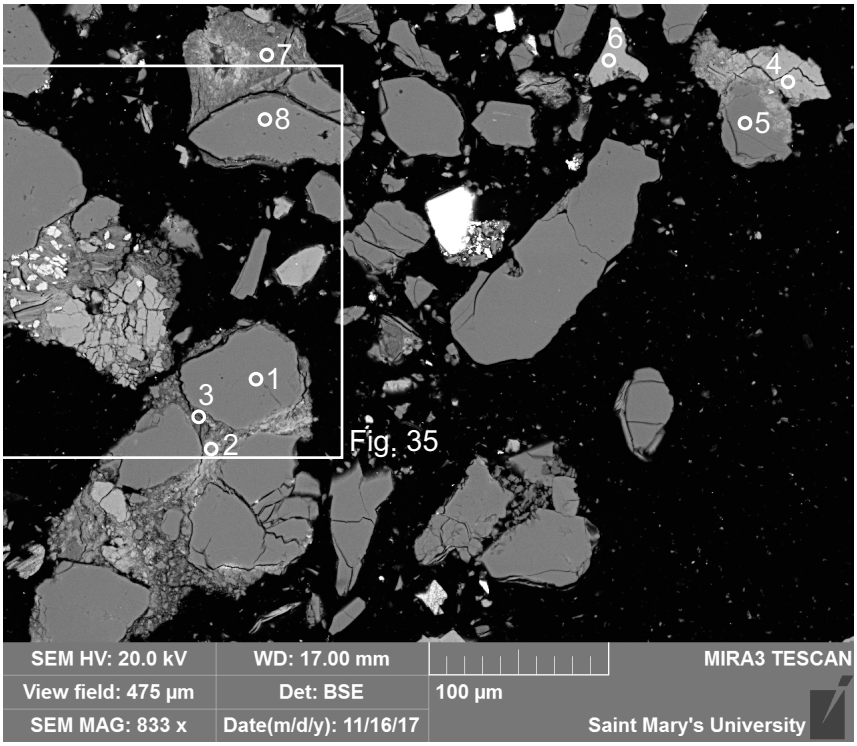
1:Calcite
2:Quartz
3:Mix
4:Quartz
5:Mix
6:Barite
7:Kaolinite +
8:Calcite +

Figure 1B.32: Sample G-24 4401.5A(2) (SEM) site 20. (Table 1B.1). Detrital minerals: Qz. Diagenetic minerals: Brt, Cal, Kln.



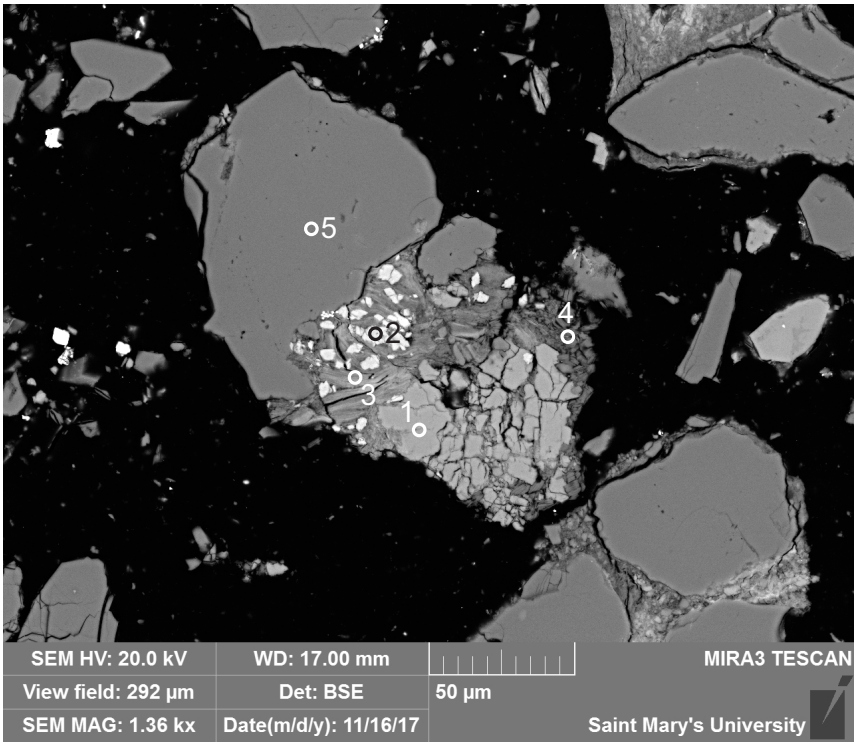
1:Quartz
2:Calcite
3:Quartz
4:Calcite
5:Quartz
6:Calcite
7:Kaolinite

Figure 1B.33: Sample G-24 4401.5A(2) (SEM) site 21. (Table 1B.1). Detrital minerals: Qz. Diagenetic minerals: Cal, Kln. The fragments are similar to fragments in other sites: quartz+calcite (1,2), kaolinite+calcite (7,6).



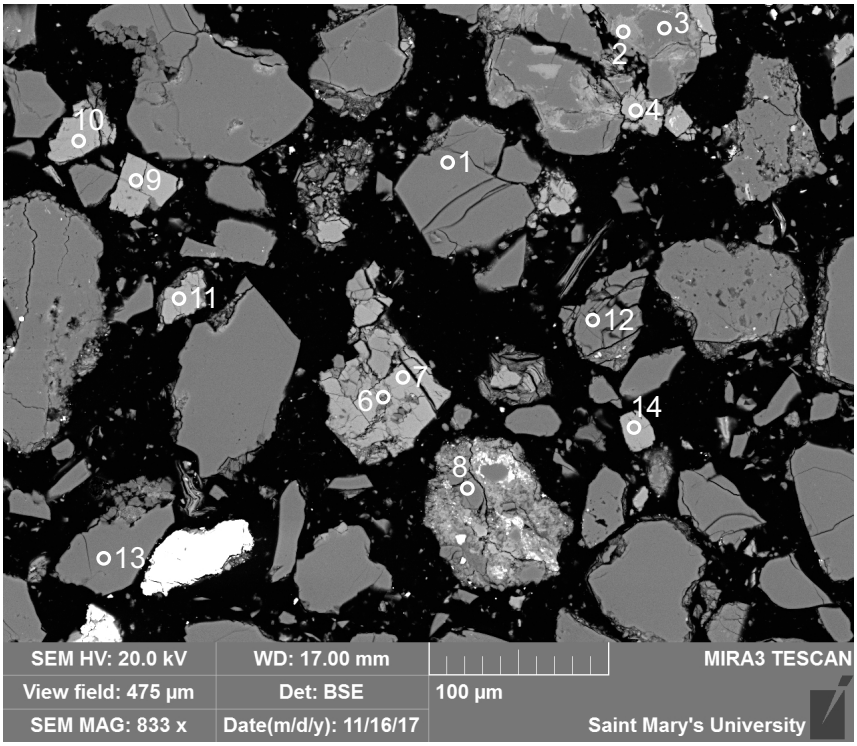
1:Quartz
2:Calcite + Chlorite
3:Kaolinite
4:Calcite +
5:Quartz
6:Calcite
7:Mix
8:Albite

Figure 1B.34: Sample G-24 4401.5A(2) (SEM) site 22. (Table 1B.1). Detrital minerals: Ab, Qz. Diagenetic minerals: Cal, Chl, Kln.



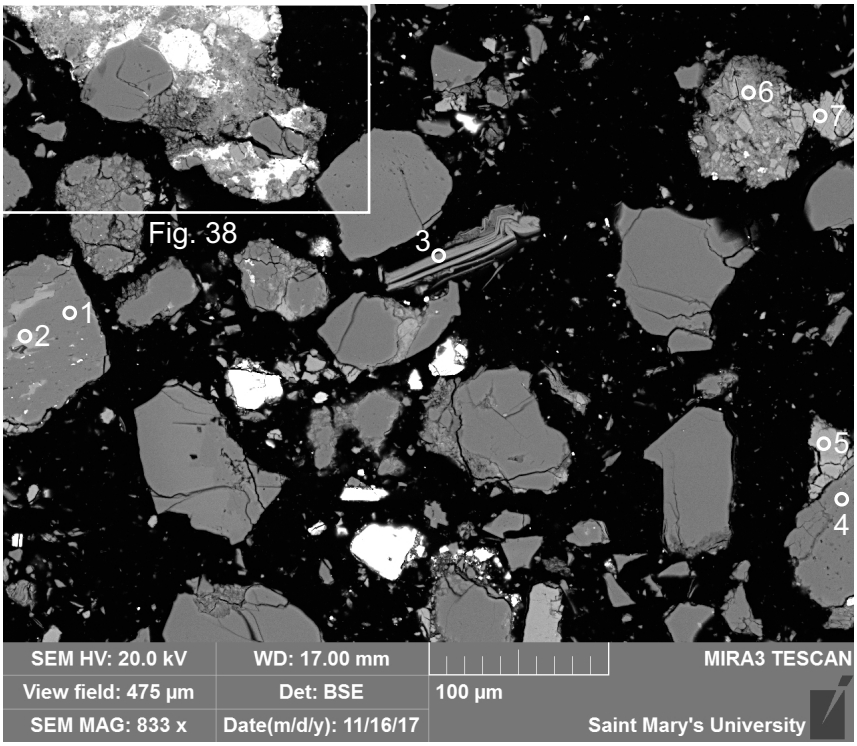
1:Calcite +
2:Siderite +
3:Chlorite
4:Kaolinite
5:Quartz

Figure 1B.35: Sample G-24 4401.5A(2) (SEM) site 22.1. (Table 1B.1). Detrital minerals: Qz. Diagenetic minerals: Cal, Chl, Kln, Sd. A fragment made up of quartz (5), kaolinite (4), calcite (1), chlorite (3), and siderite prisms (2). Siderite appears to postdate all diagenetic minerals in this site.



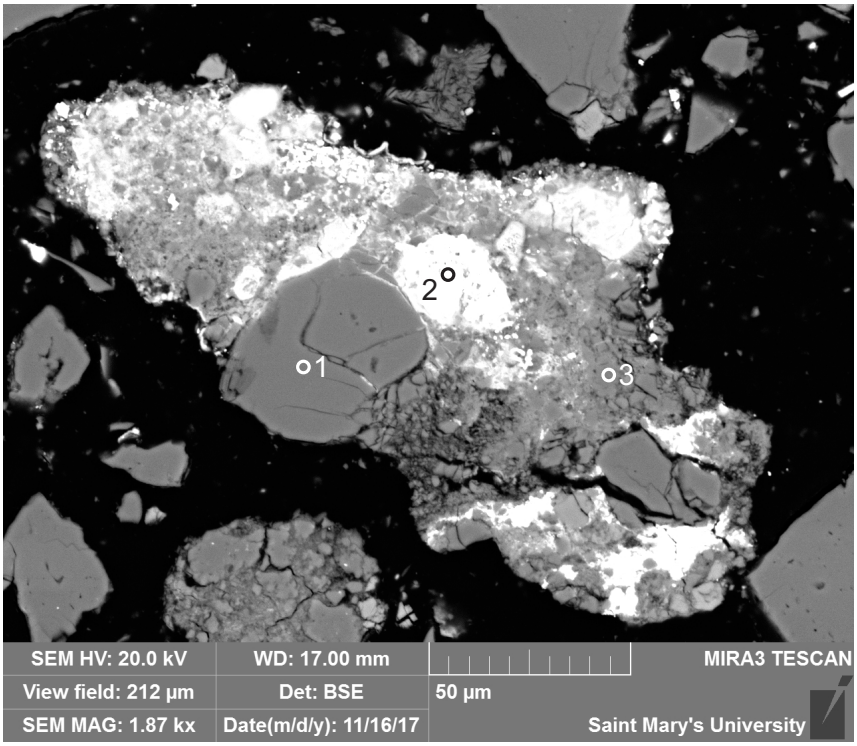
1:Quartz
2:Muscovite + Chlorite
3:Quartz
4:Calcite
5:Barite
6:Albite
7:Calcite
8:Quartz
9:Calcite +
10:Calcite
11:Calcite
12:Quartz
13:Quartz
14:Calcite

Figure 1B.36: Sample G-24 4401.5A(2) (SEM) site 23. (Table 1B.1). Detrital minerals: Ab, Ms, Qz. Diagenetic minerals: Brt, Cal, Chl. A fragment made up of quartz (3) and partly chloritized muscovite (2). Albite pieces (6) in calcite (7).



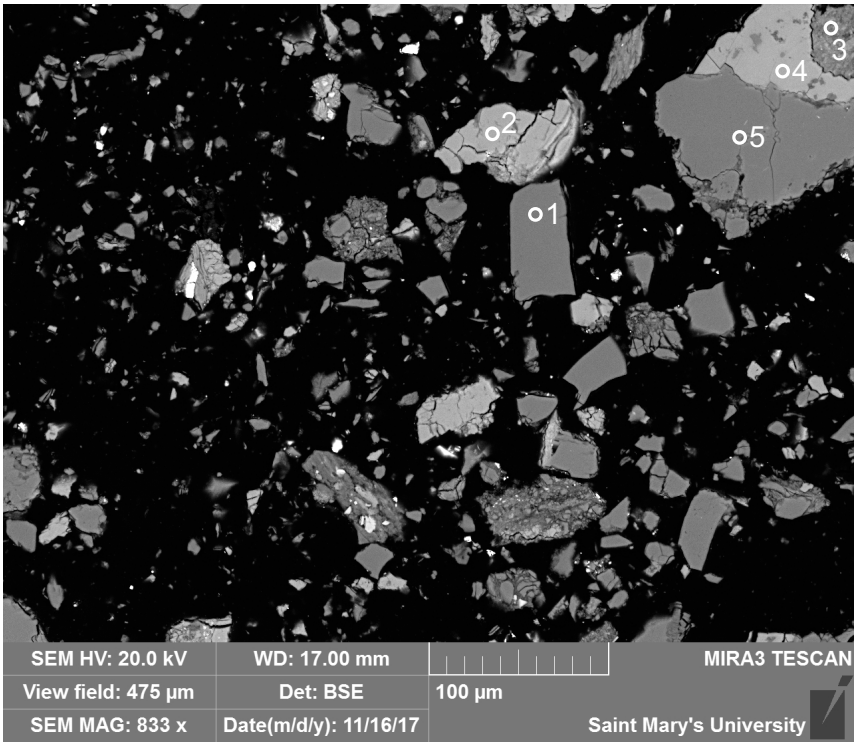
1:Albite
2:Calcite +
3:Muscovite + Chlorite
4:Quartz
5:Calcite
6:"Biotite"
7:Calcite

Figure 1B.37: Sample G-24 4401.5A(2) (SEM) site 24. (Table 1B.1). Detrital minerals: Ab, Bt, Ms, Qz. Diagenetic minerals: Cal, Chl. Partly chloritized muscovite (3). Albite (1) partly replaced by calcite (2).



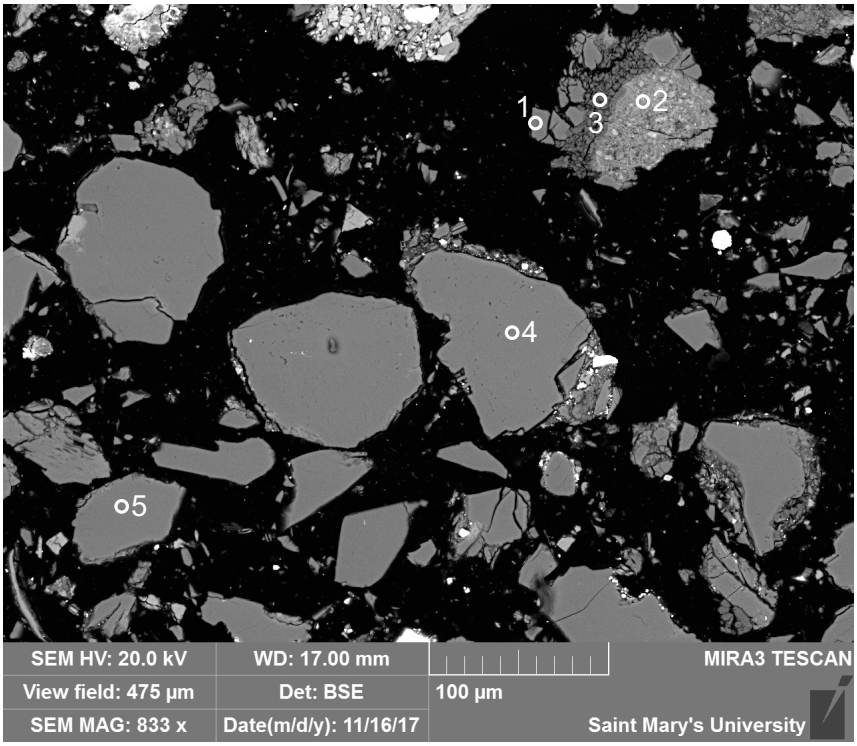
1:Quartz
2:Magnetite +
3:Albite

Figure 1B.38: Sample G-24 4401.5A(2) (SEM) site 24.1. (Table 1B.1). Detrital minerals: Ab, Qz. Diagenetic minerals: Mag. A fragment made up of quartz (1) and albite (3) grains and magnetite cement (2).



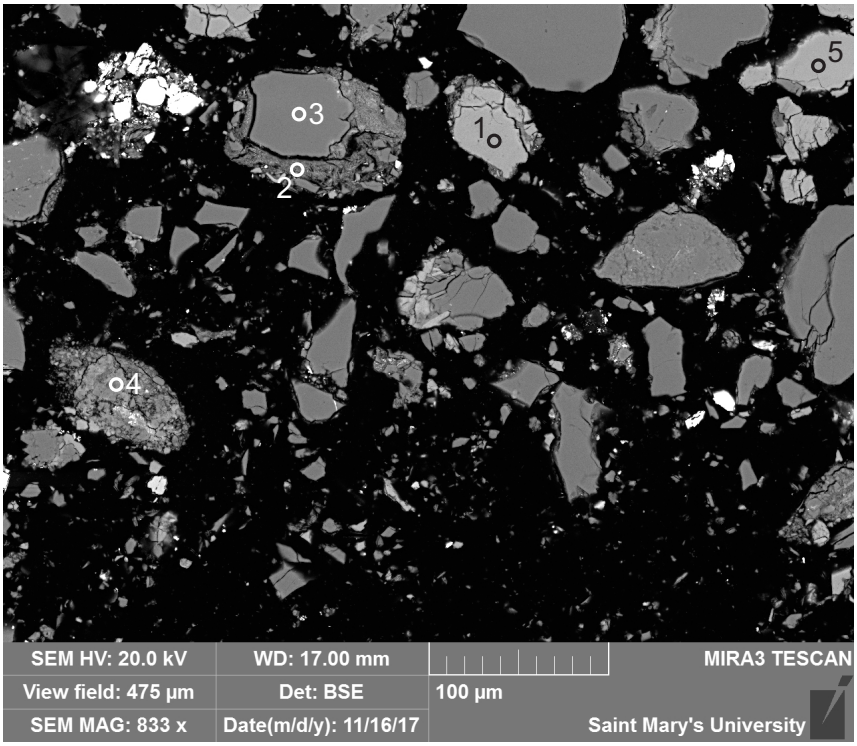
1:Quartz
2:Calcite
3:Muscovite + Apatite
4:Calcite
5:Quartz

Figure 1B.39: Sample G-24 4401.5A(2) (SEM) site 25. (Table 1B.1). Detrital minerals: Ms, Qz. Diagenetic minerals: Ap, Cal. A fragment made up of quartz (5), muscovite and probably diagenetic apatite (3), and calcite (4).



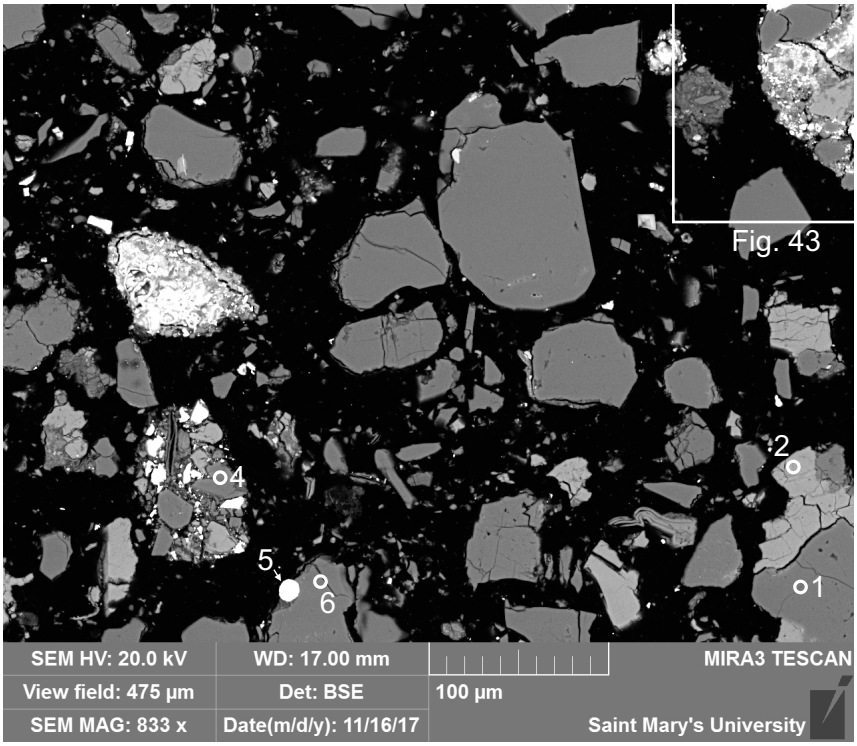
1:Quartz
2:Mix
3:Kaolinite
4:Albite
5:Quartz

Figure 1B.40: Sample G-24 4401.5A(2) (SEM) site 26. (Table 1B.1). Detrital minerals: Ab, Qz. Diagenetic minerals: Kln.



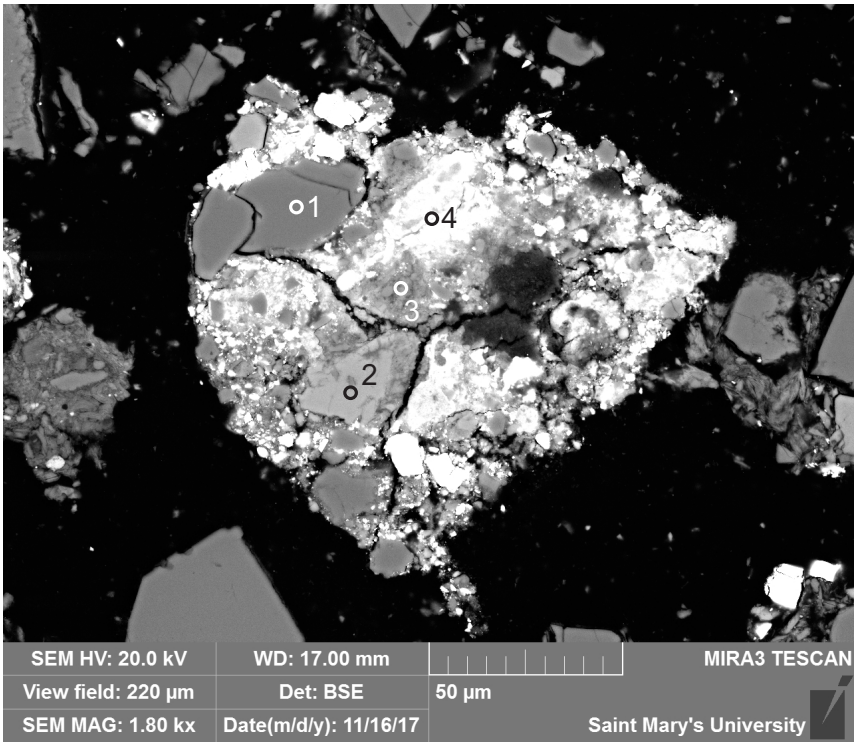
1:Calcite
2:Mix
3:Quartz
4:Albite +
5:Calcite

Figure 1B.41: Sample G-24 4401.5A(2) (SEM) site 27. (Table 1B.1). Detrital minerals: Ab, Qz. Diagenetic minerals: Cal.



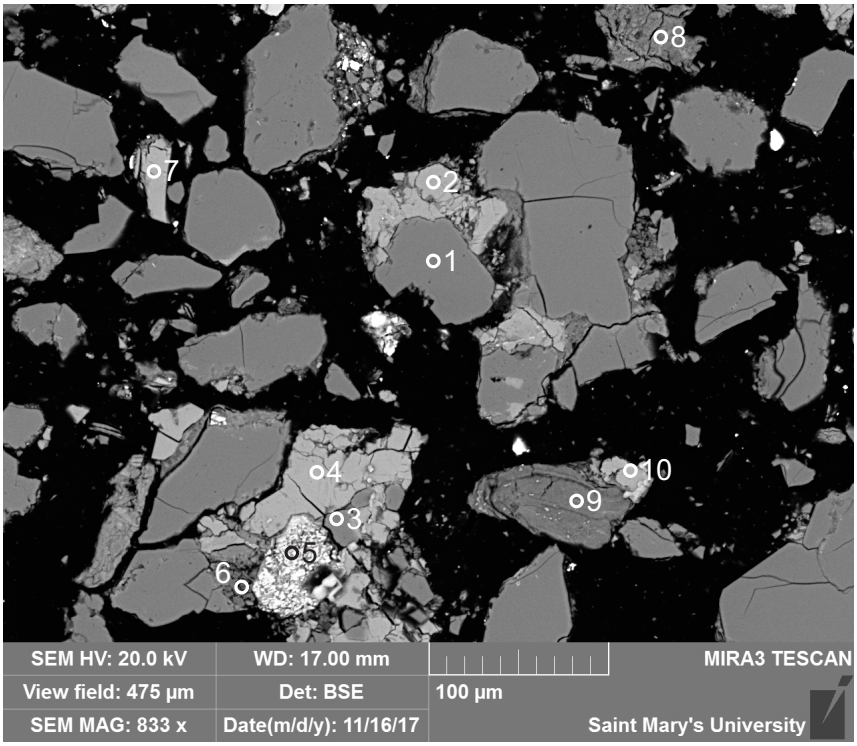
1:Quartz
2:Calcite
3:Feohy +
4:Quartz
5:Pyrite
6:Quartz

Figure 1B.42: Sample G-24 4401.5A(2) (SEM) site 28. (Table 1B.1). Detrital minerals: Qz. Diagenetic minerals: Cal, Feohy, Py.



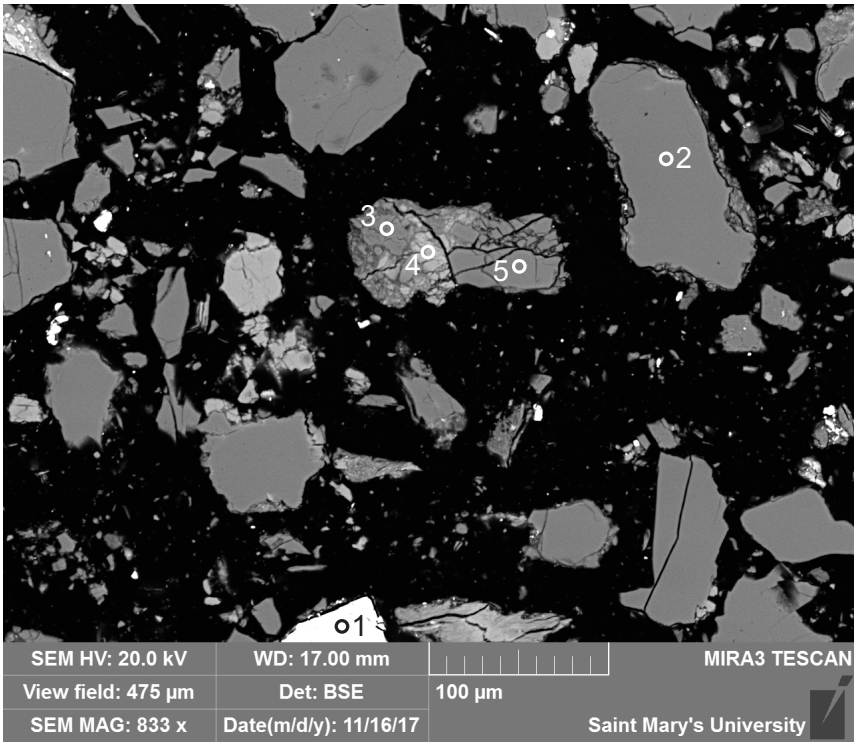
1:Quartz
2:Calcite
3:Quartz +
4:Magnetite +

Figure 1B.43: Sample G-24 4401.5A(2) (SEM) site 28.1. (Table 1B.1). Detrital minerals: Qz. Diagenetic minerals: Cal, Mag. A fragment made up of quartz (1), calcite (2), and diagenetic magnetite (4).



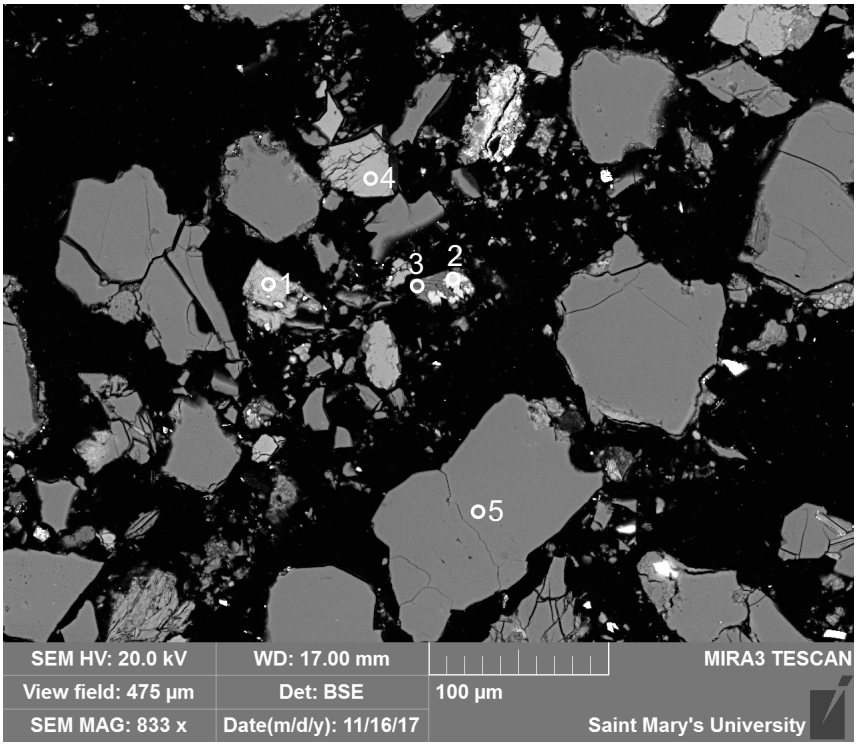
1:Quartz
2:Calcite
3:Quartz
4:Calcite
5:TiO_2
6:Kaolinite
7:Calcite
8:Kaolinite + Muscovite
9:Kaolinite
10:Calcite

Figure 1B.44: Sample G-24 4401.5A(2) (SEM) site 29. (Table 1B.1). Detrital minerals: Ms, Qz. Diagenetic minerals: Cal, Kln, TiO_2. A fragment made up of quartz (3) and diagenetic TiO_2 (5), calcite (4), and kaolinite (6). TiO_2 appears to post date calcite.



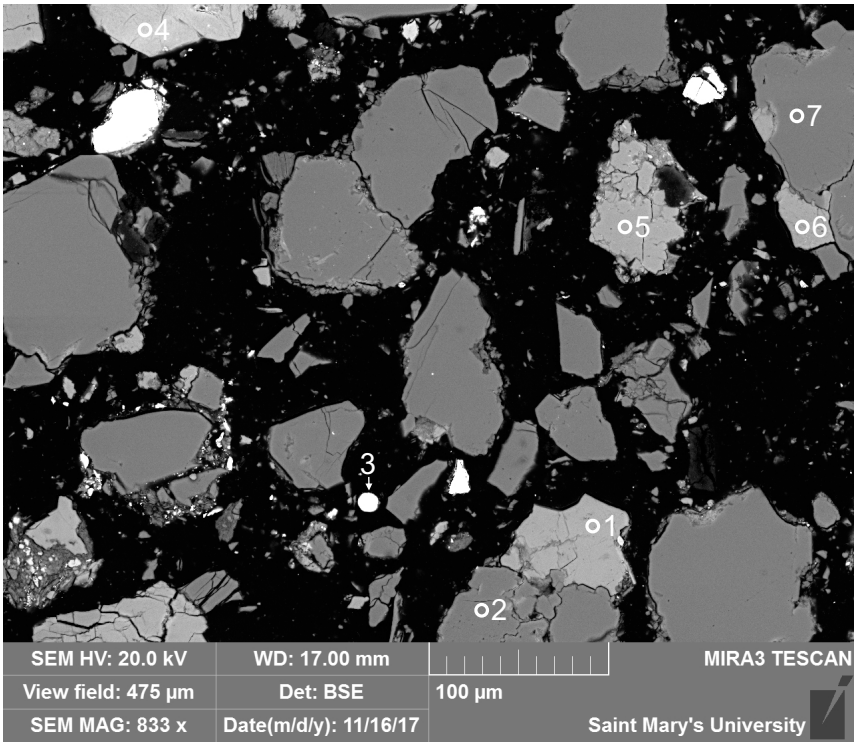
1:Barite
2:Quartz
3:Quartz +
4:Calcite
5:Quartz

Figure 1B.45: Sample G-24 4401.5A(2) (SEM) site 30. (Table 1B.1). Detrital minerals: Qz. Diagenetic minerals: Brt, Cal.



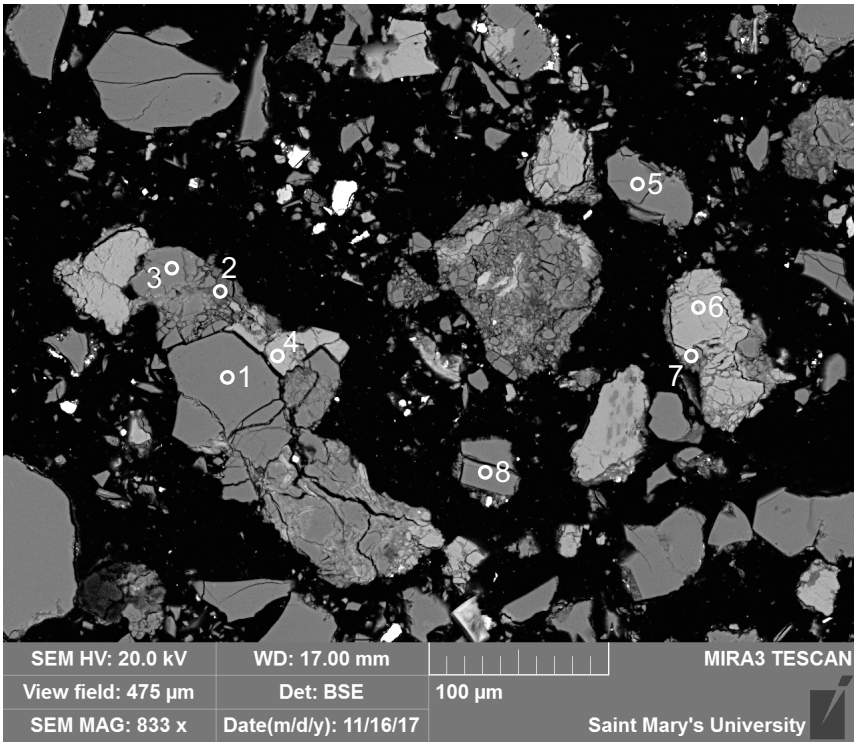
1:Mix
2:Siderite +
3:Kaolinite +
4:Calcite
5:Quartz

Figure 1B.46: Sample G-24 4401.5A(2) (SEM) site 31. (Table 1B.1). Detrital minerals: Qz. Diagenetic minerals: Cal, Kln, Sd. Siderite (2) postdates kaolinite (3).



1:Calcite
2:Quartz
3:Pyrite
4:Chlorite +
5:Calcite
6:Calcite +
7:Quartz

Figure 1B.47: Sample G-24 4401.5A(2) (SEM) site 32. (Table 1B.1). Detrital minerals: Qz. Diagenetic minerals: Cal, Chl, Py. Fragments made up of quartz+calcite.



1:Quartz
2:Kaolinite
3:Quartz
4:Calcite
5:Quartz
6:Calcite
7:Quartz
8:Albite

Figure 1B.48: Sample G-24 4401.5A(2) (SEM) site 33. (Table 1B.1). Detrital minerals: Ab, Qz. Diagenetic minerals: Cal, Kln. A fragment made up of quartz (1,3), kaolinite (2), and calcite (4).

Table 1B.1: SEM-EDS cemical analyses of minerals from sample G-24 4401.5A(2).

Site	Pos	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	Cl	Cr2O3	CoO	ZnO	SrO	BaO	Yb2O3	WO3	Total	Actual Total
1	1	Qz	98.49		0.92													0.60					100	118
1	2	Cal				1.28	0.27		53.80									0.65					56	57
1	3	Cal	0.39			1.49	0.30	0.43	52.46									0.94					56	57
1	4	Qz	99.32															0.68					100	118
1	5	Sd				45.50	1.41	5.38	2.83									0.88					56	62
1	6	Qz	99.33															0.67					100	114
2	1	Ab	68.66		18.70				0.21	11.83								0.60					100	120
2	2	Cal +	12.26		2.92	1.09	0.26		38.43		0.32							0.72					56	67
2	3	Cal +	1.22		0.75	2.00	0.59		50.52									0.93					56	59
2	4	Brt											35.08					2.29		62.76			100	114
2	5	Cal				1.33	0.32		53.52									0.83					56	56
2	6	Qz	99.41															0.59					100	121
2	7	Brt +	30.72		1.06				0.79				25.88					1.13		40.45			100	128
2	8	Ms	47.48	0.62	35.12	0.77		0.41		1.47	8.34							0.80					95	107
2	9	Qz	99.44															0.56					100	121
2	10	Cal	0.92		0.35	1.38	0.43	0.41	51.69									0.82					56	58
2	11	Qz	99.37															0.63					100	123
2	12	Fl							46.86					52.50				0.64					100	172
2	13	Qz	99.43															0.57					100	119
2	14	Qz	99.46															0.54					100	114
2.1	1	Kln	48.57		36.36				0.43									0.64					86	96
2.1	2	Cal	0.99			2.12	0.35	0.35	51.08				0.43					0.69					56	58
2.1	3	Plag(Olig)	66.41		18.00				3.89	11.10								0.60					100	118
2.1	4	Plag(Olig)	65.58		18.37				4.54	10.94								0.57					100	116
2.1	5	Cal				1.58	0.45		53.32									0.64					56	57
3	1	Qz	99.48															0.52					100	120
3	2	TiO2	0.62	97.98		0.29												1.12					100	107
3	3	Kfs + Cal	52.45		14.23				20.40		12.11							0.81					100	97
3	4	Qz	99.38															0.62					100	120
3	5	Qz	99.50															0.50					100	118
3	6	Mix	22.53	34.47	15.89	22.19		2.17	1.43		0.34				0.19			0.79					100	93
3	7	Qz	99.45															0.55					100	123
3	8	Ms + Kln + Chl	56.11	0.60	25.16	8.35		2.33	2.33		4.18				0.37			0.56					100	83
3	9	Cal	0.77		0.37	0.91	0.39		52.88									0.69					56	58
3	10	TiO2		98.22		0.46			0.43									0.89					100	108
3	11	Chl + Kln	47.25	0.68	33.38	14.36		2.37	0.52		0.79							0.65					100	96
3	12	Brt											36.14					2.04	1.90	59.97			100	115
3	13	Qz	99.50															0.50					100	120
3	14	Hole	25.00											30.10	44.90								100	2
4	1	Qz	99.50															0.50					100	122
4	2	Brt											36.35					1.86		61.92			100	114
4	3	Cal +	1.22		0.55	1.66	0.38		49.47					2.11				0.60					56	61
4	4	Qz	99.46															0.54					100	122
4	5	Brt											36.40					1.74	1.19	60.72			100	120
4	6	Kfs + Cal	64.93		17.02	0.24			1.57		15.54							0.70					100	116
4	7	Mix	50.28		27.55	5.37		1.69	3.79		5.27			5.14	0.27			0.63					100	97
4	8	Cal				1.41			53.79									0.80					56	57
4	9	Cal				1.46	0.43		53.51									0.60					56	57

Table 1B.1: SEM-EDS cemical analyses of minerals from sample G-24 4401.5A(2).

Site	Pos	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	Cl	Cr2O3	CoO	ZnO	SrO	BaO	Yb2O3	WO3	Total	Actual Total
4	10	Ab	68.57		18.59				0.29	11.85								0.71					100	121
5	1	Cal +	1.16		0.64	2.07	0.64	0.36	50.19									0.94					56	58
5	2	Ms +	53.17	0.27	22.34	7.63		1.55	3.36		5.74				0.29			0.65					95	98
5	3	Cal +	2.36		0.95	1.64			50.07									0.98					56	58
5	4	Ms	51.74	3.40	26.62	2.19		2.00	0.68		7.46				0.19			0.71					95	107
5	5	Brt											36.47					1.74	2.49	59.39			100	115
5	6	Brt											36.03					2.18	1.12	60.74			100	116
5	7	Cal	0.59			1.33	0.59		52.41									1.09					56	55
5	8	Qz	99.41															0.59					100	122
5	9	Chl + Ms	52.05	0.59	27.82	9.87		2.53	2.20		3.80				0.32			0.82					100	76
5	10	Qz	99.37															0.63					100	123
5	11	Cal	0.85		0.48	1.64	0.62		51.57									0.85					56	57
5.1	1	Chl +	41.17		29.20	10.71		1.34	1.42		0.28				0.22			0.65					85	93
5.1	2	Qz	99.47															0.53					100	122
5.1	3	Chl +	39.37		25.06	13.28		4.52	1.33		0.52				0.23			0.69					85	89
5.1	4	Ab	68.85		18.58				0.61	11.43								0.52					100	119
5.1	5	Cal				1.54	0.39		53.49									0.58					56	57
6	1	Qz	99.38															0.62					100	114
6	2	Brt											38.33					1.67		60.13			100	107
6	3	Qz	99.34															0.66					100	114
6	4	Kln	47.64		35.25	1.47			0.51		0.27				0.17			0.70					86	83
6	5	Qz	99.47															0.53					100	115
6	6	Cal				1.31	0.30	0.44	53.11									0.83					56	50
6	7	Cal	0.40			1.11			51.45					2.44				0.61					56	51
6.1	1	Ab	68.50		18.60					12.50								0.39					100	120
6.1	2	"Ilm" +	4.19	83.55	4.21	4.44		0.43	1.11			0.77			0.26				1.05					100	83
6.1	3	Cal				1.85	0.30	0.44	52.73									0.67					56	52
7	1	Brt											36.73					0.41	1.08	61.85			100	115
7	2	Qz	99.86															0.14					100	120
7	3	Cal				1.72	0.35		53.92														56	56
7	4	Ab	69.34		18.90				0.41	11.35													100	118
7	5	"Bt" +	48.50	3.95	28.76	8.85		6.38	0.34	0.71	2.50												100	92
7	6	Qz	100.00																				100	122
7	7	Py	0.25			28.46							71.11					0.18					100	224
7.1	1	Qz	100.00																				100	121
7.1	2	Kln	48.83		36.62	0.26			0.16									0.13					86	91
7.1	3	Cal + Chl	24.53	0.51	12.89	9.73	0.49	1.38	49.55		0.92												100	75
7.1	4	Chl	30.79		23.21	25.72		3.54	0.92	0.43	0.20				0.20								85	83
8	1	Cal				1.14	0.43		54.43														56	57
8	2	Brt											36.13					0.42	1.29	62.17			100	117
8	3	Brt											36.78					0.38	1.55	61.43			100	116
8	4	Brt	44.42	1.89	22.30	17.70		6.06	2.38	0.68	4.34				0.24								100	99
8	5	Brt	0.79						0.41				31.98					0.59		64.91		1.37	100	95
8	6	Qz	100.00																				100	120
8.1	1	Qz	100.00																				100	117
8.1	2	Cal	0.71			1.48	0.38		51.02					2.40									56	59
8.1	3	Hl	0.49			0.25			0.49	43.35					54.92			0.50					100	123
8.1	4	Cal	0.60			5.47	0.63	0.37	48.76						0.17								56	57
8.1	5	Hl + Chl	17.81	0.55	11.82	18.66		2.67	2.01	28.51	0.56				17.42								100	115

Table 1B.1: SEM-EDS cemical analyses of minerals from sample G-24 4401.5A(2).

Site	Pos	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	Cl	Cr2O3	CoO	ZnO	SrO	BaO	Yb2O3	WO3	Total	Actual Total
9	1	Qz	99.80			0.20																	100	122
9	2	Cal				1.78	0.34	0.37	53.51														56	58
9	3	Cal	1.04		0.52	2.04	0.63	0.36	51.42														56	59
9	4	Qz	100.00																				100	121
9	5	Qz	100.00																				100	122
9	6	Kln	44.71	0.34	32.68	3.62		0.96	2.84	0.28	0.57												86	95
9	7	Cal	0.64		0.44	1.09	0.45		53.39														56	58
9	8	Chl	36.25	0.34	26.57	17.38		2.78	0.76	0.38	0.54												85	93
9	9	Chl	41.71	0.37	30.61	9.88		1.63	0.48		0.30												85	99
10	1	TiO2	0.55	97.37	0.61	1.03			0.44														100	105
10	2	Cal	0.85	1.79	0.41	1.83	0.56	0.29	50.28														56	59
10	3	Qz	100.00																				100	119
10	4	Qz	100.00																				100	121
10	5	Qz	99.83			0.26															-0.09		100	121
10	6	Kln +	45.13		31.07	4.02		0.62	0.49	0.47	2.43			1.77									86	105
10	7	Cal	0.60		0.27	1.63	0.60	0.34	52.57														56	58
10	8	Qz	100.00																				100	123
10	9	Ab	69.33		18.48				0.21	11.99													100	121
10	10	Cal	0.66			1.34	0.39		53.60														56	58
10	11	Cal +	1.47		0.86	2.66	0.30		46.05				1.72	2.93									56	64
10	12	Qz	97.58	0.23	1.77	0.22					0.20												100	120
10.1	1	Qz	100.00																				100	122
10.1	2	Cal				1.32	0.39	0.32	53.97														56	57
10.1	3	Py	0.18			28.95			0.15	0.47			70.25										100	229
10.1	4	Py	0.72			27.91			4.37	0.74	0.13		66.12										100	180
10.1	5	Kln	48.87		36.29	0.21			0.39	0.25													86	94
11	1	Qz	100.00																				100	121
11	2	Cal +	8.68		2.73	1.14			39.96		1.69			1.81									56	67
11	3	Cal +	2.17		1.56	2.78	0.45	0.39	48.66														56	60
11	4	Brt											36.64					0.73	2.12	60.51			100	116
11	5	Brt +	8.10		3.00	9.16		1.97	3.43		0.29		25.81		0.33			0.25		47.66			100	96
11	6	Cal				1.31	0.36		54.33														56	56
11	7	Ab	69.61		18.70					11.69													100	116
11	8	Cal				2.02	0.38	0.39	53.21														56	57
11	9	Qz	100.00																				100	120
11	10	Kln	49.14		34.72	0.52			0.85	0.34			0.43										86	80
11	11	Cal	0.49			1.37	0.30		50.68					3.17									56	58
11	12	Ab	67.68		19.51	0.84			0.80	10.95	0.21												100	117
12	1	Cal				1.37	0.32		54.03									0.27					56	53
12	2	Qz	100.00																				100	117
12	3	Brt											34.80					0.58		64.75			100	101
12	4	Cal +	2.32		1.37	2.04	0.42	0.34	49.50														56	57
12	5	Qz	100.00																				100	118
12	6	Ab	73.45		16.68					9.86													100	120
12	7	Cal	1.05		0.35	1.53	0.59	0.34	52.15														56	55
12	8	Qz	100.00																				100	117
12	9	Cal +	1.68		0.91	2.04	0.35	0.41	50.27									0.34					56	58
12	10	Chl +	30.01		16.87	16.89		2.36	9.34	1.61	0.91	6.71			0.30								85	80
13	1	Qz	100.00																				100	119

Table 1B.1: SEM-EDS cemical analyses of minerals from sample G-24 4401.5A(2).

Site	Pos	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	Cl	Cr2O3	CoO	ZnO	SrO	BaO	Yb2O3	WO3	Total	Actual Total
13	2	Kln	48.33		35.94	0.54			0.21					0.98									86	87
13	3	Qz	100.00																				100	120
13	4	Bt	37.68	2.64	19.54	17.83		9.44	2.26	0.44	5.92				0.25								96	82
13	5	Cal				1.44	0.58		53.97														56	55
13	6	Py	0.22			28.70			0.23				70.85										100	218
13	7	Kln	47.65		36.06				0.62					1.44	0.24								86	78
13	8	Qz	100.00																				100	118
14	1	Qx	100.00																				100	119
14	2	Cal +	1.55		0.77	1.68	0.52		51.48														56	57
14	3	Cal	0.48		0.30	2.28	0.35	0.50	52.09														56	57
14	4	Qz	100.00																				100	119
14	5	Qz	100.00																				100	118
14	6	Kln	45.55	0.40	33.68	4.44		0.55	1.08		0.31												86	86
14	7	Brt											36.63							63.40			100	111
14	8	Ab	68.88		18.42				0.90	11.79													100	116
14	9	Cal				1.67	0.36	0.38	53.59														56	56
14.1	1	Cal	0.66		0.26	1.20	0.52		53.35														56	56
14.1	2	Kln	47.35		36.00				2.65														86	91
14.1	3	Qz	100.00																				100	118
14.2	1	Qz	100.00																				100	118
14.2	2	Kln	50.55		31.59	1.40		0.53	1.38		0.15				0.40								86	72
14.3	1	Cal	0.62		0.34	1.50	0.45		53.10														56	56
14.3	2	Kln	48.80		36.70				0.50														86	97
14.3	3	Qz	100.00																				100	118
14.3	4	Qz +	76.21	1.63	6.67	3.66		0.71	9.59	0.77	0.40				0.38								100	106
14.3	5	Mix	61.63	2.69	17.68	4.47		0.98	7.77	1.04	1.29		1.58		0.87								100	68
14.3	6	Brt											36.80							63.36			100	113
14.3	7	Qz +	84.15	0.39	6.39	2.20		0.33	5.35	0.60	0.33				0.26								100	110
15	1	Kln	46.06	0.29	33.94	2.12		0.32	0.23	0.31	2.73												86	94
15	2	Cal	0.47			1.01	0.55		52.66					1.31									56	58
15	3	Qz	100.00																				100	117
15	4	Cal +	1.72		1.16	2.20	0.43	0.32	41.56					8.61									56	68
15	5	Qz	100.00																				100	119
15	6	Qz +	94.39		4.03	0.64		0.38			0.56												100	117
15	7	?	5.30		55.80	0.49		0.43	6.14	0.64				17.53	13.67								100	66
15	8	Cal	0.68			1.67	0.40		53.25														56	56
15	9	Py	0.25			28.48							71.28										100	228
15	10	Kln +	45.68	0.34	27.94	6.13		1.01	2.44	0.34	1.86				0.26								86	79
15	11	Cal				0.85	0.40		54.75														56	56
16	1	Qz	100.00																				100	117
16	2	Kln	47.58		36.47									1.94									86	98
16	3	Kln	48.38		36.74	0.46			0.24		0.14							0.05					86	86
16	4	Cal	1.51		0.87	1.85	0.35		51.41														56	56
16	5	Qz	100.00																				100	118
16	6	Cal +	4.83		1.58	1.69	0.39	0.30	40.87	0.45				5.89									56	63
16	7	Py				28.81			0.23				70.96										100	221
16	8	Cal +	2.21		0.88	2.15	0.44	0.35	49.76		0.22												56	58
16	9	Cal +	2.07		1.25	2.25	0.32	0.48	49.63														56	58
16	10	Kln	47.47		36.75	1.00			0.78														86	92

Table 1B.1: SEM-EDS cemical analyses of minerals from sample G-24 4401.5A(2).

Site	Pos	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	Cl	Cr2O3	CoO	ZnO	SrO	BaO	Yb2O3	WO3	Total	Actual Total
16	11	Kln	47.25		33.44	2.79		0.79	0.50	0.32	0.92												86	98
16	12	Py				28.14			0.17				71.69										100	222
16	13	Chl +	32.16		21.08	25.74		2.90	1.34	0.32	1.18				0.27								85	85
16	14	Qz	100.00																				100	118
17	1	Qz	100.00																				100	119
17	2	Brt											36.80						1.16	62.05			100	114
17	3	Cal	0.63			1.50	0.40		53.47														56	56
17	4	Mix	59.21		20.79	9.51		4.49	3.80		1.75				0.45								100	97
17	5	Cal +	14.91		3.51	5.35	0.61	0.72	74.69		0.20												100	64
17	6	Qz	100.00																				100	120
17	7	Cal + Chl	12.58		9.90	14.68	0.50	1.95	60.15		0.25												100	68
17	8	"Bt"	34.08	2.30	19.93	30.94		8.92	1.17		2.48				0.19								100	89
17.1	1	Kln	47.00		36.21				2.80														86	87
17.1	2	Cal	1.23		0.86	1.94	0.36	0.31	51.31														56	58
17.1	3	Py	0.44			27.69			0.74				71.13										100	223
17.1	4	Qz	99.43		0.30	0.27																	100	119
17.1	5	Brt											37.13							62.90			100	113
18	1	Qz	100.00																				100	118
18	2	Kln	48.93		36.84				0.23														86	92
18	3	Brt											36.71							63.44			100	113
18	4	Qz	100.00																				100	120
18	5	Cal	0.59			0.94	0.25		49.77					4.45									56	58
18	6	Cal	0.77		0.31	1.52	0.59	0.31	52.49														56	58
18	7	Chl +	39.07		19.97	16.15		2.24	3.54	0.46	3.20				0.37								85	94
18	8	Qz	99.31		0.44	0.25																	100	121
18.1	1	Qz +	96.04		2.71	0.53					0.72												100	117
18.1	2	Cal + Ms	17.44		10.01	2.70	0.46	0.97	61.41		2.19			4.31	0.51								100	57
18.1	3	Cal	0.50			1.23	0.58		51.06					2.62									56	59
18.1	4	Brt											36.55					0.04	1.03	62.38			100	112
19	1	Brt											37.27						1.04	61.76			100	116
19	2	Cal	0.66			1.19	0.39		53.77														56	56
19	3	Qz	100.00																				100	120
19	4	Kln	46.60		35.55	0.33			1.01	0.28				2.06	0.17								86	93
19	5	Cal +	3.88	8.58	2.17	2.44	0.38	0.29	34.33		0.17			3.77									56	70
19	6	Qz	100.00																				100	121
19	7	Kln	48.52		37.48																		86	92
19	8	Chl	41.97	0.42	25.40	9.45		1.37	3.06	0.80	1.78				0.74								85	90
19	9	Kfs	66.36		17.63					0.66	15.35												100	119
20	1	Cal				0.89	0.26		54.85														56	56
20	2	Qz	100.00																				100	119
20	3	Mix	48.70	0.95	27.59	17.23		2.13	0.53	0.66	2.22												100	93
20	4	Qz	100.00																				100	120
20	5	Mix	69.17		21.98	3.03		3.28	1.54	0.51	0.28				0.21								100	82
20	6	Brt											36.42						1.10	62.57			100	112
20	7	Kln +	45.64		27.40	5.96		0.89	1.00		1.58			3.31	0.22								86	85
20	8	Cal +	1.78		0.89	1.62	0.44	0.40	50.67		0.18												56	57
21	1	Qz	100.00																				100	120
21	2	Cal	0.85		0.32	1.26	0.59		50.94					2.04									56	59
21	3	Qz	100.00																				100	122

Table 1B.1: SEM-EDS cemical analyses of minerals from sample G-24 4401.5A(2).

Site	Pos	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	Cl	Cr2O3	CoO	ZnO	SrO	BaO	Yb2O3	WO3	Total	Actual Total
21	4	Cal	0.50			1.35	0.35		53.80														56	56
21	5	Qz	100.00																				100	122
21	6	Cal	0.30			1.19	0.32		52.11					2.08									56	60
21	7	Kln	48.50		36.99				0.52														86	89
22	1	Qz	100.00																				100	118
22	2	Cal + Chl	31.00		14.74	10.24		0.51	30.52	0.42	0.37			11.74	0.47								100	84
22	3	Kln	43.76		34.31	0.83			3.42					3.31	0.37								86	70
22	4	Cal +	2.17		1.16	2.00	0.43	0.41	44.53		0.14			5.15									56	63
22	5	Qz	100.00																				100	117
22	6	Cal	0.99			2.18	0.38	0.55	51.89														56	55
22	7	Mix	36.36		24.12	8.57		12.32	1.88		1.06			15.69									100	102
22	8	Ab	69.82		18.62					11.56													100	114
22.1	1	Cal +	2.26		1.22	2.27	0.55		49.54		0.16												56	57
22.1	2	Sd +	2.48		1.32	44.00	0.97	3.77	3.47														56	60
22.1	3	Chl	35.56		25.65	19.15		2.89	1.06	0.32	0.37												85	93
22.1	4	Kln	50.05		32.24	2.21			0.47	0.93	0.10												86	89
22.1	5	Qz	100.00																				100	118
23	1	Qz	100.00																				100	118
23	2	Ms + Chl	52.86	0.33	25.47	6.21		5.73			9.40												100	106
23	3	Qz	100.00																				100	117
23	4	Cal	0.57	0.92		1.64	0.29	0.34	52.25														56	55
23	5	Brt											36.75							63.24			100	113
23	6	Ab	50.47		37.57	0.43			11.53														100	72
23	7	Cal				1.56	0.36		54.08														56	56
23	8	Qz	100.00																				100	122
23	9	Cal +	4.27		1.11	1.45	0.22		45.35		0.79		0.50	2.30									56	63
23	10	Cal				1.30	0.34		53.01					1.34									56	57
23	11	Cal	1.14		0.61	2.30	0.58		51.38														56	57
23	12	Qz	100.00																				100	121
23	13	Qz	100.00																				100	119
23	14	Cal	0.44			1.60	0.25	0.32	53.38														56	57
24	1	Ab	69.74		18.72					11.54													100	115
24	2	Cal +	3.47		1.00	1.35		0.28	49.14	0.76													56	60
24	3	Ms + Chl	48.27	0.52	33.58	1.58		0.84		0.78	9.43												95	105
24	4	Qz	99.68		0.32																		100	121
24	5	Cal	1.48		0.39	1.54	0.43	0.43	51.73														56	58
24	6	"Bt"	48.18	0.81	29.07	13.55		2.69	2.54	0.43	2.54				0.19								100	90
24	7	Cal	1.19		0.57	1.60	0.55		52.09														56	57
24.1	1	Qz	100.00																				100	119
24.1	2	Mag +	3.35			96.36										0.28							100	138
24.1	3	Ab	68.62		18.07	1.55				11.60					0.16								100	112
25	1	Qz	100.00																				100	118
25	2	Cal	0.69			1.18	0.49		53.65														56	55
25	3	Ms + Ap	51.20		30.19	3.31		1.40	5.68	0.30	3.97	3.94											100	90
25	4	Cal	0.54			1.23	0.38		53.86														56	55
25	5	Qz	99.81			0.19																	100	117
26	1	Qz	100.00																				100	120
26	2	Mix	27.70	12.44	20.28	26.44		3.89	5.41		0.88	2.65			0.30								100	82
26	3	Kln	48.74		37.01				0.25														86	86

Table 1B.1: SEM-EDS cemical analyses of minerals from sample G-24 4401.5A(2).

Site	Pos	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	Cl	Cr2O3	CoO	ZnO	SrO	BaO	Yb2O3	WO3	Total	Actual Total
26	4	Ab	69.52		18.77					11.71													100	118
26	5	Qz	100.00																				100	120
27	1	Cal				0.72			55.28														56	55
27	2	Mix	38.18	2.00	23.66	10.66		2.32	4.74	0.35	0.79	1.78			0.53								85	75
27	3	Qz	100.00																				100	118
27	4	Ab +	78.38		12.55	0.92			2.38	5.35	0.23				0.19								100	114
27	5	Cal				1.93	0.45		53.63														56	55
28	1	Qz	100.00																				100	120
28	2	Cal				1.25	0.32		54.43														56	56
28	3	Feohy +	12.98		1.23	75.09	0.65		5.25		0.26				4.53								100	76
28	4	Qz	100.00																				100	119
28	5	Py	0.27			28.34			0.17	0.32			70.90										100	222
28	6	Qz	100.00																				100	119
28.1	1	Qz	100.00																				100	118
28.1	2	Cal	0.53			1.60	0.37		53.51														56	56
28.1	3	Qz +	81.65	0.29	6.80	3.73		0.39	5.35	0.38	1.18				0.23								100	111
28.1	4	Mag +	3.78			84.15	0.52		8.12				1.02		2.41								100	79
29	1	Qz	100.00																				100	121
29	2	Cal	0.69			0.98	0.26		51.02					3.05									56	59
29	3	Qz	99.58	0.22					0.20														100	123
29	4	Cal	0.41			1.39	0.32		49.43					3.91	0.54								56	62
29	5	TiO2	0.71	95.14	0.99	1.25			0.84	0.50					0.58								100	101
29	6	Kln	48.15	0.29	34.42				0.45	0.54				1.83	0.32								86	87
29	7	Cal				1.13	0.31	0.35	54.21														56	56
29	8	Kln + Ms	50.57	0.33	30.35	3.27		3.71	0.94		4.66			5.96	0.21								100	98
29	9	Kln	43.47		33.53	3.35		0.33		0.46				4.72	0.14								86	100
29	10	Cal	0.90		0.53	2.08	0.30		48.63					3.57									56	63
30	1	Brt											36.84							63.27			100	116
30	2	Qz	100.00																				100	121
30	3	Qz +	97.75		1.32	0.71			0.20		0.02												100	122
30	4	Cal	1.65		0.92	1.49	0.31		51.63														56	59
30	5	Qz	100.00																				100	120
31	1	Mix	24.45	0.64	18.56	45.32	0.42	7.58	2.60		0.43												100	85
31	2	Sd +	0.46			46.15	1.36	4.50	3.53														56	60
31	3	Kln +	45.76		33.19	4.16		0.75	1.22		0.51				0.41								86	86
31	4	Cal				1.50	0.28		54.22														56	55
31	5	Qz	100.00																				100	121
32	1	Cal				1.19	0.27		54.54														56	57
32	2	Qz	100.00																				100	122
32	3	Py	0.20			28.56							71.24										100	226
32	4	Chl +	30.52	3.87	16.37	27.77	0.31	4.93	0.56	0.50					0.17								85	96
32	5	Cal	0.76		0.39	1.27	0.72		52.86														56	57
32	6	Cal +	1.15	2.63	0.70	0.92	0.34		50.25														56	59
32	7	Qz	100.00																				100	120
33	1	Qz	100.00																				100	119
33	2	Kln	49.18		36.38				0.44														86	85
33	3	Qz	100.00																				100	118
33	4	Cal				1.62	0.26		54.11														56	55
33	5	Qz	100.00																				100	118

Table 1B.1: SEM-EDS cemical analyses of minerals from sample G-24 4401.5A(2).

Site	Pos	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	Cl	Cr2O3	CoO	ZnO	SrO	BaO	Yb2O3	WO3	Total	Actual Total
33	6	Cal	1.04		0.52	1.79	0.57	0.31	51.78														56	58
33	7	Qz	98.29		0.68	0.63			0.35		0.05												100	116
33	8	Ab	70.07		18.39	0.22				11.33													100	111
Notes: Feohy = Fe-oxide/hydroxide, "mineral" = altered mineral																								

Table 1B.2: SEM-EDS cemical analyses of minerals from sample G-24 4401.5A(2).

Sample	Site	Position	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	SO3	F	CoO	ZnO	BaO	Total	Actual Total
G-24-4401.5A	1.redo*	1	Ab	71.29		17.26	0.23				10.54					0.68		100	120
G-24-4401.5A	1.redo	2	Cal				1.148			54.07						0.78		56	56
G-24-4401.5A	1.redo	3	Cal				1.45	0.31		53.27						0.97		56	56
G-24-4401.5A	1.redo	4	Qz	99.31												0.69		100	118
G-24-4401.5A	1.redo	5	Sd				45.12	1.53	5.01	3.321						1.02		56	61
G-24-4401.5A	1.redo	6	Qz	99.21												0.79		100	114
G-24-4401.5A	2.redo	1	Ab	68.47		18.88				0.3	11.68					0.67		100	120
G-24-4401.5A	2.redo	2	Mix	41.14		9.98	1.03			42.6	2.12	1.96				1.17		100	79
G-24-4401.5A	2.redo	3	Cal	0.75		0.381	1.714	0.58	0.33	51.46						0.79		56	59
G-24-4401.5A	2.redo	4	Brt										35.23		-0.07	2.26	62.58	100	115
G-24-4401.5A	2.redo	5	Cal				1.506			53.48						1.01		56	57
G-24-4401.5A	2.redo	6	Qz	99.32												0.68		100	121
G-24-4401.5A	2.redo	7	Brt	8.6		1.6				0.89			32.68		-0.11	1.19	55.15	100	118
G-24-4401.5A	2.redo	8	Ms	49.82	0.71	36.92	0.71		0.58		1.6	8.76				0.9		100	108
G-24-4401.5A	2.redo	9	Qz	99.4												0.6		100	121
G-24-4401.5A	2.redo	10	Cal	1.069		0.465	1.265	0.38		51.99						0.83		56	59
G-24-4401.5A	2.redo	11	Qz	99.45												0.55		100	124
G-24-4401.5A	2.redo	12	Cal	0.19						26.97				28.43		0.4		56	167
G-24-4401.5A	2.redo	13	Qz	99.4												0.6		100	119
G-24-4401.5A	2.redo	14	Qz	99.56												0.44		100	114
*Note: sites 1 and 2 were re-analyzed and it appears that the presence of ZnO is real																			

Appendix 1C: SEM-BSE images and EDS mineral analyses for sample G-24 4401.5B

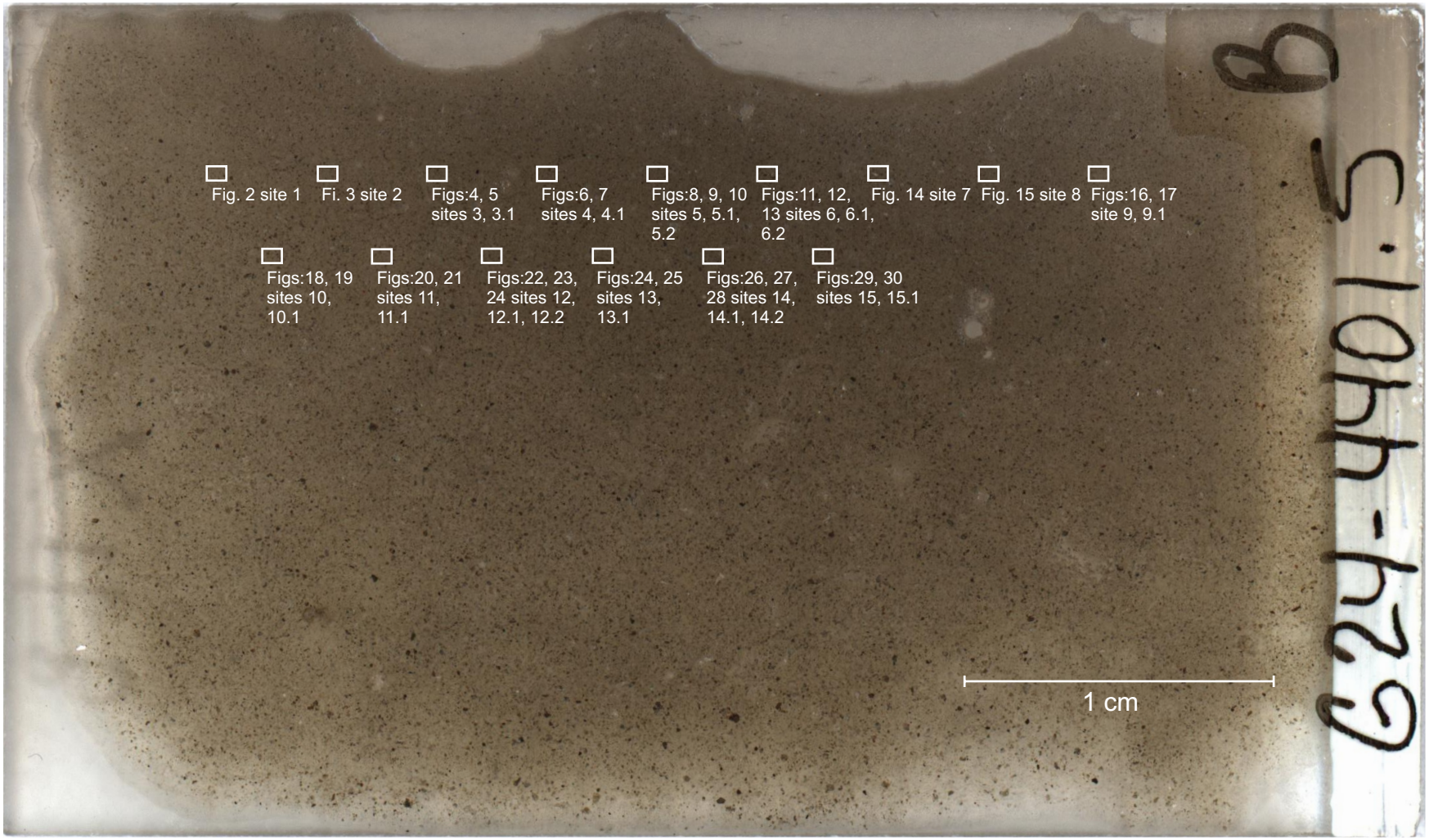
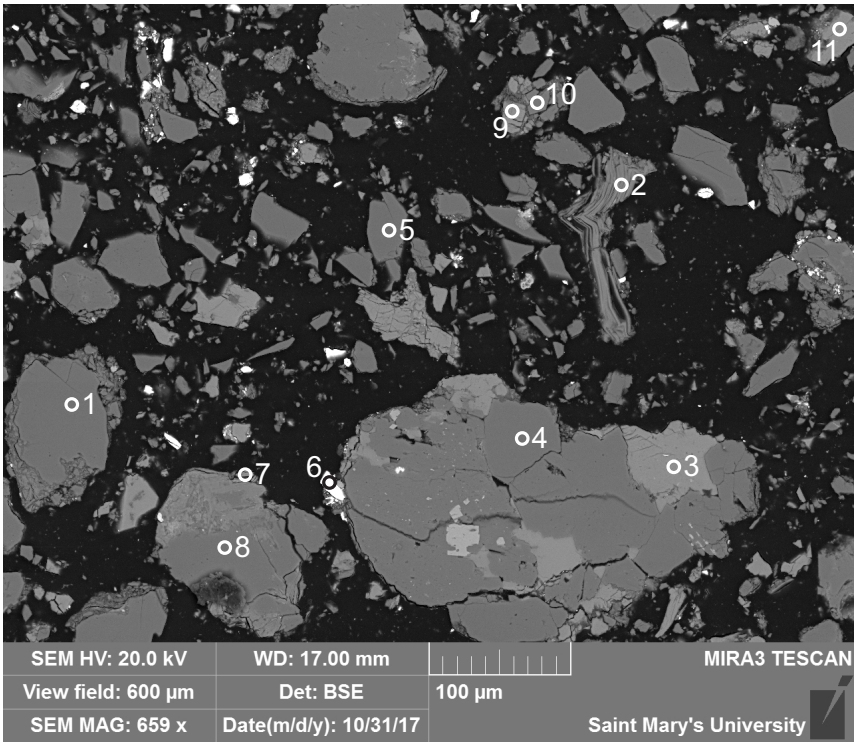
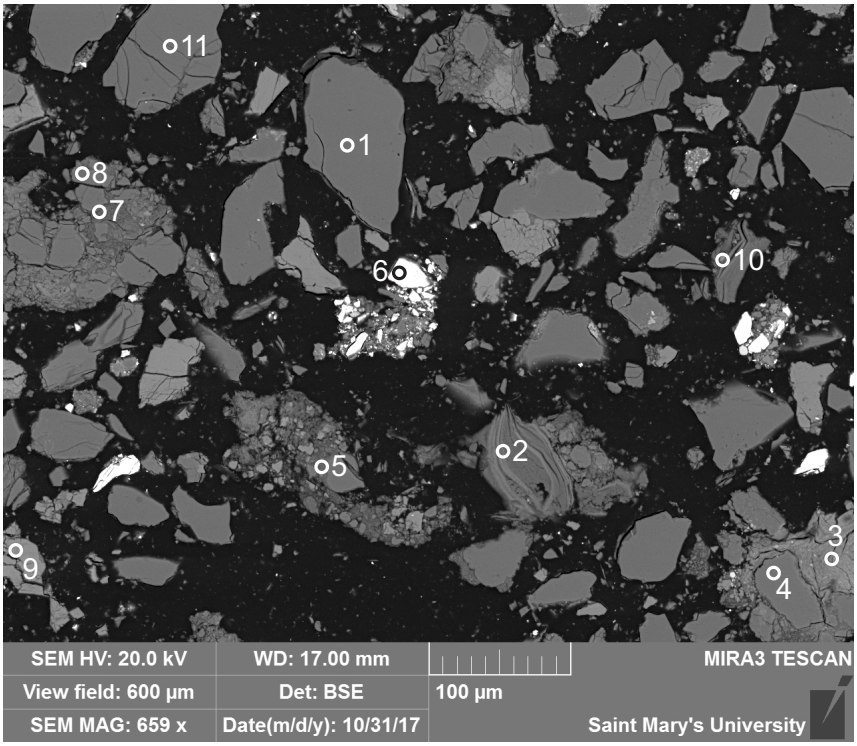


Figure 1C.1: Scanned thin section of sample G-24 4401.5B showing locations of analyzed sites:



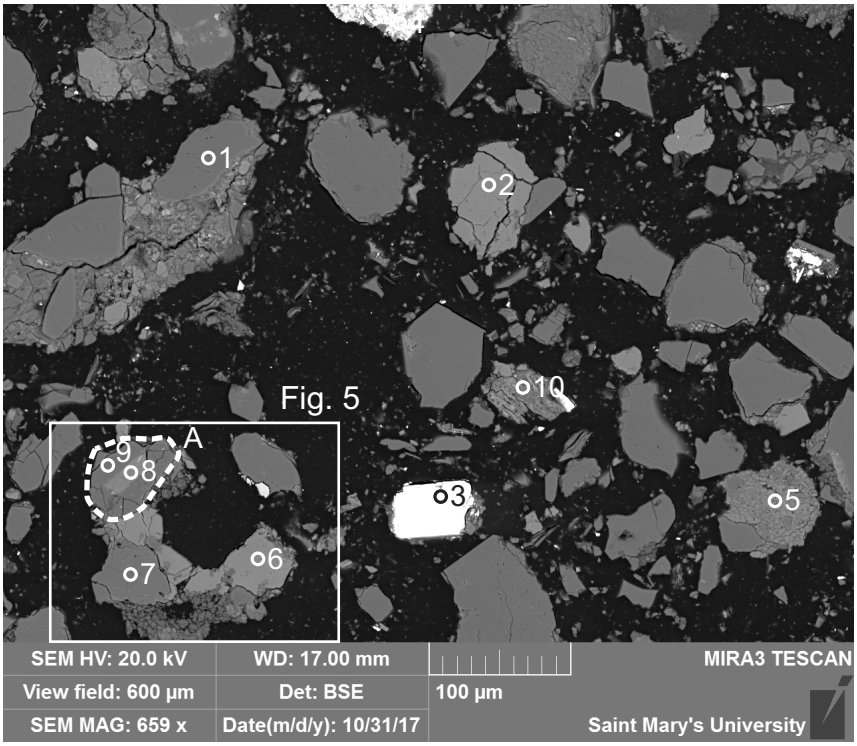
1:Quartz
2:Muscovite
3:Calcite
4:Quartz
5:Quartz
6:Barite
7:Muscovite
8:Quartz
9:Calcite
10:Oligoclase
11:Calcite

Figure 1C.2: Sample G-24 4401.5B (SEM) site 1. Detrital minerals: Ms, Olig, Qz. Diagenetic minerals: Brt, Cal. A fragment made up of quartz (4), calcite (3), and very small grains of barite (3). Detrital oligoclase (10) is partly replaced by calcite (9). Another fragment is made up of quartz (8) and muscovite (7).



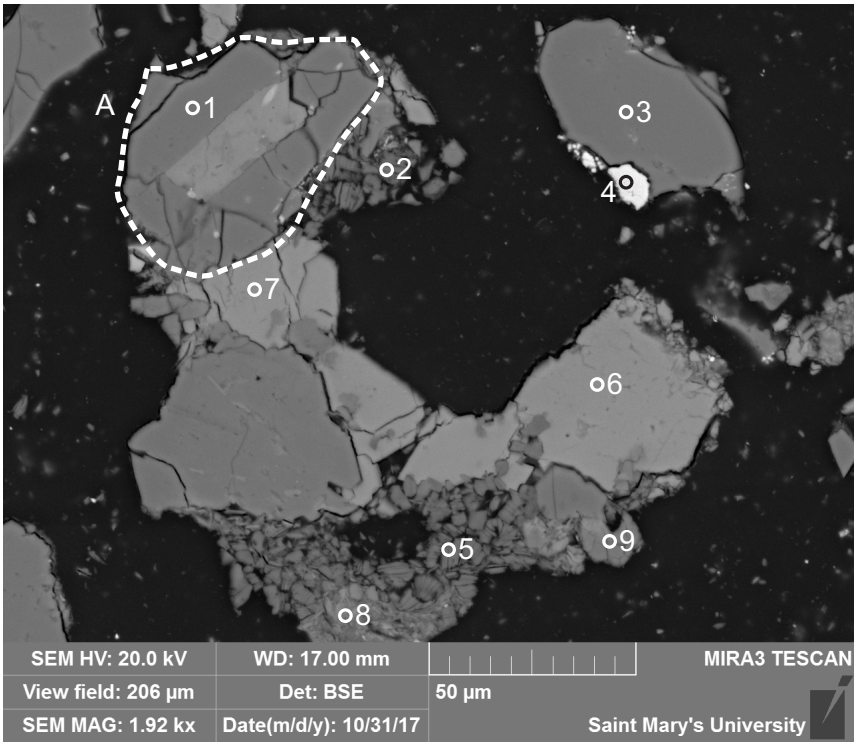
1:Quartz
2:Kaolinite
3:Chlorite + Muscovite
4:Albite
5:Quartz
6:Barite
7:Kaolinite
8:Quartz
9:Calcite
10:Kaolinite
11:Quartz

Figure 1C.3: Sample G-24 4401.5B (SEM) site 2. Detrital minerals: Ab, Ms, Qz. Diagenetic minerals: Brt, Cal, Chl, Kln. A fragment made up of albite (4) and muscovite partly altered to chlorite (3).



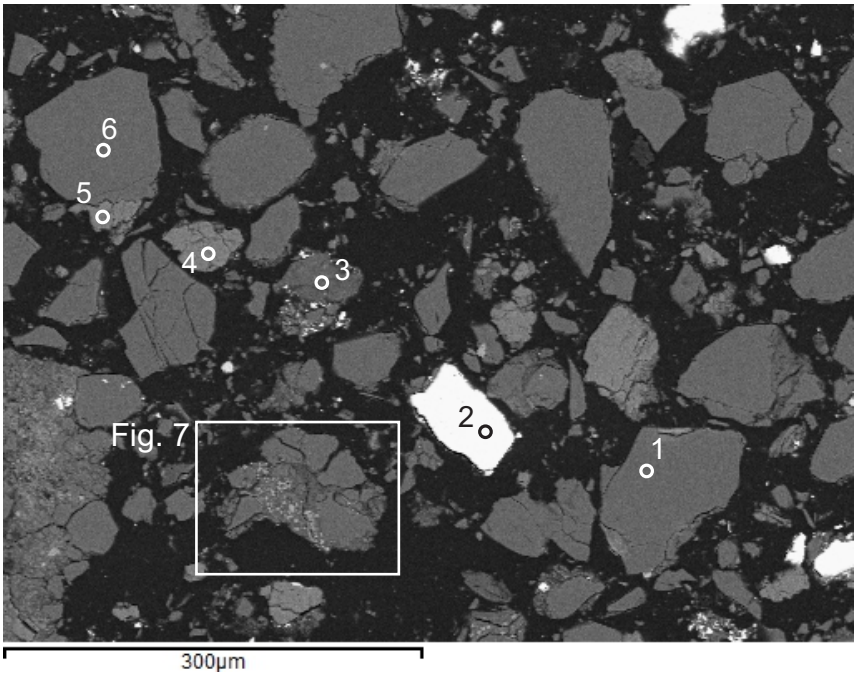
1:Quartz
2:Calcite +
3:Barite
4:Barite
5:Calcite +
6:Calcite +
7:Albite
8:Calcite + K-feldspar
9:Albite
10:Muscovite +

Figure 1C.4: Sample G-24 4401.5B (SEM) site 3. Detrital minerals: Ab, Kfs, Ms, Qz. Diagenetic minerals: Brt, Cal. The barite (3) in this site texturally (straight crystal outlines) appears to be diagenetic. Probable lithic clast (A) made up of albite (9) and K-feldspar (8).



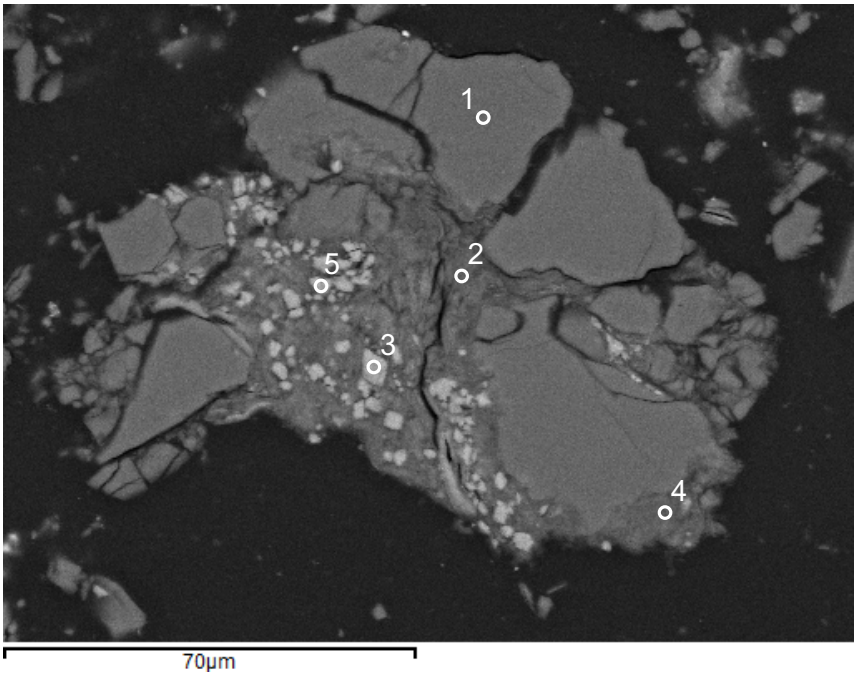
1:Albite
2:Kaolinite
3:Quartz
4:Pyrite
5:Kaolinite
6:Calcite
7:Calcite
8:Muscovite +
Chlorite
9:Quartz +

Figure 1C.5: Sample G-24 4401.5B (SEM) site 3.1. Detrital minerals: Ab, Ms, Qz. Diagenetic minerals: Cal, Chl, Kln, Py. A fragment made up of albite (1) partly altered to calcite (7), muscovite (8) partly altered to chlorite, quartz (9), and kaolinite (5). Probable lithic clast (A) made up of albite (1) and K-feldspar (Fig. 1C.4, 8).



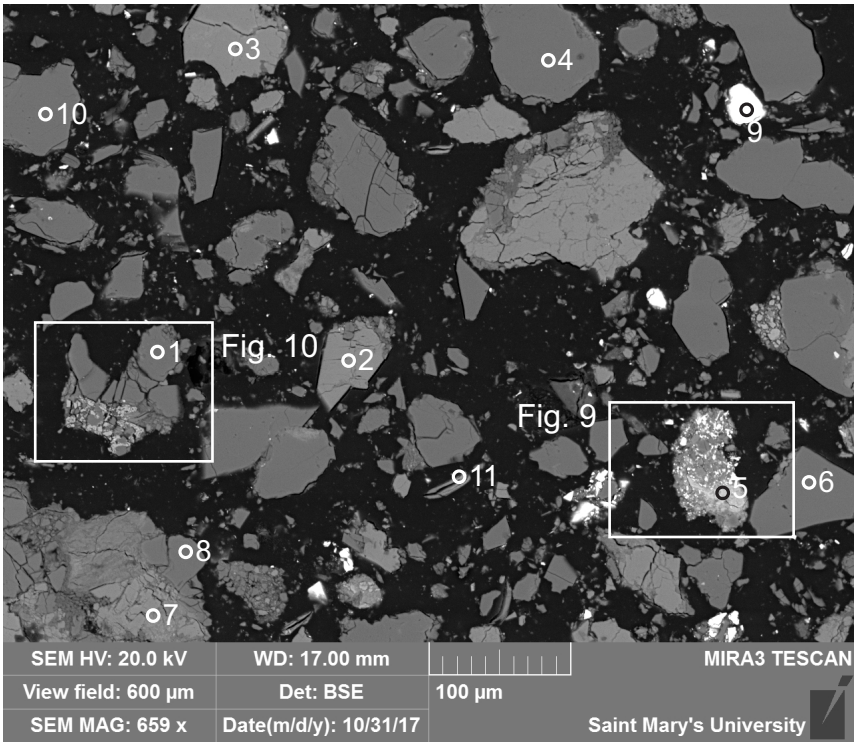
1:Quartz
2:Barite
3:Kaolinite + Apatite
4:Calcite
5:K-feldspar + Calcite
6:Quartz

Figure 1C.6: Sample G-24 4401.5B (SEM) site 4. Detrital minerals: Kfs, Qz. Diagenetic minerals: ?Ap, Brt, Cal, Kln.



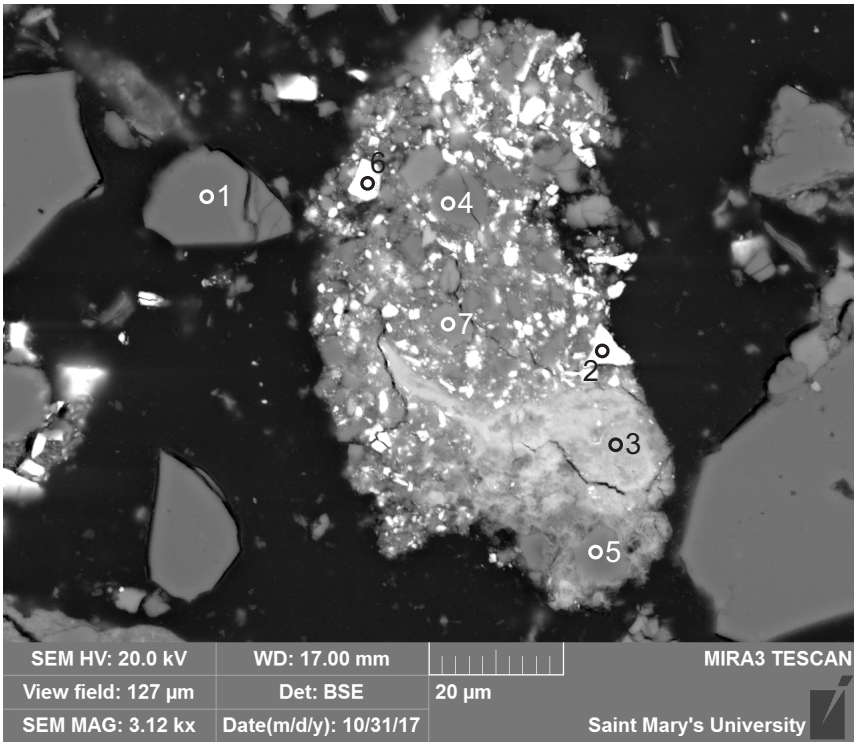
1:Quartz
2:Kaolinite
3:Siderite + Chlorite
4:Kaolinite +
K-feldspar
5:Siderite

Figure 1C.7: Sample G-24 4401.5B (SEM) site 4.1. Detrital minerals: Kfs, Qz. Diagenetic minerals: Chl, Kln, Sd. A fragment made up of quartz (1) and K-feldspar (4), cemented with kaolinite (2,4), chlorite (3), and siderite (5).



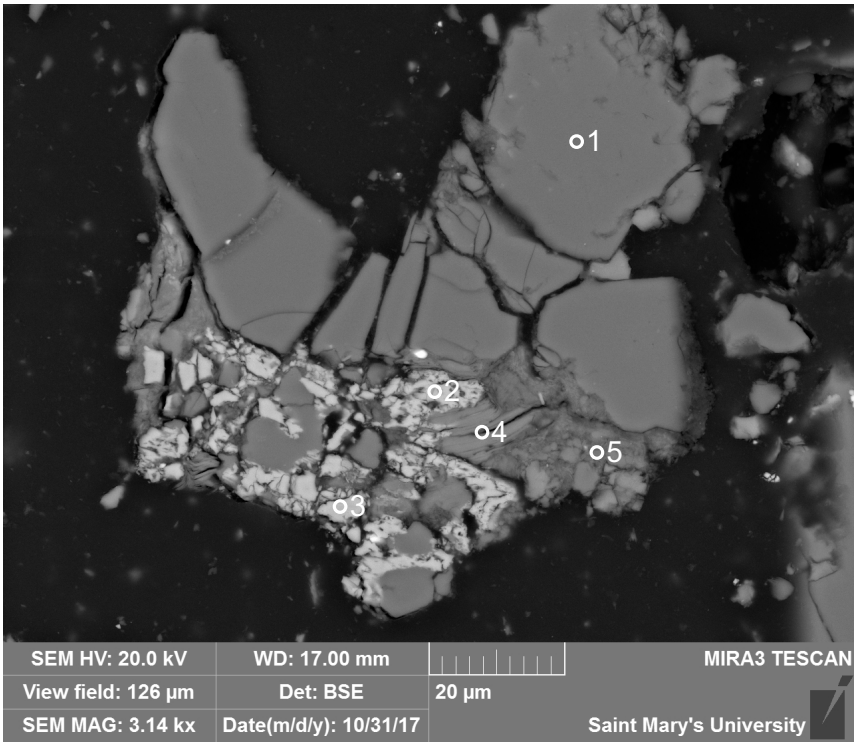
1:Quartz
2:Calcite
3:Calcite +
4:Quartz
5:Limonite +
6:Quartz
7:Mix
8:Quartz
9:Barite
10:Quartz
11:Chlorite +
Muscovite

Figure 1C.8: Sample G-24 4401.5B (SEM) site 5. Detrital minerals: Ms, Qz. Diagenetic minerals: Brt, Cal, Chl, Lim.



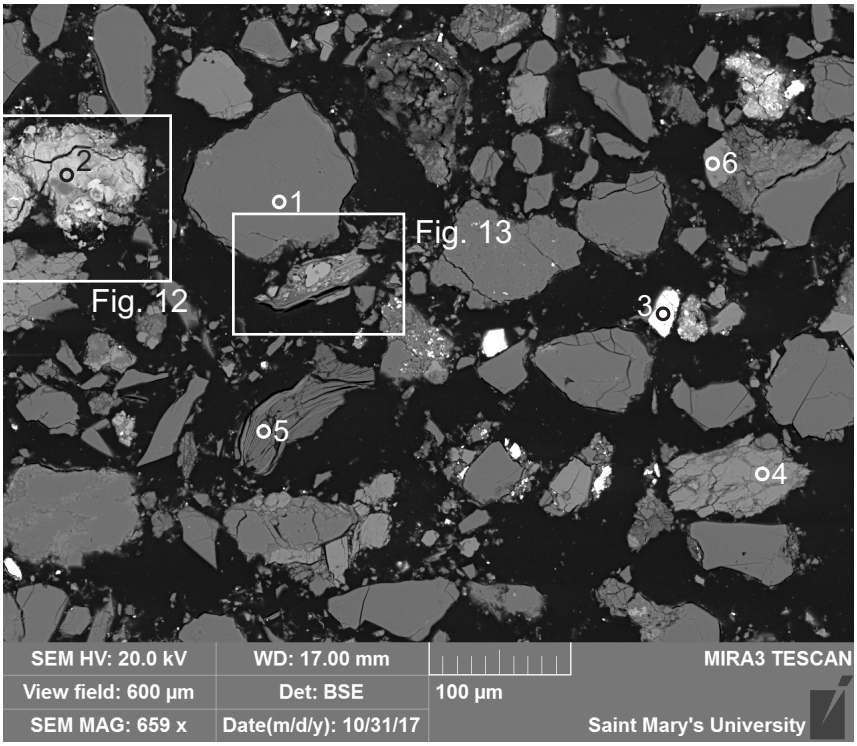
1:Quartz
2:Barite
3:Limonite +
4:Oligoclase
5:Quartz +
6:Barite
7:K-feldspar +

Figure 1C.9: Sample G-24 4401.5B (SEM) site 5.1. Detrital minerals: Kfs, Olig, Qz. Diagenetic minerals: Brt, Lim. A fragment made up of oligoclase (4), quartz (5), K-feldspar (7), and diagenetic barite (2,6), and limonite (3).



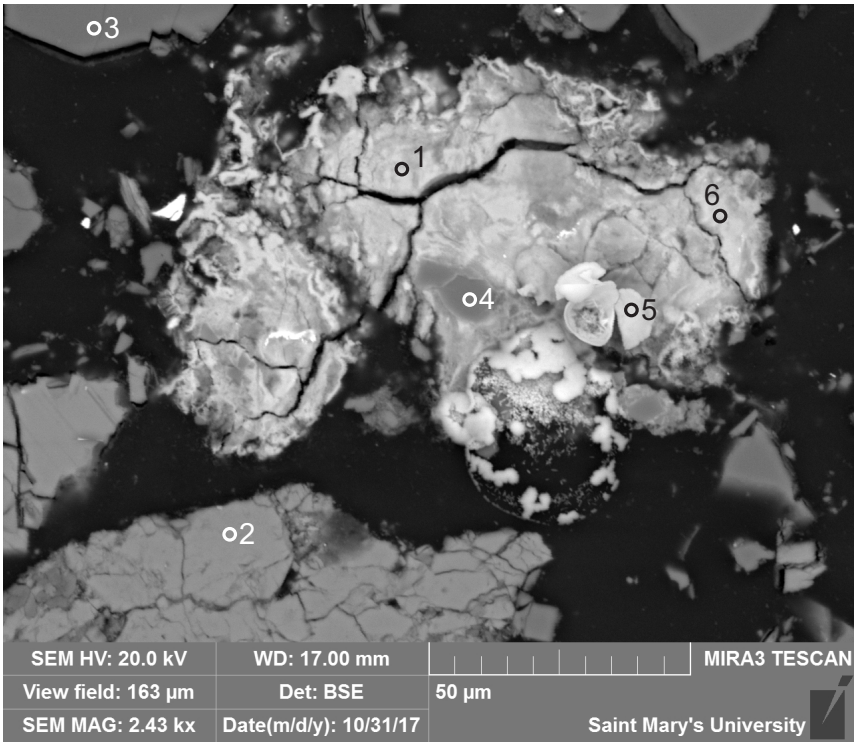
1:Quartz
2:TiO_2 +
3:TiO_2 +
4:Muscovite
5:Mix

Figure 1C.10: Sample G-24 4401.5B (SEM) site 5.2. Detrital minerals: Ms, Qz. Diagenetic minerals: TiO_2. A fragment made up of quartz (1), muscovite (4), and probably diagenetic TiO_2 (2,3).



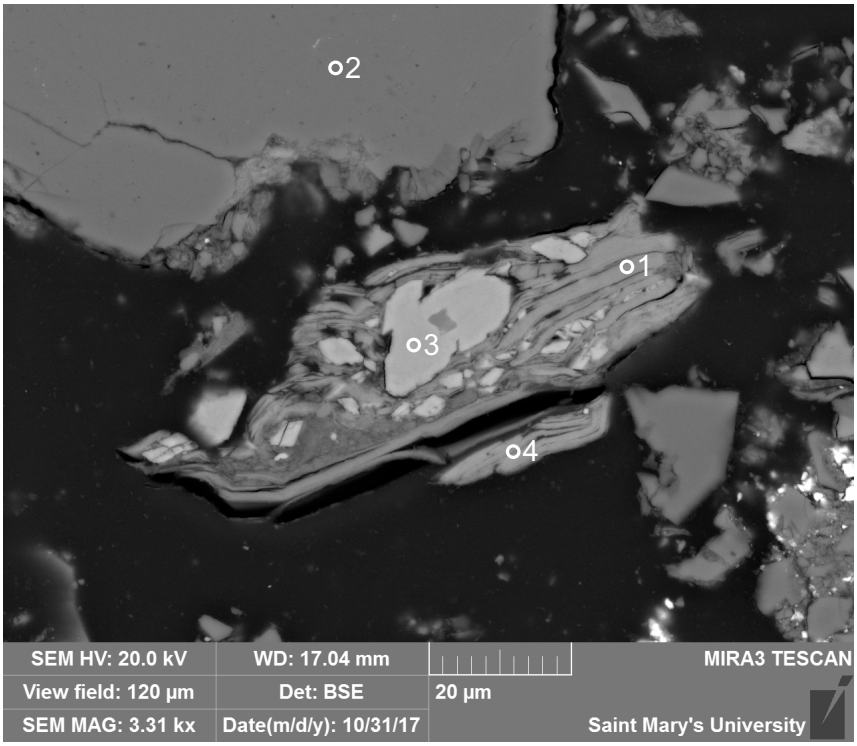
1:Quartz
2:Limonite +
3:Barite
4:Calcite +
5:Kaolinite
6:Calcite

Figure 1C.11: Sample G-24 4401.5B (SEM) site 6. Detrital minerals: Brt, Cal, Kln, Lim. Diagenetic minerals: Qz.



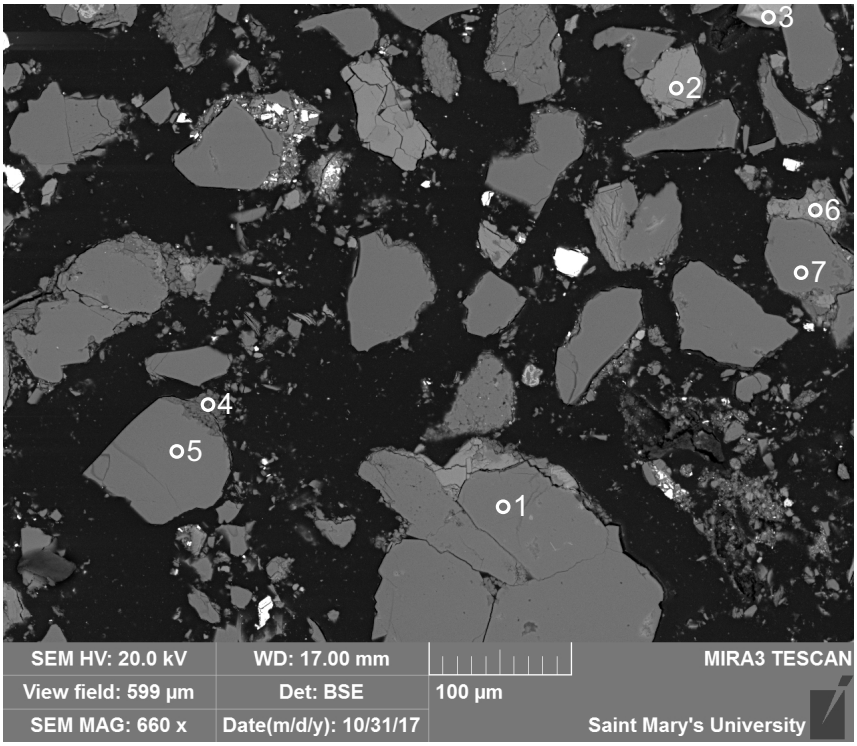
1:Limonite +
2:Calcite
3:Quartz
4:Quartz +
5:Limonite +
6:Limonite +

Figure 1C.12: Sample G-24 4401.5B (SEM) site 6.1. Detrital minerals: Qz. Diagenetic minerals: Cal, Lim. A fragment made up of quartz (4) and limonite (1,5,6).



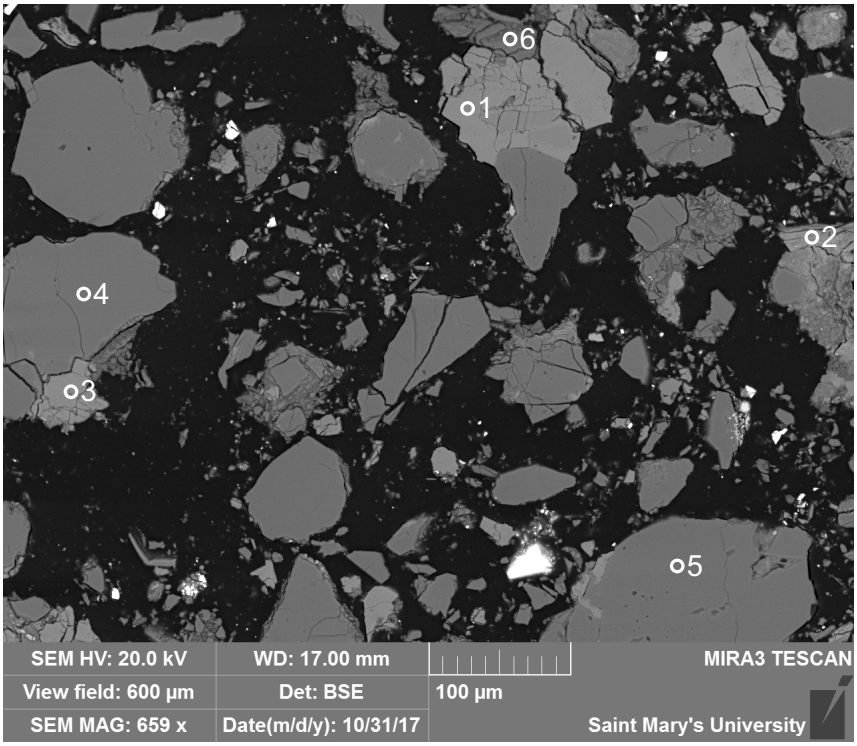
1:Biotite
2:Quartz
3:Siderite
4:Chlorite

Figure 1C.13: Sample G-24 4401.5B (SEM) site 6.2. Detrital minerals: Bt, Qz. Diagenetic minerals: Chl, Sd. Probably a detrital biotite (1) grain partly replaced by siderite (3). The chlorite (4) may also be associated with the alteration of biotite.



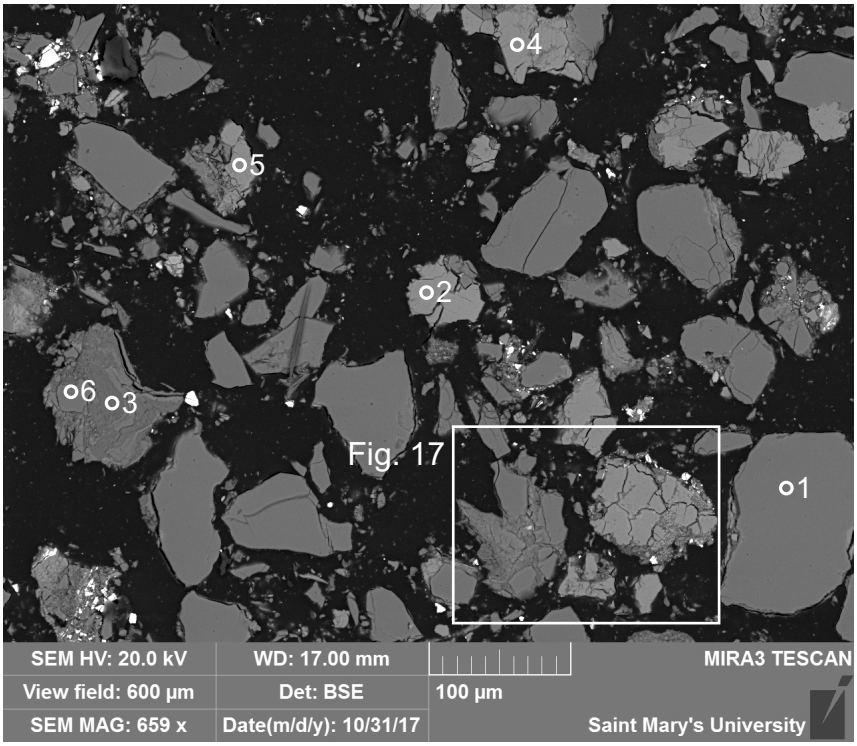
1:Albite
2:Calcite
3:Halite +
4:Kaolinite
5:Quartz
6:Calcite
7:Quartz

Figure 1C.14: Sample G-24 4401.5B (SEM) site 7. Detrital minerals: Ab, Qz. Diagenetic minerals: Cal, Kln. A fragment made up of quartz (5) and kaolinite (4). Another fragment made up of quartz (7) and calcite (6). Halite (3) is probably a contaminant.



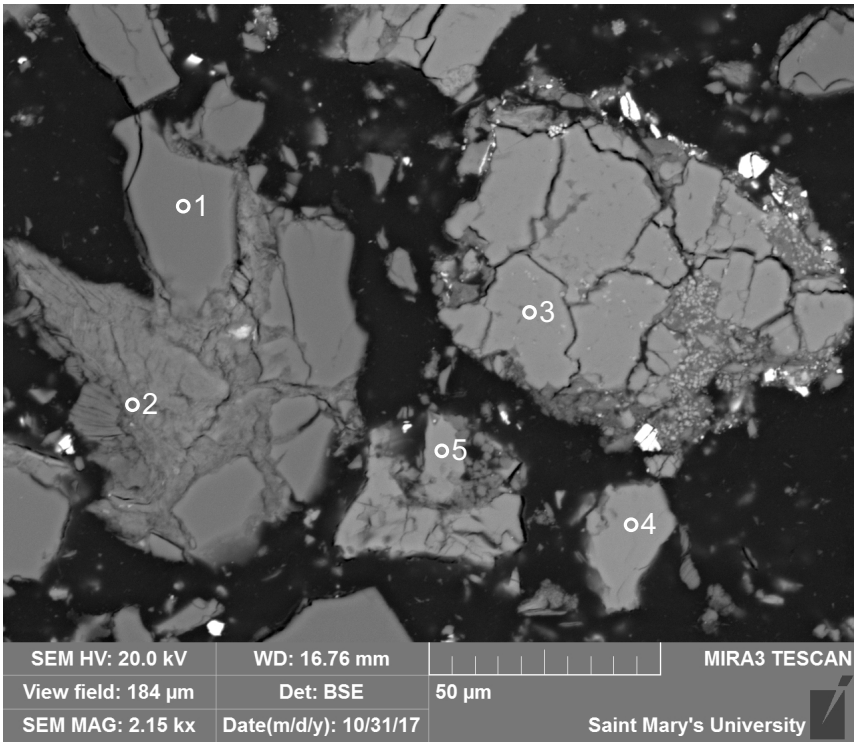
1:Calcite
2:Chlorite +
Muscovite
3:Kaolinite + Calcite
4:Quartz
5:Quartz
6:Kaolinite +

Figure 1C.15: Sample G-24 4401.5B (SEM) site 8. Detrital minerals: Ms, Qz. Diagenetic minerals: Cal, Chl, Kln. A fragment made up of quartz (4) and a mixture of kaolnite and calcite (3).



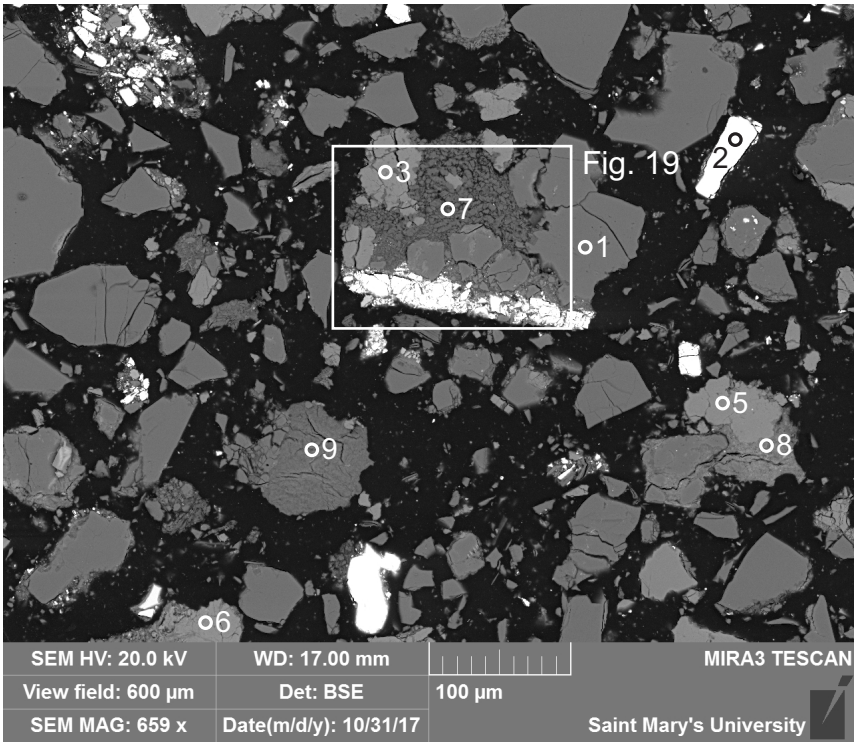
1:Quartz
2:Calcite
3:Kaolinite
4:Calcite
5:Calcite
6:Quartz

Figure 1C.16: Sample G-24 4401.5B (SEM) site 9. Detrital minerals: Qz. Diagenetic minerals: Cal, Kln. A fragment made up of quartz (6) and kaolinite (3).



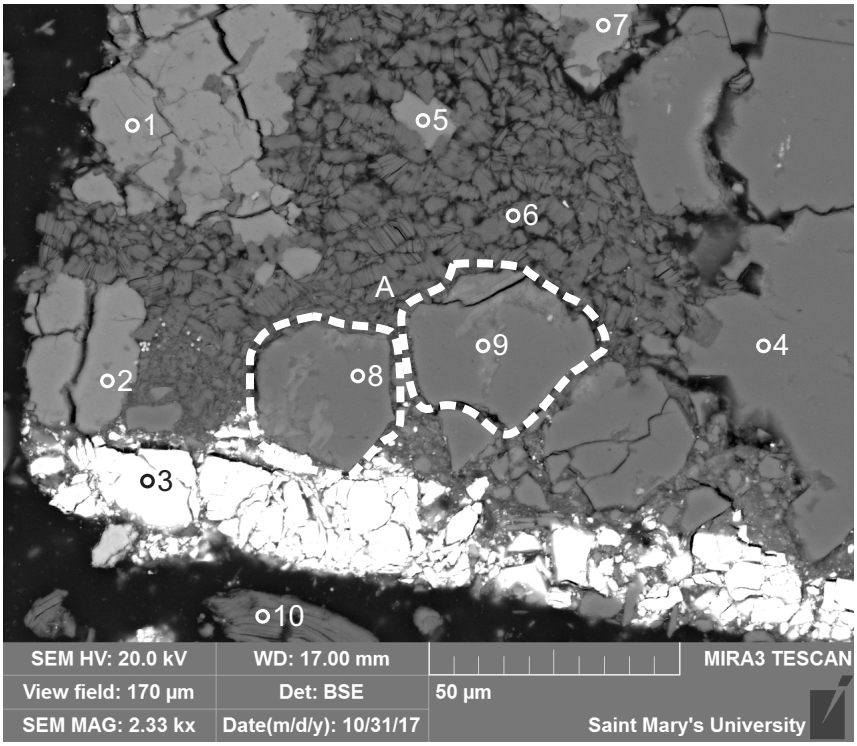
1:Quartz
2:Kaolinite +
K-feldspar
3:Calcite +
4:Calcite
5:Calcite +

Figure 1C.17: Sample G-24 4401.5B (SEM) site 9.1. Detrital minerals: Kfs, Qz. Diagenetic minerals: Cal, Kln. A fragment made up of quartz (1) and kaolinite (2). Several fragments of calcite cement (3-5).



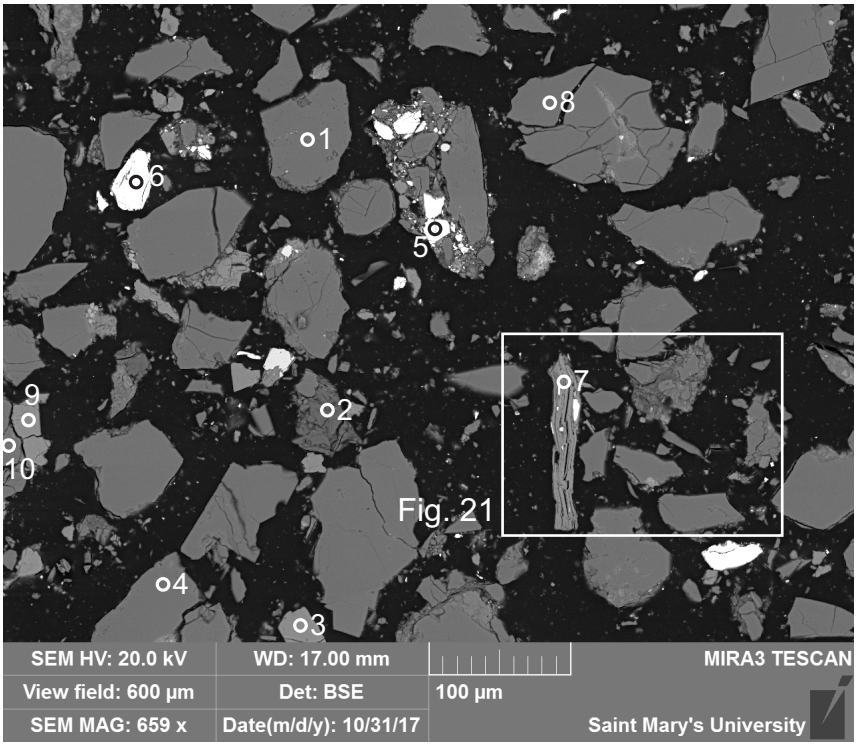
1:Quartz
2:Barite
3:Calcite +
4:Barite
5:Calcite +
6:Calcite +
7:Kaolinite
8:Chlorite +
9:Kaolinite

Figure 1C.18: Sample G-24 4401.5B (SEM) site 10. Detrital minerals: Qz. Diagenetic minerals: Brt, Cal, Kln.



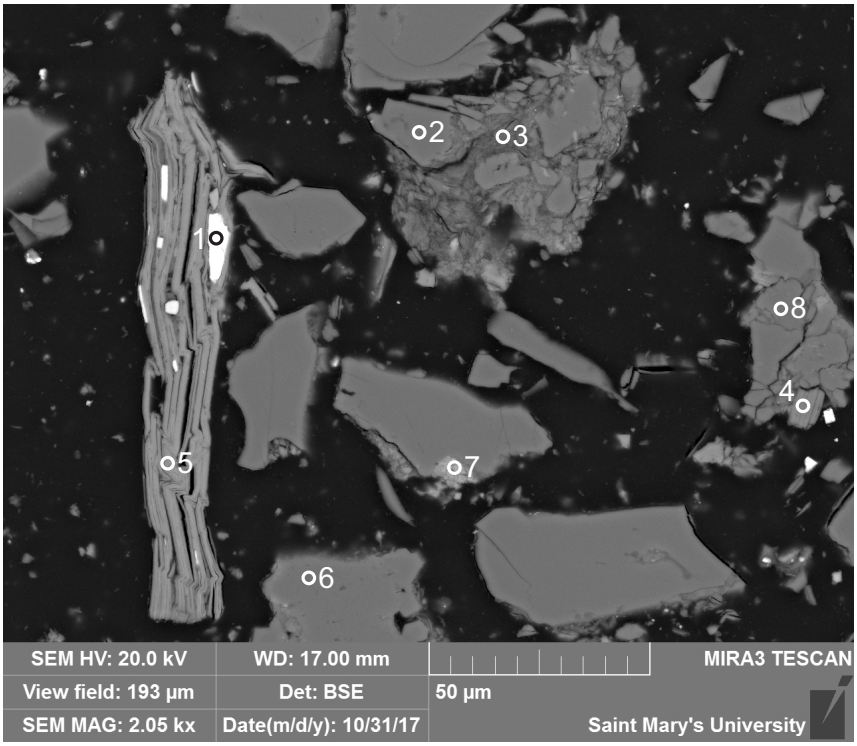
1:Calcite +
2:Calcite
3:Barite
4:Quartz
5:Calcite +
6:Kaolinite
7:Calcite +
8:Quartz
9:K-feldspar +
10:Kaolinite

Figure 1C.19: Sample G-24 4401.5B (SEM) site 10.1. Detrital minerals: Kfs, Qz. Diagenetic minerals: Brt, Ca, Kln. A fragment made up of quartz (4,8), K-feldspar (9), with cements of calcite (1,2), kaolnite (6), and probably cut by a barite (3) vein. The calcite (7,5) postdates the kaolinite (6). Lithic clasts (A) made up of of quartz (8) and K-feldspar (9).



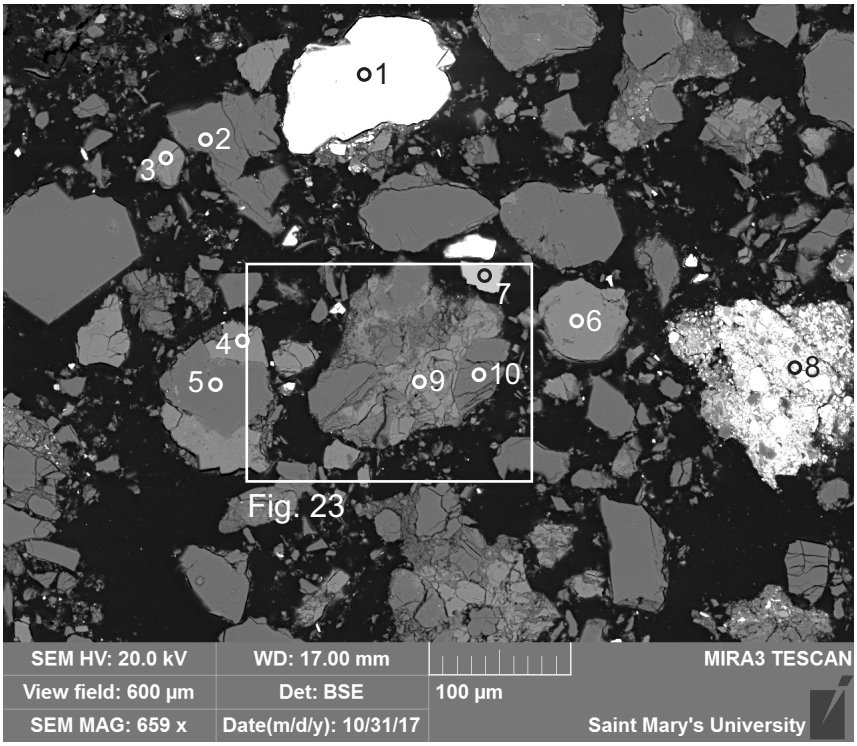
1:Quartz
2:Kaolinite
3:Calcite
4:Quartz
5:Barite
6:Barite
7:Biotite + Chlorite +
8:Quartz
9:Calcite
10:Quartz

Figure 1C.20: Sample G-24 4401.5B (SEM) site 11. Detrital minerals: Bt, Qz. Diagenetic minerals: Brt, Cal, Chl, Kln.



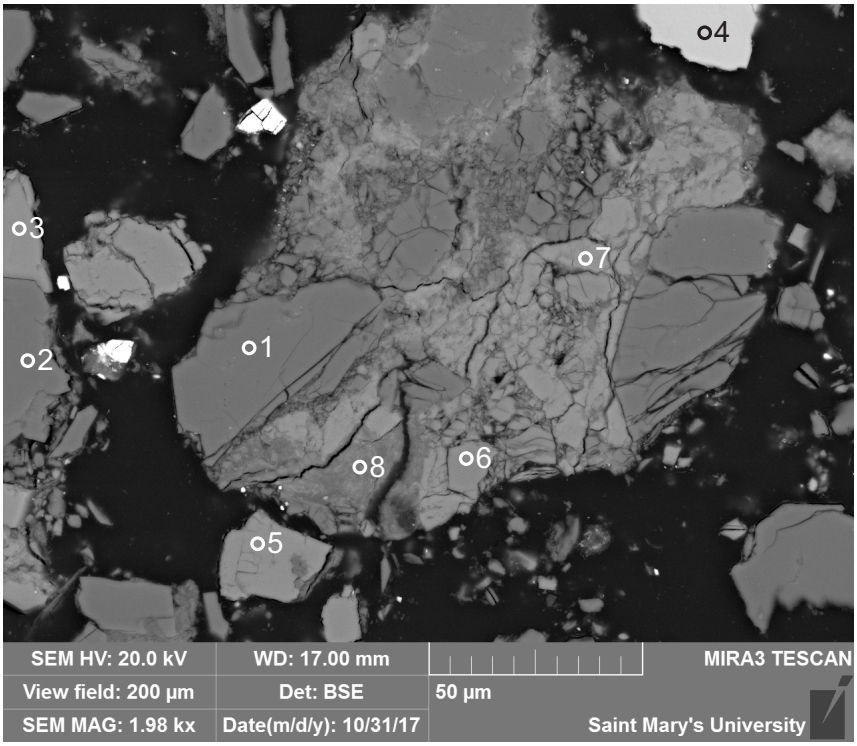
1:Sphalerite
2:Quartz
3:Kaolinite +
4:K-feldspar +
5:Biotite
6:Quartz
7:TiO_2
8:Albite

Figure 1C.21: Sample G-24 4401.5B (SEM) site 11.1. Detrital minerals: Ab, Bt, Kfs, Qz. Diagenetic minerals: Kln, Sp, TiO_2. A detrital grain of biotite (5) with sphalerite (1) precipitating along its cleavage planes. A fragment made up of quartz (2) and kaolinite (3). Another fragment made up of K-feldspar (4) and albite (8).



1:Barite
2:Albite
3:“Biotite”
4:Calcite
5:Quartz
6:Calcite
7:Chromite
8:Barite +
9:Calcite + Chlorite +
10:Quartz

Figure 1C.22: Sample G-24 4401.5B (SEM) site 12. Detrital minerals: Ab, Bt, Chr, Qz. Diagenetic minerals: Brt, Cal, Chl. A fragment made up of quartz (10) and mixtures of calcite+chlorite (9).



1:Quartz
2:Quartz
3:Calcite
4:Chromite
5:Calcite
6:K-feldspar
7:Calcite
8:Kaolinite

Figure 1C.23: Sample G-24 4401.5B (SEM) site 12.1. Detrital minerals: Chr, Kfs, Qz. Diagenetic minerals: Cal, Kln. A fragment made up of quartz (1), K-feldspar (6), calcite (7), kaolinite (8). Another fragment is made up of quartz (2) and calcite (3).

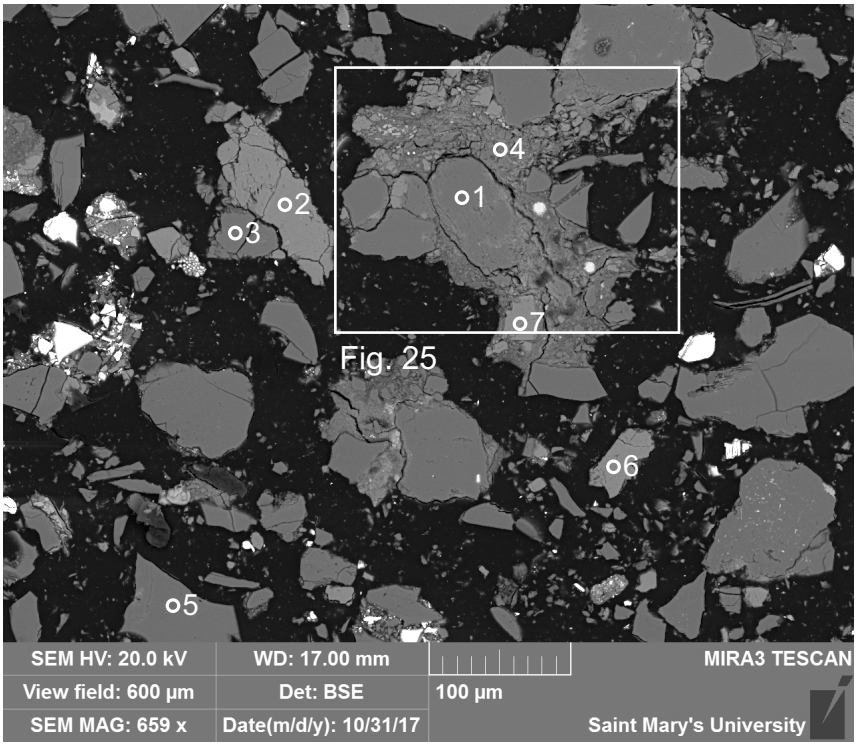


Figure 1C.24: Sample G-24 4401.5B (SEM) site 13. Detrital minerals: Ab, Qz. Diagenetic minerals: Cal. A fragment made up of quartz (1) and calcite (7). Another fragment made up of albite (3) and calcite (2).

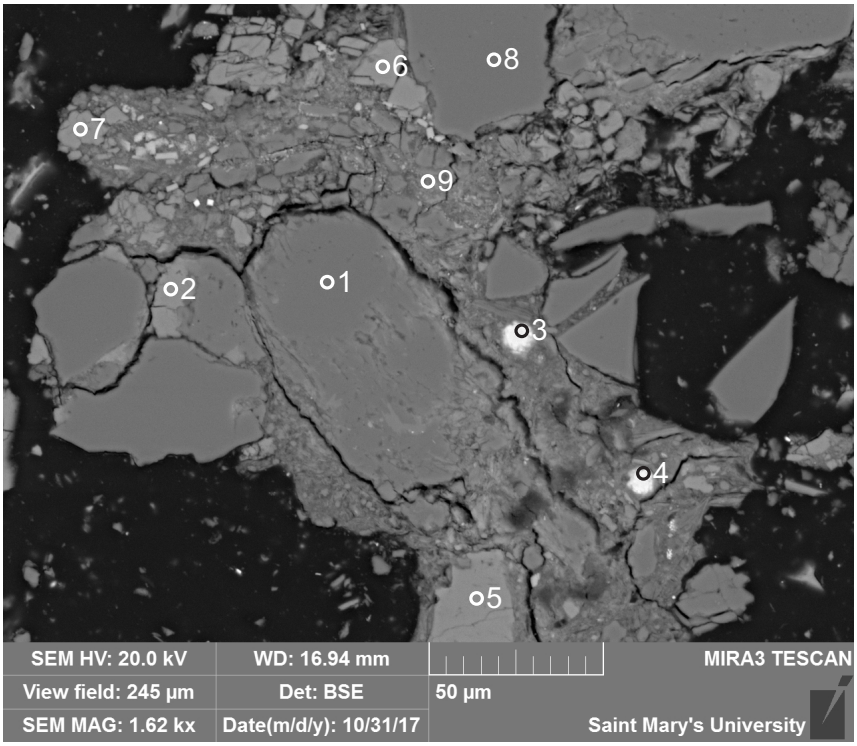
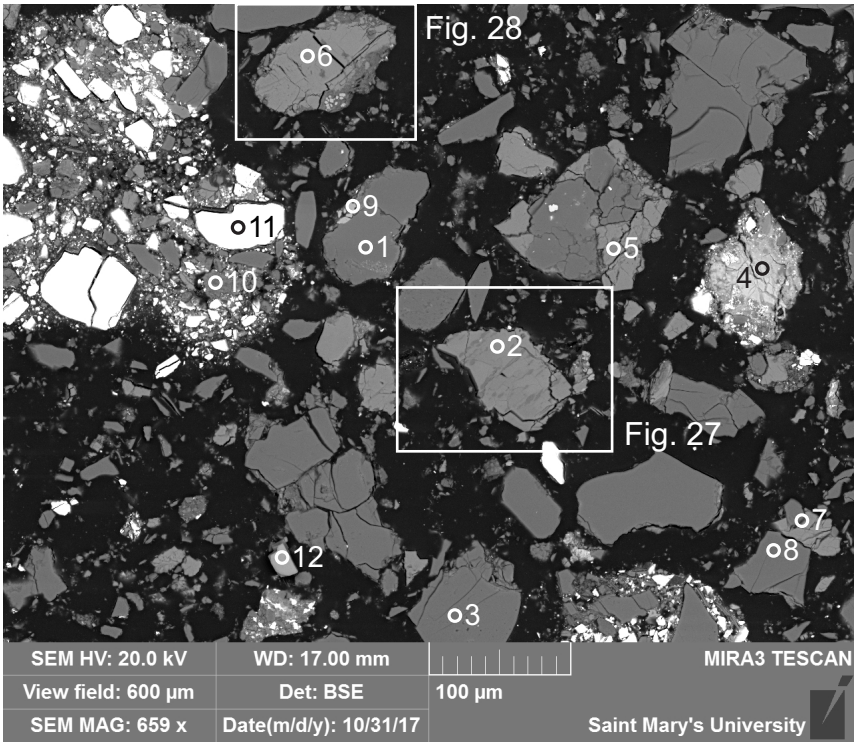
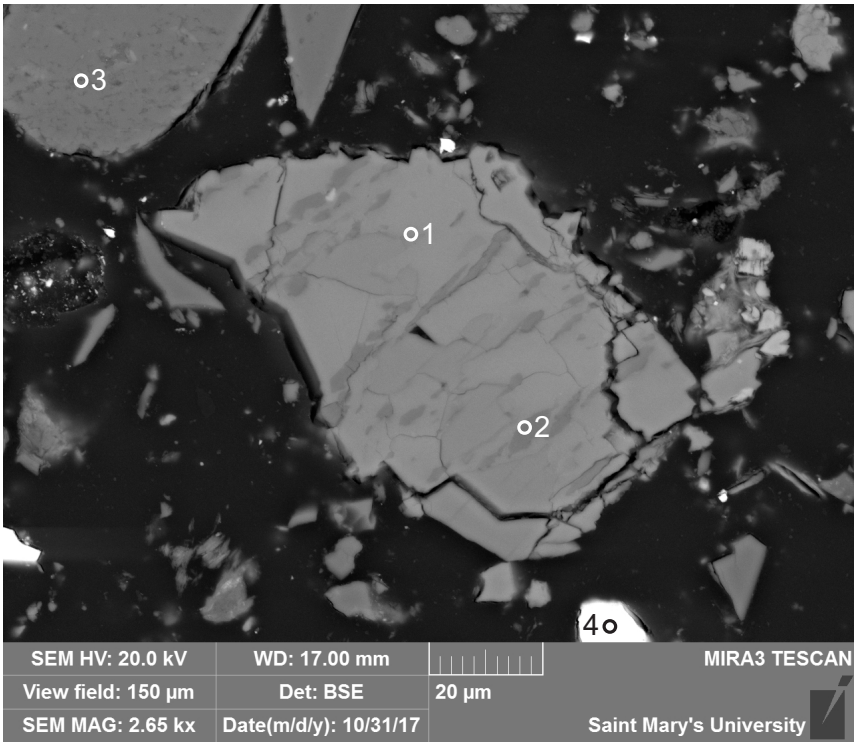


Figure 1C.25: Sample G-24 4401.5B (SEM) site 13.1. Detrital minerals: Qz. Diagenetic minerals: Cal, Py. A fragment made up of quartz (1,8), calcite (2,5,7), late pyrite (3,4) that postdates calcite.



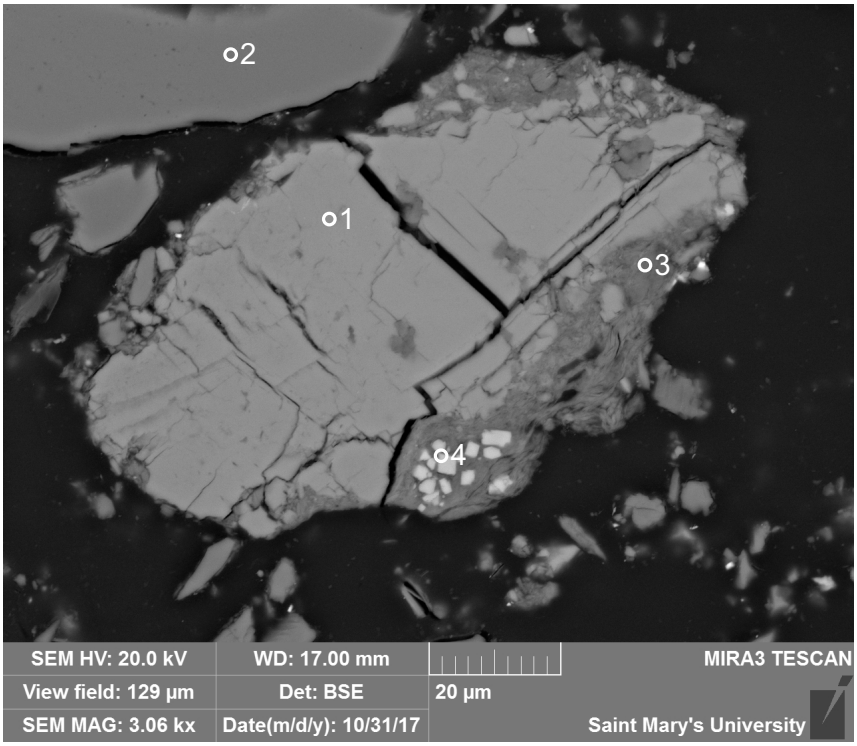
1:Quartz
2:Calcite + K-feldspar
3:Quartz
4:Limonite
5:Calcite
6:Calcite
7:Calcite
8:Quartz
9:TiO_2
10:Quartz +
11:Barite
12:Halite

Figure 1C.26: Sample G-24 4401.5B (SEM) site 14. Detrital minerals: Kfs, Qz. Diagenetic minerals: Brt, Cal, Lim, TiO_2. Halite (12) is probably a contaminant.



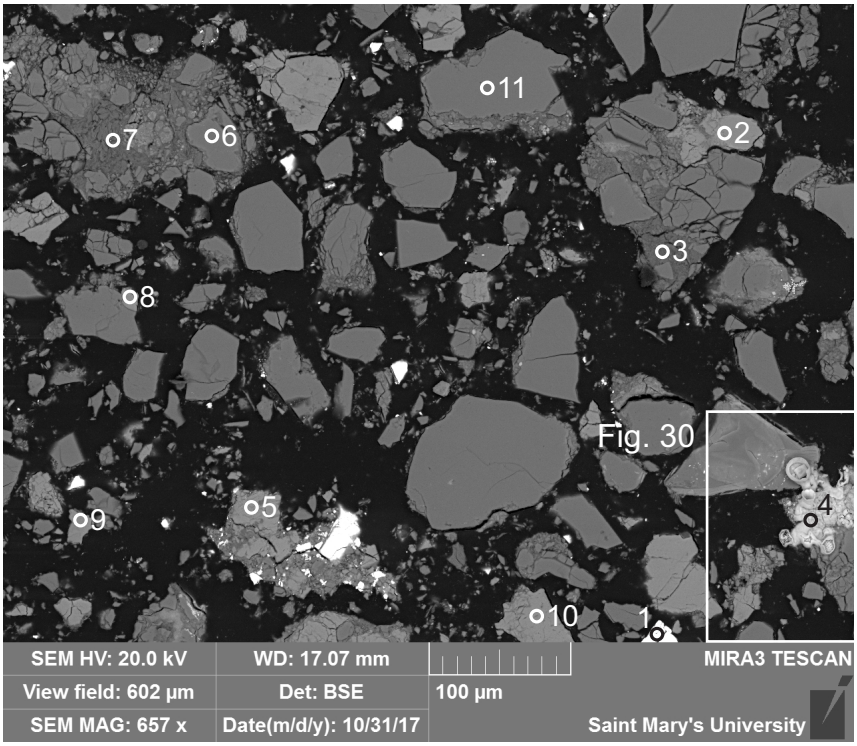
1:K-feldspar + Calcite
2:Albite
3:Quartz +
4:Barite

Figure 1C.27: Sample G-24 4401.5B (SEM) site 14.1. Detrital minerals: Ab, Kfs, Qz. Diagenetic minerals: Brt, Cal. A grain of partly albitized (2) K-feldspar (1) or it may be perthite or it may be both.



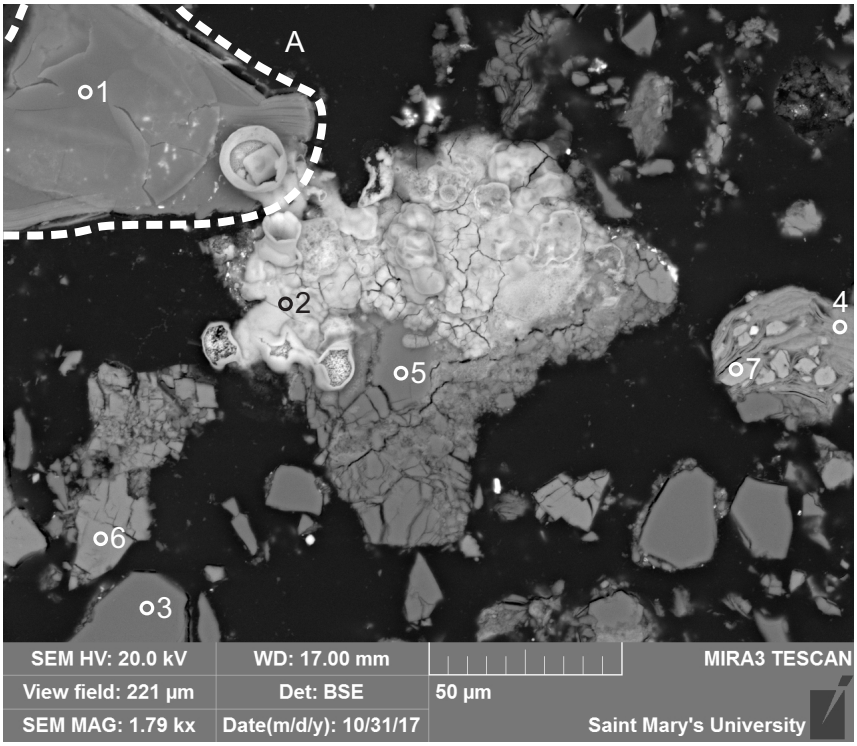
1:Calcite
2:Quartz
3:Kaolinite +
4:TiO_2

Figure 1C.28: Sample G-24 4401.5B (SEM) site 14.2. Detrital minerals: Qz. Diagenetic minerals: Cal, Kln, TiO_2. A fragment of cement made up of calcite (1), kaolinite (3), and diagenetic TiO_2 (4) that also postdates the kaolnite.



1:Barite
2:Calcite
3:Kaolinite +
4:Limonite
5:Calcite
6:Quartz
7:Kaolinite
8:Calcite + Chlorite
9:Calcite
10:Calcite
11:Quartz

Figure 1C.29: Sample G-24 4401.5B (SEM) site 15. Detrital minerals: Qz. Diagenetic minerals: Brt, Cal, Kln, Lim. A fragment of cement made up of calcite (2) and kaolinite. calcite postdates kaolnite. Another fragment consists of quartz (6) and kaolinite (7).



1:Quartz +
2:Limonite +
3:Quartz
4:Chlorite
5:Albite
6:Calcite
7:Limonite

Figure 1C.30: Sample G-24 4401.5B (SEM) site 15.1. Detrital minerals: Ab, Qz. Diagenetic minerals: Cal, Chl, Lim. A fragment made up of detrital quartz (1), albite (5), probably diagenetic and colloidal limonite (2,7). A probable lithic clast (A) made up of quartz (1) and muscovite or chlorite.

Table 1C.1: SEM-EDS cemical analyses of minerals from sample G-24 4401.5B.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	ZnO	SrO	BaO	Yb_2O_3	WO_3	Total	Actual Total
1	1	Qz	100.00																				100	120
1	2	Ms	46.87	0.92	32.06	3.70		0.60		0.53	10.32												95	105
1	3	Cal	2.09		1.57	1.24	0.44		50.66														56	59
1	4	Qz	100.00																				100	122
1	5	Qz	100.00																				100	119
1	6	Brt											37.31						1.14	61.70			100	117
1	7	Ms	48.25		31.24	3.34		2.15	0.48	0.42	9.13												95	113
1	8	Qz	100.00																				100	121
1	9	Cal	0.67			1.14	0.35	0.32	53.52														56	56
1	10	Olig	65.56		21.35				3.29	9.80													100	118
1	11	Cal	1.29		0.74	2.45	0.59	0.40	50.53														56	58
2	1	Qz	100.00																				100	118
2	2	Kln	48.69		37.31																		86	95
2	3	Chl + Ms	42.20		24.54	23.58		3.47	2.07		3.96				0.17								100	99
2	4	Ab	69.32		18.80				0.21	11.67													100	121
2	5	Qz	100.00																				100	120
2	6	Brt											36.41						1.33	62.32			100	113
2	7	Kln	47.64		35.98	0.61			1.56						0.21								86	81
2	8	Qz	99.11		0.59	0.30																	100	118
2	9	Cal				1.22	0.25		54.53														56	55
2	10	Kln	47.02	0.22	34.65	2.40		0.71	0.26		0.75												86	91
2	11	Qz	100.00																				100	117
3	1	Qz	100.00																				100	118
3	2	Cal +	0.69			1.71	0.73	0.34	52.54														56	55
3	3	Brt											36.76						1.35	61.97			100	115
3	4	Brt	3.28		0.78	10.49			1.85				32.20		0.36					51.04			100	101
3	5	Cal +	5.23		3.21	4.08		0.80	42.45		0.24												56	60
3	6	Cal +	1.15		0.64	1.94	0.60	0.34	51.31														56	57
3	7	Ab	69.26		18.95				0.20	11.59													100	117
3	8	Cal + Kfs	6.37		1.75	0.85			45.84		1.18												56	61
3	9	Ab	69.70		18.51					11.80													100	116
3	10	Ms +	36.01		18.68	20.12		3.18	7.99	0.42	2.85	5.45			0.30								95	79
3.1	1	Ab	69.41		18.72					11.87													100	117
3.1	2	Kln	49.13	0.22	36.65																		86	91
3.1	3	Qz	100.00																				100	118
3.1	4	Py	0.36			28.27							71.37										100	219
3.1	5	Kln	48.87		36.93				0.20														86	97
3.1	6	Cal	1.05		0.61	2.15	0.69	0.31	51.18														56	57

Table 1C.1: SEM-EDS cemical analyses of minerals from sample G-24 4401.5B.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	ZnO	SrO	BaO	Yb_2O_3	WO_3	Total	Actual Total
3.1	7	Cal	0.67			1.66	0.35		53.32														56	55
3.1	8	Ms + Chl	52.85	0.60	26.11	10.62		2.38	3.45		3.61				0.39								100	80
3.1	9	Qz +	96.12		1.63	1.41		0.53	0.27		0.05												100	109
4	1	Qz	100.00																				100	121
4	2	Brt											36.81						1.42	61.90			100	114
4	3	Kln + Ap	36.93		29.98	1.87			13.00	0.37		13.78		4.07									100	103
4	4	Cal	0.52			1.10	0.51		53.87														56	55
4	5	Kfs + Cal	25.62		7.40	1.52	0.37		59.76	1.03	4.29												100	73
4	6	Qz	100.00																				100	117
4.1	1	Qz	100.00																				100	120
4.1	2	Kln	47.40		34.03	2.20		0.37	0.92		0.86				0.22								86	88
4.1	3	Sd + Chl	4.80		2.91	76.84	1.78	8.46	4.76		0.45												100	62
4.1	4	Kln + Kfs	44.60		29.18	6.54		0.89	2.44		2.03				0.32								86	73
4.1	5	Sd	5.44		3.20	39.45	0.97	4.37	2.30		0.26												56	66
5	1	Qz	100.00																				100	117
5	2	Cal				1.33		0.31	54.36														56	55
5	3	Cal +	6.82		5.33	4.92	0.30	0.64	37.84		0.15												56	64
5	4	Qz	100.00																				100	115
5	5	Lim +	4.66	0.43	0.62	84.58	1.34		5.42						2.95								100	76
5	6	Qz	100.00																				100	119
5	7	Mix	30.02		21.80	25.75		2.81	18.97		0.64												100	81
5	8	Qz	100.00																				100	117
5	9	Brt											36.71						1.40	61.94			100	111
5	10	Qz	100.00																				100	115
5	11	Chl + Ms	35.45	1.63	20.92	17.73		4.22	0.80		4.25												85	75
5.1	1	Qz	100.00																				100	118
5.1	2	Brt				0.38							36.89						1.45	61.38			100	111
5.1	3	Lim +	9.29		0.68	77.26	1.72		6.00						3.01	0.88	1.17						100	75
5.1	4	Olig	66.69		20.64	0.28			2.44	9.70	0.25												100	115
5.1	5	Qz +	93.25			5.60			0.74						0.40								100	109
5.1	6	Brt				0.57			0.80				36.78							59.04		2.86	100	110
5.1	7	Kfs +	64.37		16.37	1.64			1.46	0.30	13.67		0.75		0.15					1.29			100	113
5.2	1	Qz	100.00																				100	120
5.2	2	TiO_2 +	1.63	96.26	0.82	1.28																	100	98
5.2	3	TiO_2 +	1.19	97.64		0.89			0.28														100	103
5.2	4	Ms	48.95	0.61	33.64	1.16		0.76		0.50	9.38												95	107
5.2	5	Mix	61.30	1.34	19.59	7.07		1.40	5.91	0.35	2.86				0.19								100	88
6	1	Qz	100.00																				100	116

Table 1C.1: SEM-EDS cemical analyses of minerals from sample G-24 4401.5B.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	ZnO	SrO	BaO	Yb_2O_3	WO_3	Total	Actual Total
6	2	Lim +	9.52			81.47			3.25	1.26					3.34	0.60	0.56						100	75
6	3	Brt											36.51						1.51	62.02			100	113
6	4	Cal +	7.12		2.07	1.58	0.48		44.23	0.30	0.21												56	61
6	5	Kln	48.04		36.82	0.21			0.30		0.64												86	89
6	6	Cal				1.65	0.27	0.30	53.78														56	55
6.1	1	Lim +	3.73			87.76			3.07	1.42					4.02								100	77
6.1	2	Cal	0.67			1.73	0.40		53.21														56	55
6.1	3	Qz	99.79			0.21																	100	117
6.1	4	Qz +	98.67			1.33																	100	118
6.1	5	Lim +	9.58		0.91	77.31	0.95		2.55	2.41					6.28								100	71
6.1	6	Lim +	6.24			84.57	0.39		2.98	1.11			0.81		3.09	0.39	0.42						100	76
6.2	1	Bt	41.21	3.07	21.00	16.36		11.65	0.48		6.24												100	100
6.2	2	Qz	100.00																				100	117
6.2	3	Sd				45.83	0.41	6.46	3.29														56	60
6.2	4	Chl	33.10	1.61	18.09	24.23	0.28	5.04	0.67	0.33	1.31				0.32								85	90
7	1	Ab	69.65		18.61					11.73													100	118
7	2	Cal	0.78		0.34	1.80	0.69	0.32	52.07														56	55
7	3	Hl +	2.39						0.94	35.09				0.61	60.97								100	86
7	4	Kln	48.92		36.64				0.29						0.15								86	83
7	5	Qz	100.00																				100	119
7	6	Cal	1.24		0.73	1.86	0.31		51.84														56	57
7	7	Qz	100.00																				100	119
8	1	Cal				2.18	0.37	0.46	52.99														56	54
8	2	Chl + Ms	31.39	1.20	18.73	21.56		7.23	0.77	0.32	2.71		0.93		0.16								85	94
8	3	Kln + Cal	35.19		27.48	0.86			36.47														100	74
8	4	Qz	100.00																				100	116
8	5	Qz	100.00																				100	120
8	6	Kln +	46.17		33.52	4.15		0.76	0.83	0.31	0.11				0.15								86	94
9	1	Qz	100.00																				100	122
9	2	Cal				1.30			54.70														56	56
9	3	Kln	48.59		37.41																		86	96
9	4	Cal				1.37	0.27		54.36														56	55
9	5	Cal				1.22	0.29		54.49														56	55
9	6	Qz	100.00																				100	119
9.1	1	Qz	100.00																				100	125
9.1	2	Kln + Kfs	46.08		30.42	3.72		1.43	1.87	0.28	2.05				0.17								86	97
9.1	3	Cal +	1.19		0.57	1.34	0.58		52.32														56	60
9.1	4	Cal				2.17	0.38	0.35	53.10														56	60

Table 1C.1: SEM-EDS cemical analyses of minerals from sample G-24 4401.5B.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	ZnO	SrO	BaO	Yb_2O_3	WO_3	Total	Actual Total
9.1	5	Cal +	1.29		0.84	1.56	0.35	0.30	51.66														56	59
10	1	Qz	100.00																				100	119
10	2	Brt											36.66						1.59	61.79			100	113
10	3	Cal +	1.47		0.96	1.94	0.48	0.30	50.84														56	57
10	4	Brt											37.57							62.49			100	101
10	5	Cal +	1.17		0.58	1.48	0.55		52.09		0.13												56	58
10	6	Cal +	1.33		0.68	1.57	0.52	0.32	51.36						0.24								56	58
10	7	Kln	46.04		35.89				1.51					2.07	0.49								86	54
10	8	Chl +	39.76	2.09	24.77	12.36		1.79	1.08	0.41	2.53				0.21								85	91
10	9	Kln	46.40		34.58	3.54		0.60	0.76		0.12												86	95
10.1	1	Cal +	2.32		1.00	1.55	0.71	0.31	49.93		0.18												56	58
10.1	2	Cal	0.47			1.38	0.39		53.75														56	56
10.1	3	Brt											36.29						2.36	61.43			100	113
10.1	4	Qz	100.00																				100	120
10.1	5	Cal +	4.39		3.15	1.08	0.31		47.08														56	58
10.1	6	Kln	49.05		36.56				0.40														86	97
10.1	7	Cal +	2.30		1.08	1.69	0.57	0.44	49.75		0.17												56	58
10.1	8	Qz	100.00																				100	121
10.1	9	Kfs +	58.67	0.38	24.70	3.81		2.91			9.52												100	109
10.1	10	Kln	48.36	0.24	35.75	0.58			0.84						0.23								86	82
11	1	Qz	100.00																				100	118
11	2	Kln	48.84		36.82				0.34														86	91
11	3	Cal				1.20	0.28		54.52														56	56
11	4	Qz	100.00																				100	122
11	5	Brt			0.53								36.66							60.96		2.01	100	113
11	6	Brt											36.89						1.90	61.24			100	113
11	7	Bt + Chl +	43.23	2.86	22.91	15.78	0.40	9.17	0.40		5.25												100	102
11	8	Qz	100.00																				100	120
11	9	Cal				1.53		0.35	54.11														56	55
11	10	Qz	100.00																				100	118
11.1	1	Sp	0.24			0.86							50.59					48.32					100	189
11.1	2	Qz	100.00																				100	119
11.1	3	Kln +	42.21		30.91	6.35		4.78	1.26		0.15				0.35								86	79
11.1	4	Kfs +	56.12	0.29	26.49	3.67		3.52			9.91												100	104
11.1	5	Bt	42.14	3.35	20.18	16.78	0.39	10.08	0.44		6.63												100	101
11.1	6	Qz	100.00																				100	121
11.1	7	TiO_2 +	2.64	89.57	1.37	5.17			1.25														100	87
11.1	8	Ab	70.42		18.78					10.80													100	116

Table 1C.1: SEM-EDS cemical analyses of minerals from sample G-24 4401.5B.

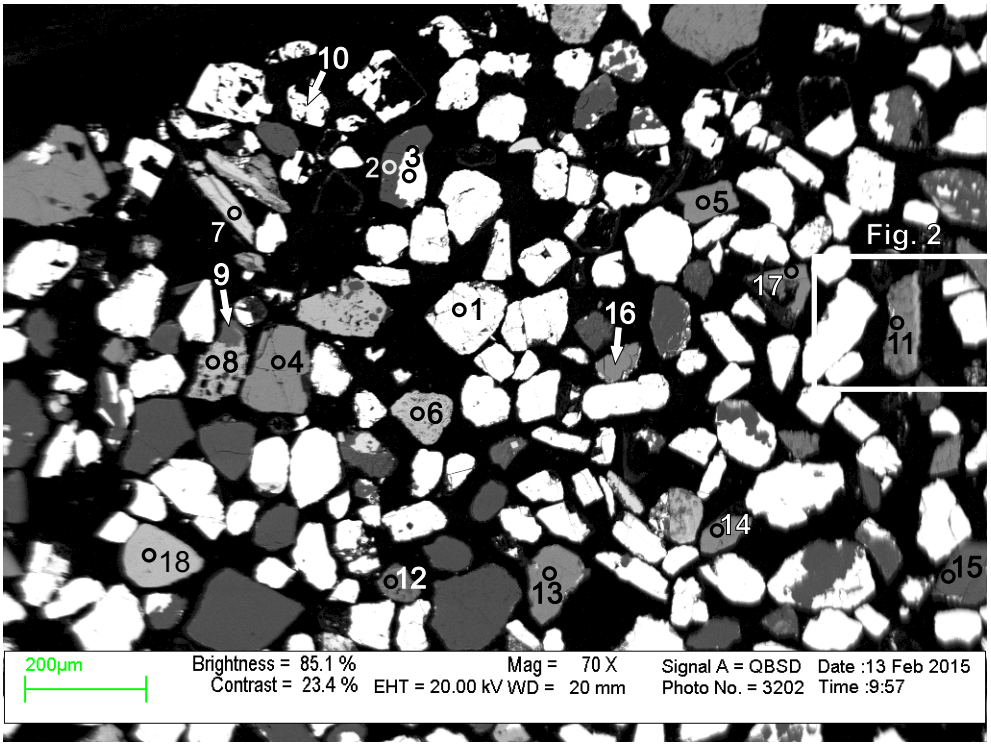
Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	ZnO	SrO	BaO	Yb_2O_3	WO_3	Total	Actual Total
12	1	Brt											36.65							63.48			100	110
12	2	Ab	67.73		20.25					10.96	1.07												100	114
12	3	"Bt"	56.69		13.67	17.26		3.07	0.49		8.82												100	100
12	4	Cal				0.62			55.38														56	56
12	5	Qz	100.00																				100	119
12	6	Cal				1.22	0.43		54.35														56	56
12	7	Chr		0.72	11.10	27.04		10.09	0.32								50.72						100	105
12	8	Brt +	6.88		2.77	1.16		0.43	4.32		0.40		26.25							57.79			100	93
12	9	Cal + Chl +	10.98	4.89	8.45	11.13		1.42	62.38		0.51				0.24								100	67
12	10	Qz	100.00																				100	110
12.1	1	Qz	100.00																				100	120
12.1	2	Qz	100.00																				100	120
12.1	3	Cal				0.77			55.23														56	56
12.1	4	Chr	0.95	0.78	11.06	27.63		9.91	0.40								49.27						100	106
12.1	5	Cal	1.29		0.83	1.43	0.31		52.14														56	56
12.1	6	Kfs	65.67		17.81					0.73	14.85									0.95			100	115
12.1	7	Cal	0.57			0.77	0.24		54.43														56	55
12.1	8	Kln	42.98		31.68	8.94		0.77	1.35						0.28								86	90
13	1	Qz	100.00																				100	118
13	2	Cal +	1.45		1.02	1.58	0.57		51.39														56	57
13	3	Ab	68.48		19.90					11.02	0.61												100	116
13	4	Mix	46.37	2.13	15.78	4.48		0.89	13.35	4.18	2.14	10.41			0.25								100	96
13	5	Qz	100.00																				100	120
13	6	Cal	0.43			1.10	0.37		54.10														56	56
13	7	Cal +	2.34		0.97	1.41	0.58	0.34	50.07		0.29												56	59
13.1	1	Qz	100.00																				100	119
13.1	2	Cal +	1.14		0.48	1.86	0.62	0.34	51.56														56	57
13.1	3	Py	0.29			28.43				0.42			70.86										100	220
13.1	4	Py	0.44			28.19			0.26	0.24			70.87										100	219
13.1	5	Cal +	4.03		2.00	1.76	0.60	0.46	46.74		0.41												56	61
13.1	6	Cal				1.35	0.60		54.05														56	55
13.1	7	Cal	0.88		0.38	1.47	0.57	0.32	52.39														56	56
13.1	8	Qz	100.00																				100	120
13.1	9	Mix	43.69	3.68	15.42	3.91		1.04	15.10	3.25	2.34	11.31			0.26								100	94
14	1	Qz	100.00																				100	120
14	2	Cal + Kfs	15.30		4.25	3.49	0.46	0.60	72.94		2.96												100	67
14	3	Qz	100.00																				100	120
14	4	Lim +	0.87			92.20			3.22						3.72								100	76

Table 1C.1: SEM-EDS cemical analyses of minerals from sample G-24 4401.5B.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	ZnO	SrO	BaO	Yb_2O_3	WO_3	Total	Actual Total
14	5	Cal	1.47		0.68	2.26	0.35		51.24														56	58
14	6	Cal	0.48		0.34	1.13	0.34		53.71														56	55
14	7	Cal				1.48	0.27	0.31	53.93														56	58
14	8	Qz	100.00																				100	120
14	9	TiO_2 +	6.52	85.32	3.16	2.78		1.27	0.39	0.57													100	100
14	10	Qz +	94.99		2.84	1.02			0.62	0.28	0.07				0.18								100	111
14	11	Brt											37.73						4.25	58.22			100	115
14	12	Hl	0.41						0.50	45.41				0.58	53.10								100	135
14.1	1	Kfs + Cal	53.35		13.74	0.36			19.48	0.32	12.75												100	96
14.1	2	Ab	66.95		17.50				4.79	10.59	0.16												100	113
14.1	3	Qz +	91.69		3.52	4.10		0.44			0.25												100	115
14.1	4	Brt											36.47						1.70	61.84			100	115
14.2	1	Cal	0.89		0.44	1.38	0.52	0.32	52.44														56	57
14.2	2	Qz	100.00																				100	120
14.2	3	Kln +	47.60	0.28	32.00	1.87		0.67	1.63		1.77				0.19								86	83
14.2	4	TiO_2 +	4.97	89.46	3.02	0.76			1.17		0.62												100	107
15	1	Brt											36.35						1.09	62.69			100	116
15	2	Cal	1.34		0.51	2.07	0.36	0.40	51.32														56	58
15	3	Kln +	47.21		33.11	2.86		0.75	1.33	0.28	0.20				0.26								86	84
15	4	Lim +	6.55		1.37	81.46	0.71		3.14	1.72	0.54				4.51								100	74
15	5	Cal				1.30	0.28		54.42														56	56
15	6	Qz	100.00																				100	119
15	7	Kln	48.80		36.79				0.41														86	89
15	8	Cal + Chl	10.75		7.55	3.17	0.57	0.58	77.38														100	60
15	9	Cal	0.61			1.45	0.25		53.69														56	57
15	10	Cal				1.29	0.32		54.39														56	55
15	11	Qz	100.00																				100	122
15.1	1	Qz +	90.27		2.41	5.98				0.64	0.45				0.25								100	114
15.1	2	Lim +	6.61		1.66	82.53			1.19	0.96	0.36				6.69								100	77
15.1	3	Qz	100.00																				100	120
15.1	4	Chl	30.23	1.84	17.57	25.89		7.19	1.17	0.37	0.43				0.29								85	95
15.1	5	Ab	69.52		18.54	0.30				11.63													100	118
15.1	6	Cal				1.86	0.38	0.32	53.44														56	57
15.1	7	Sd	0.60			46.90	1.37	6.26	0.87														56	63

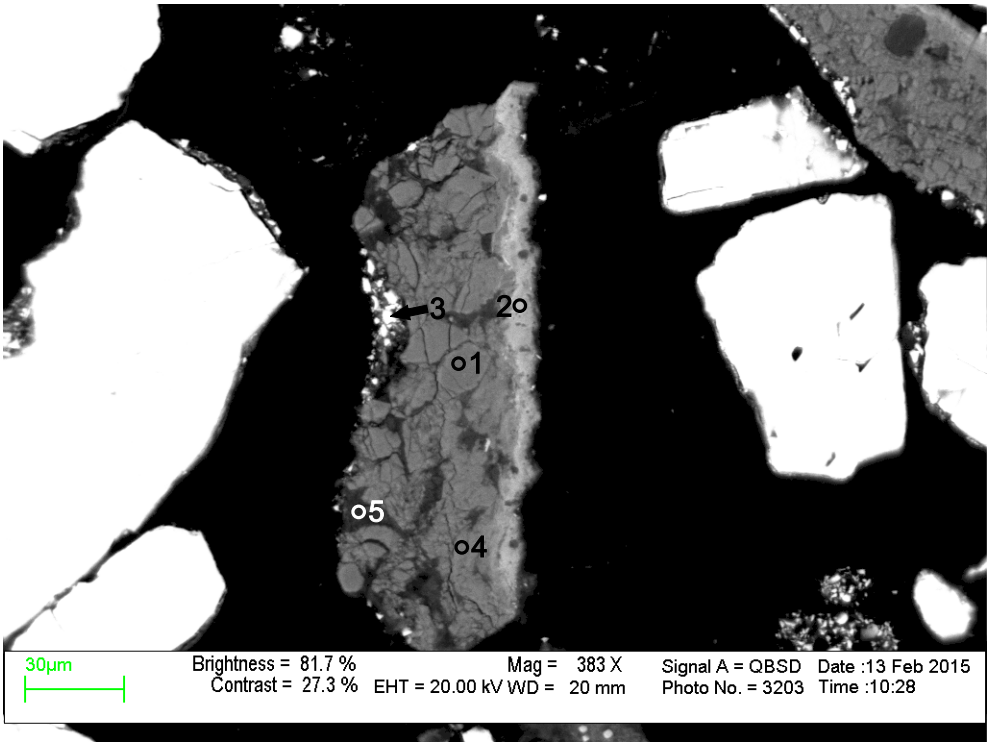
Notes: Lim = Fe-oxide/hydroxide, "mineral" = altered mineral

Appendix 1D: SEM-BSE images and EDS mineral analyses for sample G-24 5505



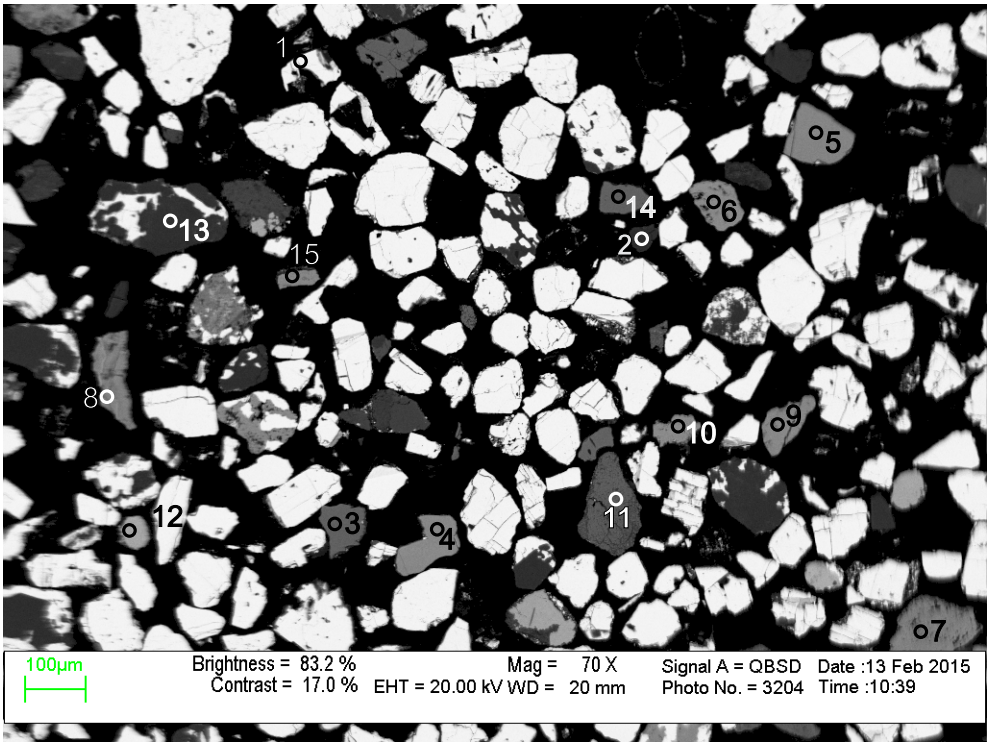
1:Barite
2:Quartz
3:Barite
4:Fluorite
5:Fluorite
6:Feohy
7:Feohy
8:Feohy
9:Muscovite
10:Barite
11:Siderite +
12:Siderite +
13:Fluorite
14:Fluorite
15:Ankerite
16:Fluorite
17:Fluorite
18:Feohy

Figure 1D.1: Annapolis G-24 5505 (SEM) site 1. A cutting made up of muscovite (9) and Feohy (magnetite)(8). Feohy (7) is possibly a contaminant.



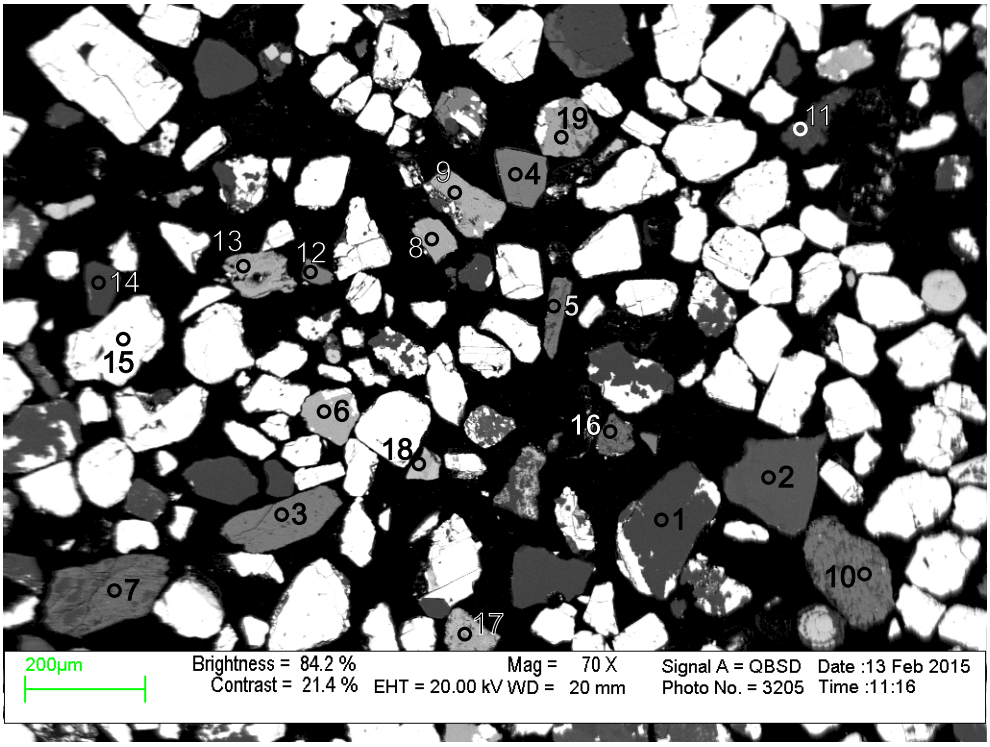
1:Siderite
2:Siderite + Kaolinite
3:Barite +
4:Siderite +
5:Kaolnite + Muscovite

Figure 1D.2: Annapolis G-24 5505 (SEM) site 2. A cutting made of siderite (1,4), kaolinite (2), and muscovite (5).



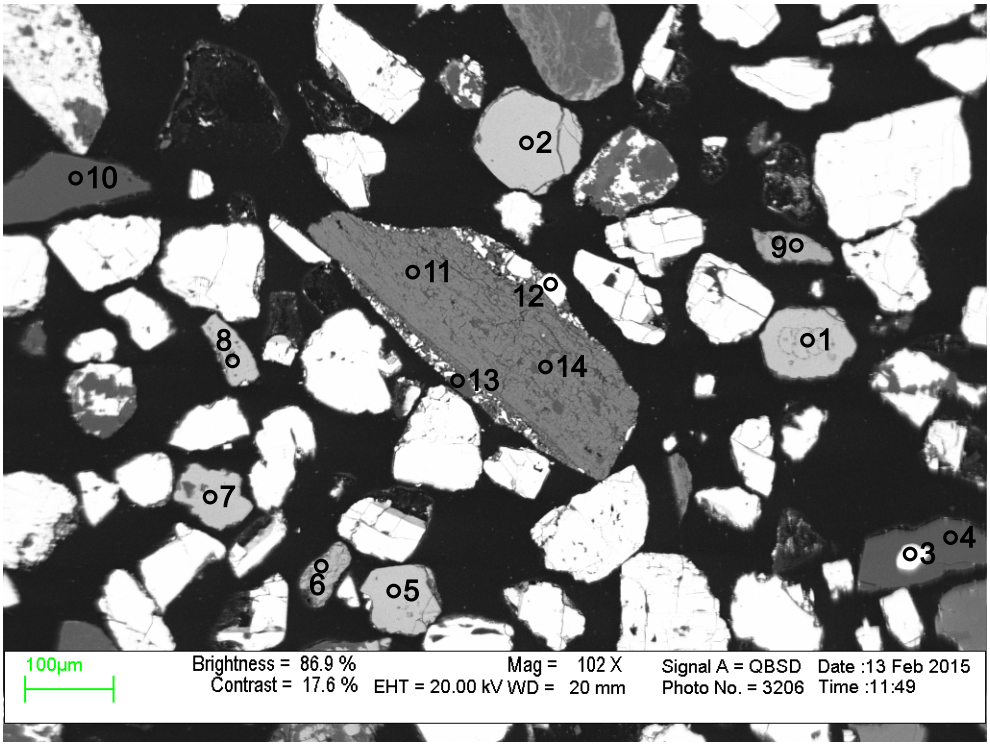
1:Barite
2:Quartz
3:Fluorite
4:Feohy +
5:Zincite
6:Feohy +
7:Feohy +
8:Feohy +
9:Feohy + Quartz
10:Feohy +
11:Siderite + Chlorite
12:Pyrite
13:Quartz
14:Fluorite
15:Feohy + Quartz

Figure 1D.3: Annapolis G-24 5505 (SEM) site 3. Grains of Feohy (7-9) appear to be either detrital or diagenetic.



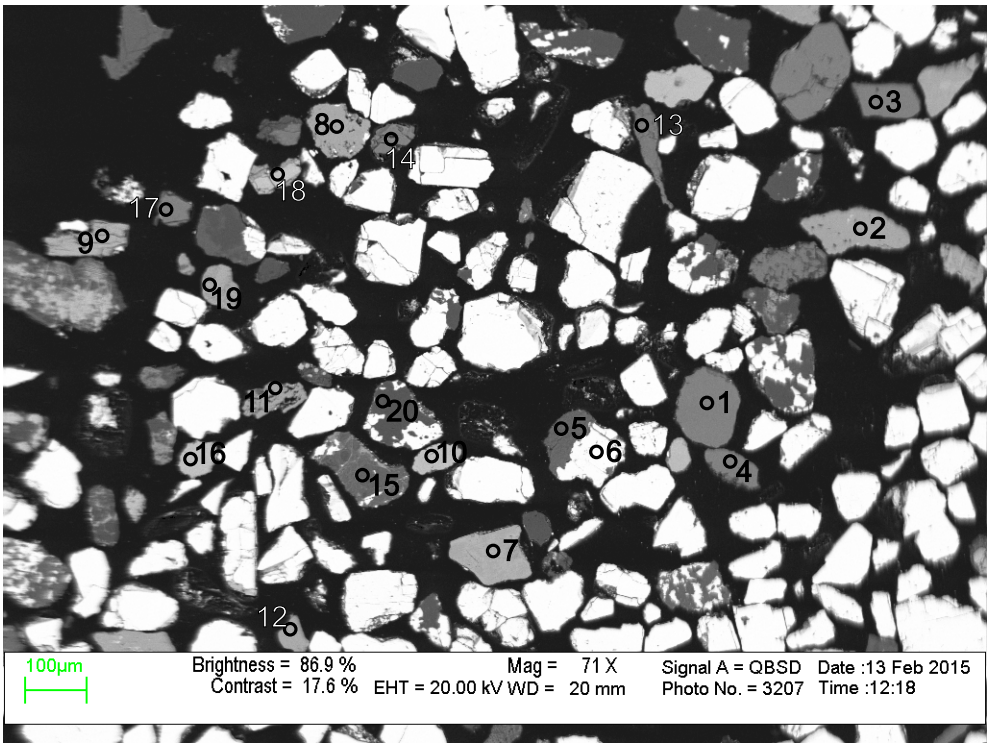
1:Quartz
2:Ankerite
3:Siderite + Chlorite
4:Fluorite
5:Mix
6:Feohy
7:Chlorite + TiO_2
8:Feohy + Quartz
9:Feohy + Quartz
10:Siderite +
11:Muscovite + Kaolinite +
12:Fluorite
13:Feohy +
14:Quartz
15:Barite
16:Siderite +
17:Siderite +
18:Feohy
19:Feohy + Apatite +

Figure 1D.4: Annapolis G-24 5505 (SEM) site 4. Fluorite (4) with sharp crystal outlines is likely diagenetic.



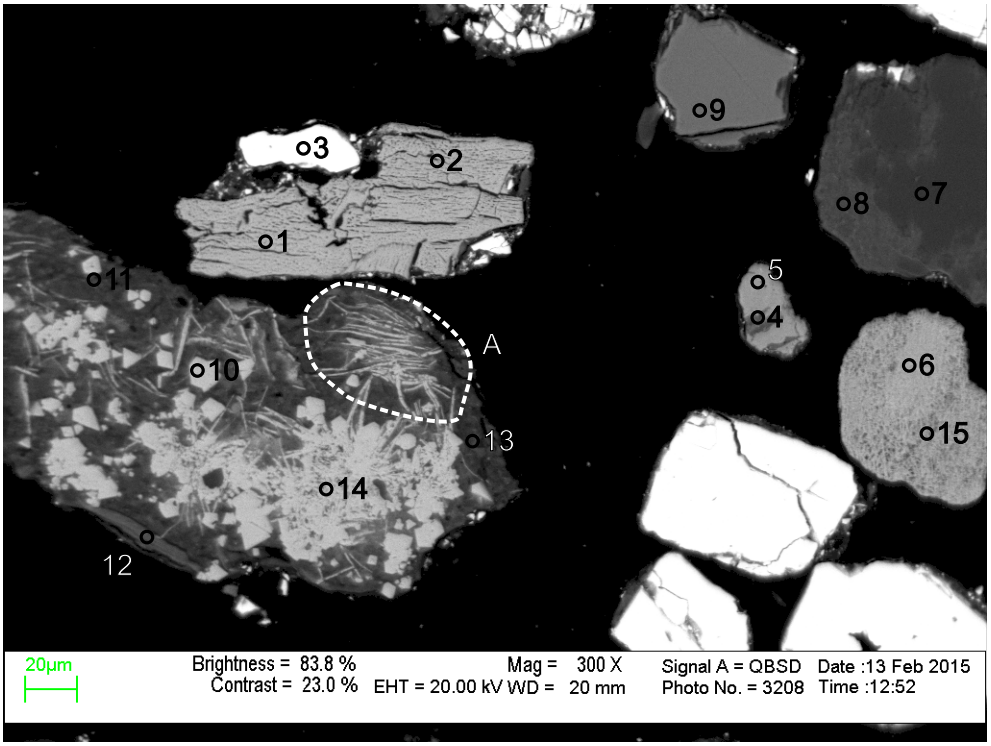
1:Pyrite
2:Pyrite
3:Barite
4:Quartz
5:Pyrite
6:Feohy + Quartz
7:Pyrite + Quartz
8:Feohy
9:Feohy + Quartz
10:Quartz
11:Siderite + Chlorite
12:Barite
13:Quartz
14:Siderite + Chlorite

Figure 1D.5: Annapolis G-24 5505 (SEM) site 5. A cutting made up of quartz (1,3), siderite (11,14). The barite (12) in this cutting appear to be drilling mud, whereas in another cutting made up of quartz (4) it may be diagenetic (3).



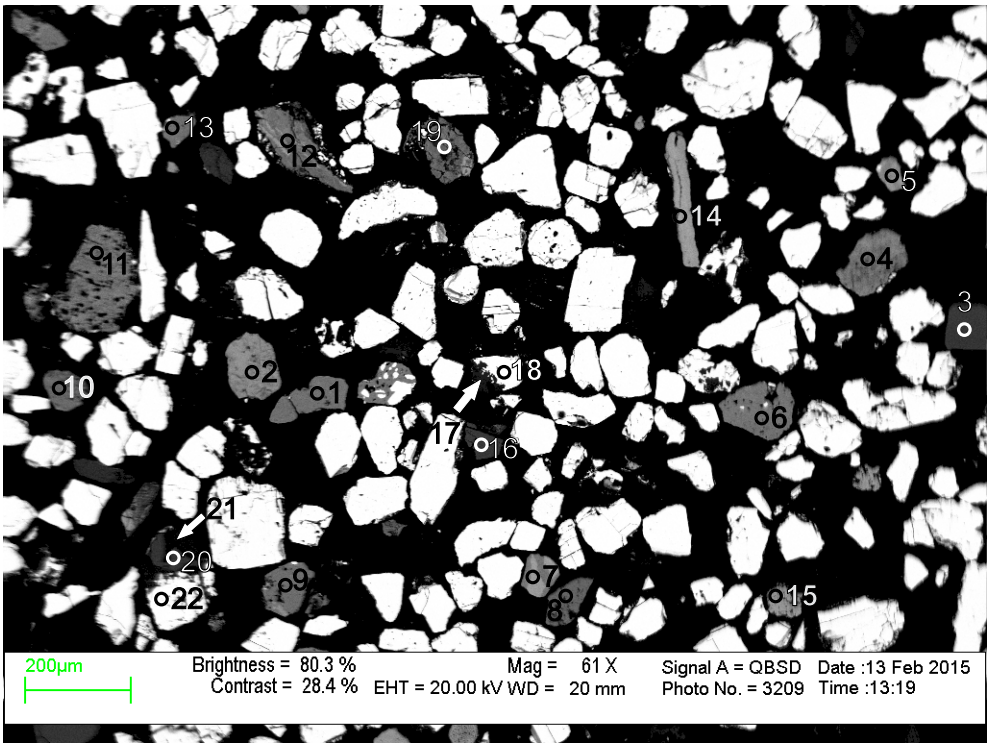
1:Apatite
2:Feohy + Quartz
3:Fluorite
4:Fluorite
5:Muscovite + Chlorite
6:Barite
7:Feohy + Quartz
8:Feohy +
9:Feohy +
10:Pyrite
11:Feohy + other
12:Feohy + Quartz
13:Siderite +
14:Fluorite
15:Muscovite +
16:Pyrite
17:Fluorite
18:Feohy
19:Psilomelane
20:Quartz

Figure 1D.6: Annapolis G-24 5505 (SEM) site 6. A cutting made up of muscovite and chlorite (5) and biotite (6). A quartz grain (20) appears to be associated with barite.



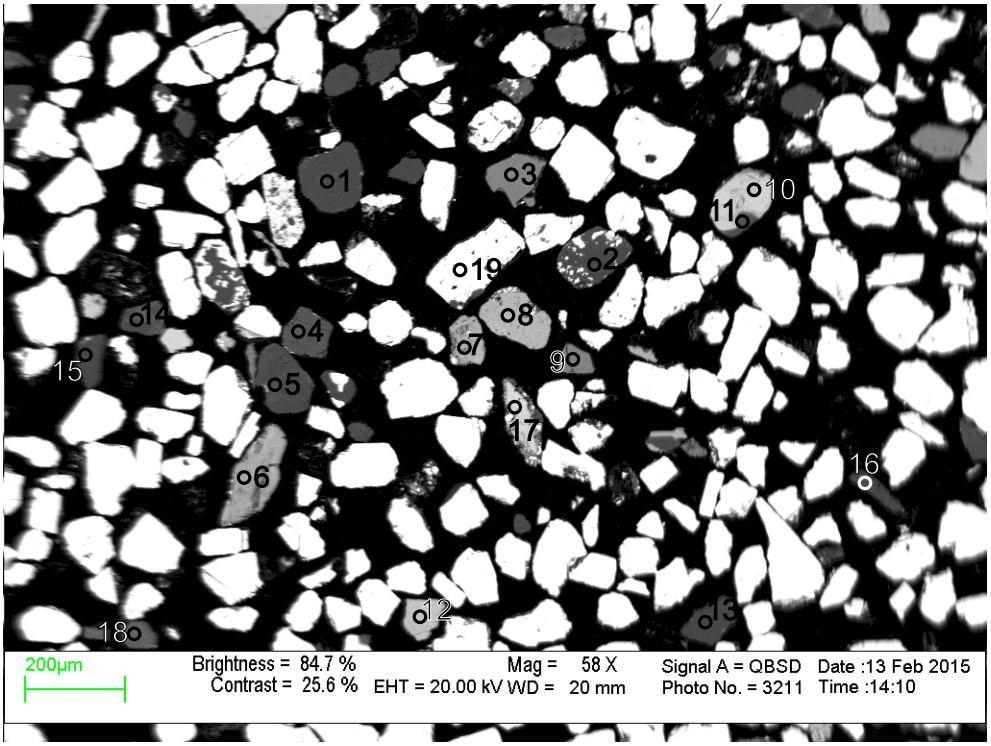
1:Pyrolusite +
2:Pyrolusite + Kaolinite
3:Barite
4:Mix
5:Feohy + Quartz
6:Psilomelane
7:Quartz
8:K-feldspar + Chlorite
9:Fluorite
10:Pyrite
11:Feldspar + Chlorite + Kaolinite +
12:Chlorite +
13:Feldspar + Chlorite + Kaolinite
14:Pyrite +
15:Psilomelane

Figure 1D.7: Annapolis G-24 5505 (SEM) site 7. A cutting made up of K-feldspar and chlorite (8), and quartz (7). Cutting made up of feldspar, chlorite, and kaolinite (11,13) with diagenetic pyrite (10,14) appearing to replace muscovite or chlorite (A).



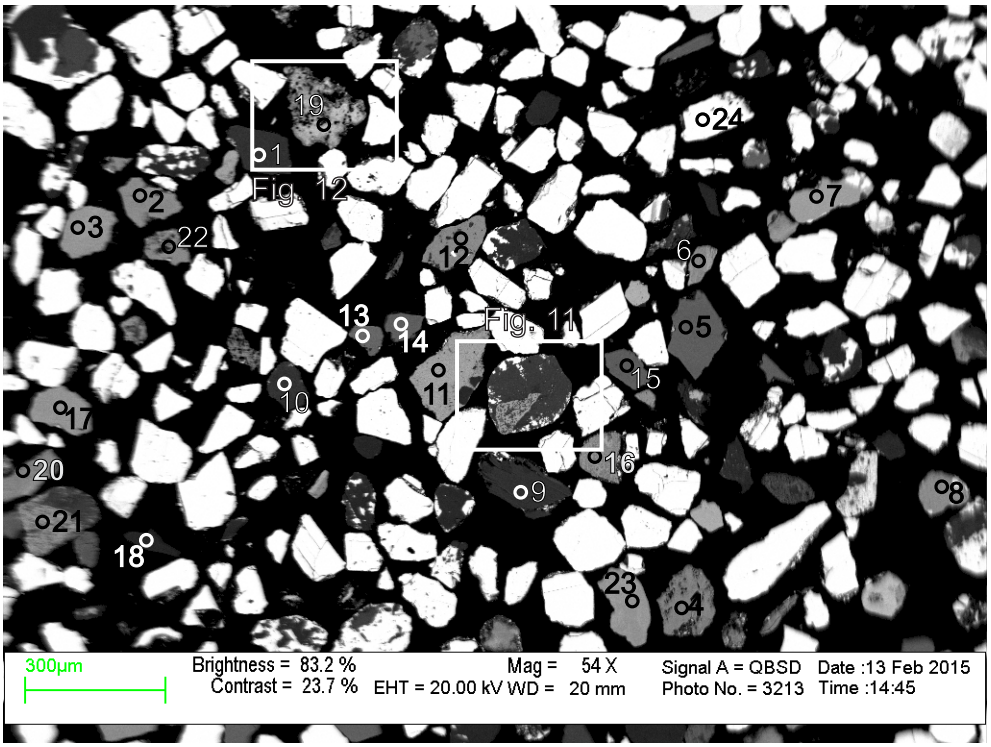
1:Feohy +
2:Feohy + Quartz
3:Fluorite
4:Feohy + Calcite
5:Mix
6:Feohy + Quartz
7:Psilomelane +
8:Siderite +
9:Siderite +
10:Siderite +
11:Pyrolusite +
12:Siderite +
13:Siderite +
14:Feohy +
15:Pyrite +
16:Calcite
17:Calcite +
18:Barite
19:Siderite +
20:Fluorite
21:Dolomite
22:Barite

Figure 1D.8: Annapolis G-24 5505 (SEM) site 8. A cutting made up of Feohy and calcite (4), both minerals appear to be diagenetic.



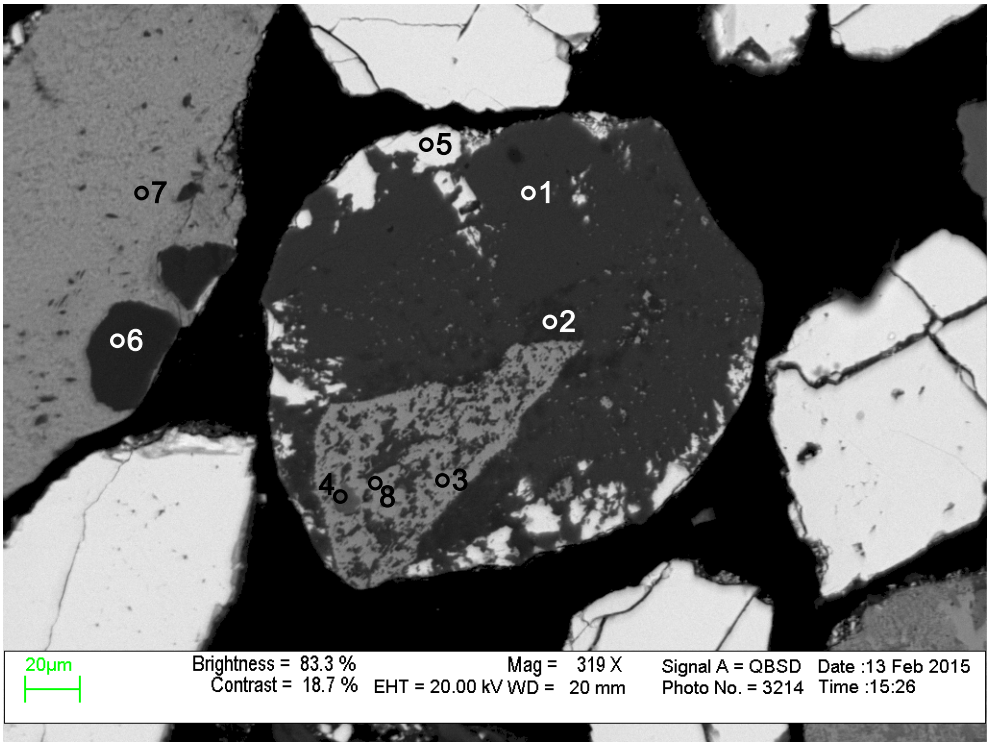
1:Dolomite
2:Quartz
3:Fluorite
4:Ankerite
5:Quartz
6:Feohy +
7:Feohy +
8:Feohy +
9:Fluorite
10:Feohy + K-feldspar
11:Feldspar + other
12:Feohy + Quartz
13:Quartz
14:K-feldspar
15:Dolomite
16:Quartz
17:Feohy
18:Calcite
19:Barite

Figure 1D.9: Annapolis G-24 5505 (SEM) site 9. A cutting made up of: K-feldspar (11) and Feohy (magnetite?)(10). Quartz (2) appears to be associated with barite.



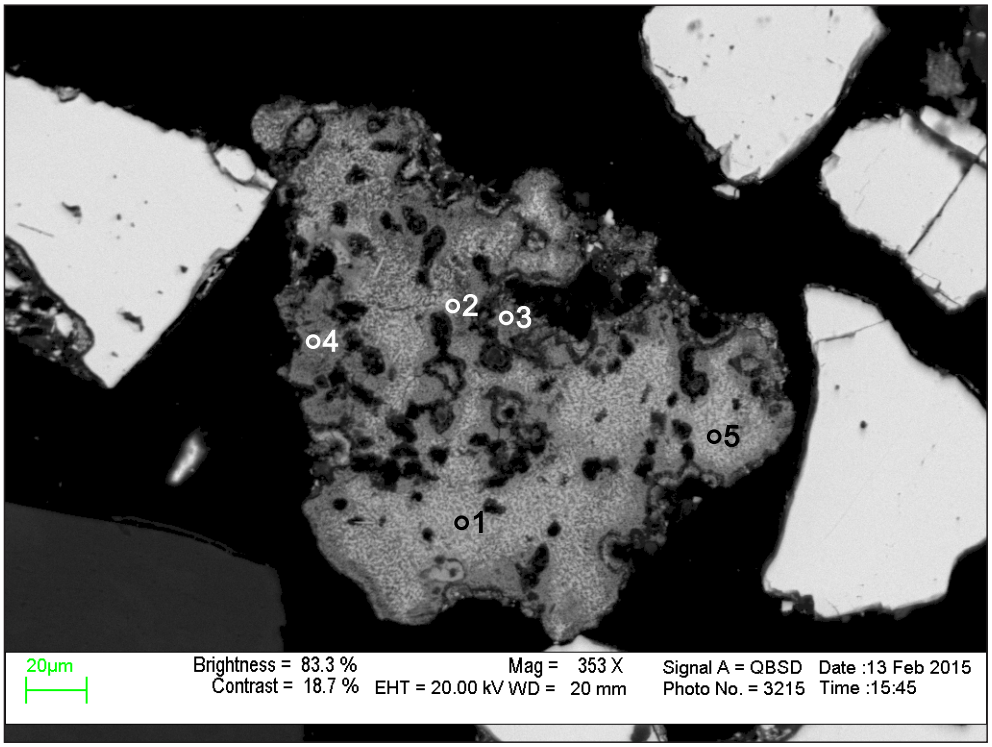
1:Ankerite
2:Feohy +
3:Feohy + Quartz
4:Mix
5:Fluorite
6:Feohy +
7:Feohy + Quartz
8:Feohy + Quartz
9:Muscovite
10:Dolomite
11-12:Feohy + Quartz
13:Siderite
14-15:Fluorite
16:Ilmenite
17:Siderite + Quartz
18:Quartz
19:Psilomelane +
20:Feohy
21:Mix
22:Siderite + Quartz
23:Feohy +
24:Barite

Figure 1D.10: Annapolis G-24 5505 (SEM) site 10. Fluorite (5) shows sharp crystal outlines and is likely diagenetic.



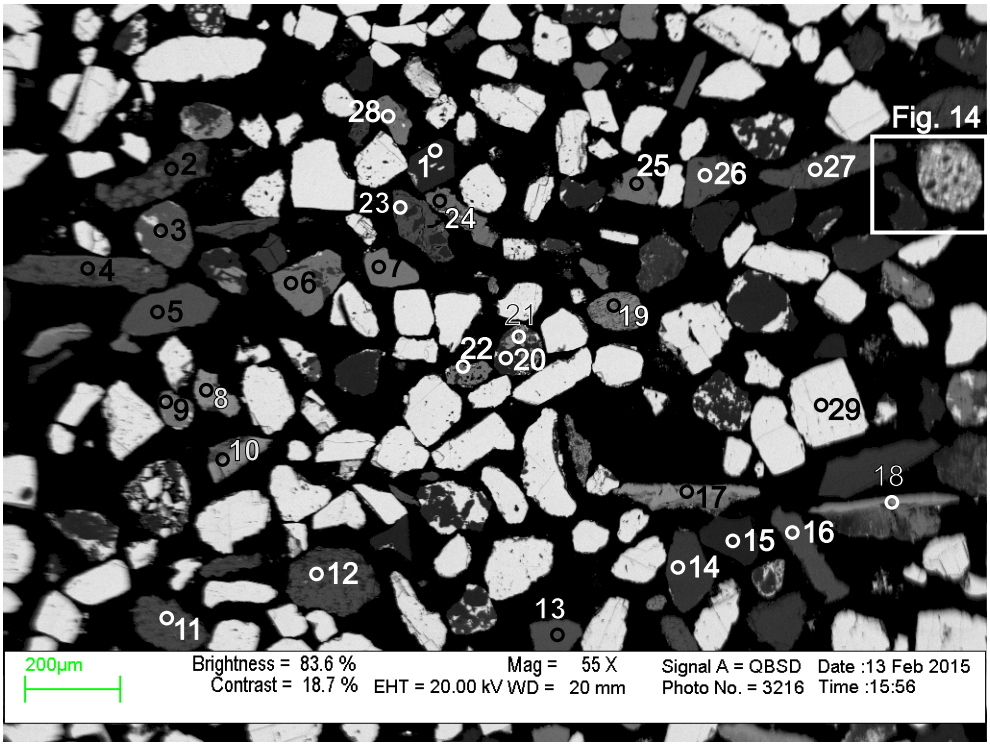
1:K-feldspar
2:Quartz + K-feldspar
3:Feohy + Quartz + K-feldspar
4:Apatite +
5:Barite
6:Quartz
7:Feohy +
8:Feohy +

Figure 1D.11: Annapolis G-24 5505 (SEM) site 11. A cutting made up of K-feldspar (1), quartz (2), Feohy (magnetite?)(3,8), and barite (5). Quartz grains (6) appears to be associated with Feohy.



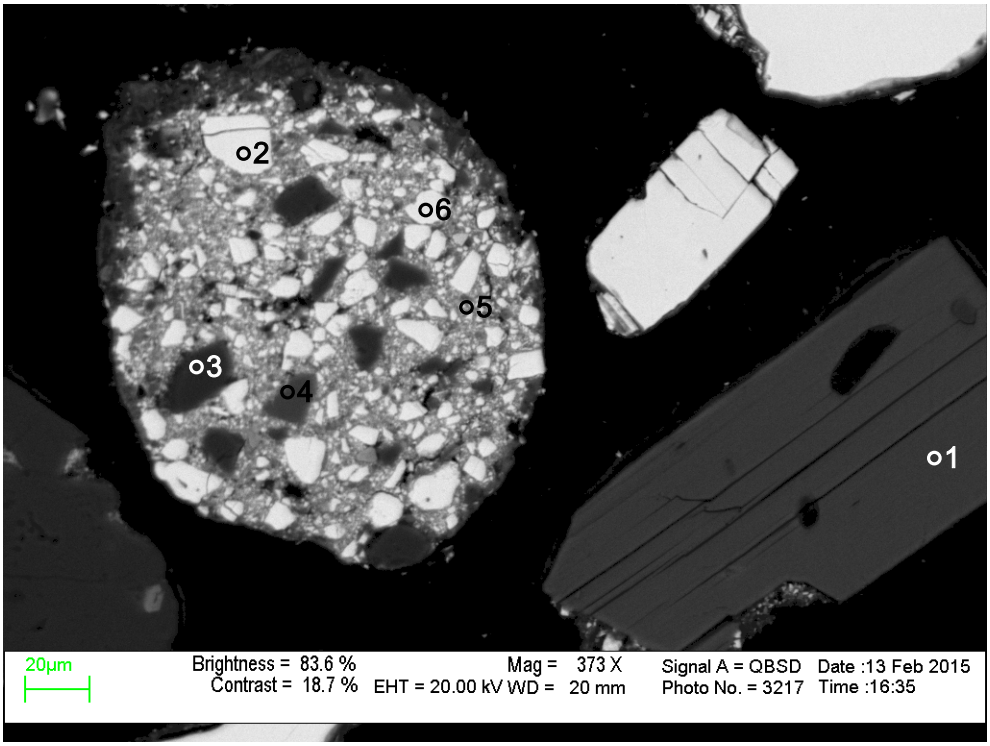
1:Psilomelane +
2:Psilomelane +
3:Psilomelane +
4:Psilomelane +
5:Psilomelane +

Figure 1D.12: Annapolis G-24 5505 (SEM) site 12. Psilomelane (1-5) is a contaminant.



1:Quartz
2:Siderite + Chlorite +
3:Fluorite
4:Siderite + Kaolinite
5:Fluorite
6:Feohy + Quartz
7:Feohy + Quartz
8:Pyrite
9:Feohy +
10:Feohy
11:Siderite + Chlorite
12:Siderite + Chlorite
13:Fluorite
14:Calcite
15:Quartz
16:Siderite + Chlorite
17:Feohy +
18:Feohy +
19:Feohy +
20:Quartz
21:Feohy +
22:Feohy +
23:Siderite +
24:Feohy + Calcite
25:Feohy + Quartz
26:Fluorite
27:Siderite +
28:Feohy +
29:Barite

Figure 1D.13: Annapolis G-24 5505 (SEM) site 13. Cuttings made up of siderite and either chlorite (2,11,12) or kaolinite (3).



1:Biotite
2:Barite
3:Quartz
4:Calcite
5:Barite +
6:Barite

Figure 1D.14: Annapolis G-24 5505 (SEM) site 14. Crushed sandstone quartz (3) mixed with drilling mud barite (2,5,6). The biotite grain (1) may also be drilling mud component.

Table 1D.1: SEM-EDS cemical analyses of minerals from sample G-24 5505.

Site	Position	Mineral*	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	CuO	ZnO	As_2O_3	SrO	BaO	WO_3	B_2O_3	Total	Actual Total
1	1	Brt											38.08										61.92			100	159
1	2	Qz	99.99																							100	172
1	3	Brt											37.46									1.24	61.31			100	161
1	4	Fl							43.31					56.69												100	242
1	5	Fl							43.35					56.65												100	277
1	6	Feohy +	4.17		0.93	94.90																				100	85
1	7	Feohy	1.56			95.23	1.33										1.89									100	125
1	8	Feohy +	5.45			93.37	0.71		0.48																	100	105
1	9	Ms	47.70		34.05	0.72		0.72		0.64	9.35			1.81												95	160
1	10	Brt											38.73					-0.01					61.29			100	156
1	11	Sd +	4.06		2.53	69.46	0.50	14.79	8.31		0.34															100	100
1	12	Sd +	36.47	0.40	4.27	46.88	0.84	8.06	2.38		0.69															100	105
1	13	Fl							43.21					56.79												100	262
1	14	Fl	0.62		0.32				43.32		0.11			55.63												100	273
1	15	Ank				8.45	0.74	18.38	28.42																	56	97
1	16	Fl							43.56					56.45												100	273
1	17	Fl							43.63					56.37												100	289
1	18	Feohy +	3.55			95.07	1.38																			100	102
2	1	Sd				38.63	0.31	11.37	5.69																	56	90
2	2	Sd + Kln	17.11		7.41	56.48	0.62	9.12	5.16	0.46	1.13		2.52													100	147
2	3	Brt +	12.49		2.44	0.98			0.27				33.76					-0.08					50.16			100	153
2	4	Sd +	3.40		1.49	69.91	0.68	15.01	9.51																	100	93
2	5	Kln + Ms	57.49	0.76	24.56	3.54		1.61	0.70	0.55	2.92		0.38	2.50												95	164
3	1	Brt	1.41			0.58				1.19			37.68		0.62			0.06				3.57	54.89			100	69
3	2	Qz	99.99																							100	192
3	3	Fl							43.35					56.65												100	249
3	4	Feohy +	4.98			92.55	0.96		1.51																	100	108
3	5	Zincite				0.77	2.23		1.36											95.65						100	96
3	6	Feohy +	2.65			97.34																				100	119
3	7	Feohy +	7.57		3.16	86.14	1.07		2.06																	100	115
3	8	Feohy +	0.77			95.33			1.85				0.75				1.30									100	103
3	9	Feohy + Qz	6.95			90.94	0.89		0.97						0.26											100	121
3	10	Feohy +	1.60			96.18							0.92										1.30			100	108
3	11	Sd + Chl	4.75		3.08	66.01	0.74	10.96	11.94			2.52														100	93
3	12	Py				27.60							72.41													100	296
3	13	Qz	99.99																							100	168
3	14	Fl							43.43					56.56												100	271
3	15	Feohy + Qz	9.84		0.64	85.13	0.67		0.91						0.31				1.09	1.41						100	106
4	1	Qz	99.79												0.21											100	129
4	2	Ank				9.93	2.03	15.59	28.44																	56	65
4	3	Sd + Chl	6.14		3.44	58.46	0.81	7.41	14.73		0.41	8.62														100	65
4	4	Fl							43.29					56.71												100	187
4	5	Mix	25.39		16.31	43.77	0.49	6.35	5.02	0.73	1.93															100	82
4	6	Feohy	1.50			97.61	0.89																			100	75
4	7	Chl + TiO_2	20.96	10.21	13.94	41.41	0.79	7.33	2.98		2.36															100	70
4	8	Feohy + Qz	8.58			88.99			1.34												1.10					100	78
4	9	Feohy + Qz	4.17			94.69	0.52		0.63																	100	78
4	10	Sd +	19.00	0.93	9.16	50.89	0.70	10.56	7.86		0.89															100	79

Table 1D.1: SEM-EDS cemical analyses of minerals from sample G-24 5505.

Site	Position	Mineral*	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	CuO	ZnO	As_2O_3	SrO	BaO	WO_3	B_2O_3	Total	Actual Total
4	11	Ms + Kln +	54.55	1.00	23.61	4.47		1.36	1.00	1.48	3.54		2.14	1.85												95	116
4	12	Fl							43.28					56.73												100	173
4	13	Feohy +				91.16	0.63		1.22						4.54		2.44									100	69
4	14	Qz	99.99																							100	112
4	15	Brt											28.27					0.01				0.83	47.87		23.06	100	139
4	16	Sd +	12.19	0.52	6.58	55.76	0.87	10.11	11.59		1.28		1.12													100	70
4	17	Sd +	12.00		6.42	78.26	0.41	1.23	0.36		1.31															100	75
4	18	Feohy	0.98			95.23	1.86		0.92				1.02													100	73
4	19	Feohy + Ap	9.73		3.16	83.92			1.79		0.34	1.08														100	79
5	1	Py				27.40			1.33				71.27													100	227
5	2	Py				27.49							72.51													100	235
5	3	Brt											28.24									2.50	45.78		23.48	100	161
5	4	Qz	99.99																							100	130
5	5	Py				27.49							72.51													100	219
5	6	Feohy + Qz	1.22			98.79																				100	80
5	7	Py + Qz	1.58			27.34							71.07													100	205
5	8	Feohy				98.89	1.11																			100	86
5	9	Feohy + Qz	6.10			91.56	1.21		1.12																	100	78
5	10	Qz	99.99																							100	116
5	11	Sd + Chl	14.12		8.14	56.52	0.48	12.70	6.45	0.62	0.98															100	68
5	12	Brt											28.49					0.01				0.88	49.19		21.42	100	148
5	13	Qz	99.69			0.31																				100	123
5	14	Sd + Chl	15.81	0.43	10.88	53.53		11.84	6.31		1.20															100	70
6	1	Ap							47.75			45.35		6.91												100	125
6	2	Feohy + Qz	1.39			98.61																				100	81
6	3	Fl							43.80					56.20												100	193
6	4	Fl							43.92					56.08												100	180
6	5	Ms + Chl	42.25		24.28	16.49	0.32	13.25	0.43		2.98															100	98
6	6	Brt											38.01									1.99	60.03			100	115
6	7	Feohy + Qz	4.13			95.03													0.84							100	76
6	8	Feohy +	1.63			96.91	1.03		0.43																	100	72
6	9	Feohy +	1.24		1.78		95.20		0.98														0.79			100	78
6	10	Py				28.14							71.87													100	207
6	11	Feohy +	7.55			90.79	0.46		1.20																	100	69
6	12	Feohy + Qz	4.66		0.74	94.61																				100	68
6	13	Sd +	3.44		1.85	64.61	0.76	11.39	8.56	0.94	0.31	3.69											1.22	3.24		100	61
6	14	Fl							43.82					56.17												100	169
6	15	Ms +	56.54		24.09	3.89		1.44		0.27	11.49			2.28												100	107
6	16	Py				27.22							72.79													100	199
6	17	Fl							42.98					57.02												100	160
6	18	Feohy				99.12	0.88																			100	86
6	19	Psi +			1.25		80.15		1.16		2.01												15.43			100	67
6	20	Qz	98.72		1.04						0.23															100	114
7	1	Prl +	1.45		1.30		90.61		0.73					5.91												100	90
7	2	Prl + Kln	1.69		1.25		95.74		1.30																	100	85
7	3	Brt											38.03					0.01					61.97			100	106
7	4	Mix	43.60	1.40	20.37	22.22	2.83	1.48	0.76		7.36															100	100
7	5	Feohy + Qz	6.20		0.98	90.79	1.38		0.64																	100	70

Table 1D.1: SEM-EDS cemical analyses of minerals from sample G-24 5505.

Site	Position	Mineral*	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	CuO	ZnO	As_2O_3	SrO	BaO	WO_3	B_2O_3	Total	Actual Total
7	6	Psi			1.21		68.80		5.55		1.48		1.02	8.32									13.62			100	80
7	7	Qz	99.99																							100	119
7	8	Kfs + Chl	58.98		22.22	4.22		0.80			12.18			1.59												100	113
7	9	Fl							43.40					56.59												100	171
7	10	Py				27.27							72.74													100	209
7	11	Feld + Chl + Kln +	60.33	0.67	24.89	3.58		1.46	0.63	4.87	2.91		0.70													100	102
7	12	Chl +	33.76	0.96	20.64	17.76		6.96	0.75	0.43	0.29		3.44													85	89
7	13	Feld + Chl + Kln +	58.98	0.60	25.43	6.39		1.29		4.38	2.91															100	80
7	14	Py +	0.53		0.36	27.30							71.82													100	199
7	15	Psi			0.98		75.84		0.43		1.72			6.29									14.74			100	71
8	1	Feohy +	2.99			94.36	2.13		0.50																	100	66
8	2	Feohy + Qz	2.82			97.17																				100	72
8	3	Fl							43.59					56.41												100	188
8	4	Feohy + Cal				84.15	1.07		14.78																	100	88
8	5	Mix	2.35		2.17	65.03	21.69		2.25						0.28								6.22			100	87
8	6	Feohy + Qz	8.28		1.59	86.54			0.55		0.36				0.29				1.29		1.10					100	77
8	7	Psi +				1.36	74.30		2.84	0.84					0.29								20.36			100	72
8	8	Sd +	13.88		2.06	80.64		0.75	2.11		0.55															100	74
8	9	Sd +	7.59			90.35	1.34		0.73																	100	64
8	10	Sd +	7.62		1.23	85.18	3.06	2.55	0.35																	100	61
8	11	Prl	2.46		2.51		93.23		0.57		1.24															100	75
8	12	Sd +	0.71			52.26	0.59		1.47								0.97									56	72
8	13	Sd +	5.50		0.62	39.43			1.18			1.50							2.68	5.08						56	66
8	14	Feohy +	1.78			97.72	0.50																			100	96
8	15	Py +	1.24		0.83	27.35	0.18						70.42													100	209
8	16	Cal							24.64					31.36												56	161
8	17	Cal +	0.81		0.40				35.68		0.12		0.54	17.80									0.64			56	80
8	18	Brt											37.63					0.10				1.63	60.64			100	107
8	19	Sd +	2.74		1.20	47.61			3.73				0.71													56	68
8	20	Fl							43.36					56.64												100	144
8	21	Dol						13.44	38.58					1.98												54	49
8	22	Brt											27.42					-0.01				0.91	46.84		24.87	100	123
9	1	Dol				0.34		23.16	29.44					1.06												54	51
9	2	Qz	98.32		1.44						0.25															100	114
9	3	Fl							43.64					56.36												100	164
9	4	Ank				9.88	1.36	16.80	27.96																	56	51
9	5	Qz	99.11		0.72						0.17															100	103
9	6	Feohy +	1.41			93.75	0.52		3.09								1.23									100	61
9	7	Feohy +	5.11			90.97		2.34	0.63											0.93						100	67
9	8	Feohy +	1.82			96.04	1.65		0.49																	100	69
9	9	Fl							44.06					55.94												100	163
9	10	Feohy +	5.78	1.90	2.99	88.66					0.66															100	89
9	11	Feld +	57.46		24.39	2.43		3.47		5.24	4.87			2.13												100	115
9	12	Feohy + Qz	5.31			91.78			0.88										2.04							100	67
9	13	Qz	99.99																							100	111
9	14	Kfs	67.06		17.63	0.33				0.27	14.71															100	96
9	15	Dol				0.33	0.24	23.19	28.87					1.19	0.17											54	46
9	16	Qz	99.99																							100	120

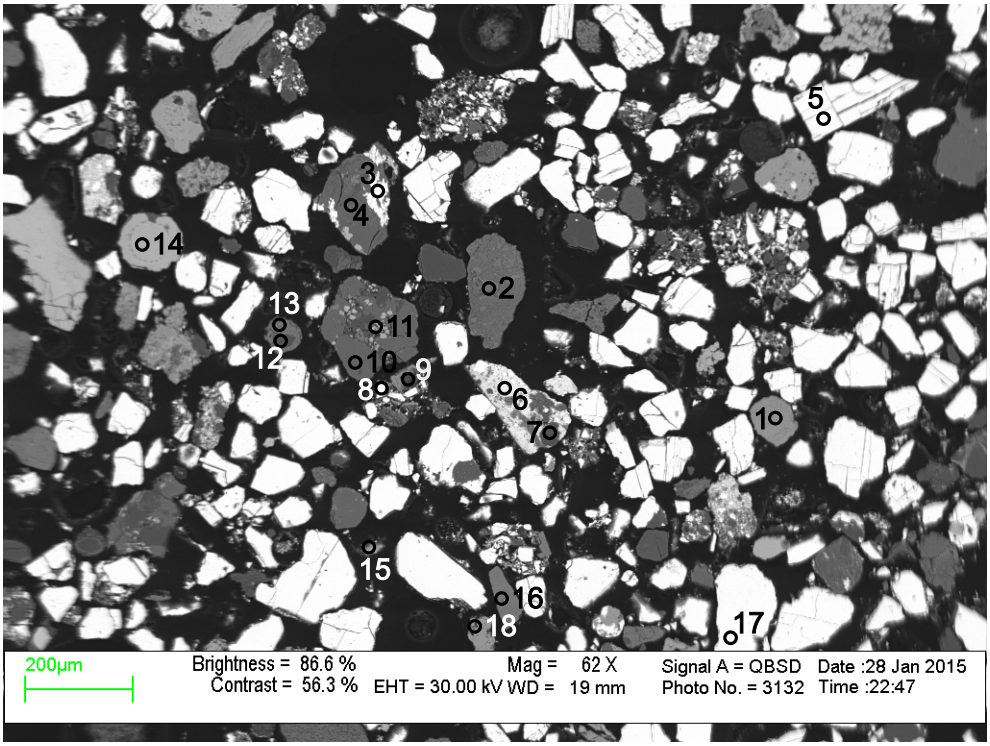
Table 1D.1: SEM-EDS cemical analyses of minerals from sample G-24 5505.

Site	Position	Mineral*	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	CuO	ZnO	As_2O_3	SrO	BaO	WO_3	B_2O_3	Total	Actual Total
9	17	Feohy	0.68			98.79	0.54																			100	82
9	18	Cal						0.40	40.10					15.50												56	58
9	19	Brt											24.97					-0.04				0.77	43.44		30.86	100	152
10	1	Ank				6.20	0.65	20.22	28.93																	56	50
10	2	Feohy +	8.11		1.34	88.25	0.74		1.57																	100	62
10	3	Feohy + Qz	6.55			89.35			1.22										1.92	0.97						100	64
10	4	Mix	4.54		2.48	74.91	10.78	0.80	2.39	0.84		1.24							0.80				1.22			100	68
10	5	Fl							43.71					56.29												100	169
10	6	Feohy +				95.97		0.80	2.22				1.00													100	70
10	7	Feohy + Qz	2.03			96.68																				99	84
10	8	Feohy + Qz	3.68			94.30	1.28		0.76																	100	76
10	9	Ms	47.60	0.29	33.44	1.79		0.58		1.62	8.47			1.22												95	102
10	10	Dol				8.03	0.94	38.82	52.22																	100	48
10	11	Feohy + Qz	2.14		0.74	97.13																				100	76
10	12	Feohy + Qz	8.24		1.04	89.82	0.56		0.36																	100	69
10	13	Sd				47.11	4.12	4.19	0.59																	56	51
10	14	Fl							43.64					56.36												100	156
10	15	Fl							43.46					56.54												100	166
10	16	Ilm		49.94		50.06																				100	89
10	17	Sd + Qz	5.75			89.87		0.85	0.74										1.97	0.83						100	59
10	18	Qz	99.99																							100	94
10	19	Psi +			2.02	7.81	60.85		2.06														27.25			100	70
10	20	Feohy	1.20			97.04	0.58		1.19																	100	52
10	21	Mix	17.67	12.29	9.94	55.45		1.21			2.89					0.55										100	74
10	22	Sd + Qz	7.77			85.86	5.36		1.02																	100	60
10	23	Feohy +	6.55			89.53													1.20	2.73						100	69
10	24	Brt											26.64									0.90	45.72		26.74	100	158
11	1	Kfs	66.94		17.67						15.39															100	125
11	2	Qz + Ksp	91.81		3.74	1.43					3.01															100	125
11	3	Feohy + Qz + Ksp	10.50	2.74	2.02	82.39	0.43				1.17					0.79										100	96
11	4	Ap +	1.16		0.36	4.49			43.88		0.36	40.21	0.97	8.42							0.13					100	124
11	5	Brt											27.64					-0.04				1.06	46.79		24.54	100	161
11	6	Qz	99.22			0.78																				100	125
11	7	Feohy +	2.93		0.98	96.09																				100	85
11	8	Feohy +	4.68	2.72	2.15	88.32		0.80			0.65					0.68										100	92
12	1	Psi +			2.10	8.01	60.24		1.87	0.70													27.07			100	85
12	2	Psi +		1.25	1.55	6.45	62.19		18.30					3.60						0.30			6.36			100	77
12	3	Psi +	0.90	0.98	1.10	5.44	53.26		26.21	0.70			1.15	3.74									3.27	3.27		100	71
12	4	Psi +			1.63	6.45	62.78		18.06														11.07			100	82
12	5	Psi +			1.57	8.22	58.51		1.99											0.57			29.13			100	85
13	1	Qz	99.99																							100	126
13	2	Sd + Chl +	15.89		8.13	51.36	0.50	13.22	8.77		0.87	1.26														100	67
13	3	Fl							43.28					56.73												100	167
13	4	Sd+ Kln	14.93		11.32	54.79	0.52	10.20	5.75	0.90	1.59															100	65
13	5	Fl							43.28					56.73												100	165
13	6	Feohy + Qz	7.42		1.45	89.77	0.92		0.43																	100	74
13	7	Feohy + Qz	5.84			93.31	0.85																			100	75
13	8	Py	1.07		1.02	26.64	0.25						71.04													100	203

Table 1D.1: SEM-EDS cemical analyses of minerals from sample G-24 5505.

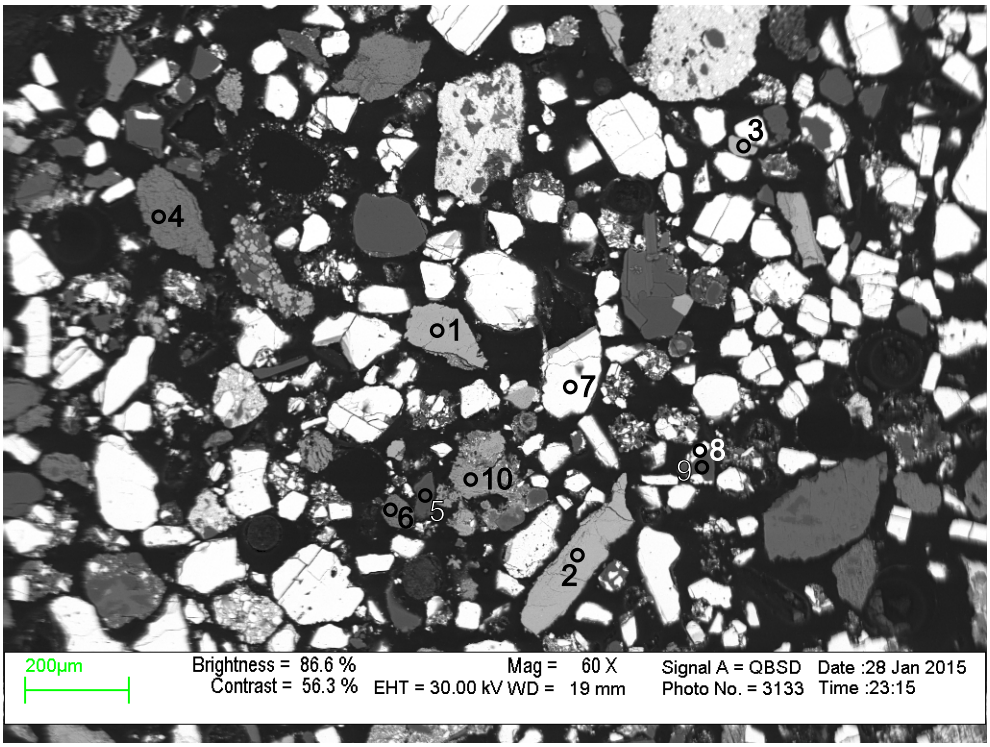
Site	Position	Mineral*	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	CuO	ZnO	As_2O_3	SrO	BaO	WO_3	B_2O_3	Total	Actual Total
13	9	Feohy +	16.79	0.48	4.95	75.27	0.59				1.90															100	76
13	10	Feohy				99.33	0.67																			100	83
13	11	Sd + Chl +	8.34		5.39	61.80	0.63	14.69	8.52		0.64															100	57
13	12	Sd + Chl +	8.51		2.99	63.94	0.83	14.94	8.31		0.48															100	59
13	13	Fl							43.71					56.29												100	173
13	14	Cal					1.62	0.48	45.34					8.56												56	68
13	15	Qz	99.99																							100	130
13	16	Sd + Chl	26.89	0.42	20.44	41.71		6.67	3.89																	100	95
13	17	Feohy +	1.50			92.15	0.52		2.10	1.02			1.05		0.27		1.39									100	82
13	18	Feohy +	2.14			92.61	1.55		1.29						0.38		2.02									100	88
13	19	Feohy +	1.20		0.62	98.18																				100	92
13	20	Qz	98.57		0.81	0.32					0.29															100	126
13	21	Feohy +	14.42	1.63		83.96																				100	96
13	22	Feohy +	6.72		3.06	75.68	0.45		0.46		0.29		4.47						0.74		0.83		7.31			100	77
13	23	Sd +	51.26		2.66	36.34	0.43	6.15	2.80		0.35															100	90
13	24	Feohy + Cal				96.28			2.84				0.87													100	70
13	25	Feohy + Qz	4.21			92.29	0.77		1.40												1.32					100	76
13	26	Fl							43.57					56.43												100	197
13	27	Sd +	47.81	2.44	2.57	37.93	0.41	4.91	3.64		0.30															100	94
13	28	Feohy +	14.25	1.17	6.44	76.17	0.59				1.37															100	83
13	29	Brt											38.35					0.29					61.37			100	131
14	1	Bt	40.56	0.82	18.88	9.46		17.51		0.57	8.67			3.53												100	121
14	2	Brt											23.67					0.04					41.51		34.82	100	180
14	3	Qz	99.99																							100	126
14	4	Cal				0.33		0.74	33.80				1.05	18.15									1.93			56	86
14	5	Brt +	5.31		2.04	6.59			7.33				28.74	5.69									44.30			100	105
14	6	Brt			0.34	0.50			0.88				25.12					-0.01				0.84	44.00		28.35	100	158
			Notes																								
			* Possible Contaminants: metal fragments. May be due to Mn being sourced from drill bit or likewise machinery, as Mn is used as a steel hardener.																								
			Prl=Pyrolusite, Psi=Psilomelane, Cont=Contamination																								

Appendix 1E: SEM-BSE images and EDS mineral analyses for sample G-24 5510



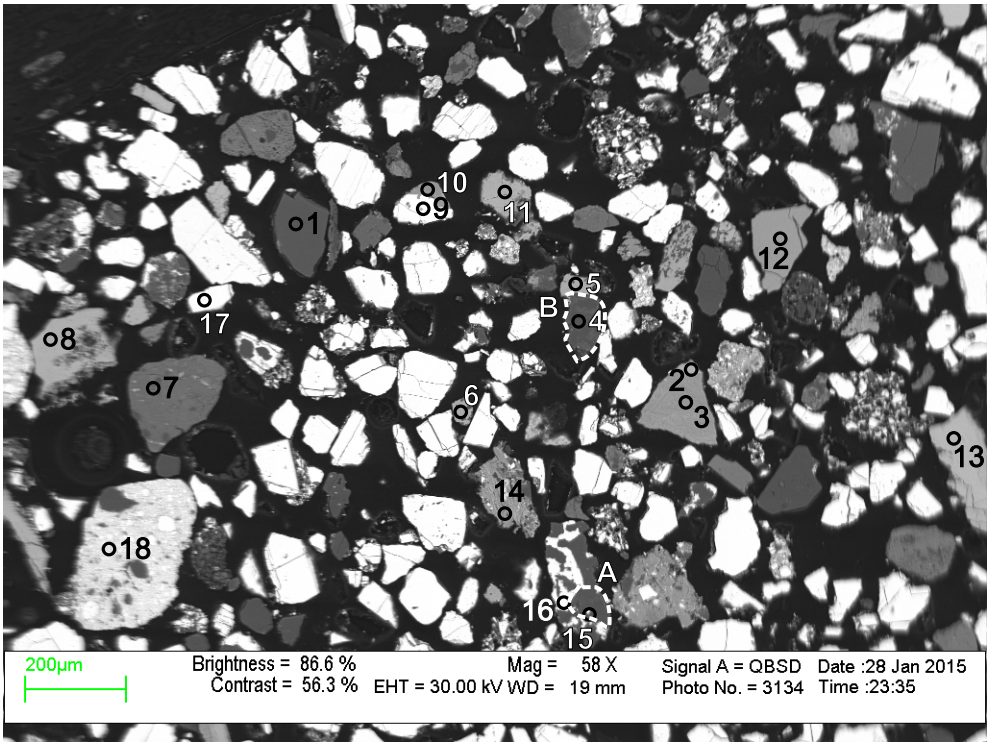
1: Feohy +
2: Siderite + Chlorite
3: Barite
4: Chlorite + Calcite
5: Barite
6: Barite
7: Quartz
8: Barite
9: Mix
10: Dolomite + Siderite + Chlorite
11: Pyrite
12: Quartz
13: Siderite + Apatite +
14: Pyrite
15: Feohy +
16: Fluorite
17: Barite
18: Feohy +

Figure 1E.1: Annapolis G-24 5510 (SEM) site 1. Cuttings are made up of: dolomite (10) and pyrite (11); barite (6) and quartz (7); and siderite and chlorite (2). Pyrite (14) appears to have replaced a bioclast.



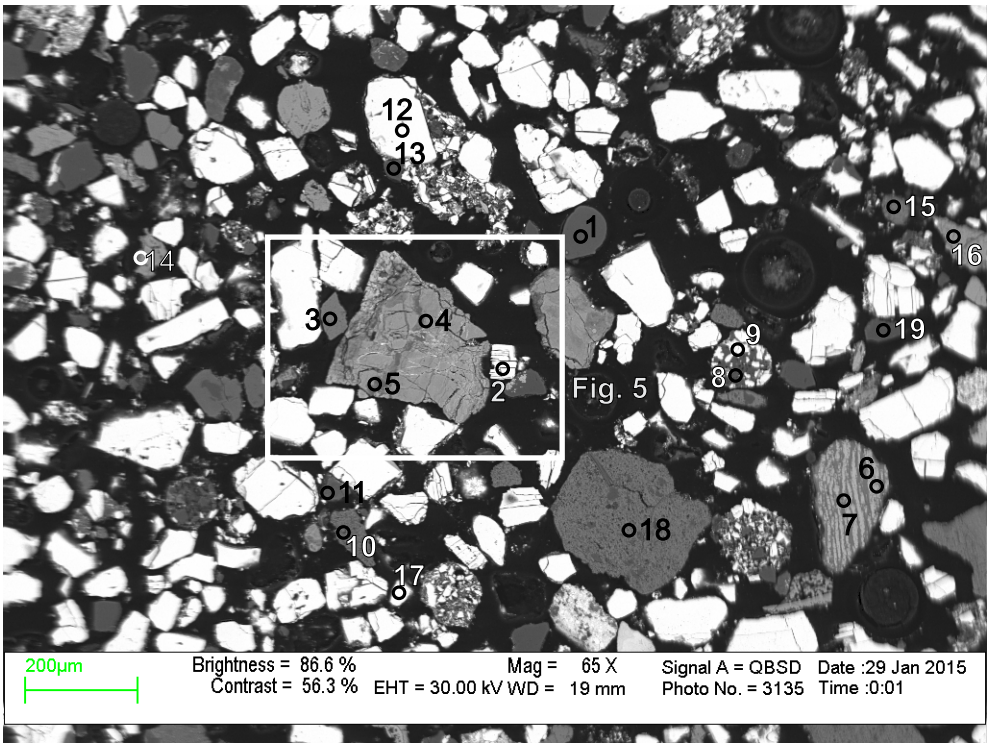
1: Pyrite
2: Feohy
3: Pyrite
4: Siderite + Chlorite
5: Quartz
6: Siderite
7: Barite
8: Barite + Quartz
9: Quartz
10: Feohy +

Figure 1E.2: Annapolis G-24 5510 (SEM) site 2. Feohy (10) appears to be associated with barite and is probably a contaminant.



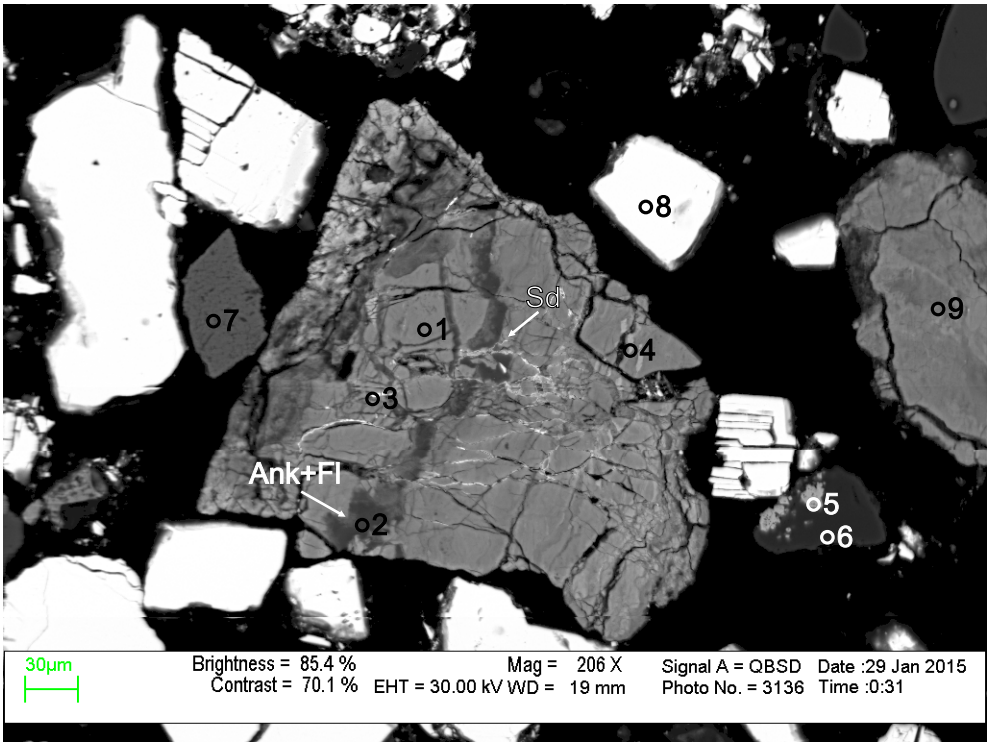
1: Quartz
2: Feohy +
3: Mix
4: K-feldspar + Quartz
5: Feohy +
6: Ti-Magnetite
7: Mix
8: Feohy
9: Barite
10: Mix
11: Pyrite
12: Mix
13: Feohy
14: Feohy +
15: Quartz + K-feldspar
16: Barite
17: Barite
18: Barite + Quartz

Figure 1E.3: Annapolis G-24 5510 (SEM) site 3. A cutting contains barite (16) and a lithic clast (A) made up of quartz and K-feldspar (15). Another lithic clast (B) is also made up of quartz and K-feldspar (4). Ti-magnetite (6) is associated with quartz, and is probably detrital.



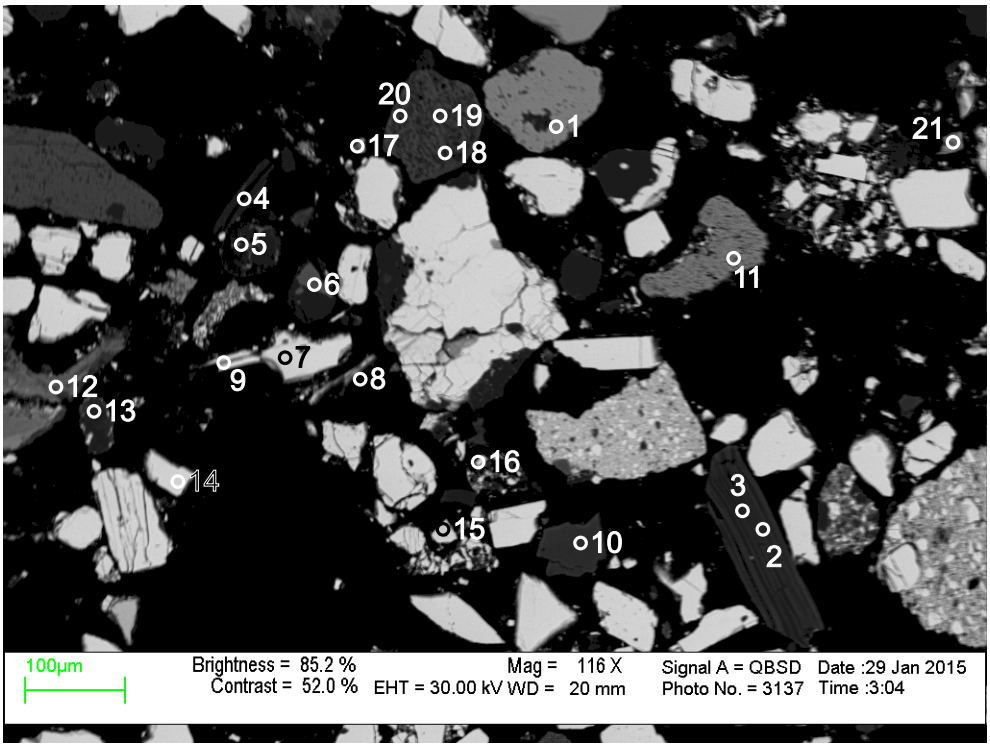
1: Tourmaline
2: Barite
3: Mix
4: Siderite +
5: Ankerite + Fluorite
6: Pyrite + Chlorite + TiO_2
7: Pyrite + Chlorite
8: Quartz + Barite
9: Barite + Quartz
10: Siderite + Chlorite +
11: Ankerite
12: Barite
13: Quartz
14: Feohy
15: Siderite + Chlorite
16: Feohy + Apatite + Chlorite
17: Barite
18: Siderite + Apatite + Chlorite
19: Quartz

Figure 1E.4: Annapolis G-24 5510 (SEM) site 4. A cutting made up of siderite (4) ankerite and fluorite (5). Another cutting made up of pyrite (6), which appears to have formed along cleavage planes of possible detrital chlorite (7).



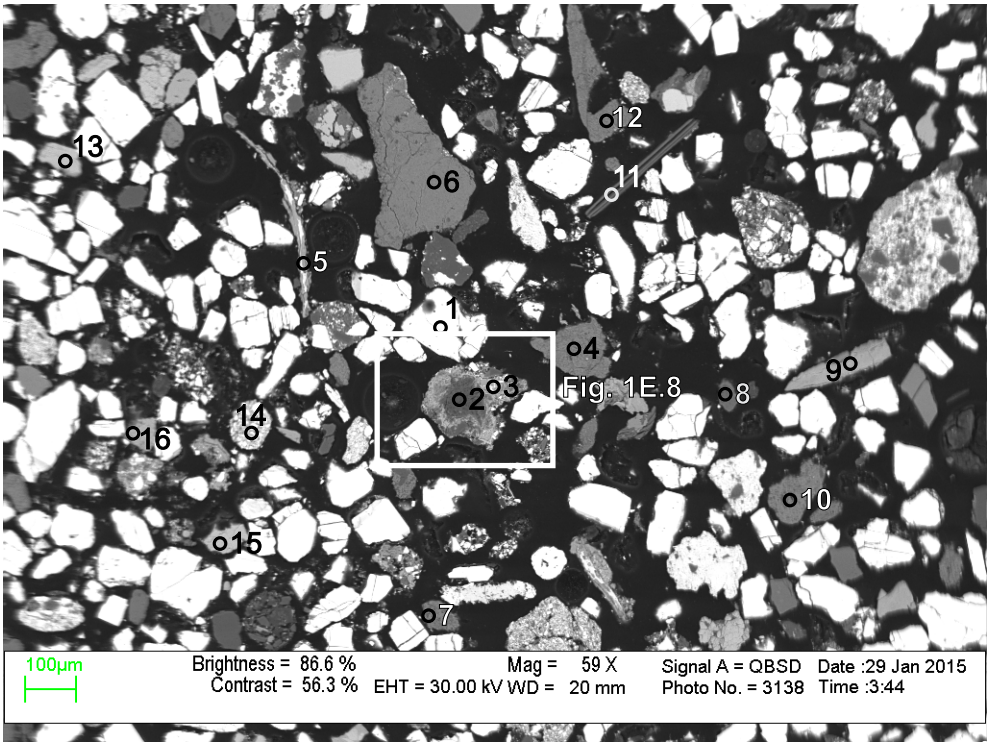
1: Feohy +
2: Calcite +
3: Siderite +
4: Siderite
5: Pyrite + Quartz
6: Quartz +
7: Siderite + Apatite + Chlorite
8: Barite
9: Siderite +

Figure 1E.5: Annapolis G-24 5510 (SEM) site 5. A cutting made up of siderite (3,4,Fig. 1E.6 spot 4), Feohy (1), ankerite and fluorite (Fig. 1E6 spot 5), and calcite (2). Feohy appears to be cut by a vein on ankerite and calcite, and also by siderite (4). A cutting with pyrite (5) and quartz (6).



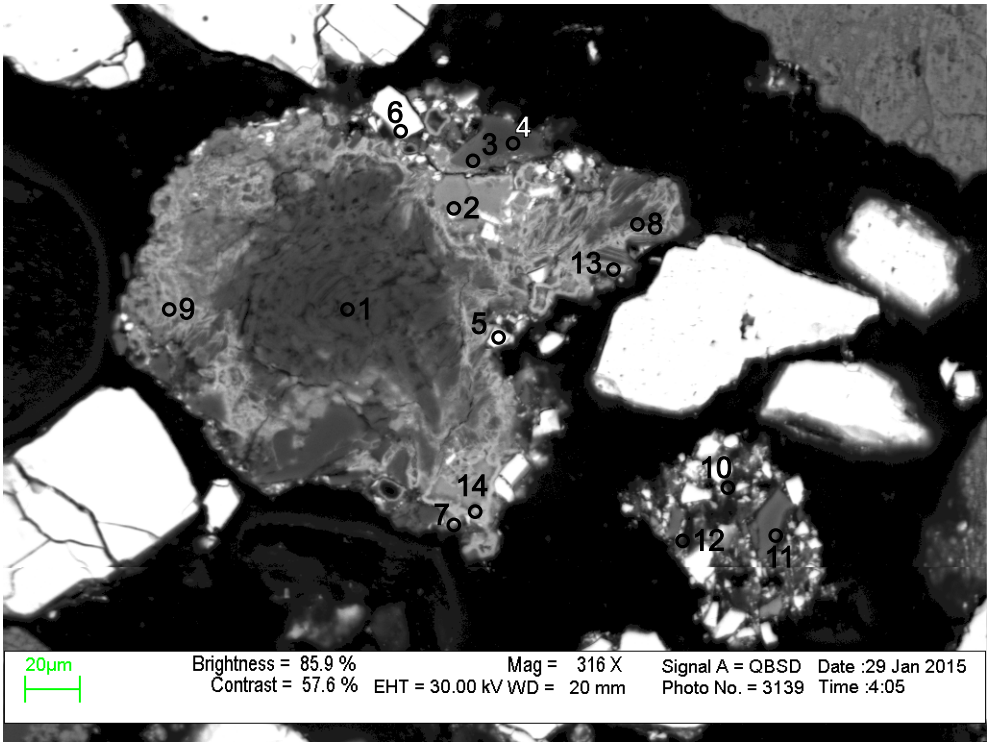
1: Pyrite
2: Muscovite + Chlorite
3: Muscovite + Chlorite
4: Muscovite + Chlorite
5: Ankerite + Chlorite
6: TiO_2 +
7: Barite
8: Barite +
9: Barite
10: Ankerite
11: Feohy
12: Ankerite
13: Quartz + K-feldspar
14: Barite
15: Barite
16: Mix
17: Barite +
18: Albite + Siderite
19: Siderite + Chlorite
20: Siderite + Chlorite
21: Magnetite + (DM)

Figure 1E.6: Annapolis G-24 5510 (SEM) site 6. A cutting made up of albite (18), siderite (18-20), and chlorite (19,20). TiO_2 (6) appears to be diagenetic.



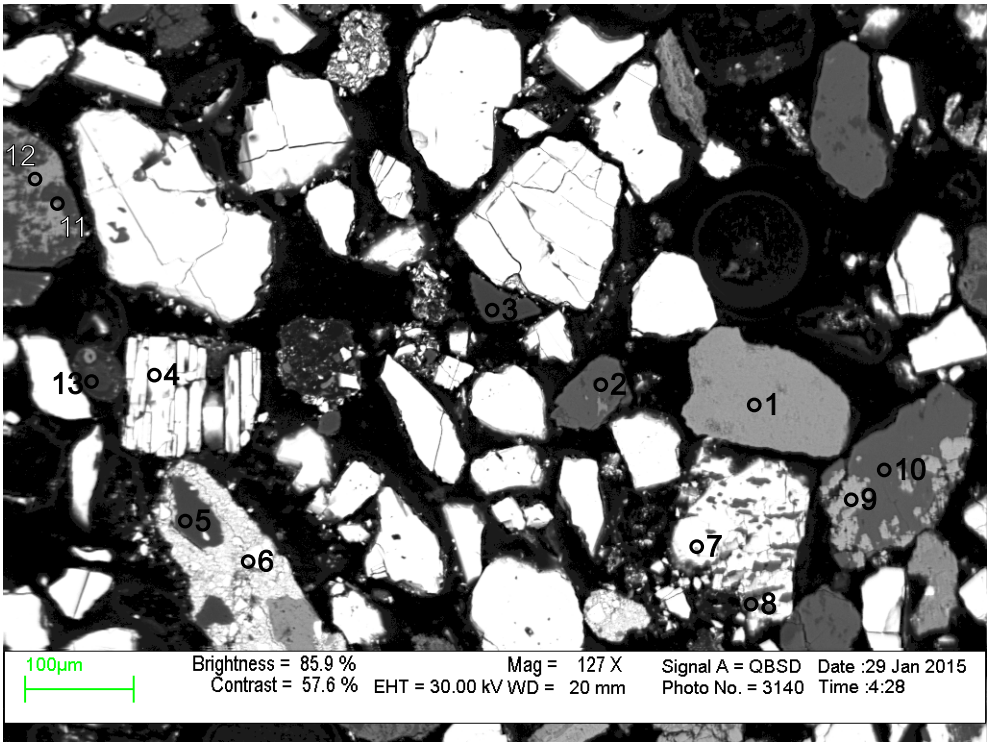
1: Barite
2: Kaolinite
3: Feohy +
4: Siderite + Chlorite +
5: Feohy +
6: Siderite + Chlorite
7: Siderite + Chlorite
8: Calcite +
9: Feohy +
10: Siderite + Chlorite
11: Muscovite + Chlorite
12: Mix
13: Feohy + Chlorite
14: Barite +
15: Pyrite
16: Hematite +

Figure 1E.7: Annapolis G-24 5510 (SEM) site 7. Feohy (5) is probably a contaminant, Feohy (9) however appears to be diagenetic.



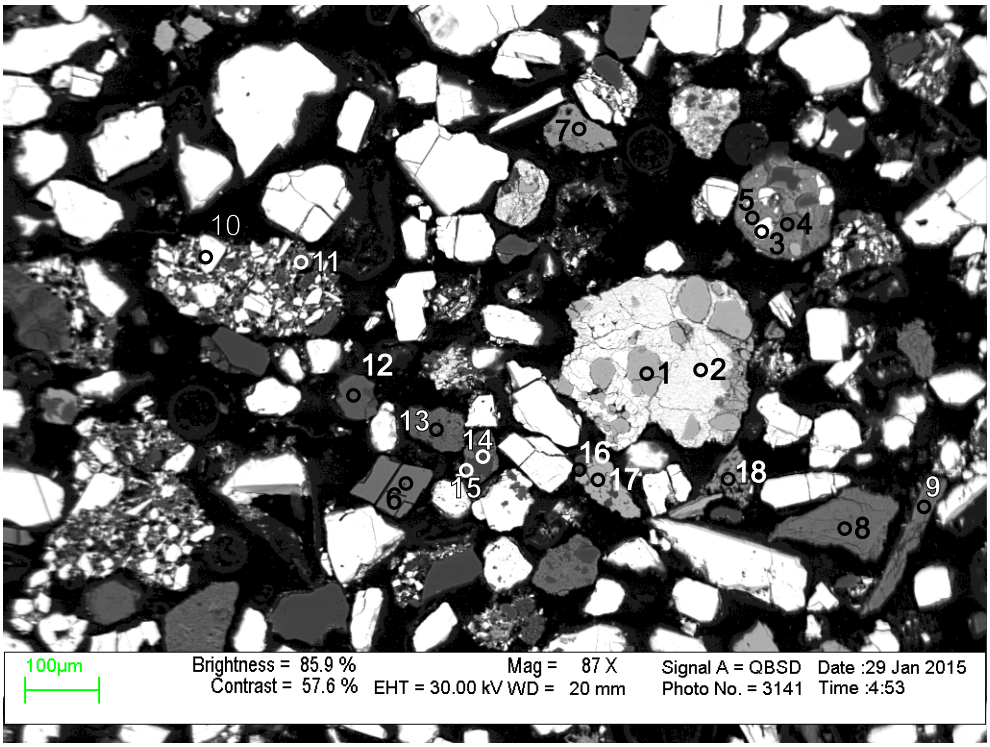
1: Kaolinite +
2: Feohy +
3: Ankerite +
4: Mix
5: Mix
6: Barite
7: Mix
8: Kaolinite + Feohy
9: Hematite + Chlorite
10: Mix
11: Calcite + Chlorite +
12: Mix
13: Feohy + Kaolinite +
14: Feohy +

Figure 1E.8: Annapolis G-24 5510 (SEM) site 8. A cutting made up of kaolinite (1), Feohy (2,8), ankerite (3), barite (6; probably from drilling mud), hematite (9), and chlorite (9), all of which appear to be diagenetic. Chlorite appears to postdate kaolinite, calcite possibly postdates chlorite, and Feohy/hematite postdates both. Probably a cutting of crushed sandstone (11) mixed with drilling mud.



1: Feohy +
2: Ankerite +
3: Quartz
4: Barite
5: Quartz
6: Barite +
7: Barite
8: Calcite +
9: Pyrite +
10: Mix
11: Quartz + Feohy
12: Feohy + Quartz
13: Quartz +

Figure 1E.9: Annapolis G-24 5510 (SEM) site 9. A cutting made up of quartz (5) and barite (6), and another cutting with quartz and Feohy (11,12). Pyrite (7) postdates calcite (8).



1: Pyrite
2: Barite
3: Barite
4: Siderite + Chlorite
5: Siderite + Chlorite
6: Fluorite
7: Siderite +
8: Siderite + Apatite + Chlorite
9: Mix
10: Barite
11: Calcite + Fluorite
12: Hematite + Ankerite
13: Siderite + Pyrite + Kaolinite
14: Albite +
15: Siderite + Chlorite +
16: Pyrite + Albite
17: Pyrite +
18: Feohy +

Figure 1E.10: Annapolis G-24 5510 (SEM) site 10. A cutting made up of pyrite (1) and barite (2), with barite appearing to postdate pyrite.

Table 1E.1: SEM-EDS cemical analyses of minerals from sample G-24 5510.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	NiO	CuO	ZnO	As_2O_3	SrO	BaO	WO_3	PbO	B_2O_3	Total	Actual Total
1	1	Feohy +				97.36			2.21						0.42												100	46
1	2	Sd + Chl	4.62		2.04	71.76	1.37	12.65	7.26		0.30																100	36
1	3	Brt											39.55									1.22	59.23				100	71
1	4	Chl + Cal	7.29		4.80	5.35		1.33	74.59		0.34			6.32													100	40
1	5	Brt											39.23									2.09	58.67				100	79
1	6	Brt											39.58									1.31	59.13				100	66
1	7	Qz	99.99																								100	78
1	8	Brt											39.63										60.37				100	69
1	9	Mix	67.73	0.72	5.31	2.35		3.86	8.42					4.83										6.76			100	39
1	10	Dol + Sd + Chl	3.44		1.98	24.55	1.15	19.28	47.75		0.70		1.15														100	39
1	11	Py	0.73		0.51	25.29			0.34				73.14														100	139
1	12	Qz	99.79			0.21																					100	76
1	13	Sd + Ap +	7.44		4.69	68.23	1.52	8.51	7.14		0.54	1.21											0.74				100	36
1	14	Py				26.33							73.69														100	127
1	15	Feohy +	4.64			94.22	0.53		0.59																		100	43
1	16	Fl	0.47						53.31					46.22													100	81
1	17	Brt											40.00									2.78	57.24				100	74
1	18	Feohy +	5.37		1.66	74.20	12.28		1.76			1.74							1.97				1.00				100	44
2	1	Py				26.64							73.36														100	139
2	2	Feohy				98.33	1.67																				100	59
2	3	Py				26.26							73.74														100	154
2	4	Sd + Chl	1.80		1.30	74.68	1.67	17.23	3.33																		100	35
2	5	Qz	99.81			0.18																					100	78
2	6	Sd	2.61		1.13	41.86	0.73	4.77	4.73		0.17																56	31
2	7	Brt											24.27									0.72	39.51			35.50	100	110
2	8	Brt + Qz	51.70										20.25										28.05				100	87
2	9	Qz	99.58		0.40																						100	83
2	10	Feohy +				96.96	0.49		1.34						1.21												100	42
3	1	Qz	99.69		0.32																						100	153
3	2	Feohy +	2.20			93.40	0.74										3.67										100	59
3	3	Mix	2.01			87.55			3.97				1.55		0.36		4.55										100	46
3	4	Kfs + Qz	80.54		10.30	0.73		0.32			8.11																100	82
3	5	Feohy +	1.03	1.83	2.19	94.39										0.55											100	56
3	6	Ti-Mt		10.19		89.80																					100	53
3	7	Mix	9.07	13.59	3.42	52.96	1.12	10.46	5.74		0.46	3.19															100	38
3	8	Feohy				98.43	1.58																				100	46
3	9	Brt											39.73									1.14	59.14				100	72
3	10	Mix	5.86		3.80	84.12	0.32		2.98			2.47							0.44								100	46
3	11	Py	0.17			26.50							73.34														100	133
3	12	Mix	28.88	0.32	6.03	54.23		1.24	2.04	0.82	1.83		3.22						0.58	0.82							100	77
3	13	Feohy				98.36	1.63																				100	65
3	14	Feohy +	3.19			92.54	0.74		1.83						1.15		0.56										100	44
3	15	Qz + Kfs	84.52		8.86	0.51					6.11																100	77
3	16	Brt	6.31		0.49						0.22		22.07										34.58			36.33	100	105
3	17	Brt											25.47									0.77	41.24			32.53	100	96
3	18	Brt + Qz	14.20		1.40								35.03										49.39				100	65
4	1	Tur	38.44	0.93	29.37	8.68		6.11	1.10	2.36																	87	72
4	2	Brt				0.32							24.62									0.99	42.87			31.21	100	97
4	3	Mix	2.27		1.08	71.17	0.85	11.14	10.41			3.12															100	38
4	4	Sd +	0.80			46.19	0.65	0.89	4.18				0.64											2.64			56	47
4	5	Ank + Fl				6.65	0.76	4.01	69.72	1.70			1.32	15.59	0.24												100	43
4	6	Py + Chl + TiO_2	23.08	5.45	18.10	31.74		4.34	0.21				17.08														100	69
4	7	Py + Chl	2.76		2.66	26.41		0.48					67.70														100	139
4	8	Qz + Brt	59.58		0.42	0.18							15.18										24.64				100	84
4	9	Brt + Qtz	8.94										17.03										29.09			44.93	100	142
4	10	Sd + Chl +	15.32	0.42	10.47	57.11	1.24	11.34	2.63		1.49																100	38
4	11	Ank				6.48	0.67	20.31	28.53																		56	37

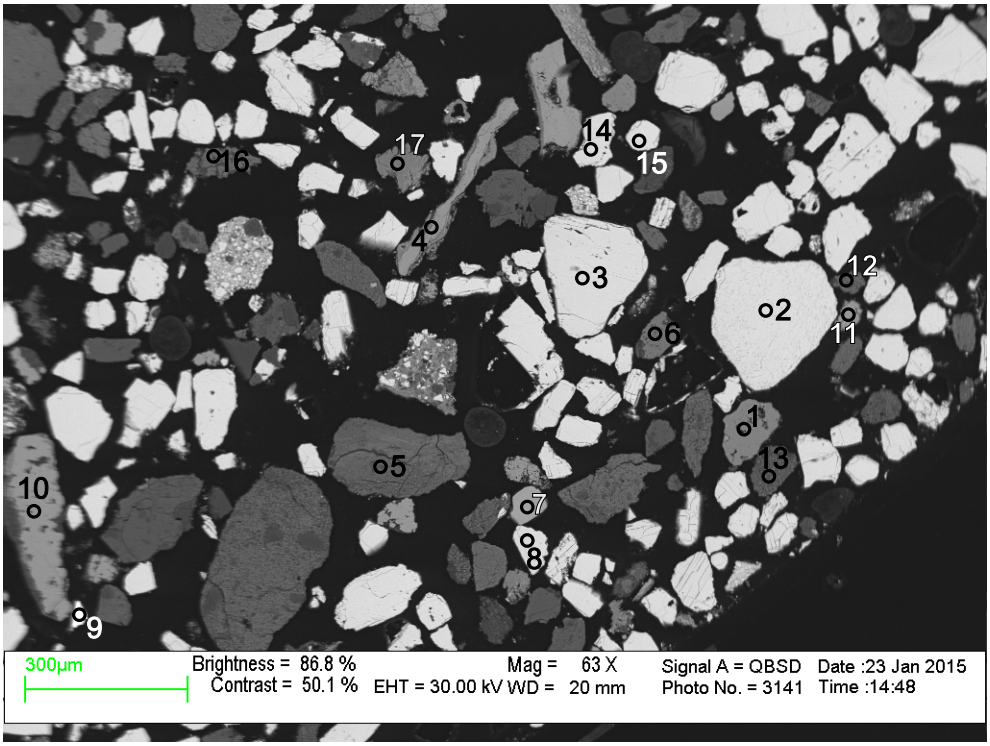
Table 1E.1: SEM-EDS cemical analyses of minerals from sample G-24 5510.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	NiO	CuO	ZnO	As_2O_3	SrO	BaO	WO_3	PbO	B_2O_3	Total	Actual Total
4	12	Brt											24.45									1.50	38.76			35.34	100	110
4	13	Qz	99.99																								100	82
4	14	Feohy				98.06	0.65		0.39						0.91												100	40
4	15	Sd + Chl	17.91		15.59	50.24	1.24	7.66	7.15		0.22																100	57
4	16	Feohy + Ap + Chl	5.63		3.42	84.93	1.32		1.86			2.15							0.70								100	52
4	17	Brt											40.28									2.19	57.54				100	71
4	18	Sd + Ap + Chl	17.86	0.93	12.43	52.80	1.03	9.90	3.58		1.47																100	47
4	19	Qz	99.99																								100	88
5	1	Feohy +	2.65			91.39	1.30	1.14	3.22						0.31												100	48
5	2	Cal +				3.14	0.52	2.39	39.09	1.00	0.11		0.73	9.03													56	45
5	3	Sd +	1.94			48.03	1.10	0.53	1.53															2.87			56	49
5	4	Sd	0.62			52.67	0.91	0.72	1.08																		56	46
5	5	Py + Qz	3.21			24.94			1.50				70.37														100	142
5	6	Qz +	97.80	0.23	1.27	0.40					0.28																100	80
5	7	Sd + Ap + Chl	4.30		2.89	64.94	0.75	10.96	10.97			5.20															100	41
5	8	Brt											39.80									1.11	59.10				100	76
5	9	Sd +	4.65		0.46	44.61	0.20	1.48	3.11				0.54		0.17		0.77										56	50
6	1	Py				26.86							73.14														100	228
6	2	Ms + Chl	41.29	0.65	19.56	8.71	0.19	17.92		0.66	8.42			2.44						0.17							100	128
6	3	Ms + Chl	41.97	0.58	19.88	8.18	0.18	17.76		0.61	8.38			2.44													100	128
6	4	Ms + Chl	56.65		25.24	3.07		2.47		0.36	10.12			2.08													100	117
6	5	Ank + Chl	21.54	1.12	25.79	12.00	0.30	3.07	36.18																		100	122
6	6	TiO_2 +	1.16	98.08		0.75																					100	98
6	7	Brt											40.63										59.38				100	112
6	8	Brt +											36.38	14.41	1.88								47.32				100	8
6	9	Brt											40.38									0.77	58.88				100	97
6	10	Ank				15.24	0.52	11.23	29.01																		56	60
6	11	Feohy	1.35			98.66																					100	75
6	12	Ank	0.79			33.41	0.18	1.14	18.86				0.50		1.12												56	62
6	13	Qz + Kfs	89.93		5.35	0.75					3.96																100	121
6	14	Brt											18.45									0.86	31.42			49.28	100	182
6	15	Brt											25.72									1.32	39.38			33.60	100	163
6	16	Mix	40.37		5.31	1.92		2.32	3.53		0.41		18.60	4.20									23.36				100	59
6	17	Brt +	1.82		0.96	0.81							38.68	1.80								3.35	52.59				100	100
6	18	Ab + Sd	41.69		11.79	32.11	0.66	3.20	1.29	9.26																	100	81
6	19	Sd + Chl	2.91		2.19	76.83	1.61	13.18	3.27																		100	51
6	20	Sd + Chl	2.72		1.97	76.10	1.39	14.14	3.69																		100	52
6	21	Mnt + (DM)*	45.39		6.65	27.78		0.91	3.57	1.47			2.45	4.23									3.06	4.48			100	47
7	1	Brt											22.17										37.55			40.30	100	180
7	2	Kln	48.44		35.99	1.57																					86	100
7	3	Feohy +	14.23		6.29	69.69	1.46		0.67				3.42										4.25				100	92
7	4	Sd + Chl +	20.26		11.70	49.21	0.62	7.45	6.23	1.44	1.63	1.44															100	72
7	5	Feohy +	4.88		0.85	85.92	0.62		2.35	2.49			1.55				1.34										100	70
7	6	Sd + Chl	5.33		2.68	56.58	0.72	11.01	22.21		0.41	1.08															100	62
7	7	Sd + Chl	9.43	0.48	6.97	63.71	1.41	14.29	2.90		0.81																100	57
7	8	Cal +	3.35		1.60	1.06	0.20		46.50		0.23			3.06													56	64
7	9	Feohy +	2.80			86.97	0.74		3.11				1.52				4.87										100	81
7	10	Sd + Chl	8.58		6.86	65.40	1.20	7.74	8.52		0.39	1.31															100	68
7	11	Ms + Chl	50.42	0.65	34.22	2.38		0.78		2.62	8.20		0.72														100	61
7	12	Mix	4.43		2.83	42.25	1.16	7.46	20.76		0.45	20.67															100	75
7	13	Feohy + Chl	2.93	0.55	1.78	94.74																					100	70
7	14	Brt +	10.25		1.97	2.19			1.18		0.26		35.28										48.90				100	85
7	15	Py				26.09							73.91														100	184
7	16	Hem +	13.26		2.80	76.58			2.34						0.40				1.06	0.49	0.26				2.82		100	66
8	1	Kln +	54.51		40.80	2.56			0.18					1.94													100	101
8	2	Feohy +	0.75			94.54	0.48		2.28				0.77										1.17				100	71
8	3	Ank +	10.10		2.04	37.90	0.84	13.46	32.01		0.22		1.12										2.31				100	70

Table 1E.1: SEM-EDS cemical analyses of minerals from sample G-24 5510.

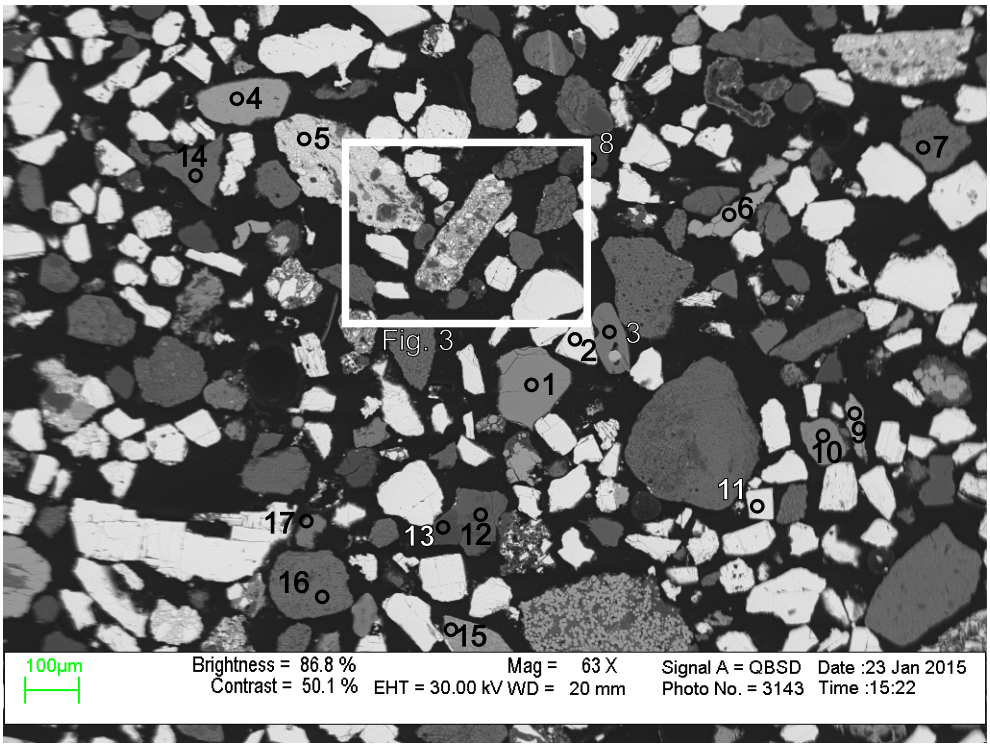
Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	NiO	CuO	ZnO	As_2O_3	SrO	BaO	WO_3	PbO	B_2O_3	Total	Actual Total
8	4	Mix	65.61		4.21	13.44		0.53	0.56	0.54	0.33		6.12										7.72	0.95			100	115
8	5	Mix	34.29		4.02	32.28	0.48		1.27	0.65			9.56										17.44				100	40
8	6	Brt				0.55							23.07										37.45			38.94	100	175
8	7	Mix	7.19		3.78	50.74	0.81	0.71	0.62				17.08										19.08				100	88
8	8	Kln + Feohy	44.52		33.22	21.41			0.87																		100	88
8	9	Hem + Chl	10.18		8.22	74.11	2.03	3.43	1.80		0.22																100	81
8	10	Mix	32.43		8.37	1.52		0.83	14.45		0.90		13.71	6.00									17.55	4.24			100	45
8	11	Cal + Chl +	2.99		1.13	0.57		0.78	80.83				3.40	4.74									5.58				100	54
8	12	Mix	26.85		4.88	2.68			8.31		0.61		20.48	2.82									33.38				100	47
8	13	Feohy + Kln +	12.41		8.75	73.32	1.06		0.57				1.72		0.26								1.93				100	87
8	14	Feohy +	2.78			90.65	1.48		2.76				0.97		0.36								0.99				100	76
9	1	Feohy +	7.94			88.91			0.60										0.60	1.94							100	80
9	2	Ank +	0.58	0.98	0.43	15.03	0.57	10.79	27.63																		56	62
9	3	Qz	99.99																								100	128
9	4	Brt											40.40										59.62				100	107
9	5	Qz	99.45		0.40										0.15												100	119
9	6	Brt +	1.41		1.66								41.13										55.81				100	114
9	7	Brt											41.10										58.91				100	117
9	8	Cal +				0.32			40.30				3.96	4.31									7.11				56	66
9	9	Py +				25.72			2.41				71.87														100	211
9	10	Mix				26.28	0.92	16.35	41.40				15.06														100	75
9	11	Qz + Feohy	80.93			18.77	0.30																				100	100
9	12	Feohy + Qz	18.40			81.09	0.53																				100	73
9	13	Qz +	91.92	0.63	1.83	0.90	0.23	2.06	2.31															0.13			100	86
10	1	Py				26.67							73.34														100	220
10	2	Brt				0.28							21.20									0.76	34.60			43.19	100	186
10	3	Brt				1.72							39.58										58.71				100	114
10	4	Sd + Chl	41.29		14.66	22.29	0.39	19.38	0.76									1.22									100	118
10	5	Sd + Chl	28.67		11.85	54.28	0.40	1.06	1.43		0.73		0.65										0.94				100	89
10	6	Fl							42.12					57.88													100	169
10	7	Sd +	3.84			50.59	0.57	0.54	0.47																		56	75
10	8	Sd + Ap + Chl	9.90		5.25	61.30	0.98	9.93	7.88	1.69	0.34	2.70															100	71
10	9	Mix	14.55		6.71	33.05		6.67	13.85				6.69	9.38									9.10				100	14
10	10	Brt											24.50									0.98	38.58			35.98	100	160
10	11	Cal + Fl							86.50					13.50													100	58
10	12	Ank	1.99		1.10	25.50	1.02	20.16	50.23																		100	57
10	13	Sd + Py + Kln	11.49		5.57	53.32	1.08	12.19	7.15		0.57	1.19	4.47											2.98			100	61
10	14	Ab +	62.87		18.39	5.45			0.31	12.98																	100	136
10	15	Sd + Chl +	19.53	0.70	11.13	52.85	1.24	9.35	3.83		1.37																100	60
10	16	Py + Ab	18.85		8.39	17.52			0.14	4.88	0.12		50.12														100	203
10	17	Py +	5.71		0.68	24.71							68.89														100	202
10	18	Feohy +	2.25			89.09	0.44		0.99				2.02		1.06									4.16			100	63
		DM*=Drilling mud																										

Appendix 1F: SEM-BSE images and EDS mineral analyses for sample G-24 5520



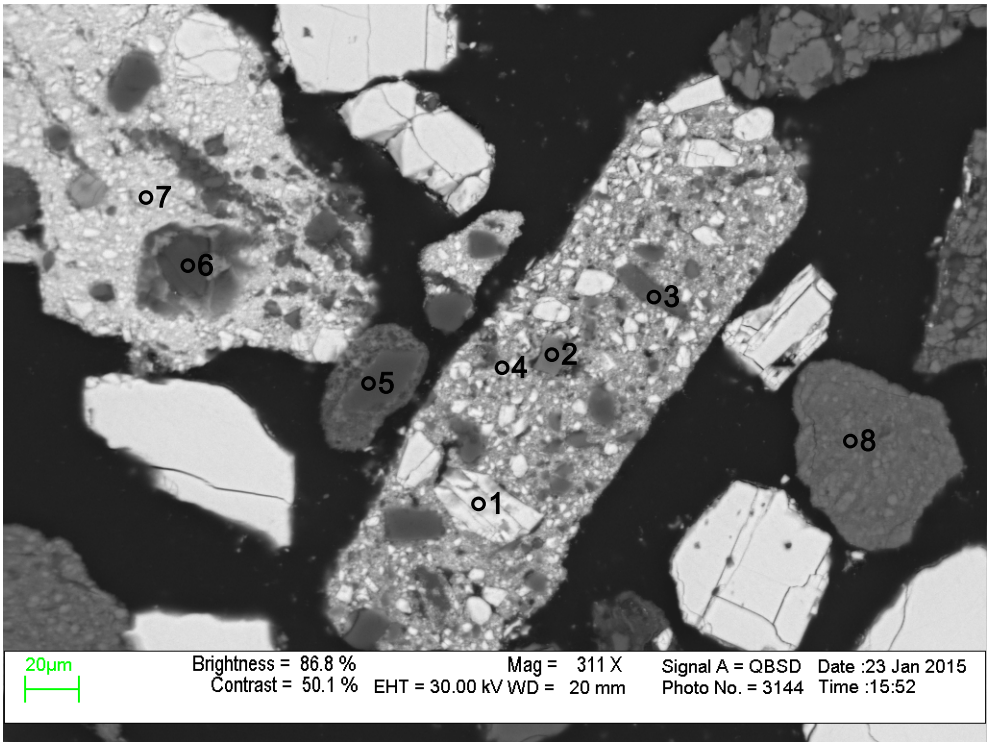
1: Feohy + Quartz
2: Barite
3: Barite
4: Feohy +
5: Siderite + Chlorite
6: TiO_2 +
7: Zircon
8: Barite
9: Wulfenite
10: Pyrite
11: Pyrite
12: Siderite
13: Siderite
14: Barite
15: Barite
16: Siderite + Ankerite + Chlorite
17: Siderite + Quartz

Figure 1F.1: Annapolis G-24 5520 (SEM) site 1. Feohy (4) apppears to be a contaminant. A cutting made up of chlorite and siderite (5).



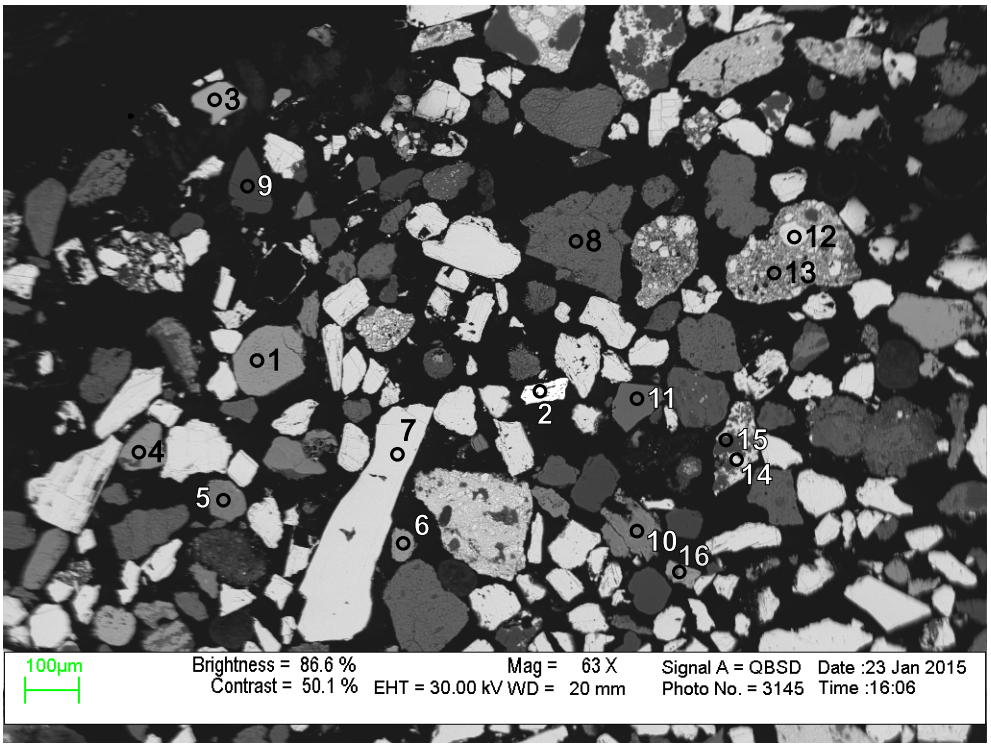
1: Feohy + Quartz
2: Barite
3: TiO_2
4: Pyrite
5: Barite
6: Magnetite
7: Siderite + Ankerite + Muscovite
8: Quartz
9: Magnetite +
10: Feohy +
11: Barite
12: Ankerite + Albite
13: Quartz
14: Siderite + Ankerite +
15: Feohy + Psilomelane
16: Siderite + Ankerite + Apatite +
17: Barite

Figure 1F.2: Annapolis G-24 5520 (SEM) site 2. A cutting made up of quartz (13) and ankerite probably replacing albite (12). TiO_2 (3) appears to be detrital. A cutting made up of quartz (13) albite and ankerite (12), in which ankerite appears to have partly replaced albite. A probable contaminant made up of Feohy and psilomelane (15).



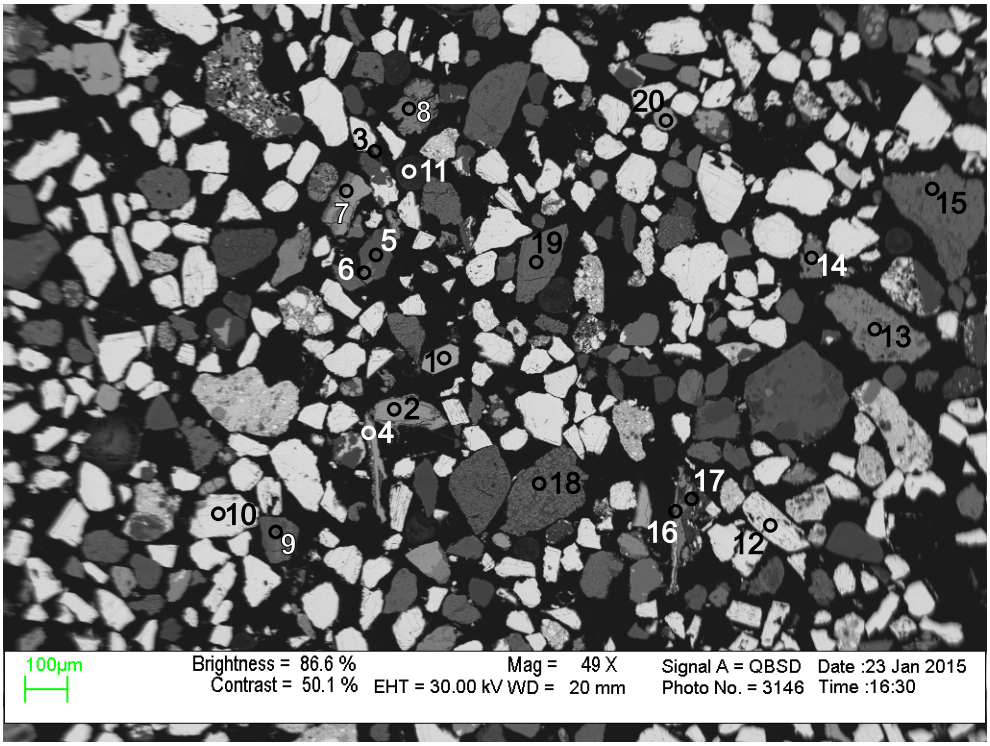
1: Barite
2: Fluorite
3: Quartz + K-feldspar + Barite
4: Barite + Chlorite
5: Albite
6: Mix
7: Barite
8: Mix

Figure 1F.3: Annapolis G-24 5520 (SEM) site 3. A cutting made up of barite (1), fluorite (2), quartz and K-feldspar (3), and chlorite is probably a mixture of drilling mud and crushed sandstone.



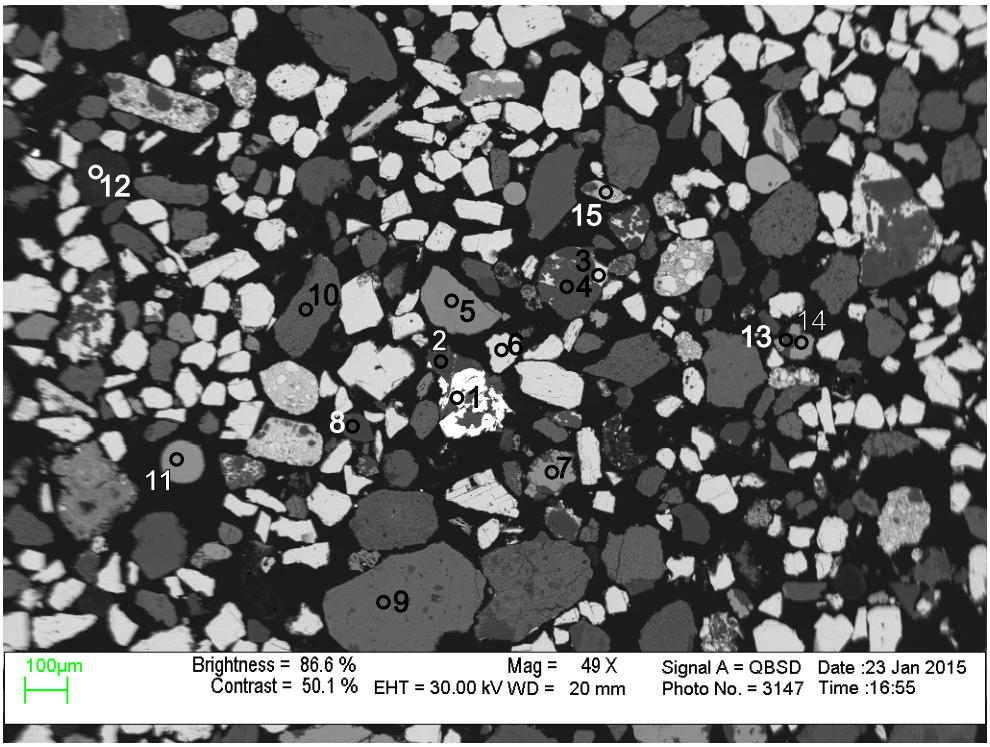
1: Pyrite
2: Wulfenite
3: Zircon
4: Feohy +
5: Siderite +
6: Magnetite
7: Barite
8: Siderite + Chlorite
9: Quartz
10: Magnetite
11: Fluorite
12: Barite
13: Barite
14: Barite
15: Albite
16: Psilomelane +

Figure 1F.4: Annapolis G-24 5520 (SEM) site 4. Magnetite (6) appears to be diagenetic/hydrothermal. Fluorite (11) shows sharp crystal outlines and is also likely diagenetic. A cutting made up of albite (15) and barite.



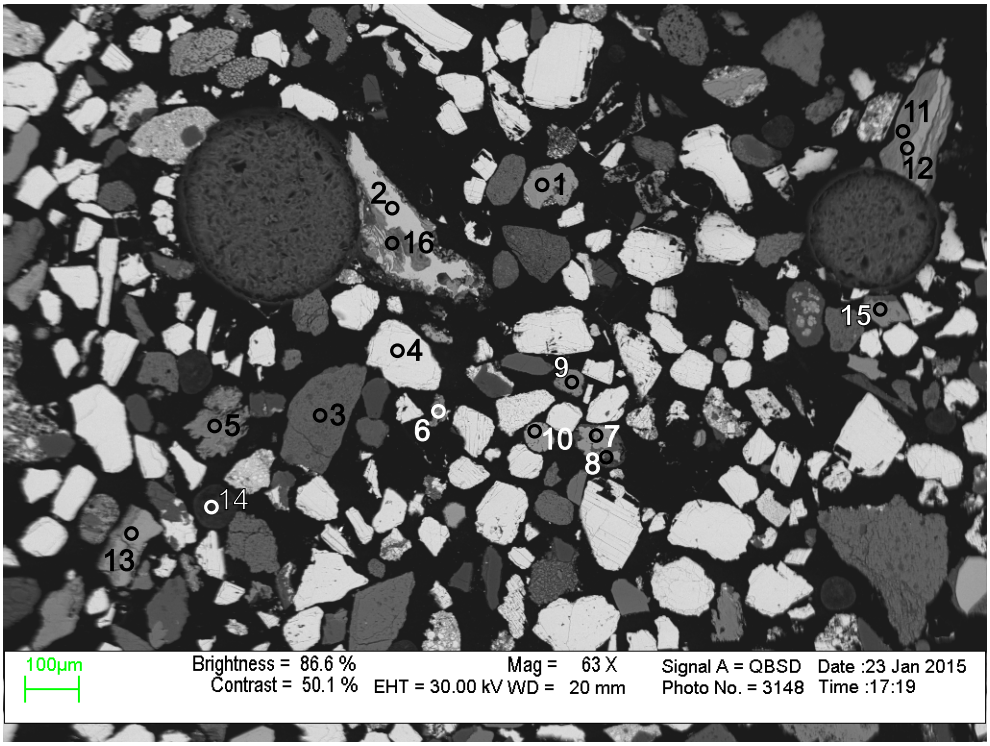
1: Zircon
2: Magnetite
3: Siderite + Chlorite
4: Magnetite
5: Ankerite + Quartz
6: TiO_2
7: Magnetite
8: Siderite +
9: Quartz +
10: Barite
11: Barite + Pyrite +
12: Barite
13: Feohy + Quartz
14: Siderite
15: Siderite +
16: Mix
17: Mix
18: Siderite +
19: Siderite + Chlorite
20: Pyrite

Figure 1F.5: Annapolis G-24 5520 (SEM) site 5. A cutting made up of quartz and ankerite (5) and TiO_2 (6).



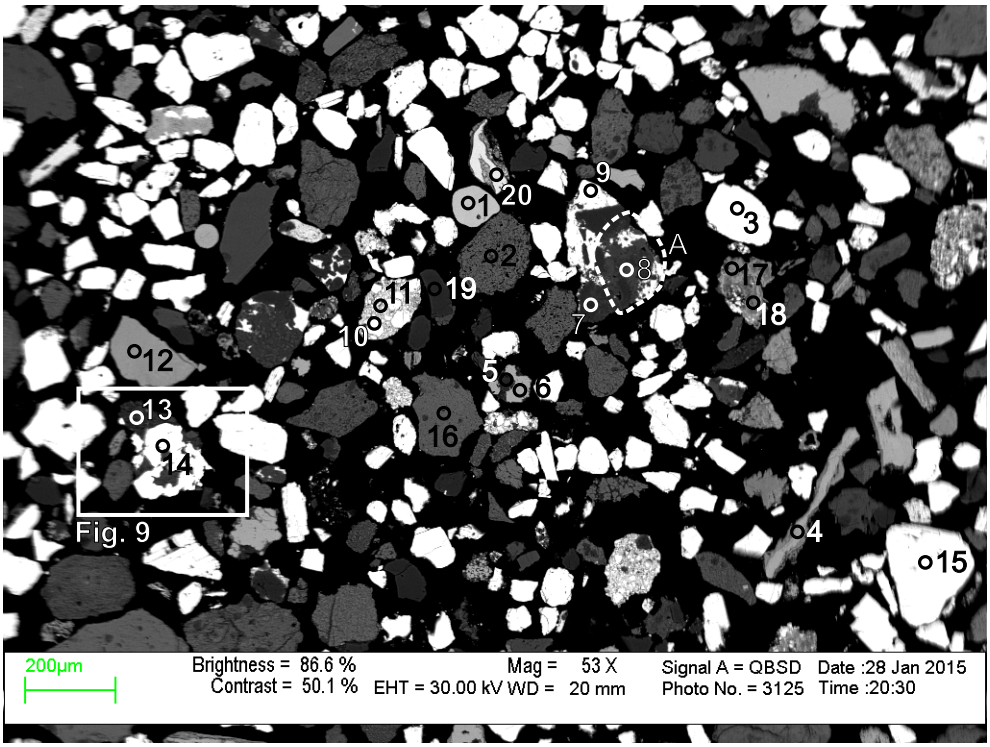
1: Wulfenite
2: Calcite + Albite
3: Barite
4: Muscovite + TiO_2
5: Feohy +
6: Barite
7: Pyrite
8: Quartz
9: Siderite + Chlorite
10: Siderite + Chlorite
11: Pyrite
12: Mix
13: Albite
14: Pyrite
15: Barite + Chlorite

Figure 1F.6: Annapolis G-24 5520 (SEM) site 6. Cuttings are made up of: calcite (2), muscovite and TiO_2 (4), and barite (3); siderite and chlorite (9,10); barite and chlorite (15); wulfenite (1) contaminant in contact with calcite and albite (2).



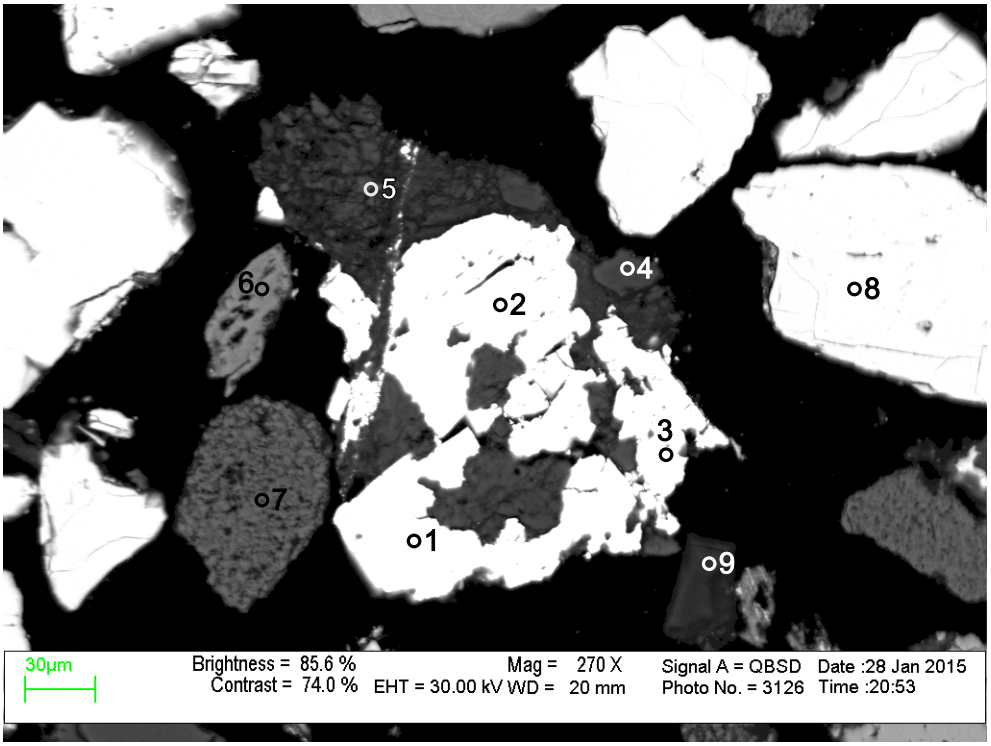
1: Magnetite +
2: Magnetite
3: Siderite + Chlorite
4: Barite
5: Siderite
6: Siderite +
7: Pyrite
8: Mix
9: Feohy +
10: Pyrite
11: Siderite +
12: Magnetite +
13: Feohy
14: Mix
15: Feohy +
16: Mix

Figure 1F.7: Annapolis G-24 5520 (SEM) site 7. A cutting is made up of siderite (11) with smeared magnetite (12) on its surface.



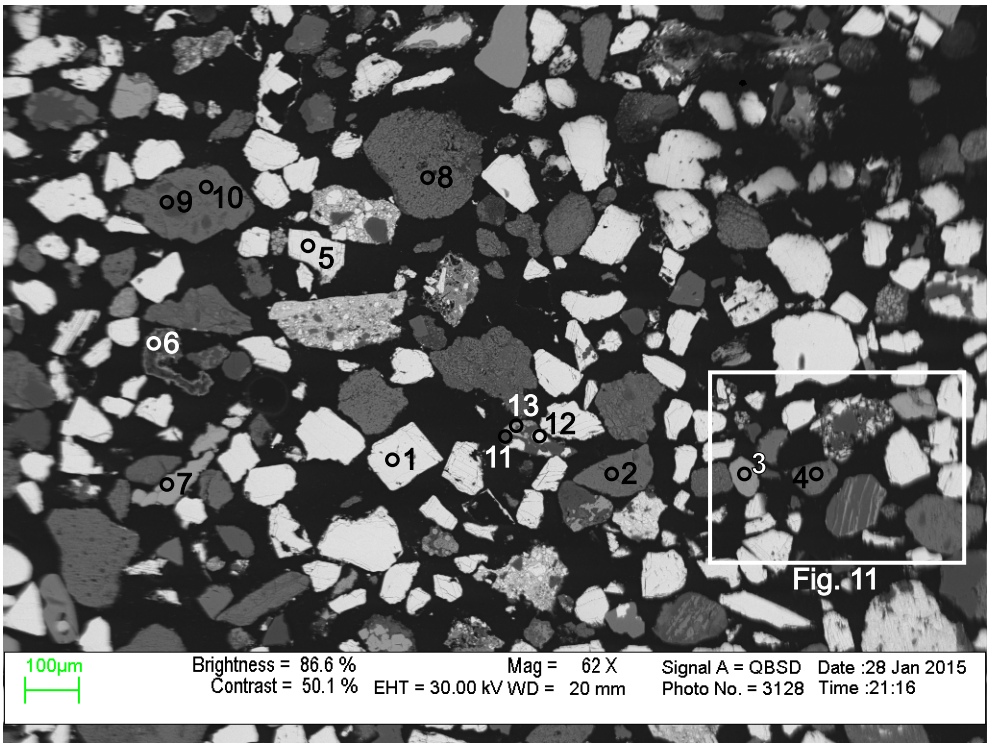
1: Zircon
2: Siderite + Chlorite +
3: Barite
4: Siderite + Chlorite +
5: Albite
6: Pyrite
7: Quartz + K-feldspar
8: Calcite +
9: Barite
10: Barite
11: Hole
12: Hole
13: Calcite +
14: Calcite + Anglesite
15: Barite
16: Siderite + Chlorite
17: Siderite +
18: Siderite + Barite +
19: Quartz
20: Siderite + Quartz

Figure 1F.8: Annapolis G-24 5520 (SEM) site 8. A cutting is made up of quartz and K-feldspar (7) and barite (9) and another one contains siderite (17) and siderite and barite (18). A lithic clast (A) made up of quartz and K-feldspar (8).



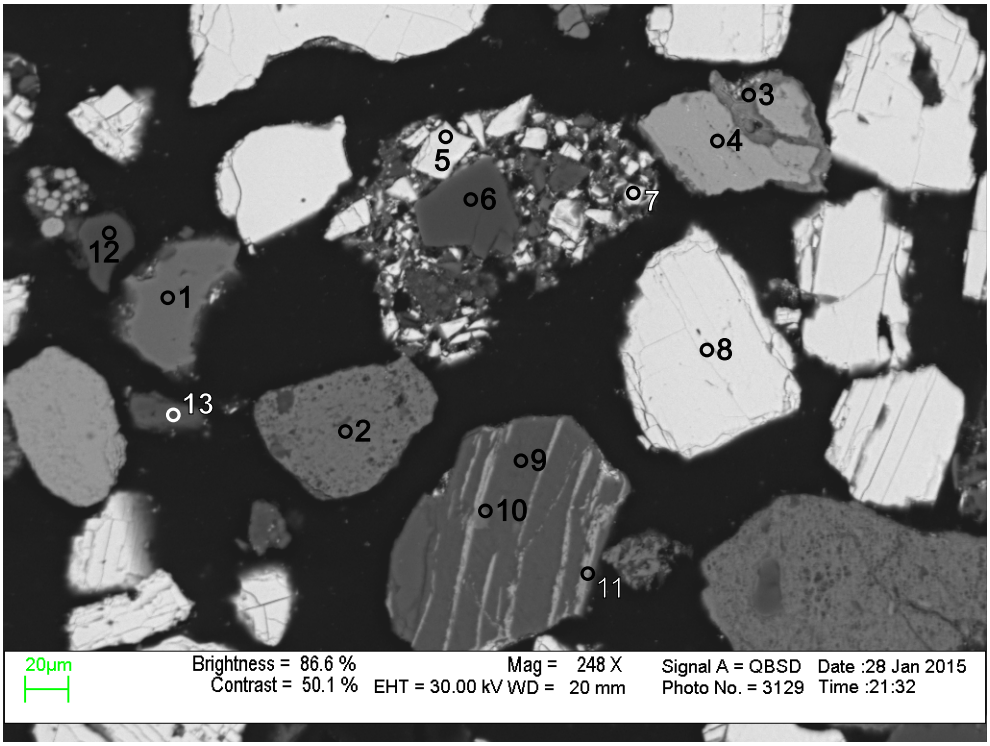
1: Wulfenite
2: Wulfenite
3: Wulfenite
4: Calcite
5: Calcite +
6: Siderite + Quartz
7: Siderite +
8: Barite +
9: Barite +

Figure 1F.9: Annapolis G-24 5520 (SEM) site 9. A cutting made up of quartz and siderite (6). The contaminant fragment of wulfenite and anglesite (site 8 position 14) is associated with calcite (1-5).



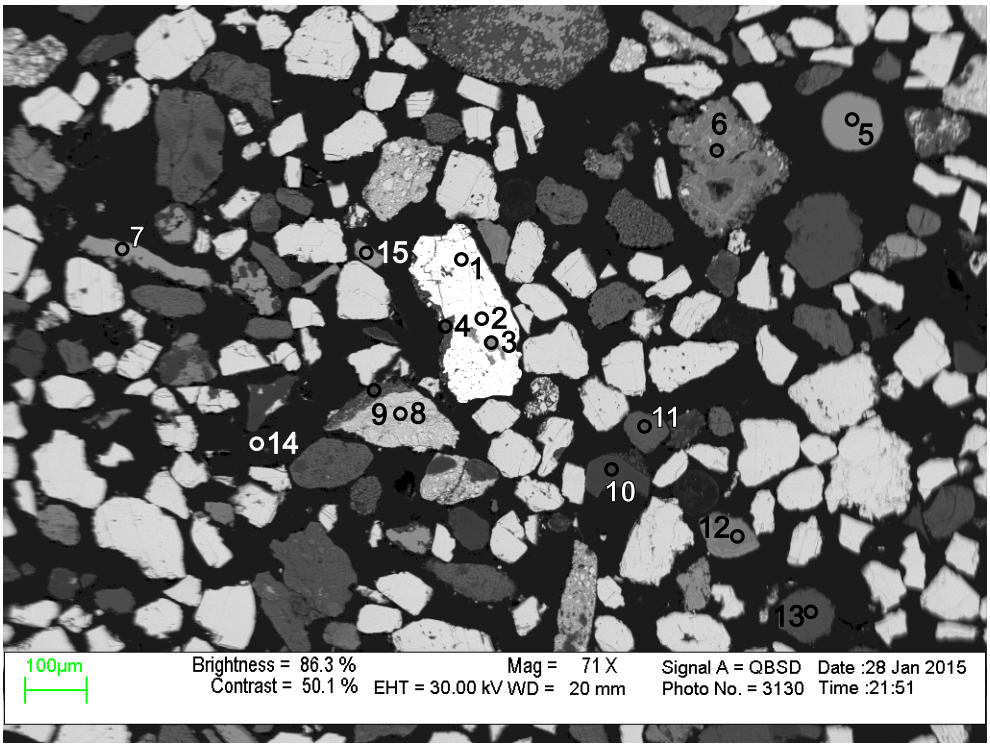
1: Barite
2: Siderite + Chlorite
3: Siderite
4: Siderite + Apatite +
5: Barite
6: Hole
7: Siderite
8: Hole
9: Quartz
10: Siderite + Quartz + Chlorite
11: Quartz
12: Barite
13: Psilomelane +

Figure 1F.10: Annapolis G-24 5520 (SEM) site 10. A cutting made up of quartz (11) and siderite (10). Siderite appears to be mixed with apatite (4).



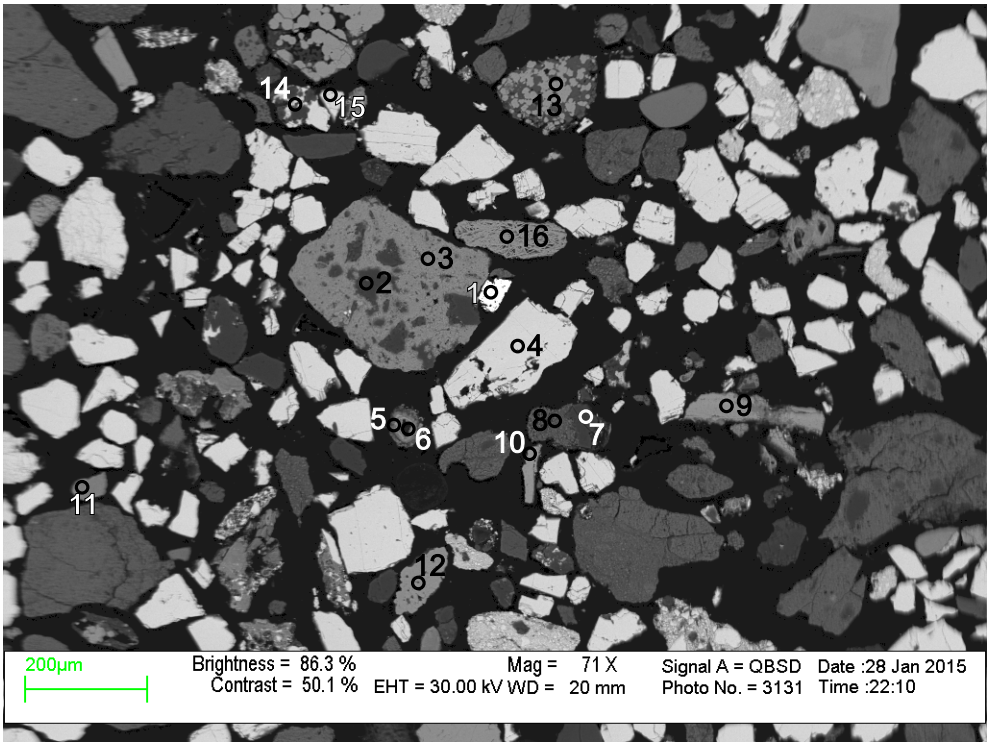
1: Fluorite
2: Siderite +
3: Mix
4: Feohy
5: Barite
6: Quartz
7: Barite + Chlorite
8: Barite
9: Muscovite + Chlorite
10: Muscovite + Apatite + Chlorite
11: Chlorite + Muscovite +
12: Quartz
13: Quartz +

Figure 1F.11: Annapolis G-24 5520 (SEM) site 11. A cutting made up of quartz (6) and chlorite (7) surrounded by drilling mud (barite)(5,7). Detrital muscovite (9,10) partly replaced by chlorite (11) mixed with apatite (10) especially along cleavage planes.



1: Wulfenite
2: Wulfenite
3: Pyrite
4: Ankerite + Pyrite
5: Pyrite
6: Siderite + Barite
7: Siderite
8: Barite
9: Pyrite +
10: Tourmaline
11: Siderite + Chlorite
12: Feohy + Chlorite
13: Ankerite
14: Hole
15: Feohy

Figure 1F.12: Annapolis G-24 5520 (SEM) site 12. A cutting (contaminant) made up of wulfenite (1,2), pyrite (3), and ankerite (4) in which wulfenite appears to postdate both ankerite and pyrite.



1: Wulfenite
2: Quartz
3: Feohy + Chlorite
4: Barite
5: Feohy
6: Hole
7: Quartz
8: Siderite + Chlorite
9: Feohy
10: Feohy + Quartz
11: Feohy + Quartz
12: Pyrite
13: Pyrite
14: Barite + Quartz
15: Barite
16: Feohy

Figure 1F.13: Annapolis G-24 5520 (SEM) site 13. It is very difficult in this slide to decide if all Feohy is contaminant, diagenetic mineral, or both. At some positions (e.g. 3) is associated with chlorite and wulfenite (1), in others (e.g. 16) morphology suggests contaminant origin, whereas in others (e.g. 10,11) it could be either although it is associated with quartz and thus probably diagenetic.

Table 1F.1: SEM-EDS cemical analyses of minerals from sample G-24 5520.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	MoO_3	Sb_2O_3	BaO	Ce_2O_3	HfO_2	WO_3	PbO	B_2O_3	Total	Actual Total
1	1	Feohy + Qz	4.88			93.57	0.96		0.59																							100	76
1	2	Brt											38.21									1.90				59.89						100	125
1	3	Brt											39.10									3.43				57.48						100	121
1	4	Feohy +	1.35			95.57	1.17										1.91															100	91
1	5	Sd + Chl	33.84		5.54	43.17	0.72	7.36	8.41		0.95																					100	75
1	6	TiO_2 +	27.10	70.61	0.55	1.75																										100	129
1	7	Zrn	31.70																				67.88					0.42				100	121
1	8	Brt											38.68									1.08				60.24						100	115
1	9	Wfn				0.35																		29.20							70.47		100	97
1	10	Py				27.78							72.22																			100	188
1	11	Py				27.70							72.32																			100	243
1	12	Sd				44.46	0.82	9.06	1.65																							56	61
1	13	Sd	1.19		0.94	43.75	0.85	8.06	1.22																							56	53
1	14	Brt											25.32									1.53				41.89					31.28	100	169
1	15	Brt											23.50													40.40					36.14	100	183
1	16	Sd + Ank + Chl	7.27		3.21	68.79	2.79	10.56	5.36		0.37	1.63																				100	61
1	17	Sd + Qz	2.67			95.86	0.37								0.51		0.58															100	68
2	1	Feohy + Qz	6.31			92.46	0.84		0.39																							100	78
2	2	Brt											39.28									1.61				59.12						100	122
2	3	TiO_2	0.58	99.05		0.39																										100	106
2	4	Py				27.32							72.69																			100	209
2	5	Brt	1.07		1.02				0.34				39.20													58.38						100	104
2	6	Mag				98.61	1.39																									100	105
2	7	Sd + Ank + Ms	10.01		6.14	66.34	1.23	7.30	6.88		0.58	1.51																				100	71
2	8	Qz	99.99																													100	127
2	9	Mag +	1.43			96.27	1.38		0.24								0.69															100	95
2	10	Feohy +	9.86		2.38	84.24			1.16		0.28	1.35							0.71													100	86
2	11	Brt											25.57									1.14				42.95					30.37	100	169
2	12	Ank + Ab	3.49		1.25	29.50	1.14	15.47	48.20	0.98																						100	62
2	13	Qz	99.99																													100	118
2	14	Sd + Ank +	12.17			65.01	0.92	12.42	8.58			0.92																				100	60
2	15	Feohy + Psi	3.83			65.82	23.24		0.87										1.71							4.54						100	78
2	16	Sd + Ank + Ap +	4.39		2.27	75.13	1.11	6.52	9.32			1.28																				100	55
2	17	Brt		99.67		0.35																										100	98
3	1	Brt											22.80													42.15					35.08	100	154
3	2	Fl							44.96				0.35	54.69																		100	166
3	3	Qz + Kfs + Brt	84.71		4.53	1.04					4.16		2.77													2.77						100	123
3	4	Brt + Chl	4.71		1.36	2.10		0.63	1.61				34.33									1.56				53.72						100	90
3	5	Ab	67.53		19.24	0.91			0.36	11.77	0.18																					100	125
3	6	Mix	45.46		10.09	1.52		0.76	3.60	1.00			8.37	6.07	0.32											16.00			6.82			100	96
3	7	Brt	0.64						0.24				21.62									1.08				34.33					42.13	100	185
3	8	Mix	4.71		1.95	73.36	0.62	9.02	8.65		0.37	1.33																				100	59
4	1	Py	0.15			26.85			0.59				72.41																			100	197
4	2	Wfn																						29.21							70.79		100	155
4	3	Zrn	31.40																				68.13					0.46				100	118
4	4	Feohy +		3.05	1.13	94.05	0.34	1.43																								100	79
4	5	Sd +	11.53			82.21	3.49		2.78																							100	66
4	6	Mag				98.93	1.06																									100	86
4	7	Brt											39.23									1.51				59.28						100	110
4	8	Sd + Chl	4.92		2.46	71.77	1.46	14.36	4.55		0.49																					100	56
4	9	Qz	99.99																													100	114
4	10	Mag	4.17			94.30	0.50								0.57		0.47															100	73
4	11	Fl							43.68					56.31																		100	185
4	12	Brt											39.33									2.29				58.40						100	123
4	13	Brt	4.45		3.04	0.41			0.80				41.45		0.55											49.31						100	48
4	14	Brt											26.17									0.60				45.66					27.60	100	155
4	15	Ab	67.11		19.93	0.24			0.60	11.37	0.73																					100	131
4	16	Psi +	2.44		0.43	7.04	62.58		0.84				1.02						8.78	0.47						16.41						100	78
5	1	Zrn	31.60																				67.86					0.53				100	122
5	2	Mag				99.15	0.85																									100	92
5	3	Sd + Chl	13.58		10.73	47.90	1.19	10.48	2.87				4.99		1.32											6.96						100	11
5	4	Mag				98.45	1.55																									100	90
5	5	Ank + Qz	23.49			20.40	0.83	12.09	43.19																							100	72
5	6	TiO_2	0.56	97.76	0.68	0.59			0.42																							100	100
5	7	Mag				98.65	1.36																									100	92
5	8	Sd +	0.73			52.96	1.59		0.29						0.43																	56	56
5	9	Qz +	80.65		1.11	14.51		1.74	1.16		0.19		0.65																			100	93
5	10	Brt											21.85													38.31					39.88	100	156
5	11	Brt + Py +	10.46		2.53	25.03		4.34	1.02	2.63			19.43		1.06		5.93	8.07								19.51						100	20
5	12	Brt											19.40													38.26					42.36	100	174
5	13	Feohy + Qz	7.98			87.07	1.28	0.85	1.29										1.55													100	86
5	14	Sd				53.81	0.25		0.26	0.89					0.40		0.39															56	47
5	15	Sd +	23.17	0.32	4.95	55.04	0.93	10.45	4.48		0.67																					100	84

Table 1F.1: SEM-EDS cemical analyses of minerals from sample G-24 5520.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	MoO_3	Sb_2O_3	BaO	Ce_2O_3	HfO_2	WO_3	PbO	B_2O_3	Total	Actual Total
5	16	Mix	4.26		1.98	84.57	0.46		0.78	2.26			1.75		1.91		0.34		0.41							1.27						100	67
5	17	Mix	12.32		2.15	54.87			2.42	3.33			15.93		2.02		3.22	-9.15								12.89						100	21
5	18	Sd +	3.74		1.75	40.84	0.26	5.57	2.86		0.27	0.71																				56	57
5	19	Sd + Chl	2.50		1.36	75.74	0.71	11.92	6.30			1.44																				100	64
5	20	Py	0.15			27.48							72.37																			100	234
6	1	Wfn							0.46															29.56						69.98		100	150
6	2	Cal + Ab	7.96		2.99	2.17	0.56		84.68	1.67																						100	55
6	3	Brt											24.40									1.10				42.33					32.18	100	167
6	4	Ms + TiO_2	48.46	6.86	24.20	3.03		2.11		0.37	9.64					0.32																95	96
6	5	Feohy +	7.47			90.03			1.86												0.65											100	85
6	6	Brt											25.62									1.64				42.02					30.73	100	163
6	7	Py				27.61							72.39																			100	221
6	8	Qz	99.99																													100	118
6	9	Sd + Chl	5.41		3.44	74.92	0.76	6.05	7.14		0.46	1.83																				100	59
6	10	Sd + Chl	15.72		13.68	57.70	1.77	7.74	3.37																							100	67
6	11	Py	0.17			27.43							72.39																			100	195
6	12	Mix	9.11			32.45	0.90		1.01				20.18		0.86		7.81	10.75								16.95						100	19
6	13	Ab	68.88		18.78	0.24				12.12																						100	137
6	14	Py	0.43			27.74							71.84																			100	242
6	15	Brt + Chl	1.63		1.02	0.45		0.28	0.24				19.58													32.95					43.84	100	184
7	1	Mag +	3.53		0.70	90.77			1.37			1.40				0.37					1.85											100	92
7	2	Mag	0.73			97.30	1.58										0.41															100	132
7	3	Sd + Chl	35.92	0.30	18.33	34.12	0.45	5.69	3.40		1.79																					100	73
7	4	Brt											24.87									1.11				41.53					32.50	100	161
7	5	Sd				55.09	0.45								0.46																	56	59
7	6	Sd +	2.25		0.52	45.16	0.40		0.81				2.99		0.23											3.64						56	64
7	7	Py				26.99							73.01																			100	229
7	8	Mix	53.59	0.32	18.01	11.78	0.25	3.05	6.63		2.53		3.82																			100	91
7	9	Feohy +	6.31		3.34	88.43	0.79		0.55		0.59																					100	79
7	10	Py				27.53							72.46																			100	227
7	11	Sd +	0.73			51.12	0.40		1.49				1.15		0.21		0.90															56	58
7	12	Mag +	1.24			95.61	0.50						0.70				1.96															100	105
7	13	Feohy				97.97	1.34										0.69															100	84
7	14	Mix	9.11			28.03			0.99	2.51			22.00		1.01		7.09	8.75								20.51						100	20
7	15	Feohy +	8.86		5.01	77.19			1.69			1.49			0.45				1.54	2.37	1.44											100	87
7	16	Mix	6.80		1.64	83.53	0.68		0.81				2.60		0.66		2.24									1.04						100	39
8	1	Zrn	32.07																				67.92									100	72
8	2	Sd + Chl +	2.25		1.30	73.59	1.56	18.39	2.91																							100	34
8	3	Brt											39.38									1.36				59.27						100	72
8	4	Sd + Chl +	2.22		0.74	88.65	0.83		1.01	0.92			0.62		0.21					0.65									4.15			100	37
8	5	Ab	67.71		18.88	0.49				12.34	0.17		0.42																			100	74
8	6	Py	0.24			26.84							72.94																			100	122
8	7	Qz + Kfs	81.12		10.45	0.67		0.32		0.61	6.85																					100	75
8	8	Cal +	1.95			0.55	2.30		90.14					5.08																		100	34
8	9	Brt											22.15													36.42					41.46	100	108
8	10	Brt											40.55													59.47						100	62
8	11	Hole	4.58		2.10	0.66		0.80	1.19		0.24		35.98									1.50				52.95						100	55
8	12	Hole	8.26			88.66			1.97											0.44	0.67											100	38
8	13	Cal +	4.97		1.87	0.92	0.22		44.13	0.91				2.97																		56	26
8	14	Cal + Ang						0.95	40.76				17.25																	41.05		100	43
8	15	Brt											40.40									4.06				55.55						100	73
8	16	Sd + Chl	9.97		3.74	62.99	1.07	12.50	9.25		0.49																					100	36
8	17	Sd +	3.25			50.45	1.27		0.79						0.25																	56	48
8	18	Sd + Brt +	3.08		1.06	84.50	1.86		1.50				3.52		0.40											4.09						100	49
8	19	Qz	99.99																													100	70
8	20	Sd + Qz	2.11	2.50		47.75	0.33		0.55	0.49			1.05				0.74										0.48					56	49
9	1	Wfn																						29.83						70.18		100	87
9	2	Wfn																						30.46						69.54		100	88
9	3	Wfn							0.59															29.63						69.79		100	88
9	4	Cal						1.78	52.58	0.76			0.88																			56	32
9	5	Cal +	1.64		0.62	1.31	0.30	0.53	47.27	0.57				3.76																		56	30
9	6	Sd + Qz	12.98		3.14	78.78	0.50	1.56	1.50						0.85					0.70												100	42
9	7	Sd +				43.67	0.94	9.56	1.83																							56	30
9	8	Brt +	6.23		2.15	3.10			0.31				35.93									2.61				49.67						100	62
9	9	Brt +	6.80		3.00	0.59			3.57		0.28		35.81													49.96						100	58
10	1	Brt											24.45									1.32				39.34					34.92	100	84
10	2	Sd + Chl	3.76		2.25	71.43	0.98	13.61	7.96																							100	31
10	3	Sd	0.42			55.58																										56	45
10	4	Sd + Ap +	7.25	1.93	4.01	64.29	1.11	7.06	12.86		0.28	1.24																				100	36
10	5	Brt											22.22									0.70				36.18					40.94	100	89
10	6	Hole				91.39									8.61																	100	12
10	7	Sd				55.18	0.82																									56	40
10	8	Hole				72.17	1.76	23.41	2.66																							100	23

Table 1F.1: SEM-EDS cemical analyses of minerals from sample G-24 5520.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	MoO_3	Sb_2O_3	BaO	Ce_2O_3	HfO_2	WO_3	PbO	B_2O_3	Total	Actual Total
10	9	Qz	99.75			0.24																										100	58
10	10	Sd + Qz + Chl	31.92		2.48	47.52	0.84	7.16	9.70		0.37																					100	34
10	11	Qz	99.26			0.17	0.58																									100	65
10	12	Brt											38.45												61.55						100	55
10	13	Psi +	68.71			0.66	23.25												0.45						6.93						100	42
11	1	Fl							43.11					56.89																	100	88
11	2	Sd +	14.27		3.06	61.02	1.51	6.55	13.17		0.42																					100	32
11	3	Mix	4.88		1.27	77.52	1.07	1.34	3.36	1.24		3.76	2.80		0.48					0.56					1.73						100	38
11	4	Feohy				98.69	1.32																									100	46
11	5	Brt											40.40												59.61						100	58
11	6	Qz	99.99																													100	63
11	7	Brt + Chl	3.10		2.19	1.26			0.48				38.65												54.34						100	47
11	8	Brt											40.33									1.95			57.73						100	60
11	9	Ms + Chl	54.87		25.11	3.82		3.28			10.00			2.93																	100	61
11	10	Ms + Ap + Chl	39.60		16.87	8.88		1.96	7.99		8.61	13.77		2.32																	100	54
11	11	Chl + Ms +	38.87	0.27	20.20	31.18		2.52			6.96																				100	44
11	12	Qz	99.71			0.28																									100	58
11	13	Qz +	88.71	0.33	8.96	0.85		0.41	0.45		0.28																				100	51
12	1	Wfn																						29.09						70.92		100	87
12	2	Wfn																						29.92						70.09		100	87
12	3	Py				26.69			0.18				72.34								0.30									0.50		100	122
12	4	Ank + Py				27.14	0.77	16.96	45.71				9.41																			100	37
12	5	Py	0.17			26.64							73.19																			100	135
12	6	Sd + Brt	3.81		1.74	68.42	0.52	4.46	2.78				8.12		0.47										9.69						100	47
12	7	Sd				55.19	0.81																								56	47
12	8	Brt											20.53												35.50					44.00	100	98
12	9	Py +	29.09	0.58	11.90	13.68		1.19	4.70	1.07	1.30		36.46																		100	75
12	10	Tur	39.34	0.44	34.21	5.39		5.32	0.18	2.12																					87	61
12	11	Sd + Chl	19.23		15.99	44.47	0.75	7.86	10.35				1.35																		100	46
12	12	Feohy + Chl	16.09		13.36	68.99			0.62				0.70		0.25																100	52
12	13	Ank		0.50		15.15	0.74	11.04	28.56																						56	36
12	14	Hole	22.91		2.31	26.14		2.49	0.67				18.68		0.79		6.15	3.26							16.63						100	11
12	15	Feohy				98.58	1.42																								100	49
13	1	Wfn																						29.86						70.16		100	84
13	2	Qz	98.98		0.51	0.51																										100	70
13	3	Feohy + Chl	4.75		2.49	92.51					0.25																					100	45
13	4	Brt											39.50									2.50			58.00						100	64
13	5	Feohy				98.34	0.59								1.07																	100	35
13	6	Hole	5.09			52.51	1.01						17.05		1.97		6.04	1.63							14.71						100	10
13	7	Qz	99.99																												100	69
13	8	Sd + Chl	2.65		1.93	73.12	1.29	18.29	2.73																						100	31
13	9	Feohy	0.79			98.35	0.87																								100	51
13	10	Feohy + Qz	2.97			95.21	1.48										0.32														100	51
13	11	Feohy + Qz	2.48			96.04	1.48																								100	35
13	12	Py				26.42							73.59																		100	112
13	13	Py	0.21			26.26			0.14				73.39																		100	118
13	14	Brt + Qz	3.83										16.83									0.62			27.37					51.38	100	119
13	15	Brt											39.63									1.15			59.24						100	60
13	16	Feohy	1.16			98.08																				0.75					100	45
		Ang=Anglesite, Wfn=Wulfinite																															

Appendix 1G: SEM-BSE images and EDS mineral analyses for sample G-24 5530

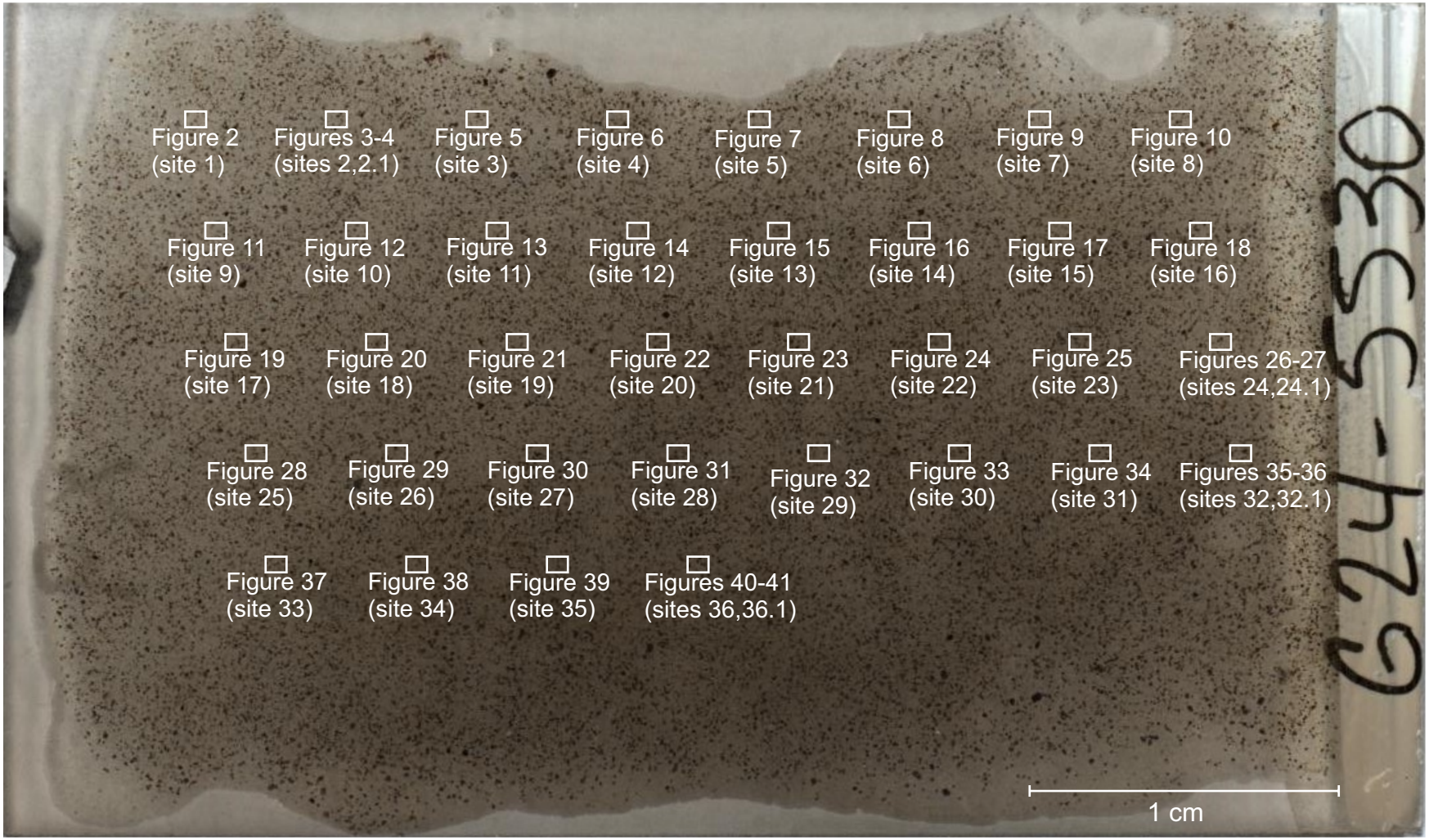
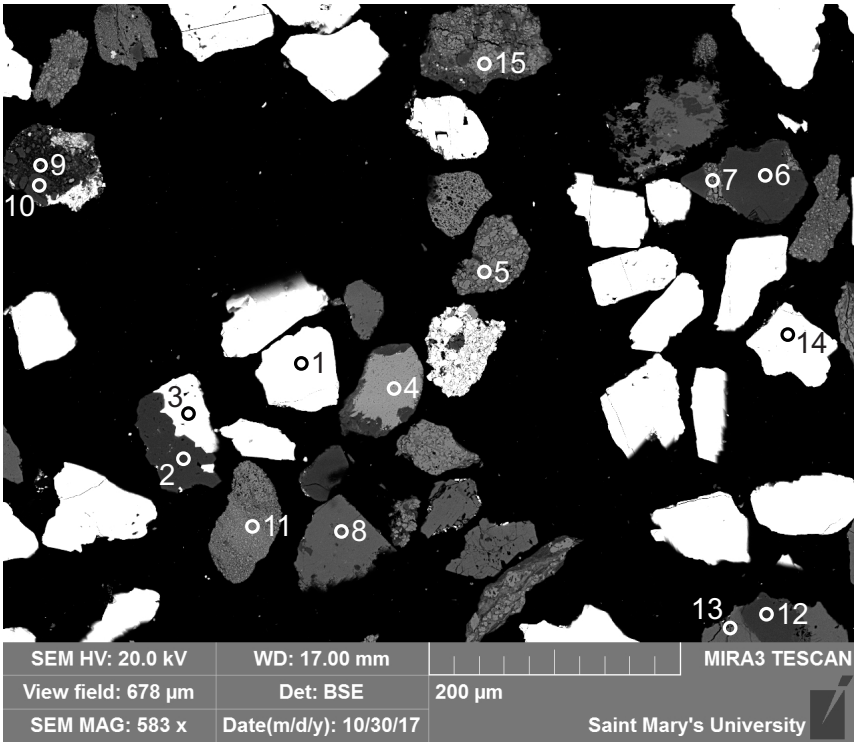
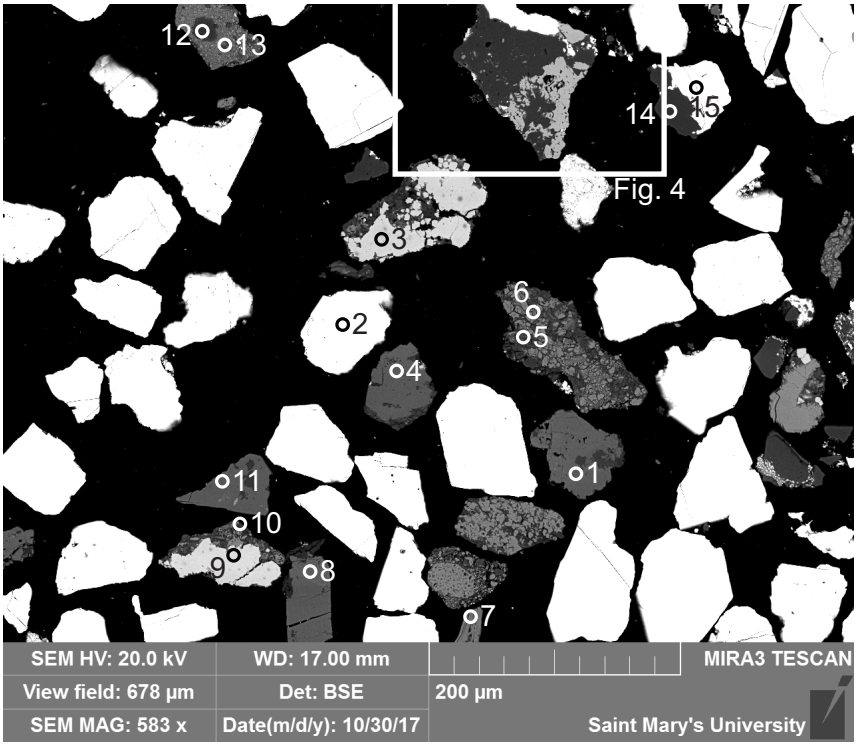


Figure 1G.1: Scanned thin section of sample G-24 5530 showing the location of analyzed sites.



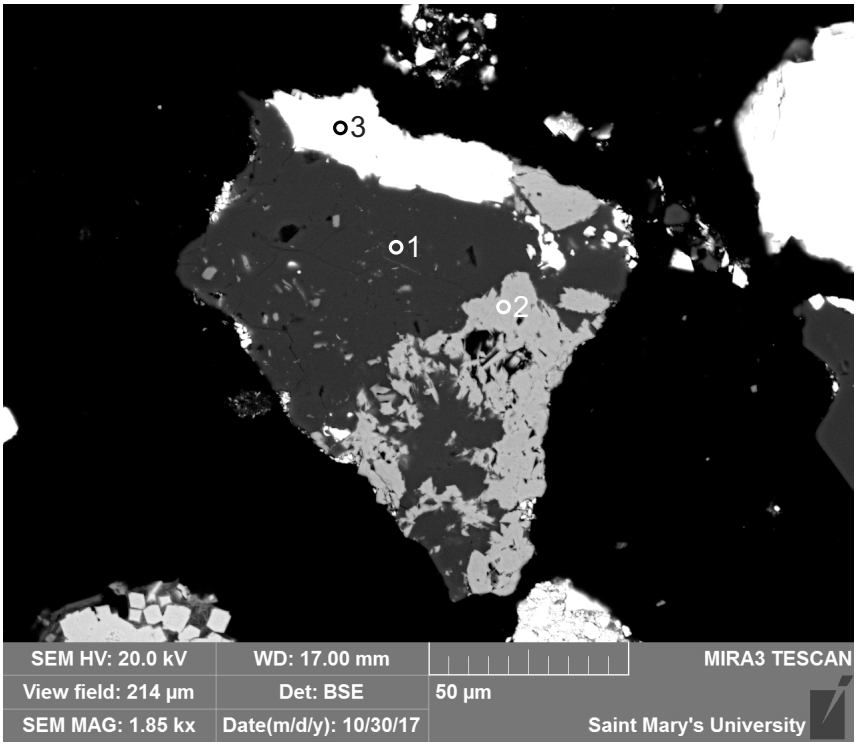
1:Barite
2:Quartz
3:Barite
4:TiO_2
5:Siderite
6:Quartz
7:Siderite + Chlorite
8:Ankerite
9:Quartz +
10:Quartz
11:Siderite +
12:Quartz
13:Ankerite
14:Barite
15:Siderite +
Chlorite

Figure 1G.2: Sample G-24 5530 (SEM) site 1. A cutting made up of quartz (6) and siderite, and chlorite (7). Another cutting made up of quartz (12) and ankerite (13). TiO2 (4) is associated with quartz and appears to be detrital.



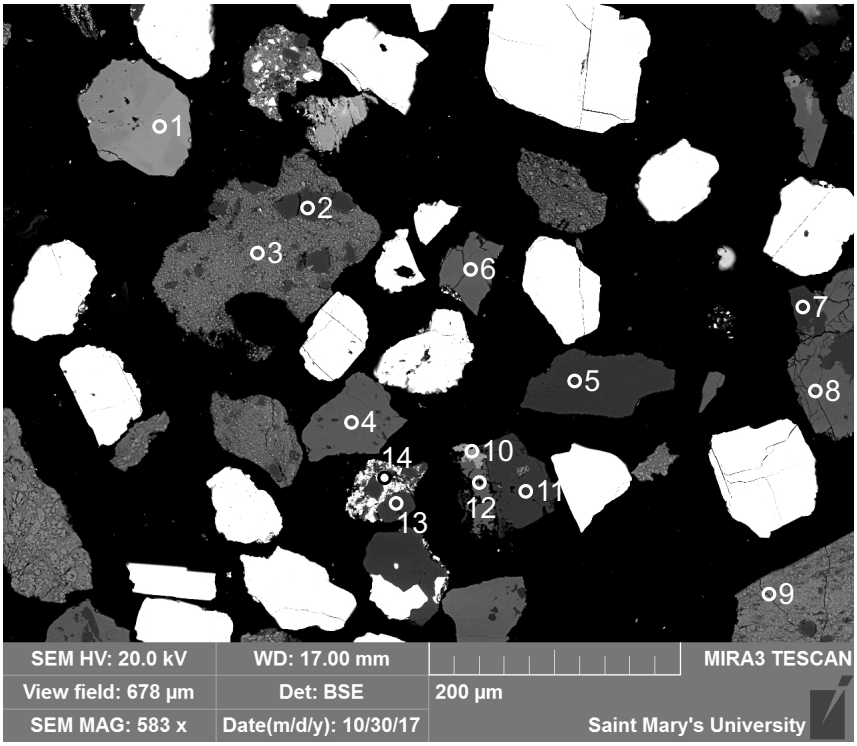
1:Ankerite
2:Barite
3:Pyrite
4:Ankerite +
5:Muscovite +
Chlorite
6:Siderite + Chlorite
7:Chlorite +
8:Ankerite
9:Pyrite
10:Chlorite +
11:Ankerite
12:Quartz
13:Siderite +
Chlorite
14:Quartz
15:Barite

Figure 1G.3: Sample G-24 5530 (SEM) site 2. Cuttings made up of: muscovite, chlorite and siderite (5,6); pyrite (9) and chlorite (10); quartz (12) and siderite (13) and quartz (14) and barite (15).



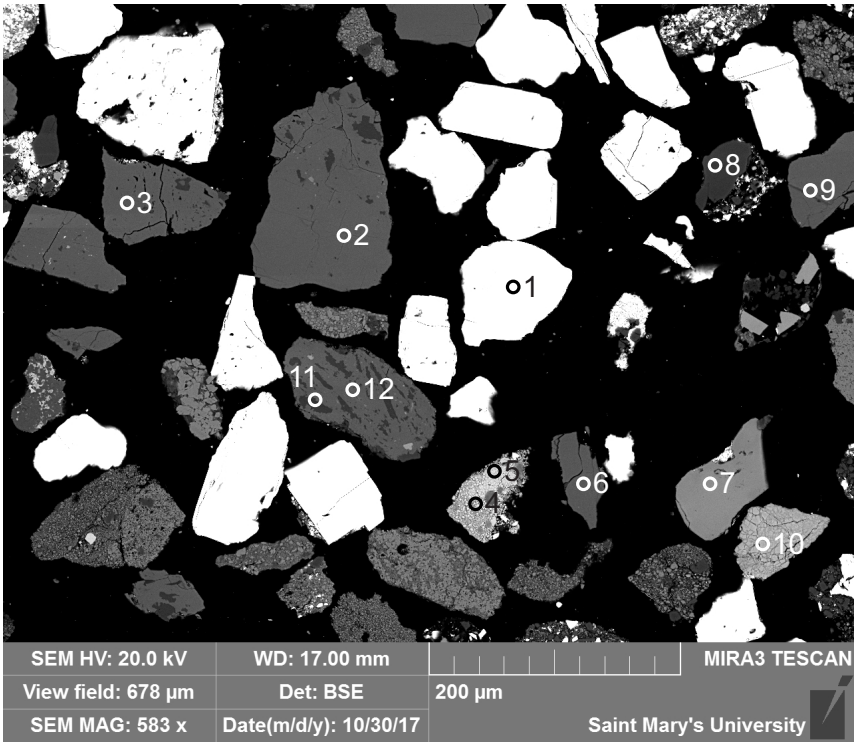
1:Quartz
2:Limonite +
3:Barite

Figure 1G.4: Sample G-24 5530 (SEM) site 2.1. A cutting made up of quartz (1), limonite (2), and barite (3).



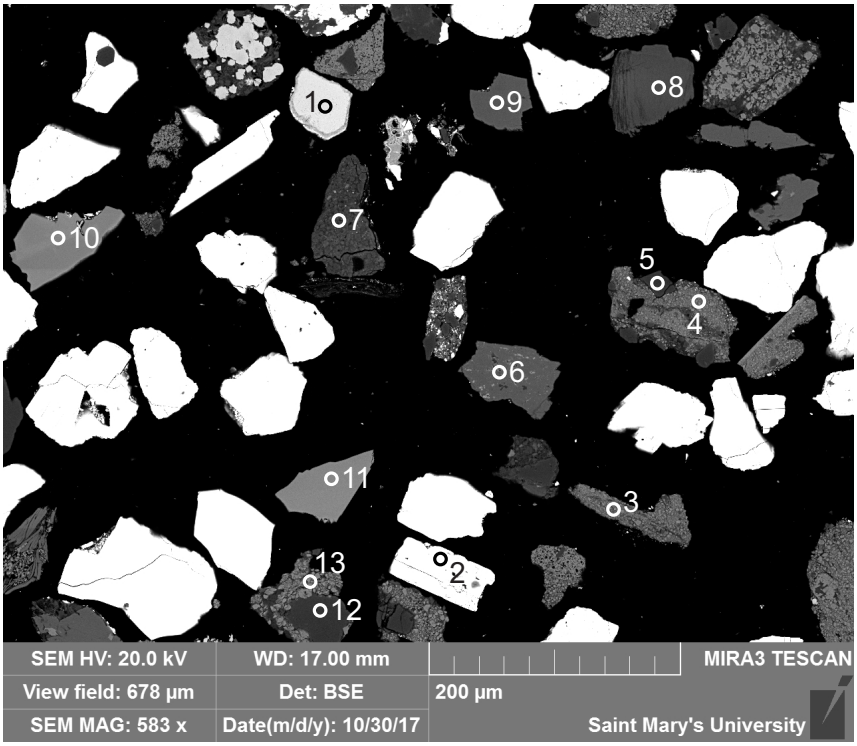
1:Fluorite
2:Quartz
3:Siderite + Chlorite
4:Ankerite
5:Quartz
6:Ankerite
7:Quartz
8:Ankerite
9:Chlorite +
10:TiO_2 +
11:Albite
12:Ankerite
13:Quartz +
14:Barite +

Figure 1G.5: Sample G-24 5530 (SEM) site 3. Cuttings made up of; albite (11), ankerite (12), and diagenetic TiO_2 (10); quartz (13) and barite (14). Ankerite (12) appears to have been partly replaced by TiO_2 (10).



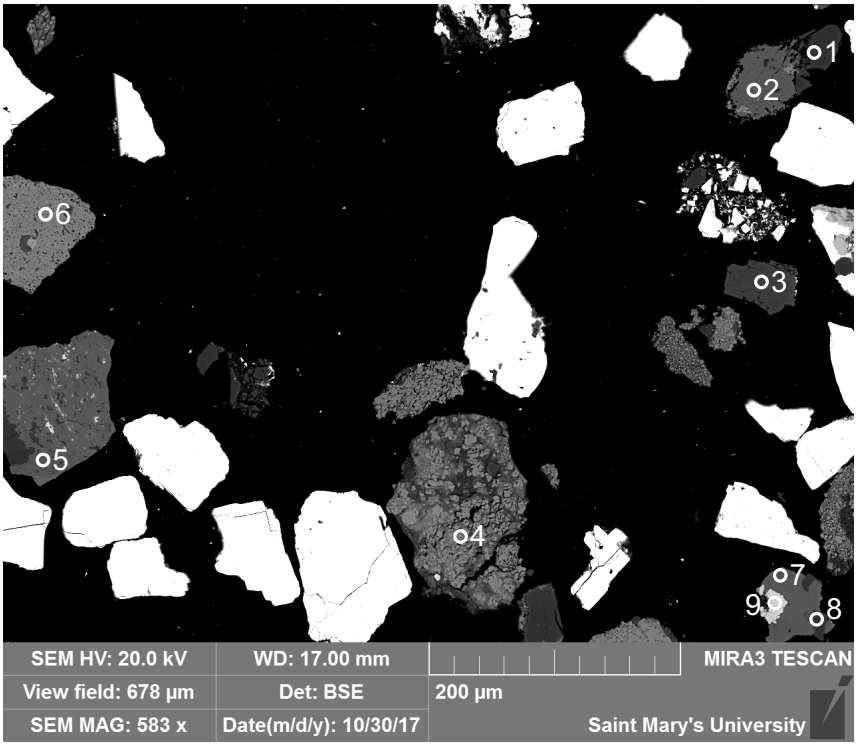
1:Barite
2:Ankerite
3:Ankerite
4:Pyrite
5:Pyrite
6:Ankerite
7:Fluorite
8:Quartz
9:Ankerite
10:Siderite
11:Albite
12:Ankerite +

Figure 1G.6: Sample G-24 5530 (SEM) site 4. A cutting is made up of albite (11) and ankerite.



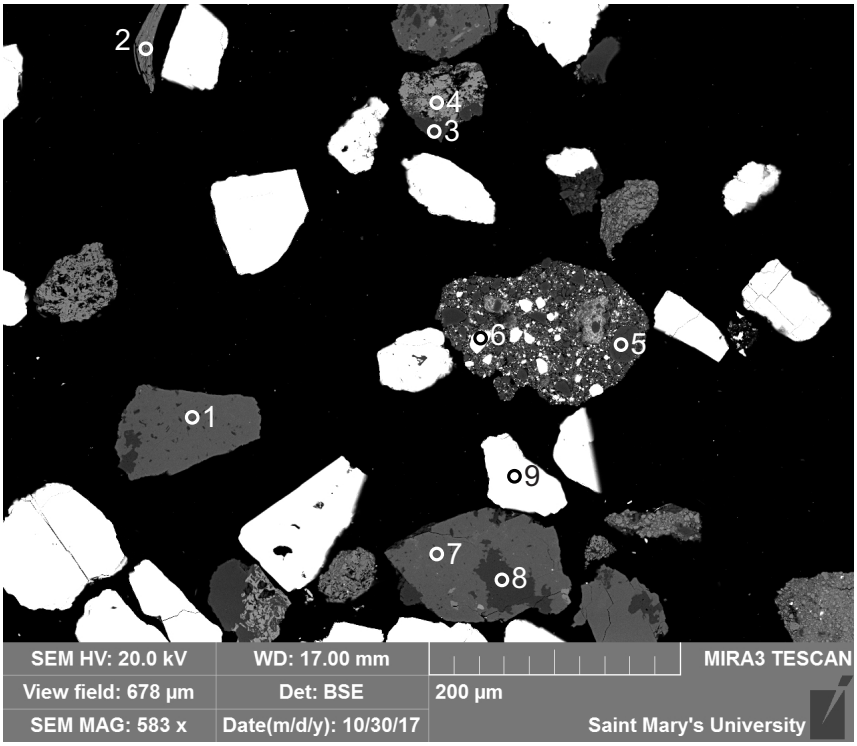
1:Mn-Oxide
2:Barite
3:Siderite +
4:Siderite +
5:Quartz
6:Apatite +
7:Mixture
8:Chlorite
9:Mixture
10:Fluorite
11:Fluorite
12:Quartz
13:Siderite

Figure 1G.7: Sample G-24 5530 (SEM) site 5. Cuttings made up of: quartz (5) and siderite (4); quartz (12) and siderite (13).



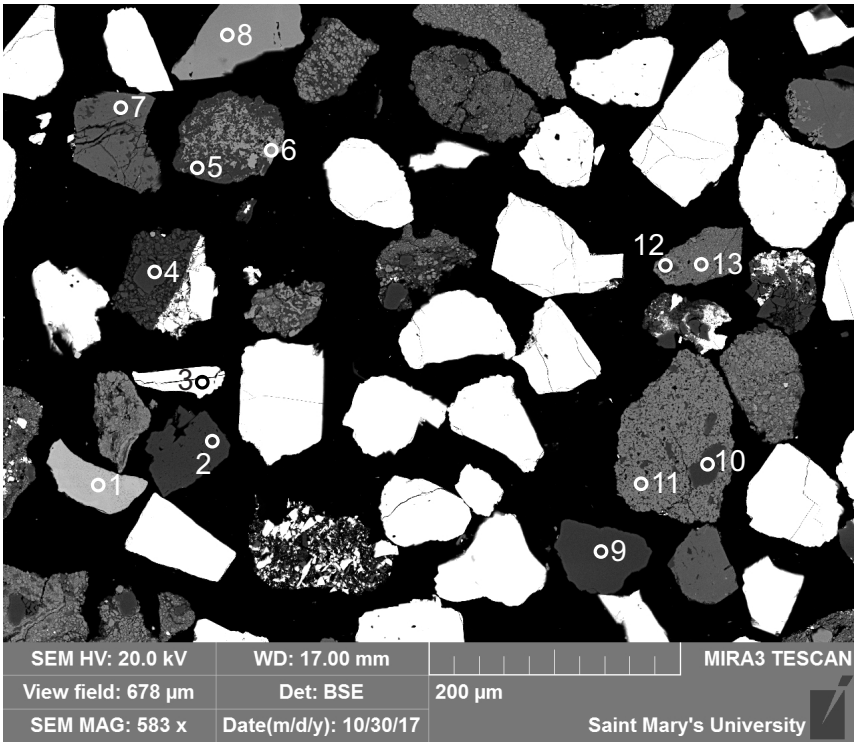
1:Quartz
2:Ankerite
3:Ankerite
4:Siderite + Chlorite
5:Ankerite
6:Chlorite + Siderite
7:Ankerite
8:Quartz +
9:Pyrite +

Figure 1G.8: Sample G-24 5530 (SEM) site 6. A cutting is made up of quartz (8), ankerite (7), and pyrite (9).



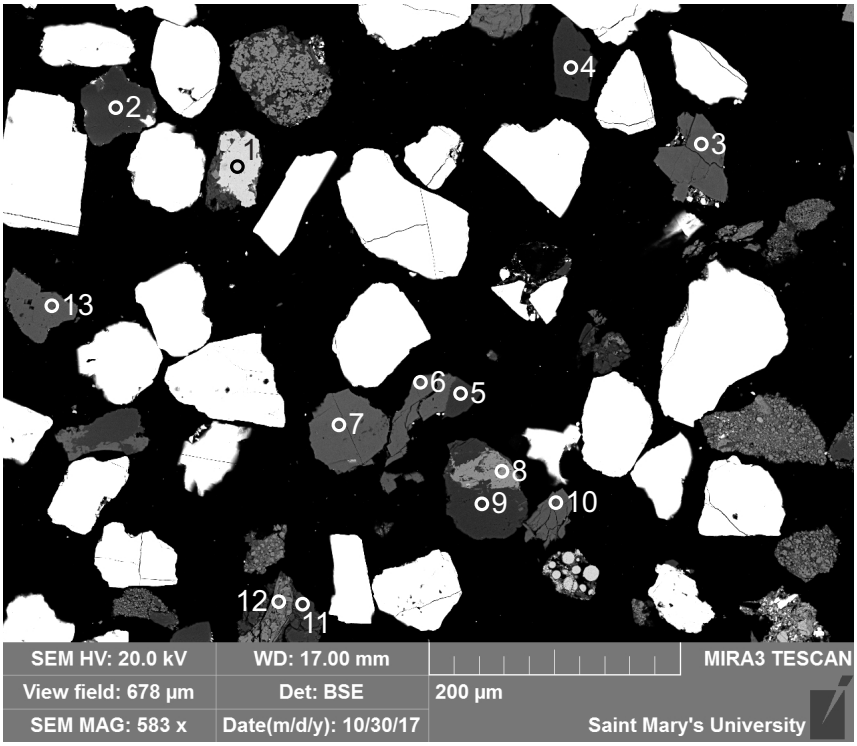
1:Mix
2:Chlorite
3:Quartz
4:TiO_2
5:Oligoclase
6:Barite
7:Ankerite
8:Albite
9:Barite

Figure 1G.9: Sample G-24 5530 (SEM) site 7. Cuttings made up of: oligoclase (5) and barite (6); albite (8) and ankerite (7).



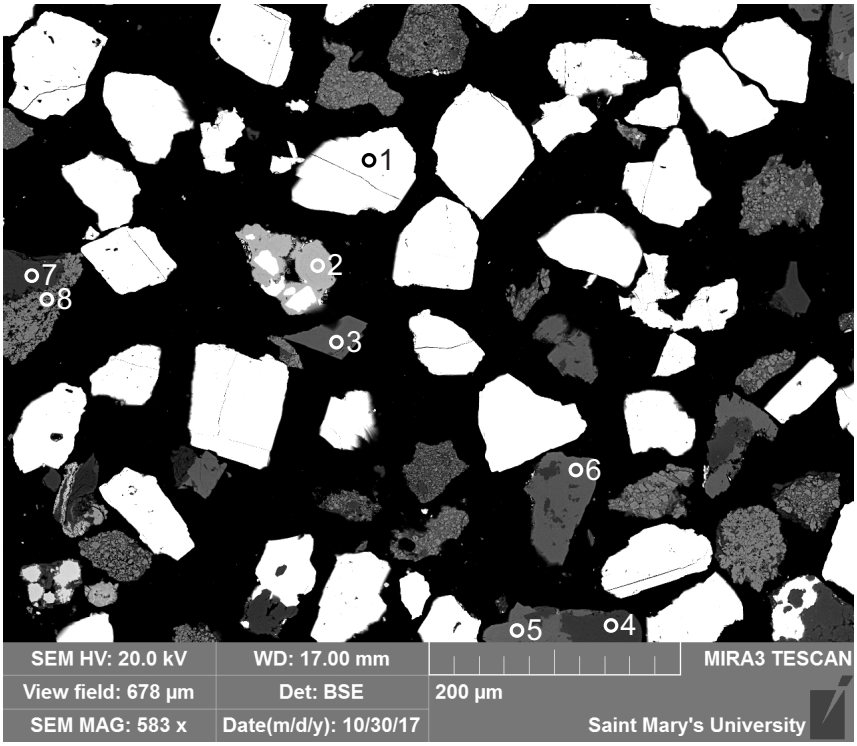
1:Limonite +
2:Albite
3:Barite
4:Quartz
5:Quartz
6:TiO_2
7:Ankerite
8:Fluorite
9:Quartz
10:Quartz
11:Siderite +
12:Quartz
13:Siderite +
Chlorite

Figure 1G.10: Sample G-24 5530 (SEM) site 8. Cuttings made up of: quartz (5) and TiO_2 (6); quartz (12), siderite and chlorite (13).



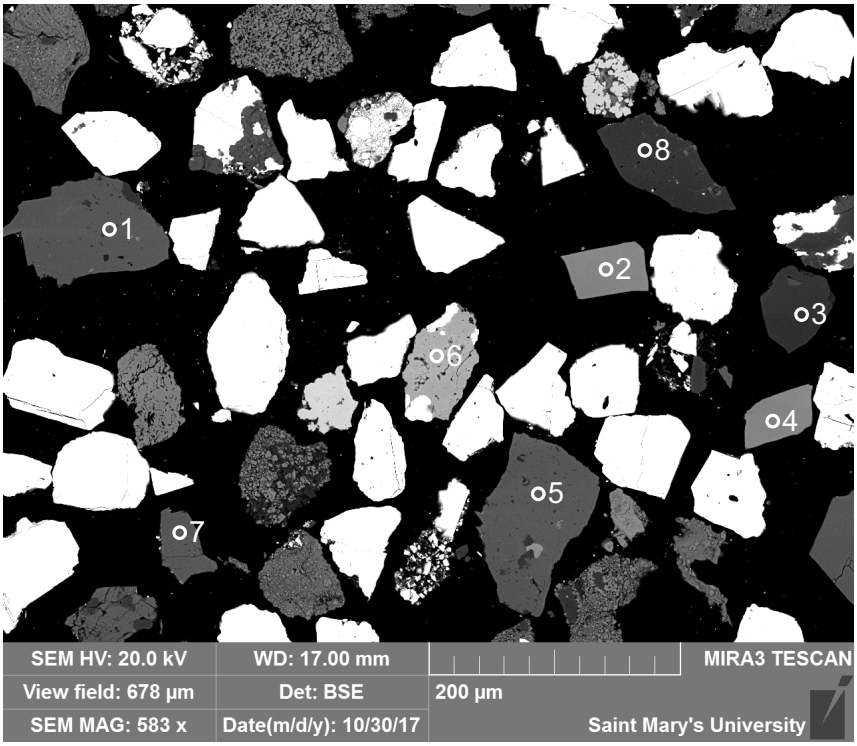
1:Pyrite
2:Quartz
3:Ankerite
4:Quartz
5:Quartz
6:Ankerite
7:Ankerite +
8:TiO_2
9:Quartz
10:Ankerite
11:Quartz
12:Siderite +
13:Ankerite

Figure 1G.11: Sample G-24 5530 (SEM) site 9. Lithic clast (8,9) made up of quartz (9) and TiO_2 (8). Cutting made up of quartz (5) and ankerite (6).



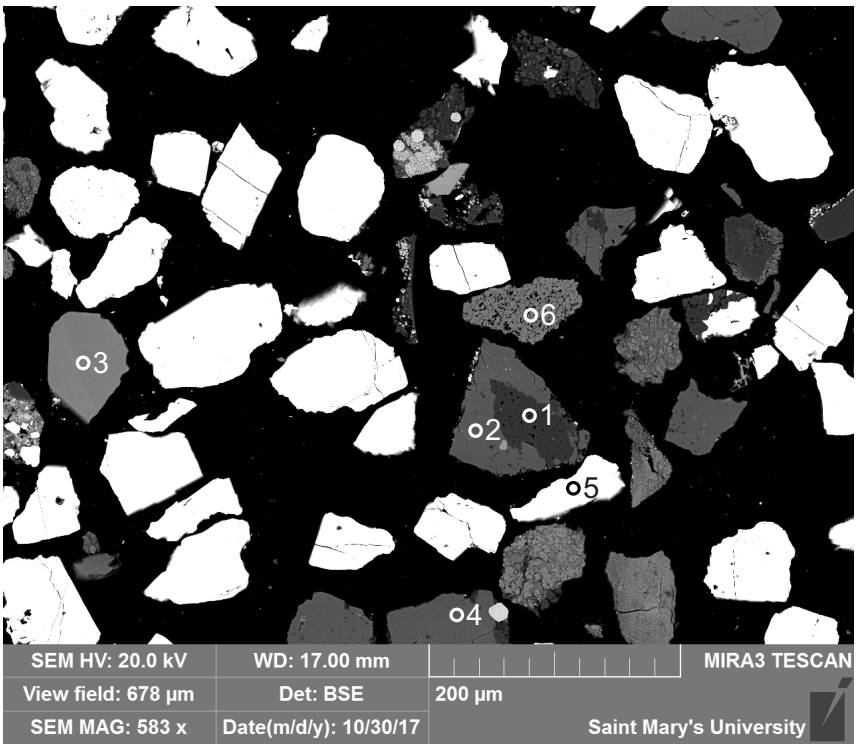
1:Barite
2:Limonite +
3:Ankerite
4:Quartz
5:Ankerite +
Chlorite
6:Ankerite
7:Quartz
8:Siderite

Figure 1G.12: Sample G-24 5530 (SEM) site 10. Cuttings made up of: quartz (4) and ankerite and chlorite (5); quartz (7) and siderite (8). A contaminant made up of limonite (2) and barite.



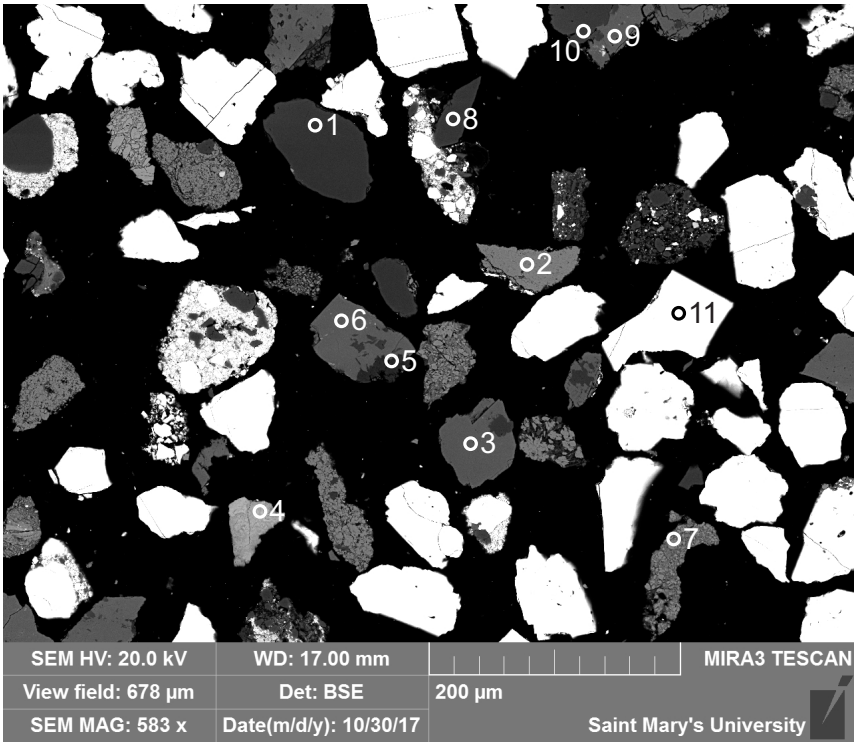
1:Ankerite
2:Fluorite
3:Quartz
4:Fluorite
5:Ankerite
6:Limonite +
7:Ankerite
8:Albite

Figure 1G.13: Sample G-24 5530 (SEM) site 11. A contaminant made up of barite and limonite (6).



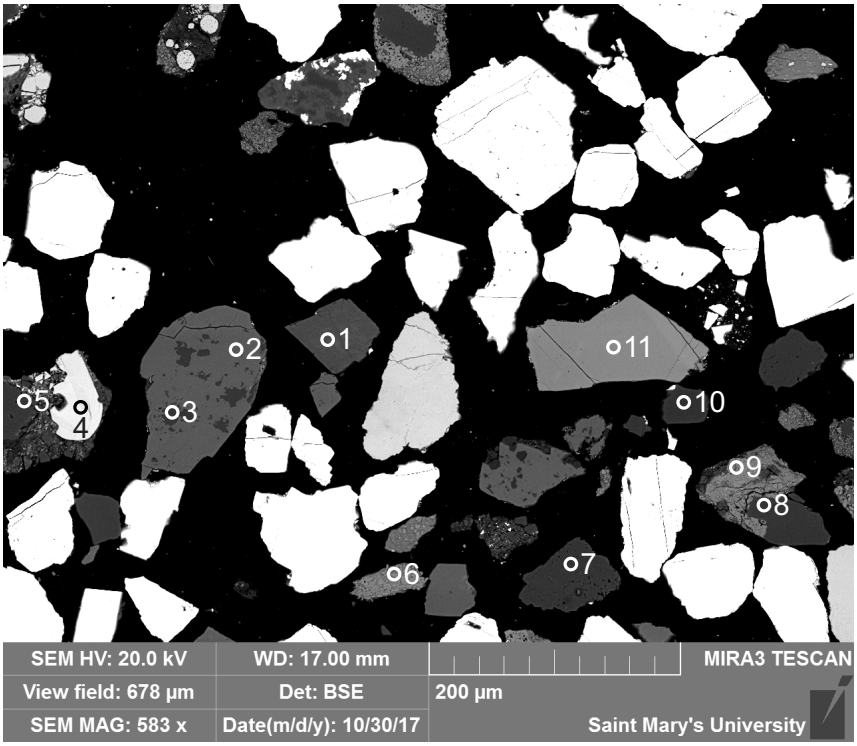
1:Quartz
2:Ankerite
3:Fluorite
4:Ankerite
5:Barite
6:Siderite

Figure 1G.14: Sample G-24 5530 (SEM) site 12. A cutting made up of quartz (1) and ankerite (2).



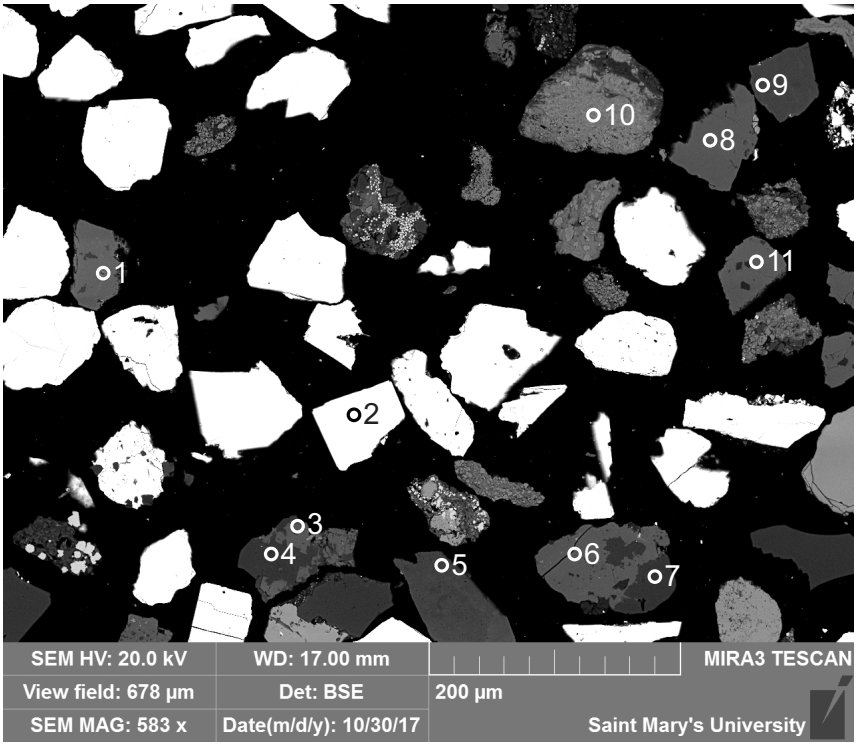
1:Quartz
2:Siderite + Apatite + Chlorite
3:Ankerite + Chlorite
4:Limonite
5:Kaolinite
6:Ankerite +
7:Siderite +
8:Quartz
9:Ankerite
10:Quartz
11:Barite

Figure 1G.15: Sample G-24 5530 (SEM) site 13. Cuttings made up of; quartz (10) and ankerite (9); kaolnite (5) and ankerite (6).



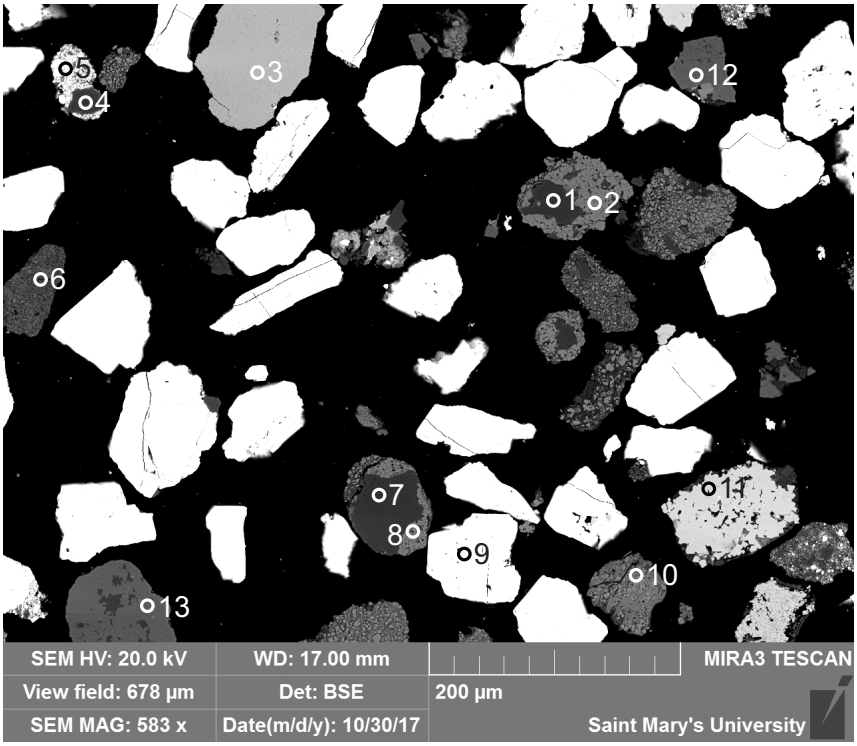
1:Ankerite
2:Ankerite
3:Albite
4:Zircon
5:Albite
6:Siderite + Chlorite
7:Dolomite
8:Quartz
9:Siderite +
10:Quartz
11:Fluorite

Figure 1G.16: Sample G-24 5530 (SEM) site 14. Cuttings made up of: quartz (8) and siderite (9); albite (5) and zircon (4); albite (3) and ankerite (2).



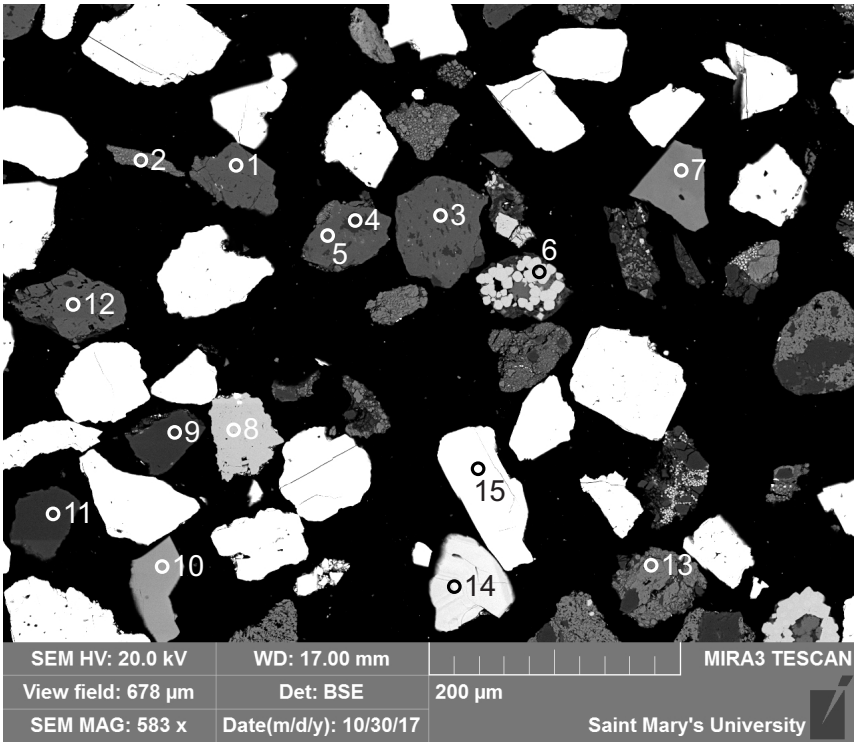
1:Mixture
2:Barite
3:Siderite +
4:Albite + Quartz
5:Ankerite
6:Ankerite
7:Quartz
8:Ankerite
9:Ankerite
10:Mixture
11:Ankerite

Figure 1G.17: Sample G-24 5530 (SEM) site 15. Cuttings made up of: quartz, albite (3) and siderite (3); quartz (7) and ankerite (6).



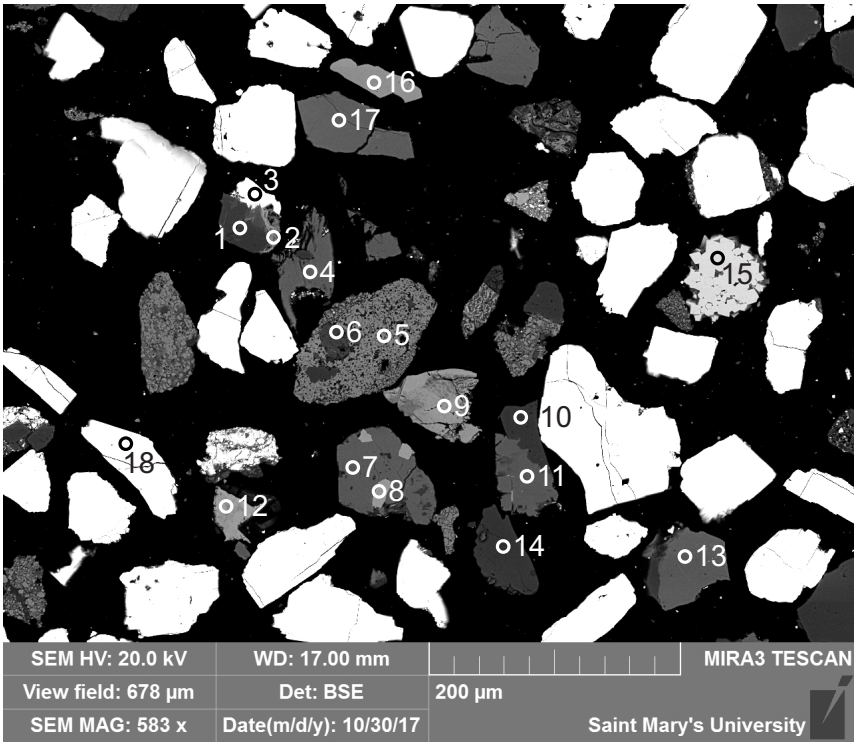
1:Quartz
2:Siderite +
3:Limonite +
4:Quartz
5:Barite +
6:Chlorite +
7:Quartz
8:Siderite + Chlorite
9:Barite
10:Siderite +
11:Pyrite
12:Ankerite
13:Ankerite

Figure 1G.18: Sample G-24 5530 (SEM) site 16. Cuttings made up of: quartz (1) and siderite (2); quartz (4) and barite (6); quartz (7), and siderite and chlorite (8).



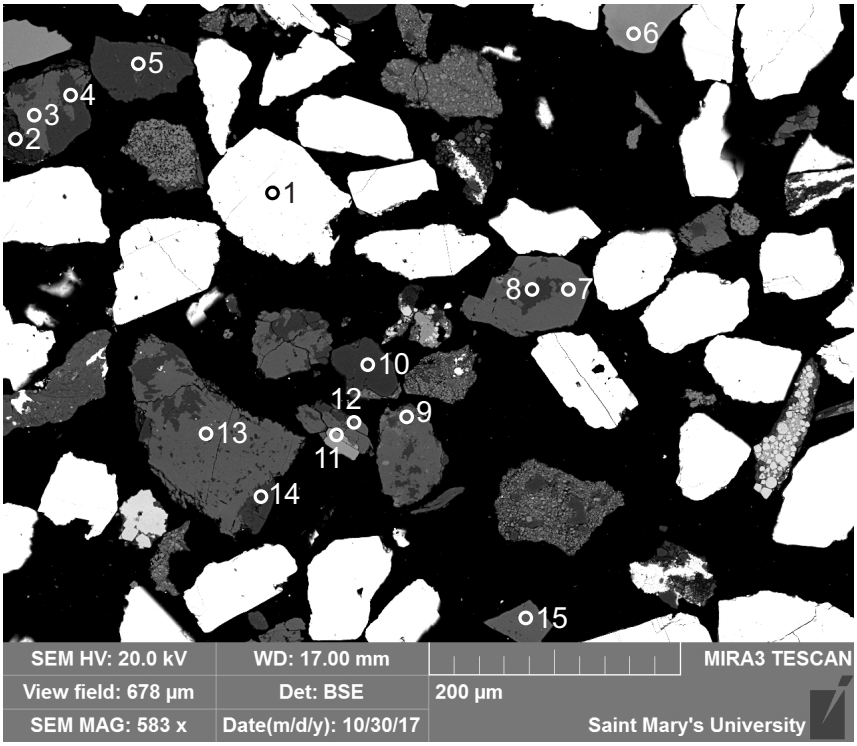
1:Ankerite
2:Siderite +
3:Ankerite +
4:Albite
5:Ankerite +
6:Pyrite
7:Fluorite
8:Hematite +
9:Quartz
10:Spinel
11:Quartz
12:Ankerite
13:Siderite
14:Zircon
15:Barite

Figure 1G.19: Sample G-24 5530 (SEM) site 17. A cutting made up of albite (4) and ankerite (5).



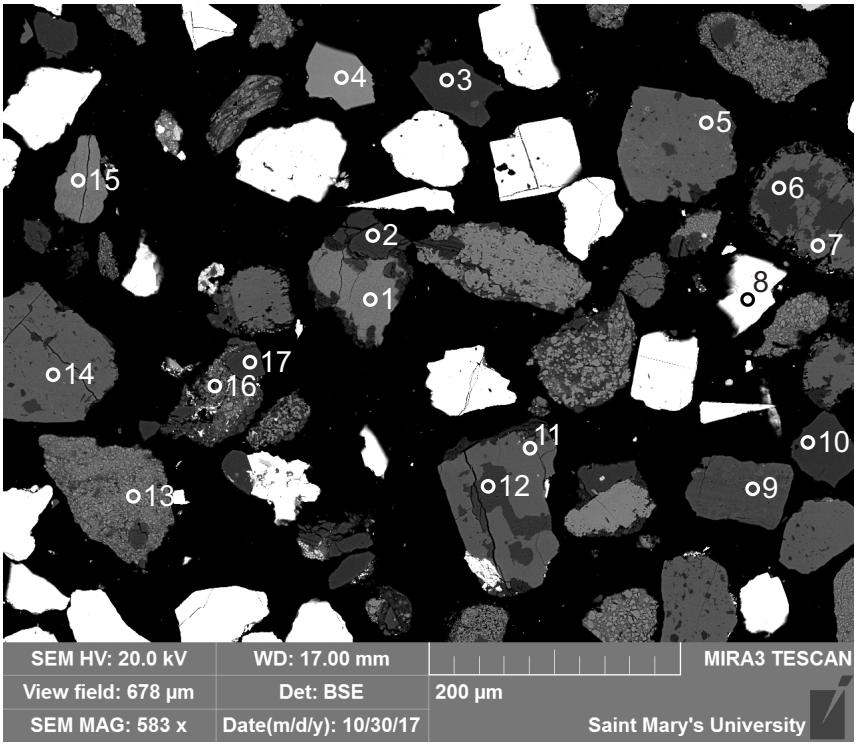
1:Albite
2:Chlorite + Muscovite
3:Barite
4:Chlorite
5:Siderite +
6:Quartz
7:Ankerite
8:TiO_2
9:TiO_2
10:Quartz
11:Ankerite
12: Mixture ?
13:Ankerite
14:Quartz
15:Pyrite
16:TiO_2
17:Ankerite
18:Barite

Figure 1G.20: Sample G-24 5530 (SEM) site 18. Cuttings made up of: albite (1), muscovite and chlorite (2); ankerite (7) and diagenetic TiO_2 (8) in which TiO_2 appears to postdate ankerite; quartz (10) and ankerite (10); quartz (6) and siderite (5).



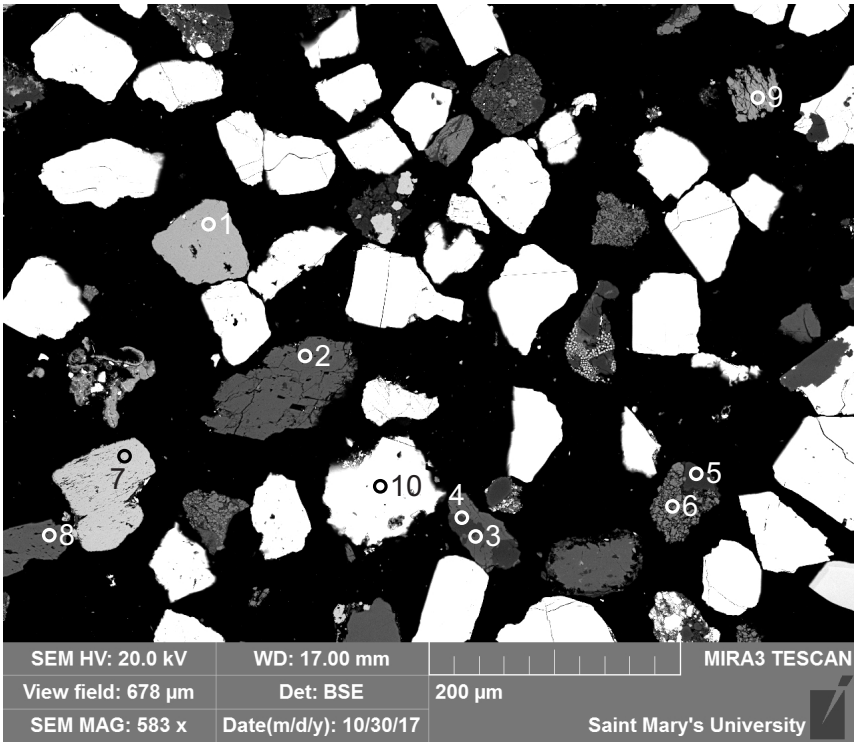
1:Barite
2:Kaolinite +
3:Ankerite
4:Albite
5:Albite
6:Fluorite
7:Ankerite
8:Albite
9:Ankerite
10:Quartz
11:TiO_2 +
12:Ankerite
13:Ankerite
14:Quartz
15:Ankerite

Figure 1G.21: Sample G-24 5530 (SEM) site 19. Cuttings made up of: albite (4), ankerite (3), and kaolinite (2); quartz (14) and ankerite (13).



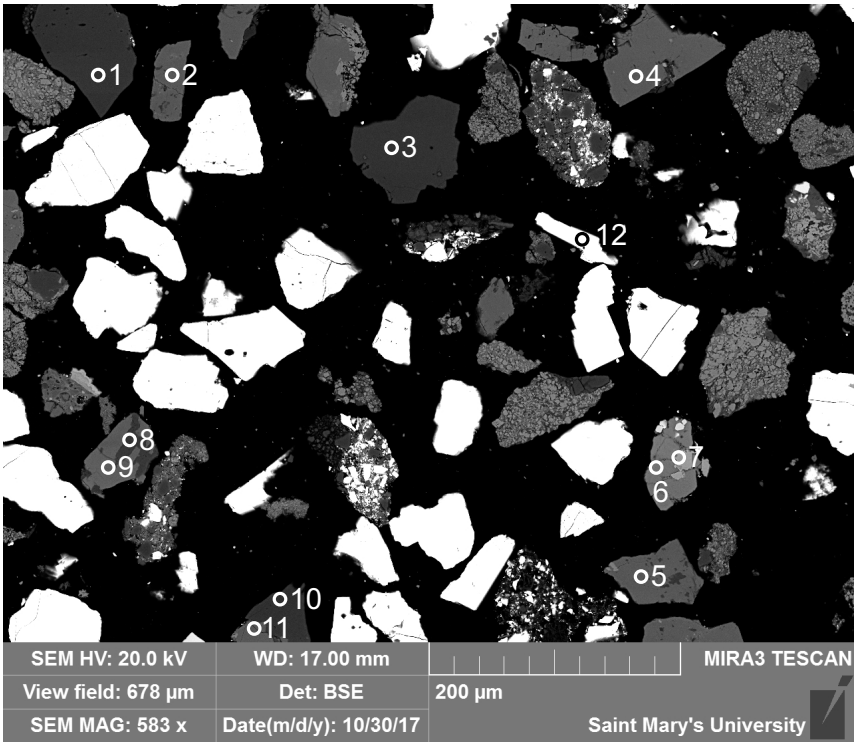
1:TiO_2
2:Quartz
3:Quartz
4:Fluorite
5:Ankerite
6:Albite
7:Ankerite +
8:Barite
9:Ankerite +
10:Quartz
11:Ankerite
12:Albite
13:Siderite +
Chlorite
14:Ankerite
15:Chlorite
16:Altered Ilmenite
17:Quartz

Figure 1G.22: Sample G-24 5530 (SEM) site 20. Cuttings made up of: quartz (2) and TiO_2 (1); albite (6) and ankerite (7); albite (12) and ankerite (11); quartz (17) and ilmenite (16).



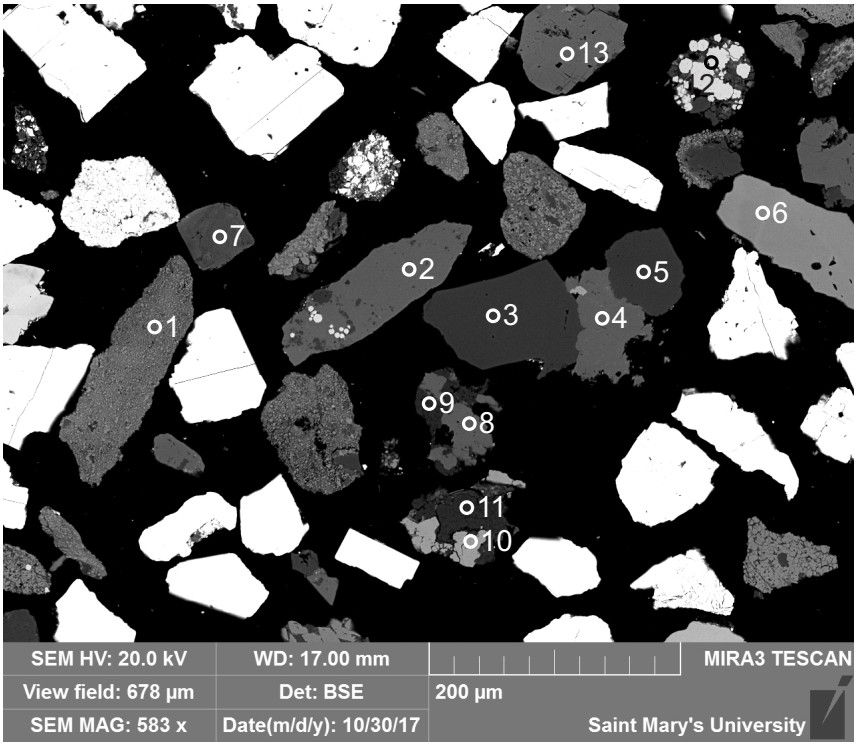
1:Limonite
2:Ankerite
3:Ankerite
4:Albite
5:Quartz
6:Siderite
7:Magnetite
8:Ankerite
9:Limonite
10:Barite

Figure 1G.23: Sample G-24 5530 (SEM) site 21. Cuttings made up of: albite (4) and ankerite (3); quartz (5) and siderite (6).



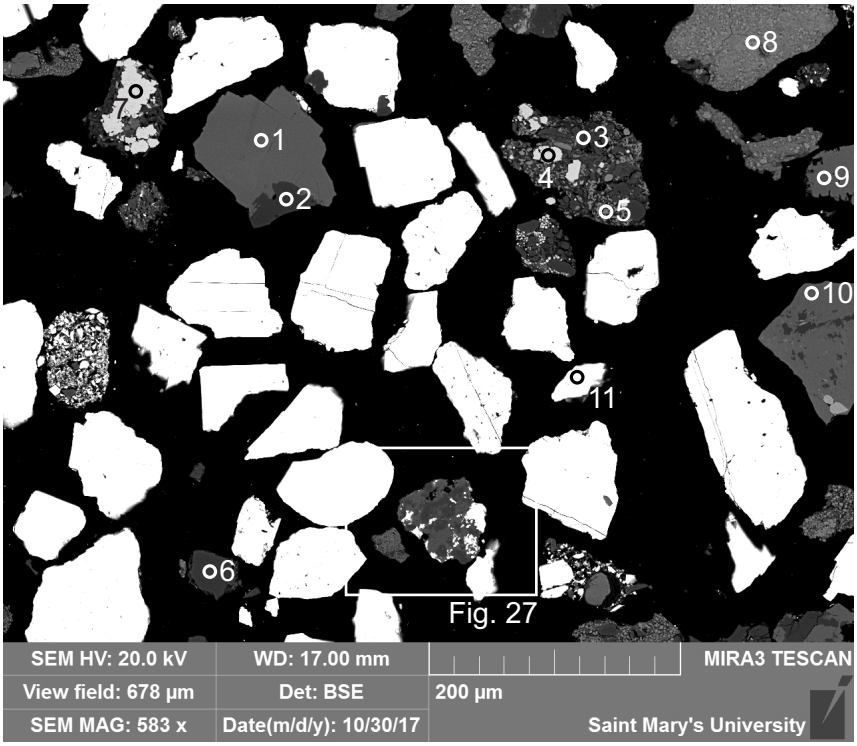
1:Quartz
2:Ankerite
3:Quartz
4:Ankerite
5:Ankerite
6:Fluorite
7:TiO_2
8:Albite
9:Ankerite
10:Quartz
11:Ankerite
12:Barite

Figure 1G.24: Sample G-24 5530 (SEM) site 22. Cuttings made up of: albite (8) and ankerite; quartz (10) and ankerite (11); fluorite (6) and TiO_2 (7).



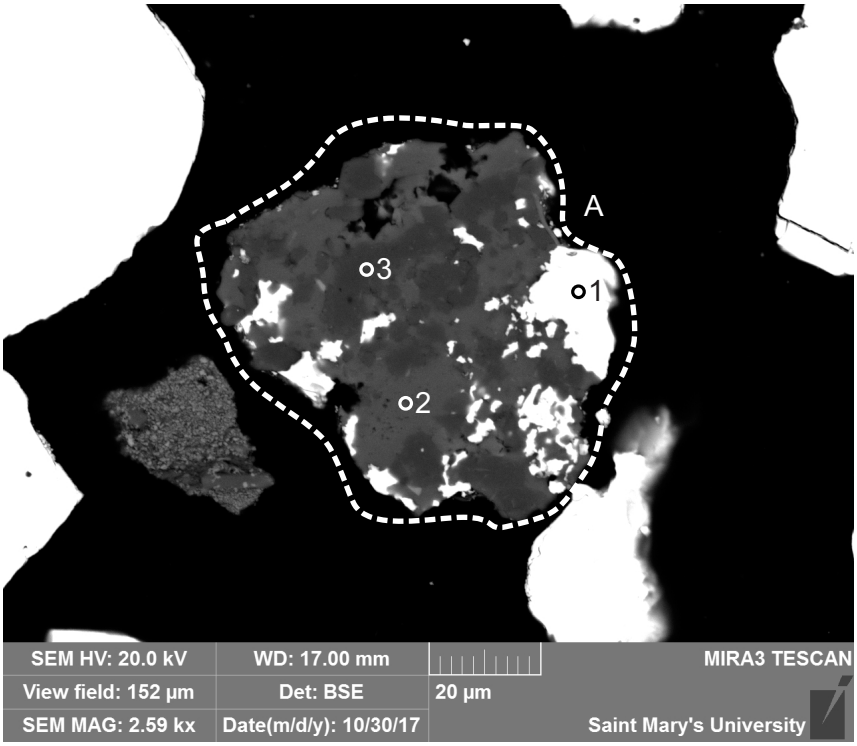
1:Siderite + Chlorite
2:Ankerite +
3:Quartz
4:Ankerite
5:Quartz
6:Fluorite
7:Dolomite
8:Ankerite
9:Kaolinite
10:TiO_2
11:Kaolinite
12:Pyrite
13:Ankerite

Figure 1G.25: Sample G-24 5530 (SEM) site 23. Cuttings made up of: quartz (3,5) and ankerite (4); ankerite (8) and kaolnite (9); kaolnite (11) and TiO_2 (10).



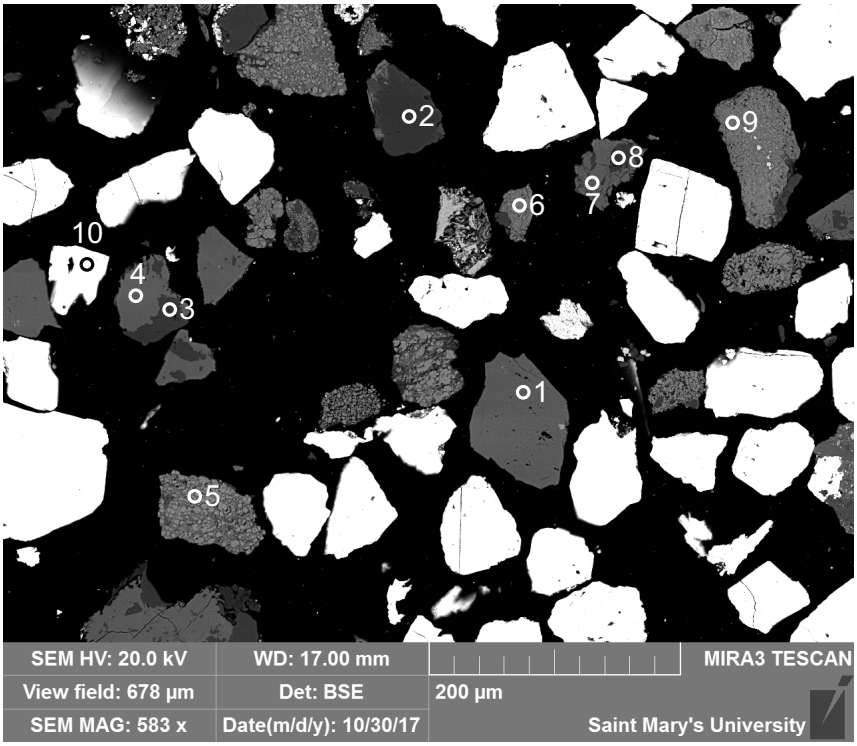
1:Ankerite
2:Quartz
3:Quartz
4:Pyrite
5:Siderite +
6:Quartz
7:Pyrite
8:Chlorite
9:Ankerite
10:Ankerite
11:Barite

Figure 1G.26: Sample G-24 5530 (SEM) site 24. Cuttings made up of: quartz (2) and ankerite (1); quartz (3), pyrite (4) and siderite (5).



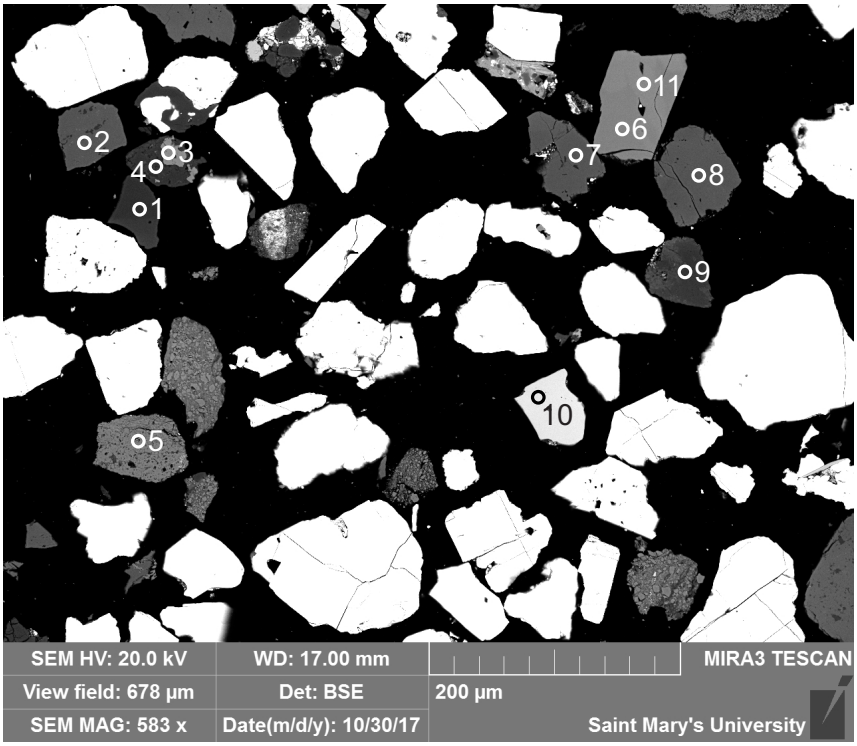
1:Barite
2:K-feldspar
3:Quartz + Feldspar

Figure 1G.27: Sample G-24 5530 (SEM) site 24.1. A cutting made up of K-feldspar (2), quartz (3) and barite (1). The K-feldspar might have been albitized (3). A probable felsic lithic clast (A) made up of K-feldpar and quartz (2,3).



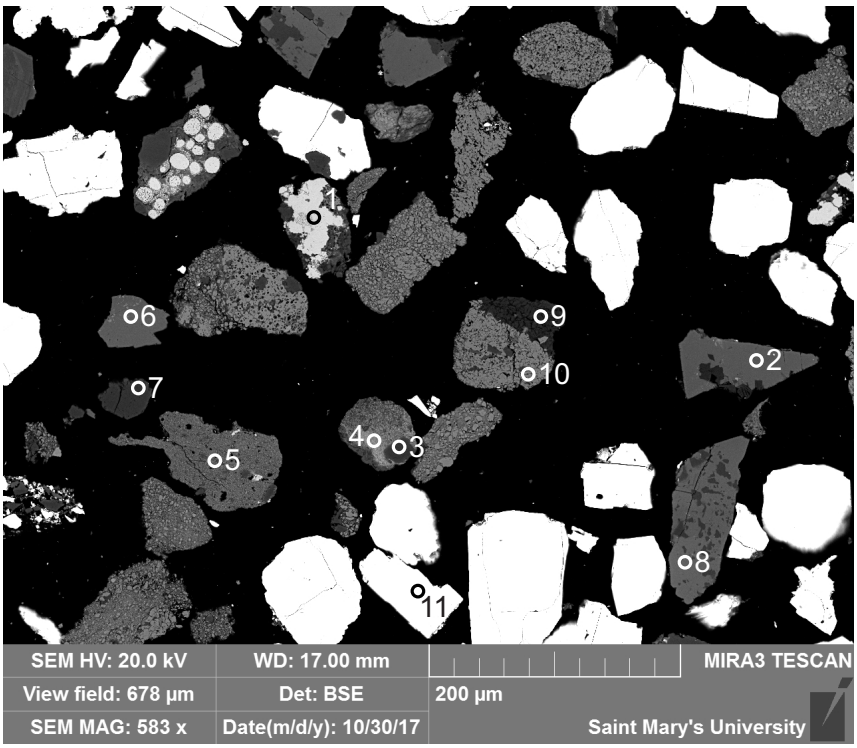
1:Ankerite
2:Quartz
3:Albite
4:Ankerite
5:Chlorite
6:Chlorite
7:Ankerite
8:Albite
9:Siderite + Chlorite
10:Barite

Figure 1G.28: Sample G-24 5530 (SEM) site 25. Cuttings made up of albite (3,8) and ankerite (4,7).



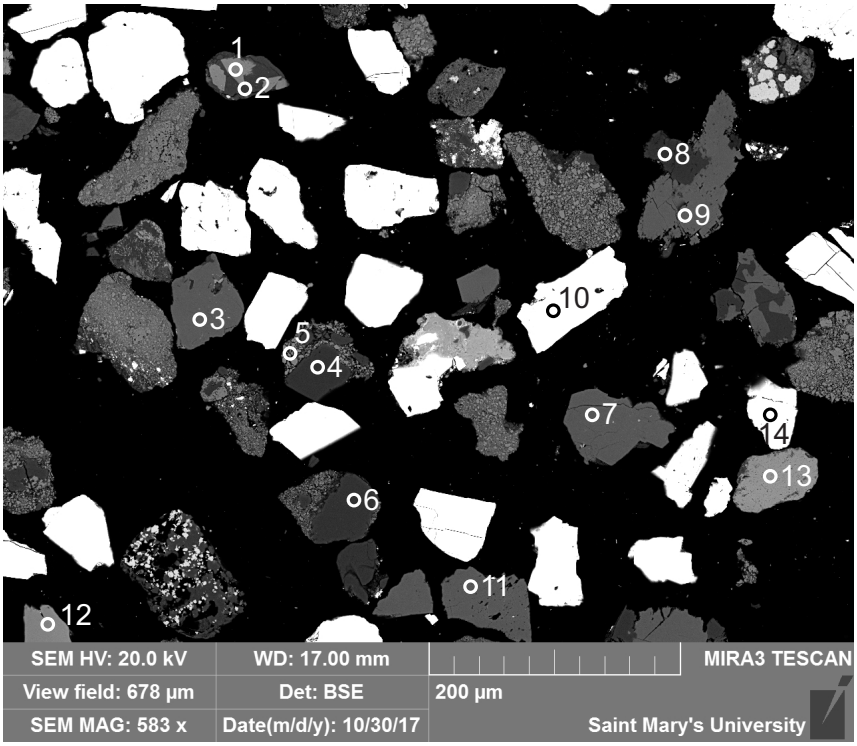
1:Quartz
2:Ankerite +
3:TiO_2
4:Quartz +
5:Siderite + Chlorite
6:Fluorite
7:Ankerite
8:Ankerite
9:Quartz
10:Zircon
11:Fluorite

Figure 1G.29: Sample G-24 5530 (SEM) site 26. Cutting made up of quartz (4) and TiO_2 (3).



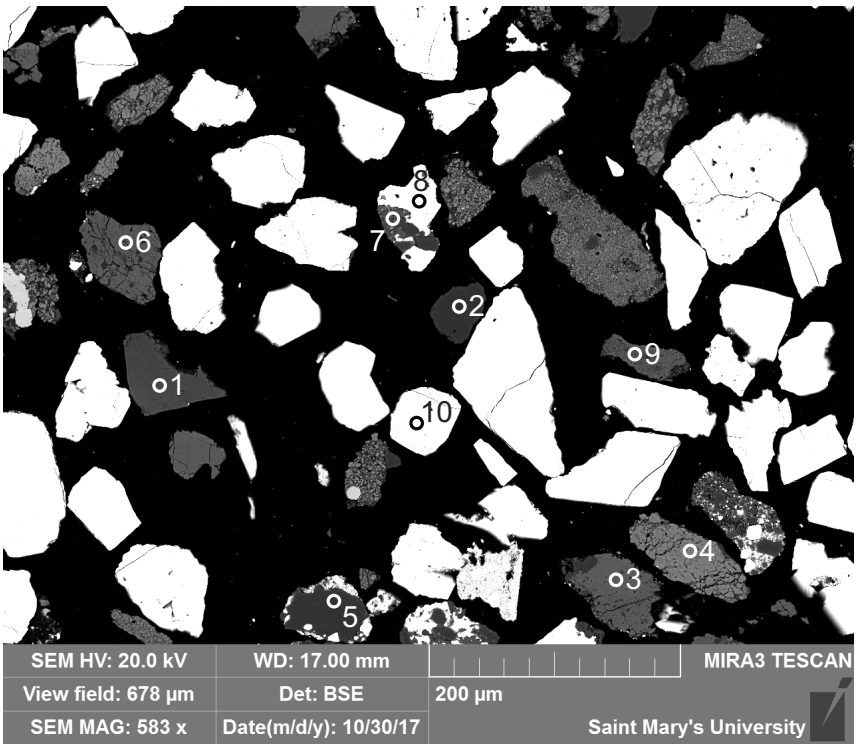
1:Pyrite
2:Ankerite
3:Quartz
4:Chlorite +
5:Siderite + Chlorite
6:Ankerite
7:Albite
8:Ankerite
9:Kaolinite
10:Siderite +
11:Barite

Figure 1G.30: Sample G-24 5530 (SEM) site 27. A cutting made up of: quartz (3) and chlorite (4); kaolnite (9) and siderite (10).



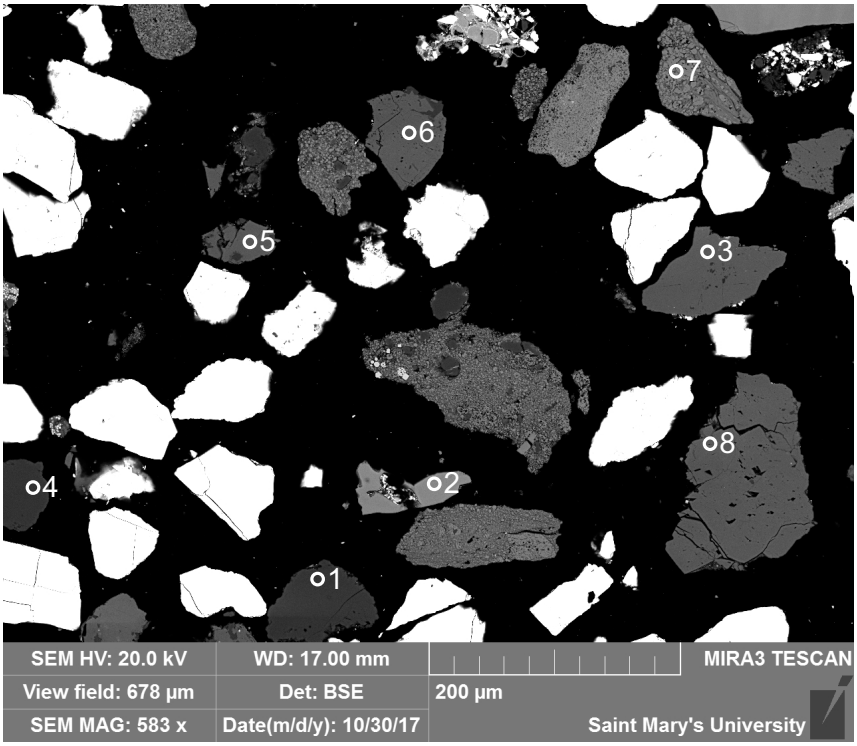
1:Siderite
2:Albite +
3:Ankerite +
4:Quartz
5:Siderite + Chlorite
6:Quartz
7:Ankerite
8:Quartz
9:Ankerite
10:Barite
11:Ankerite
12:Fluorite
13:TiO_2
14:Barite

Figure 1G.31: Sample G-24 5530 (SEM) site 28. Cuttings made up of: albite (2) and siderite (1); quartz (4) and siderite and chlorite (5); quartz (8) and ankerite (9).



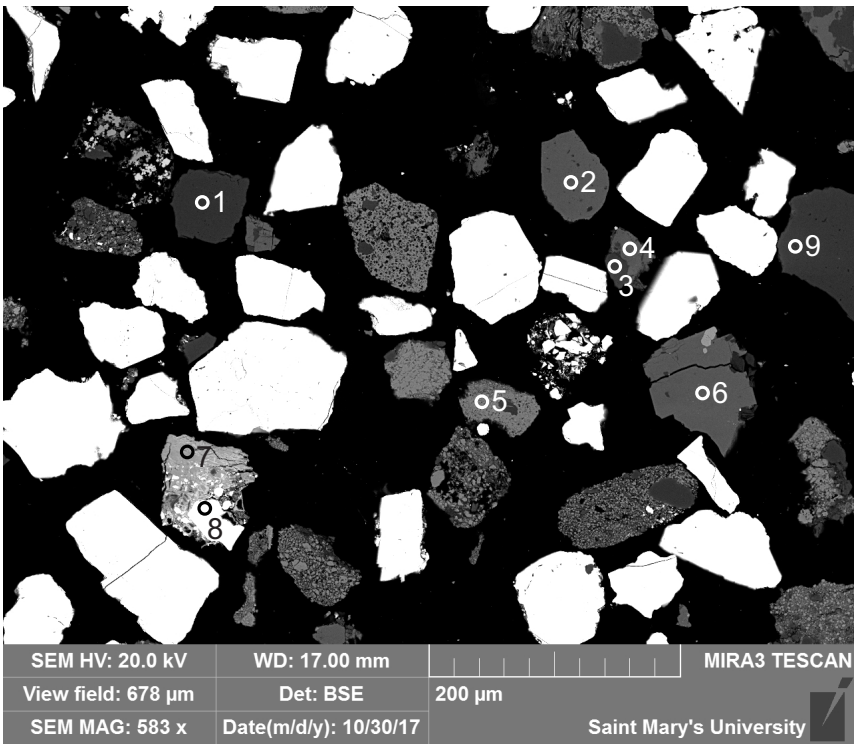
1:Dolomite
2:Quartz
3:Ankerite
4:Siderite + Chlorite
5:Quartz
6:Ankerite + Chlorite
7:Muscovite +
8:Barite
9:Siderite +
10:Barite

Figure 1G.32: Sample G-24 5530 (SEM) site 29. Cutting made up of muscovite (7) and barite (8).



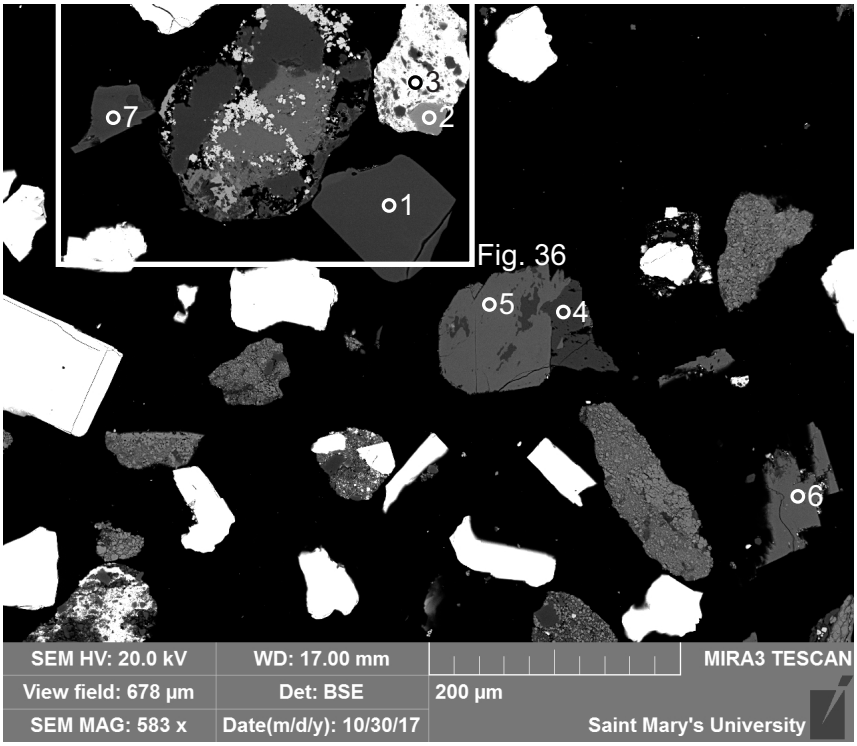
1:Quartz
2:Fluorite
3:Ankerite
4:Quartz
5:Ankerite
6:Ankerite
7:Ankerite
8:Ankerite + Chlorite

Figure 1G.33: Sample G-24 5530 (SEM) site 30. Fibrous chlorite appears to cut ankerite (8).



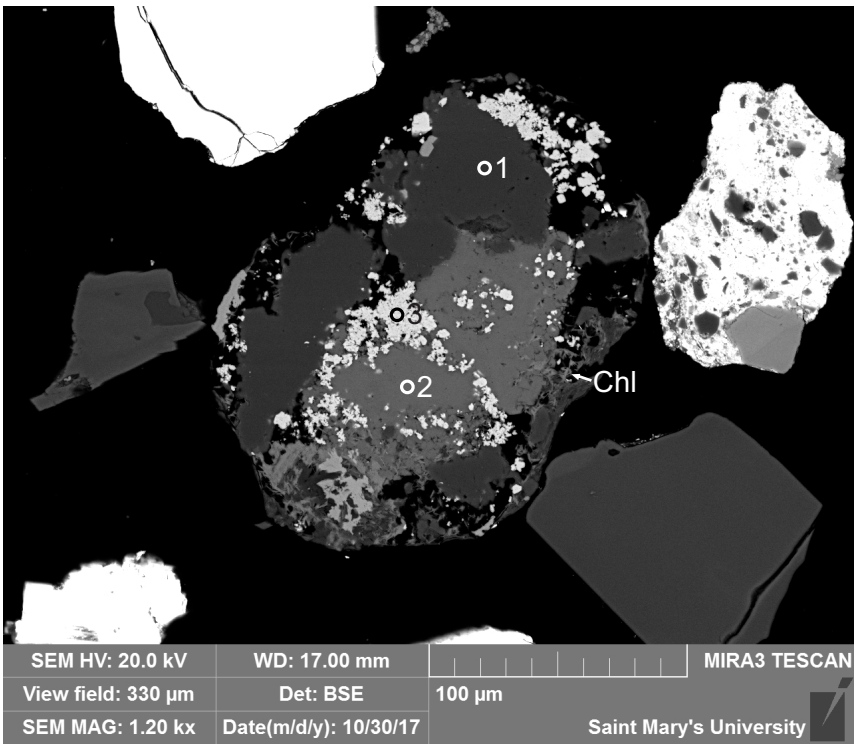
1:Quartz
2:Ankerite
3:Quartz
4:Ankerite +
5:Siderite + Chlorite
6:Ankerite
7:Limonite
8:Barite
9:Quartz

Figure 1G.34: Sample G-24 5530 (SEM) site 31. Cutting made up of quartz (3) and ankerite (4). A fragment of limonite (7) and barite (8)(?contaminant).



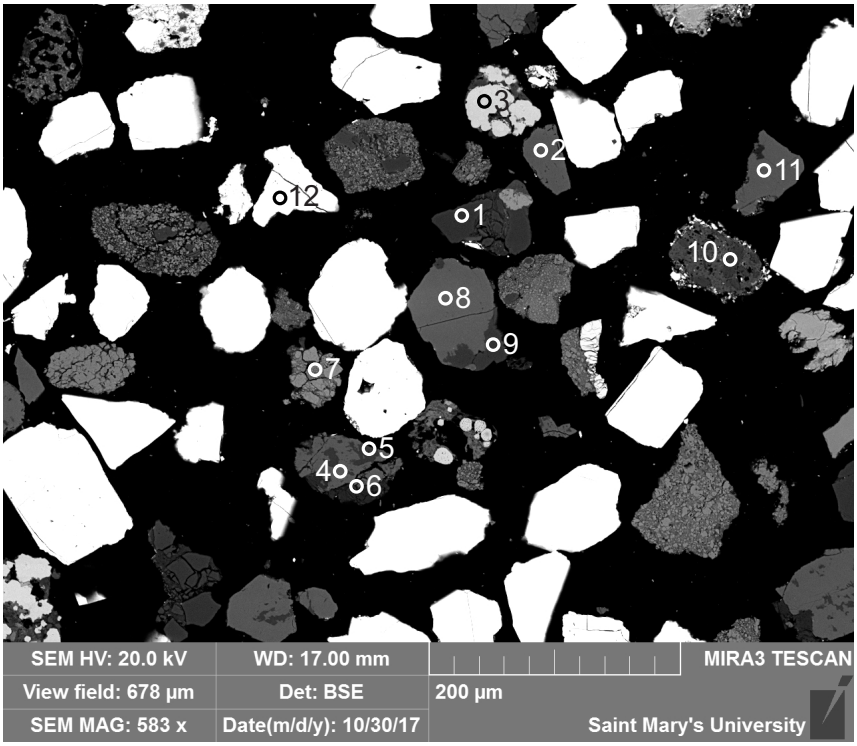
1:Kaolinite +
2:Siderite
3:Barite +
4:Albite
5:Ankerite
6:Ankerite +
Chlorite
7:Kaolinite +

Figure 1G.35: Sample G-24 5530 (SEM) site 32. Cuttings made up of: siderite (2) and barite (3); albite (4) and ankerite (5).



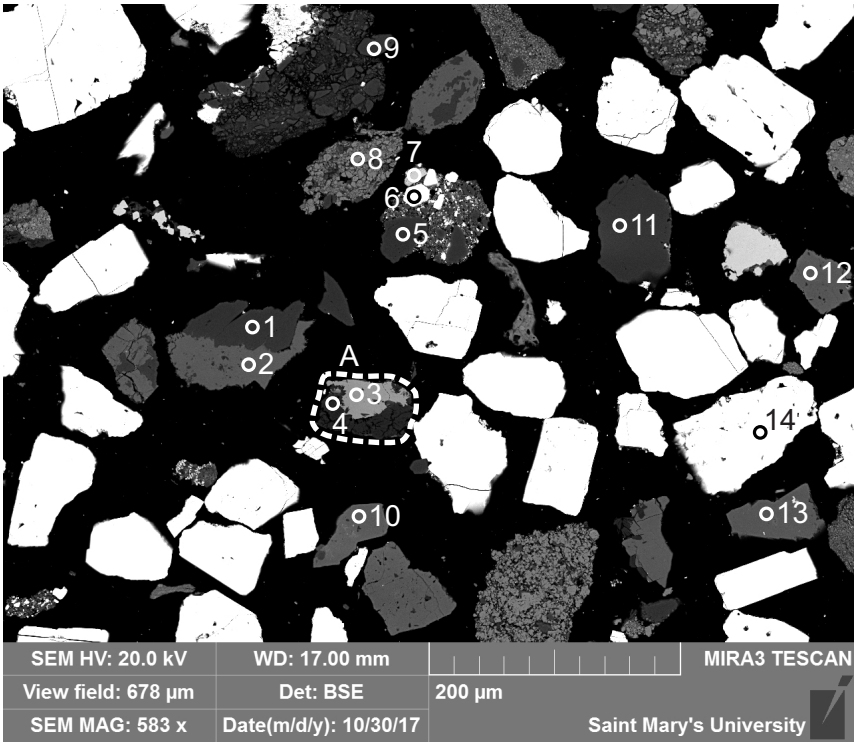
1:Quartz
2:Fluorite
3:Ankerite

Figure 1G.36: Sample G-24 5530 (SEM) site 32.1. Cutting made up of quartz (1), fluorite (2) and ankerite (3), in which fluorite appears to be postdated by ankerite and chlorite. If this is the case, the fluorite is cement, otherwise, this fragment is a lithic clast.



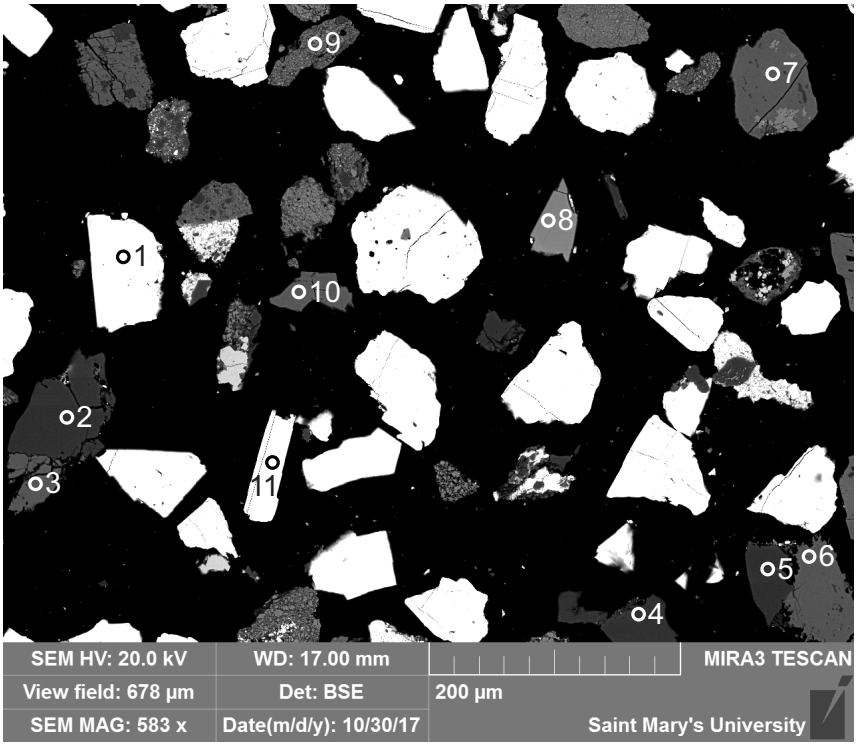
1:Quartz
2:Ankerite
3:Pyrite
4:Ankerite
5:Albite
6:Kaolinite
7:TiO_2
8:Ankerite
9:Quartz
10:Quartz
11:Ankerite
12:Barite

Figure 1G.37: Sample G-24 5530 (SEM) site 33. Cuttings made up of: albite (5), kaolnite (6) and ankerite (4); quartz (9) and ankerite (8).



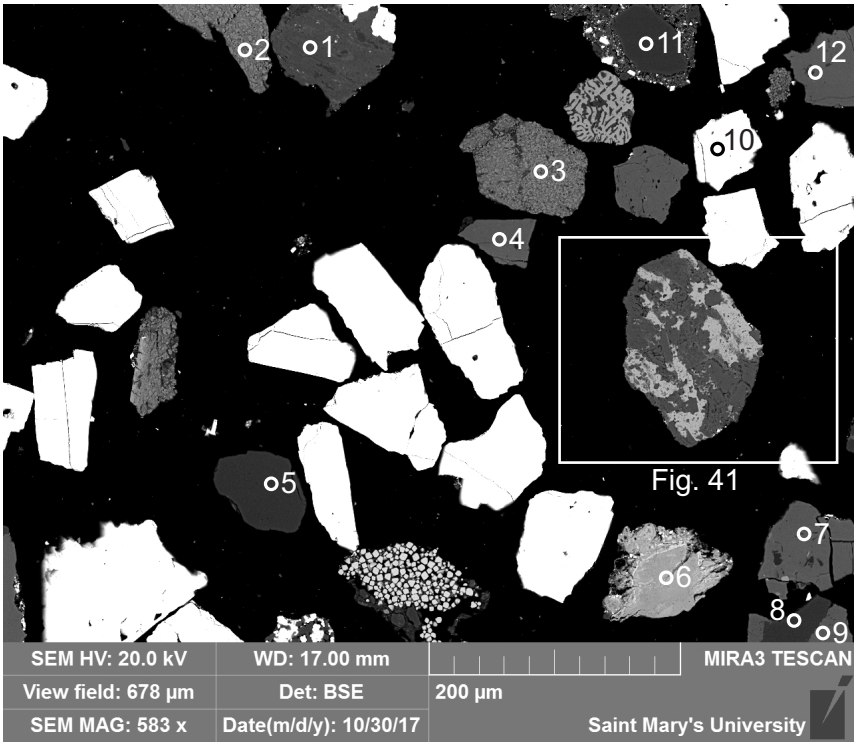
1:Quartz
2:Ankerite
3:TiO_2
4:Kaolinite
5:Quartz
6:Barite
7:Hematite
8:Siderite + Chlorite
9:Quartz
10:Ankerite
11:Quartz
12:Ankerite
13:Ankerite
14:Barite

Figure 1G.38: Sample G-24 5530 (SEM) site 34. Cuttings made up of: quartz (5), barite (6), and hematite (7); quartz (1) and ankerite (2). A possible lithic clast (A) made up of kaolinite (4) and TiO_2.



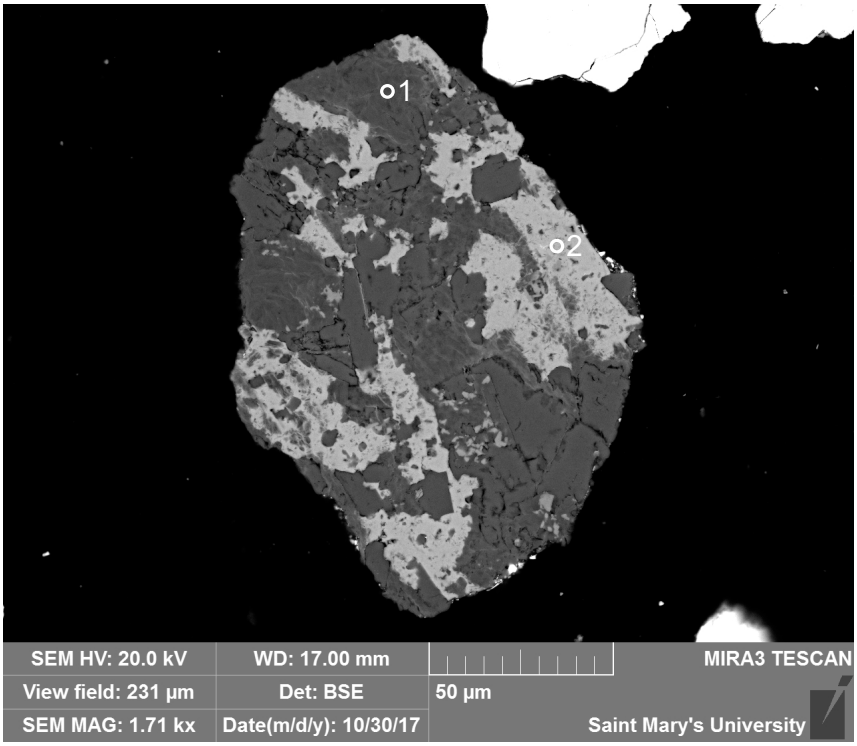
1:Barite
2:Quartz
3:Ankerite
4:Quartz
5:Quartz
6:Ankerite
7:Ankerite
8:Fluorite
9:Chlorite + Siderite
10:Ankerite
11:Barite

Figure 1G.39: Sample G-24 5530 (SEM) site 35. Cuttings made up of: quartz (2) and ankerite (3); quartz (5) and ankerite (6).



1:Muscovite +
2:Chlorite
3:Chlorite +
4:Ankerite
5:Quartz
6:Limonite
7:Ankerite
8:Quartz
9:Ankerite +
10:Barite
11:Quartz
12:Ankerite

Figure 1G.40: Sample G-24 5530 (SEM) site 36. Cutting made up of quartz (8) and ankerite (9).



1:Muscovite +
2:Siderite + Chlorite

Figure 1G.41: Sample G-24 5530 (SEM) site 36.1. Cutting made up of muscovite (1) and siderite mixed with chlorite (2).

Table 1G.1: EDS geochemical analyses from sample G-24 5530.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	Nb_2O_5	BaO	HfO_2	WO_3	Total	Actual Total
1	1	Brt											36.88										1.68			61.53			100	114
1	2	Qz	100.00																										100	118
1	3	Brt											36.08										1.89			62.13			100	109
1	4	TiO_2	0.67	98.95		0.38																							100	106
1	5	Sd	0.99		0.70	42.98	1.42	6.72	3.19																				56	59
1	6	Qz	100.00																										100	118
1	7	Sd + Chl	18.05	0.47	13.03	58.16	0.95	8.22	1.12																				100	60
1	8	Ank	0.60		0.49	16.58	0.60	10.38	27.35																				56	61
1	9	Qz +	75.07		14.51	1.38			0.31				1.96	5.27														1.49	100	90
1	10	Qz	100.00																										100	117
1	11	Sd +	3.37		2.02	40.98	0.67	4.23	1.37		0.26																	3.11	56	63
1	12	Qz	100.00																										100	122
1	13	Ank				15.64	0.62	10.76	28.99																				56	61
1	14	Brt											36.57					0.01					1.92			61.50			100	114
1	15	Sd + Chl	8.53		6.85	70.24	1.82	8.36	4.20																				100	64
2	1	Ank				16.19	0.49	11.65	27.67																				56	60
2	2	Brt											37.04										3.09			59.96			100	115
2	3	Py				29.08							70.92																100	214
2	4	Ank +											20.74					-0.06					1.73			33.58			56	61
2	5	Ms + Chl	63.82	0.74	21.51	6.64		1.34		0.46	5.48																		100	91
2	6	Sd + Chl	4.26		2.46	75.44	1.30	13.54	2.58		0.43																		100	59
2	7	Chl +	28.24	1.78	16.95	28.40	0.34	7.84			1.46																		85	92
2	8	Ank	0.49			15.26	0.69	9.61	29.95																				56	60
2	9	Py				29.04							70.96																100	223
2	10	Chl +	31.03		17.33	27.33	0.48	3.60	0.94	2.68	1.63																		85	90
2	11	Ank				16.83	0.62	10.26	28.30																				56	60
2	12	Qz	99.61			0.39																							100	117
2	13	Sd + Chl	29.80		9.57	45.94	0.42	5.21	2.88		1.96																	4.21	100	67
2	14	Qz	98.54		1.26						0.20																		100	117
2	15	Brt											34.17										1.11			64.97			100	99
2.1	1	Qz	99.44		0.34	0.22																							100	119
2.1	2	Lm +	2.67			97.33																							100	79
2.1	3	Brt											37.17					0.12								62.72			100	113
3	1	Fl							47.68					52.32															100	164
3	2	Qz	99.50			0.50																							100	119
3	3	Sd + Chl	14.08		8.79	61.31	1.33	9.09	3.34		2.06																		100	61
3	4	Ank				16.45	0.63	10.30	28.62																				56	60
3	5	Qz	100.00																										100	120
3	6	Ank				14.46	0.65	9.37	31.52																				56	59
3	7	Qz	100.00																										100	119
3	8	Ank				15.09	0.71	9.87	30.33																				56	61
3	9	Chl +	18.21	0.99	7.07	46.12	0.56	6.15	4.04	1.04	0.82																		85	73
3	10	TiO_2 +	4.31	88.85	1.57	1.70			0.36	1.27															1.94				100	110
3	11	Ab	69.83		18.63					11.54																			100	118
3	12	Ank	0.80			16.56	0.50	11.32	26.81																				56	43
3	13	Qz +	97.91		1.45	0.64																							100	119
3	14	Brt +	1.20										36.51					0.09								62.19			100	107
4	1	Brt											36.84													63.23			100	113
4	2	Ank				14.98	0.69	9.63	30.70																				56	59
4	3	Ank				15.73	0.62	9.96	29.69																				56	59

Table 1G.1: EDS geochemical analyses from sample G-24 5530.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	Nb_2O_5	BaO	HfO_2	WO_3	Total	Actual Total
4	4	Py				33.85			0.24				63.10															2.81	100	170
4	5	Py				29.41			0.22				69.43															0.94	100	204
4	6	Ank				15.01	0.57	9.31	31.11																				56	60
4	7	Fl							47.39					52.61															100	171
4	8	Qz	100.00																										100	119
4	9	Ank				16.39	0.64	10.40	28.57																				56	60
4	10	Sd	0.96			53.89	0.36	0.32	0.46																				56	76
4	11	Ab	69.16		18.38	0.31			0.53	11.62																			100	116
4	12	Ank +	2.74	3.18	2.21	14.57	0.52	8.27	24.52																				56	64
5	1	Mn-Oxide	0.83				76.08		0.39																	22.70			100	82
5	2	Brt											36.82													63.27			100	113
5	3	Sd +	18.81	0.53	9.31	51.29	0.62	9.30	2.93	0.63	1.25																	5.33	100	70
5	4	Sd +	5.46	0.31	2.78	38.27	0.48	5.55	2.75		0.40																		56	61
5	5	Qz	98.97		0.59	0.34					0.10																		100	118
5	6	Ap +			0.65	17.89	0.66	9.59	52.40			18.80																	100	69
5	7	Mix	55.64	0.93	26.51	5.96		1.84	2.06	1.97	3.80																	1.29	100	97
5	8	Chl	31.37		24.53	13.00		15.41		0.69																			85	95
5	9	Mix	23.75		7.47	18.29	0.88	9.13	34.35	6.12																			100	74
5	10	Fl							47.66					52.34															100	163
5	11	Fl							47.42					52.58															100	166
5	12	Qz	99.67			0.33																							100	120
5	13	Sd	1.05			43.32	0.88	8.23	2.52																				56	59
6	1	Qz	100.00																										100	117
6	2	Ank	0.60			16.02	0.69	9.72	28.96																				56	60
6	3	Ank				6.01	1.24	18.83	29.92																				56	58
6	4	Sd + Chl	14.92		12.68	56.56	1.80	10.33	3.71																				100	69
6	5	Ank	0.45			15.56	0.59	9.98	29.43																				56	58
6	6	Chl + Sd	25.25		6.91	51.85	0.69	7.39	6.28		1.64																		100	71
6	7	Ank				16.67	0.73	10.08	28.52																				56	61
6	8	Qz +	96.22			1.23		0.48	2.07																				100	117
6	9	Py +	1.27		0.74	27.43		0.32	0.66				69.37						0.21										100	214
7	1	Mix	22.91		17.93	17.39	0.75	8.91	32.11																				100	71
7	2	Chl	26.64	0.41	20.29	32.05		5.13	0.48																				85	87
7	3	Qz	100.00																										100	117
7	4	TiO_2		99.38		0.62																							100	103
7	5	Olig	67.09		20.59				2.14	10.18																			100	113
7	6	Brt											36.87					0.04								63.09			100	111
7	7	Ank				15.96	0.71	9.98	29.35																				56	61
7	8	Ab	69.38		18.62	0.22				11.77																			100	119
7	9	Brt											36.71					0.09								63.20			100	113
8	1	Lm +	5.04			90.45			0.58			1.49									1.36	1.07							100	77
8	2	Ab	69.67		18.67					11.65																			100	117
8	3	Brt											36.44													63.78			100	112
8	4	Qz	100.00																										100	118
8	5	Qz	96.98	1.22	0.72	0.83		0.25																					100	113
8	6	TiO_2	0.60	96.25	0.39	2.76																							100	103
8	7	Ank		0.67		15.97	0.67	9.82	28.05			0.81																	56	60
8	8	Fl							47.18					52.82															100	164
8	9	Qz	100.00																										100	122
8	10	Qz	99.14		0.31	0.54																							100	121

Table 1G.1: EDS geochemical analyses from sample G-24 5530.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	Nb_2O_5	BaO	HfO_2	WO_3	Total	Actual Total
8	11	Sd +	15.54		9.82	60.65	1.27	6.08	5.59		1.05																		100	66
8	12	Qz	99.54			0.46																							100	121
8	13	Sd + Chl	6.34		3.90	71.31	1.35	8.50	4.45		0.56																	3.59	100	59
9	1	Py	0.19			28.98							70.83																100	212
9	2	Qz	98.22		1.33						0.44																		100	115
9	3	Ank				16.34	0.55	11.46	27.65																				56	58
9	4	Qz	100.00																										100	116
9	5	Qz	100.00																										100	120
9	6	Ank				14.56	0.60	10.40	30.44																				56	57
9	7	Ank +	56.00																										56	62
9	8	TiO_2	0.68	98.47	0.37	0.48																							100	107
9	9	Qz	100.00																										100	120
9	10	Ank				16.43	0.59	10.03	27.85																			1.09	56	58
9	11	Qz	100.00																										100	119
9	12	Sd +	1.63		1.45	42.02	1.07	7.21	2.62																				56	63
9	13	Ank	0.56			15.70	0.63	8.44	30.44						0.23														56	58
10	1	Brt											36.58										1.15			62.36			100	112
10	2	Lm +	5.75		1.87	89.91	1.56		0.91																				100	78
10	3	Ank				16.84	0.76	10.16	28.24																				56	59
10	4	Qz	100.00																										100	122
10	5	Ank + Chl	3.08		2.08	28.96	1.07	17.18	47.63																				100	62
10	6	Ank				15.97	0.66	9.60	29.78																				56	60
10	7	Qz	100.00																										100	117
10	8	Sd				44.40	0.74	9.67	1.18																				56	56
11	1	Ank				15.39	0.73	9.66	30.22																				56	58
11	2	Fl							47.18					52.82															100	167
11	3	Qz	100.00																										100	119
11	4	Fl							47.05					52.95															100	169
11	5	Ank				16.31	0.85	9.64	29.19																				56	60
11	6	Lm +	8.36		2.67	85.12	1.36		1.65			0.85																	100	78
11	7	Ank				14.65	0.59	9.59	31.17																				56	59
11	8	Ab	69.44		18.80					11.76																			100	116
12	1	Qz	95.66		2.42	0.22				1.69																			100	122
12	2	Ank	0.48			15.26	0.77	9.52	29.97																				56	60
12	3	Fl							47.39					52.61															100	165
12	4	Ank				14.89	0.54	9.59	30.98																				56	61
12	5	Brt											36.51										1.21			62.48			100	114
12	6	Sd	0.54			44.88	0.73	8.57	1.28																				56	55
13	1	Qz	100.00																										100	119
13	2	Sd + Ap + Chl	3.00		1.48	68.13	0.55	9.34	11.71		0.43	5.35																	100	65
13	3	Ank + Chl	2.26		2.12	29.11	0.90	16.62	48.99																				100	62
13	4	Lm				91.65	1.09	1.09	0.99				1.02													1.11		3.05	100	74
13	5	Kln	47.21		36.61	0.31								1.87															86	96
13	6	Ank +				51.32	0.61	0.61	0.55				0.57													0.62		1.71	56	63
13	7	Sd +	12.55		8.73	62.59	1.90	9.99	3.24																	0.99			100	70
13	8	Qz	100.00																										100	118
13	9	Ank				15.49	0.70	9.66	30.15																				56	58
13	10	Qz	99.80			0.20																							100	116
13	11	Brt											36.46										1.91			61.79			100	114
14	1	Ank				12.23	2.16	13.33	28.07						0.21														56	60

Table 1G.1: EDS geochemical analyses from sample G-24 5530.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	Nb_2O_5	BaO	HfO_2	WO_3	Total	Actual Total
14	2	Ank				17.55	0.55	10.57	27.33																				56	60
14	3	Ab	69.16		18.61	0.35			0.30	11.58																			100	118
14	4	Zrn	31.13																					67.39			1.48		100	121
14	5	Ab	69.88		18.51					11.61																			100	117
14	6	Sd + Chl	11.56		10.00	63.86	2.03	9.20	3.35																				100	72
14	7	Dol				0.33		21.94	31.54						0.18														54	57
14	8	Qz	99.59			0.41																							100	123
14	9	Sd +	5.35		1.97	36.66	0.67	5.05	1.53		0.15																	4.62	56	71
14	10	Qz	100.00																										100	120
14	11	Fl							47.15					52.85															100	170
15	1	Mix	4.99	46.44	1.43	14.06	0.66	6.88	25.55																				100	65
15	2	Brt											36.51										1.71			61.94			100	115
15	3	Sd +	12.82		3.38	24.49	0.97	14.61	41.58	2.15																			100	67
15	4	Ab + Qz	78.62		13.07					8.31																			100	126
15	5	Ank				5.69	1.09	18.88	30.33																				56	58
15	6	Ank				16.57	0.58	9.88	28.98																				56	61
15	7	Qz	100.00																										100	121
15	8	Ank				15.06	0.55	9.73	30.66																				56	59
15	9	Ank				7.60	1.28	17.46	29.66																				56	57
15	10	Mix	11.85		10.49	31.29	0.29	2.65	19.89					23.53															100	102
15	11	Ank				16.00	0.55	10.26	29.19																				56	59
16	1	Qz	99.55			0.45																							100	118
16	2	Sd +	3.14		1.68	39.61	0.72	6.97	3.58		0.29																		56	63
16	3	Lm +	1.43			97.97	0.59																						100	76
16	4	Qz	95.84		3.14	0.59					0.43																		100	112
16	5	Brt +	2.49		1.47								36.64													59.54			100	110
16	6	Chl +	28.48		11.69	35.55	0.63	4.73	2.20		1.72																		85	58
16	7	Qz	99.64			0.36																							100	118
16	8	Sd + Chl	5.10		2.12	77.20	1.56	10.33	3.25		0.44																		100	57
16	9	Brt											36.31										1.21			62.61			100	115
16	10	Sd +	12.82		9.78	63.50	1.39	9.41	3.11																				100	71
16	11	Py				28.09							71.91																100	232
16	12	Ank				16.55	0.67	10.74	28.04																				56	59
16	13	Ank				16.32	0.72	9.89	29.07																				56	60
17	1	Ank				15.74	0.61	9.84	29.81																				56	58
17	2	Sd +	1.93		1.17	37.81	0.52	6.22	4.59			1.20																2.57	56	58
17	3	Ank +				15.74	0.61	9.84	29.81																				56	60
17	4	Ab	69.02		18.55	0.33			0.19	11.91																			100	117
17	5	Ank +	1.15		0.39	15.31	0.68	9.26	29.21																				56	61
17	6	Py				28.97							71.03																100	223
17	7	Fl							46.39					53.61															100	167
17	8	Hem +	2.11			97.89																							100	86
17	9	Qz	100.00																										100	118
17	10	Spl		1.17	25.32	25.94		7.92								0.83	38.83												100	107
17	11	Qz	100.00																										100	118
17	12	Ank				16.54	0.66	10.74	28.07																				56	59
17	13	Sd	0.53			43.83	0.74	8.58	2.32																				56	62
17	14	Zrn	31.13																					67.05			1.82		100	116
17	15	Brt											36.53					0.04								63.43			100	114
18	1	Ab	69.08		19.03				0.42	11.35	0.11																		100	117

Table 1G.1: EDS geochemical analyses from sample G-24 5530.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	Nb_2O_5	BaO	HfO_2	WO_3	Total	Actual Total
18	2	Chl + Ms	42.26	0.37	21.93	25.68		1.69	0.73		6.31									1.02									100	86
18	3	Brt											36.62										1.15			62.32			100	114
18	4	Chl	25.95		22.45	23.17		13.44																					85	98
18	5	Sd +	21.18	0.51	11.07	56.73	1.14	4.48	2.90		1.99																		100	59
18	6	Qz	97.21		1.63	0.96					0.19																		100	113
18	7	Ank				13.83	0.69	9.33	32.15																				56	61
18	8	TiO_2	0.61	95.97	0.40	1.99			1.03																				100	108
18	9	TiO_2	1.07	92.24	1.08	1.36			0.52																3.72				100	102
18	10	Qz	98.81		0.83					0.36																			100	121
18	11	Ank				15.93	0.52	10.05	29.50																				56	60
18	12	Mix?	5.98		21.10	15.16		12.15	45.62																				100	110
18	13	Ank				16.22	0.74	9.91	29.13																				56	62
18	14	Qz	100.00																										100	121
18	15	Py	0.11			28.62							71.27																100	226
18	16	TiO_2		99.71		0.29																							100	106
18	17	Ank				15.39	0.72	9.67	30.23																				56	59
18	18	Brt											36.44													63.60			100	114
19	1	Brt											36.72										2.12			61.18			100	113
19	2	Kln +	45.28		35.86					0.28				4.58															86	104
19	3	Ank				16.15	0.56	10.53	28.76																				56	58
19	4	Ab	69.12		18.83	0.23				11.81																			100	115
19	5	Ab	69.41		18.67					11.18	0.74																		100	114
19	6	Fl							47.03					52.97															100	164
19	7	Ank				15.48	0.56	9.92	30.04																				56	59
19	8	Ab	69.01		18.97	0.24			0.21	11.56																			100	117
19	9	Ank	0.49			15.89	0.58	9.98	29.06																				56	60
19	10	Qz	100.00																										100	119
19	11	TiO2 +	6.83	88.79	2.29	1.36			0.72																				100	102
19	12	Ank				15.47	0.66	9.91	29.96																				56	59
19	13	Ank	0.75		0.47	15.49	0.69	9.88	28.73																				56	60
19	14	Qz	99.50		0.50																								100	119
19	15	Ank				15.82	0.65	9.45	30.09																				56	60
20	1	TiO_2		96.63		0.51			0.36																			2.49	100	88
20	2	Qz	99.43		0.50						0.07																		100	119
20	3	Qz	100.00																										100	118
20	4	Fl							47.77					52.23															100	164
20	5	Ank				18.52	0.85	8.47	28.16																				56	59
20	6	Ab	69.33		18.61	0.23				11.84																			100	118
20	7	Ank +				18.52	0.85	8.47	28.16																				56	65
20	8	Brt											36.68										1.61			61.78			100	115
20	9	Ank +	5.07		1.42	14.49	0.60	8.30	25.06	1.05																			56	58
20	10	Qz	100.00																										100	122
20	11	Ank				16.89	0.64	10.35	28.12																				56	60
20	12	Ab	69.57		18.66	0.23				11.54																			100	119
20	13	Sd + Chl	16.04		11.13	56.59	0.89	7.13	4.06		0.98																	3.17	100	68
20	14	Ank				16.40	0.58	10.27	28.74																				56	59
20	15	Chl	21.02		17.13	35.50		4.04	4.46			2.86																	85	89
20	16	"Ilm"	18.02	47.31	12.75	9.85		2.20	7.04		0.83																	2.01	100	91
20	17	Qz	100.00																										100	119
21	1	Lm	2.03			96.10	1.49		0.38																				100	77

Table 1G.1: EDS geochemical analyses from sample G-24 5530.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	Nb_2O_5	BaO	HfO_2	WO_3	Total	Actual Total
21	2	Ank				16.72	0.68	10.01	28.59																				56	59
21	3	Ank				15.03	0.53	9.70	30.74																				56	60
21	4	Ab	69.79		18.54					11.67																			100	119
21	5	Qz	100.00																										100	121
21	6	Sd				45.93	0.89	8.53	0.64																				56	61
21	7	Mag		1.22		98.78																							100	90
21	8	Ank				16.31	0.69	10.13	28.87																				56	59
21	9	Lm	0.94			95.13	2.58		0.71						0.64														100	70
21	10	Brt											36.55										1.12			62.32			100	115
22	1	Qz	100.00																										100	116
22	2	Ank				17.15	0.61	10.39	27.85																				56	58
22	3	Qz	100.00																										100	119
22	4	Ank				15.20	0.68	9.16	30.96																				56	59
22	5	Ank				16.62	0.66	9.72	28.99																				56	60
22	6	Fl				0.71			44.38					54.33									0.59						100	149
22	7	TiO_2	1.41	94.56	0.70	1.89			1.43																				100	105
22	8	Ab	69.22		18.63	0.34			0.23	11.57																			100	116
22	9	Ank				17.20	0.58	9.98	28.23																				56	60
22	10	Qz	100.00																										100	121
22	11	Ank	0.40			15.06	0.59	9.66	30.29																				56	60
22	12	Brt											36.53										1.54			62.00			100	113
23	1	Sd + Chl	6.54		3.98	71.09	1.71	10.26	2.67		0.59																	3.16	100	58
23	2	Ank +											20.46					-0.04					0.86			34.72			56	61
23	3	Qz	100.00																										100	121
23	4	Ank				16.29	0.69	9.65	29.37																				56	60
23	5	Qz	100.00																										100	121
23	6	Fl							47.70					52.30															100	169
23	7	Dol				9.16	1.02	15.65	28.17																				54	59
23	8	Ank	0.54			16.03	0.62	10.43	28.39																				56	60
23	9	Kln	48.40		37.39	0.21																							86	94
23	10	TiO_2	0.49	97.85		1.66																							100	109
23	11	Kln	48.81	0.24	36.95																								86	90
23	12	Py				28.68							71.32																100	220
23	13	Ank	0.53			15.30	0.64	9.49	30.05																				56	60
24	1	Ank				15.53	0.69	9.96	29.81																				56	59
24	2	Qz	100.00																										100	118
24	3	Qz	95.78		3.26	0.69					0.27																		100	113
24	4	Py				28.29							70.41											1.29					100	217
24	5	Sd +	16.29		8.78	60.33	1.20	8.09	3.99		1.32																		100	51
24	6	Qz	100.00																										100	120
24	7	Py				28.55							71.45																100	220
24	8	Chl	19.81		14.42	39.94	0.73	7.61	2.49																				85	83
24	9	Ank				15.97	0.68	10.58	28.76																				56	58
24	10	Ank				15.12	0.62	9.68	30.58																				56	58
24	11	Brt											36.00										0.96			63.17			100	110
24.1	1	Brt											36.71										2.58			60.76			100	113
24.1	2	Kfs	65.94		17.62					0.32	16.12																		100	112
24.1	3	Qz + Feld*	77.37		12.85	0.48				3.05	6.25																		100	118
25	1	Ank	0.69		0.37	17.35	0.65	9.29	27.65																				56	61
25	2	Qz	100.00																										100	119

Table 1G.1: EDS geochemical analyses from sample G-24 5530.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	Nb_2O_5	BaO	HfO_2	WO_3	Total	Actual Total
25	3	Ab	69.39		18.56	0.22				11.83																			100	119
25	4	Ank				16.98	0.62	10.21	28.18																				56	60
25	5	Chl	29.39	0.48	21.29	27.53	0.29	5.25	0.43		0.37																		85	90
25	6	Chl	23.59	0.43	18.45	35.70	0.39	5.72	0.72																				85	88
25	7	Ank				16.69	0.58	9.93	28.80																				56	60
25	8	Ab	69.48		18.55	0.22				11.74																			100	116
25	9	Sd + Chl	15.01		12.86	56.14	0.76	9.93	5.30																				100	76
25	10	Brt											36.85													63.23			100	113
26	1	Qz	100.00																										100	117
26	2	Ank +	2.44		0.75	15.48	0.67	9.63	27.04																				56	60
26	3	TiO_2	0.88	99.12																									100	105
26	4	Qz +	86.17	0.39	8.11	0.63		0.70			2.00			1.99															100	115
26	5	Sd + Chl	5.90		3.52	67.66	1.22	7.73	9.22		0.45	4.29																	100	65
26	6	Fl							47.39					52.61															100	165
26	7	Ank				15.35	0.73	9.63	30.29																				56	59
26	8	Ank				14.64	0.68	9.36	31.32																				56	59
26	9	Qz	99.02		0.63	0.20					0.15																		100	118
26	10	Zrn	31.10																					68.90					100	120
26	11	Fl							47.80					52.20															100	164
27	1	Py				29.07							70.93																100	220
27	2	Ank				15.79	0.52	10.25	29.44																				56	60
27	3	Qz	99.62			0.38																							100	120
27	4	Chl +	23.92	0.82	11.44	43.97		0.88	0.33		3.62																		85	98
27	5	Sd + Chl	8.13		5.73	70.02	1.53	8.76	5.45		0.37																		100	59
27	6	Ank				14.90	0.59	9.78	30.73																				56	58
27	7	Ab	69.37		18.58	0.42				11.63																			100	117
27	8	Ank				15.61	0.77	9.08	30.54																				56	60
27	9	Kln	48.56		36.88	0.56																							86	90
27	10	Sd +	4.58		2.03	39.24	0.54	7.04	2.05		0.52																		56	63
27	11	Brt											36.56													63.51			100	115
28	1	Sd	0.63			44.61	1.32	7.85	1.60																				56	60
28	2	Ab +	62.92	0.45	19.32	7.45		0.94		8.92																			100	101
28	3	Ank +	0.54		1.37	15.79	0.70	9.40	26.92			1.28																	56	60
28	4	Qz	100.00																										100	119
28	5	Sd + Chl	22.47	0.93	14.73	50.88	0.67	8.45	0.57																			1.30	100	59
28	6	Qz	100.00																										100	121
28	7	Ank	0.81		0.52	14.90	0.73	8.68	30.36																				56	61
28	8	Qz	99.39		0.38	0.24																							100	119
28	9	Ank				17.63	0.79	8.92	28.67																				56	60
28	10	Brt											36.56					0.03					1.87			61.53			100	115
28	11	Ank				16.06	0.69	9.56	29.69																				56	60
28	12	Fl							47.88					52.12															100	168
28	13	TiO_2	0.55	98.82	0.33	0.29																							100	109
28	14	Brt											36.80										2.45			60.84			100	116
29	1	Dol				6.02	1.99	17.03	28.96																				54	58
29	2	Qz	100.00																										100	119
29	3	Ank				16.74	0.73	9.11	29.42																				56	61
29	4	Sd + Chl	21.17		18.21	50.40	0.90	7.30	2.01																				100	84
29	5	Qz	100.00																										100	121
29	6	Ank + Chl	6.15		5.28	28.77	0.94	15.18	43.68																				100	62

Table 1G.1: EDS geochemical analyses from sample G-24 5530.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	Nb_2O_5	BaO	HfO_2	WO_3	Total	Actual Total
29	7	Ms +	48.72	8.64	23.79	3.47		1.75			8.64																		95	109
29	8	Brt											36.83													63.20			100	112
29	9	Sd +	15.85		6.28	64.08	1.04	7.18	4.93		0.65																		100	57
29	10	Brt											36.40										1.54			62.15			100	115
30	1	Qz	100.00																										100	121
30	2	Fl				0.22			48.26					51.52															100	168
30	3	Ank	0.68		0.42	15.26	0.70	9.05	29.89																				56	60
30	4	Qz	100.00																										100	112
30	5	Ank				14.12	0.65	9.48	31.75																				56	58
30	6	Ank				17.76	0.75	9.03	28.46																				56	60
30	7	Ank				44.25	0.78	7.38	3.60																				56	59
30	8	Ank + Chl	2.21		1.53	30.52	1.19	16.19	47.91						0.45														100	63
31	1	Qz	100.00																										100	117
31	2	Ank	0.42			16.27	0.63	10.31	28.37																				56	60
31	3	Qz	100.00																										100	119
31	4	Ank +	0.42			16.27	0.63	10.31	28.37																				56	62
31	5	Sd + Chl	2.28		1.12	78.52	1.22	9.93	6.94																				100	59
31	6	Ank				18.12	0.66	9.56	27.65																				56	60
31	7	Lim				98.92									1.08														100	68
31	8	Brt				0.55							36.36										1.17			61.93			100	116
31	9	Qz	99.55		0.45																								100	119
32	1	Kln +	37.36	0.38	33.66	6.25		5.59	1.14	1.61																			86	98
32	2	Sd				49.73	3.66	1.81	0.80																				56	59
32	3	Brt +	2.97		0.99	0.44							34.56													58.00		3.08	100	103
32	4	Ab	69.74		18.70					11.56																			100	115
32	5	Ank				15.88	0.63	9.92	29.57																				56	60
32	6	Ank + Chl	9.92		7.44	25.50	0.70	13.86	42.58																				100	64
32	7	Kln +	37.94	0.70	32.13	9.36		3.81	0.25	1.81																			86	97
32.1	1	Qz	99.78			0.22																							100	119
32.1	2	Fl	0.99		0.60	1.89	0.39	0.50	54.82					40.80															100	99
32.1	3	Ank	0.46		0.18	15.95			0.64		0.07		38.69																56	197
33	1	Qz	100.00																										100	118
33	2	Ank				14.71	0.63	9.70	30.96																				56	58
33	3	Py				28.65							71.35																100	216
33	4	Ank				15.46	0.57	9.93	30.04																				56	59
33	5	Ab	69.51		18.60					11.89																			100	118
33	6	Kln	48.41		36.15	0.35			0.19																			0.90	86	80
33	7	TiO_2		97.52	0.39	0.47			0.28																			1.33	100	86
33	8	Ank				16.34	0.67	10.01	28.98																				56	59
33	9	Qz	100.00																										100	117
33	10	Qz	97.01		2.03	0.39					0.57																		100	116
33	11	Ank	0.46			15.71	0.65	9.67	29.51																				56	58
33	12	Brt											36.87										2.13			61.10			100	112
34	1	Qz	100.00																										100	119
34	2	Ank				15.33	0.64	9.78	30.24																				56	58
34	3	TiO_2	1.05	95.89	1.30	1.76																							100	104
34	4	Kln	47.47		36.76									1.77															86	97
34	5	Qz	100.00																										100	118
34	6	Brt											36.74													63.39			100	114
34	7	Hem	1.27			96.91																1.83							100	88

Table 1G.1: EDS geochemical analyses from sample G-24 5530.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	Nb_2O_5	BaO	HfO_2	WO_3	Total	Actual Total
34	8	Sd + Chl	6.25		3.30	69.53	1.16	14.52	4.63		0.61																		100	64
34	9	Qz	100.00																										100	117
34	10	Ank				15.35	0.61	10.01	30.04																				56	60
34	11	Qz	100.00																										100	118
34	12	Ank				15.50	0.59	9.81	30.10																				56	59
34	13	Ank	0.54		0.48	16.56	0.83	9.86	27.72																				56	62
34	14	Brt											36.64										1.73			61.82			100	116
35	1	Brt											36.67										1.36			62.05			100	113
35	2	Qz	100.00																										100	119
35	3	Ank				15.63	0.71	9.34	30.32																				56	59
35	4	Qz	100.00																										100	122
35	5	Qz	100.00																										100	122
35	6	Ank				15.68	0.63	9.97	29.72																				56	61
35	7	Ank				16.68	0.71	10.04	28.57																				56	59
35	8	Fl							47.95					52.05															100	165
35	9	Chl + Sd	22.21	0.44	11.49	53.81	1.32	5.60	4.09		1.04																		100	57
35	10	Ank				16.81	0.63	9.80	28.76																				56	60
35	11	Brt											36.70										1.10			62.29			100	116
36	1	Ms +	48.66		27.95	3.48		2.01		0.28	9.81			2.81															95	110
36	2	Chl	21.48	0.42	17.32	39.70	0.34	4.62	1.12																				85	77
36	3	Chl +	21.34		17.19	39.30	0.48	4.97	1.71																				85	81
36	4	Ank				15.67	0.68	10.07	29.57																				56	59
36	5	Qz	100.00																										100	120
36	6	Lm				98.94	0.73								0.34														100	74
36	7	Ank				15.14	0.60	10.05	30.20																				56	60
36	8	Qz	99.73			0.27																							100	124
36	9	Ank +				15.14	0.60	10.05	30.20																				56	64
36	10	Brt											36.74										1.08			62.28			100	113
36	11	Qz	100.00																										100	117
36	12	Ank				15.06	0.60	9.65	30.68																				56	58
36.1	1	Ms +	52.23		25.70	4.54		2.67			9.86																		95	108
36.1	2	Sd + Chl	6.16	0.54	3.82	87.47	0.92		0.49		0.61																		100	78
								Notes																						
							1. + indicates more than one mineral present																								
							2. " " indicates altered mineral																								
							3. Limonite is used to refer to Fe-oxide/hydroxide mixtures																								
							*Feld=Feldspar (Ab+Kfs)																								

Appendix 1H: SEM-BSE images and EDS mineral analyses for sample G-24 5535(1)

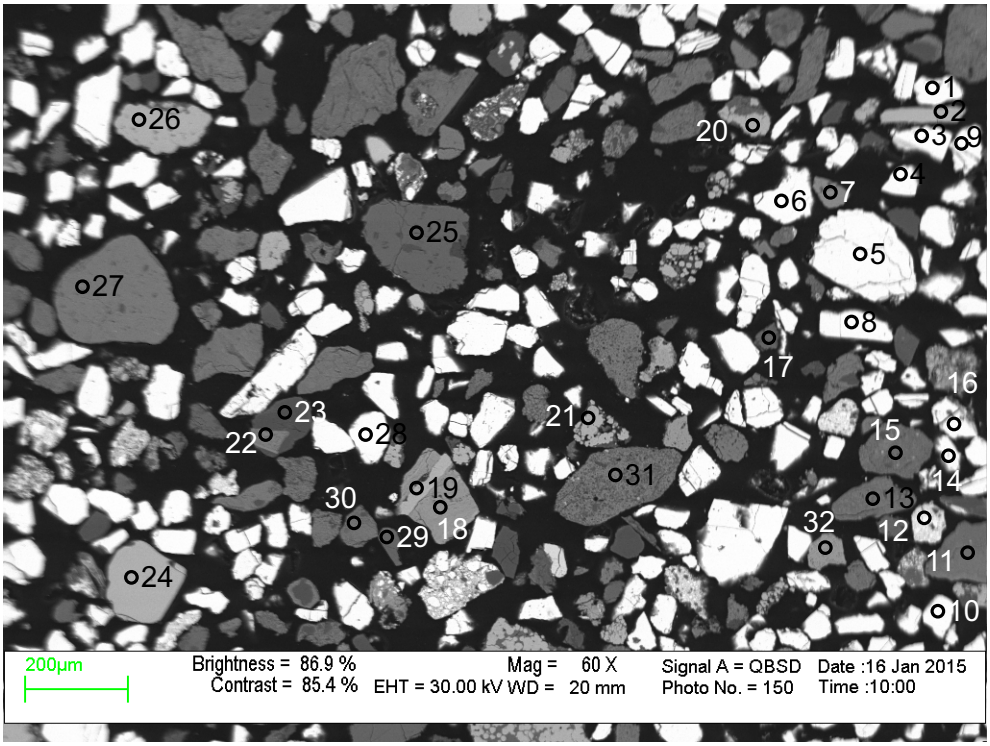


Figure 1H.1: Annapolis G-24 5535(1) (SEM) site 1. Feohy (19) cuts siderite (18). A cutting made up of quartz (23) and detrital TiO_2 (22).

1:Barite
2:Feohy +
3:Barite
4:Barite
5:Barite
6:Barite
7:TiO_2
8:Barite
9:Barite
10:Barite
11:Siderite +
12:Barite
13:Siderite +
14:Barite
15:?
16:Barite
17:Ankerite +
18:Siderite
19:Feohy +
20:Pyrite
21:Pyrite
22:TiO_2 +
23:Quartz
24:Pyrite
25:Ankerite
26:Pyrite
27:Siderite
28:Barite
29:Clinopyroxene (Augite)
30:Siderite +
31:Siderite + Chlorite +
32:Feohy +

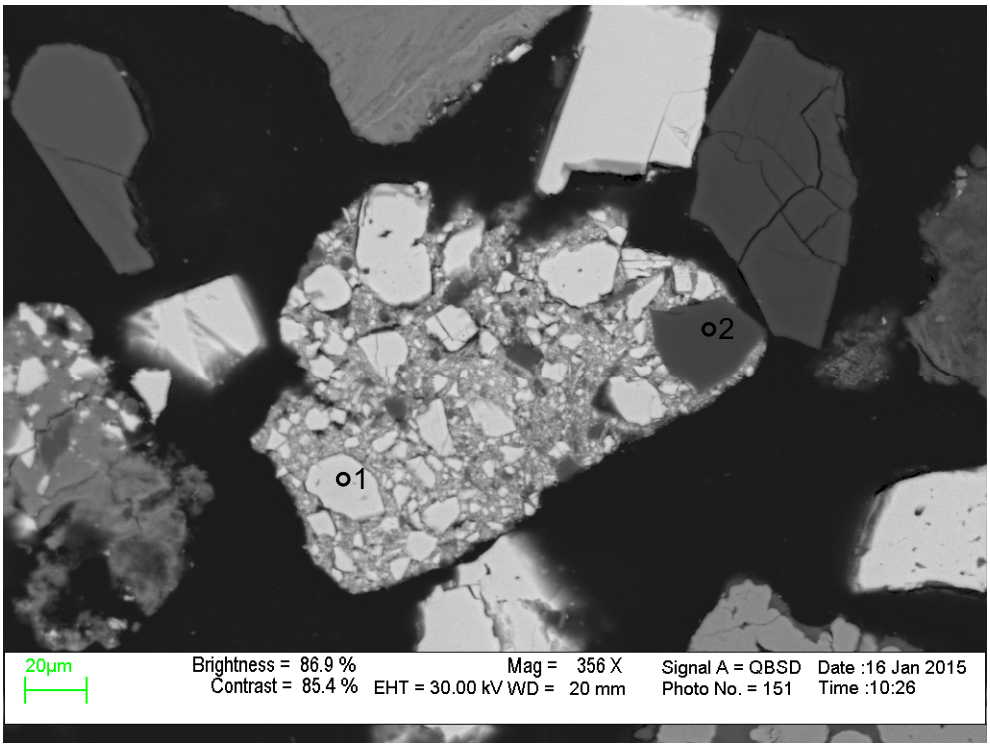
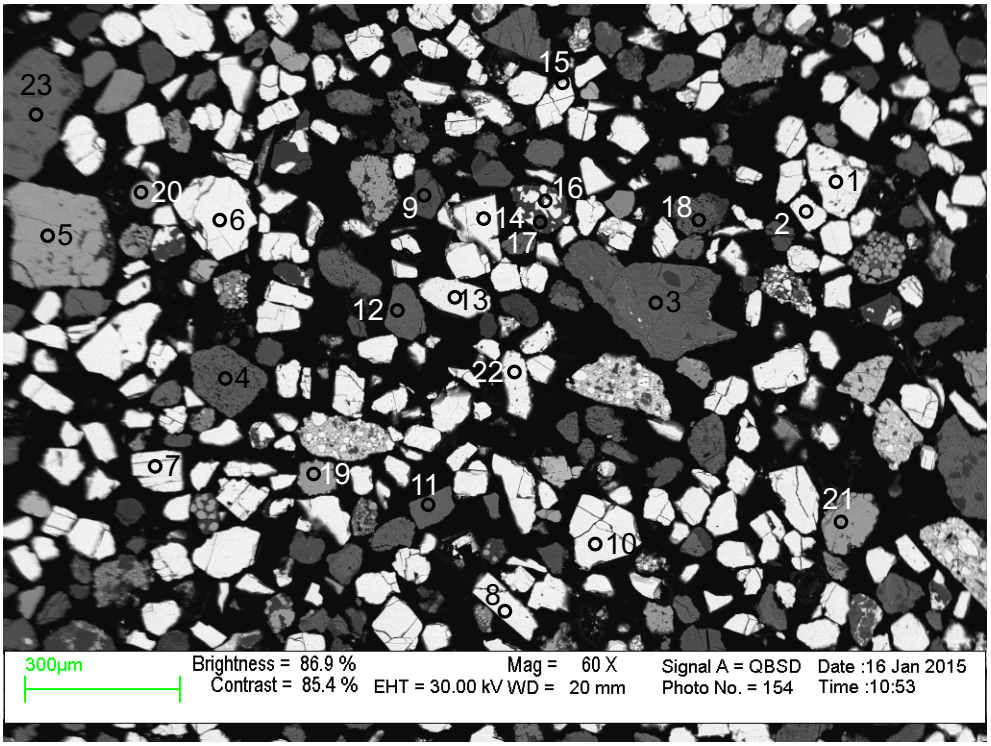


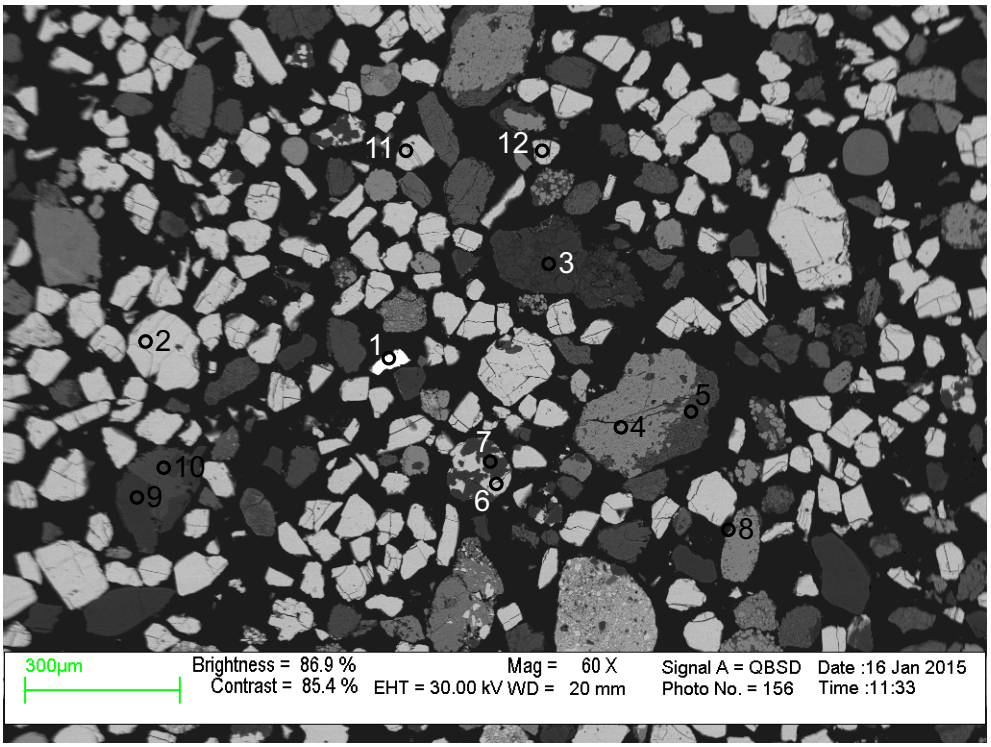
Figure 1H.2: Annapolis G-24 5535(1) (SEM) site 2. Mixture of crushed sandstone (2) and drilling mud barite (1).

1:Barite
2:Quartz



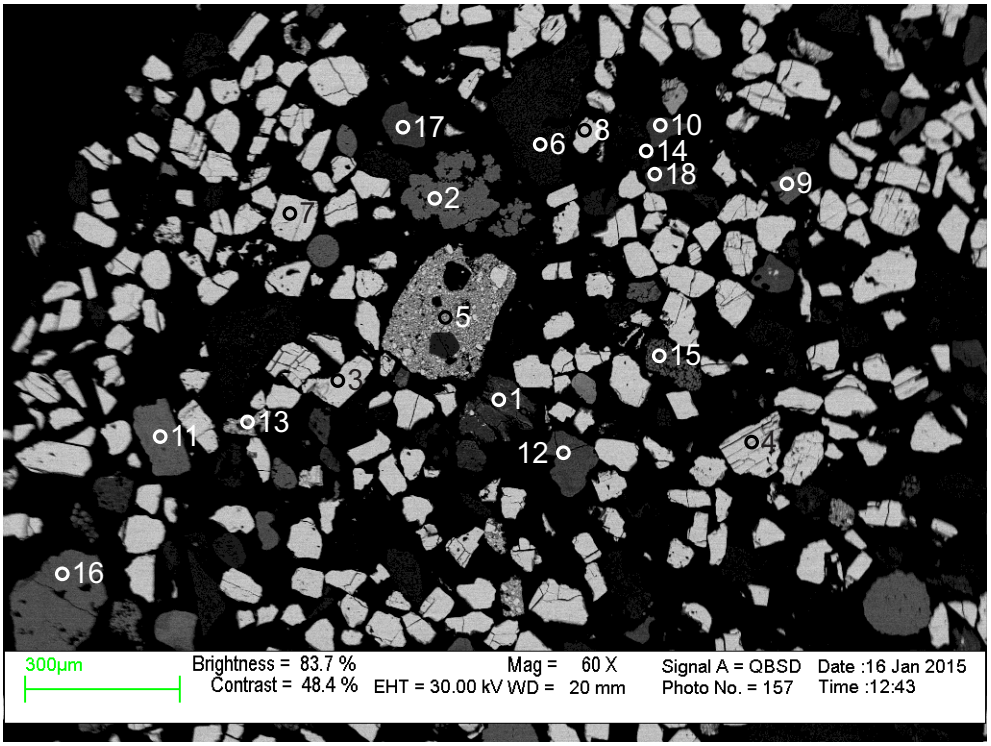
1:Barite
2:Barite
3:Siderite +
4:Siderite
5:Pyrite
6:Barite
7:Barite
8:Barite
9:Ankerite
10:Barite
11:Siderite +
12:Siderite + Chlorite
13:Barite
14:Barite
15:Barite
16:Barite
17:Quartz
18:Siderite +
19:Pyrite
20:Pyrite
21:Pyrite
22:Barite
23:Siderite

Figure 1H.3: Annapolis G-24 5535(1) (SEM) site 3. A cutting made up of quartz (17) and barite (16) in which barite appears to be diagenetic.



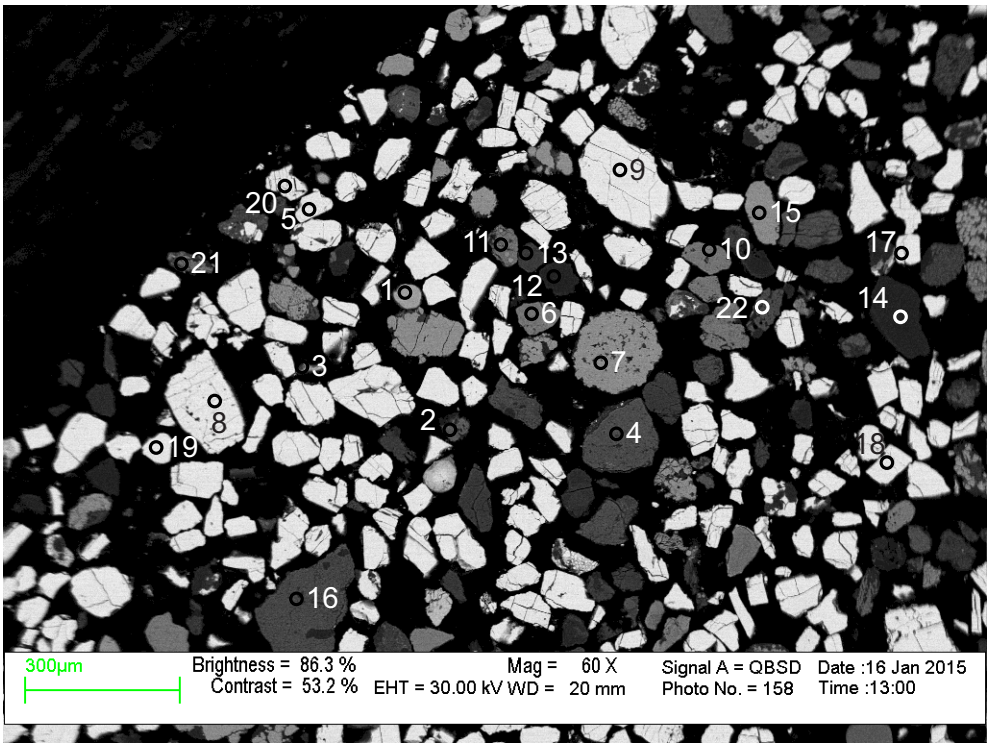
1:Anglesite
2:Barite
3:Albite +
4:Pyrite +
5:Mix
6:Barite
7:Quartz
8:Pyrite
9:Quartz
10:Quartz + Calcite
11:Barite
12:Barite

Figure 1H.4: Annapolis G-24 5535(1) (SEM) site 4. A cutting made up of quartz (6) and barite (7) in which barite appears to be diagenetic.



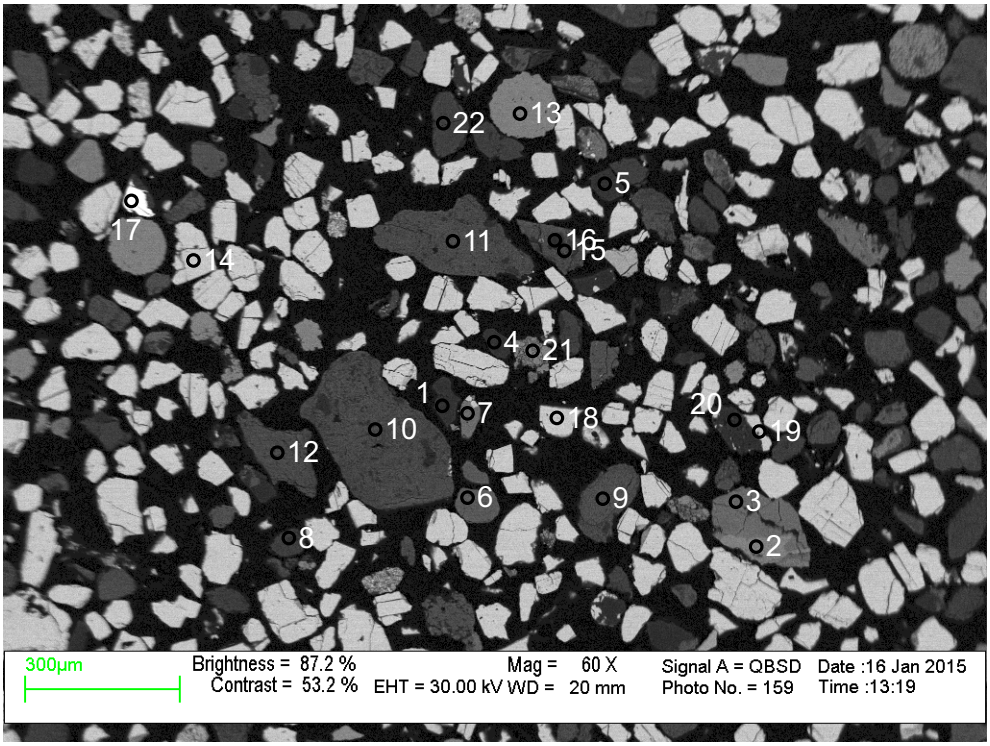
1:Feohy
2:Pyrite +
3:Barite
4:Barite
5:Barite
6:Siderite +
7:Barite
8:Barite
9:Pyrite
10:Feohy +
11:Feohy
12:Feohy +
13:Barite +
14:Muscovite +
15:Pyrite +
16:Pyrite
17:Feohy +
18:Feohy +

Figure 1H.5: Annapolis G-24 5535(1) (SEM) site 5. A cutting made up of barite (5) drilling mud with suspended grains of sandstone (likely quartz).



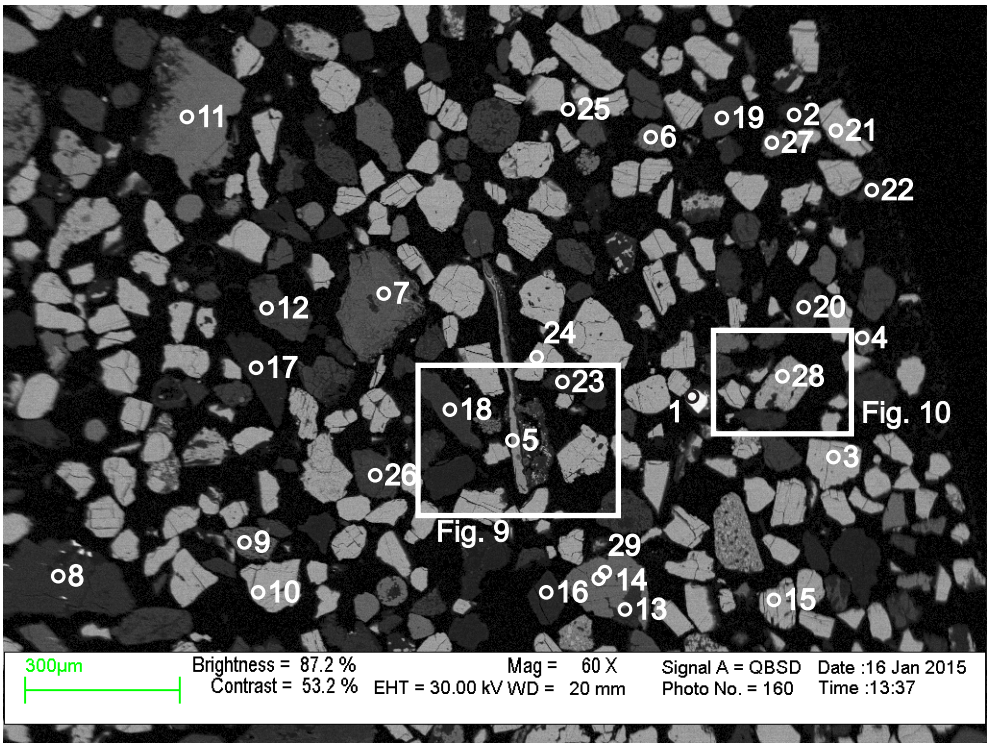
1:Zircon
2:TiO_2 +
3:Zircon
4:Mix
5:Barite
6:Feohy +
7:Pyrite
8:Barite
9:Barite
10:Feohy +
11:Pyrite +
12:Quartz
13:Ankerite
14:Quartz
15:Pyrite
16:Siderite + Chlorite
17:Barite
18:Barite
19:Barite
20:Barite
21:Pyrite
22:Siderite +

Figure 1H.6: Annapolis G-24 5535(1) (SEM) site 6.



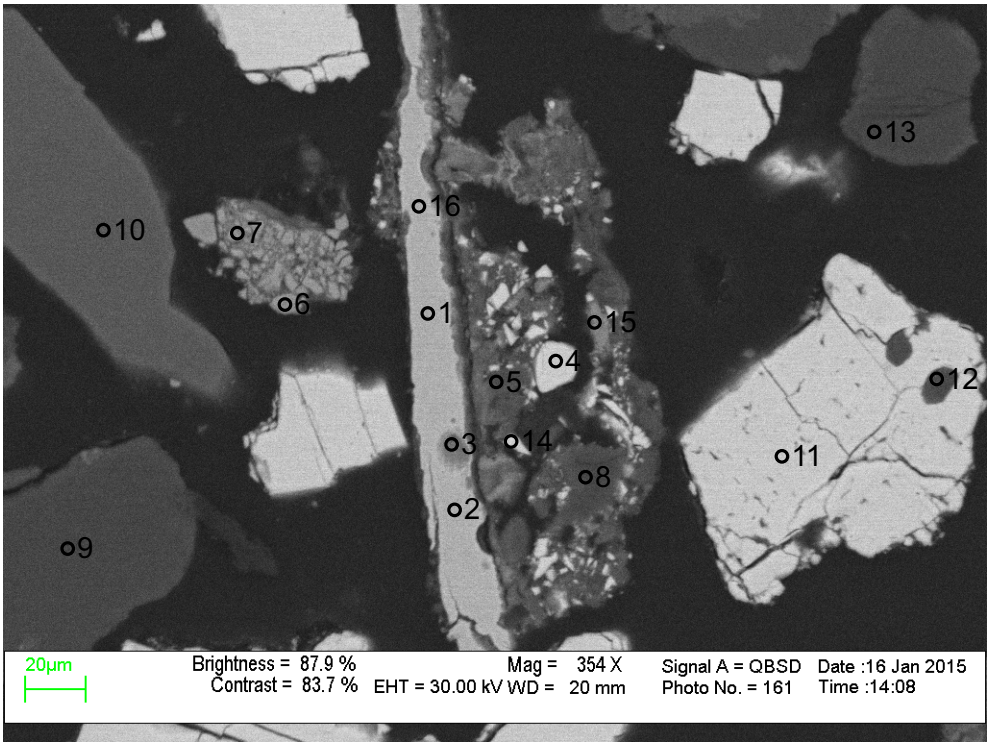
1:Tourmaline
2:Feohy +
3:Siderite +
4:Tourmaline
5:Tourmaline
6:TiO2
7:Feohy +
8:Oligoclase
9:Siderite + Chlorite
10:Siderite + Chlorite
11:Siderite +
12:Siderite + Chlorite
13:Pyrite
14:Barite
15:Siderite + Chlorite
16:Quartz
17:Anglesite
18:Barite
19:Barite
20:Quartz
21:Pyrite
22:Ankerite

Figure 1H.7: Annapolis G-24 5535(1) (SEM) site 7. A cutting made up of Feohy (2) and siderite (3) in which Feohy appears to cut siderite. Several cuttings are made up of siderite and chlorite (9-12).



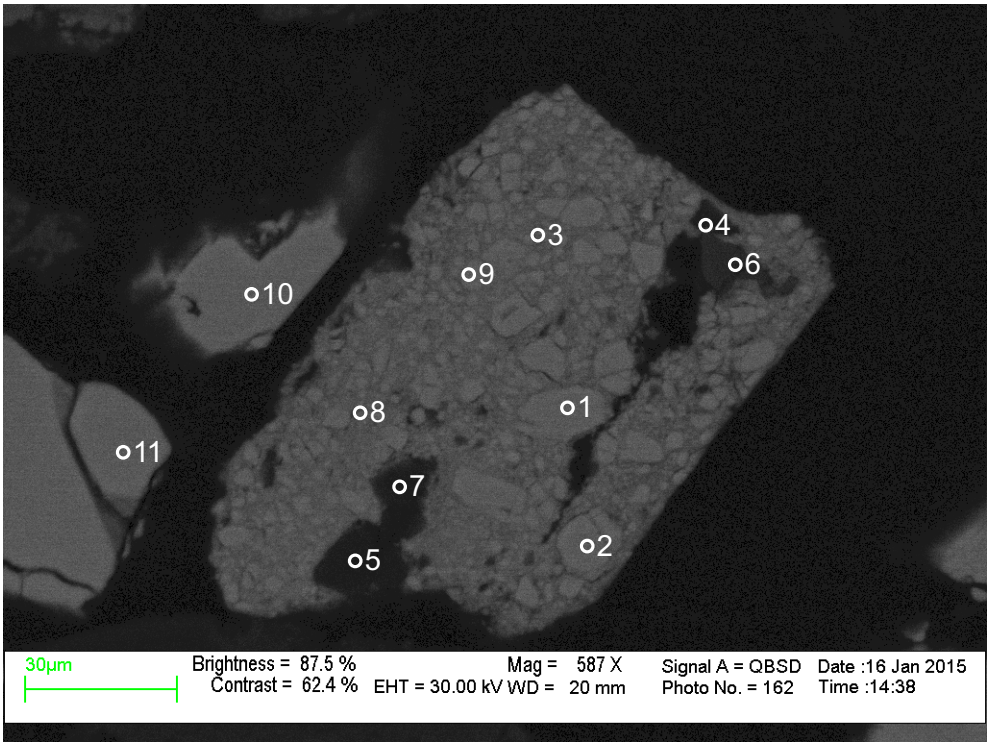
1:Contamination (W)
2:Tourmaline
3:Barite
4:Feohy +
5:Feohy
6:Pyrite
7:Feohy
8:Ankerite
9:Feohy
10:Barite
11:Feohy
12:Siderite + Chlorite
13:Calcite
14:Pyrite
15:Barite
16:Siderite
17:Mix
18:Mix
19:Siderite + Chlorite
20:Siderite + Chlorite
21:Barite
22:Mix
23:Mix
24:Barite
25:Hole
26:Siderite +
27:Pyrite
28:Barite
29:Pyrite

Figure 1H.8: Annapolis G-24 5535(1) (SEM) site 8. Feohy (5) is likely a contaminant. A cutting made up of calcite (13) and pyrite (14,29) in which calcite appears to surround pyrite.



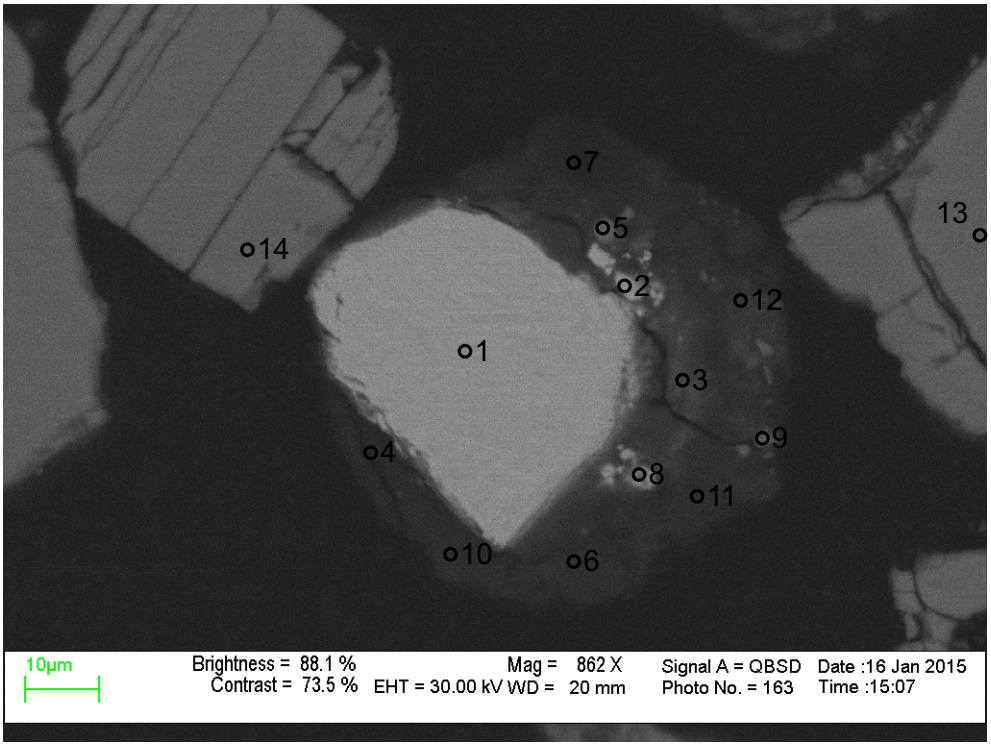
1:Feohy
2:Feohy
3:Feohy
4:Barite
5:Quartz
6:Pyrite
7:Pyrite
8:Quartz
9:Quartz
10:Amphibole
11:Barite
12:Quartz
13:Quartz
14:Barite
15:Mix
16:Feohy

Figure 1H.9: Annapolis G-24 5535(1) (SEM) site 9. Similar to Fig. 1I.5. a cutting made up of Feohy (1-3,16), barite (4,14), and quartz (5,8), in which Feohy and barite are contaminants. A grain of barite (11) associated with quartz (12) is likely diagenetic.



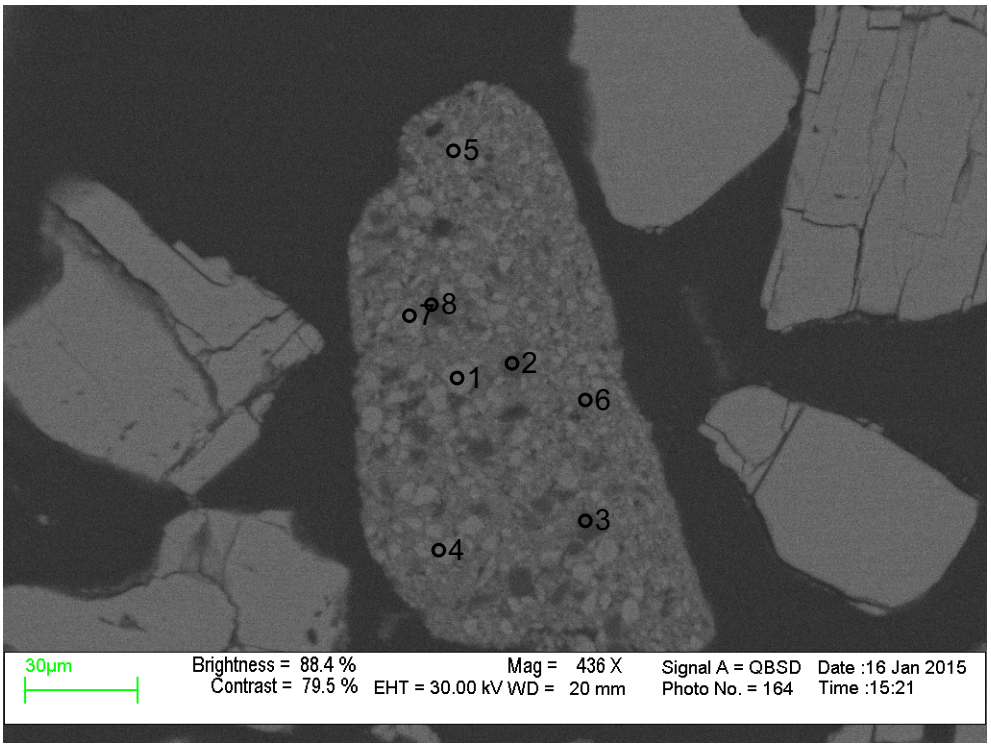
1:Barite
2:Barite
3:Barite
4:Mix
5:Quartz
6:Fluorite
7:Quartz
8:Barite
9:Barite
10:Barite
11:Barite

Figure 1H.10: Annapolis G-24 5535(1) (SEM) site 10. Drilling mud with fragments of sandstone.



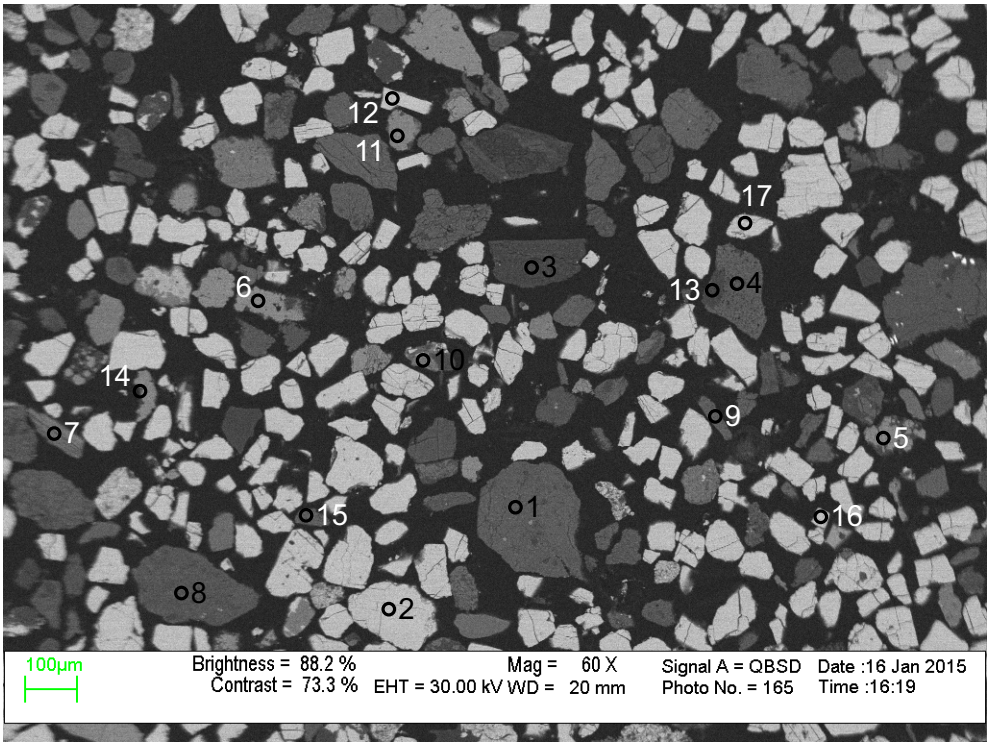
1:Bad analysis
2:Bad analysis
3:Bad analysis
4:Bad analysis
5:Bad analysis
6:Bad analysis
7:Bad analysis
8:Bad analysis
9:Bad analysis
10:Bad analysis
11:Bad analysis
12:Bad analysis
13:Bad analysis
14:Bad analysis

Figure 1H.11: Annapolis G-24 5535(1) (SEM) site 11. Not good analyses.



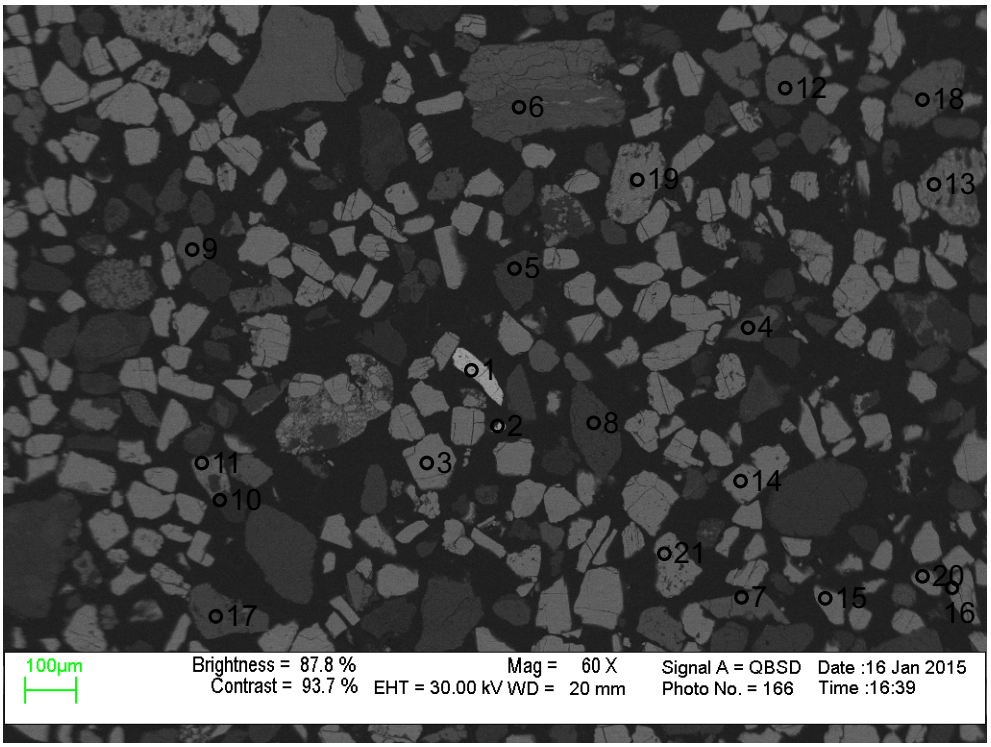
1:Bad analysis
2:Bad analysis
3:Bad analysis
4:Bad analysis
5:Bad analysis
6:Bad analysis
7:Bad analysis
8:Bad analysis

Figure 1H.12: Annapolis G-24 5535(1) (SEM) site 12. Not good analyses.



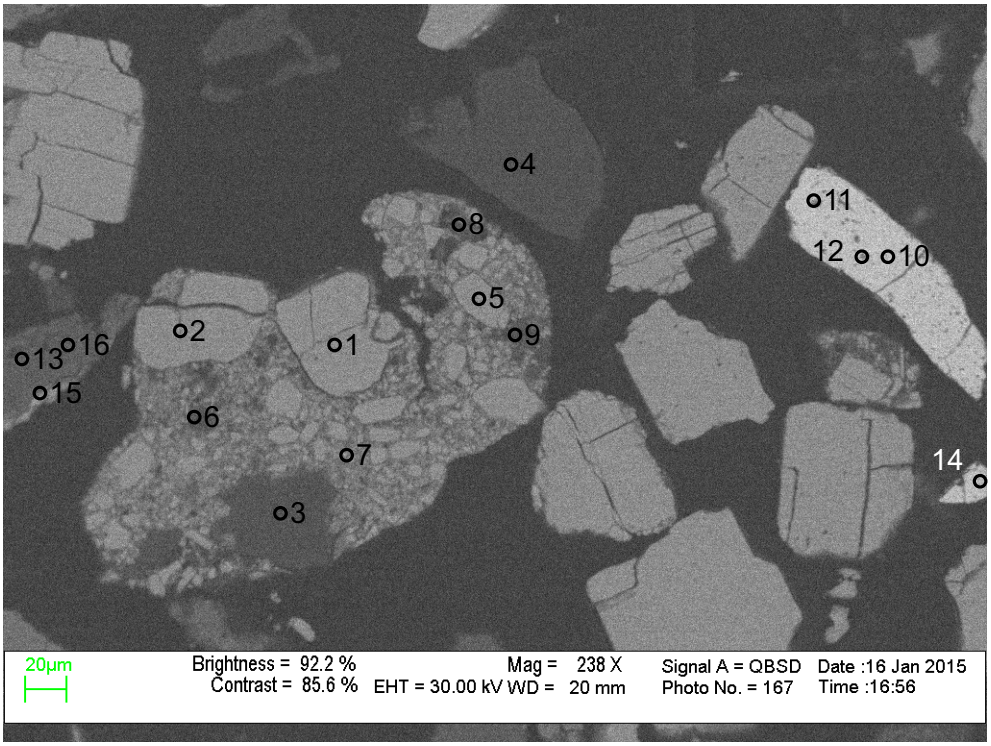
1:Siderite + Chlorite
2:Barite
3:Mix
4:Bad analysis
5:Pyrite
6:Pyrite
7:Mix
8:Bad analysis
9:Bad analysis
10:Bad analysis
11:Feohy
12:Barite
13:Quartz
14:Pyrite
15:Bad analysis
16:Barite
17:Barite

Figure 1H.13: Annapolis G-24 5535(1) (SEM) site 13.



1:Anglesite
2:Bad analysis
3:Bad analysis
4:Pyrite
5:Bad analysis
6:Bad analysis
7:Bad analysis
8:Bad analysis
9:Pyrite
10:Bad analysis
11:Bad analysis
12:Pyrite
13:Bad analysis
14:Bad analysis
15:Bad analysis
16:Bad analysis
17:Bad analysis
18:Pyrite
19:Bad analysis
20:Bad analysis
21:Bad analysis

Figure 1H.14: Annapolis G-24 5535(1) (SEM) site 14. Not good analyses.



1:Bad analysis
2:Bad analysis
3:Bad analysis
4:Bad analysis
5:Bad analysis
6:Bad analysis
7:Bad analysis
8:Bad analysis
9:Bad analysis
10:Bad analysis
11:Bad analysis
12:Bad analysis
13:Bad analysis
14:Bad analysis
15:Bad analysis
16:Bad analysis

Figure 1H.15: Annapolis G-24 5535(1) (SEM) site 15. Not good analyses.

Table 1H.1 SEM-EDS chemical analyses of minerals from sample G-24 5535(1).

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	NiO	CuO	ZnO	Rb_2O	SrO	ZrO_2	MoO_3	BaO	HfO_2	WO_3	PbO	B_2O_3	Total	Actual Total
1	1	Brt											25.09								1.15			41.92				31.84	100	130
1	2	Feohy +	2.03			93.58	1.36									3.03													100	71
1	3	Brt				0.26							21.67											37.64				40.42	100	139
1	4	Brt											38.48								1.41			60.11					100	87
1	5	Brt											38.40								2.35			59.25					100	87
1	6	Brt											38.65											61.35					100	83
1	7	TiO_2	0.47	97.66	0.66	1.21																							100	75
1	8	Brt											39.02								2.96			58.02					100	84
1	9	Brt											38.47								1.45			60.08					100	83
1	10	Brt											38.15											61.85					100	79
1	11	Sd +	3.46		1.96	36.56	0.82	7.62	5.36		0.22																		56	46
1	12	Brt											22.05								1.16			38.98				37.82	100	106
1	13	Sd +	14.65		7.35	61.15	1.32	9.68	5.09		0.76																		100	48
1	14	Brt											38.40								1.53			60.07					100	81
1	15	?	36.32		12.26	35.38	0.85	3.83	1.20	10.17																			100	71
1	16	Brt											37.86											62.14					100	77
1	17	Ank +	2.39		1.34	14.78	0.60	10.48	26.10		0.30																		56	41
1	18	Sd				51.83	0.26	1.55	2.16						0.20														56	41
1	19	Feohy +	1.69			94.71	0.74									2.86													100	53
1	20	Py				27.47							72.53																100	142
1	21	Py				27.30							72.70																100	133
1	22	TiO2 +	3.42	93.96	2.12	0.50																							100	55
1	23	Qz	100.00																										100	69
1	24	Py				27.08							72.92																100	114
1	25	Ank				15.59	0.67	9.06	30.68																				56	34
1	26	Py				26.87							73.13																100	114
1	27	Sd	2.43		1.20	39.62	0.44	5.13	6.29			0.87																	56	32
1	28	Brt											38.90											61.10					100	62
1	29	Cpx (Aug)	54.99	0.43	2.74	5.51		15.80	20.53																				100	65
1	30	Sd +	4.55		2.44	32.28	0.52	5.20	9.16		0.36	1.49																	56	35
1	31	Sd + Chl +	6.31		3.82	72.57	1.05	5.55	7.28	1.38	0.46	1.58																	100	36
1	32	Feohy +	9.07		1.04	88.02			1.50						0.37														100	45
2	1	Brt											39.04								3.25			57.71					100	64
2	2	Qz	100.00																										100	68
3	1	Brt											38.70											61.30					100	58
3	2	Brt											38.48											61.52					100	56
3	3	Sd +	3.56		1.43	38.31	0.45	5.70	5.08		0.20	1.27																	56	29
3	4	Sd	0.91			43.12	0.81	9.28	1.88																				56	23
3	5	Py	0.41			27.21							72.38																100	83
3	6	Brt											38.95								1.44			59.61					100	46
3	7	Brt											38.55								2.16			59.29					100	44
3	8	Brt											24.26								0.90			41.77				33.07	100	67
3	9	Ank	2.26		1.57	15.85	0.62	8.82	26.88																				56	26
3	10	Brt											39.12											60.88					100	44
3	11	Sd +	1.38			42.01	0.64	7.94	4.04																				56	21
3	12	Sd + Chl	5.11	1.72	4.78	68.16	1.78	12.30	6.16																				100	24
3	13	Brt											39.18								5.31			55.51					100	44
3	14	Brt											39.14											60.86					100	44
3	15	Brt											41.54											58.46					100	39
3	16	Brt	4.94										37.98											57.08					100	48
3	17	Qz	100.00																										100	48
3	18	Sd +	1.65		0.86	41.67	0.74	9.39	1.69																				56	22
3	19	Py				26.90							73.10																100	74

Table 1H.1 SEM-EDS chemical analyses of minerals from sample G-24 5535(1).

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	NiO	CuO	ZnO	Rb_2O	SrO	ZrO_2	MoO_3	BaO	HfO_2	WO_3	PbO	B_2O_3	Total	Actual Total
3	20	Py				27.44							72.56																100	71
3	21	Py				27.36							72.64																100	84
3	22	Brt											39.70											60.30					100	42
3	23	Sd	1.18		0.94	43.26	0.71	3.11	6.80																				56	18
4	1	Ang																					29.62				70.38		100	47
4	2	Brt											20.78											36.21		1.02		42.00	100	55
4	3	Ab +	73.56		19.33	3.34		0.65		2.37	0.75																		100	29
4	4	Py +	2.16		2.04	27.20			0.36		0.28		67.96																100	68
4	5	Mix	20.22		12.07	51.82	1.72	7.25	2.64	1.98	1.10		1.20																100	24
4	6	Brt											38.63											61.37					100	33
4	7	Qz	100.00																										100	35
4	8	Py				27.36							72.64																100	68
4	9	Qz	100.00																										100	33
4	10	Qz + Cal	74.81			7.06		5.37	12.76																				100	23
4	11	Brt											30.29											69.71					100	18
4	12	Brt											39.43											60.57					100	33
5	1	Feohy				96.85	0.80		0.50						0.58	1.27													100	38
5	2	Py +	6.18		6.31	30.03		1.18					56.30																100	92
5	3	Brt											38.59											61.41					100	57
5	4	Brt											37.36											62.64					100	65
5	5	Brt	7.70		3.85				1.11		0.98		34.30											52.06					100	55
5	6	Sd +	5.10		4.44	35.92	0.80	4.78	3.25		0.46	1.24																	56	38
5	7	Brt											39.03								3.96			57.01					100	57
5	8	Brt											40.00											60.00					100	65
5	9	Py				27.50							72.50																100	122
5	10	Feohy +	5.13			93.45	0.62		0.80																				100	41
5	11	Feohy				100.00																							100	43
5	12	Feohy +	4.39			95.61																							100	39
5	13	Brt +	5.71										36.13											58.16					100	45
5	14	Ms +	61.99		12.67	16.98					3.36																		95	35
5	15	Py +	7.40		7.26	29.59		1.67					54.08																100	90
5	16	Py				27.92							72.08																100	86
5	17	Feohy +	4.34			95.05	0.61																						100	36
5	18	Feohy +	13.33		4.50	76.73	1.33		2.27		1.84																		100	40
6	1	Zrn	31.83																			67.46			0.71				100	51
6	2	TiO2 +	4.58	95.42																									100	43
6	3	Zrn	32.73		1.68																	65.59							100	44
6	4	Mix	9.63		9.13	63.88		7.45	9.16		0.76																		100	30
6	5	Brt											38.53								3.25			58.22					100	46
6	6	Feohy +	6.85			88.62			1.90										2.63										100	31
6	7	Py				28.69							71.31																100	93
6	8	Brt											38.83											61.17					100	43
6	9	Brt											37.83								3.75			58.42					100	55
6	10	Feohy +	4.15			95.30			0.55																				100	33
6	11	Py +	1.13		0.70	28.68							69.49																100	72
6	12	Qz	100.00																										100	51
6	13	Ank				15.64	0.90	8.14	31.33																				56	24
6	14	Qz	100.00																										100	55
6	15	Py				28.32							71.68																100	95
6	16	Sd + Chl	3.51		2.29	73.92	2.12	11.38	6.07		0.71																		100	21
6	17	Brt											37.23											62.77					100	43
6	18	Brt											37.36											62.64					100	48
6	19	Brt											37.60											62.40					100	39

Table 1H.1 SEM-EDS chemical analyses of minerals from sample G-24 5535(1).

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	NiO	CuO	ZnO	Rb_2O	SrO	ZrO_2	MoO_3	BaO	HfO_2	WO_3	PbO	B_2O_3	Total	Actual Total
6	20	Brt											37.18											62.82					100	39
6	21	Py	4.17		2.10	32.63							61.10																100	54
6	22	Sd +	3.32		1.90	36.86		9.02	4.91																				56	26
7	1	Tur	38.11		30.49	6.83		8.70	1.04	1.83																			87	32
7	2	Feohy +	1.95			94.66										3.39													100	30
7	3	Sd +				96.47			3.01						0.52														100	23
7	4	Tur	39.23	0.72	31.32	5.32		7.54	1.04	1.81																			87	32
7	5	Tur	38.58	0.87	33.65	7.15		4.73		2.02																			87	33
7	6	TiO2		100.00																									100	30
7	7	Feohy +	2.87			97.13																							100	24
7	8	Olig	65.15		17.38	1.94		1.41	3.82	10.30																			100	31
7	9	Sd + Chl	5.26		6.12	69.05	1.73	9.22	8.62																				100	21
7	10	Sd + Chl	17.97		14.78	53.13	0.92	8.61	3.86		0.73																		100	21
7	11	Sd +	1.82			44.05	0.74	6.32	3.08																				56	18
7	12	Sd + Chl	6.29	1.15	3.04	71.13		13.81	4.58																				100	17
7	13	Py				28.79							71.21																100	62
7	14	Brt											39.40											60.60					100	33
7	15	Sd + Chl	3.89		2.57	76.22	1.94	11.04	4.34																				100	18
7	16	Qz	100.00																										100	38
7	17	Ang											29.13														70.87		100	36
7	18	Brt											40.67											59.33					100	39
7	19	Brt											37.23											62.77					100	35
7	20	Qz	97.69		2.31																								100	38
7	21	Py	0.66			33.11							66.23																100	47
7	22	Ank				17.98	0.67	9.12	28.23																				56	17
8	1	Cont (w)																								100.00			100	41
8	2	Tur	38.54	0.98	30.71	5.64		7.60	0.39	3.13																			87	28
8	3	Brt											37.48											62.52					100	29
8	4	Feohy +	3.89			93.88			1.08									1.15											100	23
8	5	Feohy				97.89	0.77									1.34													100	32
8	6	Py				33.15							66.85																100	44
8	7	Feohy				99.20			0.80																				100	17
8	8	Ank				16.48	0.82	9.48	29.21																				56	12
8	9	Feohy				100.00																							100	18
8	10	Brt											38.38											61.62					100	24
8	11	Feohy				98.77	1.23																						100	21
8	12	Sd + Chl	8.11		6.05	65.87		12.82	7.16																				100	14
8	13	Cal				2.11			53.89																				56	13
8	14	Py				28.21							71.79																100	50
8	15	Brt											38.82											61.18					100	26
8	16	Sd				7.83	2.04	16.16	29.98																				56	13
8	17	Mix	66.49		23.26	4.00		1.74		1.56	2.95																		100	21
8	18	Mix	47.15	1.28	12.15	15.05		10.84	12.02		1.51																		100	24
8	19	Sd + Chl	17.20		12.00	58.37	0.98	7.48	3.97																				100	18
8	20	Sd + Chl	16.64		6.35	58.74		11.66	5.78		0.83																		100	15
8	21	Brt											38.77											61.23					100	26
8	22	Mix	49.93	1.07	9.01	15.46		12.59	11.33		0.61																		100	26
8	23	Mix	41.41		1.80	17.55		8.59	30.66																				100	17
8	24	Brt											38.75											61.25					100	23
8	25	Hole											100.00																100	0
8	26	Sd +	2.43			42.00		6.55	5.02																				56	12
8	27	Py				27.66							72.34																100	48
8	28	Brt											37.25											62.75					100	22

Table 1H.1 SEM-EDS chemical analyses of minerals from sample G-24 5535(1).

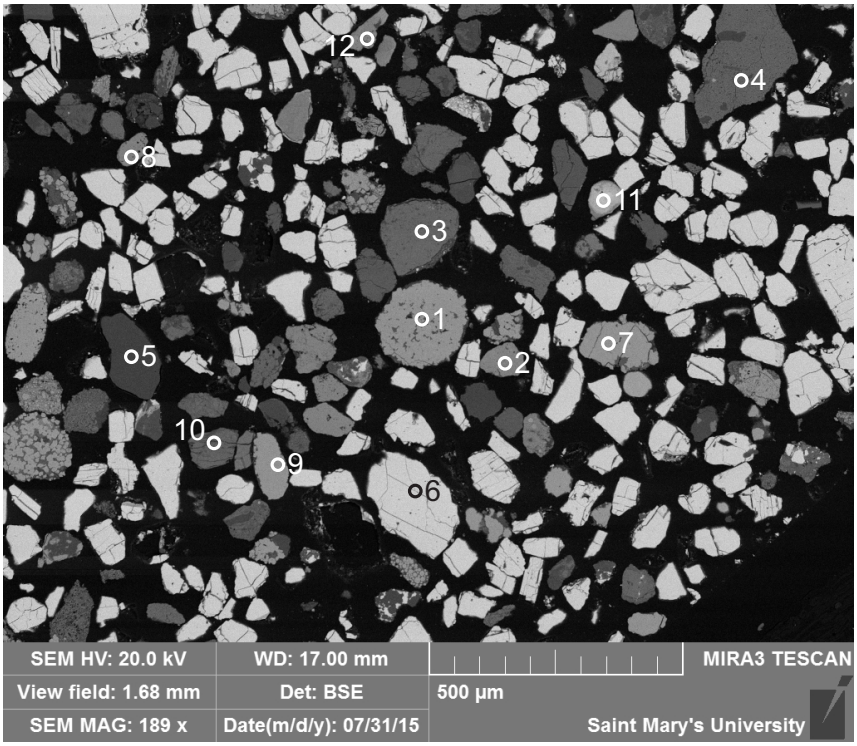
Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	NiO	CuO	ZnO	Rb_2O	SrO	ZrO_2	MoO_3	BaO	HfO_2	WO_3	PbO	B_2O_3	Total	Actual Total
8	29	Py				28.37							71.63																100	42
9	1	Feohy				98.40	0.75									0.85													100	23
9	2	Feohy				97.90	0.70									1.40													100	23
9	3	Feohy	2.20			92.27			0.99				1.60			2.94													100	19
9	4	Brt											40.95											59.05					100	20
9	5	Qz	80.98		2.76	9.10		1.44	0.64		0.52		1.67											2.88					100	20
9	6	Py				27.76							72.24																100	35
9	7	Py				30.19							69.81																100	30
9	8	Qz	100.00																										100	18
9	9	Qz	100.00																										100	20
9	10	Amph	44.19	0.87	11.81	14.79		10.95	11.45	1.81	1.13																		97	18
9	11	Brt											41.40											58.60					100	18
9	12	Qz	100.00																										100	18
9	13	Qz	100.00																										100	22
9	14	Brt											38.88											61.12					100	16
9	15	Mix	35.92		6.31	55.82					1.95																		100	16
9	16	Feohy				98.95										1.05													100	21
10	1	Brt											36.38											63.62					100	14
10	2	Brt											38.77											61.23					100	12
10	3	Brt											36.78											63.22					100	12
10	4	Mix	42.33		5.22				9.74		2.17		13.78	9.23										17.54					100	13
10	5	Qz	100.00																										100	14
10	6	Fl							47.71				1.45	50.84															100	17
10	7	Qz	91.31																					8.69					100	14
10	8	Brt											41.33											58.67					100	12
10	9	Brt											42.85											57.15					100	12
10	10	Brt											40.23											59.77					100	13
10	11	Brt											36.13											63.87					100	13
11	1	Cont (w)																								100.00			100	11
11	2	Cont (w)																								100.00			100	10
11	3		11.12		7.43		5.25		1.76				5.49		4.05		52.64	12.26											100	6
11	4		64.26		29.55	3.06					3.13																		100	5
11	5		15.27		7.44				1.55				30.31				3.30							42.14					100	7
11	6		97.69		2.31																								100	8
11	7		65.13		22.49	9.07					3.31																		100	3
11	8				4.36				1.82																	93.82			100	8
11	9		16.66		10.18								30.46					3.54						39.15					100	7
11	10		72.82		21.81	2.64					2.73																		100	6
11	11		54.91		22.94	4.26			2.60	6.13	2.08		7.04				0.04												100	6
11	12		28.92		8.82				9.56		1.87		29.27					21.57											100	6
11	13												39.07											60.93					100	8
11	14												41.00											59.00					100	8
12	1												39.60											60.40					100	7
12	2		50.49		13.06	2.89					8.94		8.09											16.53					100	7
12	3		100.00																										100	5
12	4												41.95											58.05					100	6
12	5												43.40											56.60					100	7
12	6												40.25											59.75					100	4
12	7												36.50											63.50					100	6
12	8		100.00																										100	5
13	1	Sd + Chl	5.33		4.01	70.91		12.60	7.15																				100	9
13	2	Brt											37.97											62.03					100	14
13	3	Mix	73.50	1.18	17.29	2.15			1.44	1.77	2.67																		100	13

Bad Analyses

Table 1H.1 SEM-EDS chemical analyses of minerals from sample G-24 5535(1).

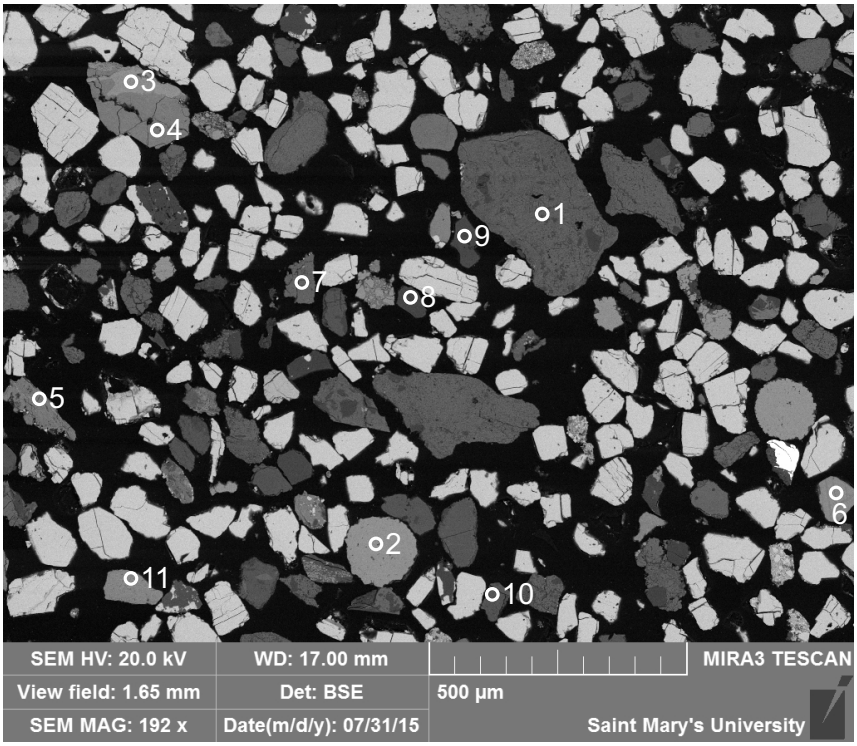
Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	NiO	CuO	ZnO	Rb_2O	SrO	ZrO_2	MoO_3	BaO	HfO_2	WO_3	PbO	B_2O_3	Total	Actual Total
13	4	BA				42.19	1.24	11.06	1.51																				56	9
13	5	Py				28.02							71.98																100	30
13	6	Py				27.43							72.57																100	26
13	7	Mix	31.36	2.35	11.07	44.67		5.59			4.97																		100	11
13	8	BA	8.13			73.11		15.22	3.54																				100	5
13	9	BA	4.77			75.72		10.86	8.65																				100	7
13	10	BA				87.60			1.68				4.20											6.52					100	9
13	11	Feohy		6.46		93.54																							100	10
13	12	Brt											39.23											60.77					100	12
13	13	Qz	100.00																										100	14
13	14	Py				27.62							72.38																100	21
13	15	BA				41.26		10.46	4.28																				56	6
13	16	Brt											37.43											62.57					100	12
13	17	Brt											36.33											63.67					100	12
14	1	Ang											30.74														69.26		100	10
14	2	BA											26.29														73.71		100	8
14	3	BA											40.00											60.00					100	7
14	4	Py				28.03							71.97																100	14
14	5	Bad Analyses	30.36		23.68	30.86		12.80	2.29																				100	6
14	6					100.00																							100	5
14	7					97.99	2.01																						100	6
14	8		10.16		9.73	62.58		10.00	7.53																				100	4
14	9	Py				26.78							73.22																100	12
14	10	BA	100.00																										100	7
14	11	BA											38.90											61.10					100	5
14	12	Py				27.63							72.37																100	14
14	13	Bad Analyses											39.92											60.08					100	5
14	14												37.33											62.67					100	6
14	15												40.18											59.82					100	6
14	16												31.81											68.19					100	4
14	17					93.83														6.17									100	3
14	18	Py				27.34							72.66																100	12
14	19	Bad Analyses											40.85											59.15					100	6
14	20												41.12											58.88					100	6
14	21												37.08											62.92					100	6
15	1												40.08											59.92					100	4
15	2												39.72											60.28					100	4
15	3		100.00																										100	5
15	4		100.00																										100	5
15	5												37.30											62.70					100	4
15	6		100.00																										100	4
15	7												41.88											58.12					100	3
15	8		13.69		7.41				24.60				22.82											31.48					100	3
15	9		100.00																										100	5
15	10												30.39														69.61		100	5
15	11					22.86							77.14																100	6
15	12								21.02				19.58														59.41		100	4
15	13					87.23			12.77																				100	1
15	14												31.10														68.90		100	4
15	15												40.05											59.95					100	3
15	16					100.00																							100	1
		BA=Bad analysis																												

Appendix 1I: SEM-BSE images and EDS mineral analyses for sample G-24 5535(2)



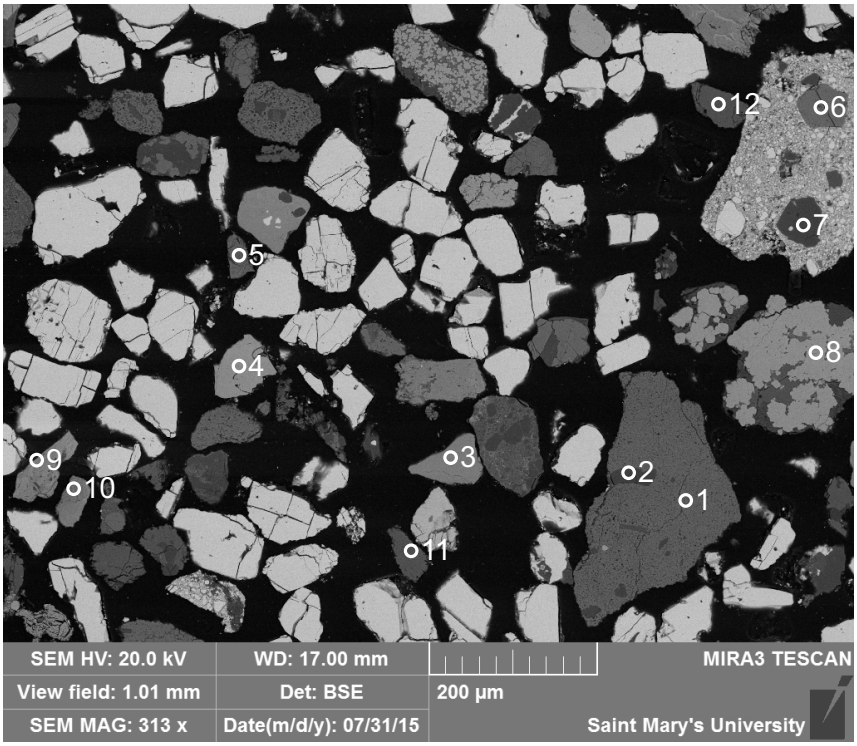
1:Pyrite
2:Feohy +
3:Siderite
4:Siderite
5:Quartz
6:Barite
7:Pyrite
8:Feohy +
9:Pyrite
10:Siderite + Chlorite
11:Contaminant (Mn+Pb)
12:Feohy

Figure 1I.1:Sample Annapolis 5535(2) site 1 (SEM).



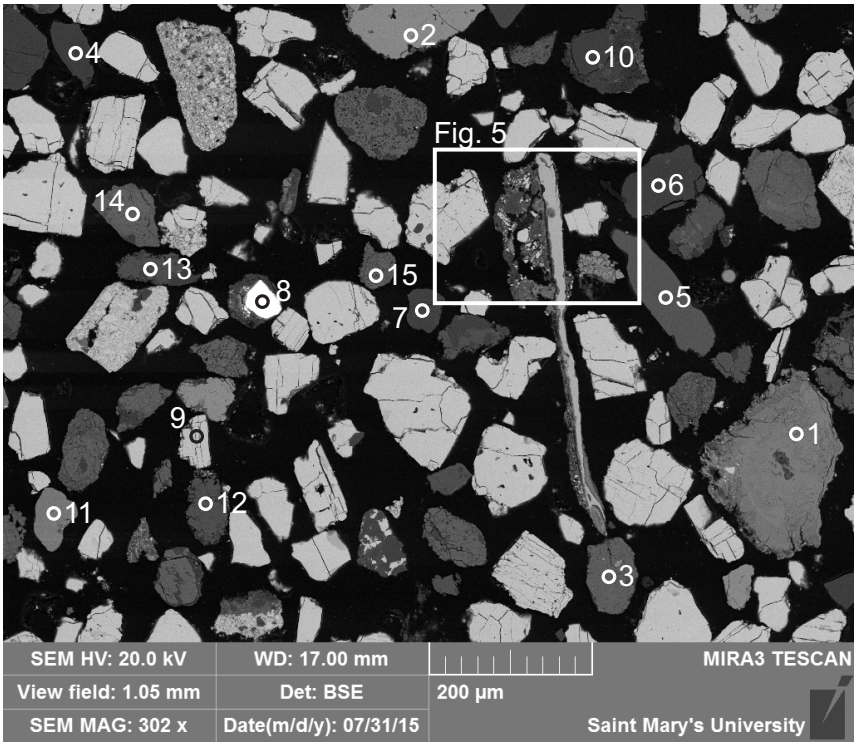
1:Feohy +
2:Pyrite
3:Magnetite
4:Feohy +
5:Feohy
6:Magnetite
7:Siderite
8:Tourmaline
9:Tourmaline
10:Clinopyroxene
11:Magnetite

Figure 1I.2:Sample Annapolis 5535(2) site 2 (SEM). A grain is made up of magnetite (3) and Feohy (4). This grain might have been of detrital magnetite partly altered to limonite (Feohy) or it may be part of the drilling mud, morphology suggests the latter.



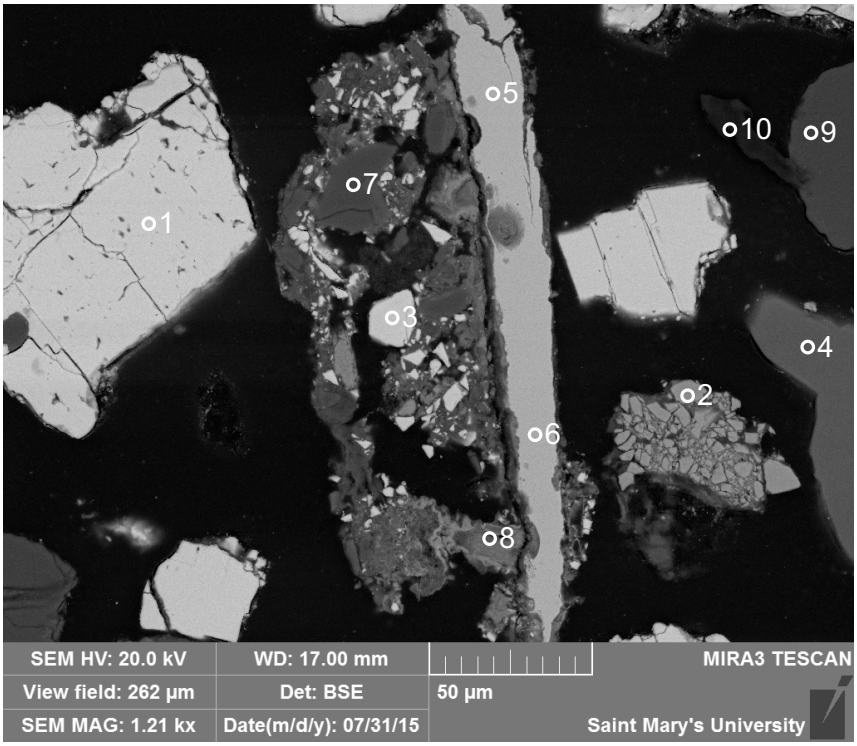
1:Siderite
2:Quartz
3:Feohy +
4:Pyrite
5:Mix
6:Siderite
7:Quartz
8:Pyrite
9:Siderite
10:Feohy +
11:Ankerite
12:Ankerite

Figure 1I.3:Sample Annapolis 5535(2) site 3 (SEM).
Cuttings made up mostly of: quartz and siderite (1,2,6,7).



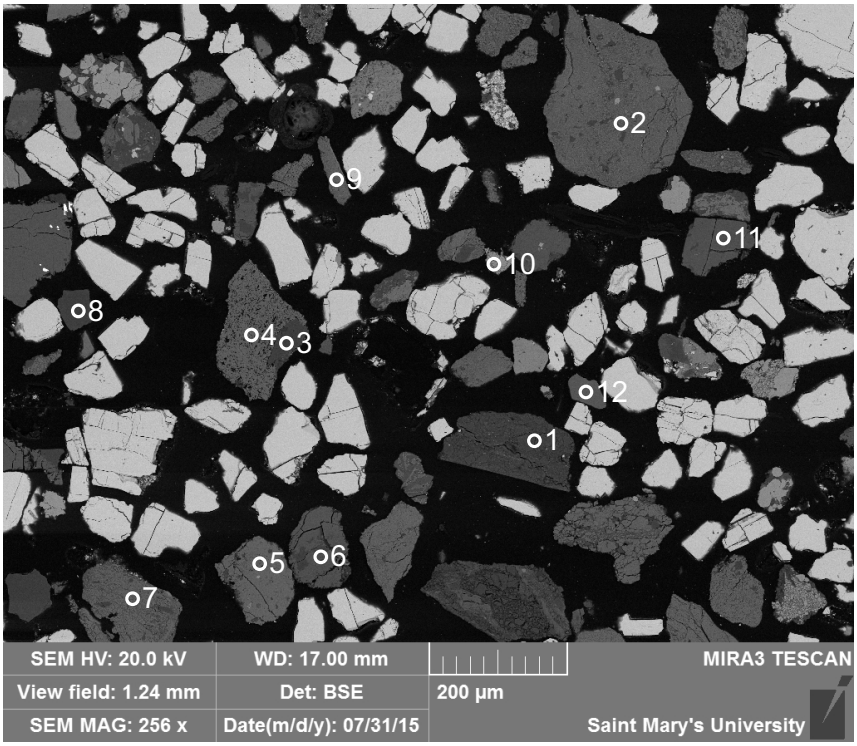
1:Limonite
2:Pyrite
3:Siderite
4:Quartz
5:Hornblende
6:Quartz
7:Quartz
8:Contamination (W)
9:Barite
10:Quartz
11:Feohy +
12:Ankerite
13:Albite
14:Siderite
15:Siderite

Figure 1I.4:Sample Annapolis 5535(2) site 4 (SEM).



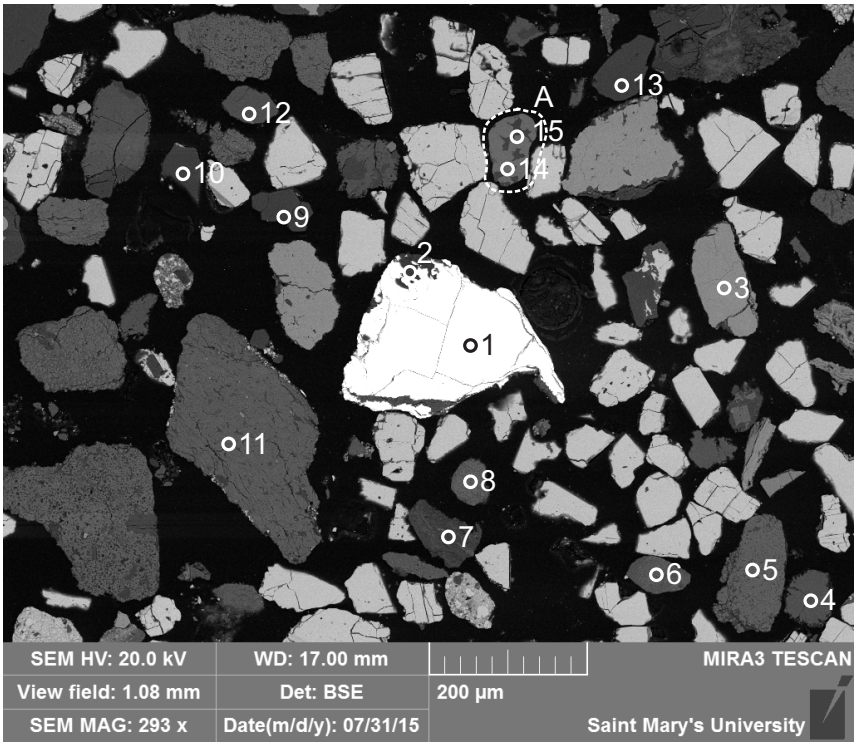
1:Barite
2:Pyrite
3:Barite
4:Hornblende
5:Magnetite
6:Magnetite
7:Quartz
8:Feohy +
9:Quartz
10:Hole

Figure 1I.5:Sample Annapolis 5535(2) site 5 (SEM). A mixture of crushed sandstone that contains quartz (7) and drilling mud components, barite (3), magnetite (5,6) and Feohy (8). The hornblende (4) and the pyrite (2) morphologically also appear to be part of the drilling mud.



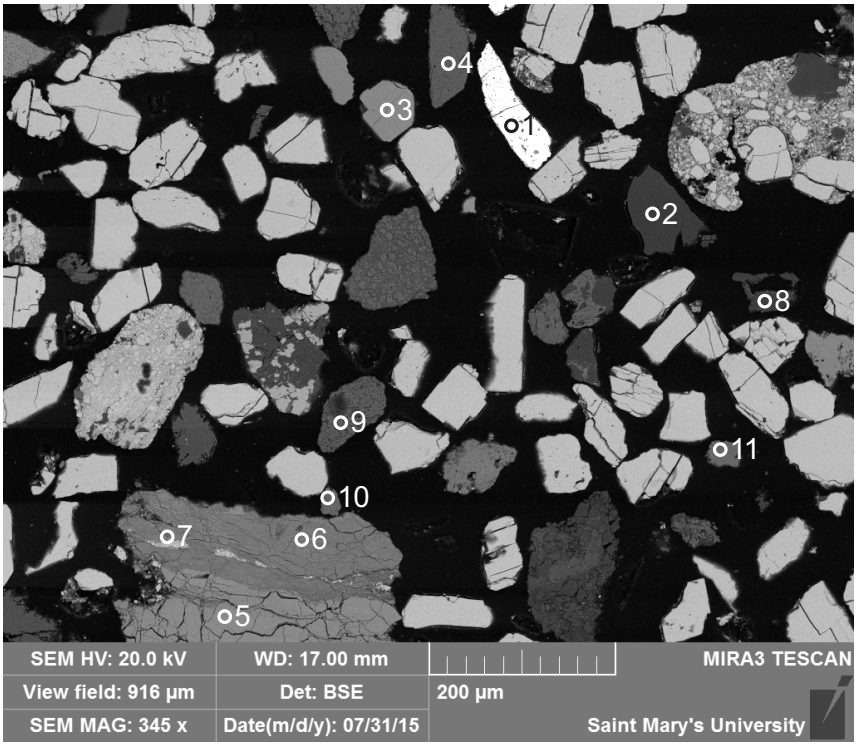
1:Muscovite +
2:Siderite + Chlorite
3:Quartz
4:Siderite
5:Siderite +
6:Ankerite
7:Ankerite + Apatite +
Chlorite
8:Quartz
9:Siderite
10:Pyrite
11:Mix
12:Epidote

Figure 1I.6:Sample Annapolis 5535(2) site 6 (SEM). Cuttings made up of quartz (3), siderite (2,4), and chlorite (2).



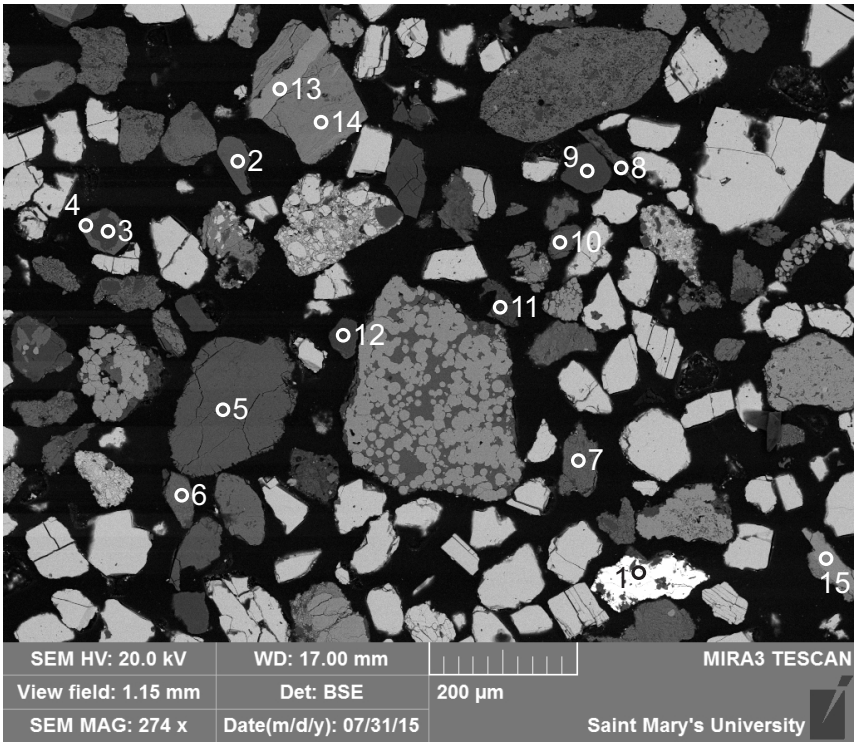
1:Contaminant (Mo+Pb)
2:Kaolinite +
3:Pyrite
4:Ankerite
5:Siderite +
6:Mix
7:Quartz
8:Chlorite+Siderite
9:Quartz
10:Quartz
11:Siderite
12:Ankerite
13:Quartz
14:Titania
15:Quartz

Figure 1I.7:Sample Annapolis 5535(2) site 7 (SEM). Either, cutting made up of quartz (15) and TiO_2 (14) in which TiO_2 is diagenetic, or a lithic clast (A) made up of TiO_2 and quartz.



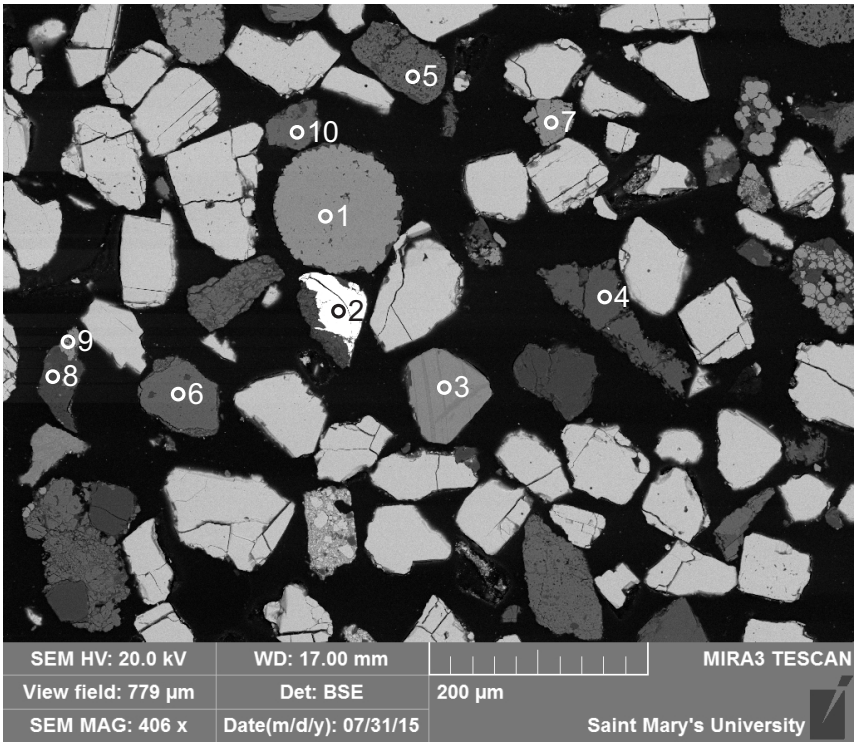
1:Contaminant (Mo+Pb)
2:Quartz
3:Pyrite
4:Siderite
5:Magnetite
6:Magnetite
7:Barite
8:Quartz
9:Siderite
10:Titania
11:Titania

Figure 1I.8:Sample Annapolis 5535(2) site 8 (SEM). A fragment made up of magnetite (5,6) and barite (7), probably a contaminant.



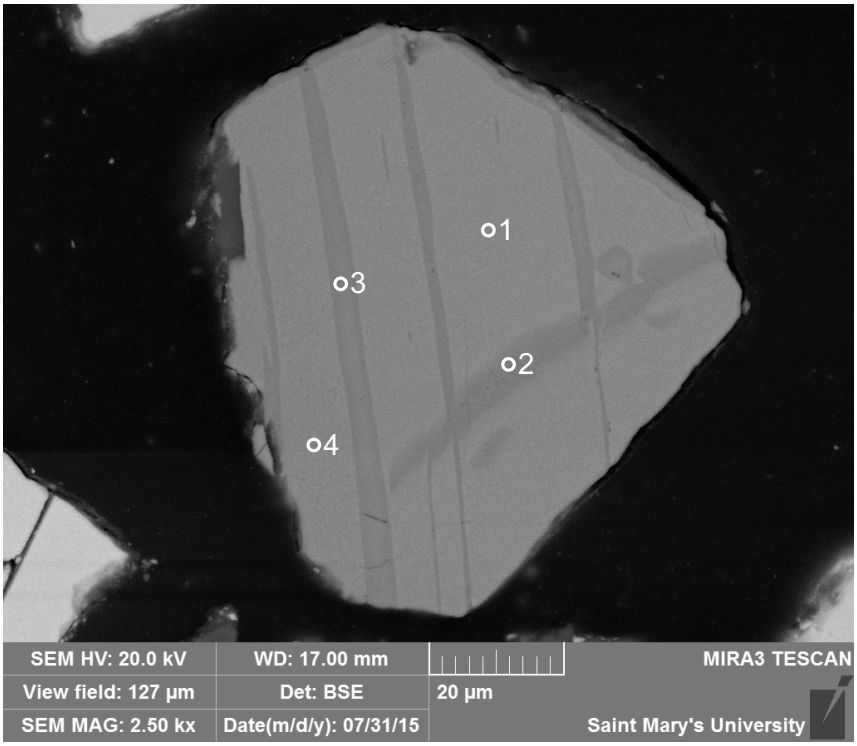
1:Galena
2:Clino-pyroxene?
3:Quartz
4:Siderite +
5:Ankerite
6:Siderite +
7:Siderite +
8:Mix
9:Quartz
10:Ankerite
11:Mix
12:Quartz
13:Magnetite +
14:Feohy +
15:Magnetite

Figure 1I.9:Sample Annapolis 5535(2) site 9 (SEM). A cutting in which a band of magnetite (13) cuts Feohy (14).



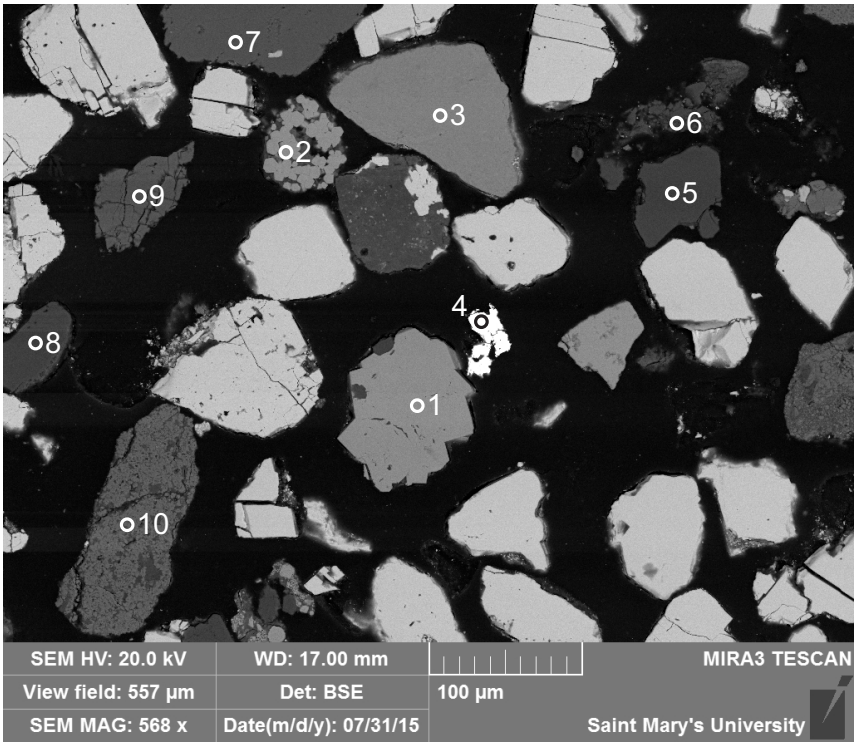
1:Pyrite
2:Contaminant (Mo+Pb)
3:Magnetite
4:Ankerite
5:Siderite
6:Siderite
7:Pyrite
8:Albite+Quartz
9:Chlorite
10:Siderite

Figure 1I.10:Sample Annapolis 5535(2) site 10 (SEM). A cutting made up of chlorite (9), and albite and quartz (8).



1:Magnetite +
2:Ilmenite
3:Ilmenite
4:Magnetite +
Ilmenite

Figure 1I.11:Sample Annapolis 5535(2) site 11 (SEM).
Magnetite grain (1) with exsolution lamelae of ilmenite (3).



1:Pyrite
2:Pyrite
3:Feohy +
4:Contaminant
(Mo+Pb)
5:Quartz
6:Quartz
7:F-Calcite
8:Tourmaline
9:Ankerite
10:Chlorite +

Figure 1I.12:Sample Annapolis 5535(2) site 12 (SEM).
Detrital grains of tourmaline (8) and quartz (5,6).

Table 1I.1 SEM-EDS chemical analyses of minerals from sample G-24 5535(2).

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	CuO	ZnO	As_2O_3	SrO	MoO_3	BaO	Ce_2O_3	Nd_2O_3	WO_3	PbO	B_2O_3	Total	Actual Total
1	1	Py				28.44			0.27				71.29																	100	248
1	2	Feohy +	7.34			86.30			1.39											3.14	1.84									100	88
1	3	Sd	0.83		0.38	42.24	0.45	4.47	7.04			0.58																		56	68
1	4	Sd	1.36		0.75	41.97	1.14	7.21	3.58																					56	65
1	5	Qz	99.99																											100	130
1	6	Brt											29.67					0.01				1.34		51.80					17.20	100	158
1	7	Py				28.60				0.20			71.19																	100	248
1	8	Feohy +	4.75			93.87	1.38																							100	84
1	9	Py				28.37							71.64																	100	261
1	10	Sd + Chl	22.48	0.38	17.38	44.63	0.68	6.73	5.04		0.25	2.43																		100	92
1	11	Cont (Mn+Pb)	1.13			15.17	53.67												1.11									28.94		100	92
1	12	Feohy +	7.59	0.52	1.97	83.96	1.68	1.13	2.42		0.45				0.30															100	89
2	1	Feohy +	4.24		2.80	67.48	1.42	11.11	7.92		0.34			4.70																100	70
2	2	Py				28.82							71.19																	100	247
2	3	Mag	1.22			96.16	0.53										2.09													100	97
2	4	Feohy +				95.50			3.15				0.77		0.60															100	71
2	5	Feohy +	1.05			92.85	2.61		2.39				1.10																	100	77
2	6	Mag		11.86	1.63	84.93		0.63								0.95														100	110
2	7	Sd	0.66			45.85	0.63	5.28	3.59																					56	65
2	8	Tur	38.48	0.70	31.99	5.53		7.39	0.98	1.93																				87	107
2	9	Tur	38.51	0.39	30.88	6.11		8.38	0.89	1.85																				87	105
2	10	Cpx	48.02		0.91	16.04	0.62	6.83	27.55																					100	91
2	11	Mag	3.59			96.40																								100	93
3	1	Sd	1.71		1.25	42.32	1.20	6.56	2.77		0.18																			56	64
3	2	Qz	99.37			0.63																								100	125
3	3	Feohy +	4.21			93.60	1.33		0.85																					100	80
3	4	Py				28.08							71.92																	100	229
3	5	Mix	17.78	66.74	11.17	1.53					2.79																			100	109
3	6	Sd				48.73	3.15	2.83	0.60															0.68						56	59
3	7	Qz	99.99																											100	121
3	8	Py	0.19			28.30	0.22						71.29																	100	228
3	9	Sd	0.69			50.93	1.69	0.72	1.79						0.19															56	73
3	10	Feohy +	1.20			93.93			3.76						0.59		0.53													100	69
3	11	Ank	0.54			14.79	0.77	8.40	31.50																					56	61
3	12	Ank	0.69	3.89	0.59	14.65	0.55	8.11	27.51																					56	61
4	1	Lim				97.95	0.81		0.53						0.71															100	75
4	2	Py				28.61							71.39																	100	218
4	3	Sd	0.79			43.02	1.56	8.11	2.51																					56	65
4	4	Qz	99.99																											100	120
4	5	Hbl	44.93	1.36	11.09	14.89		10.97	11.29	1.24	1.22																			97	112
4	6	Qz	99.99																											100	122
4	7	Qz	99.99																											100	135
4	8	Cont (W)																									100.00			100	154
4	9	Brt											22.77											77.24						100	72
4	10	Qz	99.99																											100	129
4	11	Feohy +	4.71			94.61	0.68																							100	79
4	12	Ank				13.81	1.56	9.05	31.57																					56	60
4	13	Ab	62.66		16.14	3.38		1.74	6.09	9.99																				100	104
4	14	Sd	1.29		0.73	41.58	0.35	6.45	4.85			0.74																		56	60
4	15	Sd	3.03		2.44	39.86	1.22	5.82	3.63																					56	62
5	1	Brt											35.98											64.03						100	122
5	2	Py				28.26							71.74																	100	257
5	3	Brt											35.33											64.69						100	118
5	4	Hbl	44.80	1.31	11.44	14.85		10.71	10.95	1.72	1.22																			97	116
5	5	Mag	0.66			97.72	0.50										1.11													100	142
5	6	Mag	0.66			97.68	0.46										1.18													100	144

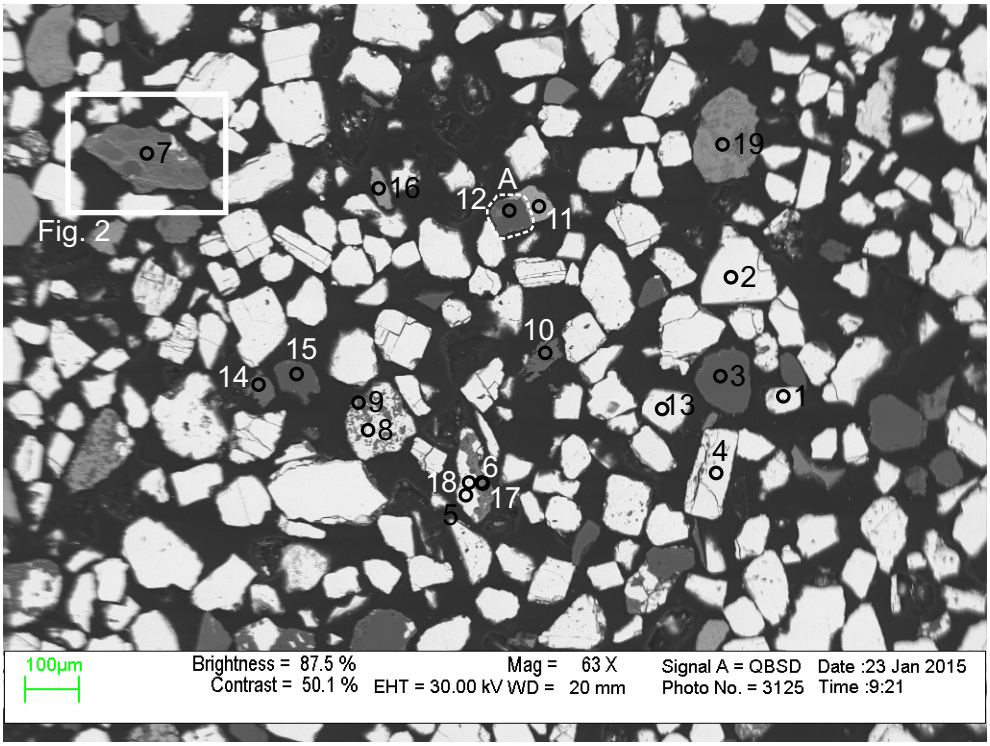
Table 1I.1 SEM-EDS chemical analyses of minerals from sample G-24 5535(2).

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	CuO	ZnO	As_2O_3	SrO	MoO_3	BaO	Ce_2O_3	Nd_2O_3	WO_3	PbO	B_2O_3	Total	Actual Total
5	7	Qz	99.99																											100	129
5	8	Feohy +				84.11			1.26	2.06			0.90		2.85		1.43										7.39			100	68
5	9	Qz	99.99																											100	137
5	10	Hole	3.00						4.57	29.63	7.51		13.01	22.38	15.19					4.71										100	21
6	1	Ms +	52.44	4.36	24.34	4.65		1.82	0.56	0.69	4.49			1.64																95	98
6	2	Sd + Chl	4.02		2.83	69.71	1.34	11.26	5.74					5.10																100	64
6	3	Qz	99.73			0.26																								100	123
6	4	Sd	1.55	1.09	1.05	42.61	0.67	7.96	1.07																					56	58
6	5	Sd +	3.02		2.04	42.26	0.38	3.19	3.81		0.37	0.94																		56	67
6	6	Ank	0.41			17.53	0.85	8.83	28.38																					56	63
6	7	Ank + Ap + Chl	4.75		3.14	46.25	0.81	6.55	20.69		0.45	17.35																		100	73
6	8	Qz	99.99																											100	120
6	9	Sd	2.13		1.36	41.98	0.50	5.36	4.66																					56	61
6	10	Py				29.61							70.39																	100	207
6	11	Mix	19.30			23.97	1.01	14.84	40.88																					100	70
6	12	Ep	39.72		21.94	12.65			22.69																					97	112
7	1	Cont (Mo+Pb)																					29.45					70.56		100	153
7	2	Kln +	46.93		35.23	0.40				0.36			0.86	2.22																86	88
7	3	Py				29.07							70.92																	100	224
7	4	Ank				15.18	0.60	9.22	31.00																					56	62
7	5	Sd +	2.46		0.82	42.42	0.41	5.35	4.31		0.22																			56	65
7	6	Mix	4.56		2.74	50.74	0.48	6.75	20.64			14.12																		100	71
7	7	Qz	96.54		2.72	0.31				0.43																				100	119
7	8	Chl+Sd	26.23		21.96	42.04	0.44	6.09	3.26																					100	94
7	9	Qz	99.99																											100	117
7	10	Qz	99.64		0.34																									100	117
7	11	Sd	0.91		0.66	38.57		9.48	6.38																					56	62
7	12	Ank	0.65		0.63	17.18	0.64	9.41	27.49																					56	60
7	13	Qz	99.99																											100	121
7	14	TiO2	0.90	99.10																										100	107
7	15	Qz	97.21	2.79																										100	123
8	1	Cont (Mo+Pb)																					29.14					70.87		100	149
8	2	Qz	99.99																											100	137
8	3	Py				28.41							71.59																	100	228
8	4	Sd	0.79		0.54	41.95	0.45	6.45	5.02			0.80																		56	60
8	5	Mag +	1.18			95.41	1.11		0.35								1.97													100	99
8	6	Mag				95.71	0.59	1.06	2.34						0.29															100	77
8	7	Brt				2.69							25.62					-0.03				0.76		45.93					25.06	100	149
8	8	Qz	99.99																											100	121
8	9	Sd +	5.16		1.57	28.98	0.68	4.00	8.68		0.26	6.67																		56	69
8	10	TiO2		99.15		0.85																								100	108
8	11	TiO2		100.00																										100	109
9	1	Gn											28.54															71.46		100	146
9	2	Cpx*	54.34	0.48	2.59	6.00		15.22	21.04	0.32																				100	113
9	3	Qz	99.34		0.38	0.27																								100	118
9	4	Sd +	1.40		0.64	42.68	0.68	7.35	3.25																					56	60
9	5	Ank				15.24	0.67	8.31	31.79																					56	59
9	6	Sd +	2.73		2.31	40.14	0.80	6.08	3.94																					56	66
9	7	Sd +	2.06		0.80	39.14	0.72	6.18	4.42			1.41	1.27																	56	60
9	8	Mix	68.26	0.98	15.49	8.83		1.61	0.46	0.66	3.08		0.62																	100	83
9	9	Qz	99.99																											100	117
9	10	Ank				14.32	1.49	8.31	31.88																					56	58
9	11	Mix	35.40	0.80	31.44	2.29		0.81	1.64	1.35	2.07	15.28	2.07	2.13											3.50	1.22				100	97
9	12	Qz	99.99																											100	122
9	13	Mag +	2.05			93.84	0.74										3.38													100	91
9	14	Feohy +				96.23			3.78																					100	71

Table 1I.1 SEM-EDS chemical analyses of minerals from sample G-24 5535(2).

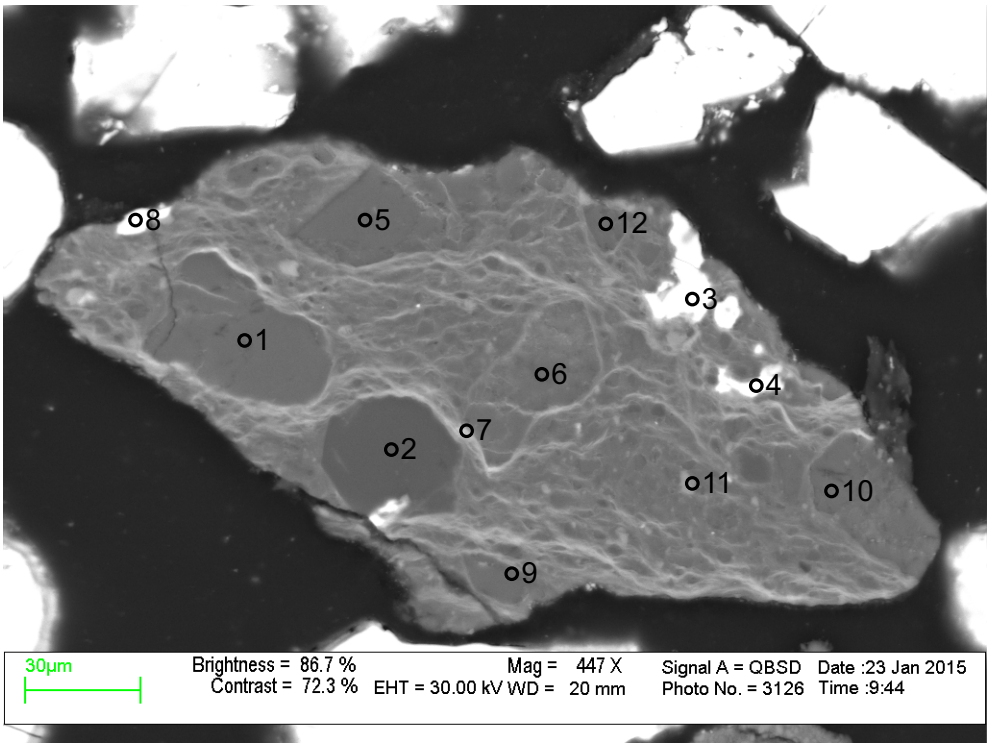
Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	CuO	ZnO	As_2O_3	SrO	MoO_3	BaO	Ce_2O_3	Nd_2O_3	WO_3	PbO	B_2O_3	Total	Actual Total
9	15	Mag	1.52			94.79	1.05						0.72				1.91													100	95
10	1	Py				28.37							71.64																	100	233
10	2	Cont (Mn+Pb)																					29.18					70.82		100	155
10	3	Mag		12.49	1.47	84.60		0.70								0.73														100	100
10	4	Ank				17.90	0.81	8.65	28.64																					56	60
10	5	Sd	1.34		0.64	43.20	0.92	7.02	2.17															0.69						56	55
10	6	Sd				44.53		6.28	4.24			0.95																		56	61
10	7	Py				28.55							71.44																	100	228
10	8	Ab+Qz	81.67		10.45					7.50	0.40																			100	119
10	9	Chl	33.43	0.74	24.28	26.55																								85	76
10	10	Sd				46.02	0.97	7.95	1.06																					56	62
11	1	Mag +		12.44	1.40	84.52		0.83								0.80														100	100
11	2	Ilm		48.99		48.49	0.65	1.89																						100	104
11	3	Ilm		42.07		55.63	0.65	1.66																						100	104
11	4	Mag + Ilm		12.89	1.76	84.62										0.73														100	97
12	1	Py				28.98							71.02																	100	232
12	2	Py				27.99							72.02																	100	236
12	3	Feohy +	4.77			92.58			1.68										0.98											100	82
12	4	Cont (Mo+Pb)																					28.93					71.08		100	152
12	5	Qz	99.99																											100	121
12	6	Qz	95.64	0.30	2.14	1.60		0.33																						100	111
12	7	Cal				0.40	1.65		47.36					6.59																56	64
12	8	Tur	39.18	0.50	30.66	4.06		9.54	0.49	2.58																				87	101
12	9	Ank				16.08	0.76	8.84	30.32																					56	59
12	10	Chl +	41.92		9.32	24.88	0.57	3.94	2.78		1.59																			85	93
*=Endiopsiole (pegmatitc grabbroite, ophiolites), Gn=Galena																															

Appendix 1J: SEM-BSE images and EDS mineral analyses for sample G-24 6045(1)



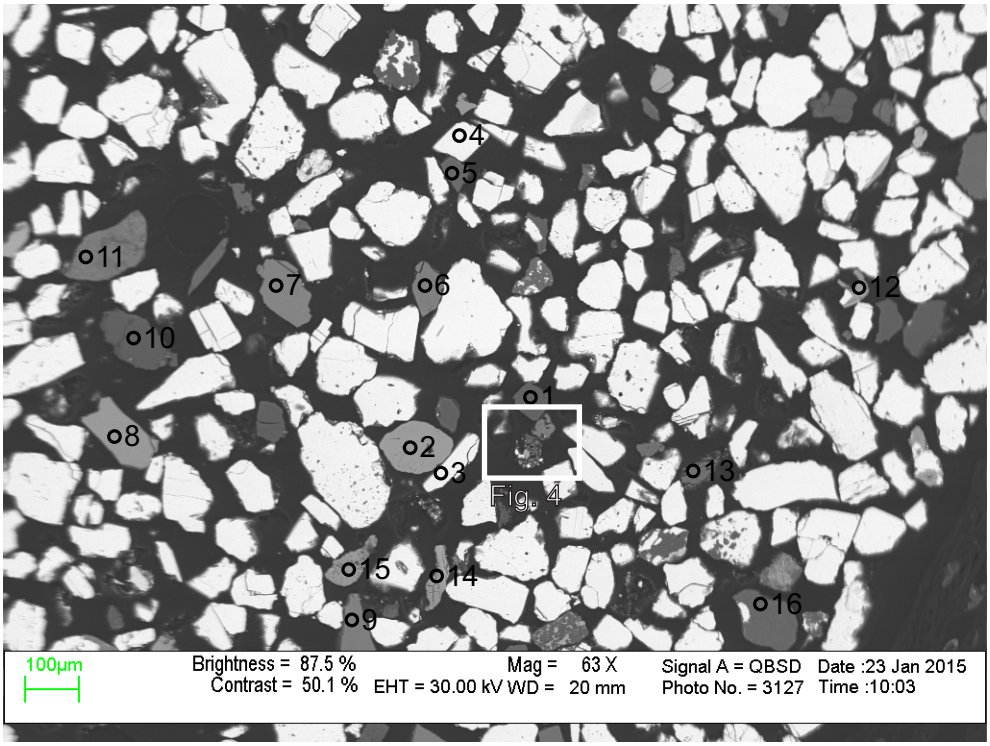
1:Barite
2:Barite
3:Quartz
4:Barite
5:Barite
6:K-feldspar +
7:K-feldspar + Chlorite
8:Barite + K-feldspar
9:Quartz + K-feldspar
10:Calcite
11:Feohy +
12:Quartz + K-feldspar
13:Barite
14:Calcite
15:Quartz
16:Siderite + Calcite
17:K-feldspar + Hematite
18:Barite
19:Siderite + Zircon

Figure 1J.1: Annapolis G-24 6045(1) site 1 (SEM). A lithic clast (A) made up of quartz and K-feldspar (12). A cutting made up of barite (5,18), K-feldspar (6,17), and hematite (17) in which barite appears to be diagenetic and replacing hematite.



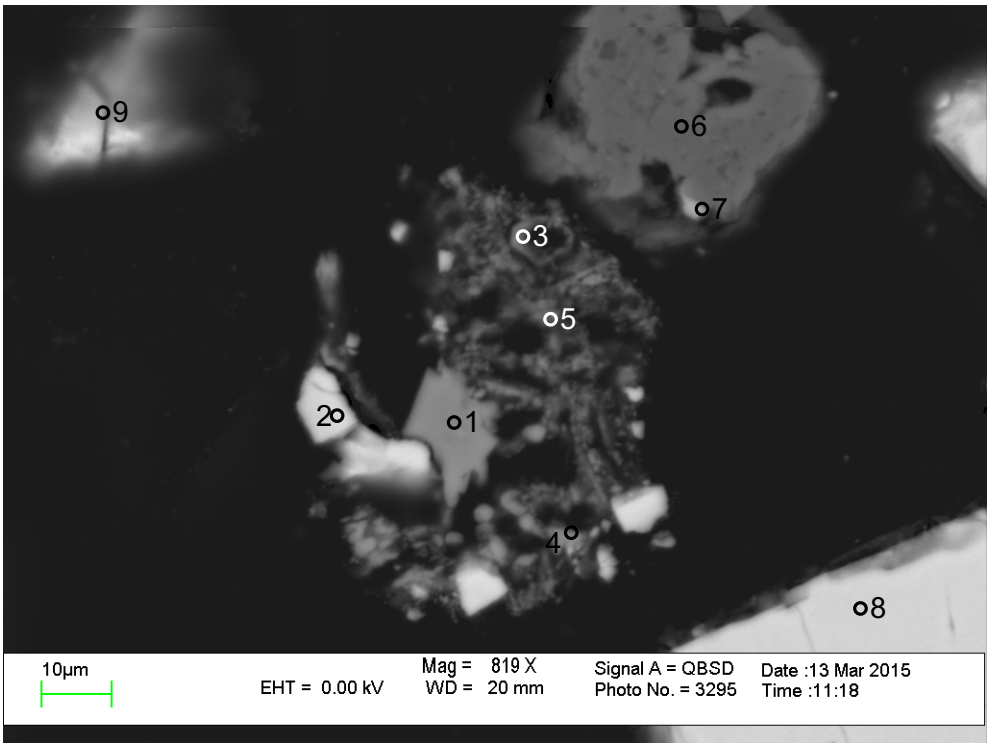
1:K-feldspar
2:Quartz
3:Barite
4:Barite + K-feldspar
5:K-feldspar
6:K-feldspar
7:Quartz + Psilomelane +
K-feldspar + Feohy
8:Barite + K-feldspar
9:K-feldspar
10:K-feldspar
11:K-feldspar + Chlorite + TiO_2
12:K-feldspar + Chlorite

Figure 1J.2: Annapolis G-24 6045(1) site 2 (SEM). Either silty mudstone with late barite, Mn diagenesis or dried out mass of drilling mud.



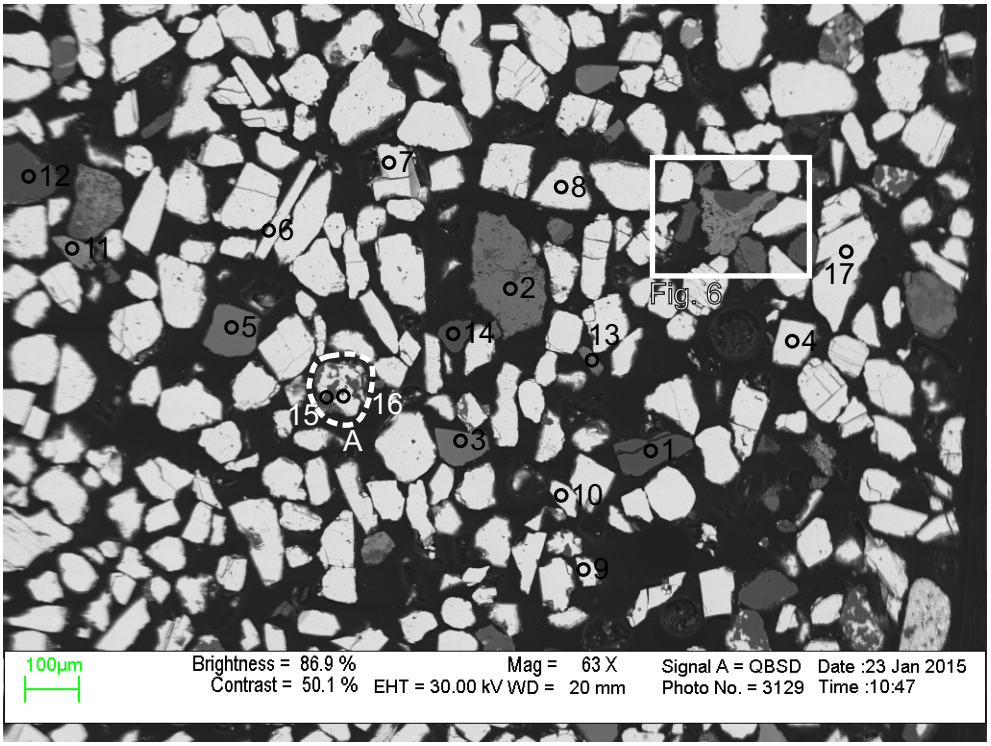
1:Tourmaline
2:Siderite + Quartz
3:Barite
4:Barite
5:Tourmaline
6:Fluorite
7:Siderite +
8:Feohy + K-feldspar +
9:Fluorite
10:Quartz
11:Quartz + Hematite
12:Hematite + Quartz +
13:Calcite
14:Feohy + Calcite
15:Feohy + Kaolinite
16:Dolomite + Feohy

Figure 1J.3: Annapolis G-24 6045(1) site 3 (SEM). Fluorite (9) has a straight crystal outline and may be diagenetic.



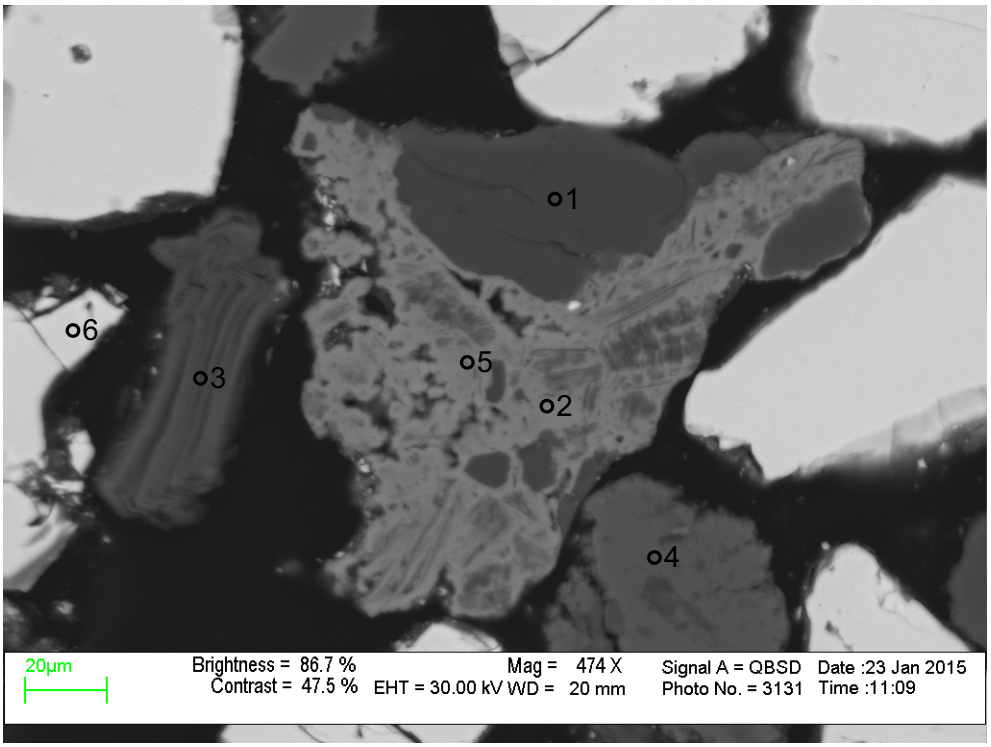
1:Zircon + Hematite
2:Barite
3:K-feldspar + Pyrite + Feohy
4:Feohy + Zircon + Pyrite
5:Feohy + Zircon + Pyrite
6:Feohy + Pyrite +
7:Zircon + Pyrite + Feohy +
8:Barite
9:Barite

Figure 1J.4: Annapolis G-24 6045(1) site 4 (SEM). A cutting made up of zircon (1), hematite (1), Feohy (3-5), pyrite (3-5), barite (2), and K-feldspar (3) is probably a combination of rock fragments and drilling mud.



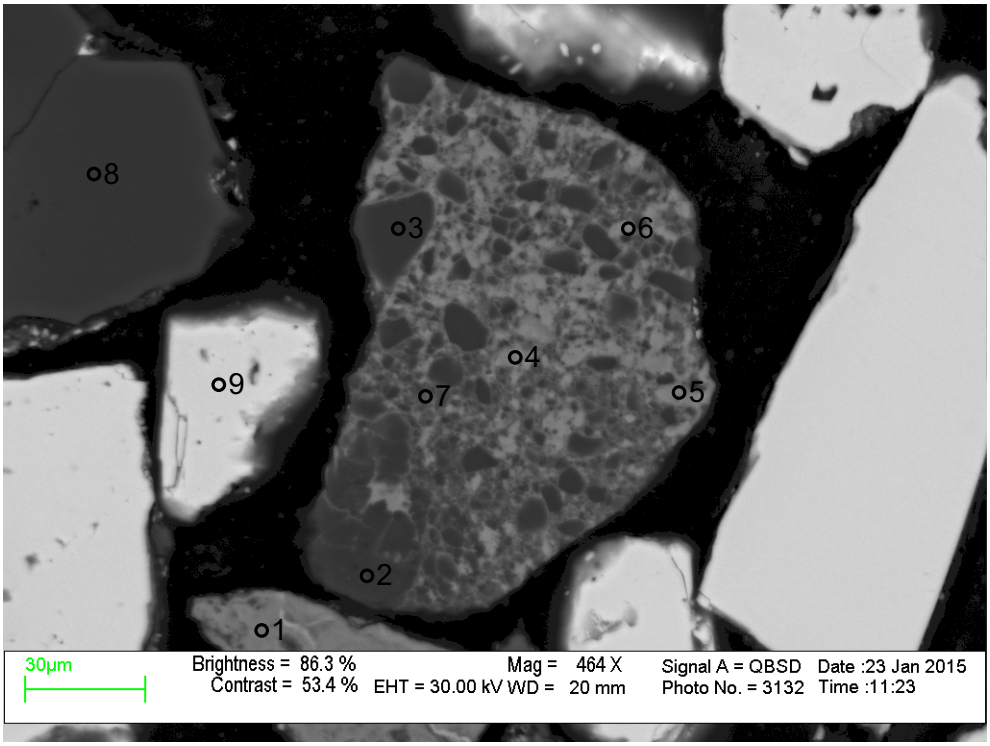
1:Muscovite + Chlorite + Albite
2:Feohy + Dolomite
3:Fluorite
4:Barite
5:Fluorite
6:Barite
7:Barite
8:Barite
9:Barite
10:Barite
11:Feohy + Calcite
12:Quartz
13:Fluorite
14:Dolomite
15:Quartz + Barite + K-feldspar
16:Barite
17:Barite

Figure 1J.5: Annapolis G-24 6045(1) site 5 (SEM). A probable lithic clast (A) made up of quartz and K-feldspar (15) associated with barite (16).



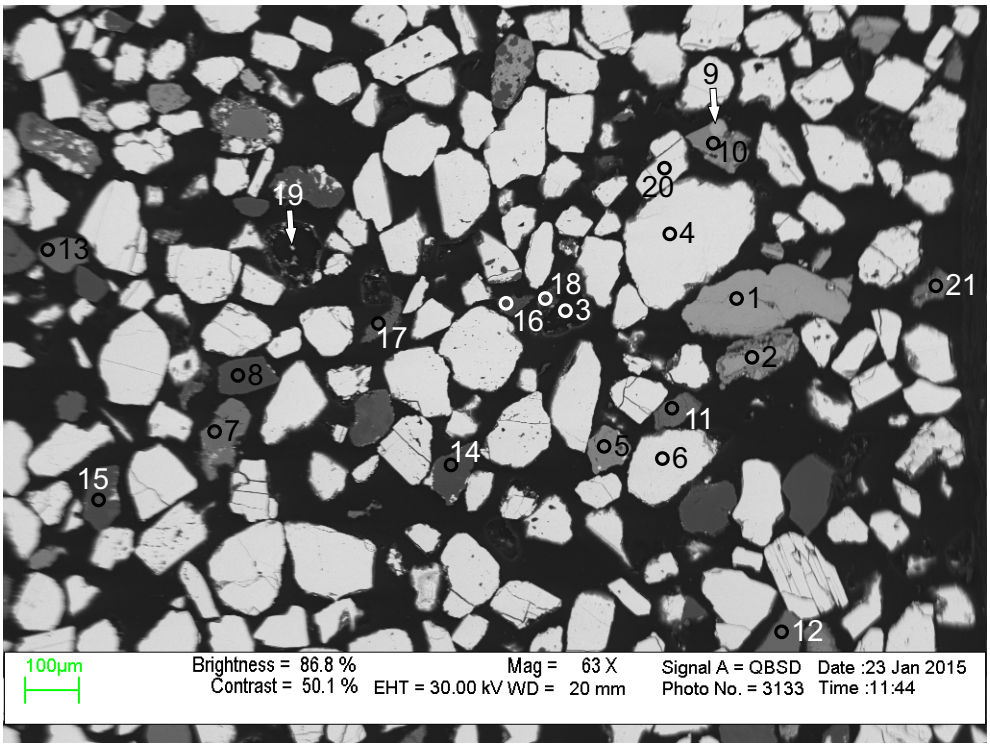
1:Quartz
2:Feohy + Kaolinite + Apatite
3:Muscovite +
4:Calcite + Feohy +
5:Feohy + Apatite + K-feldspar
6:Barite

Figure 1J.6: Annapolis G-24 6045(1) site 6 (SEM). A cutting made up of quartz (1), Feohy (2), apatite (2,5), kaolinite (2), and K-feldspar (5). Feohy forms between the layers in kaolinite.



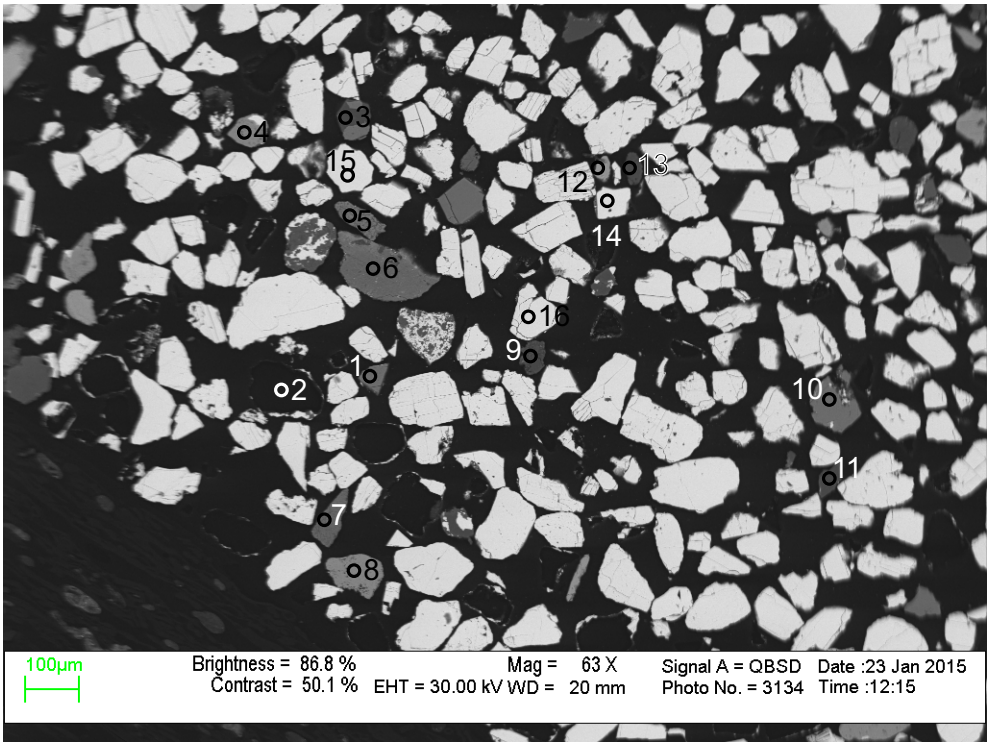
1:Feohy + Calcite
2:Quartz + K-feldspar
3:Quartz
4:Feohy + Pyrolusite + K-feldspar
5:Psilomelane + K-feldspar +
6:Psilomelane + K-feldspar + Zincite
7:Psilomelane + K-feldspar + Zincite
8:Quartz
9:Barite

Figure 1J.7: Annapolis G-24 6045(1) site 7 (SEM). A cutting made up of quartz (2,3), K-feldspar (2), Feohy (4), pyrolusite (4), psilomelane (5-7), and zincite (6,7). Feohy, pyrolusite, psilomelane, and zincite are probably drilling contaminants surrounding crushed sandstone.



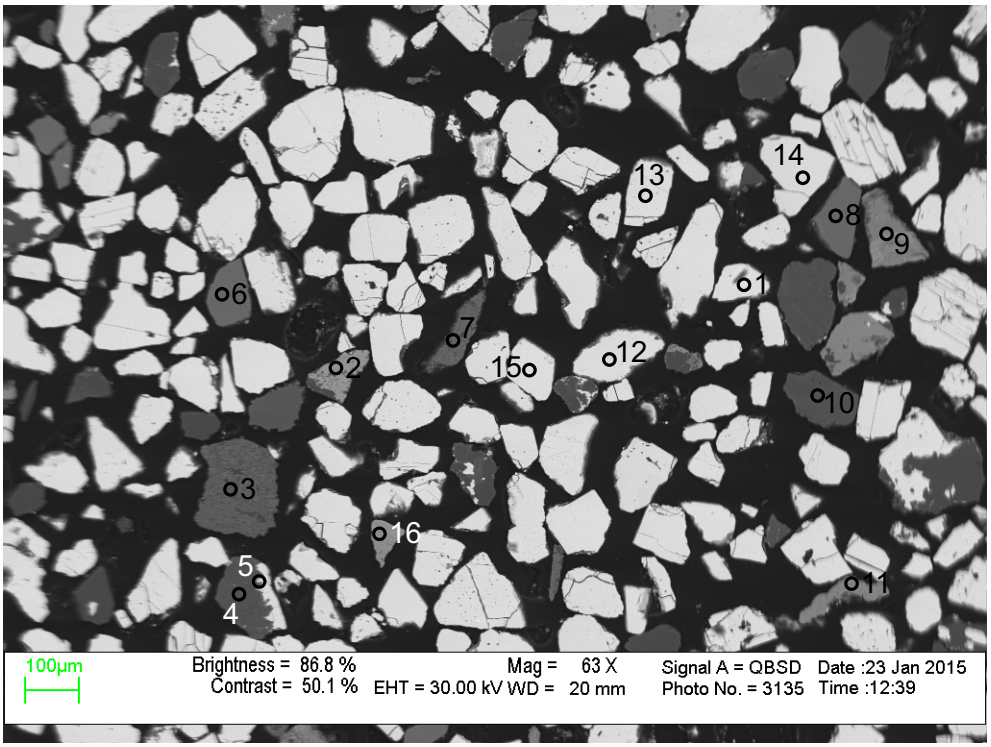
1:Hematite
2:Hematite +
3:Bad Analysis
4:Barite
5:Siderite +
6:Barite
7:Siderite +
8:Quartz
9:Psilomelane + Zincite +
10:Feohy + Psilomelane + Apatite +
11:Feohy + Kaolinite +
12:Fluorite
13:Fluorite
14:Quartz + K-feldspar
15:Quartz + K-feldspar + Barite
16:Quartz + K-feldspar + Fluorite
17:Feohy + Ankerite + Kaolinite
18:Muscovite + Barite + TiO_2
19:Bad Analysis
20:Barite
21:Feohy + Muscovite +

Figure 1J.8: Annapolis G-24 6045(1) site 8 (SEM). A cutting made up of psilomelane (9,10), zincite (9), apatite (10), Feohy (10) in which these minerals are likely contaminants.



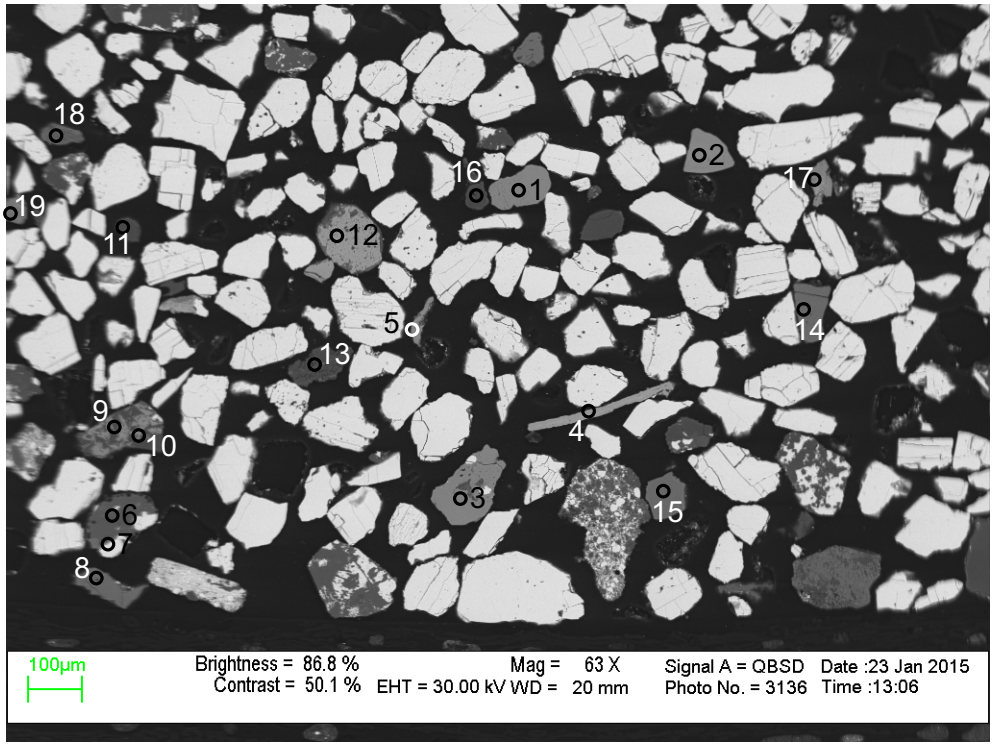
1:Siderite +
2:Bad Analysis
3:Quartz
4:Siderite +
5:TiO_2 + Feohy + Kaolinite
6:Feohy + K-feldspar +
Dolomite + Pyrite + Apatite
7:Feohy + K-feldspar +
8:Siderite + Quartz
9:Quartz + Kaolinite + Feohy
10:Feohy +
11:Quartz
12:Hematite + Quartz
13:Quartz
14:Barite
15:Barite
16:Barite

Figure 1J.9: Annapolis G-24 6045(1) site 9 (SEM). Cuttings made up of: TiO_2, Feohy, and kaolinite (5); quartz, kaolinite, Feohy (9); and Feohy, K-feldspar, dolomite, pyrite, and apatite.



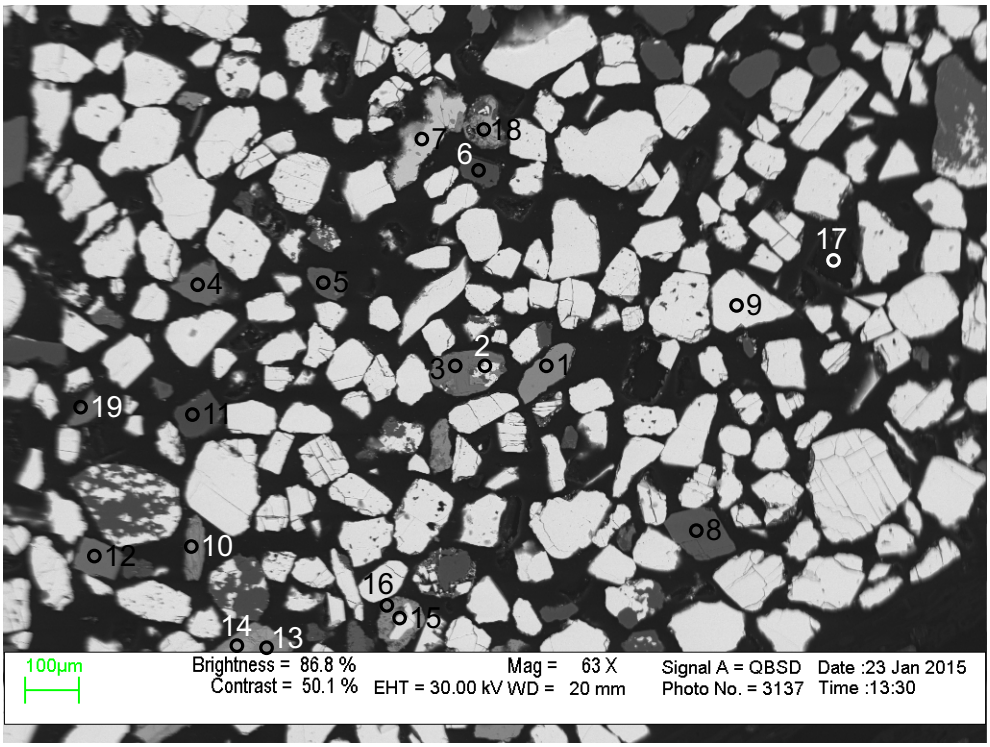
1:Barite
2:Pyrite + K-feldspar
3:Feohy + K-feldspar +
4:K-feldspar
5:Barite
6:Fluorite
7:Feohy +
8:Fluorite
9:Feohy +
10:Ankerite
11:Feohy +
12:Barite
13:Barite
14:Barite
15:Barite
16:Feohy + Quartz +

Figure 1J.10: Annapolis G-24 6045(1) site 10 (SEM). A cutting made up of K-feldspar (4) and barite (5) in which barite is diagenetic. Pyrite (2) appears to be replacing K-feldspar (3).



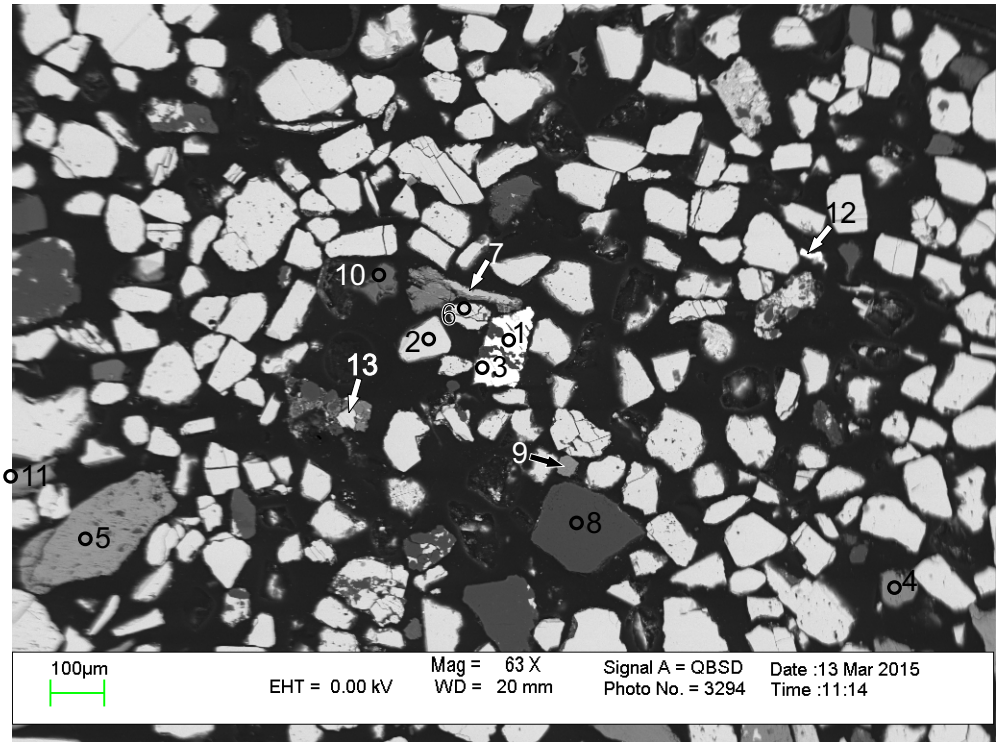
1:Feohy + Quartz +
2:Feohy + Zircon
3:Feohy + Quartz + Apatite +
4:Feohy
5:Feohy + Quartz
6 Calcite
7:Barite
8:Fluorite
9:Hematite + Quartz
10:Quartz + Hematite
11:Quartz
12:Pyrite + Quartz
13:Ankerite + Quartz
14:Fluorite
15:Fluorite
16:Quartz
17:Feohy + Psilomelane +
18:Feohy + K-feldspar + Ank
19:Psilomelane/Pyrolusite +
Zircon +

Figure 1J.11: Annapolis G-24 6045(1) site 11 (SEM). Feohy (4) appears to be a contaminant. A cutting made up of quartz (9,10) and hematite (9,10) in which hematite appears to be diagenetic.



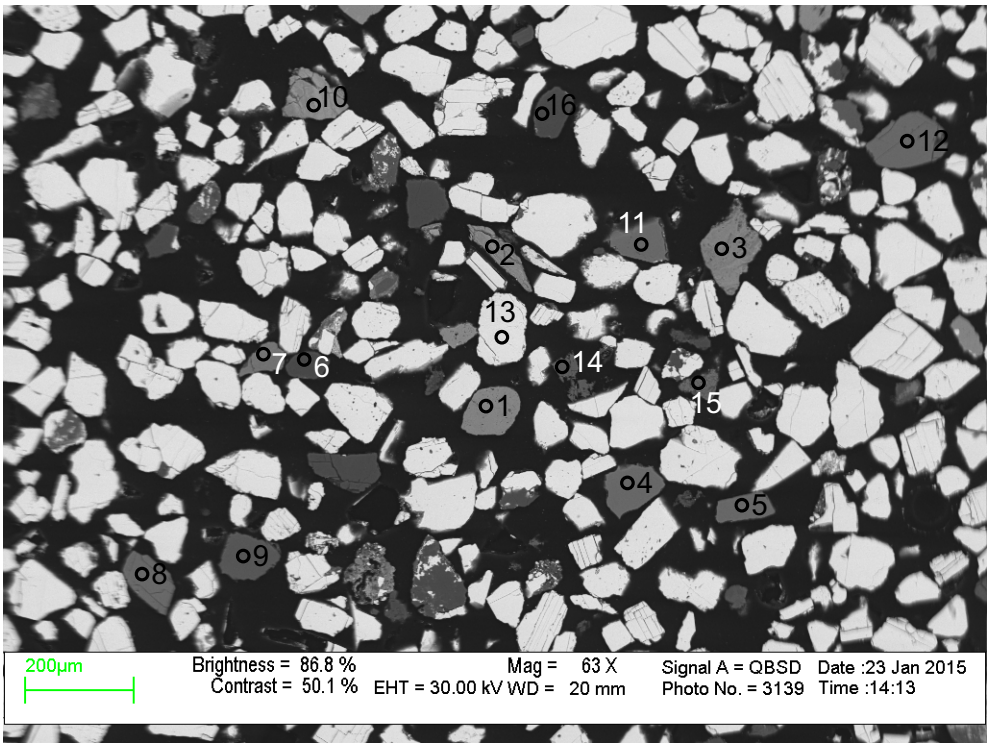
1:Siderite + Quartz
2:Barite
3:Feohy + Kaolinite
4:Fluorite
5:Ankerite +
6:Dolomite
7:Magnetite +
8:Ankerite
9:Barite
10:Feohy + Ankerite
11:Quartz
12:Fluorite
13:Feohy + Pyrite +
14:Feohy +
15:Barite
16:Siderite + Quartz
17:Chlorine
18:Pyrolusite + Barite
19:Fluorite

Figure 1J.12: Annapolis G-24 6045(1) site 12 (SEM). Feohy (14) appears to cut pyrite (13). Feohy and kaolinite (3) with late barite (2). Magnetite (7) is possibly diagenetic.



1:Wulfenite
2:Barite
3:Wulfenite
4:Feohy +
5:Pyrite + K-feldspar
6:Barite
7:Feohy +
8:Dolomite +
9:Feohy + Quartz
10:Fluorite
11:Feohy +
12:Anglesite + Quartz + Fluorine
13:Barite

Figure 1J.13: Annapolis G-24 6045(1) site 13 (SEM). Anglesite (12) is likely a contaminant. A cutting made up of quartz? and wulfinite (1,3) in which wulfinite is either diagenetic or a contaminant.



1:Feohy + Quartz +
2:Feohy + Quartz +
3:Feohy + Quartz +
4:Fluorine
5:Fluorine
6:Quartz
7:TiO_2
8:Fluorine
9:Calcite
10:Feohy
11:Fluorine
12:Fluorine
13:Barite
14:Ankerite
15:Feohy + K-feldspar + Apatite
16:Albite

Figure 1J.14: Annapolis G-24 6045(1) site 14 (SEM). A cutting made up of Feohy, K-feldspar, and apatite (15). TiO_2 (7) appears to be diagenetic and associated with quartz.

Table 1J.1 SEM-EDS chemical analyses of minerals from sample G-24 6045(1).

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	MoO_3	Sb_2O_3	BaO	WO_3	PbO	B_2O_3	Total	Actual Total
1	1	Brt											38.88									1.03			60.10				100	120
1	2	Brt											38.85									0.88			60.29				100	120
1	3	Qz	99.84												0.16														100	126
1	4	Brt											38.83									3.04			58.15				100	117
1	5	Brt											39.65									1.53			58.85				100	111
1	6	Kfs +	67.02	0.68	14.19	11.81		0.85		0.35	5.08																		100	104
1	7	Kfs + Chl	52.75	1.57	18.88	9.78	5.73	0.58			10.73																		100	98
1	8	Brt + Kfs	4.60		1.17						1.04		36.13									1.48			55.60				100	109
1	9	Qz + Kfs	77.18		11.58	0.64					9.68														0.89				100	116
1	10	Cal						0.99	55.01																				56	55
1	11	Feohy +	4.73		2.59	92.28					0.40																		100	89
1	12	Qz + Kfs	89.59		4.65	4.41					1.36																		100	119
1	13	Brt											38.65									2.25			59.10				100	117
1	14	Cal						0.80	55.20																				56	50
1	15	Qz	99.99																										100	115
1	16	Sd + Cal				91.88	1.54		5.07						0.62										0.90				100	72
1	17	Kfs + Hem	58.23	2.00	21.45	8.95		1.44			7.90																		100	108
1	18	Brt				0.30							38.85												60.87				100	108
1	19	Sd + Zrn	1.37			97.93														0.70									100	73
2	1	Kfs	66.25		18.16	0.17					15.42																		100	118
2	2	Qz	99.99																										100	121
2	3	Brt				0.55	0.65				0.24		38.38												60.19				100	111
2	4	Brt + Kfs	2.63		1.85	1.93	1.94				0.51		22.12												37.35			31.70	100	158
2	5	Kfs	65.63	1.42	17.57	0.21					15.19																		100	118
2	6	Kfs	64.26		18.76	1.54	0.36				15.09																		100	116
2	7	Qz + Psi + Kfs + Feohy	30.16	0.70	13.43	17.53	27.05				4.84														6.26				100	93
2	8	Brt + Kfs	2.31		1.23	2.97	1.54				1.02		23.15												34.71			33.11	100	136
2	9	Kfs	63.79	0.30	18.67	2.26	0.81				14.18																		100	115
2	10	Kfs	64.09		18.06	0.96	1.56				14.68														0.64				100	118
2	11	Kfs + Chl + TiO_2	34.87	30.34	16.72	8.04	1.37	0.96			7.70																		100	94
2	12	Ms + Chl	60.82	0.42	19.84	3.76	1.74	0.55			12.89																		100	114
3	1	Tur	38.45	0.67	33.99	5.05		6.09	0.89	1.86																			87	104
3	2	Sd + Qz	3.40			94.43	0.46		1.43						0.28														100	73
3	3	Brt											38.85									1.62			59.54				100	111
3	4	Brt											38.65									2.08			59.27				100	115
3	5	Tur	37.95	0.76	33.69	9.95		2.26	0.31	2.08																			87	104
3	6	Fl							43.39					56.61															100	175
3	7	Sd				47.52	3.88	3.64	0.96																				56	56
3	8	Feohy + Kfs +	33.74	0.28	5.33	50.48		0.95	1.05	0.96	1.54		2.55						1.66	1.44									100	100
3	9	Fl							42.87					57.13															100	165
3	10	Qz	99.99																										100	112
3	11	Qz + Hem	67.38			32.61																							100	96
3	12	Hem + Qz +	10.12	0.37		84.46									0.33				4.73										100	87
3	13	Cal				0.20		0.81	55.00																				56	58
3	14	Feohy + Cal				95.95	2.10		1.94																				100	72
3	15	Feohy + Kln	3.94	0.37	2.29	93.04			0.38																				100	64
3	16	Dol + Feohy				12.70	1.58	33.91	51.81																				100	62
4	1	Zrn +Hem	28.77			22.35	0.62												0.61	47.67									100	87
4	2	Brt	0.64			0.49							15.16							0.19					24.88			58.66	100	220
4	3	Kfs + Py + Feohy	33.80	2.35	7.20	46.61	0.99		2.25		1.46		2.72		0.70					1.90									100	20
4	4	Feohy + Zrn + Py	16.88		2.80	56.08	0.59		1.50		0.30		7.09		0.34				0.75	4.41					9.23				100	60
4	5	Feohy + Zrn + Py	18.93		1.61	66.90	1.69		2.11				1.20						2.57	3.98					1.03				100	47
4	6	Feohy + Py +	6.78		1.81	64.54	2.89	13.71	4.74		0.87		4.67																100	67
4	7	Zrn + Py + Feohy +	19.83	0.38	11.92	21.66	0.61	3.60	4.17		0.51	2.29	19.33							15.71									100	70
4	8	Brt											38.93									1.69			59.38				100	114
4	9	Brt	1.18		1.04								33.66	1.83											62.29				100	86
5	1	Tur	38.25	1.09	33.86	6.46		5.11	0.36	1.88																			87	107
5	2	Feohy + Dol	4.30		1.64	76.82	1.51	7.35	7.32			1.05																	100	62

Table 1J.1 SEM-EDS chemical analyses of minerals from sample G-24 6045(1).

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	MoO_3	Sb_2O_3	BaO	WO_3	PbO	B_2O_3	Total	Actual Total
5	3	Fl							43.19					56.80															100	175
5	4	Brt											38.93									1.96			59.10				100	124
5	5	Fl							43.50					56.50															100	166
5	6	Brt											39.08									1.24			59.70				100	109
5	7	Brt											38.93									2.37			58.72				100	113
5	8	Brt											38.98									1.71			59.31				100	119
5	9	Brt											38.95												61.06				100	114
5	10	Brt											38.53												61.47				100	115
5	11	Feohy + Cal	3.21		1.08	88.77	0.52		4.48				0.92			1.02													100	65
5	12	Qz	99.99																										100	110
5	13	Fl							43.19					56.80															100	184
5	14	Dol				0.56	0.39	22.47	30.44						0.15														54	58
5	15	Qz + Brt + Ms	91.90		1.61	0.23					0.48		2.05												3.73				100	122
5	16	Brt											38.68									1.56			59.77				100	108
5	17	Brt											38.70									0.80			60.51				100	126
6	1	Qz	99.81			0.19																							100	122
6	2	Feohy + Kln + Ap	10.42		4.70	80.95			0.67			1.60							1.68										100	75
6	3	Ms	51.67	0.36	27.70	2.40		2.70		0.82	9.35																		95	103
6	4	Cal + Feohy +	3.04		1.81	27.27	1.15	16.38	50.33																				100	62
6	5	Feohy + Ap + Kfs	16.30		7.14	72.61			0.67		0.71	1.05							1.51										100	81
6	6	Brt											25.77									1.04			42.44			30.76	100	154
7	1	Feohy + Cal	1.20			92.31	0.59		5.02				0.90																100	71
7	2	Qz + Kfs	97.93		0.57	0.67	0.67				0.16																		100	121
7	3	Qz	98.21				1.63				0.17																		100	124
7	4	Feohy + Pyro + Kfs	14.31	0.60	5.37	61.91	15.09		0.74		0.95									1.02									100	89
7	5	Psi + Ms +	15.47		6.63	1.49	67.13		0.59		1.93								0.64	1.12					5.00				100	84
7	6	Psi + Ms + Znc	28.32		7.88	0.87	53.88		0.48	0.98	2.29								0.41	0.82					4.04				100	96
7	7	Psi + Ms + Znc	63.58		6.10	1.17	24.59		0.28		1.81									0.45					2.01				100	112
7	8	Qz	99.99																										100	119
7	9	Brt											39.18									2.76			58.08				100	112
8	1	Hem				99.19	0.81																						100	99
8	2	Hem +	0.71			96.94	1.36		0.28							0.72													100	93
8	3	BA													100.00														100	0.51
8	4	Brt											38.93									2.19			58.88				100	119.12
8	5	Sd +	1.29			53.36	1.12		0.23																				56	76
8	6	Brt											39.18									1.88			58.94				100	117
8	7	Sd +				46.82	2.59	6.59																					56	54
8	8	Qz	99.62		0.38																								100	113
8	9	Psi + Znc +			2.34	2.74	71.14		0.84	0.57	0.35									0.61					12.71		8.69		100	89
8	10	Feohy + Psi + Ap +	3.85		6.78	79.47	5.02		1.61			0.99	1.02							0.46					0.83				100	82
8	11	Feohy + Kln +	28.56		23.03	39.06	0.22	6.50	2.64																				100	96
8	12	Fl							43.49					56.51															100	181
8	13	Fl							43.15					56.85															100	154
8	14	Qz + Ms	97.91		1.34	0.23					0.52																		100	117
8	15	Qz + Kfs + Brt	84.75		6.29	0.42		0.43			5.25		0.67												2.19				100	112
8	16	Qz + Ms	72.20	2.32	17.06	2.12		0.99	0.41	0.54	2.99			1.48												-0.10			100	107
8	17	Feohy + Ank + Kln	5.63		2.14	25.25	1.03	16.63	49.32																				100	59
8	18	BA	38.66	2.29	20.16	11.18		1.36	1.13		6.44		3.60												15.19				100	20
8	19	BA													100.00														100	0.18
8	20	Brt											39.10									1.44			59.46				100	120.36
8	21	Feohy + Ms + Brt	21.28		6.69	62.14	0.44	1.33	2.11		0.71		2.70		0.97										1.64				100	79.51
9	1	Sd				46.98	3.70	4.35	0.97																				56	56.67
9	2	BA													100.00														100	0.43
9	3	Qz	98.32		0.94						0.73																		100	120
9	4	Sd + Qz	3.98			90.76	4.51		0.76																				100	70
9	5	TiO_2 + Feohy + Kln	7.79	74.78	6.63	9.49		1.31																					100	98
9	6	Feohy + Kfs + Dol + Py + Ap	6.29		2.97	66.49	0.68	11.31	8.61		0.47	1.49	1.70																100	61
9	7	Feohy + Kfs +	6.80	0.43	2.91	66.70	0.88	15.74	6.06		0.48																		100	56

Table 1J.1 SEM-EDS chemical analyses of minerals from sample G-24 6045(1).

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	MoO_3	Sb_2O_3	BaO	WO_3	PbO	B_2O_3	Total	Actual Total
9	8	Sd + Qz	4.90			94.03	0.61		0.46																				100	69
9	9	Qz + Kln + Feohy	66.66	0.22	23.68	6.90		1.21	0.34	0.63	0.39																		100	99
9	10	Feohy +				83.53	8.78	6.85	0.84																				100	65
9	11	Qz	99.99																										100	131
9	12	Hem + Qz	2.59			97.40																							100	90
9	13	Qz	99.99																										100	129
9	14	Brt											38.55												61.46				100	118
9	15	Brt											38.90									1.41			59.70				100	112
9	16	Brt											38.70									1.10			60.20				100	116
10	1	Brt											39.08									1.93			59.01				100	124
10	2	Py + Ms	1.09		0.83	27.18			0.38		0.17		70.37																100	198
10	3	Feohy +	7.98	2.04	5.22	63.98	1.14	14.84	4.34		0.49																		100	56
10	4	Kfs	62.06	0.67	21.75	1.05		0.95			13.54																		100	103
10	5	Brt	0.45		0.40								20.85									0.98			36.94			40.39	100	156
10	6	Fl							42.97					57.03															100	167
10	7	Feohy +	5.39	0.97	2.74	67.72	0.96	15.27	6.66		0.29																		100	63
10	8	Fl							43.33					56.67															100	196
10	9	Feohy +	0.81			96.22	0.77		0.81							1.37													100	87
10	10	Ank				10.05	2.61	15.19	28.14																				56	66
10	11	Feohy +	5.03			92.96	1.39		0.63																				100	81
10	12	Brt											26.04									1.41			42.81			29.76	100	162
10	13	Brt											25.20									1.32			41.76			31.73	100	172
10	14	Brt											39.03									3.10			57.89				100	126
10	15	Brt											38.95												61.06				100	114
10	16	Feohy + Qz +	7.08		1.17	91.46			0.28																				100	80
11	1	Feohy + Qz +	9.54		0.76	88.11	0.74		0.88																				100	80
11	2	Feohy + Zrn	5.18			91.83													1.38	1.62									100	82
11	3	Feohy + Qz + Ap +	9.09		2.06	86.40	0.54		0.99			0.89																	100	76
11	4	Feohy				99.11	0.89																						100	95
11	5	Feohy + Qz	3.06			95.71	0.79		0.42																				100	75
11	6	Cal							56.00																				56	50
11	7	Brt											38.88									1.44			59.67				100	101
11	8	Fl							42.73					57.27															100	154
11	9	Hem + Qz	58.79			40.52																		0.69					100	110
11	10	Qz + Hem	95.49			4.49																							100	114
11	11	Qz	99.99																										100	116
11	12	Py + Qz	2.08		0.34	26.31			0.83				70.44																100	209
11	13	Ank + Qz	34.38	0.83	2.85	19.61	0.57	9.53	32.25																				100	68
11	14	Fl							44.06					55.95															100	193
11	15	Fl							43.68					56.31															100	184
11	16	Qz	98.42		1.15	0.15			0.25																				100	103
11	17	Feohy + Psi +	4.60			63.64	24.32	2.39	1.34																3.70				100	84
11	18	Feohy + Kfs + Ank	25.11		10.43	47.30	0.74	8.19	7.01		1.23																		100	63
11	19	Psi/Pyro + Zrn+	0.79		25.32		61.03		1.75		0.53			0.95			0.45	2.75		2.65					3.76				100	70
12	1	Sd + Qz	1.69			98.31																							100	76
12	2	Brt				0.39							38.95									0.96			59.68				100	114
12	3	Feohy + Kln?	30.25		24.43	42.12		2.87			0.34																		100	99
12	4	Fl							43.38					56.63															100	163
12	5	Ank +	1.19		0.51	16.37	0.67	10.20	27.07																				56	60
12	6	Dol				1.84	0.85	21.88	29.44																				54	58
12	7	Mag +	0.60			97.61	0.68									1.13													100	129
12	8	Ank				12.78	1.02	14.36	27.84																				56	63
12	9	Brt											38.75									1.38			59.86				100	123
12	10	Feohy + Ank	2.35			87.13	0.92	1.66	3.53						0.37	4.05													100	65
12	11	Qz	99.99																										100	113
12	12	Fl							42.66					57.35															100	155
12	13	Feohy + Py +				94.89	1.39		2.46				0.95		0.29														100	64
12	14	Feohy +	1.84			94.75	1.34									2.06													100	82

Table 1J.1 SEM-EDS chemical analyses of minerals from sample G-24 6045(1).

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	MoO_3	Sb_2O_3	BaO	WO_3	PbO	B_2O_3	Total	Actual Total
12	15	Brt				0.46							39.45									1.87			58.21				100	111
12	16	Sd + Qz	5.97			91.12	0.77		0.83										1.31										100	71
12	17	BA													100.00														100	0
12	18	Pryo + Brt			2.04	3.19	74.13		0.78				7.09							1.97					10.81				100	98
12	19	Fl							42.86					57.14															100	157
13	1	Wfn																					29.78				70.23		100	153
13	2	Brt											38.98									1.54			59.48				100	114
13	3	Wfn																					29.65				70.36		100	151
13	4	Feohy +	2.37			95.92	1.39		0.32																				100	82
13	5	Py + Ms	3.17		1.87	25.85					0.19		68.17								0.77								100	173
13	6	Brt				0.36							21.37												36.95			41.36	100	182
13	7	Feohy +	0.73			97.79	0.41									1.07													100	130
13	8	Dol				0.44	0.43	21.94	31.19																				54	55
13	9	Feohy + Qz	5.05			92.78			1.18												0.98								100	80
13	10	Fl							42.69					57.31															100	178
13	11	Feohy +	1.82			95.41	0.89									1.90													100	75
13	12	Ang + Qz + F	2.65										23.50	10.53	1.70												61.64		100	13
13	13	Brt											39.40												60.61				100	109
14	1	Feohy + Qz +	7.44		0.85	90.18	0.88		0.66																				100	78
14	2	Feohy + Qz +	4.56			84.62	0.45		4.70				1.17		0.28	4.20													100	79
14	3	Feohy + Qz +	4.17			87.47	0.84		3.06						0.28	1.78		2.39											100	78
14	4	Fl							43.45					56.56															100	184
14	5	Fl							43.32					56.69															100	190
14	6	Qz	99.99																										100	118
14	7	TiO_2		98.65	1.34																								100	99
14	8	Fl							43.05					56.95															100	158
14	9	Cal				0.21		0.68	55.12																				56	50
14	10	Feohy	1.37			95.37	2.09		1.16																				100	80
14	11	Fl							43.35					56.65															100	190
14	12	Fl							43.57					56.43															100	204
14	13	Brt											39.00									1.50			59.49				100	118
14	14	Ank				15.65	0.74	9.76	29.85																				56	63
14	15	Feohy + Kfs + Ap	32.30	0.28	13.04	41.90	1.01	4.23	4.27		1.30	1.67																	100	84
14	16	Ab	68.69		19.10					12.21																			100	133
Znc=Zincite																														
BA=Bad Analysis																														

Appendix 1K: SEM-BSE images and EDS mineral analyses for sample G-24 6045(2)

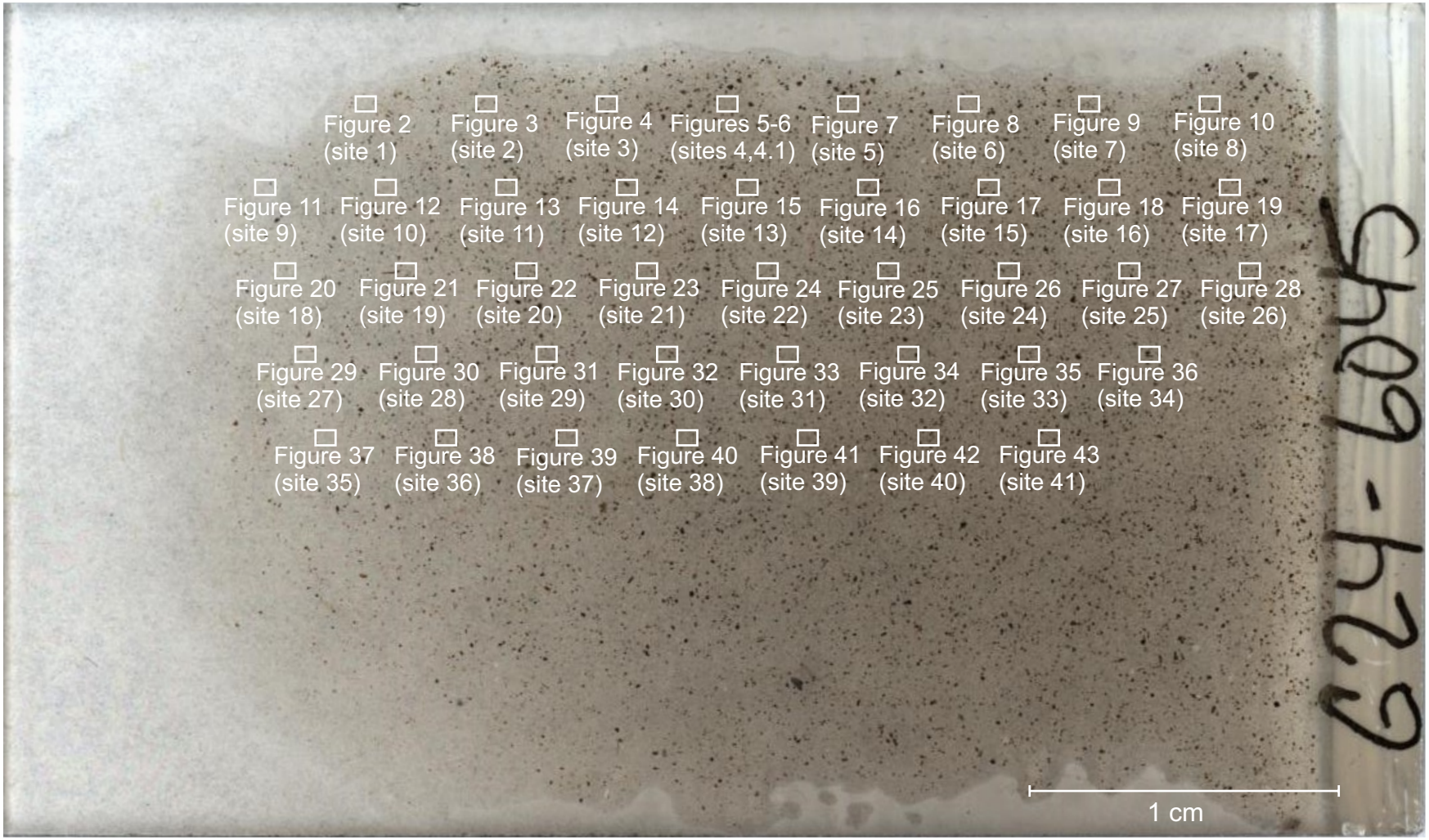
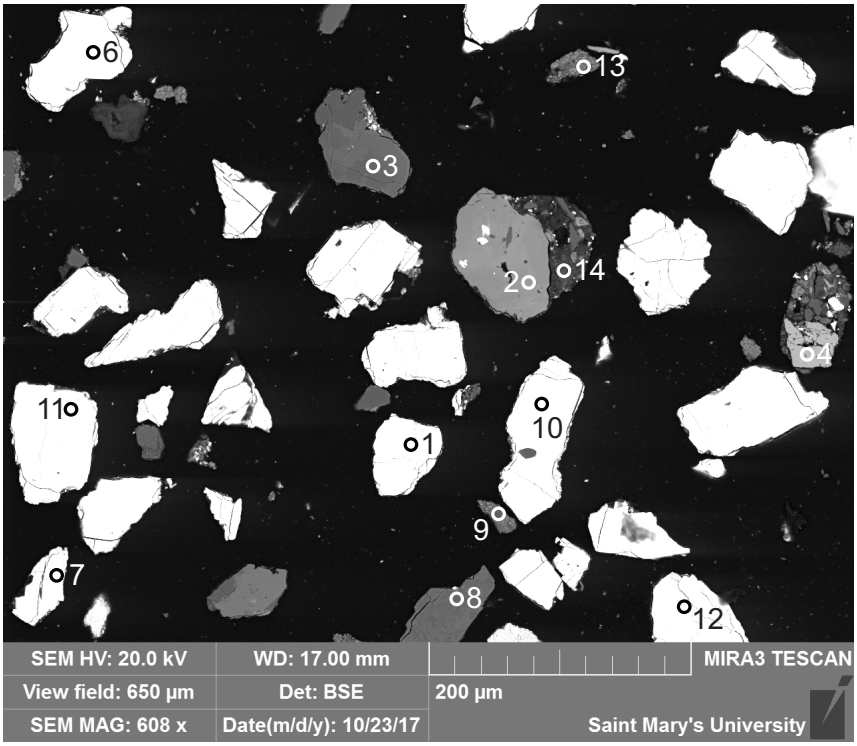
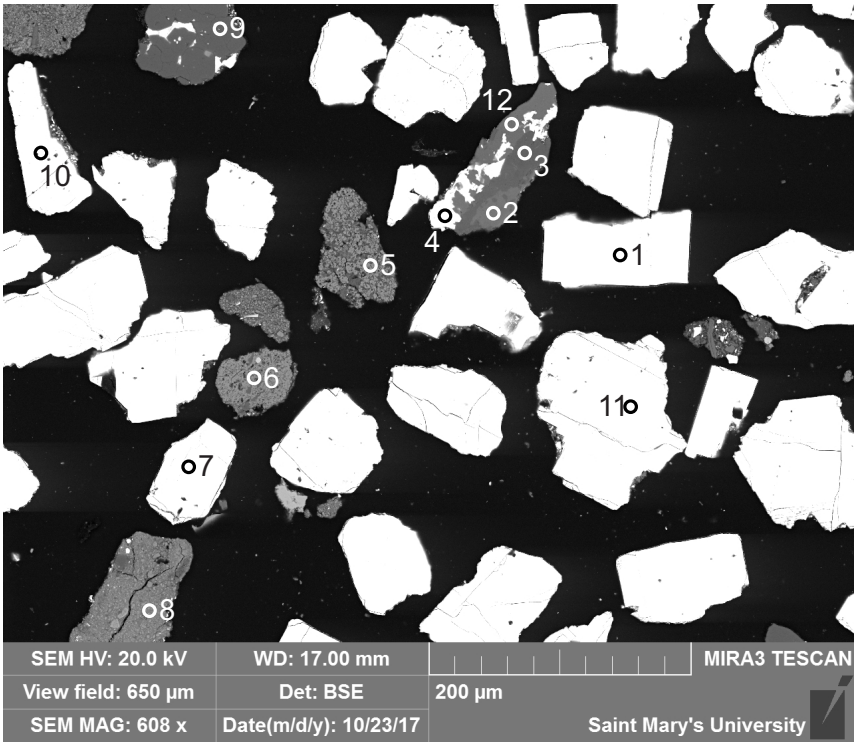


Figure 1K.1: Scanned thin section of sample G-24 6045(2) showing the location of analyzed sites.



1:Barite
2:Fluorite
3:Ankerite
4:Limonite +
6:Barite
7:Barite
8:Ankerite
9:Chlorite +
10:Barite
11:Barite
12:Barite
13:Siderite +
14:Quartz +

Figure 1K.2: Sample G-24 6045(2) (SEM) site 1. A cutting made up of quartz (14) and fluorite (2).



1:Barite
2:K-feldspar
3:Albite
4:Barite
5:Siderite + Chlorite
6:Siderite + Chlorite
7:Barite
8:Mixture
9:Quartz
10:Barite
11:Barite
12:K-feldspar

Figure 1K.3: Sample G-24 6045(2) (SEM) site 2. A cutting made up of mainly K-feldpsar (2,12), some albite (3) that may be diagenetic, and diagenetic barite (4).

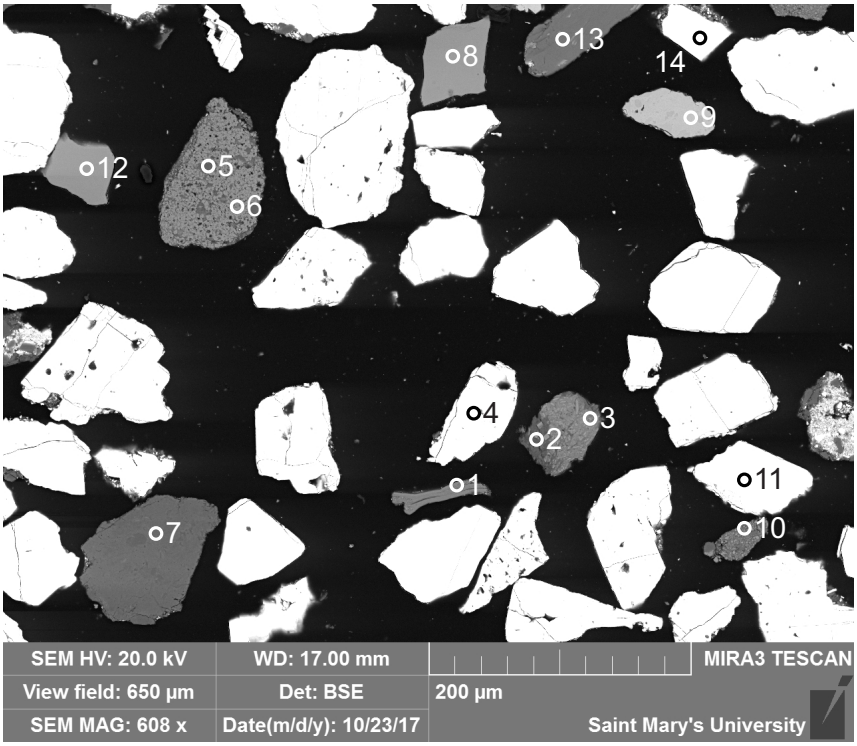


Figure 1K.4: Sample G-24 6045(2) (SEM) site 3. Cuttings made up of: quartz (5) and siderite and chlorite (6); K-feldspar+albite (2) and chlorite (3).

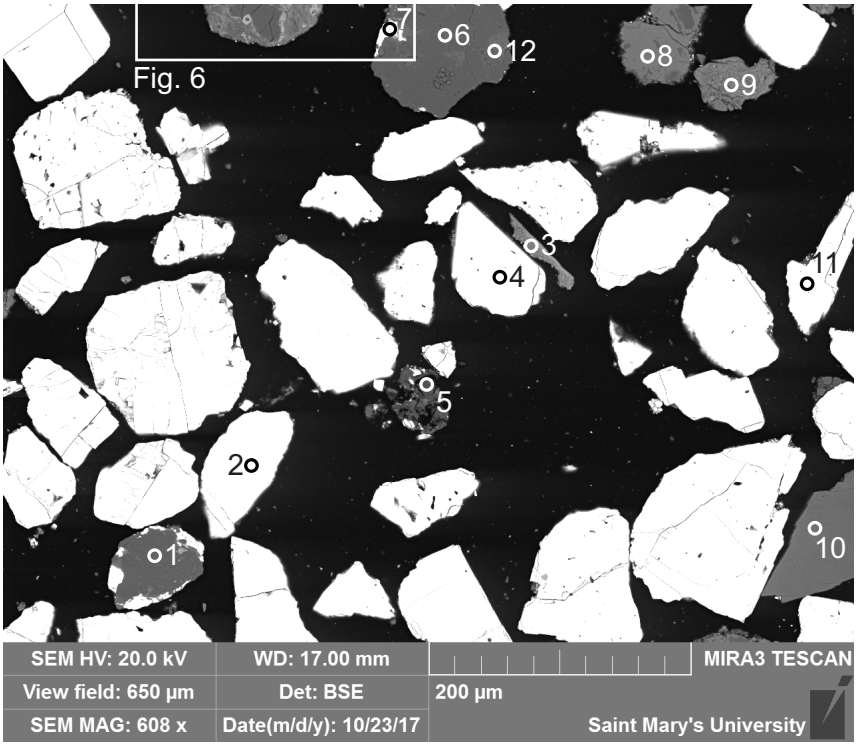
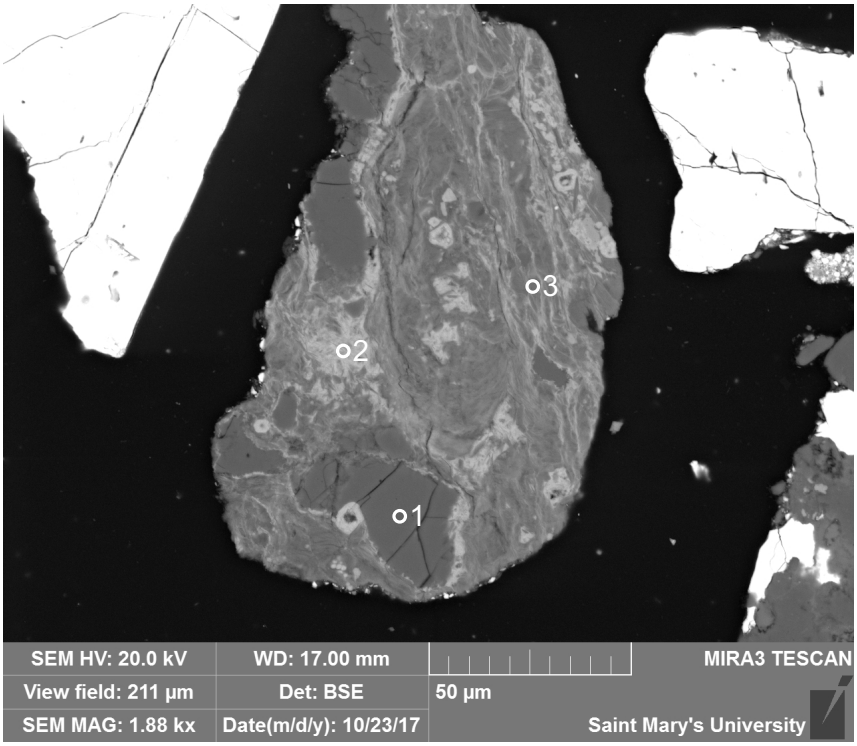
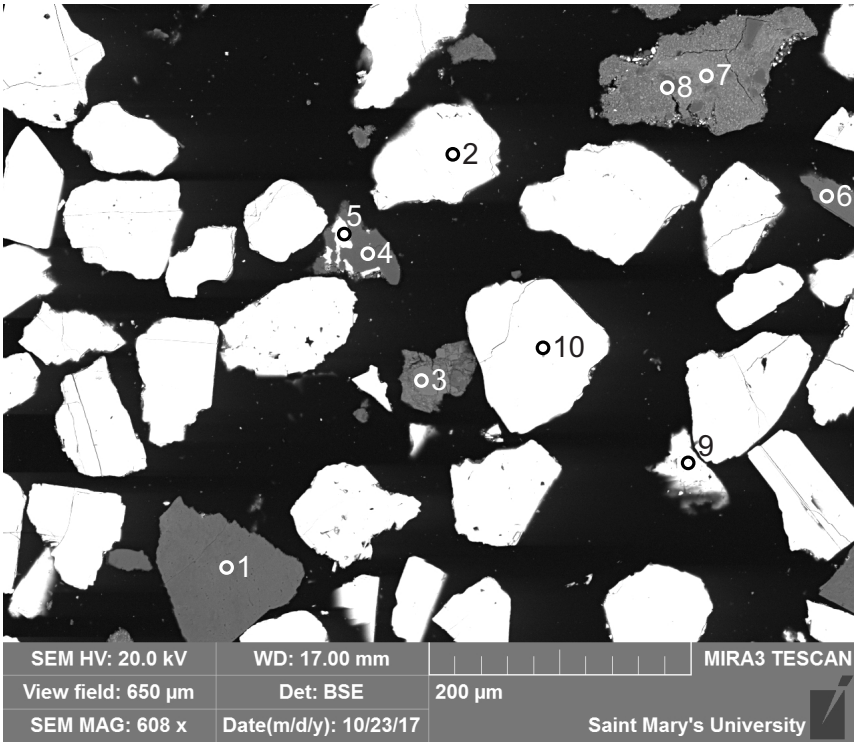


Figure 1K.5: Sample G-24 6045(2) (SEM) site 4. A cutting made up of quartz (7), muscovite (12) and barite (7). An albite grain (1) is rimmed with barite. A grain is made up of a mixture of albite and ankerite (8).



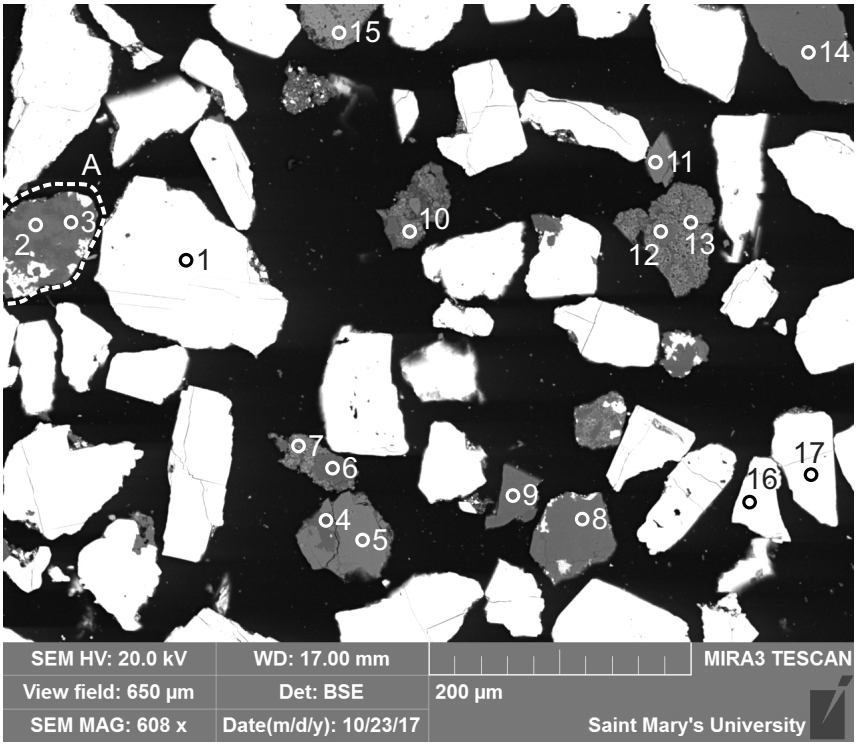
1:Quartz
2:Limonite +
3:Muscovite

Figure 1K.6: Sample G-24 6045(2) (SEM) site 4.1. A cutting or a contaminant made up of quartz (1), muscovite (3), and limonite (3) along grain boundaries.



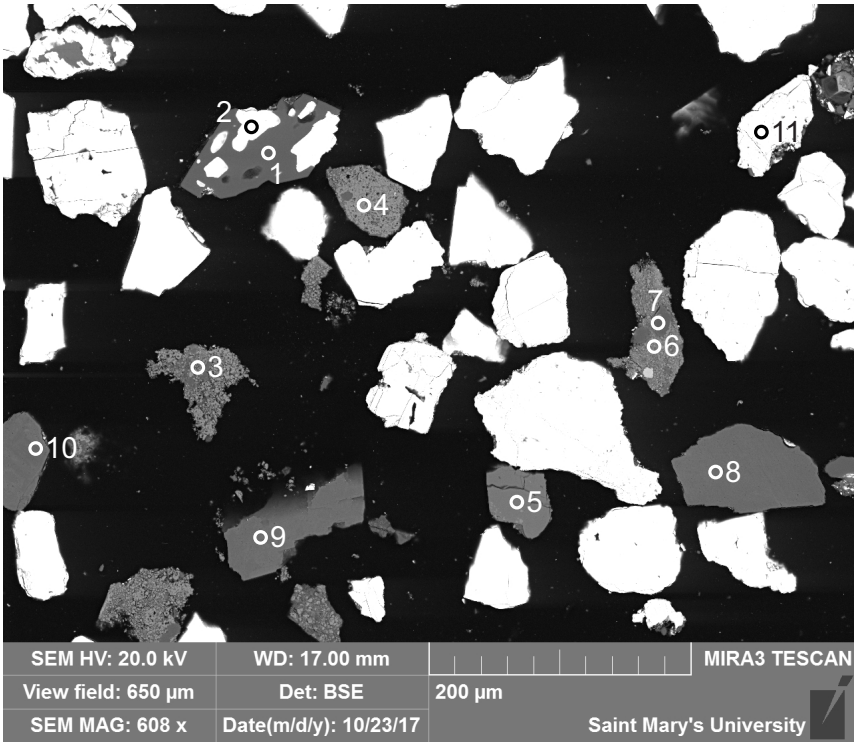
1:Ankerite
2:Barite
3:Ankerite
4:Quartz
5:Barite
6:Ankerite
7:Mixture
8:Quartz
9:Barite
10:Barite

Figure 1K.7: Sample G-24 6045(2) (SEM) site 5. A cutting made up of quartz (4) and barite (5).



1:Barite
2:K-feldspar
3:Quartz
4:Albite
5:Ankerite
6:Quartz
7:Chlorite + Muscovite
8:Ankerite
9:Ankerite
10:Chlorite
11:Ankerite +
12:Muscovite +
13:Siderite + Chlorite
14:Ankerite
15:Chlorite +
16:Barite
17:Barite

Figure 1K.8: Sample G-24 6045(2) (SEM) site 6. Cutting made up of: K-feldspar (2) and biotite (1); albite (4) and ankerite (5); quartz (6), and chlorite and muscovite (7); muscovite (12) and siderite and chlorite (13). A possible lithic clast (A) made up of quartz (3) and K-feldspar (2).



1:Quartz
2:Barite
3:Siderite +
4:Siderite +
5:Ankerite
6:Siderite + Chlorite
7:Quartz
8:Ankerite
9:Ankerite
10:Ankerite
11:Barite

Figure 1K.9: Sample G-24 6045(2) (SEM) site 7. Cutting made up of: quartz (1) and barite (2); Quartz (7) and ankerite and chlorite (6).

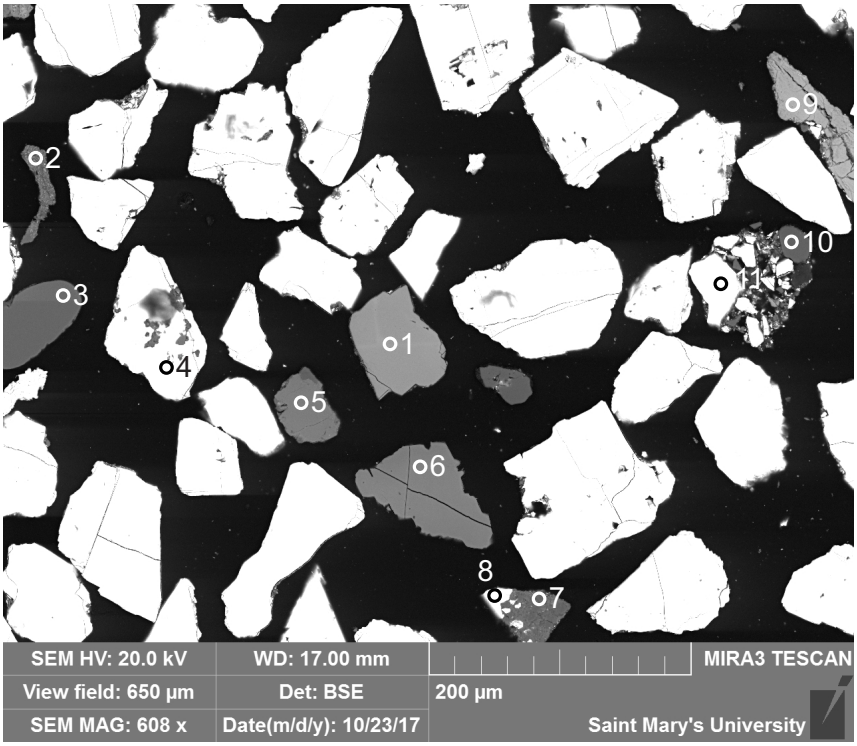


Figure 1K.10: Sample G-24 6045(2) (SEM) site 8. A cutting made up of K-feldspar (7) and barite (8).

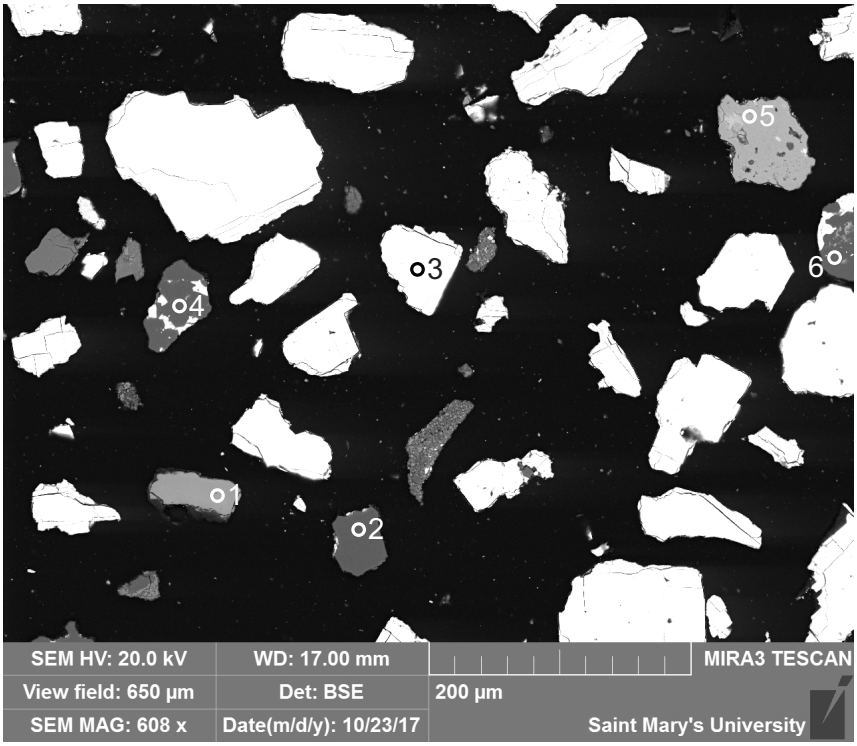
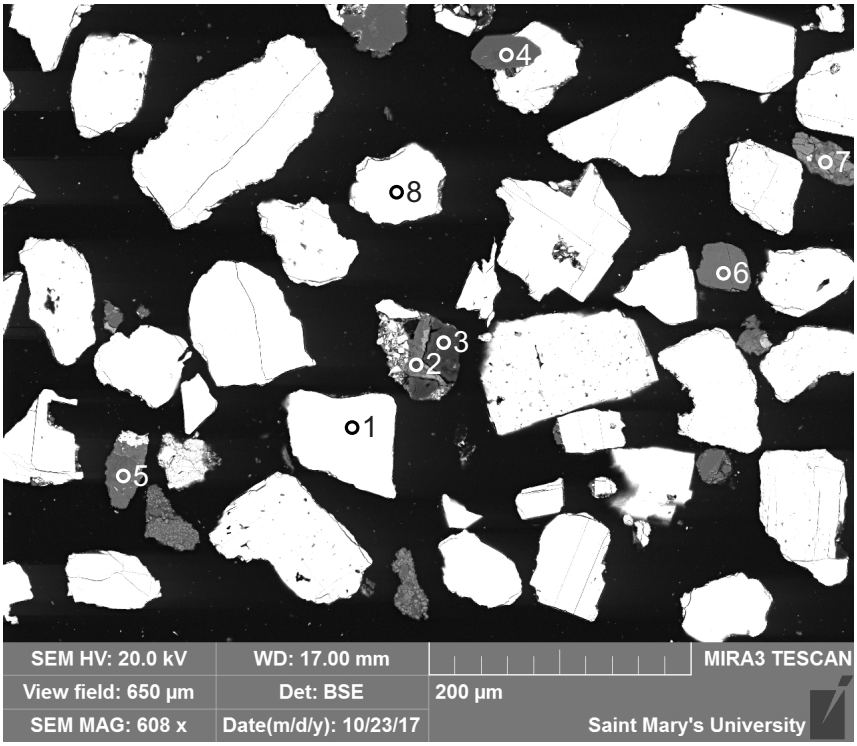
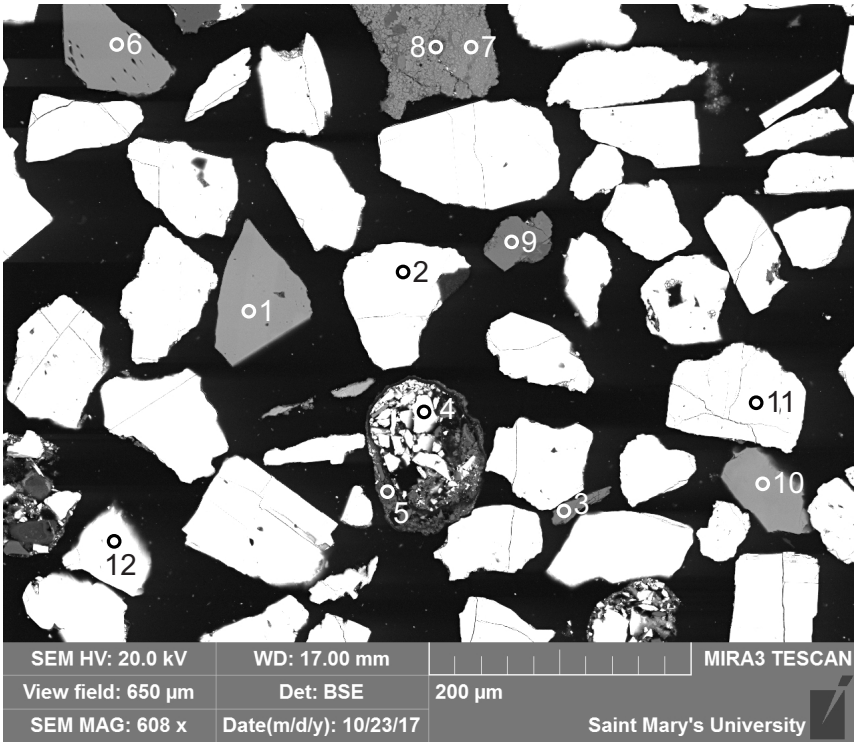


Figure 1K.11: Sample G-24 6045(2) (SEM) site 9. Quartz crystals rimmed with barite (4,6).



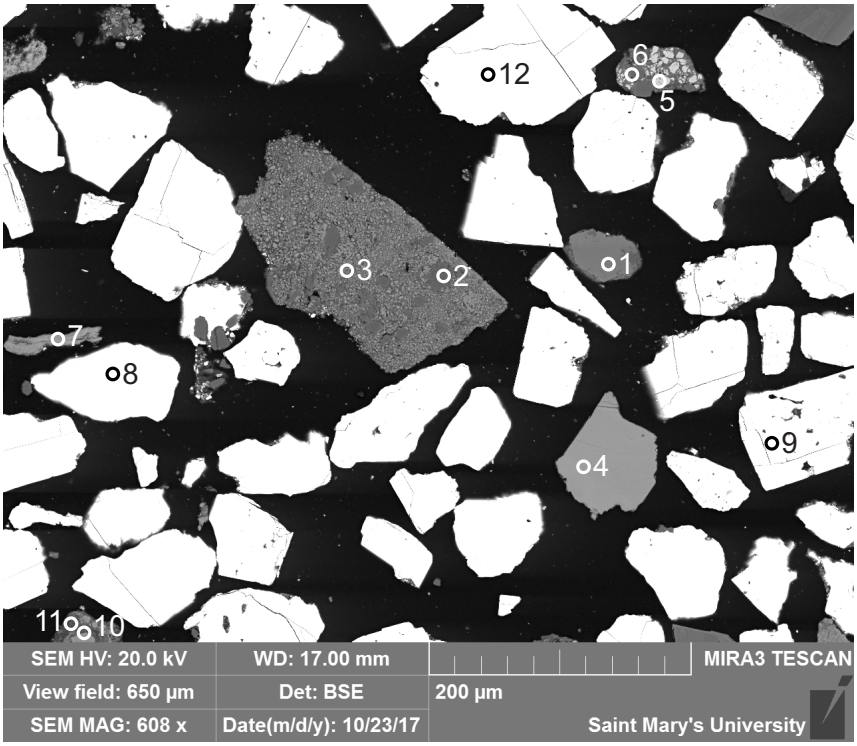
1:Barite
2:Mixture
3:Mixture
4:Quartz
5:K-feldspar
6:Ankerite
7:Mixture
8:Barite

Figure 1K.12: Sample G-24 6045(2) (SEM) site 10. Grains of quartz (4) and K-feldspar (5) rimmed with barite.



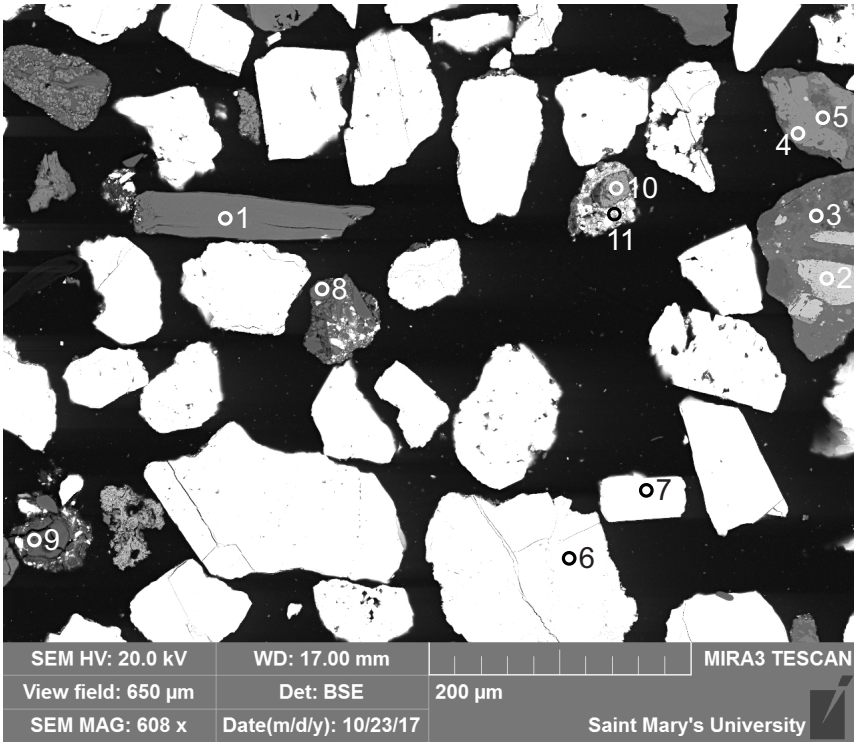
1:Fluorite
2:Barite
3:Ankerite
4:Barite
5:Albite
6:Fluorite
7:Siderite +
8:Mixture
9:Ankerite +
10:Fluorite
11:Barite
12:Barite

Figure 1K.13: Sample G-24 6045(2) (SEM) site 11. Fluorite (6) appears to have dissolution voids and is likely diagenetic. A cutting made up of barite (4) and albite (5)



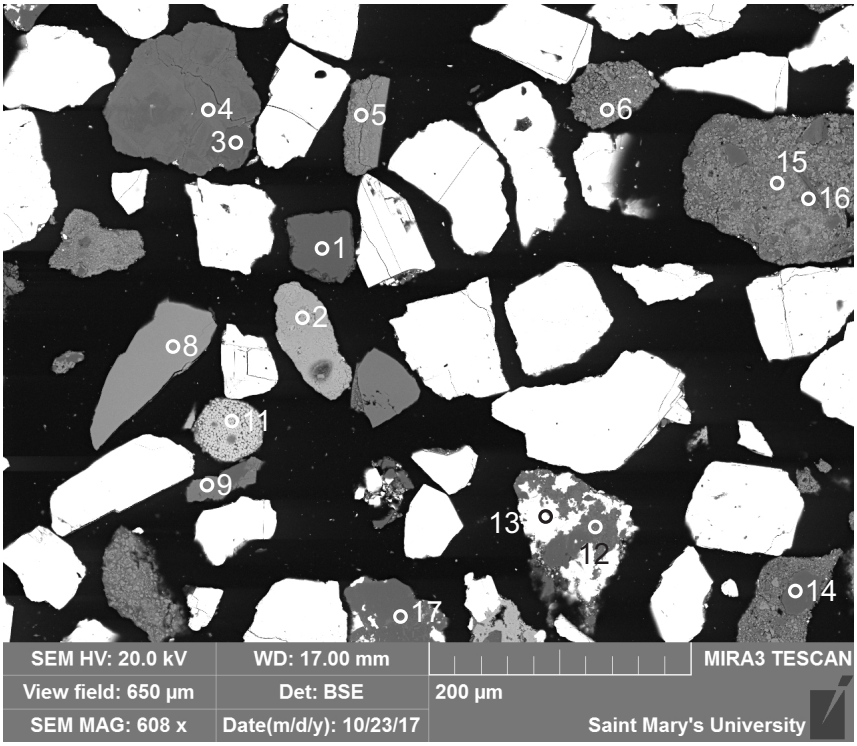
1:Ankerite
2:Albite
3:Siderite + Chlorite
4:Fluorite
5:Pyrite
6:Albite
7:Siderite + Chlorite
8:Barite
9:Barite
10:Siderite
11:Apatite + Albite +
12:Barite

Figure 1K.14: Sample G-24 6045(2) (SEM) site 12. Cutting made up of: albite (2) and siderite and chlorite (3); albite (6) and pyrite (5); mixture of albite and apatite (11) and siderite (10).



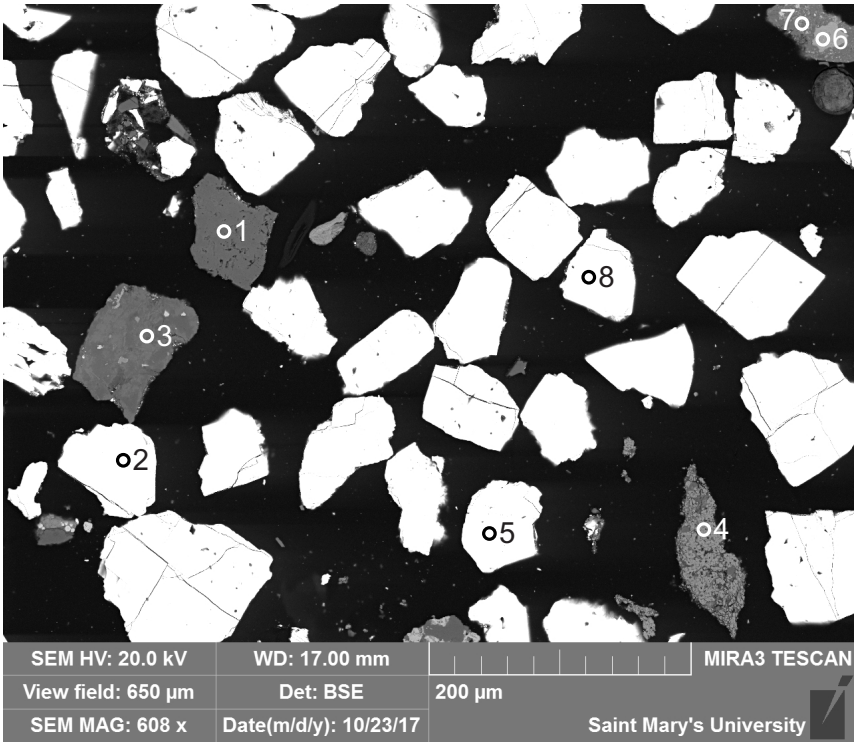
1:Chlorite
2:Magnetite
3:Albite
4:Siderite
5:Albite
6:Barite
7:Barite
8:Quartz
9:Corundum?
10:Mixture
11:Barite

Figure 1K.15: Sample G-24 6045(2) (SEM) site 13. Cuttings made up of: albite (5) and siderite (4); albite (3) and magnetite (2).



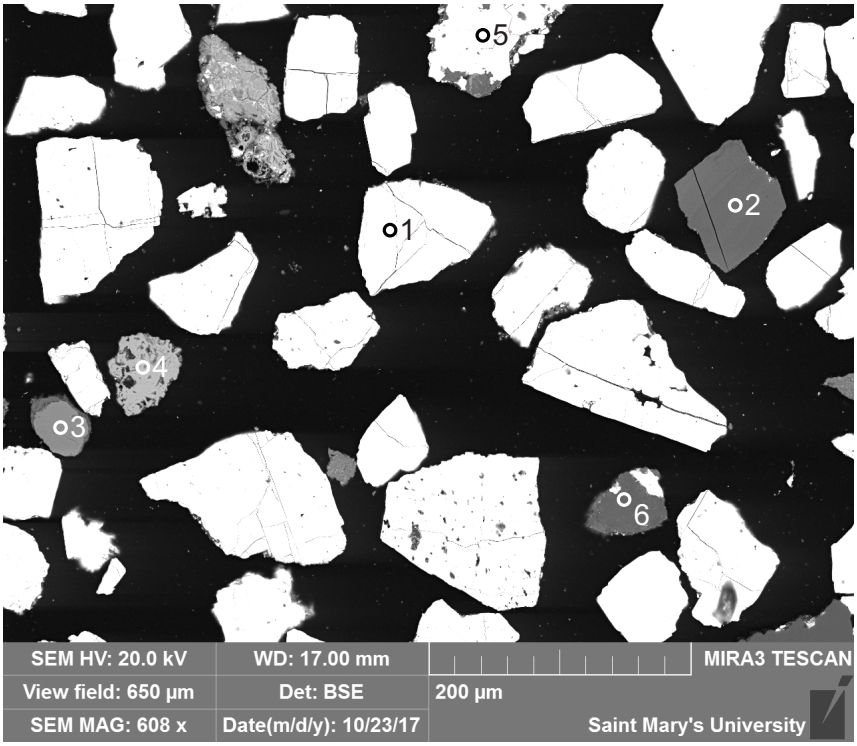
1:Quartz
2:Siderite +
3:Quartz +
4:Ankerite
5:Siderite + Chlorite
6:Siderite + Chlorite
7:Barite
8:Fluorite
9:Ankerite
10:Barite
11:Pyrite
12:Quartz +
13:Barite
14:Quartz
15:Mixture
16:Quartz
17:Muscovite

Figure 1K.16: Sample G-24 6045(2) (SEM) site 14. Cuttings made up of: quartz (3) and ankerite (4); quartz (12) and barite (13).



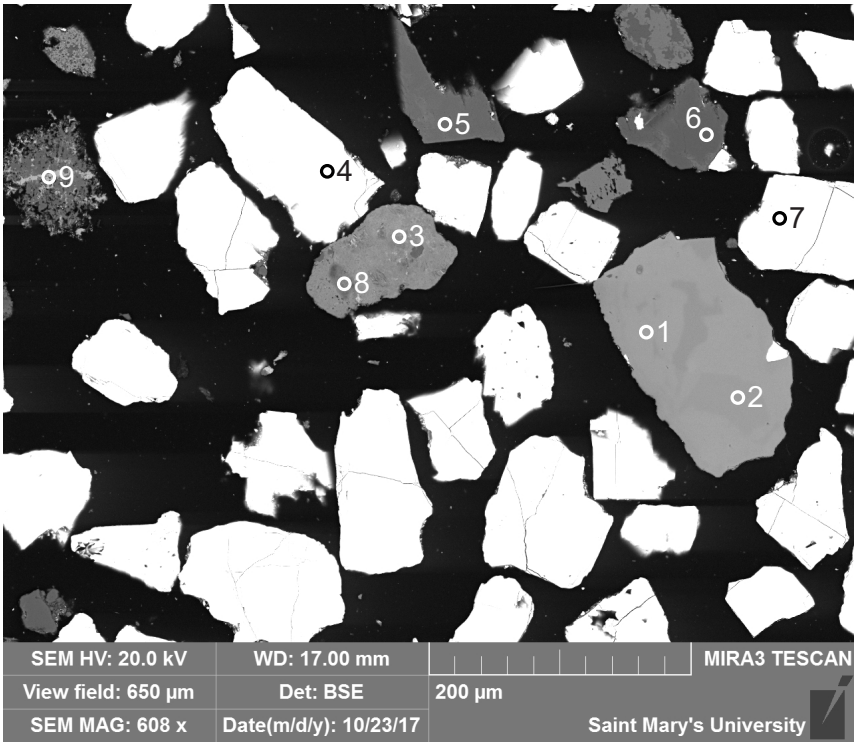
1:Ankerite
2:Barite
3:Feldspar
(Albite+K-feldspar)
4:Siderite +
5:Barite
6:Al-phosphate +
7:Biotite +
8:Barite

Figure 1K.17: Sample G-24 6045(2) (SEM) site 15. Al-phosphate (6) probably is replacing a mica (7).



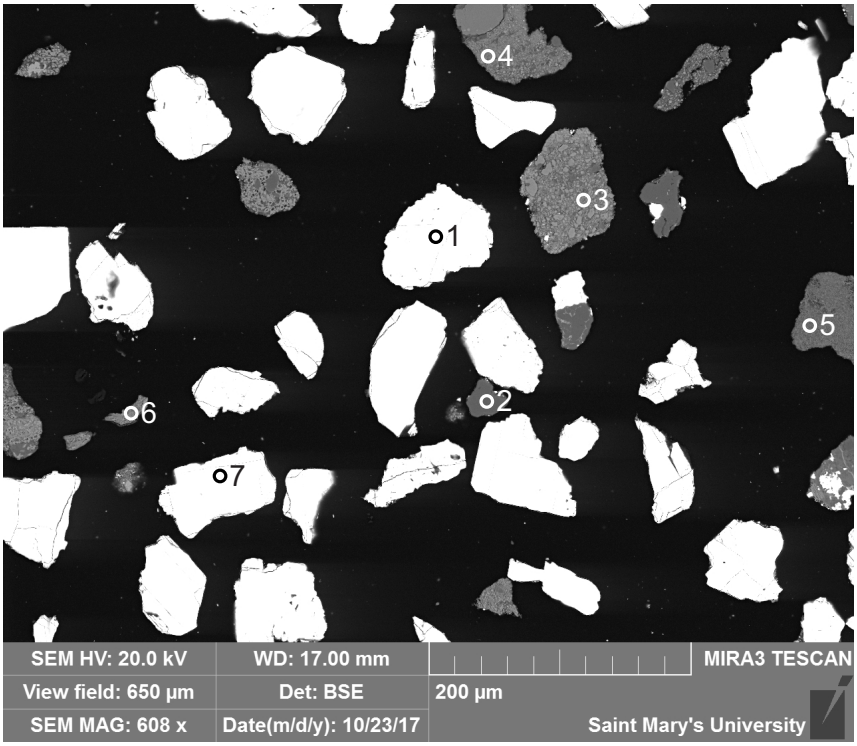
1:Barite
2:Ankerite
3:Siderite
4:Limonite +
5:Barite
6:Quartz +

Figure 1K.18: Sample G-24 6045(2) (SEM) site 16. Barite (5) is associated with quartz (6).



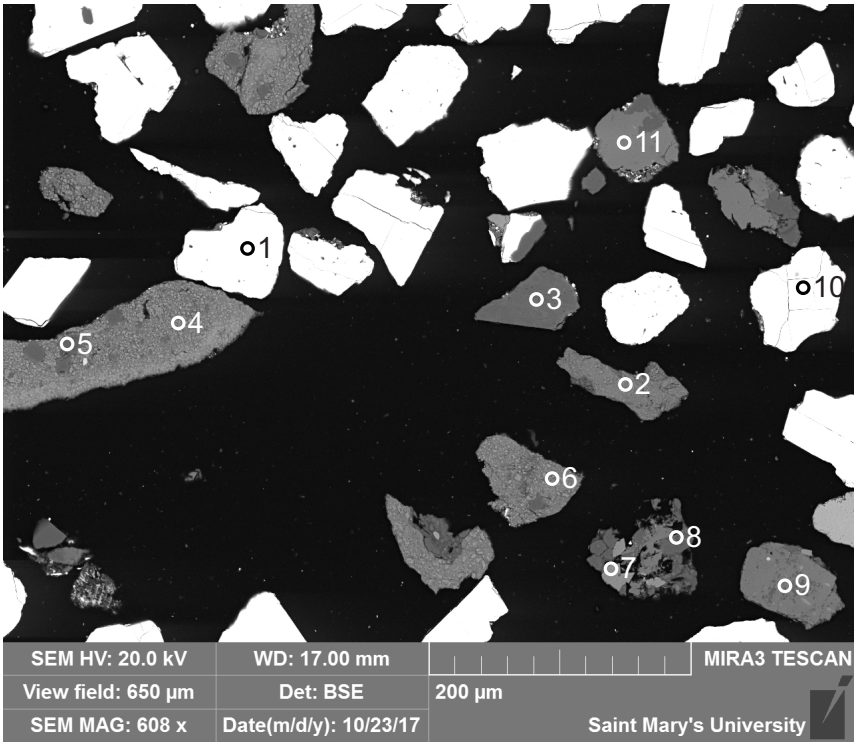
1:Fluorite
2:Fluorite
3:Mixture (Mn+Al)
4:Barite
5:Ankerite
6:Quartz
7:Barite
8:Mixture (Mn+Al)
9:Siderite

Figure 1K.19: Sample G-24 6045(2) (SEM) site 17. Fluorite (1,2) cutting shows dark patches, no change in chemistry is noted (Table 1K.1).



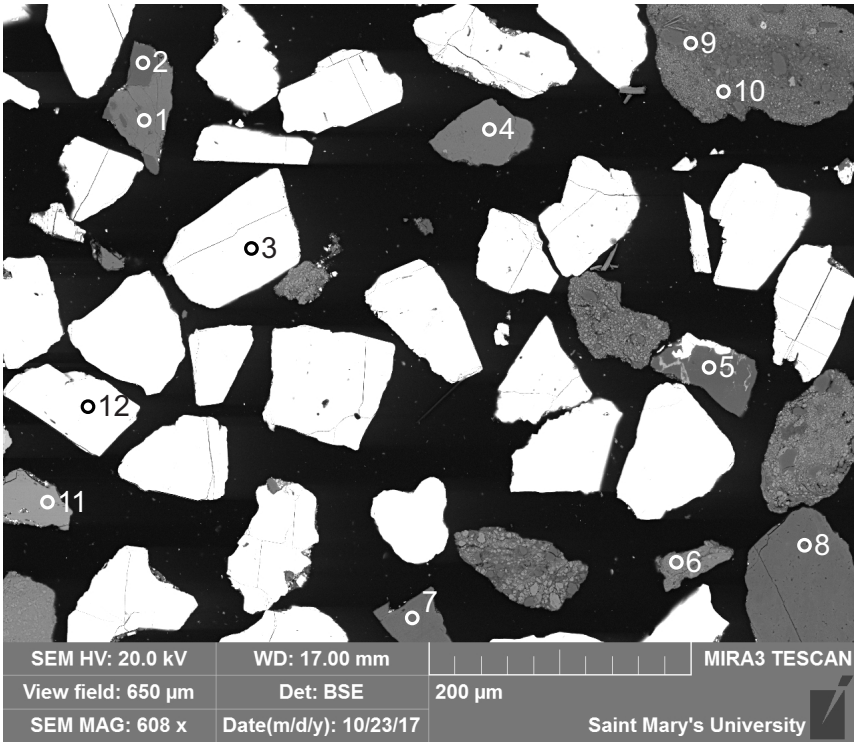
1:Barite
2:Quartz
3:Siderite +
4:Chlorite
5:Chlorite
6:Chlorite
7:Barite

Figure 1K.20: Sample G-24 6045(2) (SEM) site 18. Cuttings made up of chlorite (3-5).



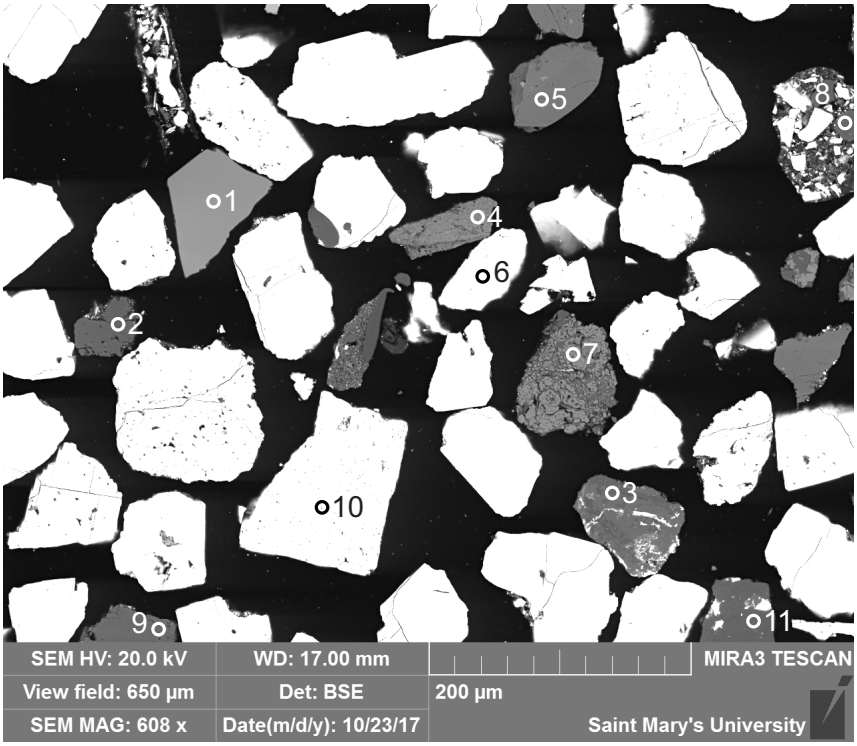
1:Barite
2:Chlorite
3:Ankerite
4:Siderite +
5:Quartz
6:Siderite +
7:Siderite
8:Quartz
9:Ankerite +
10:Barite
11:Ankerite

Figure 1K.21: Sample G-24 6045(2) (SEM) site 19. Cuttings made up mostly of quartz (5) and siderite (4).



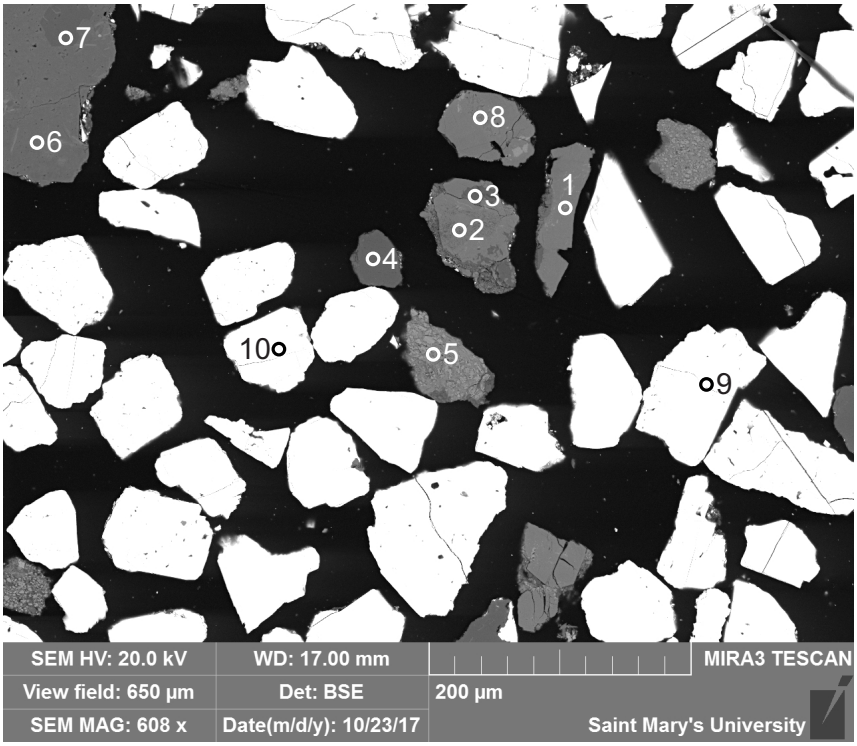
1:Ankerite + Chlorite
2:Quartz
3:Barite
4:Ankerite + 5:Quartz
6:Chlorite
7:Ankerite
8:Ankerite
9:Mixture
10:Mixture
11:Fluorite
12:Barite

Figure 1K.22: Sample G-24 6045(2) (SEM) site 20. Fluorite (11) has voids filled with drilling mud.



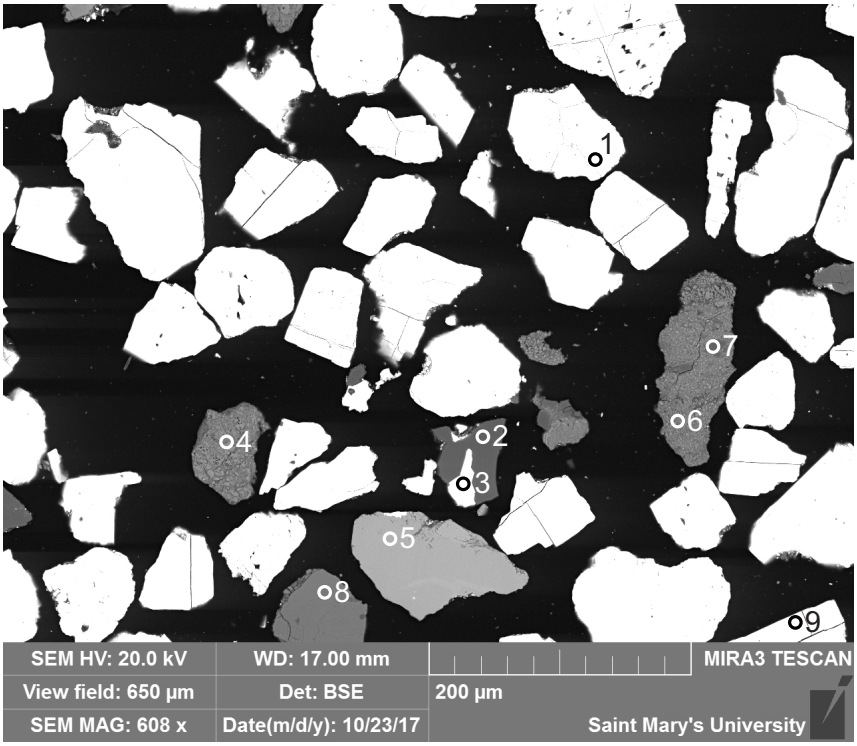
1:Fluorite
2:Ankerite
3:K-feldspar
4:Mixture
5:Ankerite + Chlorite
6:Barite
7:Siderite + 8:Quartz + 9:Ankerite
10:Barite
11:Quartz +

Figure 1K.23: Sample G-24 6045(2) (SEM) site 21. Grains of K-feldspar (3) and quartz (11) appears to be associated with barite.



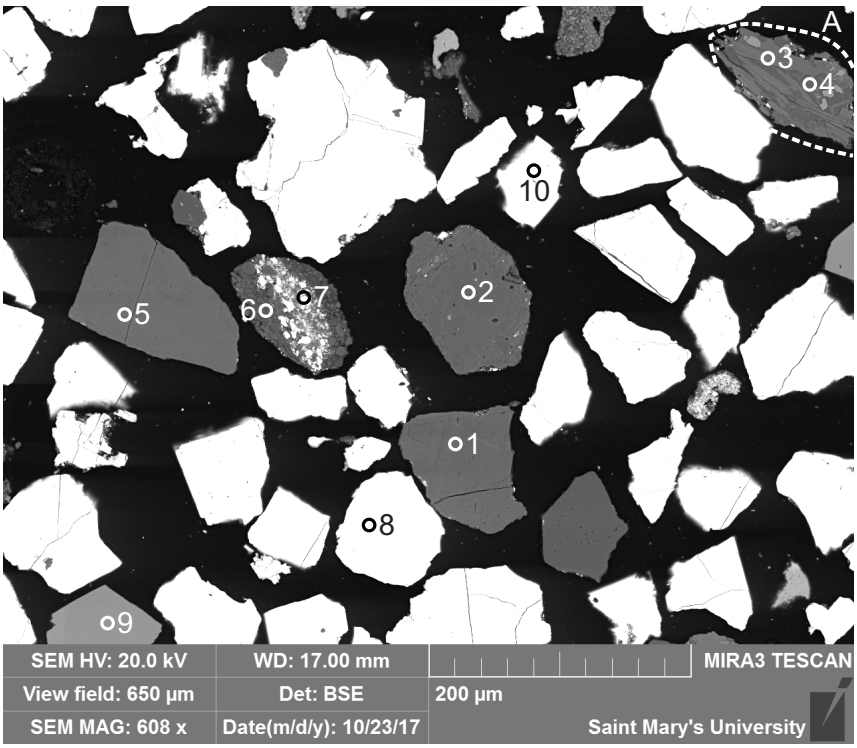
1:Ankerite +
2:Ankerite + Quartz
3:Albite
4:Quartz
5:Chlorite
6:Ankerite
7:Quartz
8:Fluorite +
9:Barite
10:Barite

Figure 1K.24: Sample G-24 6045(2) (SEM) site 22. Cuttings made up: albite (3) and ankerite and quartz (2); quartz (7) and ankerite (6).



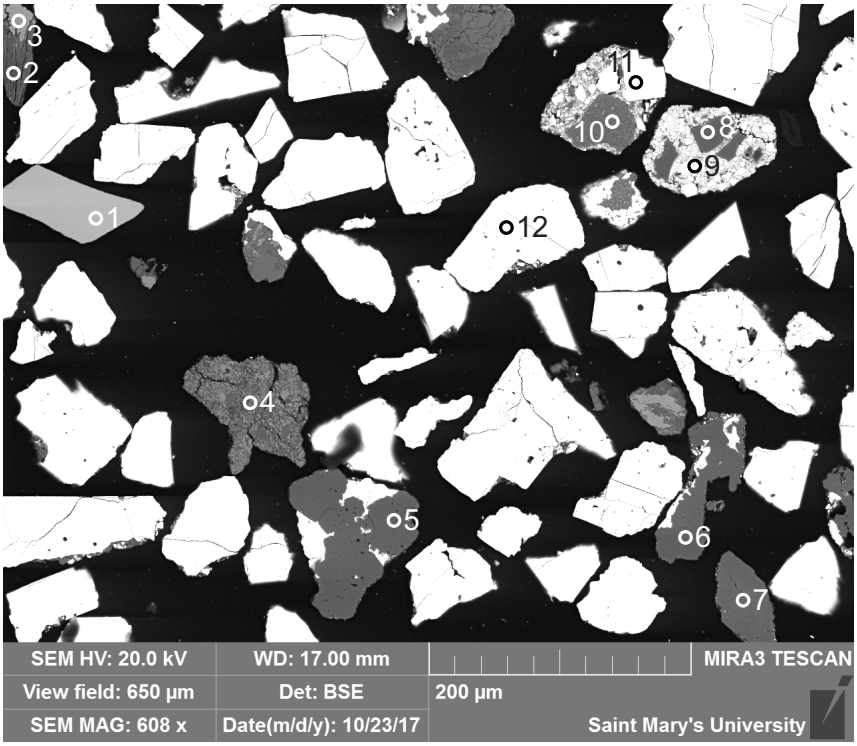
1:Barite
2:Quartz
3:Barite
4:Siderite + Chlorite
5:Zincite +
6:Siderite +
7:Quartz +
8:Ankerite
9:Barite

Figure 1K.25: Sample G-24 6045(2) (SEM) site 23. A cutting made up of quartz (3) and barite (3).



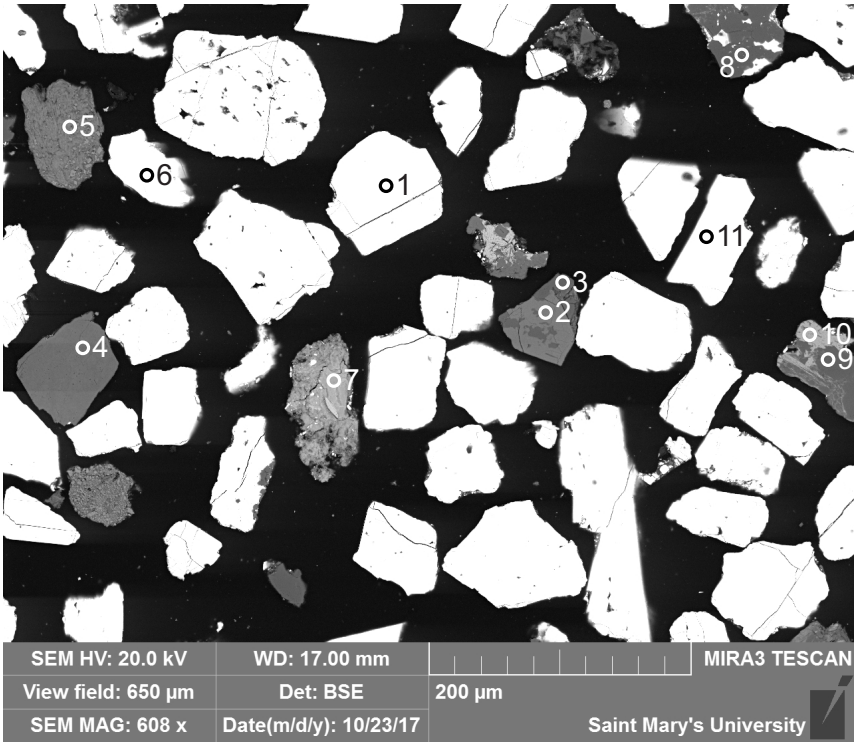
1:Ankerite
2:Ankerite +
3:Muscovite
4:Albite
5:Ankerite
6:Quartz +
7:Barite
8:Barite
9:Fluorite
10:Barite

Figure 1K.26: Sample G-24 6045(2) (SEM) site 24. A cutting made up of muscovite (3) and albite (4) is possibly a lithic clast (slate; A).



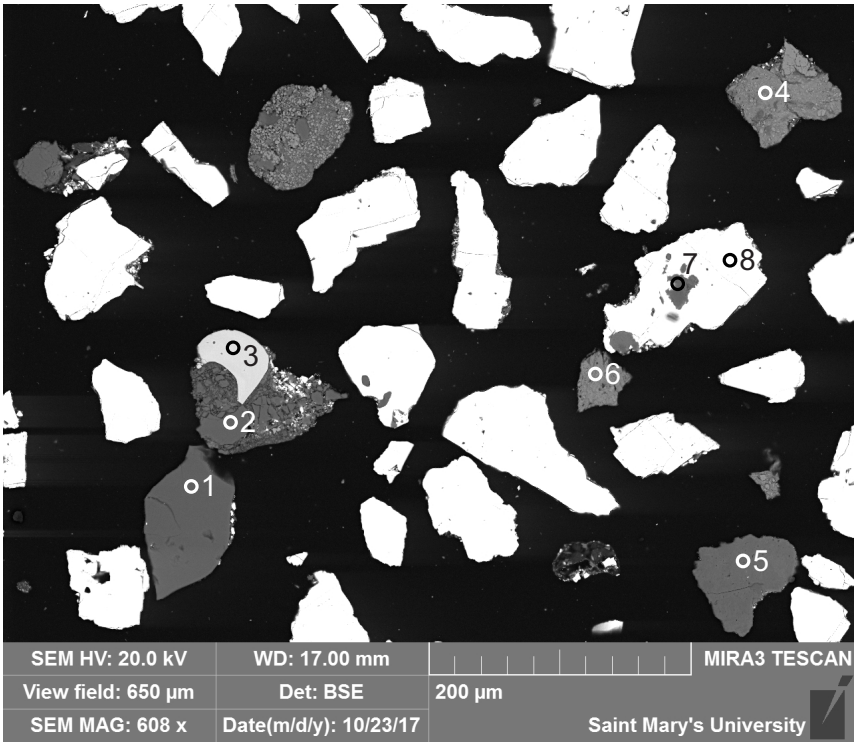
1:Limonite
2:Kaolinite +
3:TiO_2
4:Siderite +
5:Quartz
6:Quartz
7:Ankerite
8:Quartz
9:Barite
10:K-feldspar +
11:Barite
12:Barite

Figure 1K.27: Sample G-24 6045(2) (SEM) site 25. Cuttings made up of: kaolnite (2)and TiO_2 (3); K-feldspar (10) and barite (11); quartz (8) and barite (9). Certain grains of quartz appear to be associated with barite (5,6).



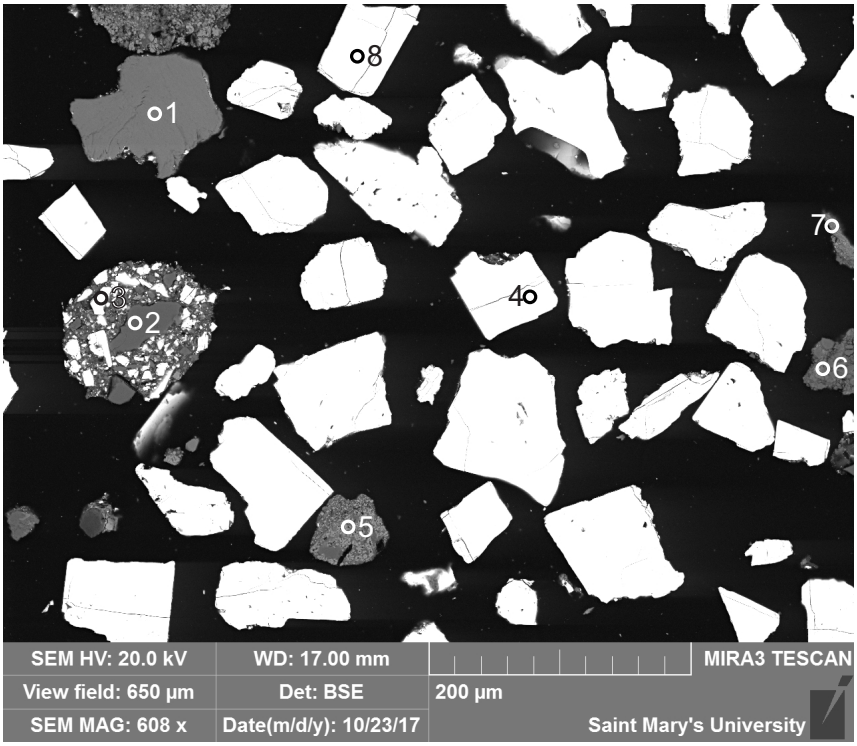
1:Barite
2:Ankerite
3:Quartz
4:Ankerite
5:Chlorite
6:Barite
7:Limonite
8:Quartz
9:Quartz
10:Mixture
11:Barite

Figure 1K.28: Sample G-24 6045(2) (SEM) site 26. A cutting made up of quartz (3) and ankerite (2).



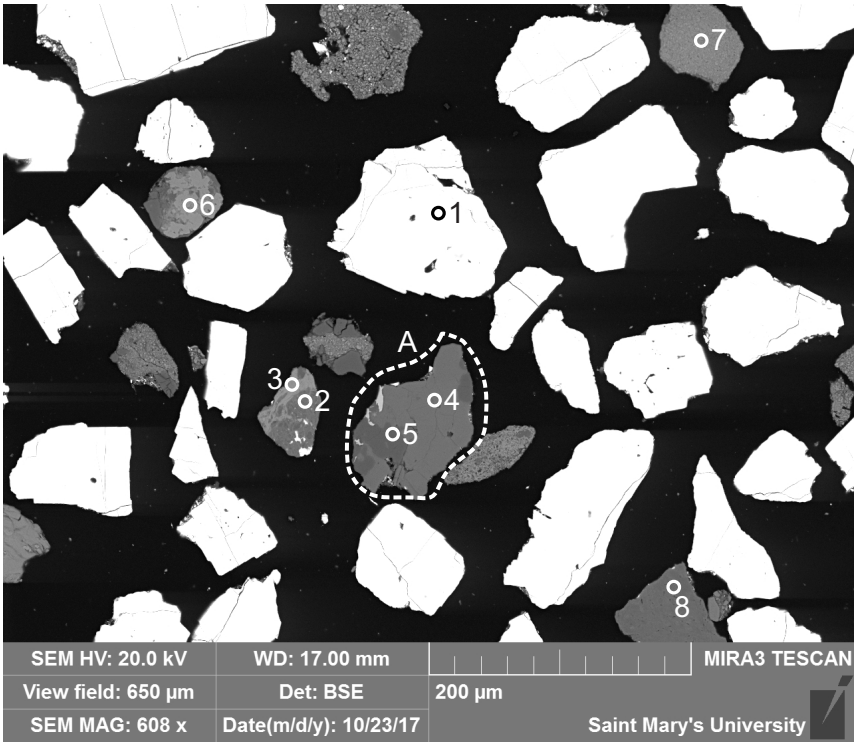
1:Quartz
2:Quartz
3:Zircon
4:Chlorite
5:Ankerite +
6:Chlorite
7:Quartz +
8:Barite

Figure 1K.29: Sample G-24 6045(2) (SEM) site 27. Cuting made up of quartz (3) and zircon (3); barite (8) and quartz (7).



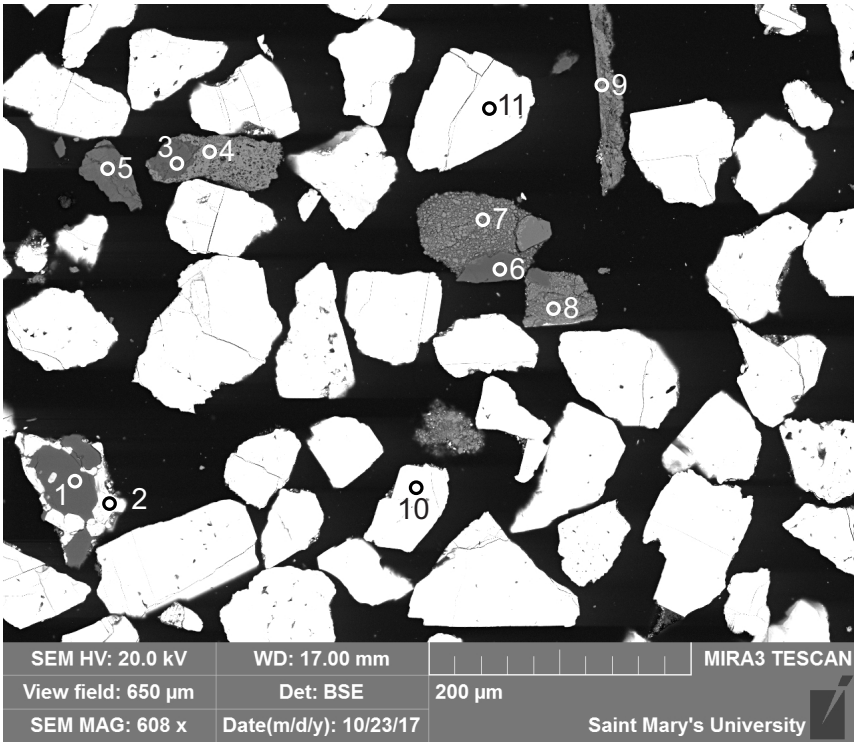
1:Chlorite
2:Quartz
3:Barite
4:Barite
5:Mixture
6:Quartz +
7:Mixture
8:Barite

Figure 1K.30: Sample G-24 6045(2) (SEM) site 28. A cutting made up of quartz (2) and barite (3) from drilling mud.



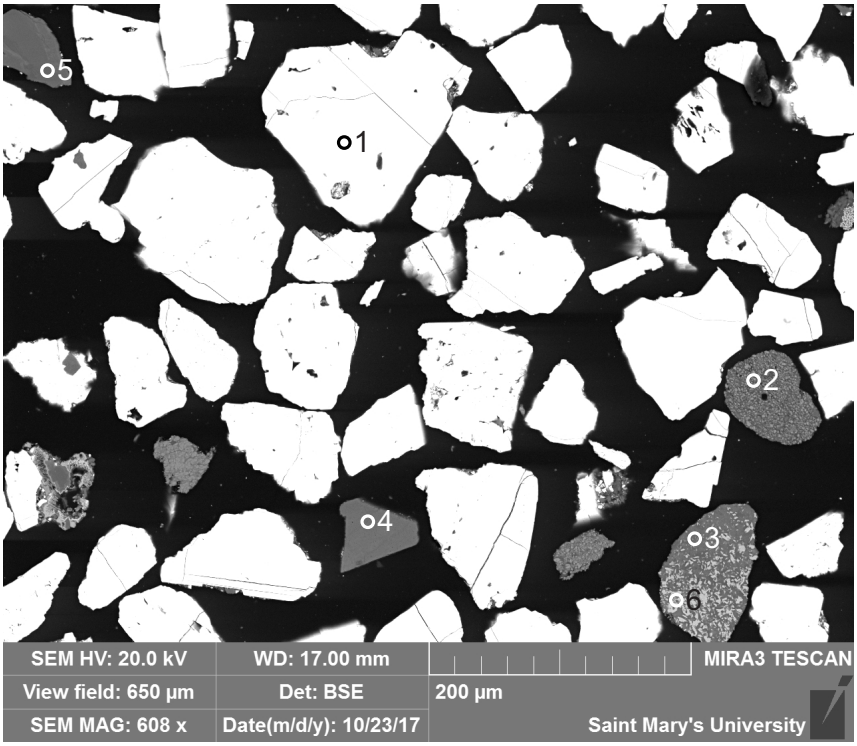
1:Barite
2:Muscovite +
3:Chlorite
4:K-feldspar
5:Quartz
6:Siderite + Chlorite
7:Chlorite
8:Ankerite

Figure 1K.31: Sample G-24 6045(2) (SEM) site 29. Cuttings made up of: muscovite (2) and chlorite (3). A lithic clast (A) made up of K-feldspar (4) and quartz (5).



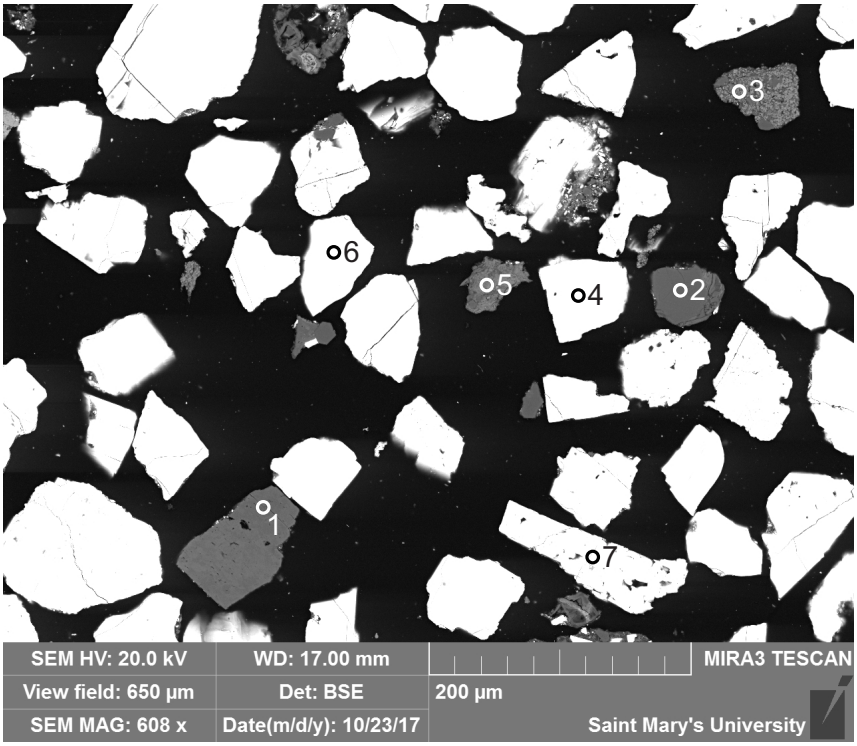
1:Quartz
2:Barite
3:Muscovite + Kaolinite
4:Siderite + Chlorite
5:Ankerite
6:Quartz
7: Siderite + Chlorite
8:Siderite + Chlorite
9:Siderite + Chlorite
10:Barite
11:Barite

Figure 1K.32: Sample G-24 6045(2) (SEM) site 30. Cuttings made up of: quartz (1) and barite (2); muscovite and kaolinite (3) and siderite and chlorite (4); quartz (6) and siderite and chlorite (7).



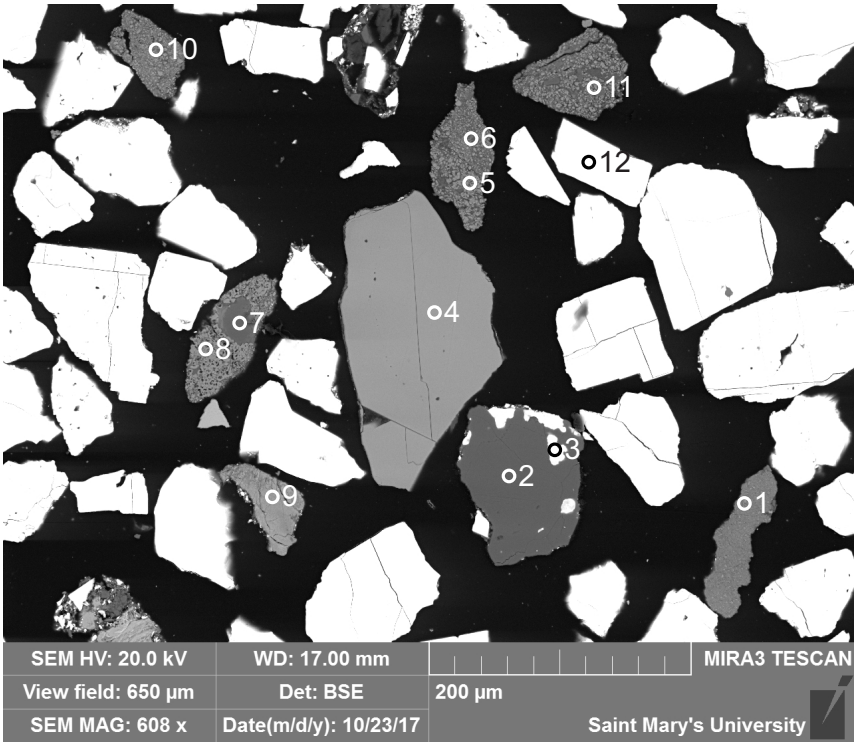
1:Barite
2:Chlorite
3:K-feldspar
4:Ankerite
5:Ankerite
6:K-feldspar + Limonite

Figure 1K.33: Sample G-24 6045(2) (SEM) site 31. K-feldspar appears to be associated with limonite (6).



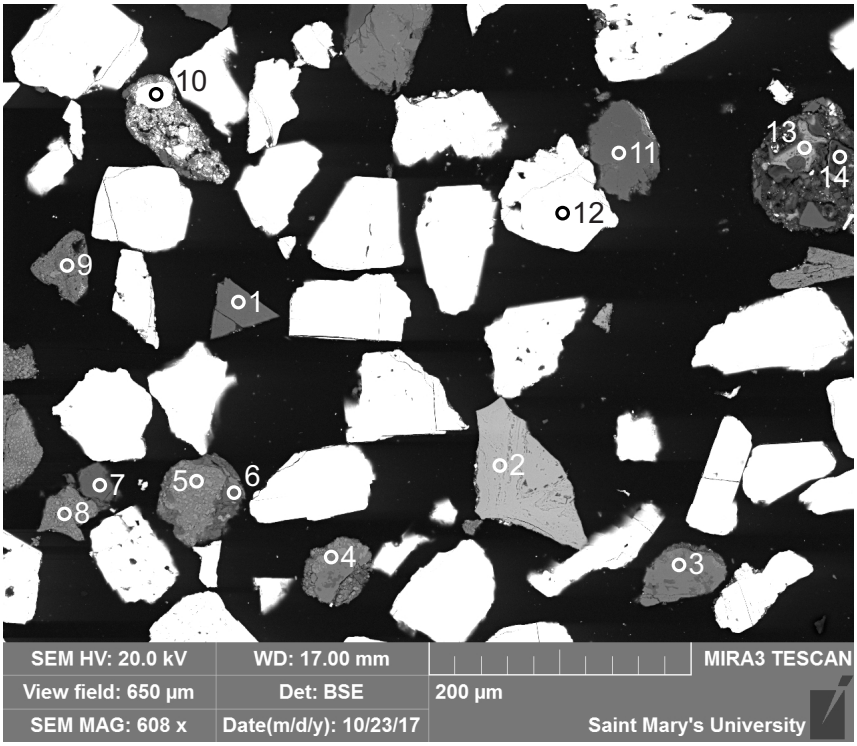
1:Ankerite
2:Quartz
3:Siderite +
4:Barite
5:Chlorite
6:Barite
7:Barite

Figure 1K.34: Sample G-24 6045(2) (SEM) site 32.



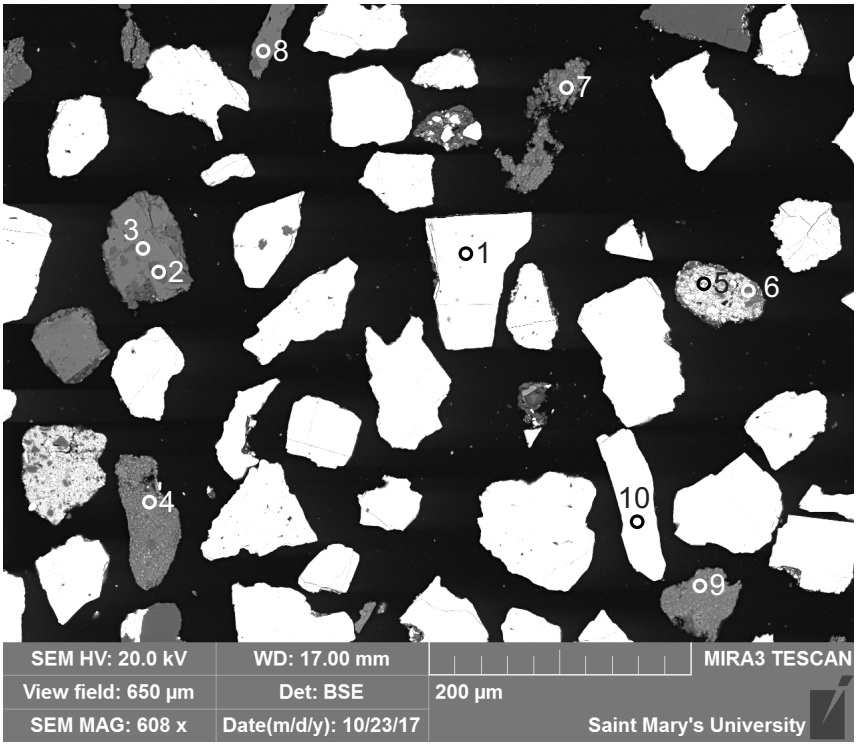
1:Chlorite
2:Quartz
3:Barite
4:Fluorite
5:Chlorite + Siderite
6:Chlorite + Siderite
7:Quartz
8:Siderite + Chlorite
9:Siderite +
10:Siderite +
Chlorite
11:Chlorite
12:Barite

Figure 1K.35: Sample G-24 6045(2) (SEM) site 33. Cuttings made up of: quartz (2) and barite (3); quartz (7) and siderite (8).



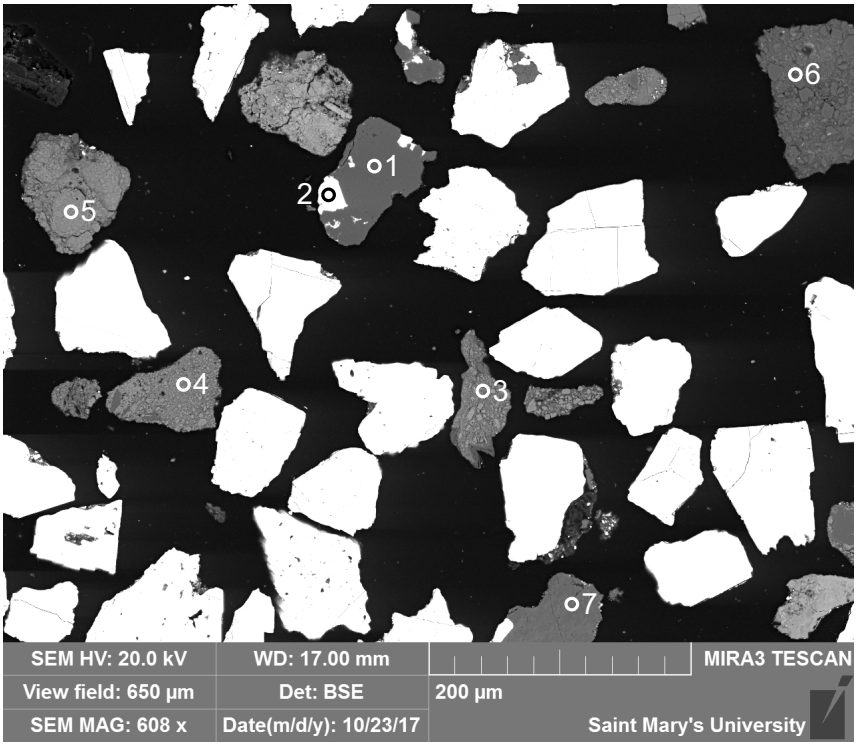
1:Ankerite
2:Limonite +
3:Ankerite +
4:Ankerite
5:Chlorite
6:Quartz +
7:Quartz
8:Mixture
9:Chlorite
10:Barite
11:Albite
12:Barite
13:Mixture
14:Mixture

Figure 1K.36: Sample G-24 6045(2) (SEM) site 34. A mixture of minerals (13,14) appears to be fragments of the host rock and drilling mud.



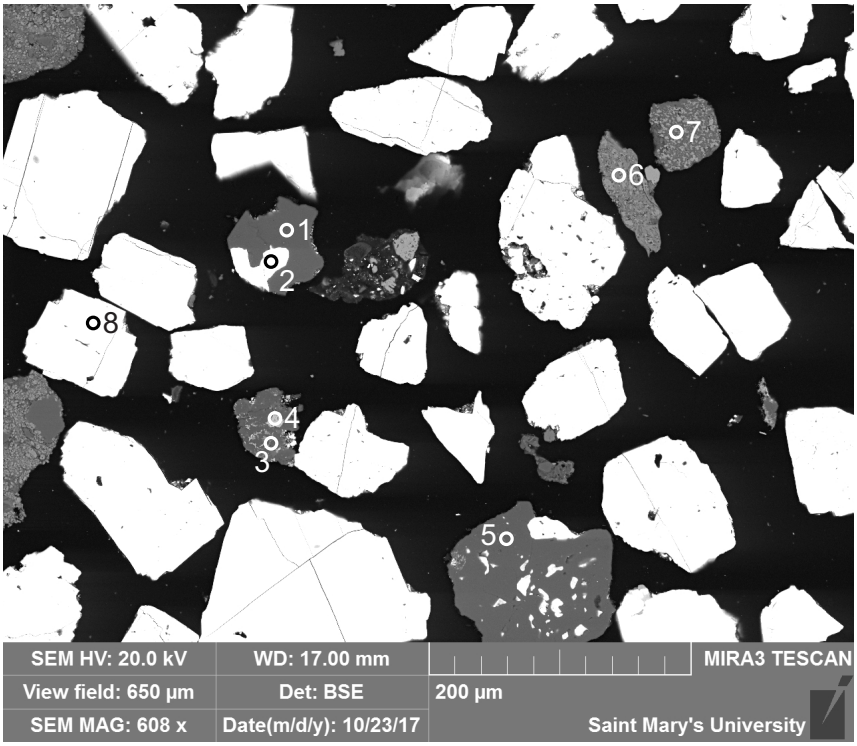
1:Barite
2:Quartz
3:Ankerite +
4:Siderite +
5:Barite +
6:Quartz +
K-feldspar
7:Albite +
8:Ankerite
9:Siderite +
10:Barite

Figure 1K.37: Sample G-24 6045(2) (SEM) site 35. Cuttings made up of: quartz and K-feldspar (6) and barite (6); quartz (2) and ankerite (3).



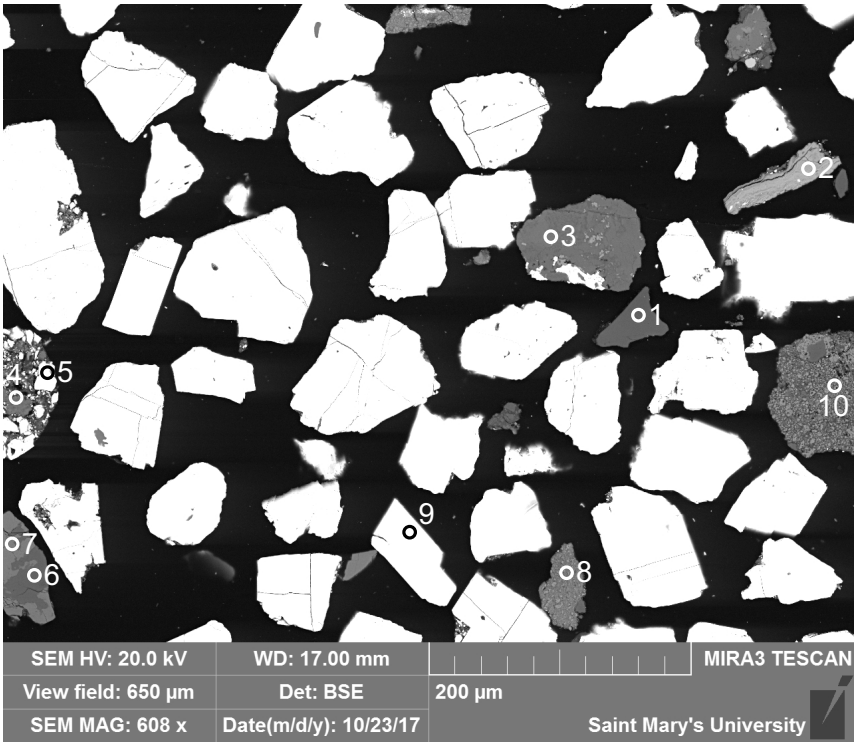
1:Quartz
2:Barite
3:Siderite + Chlorite
4:Siderite + Chlorite
5:Siderite + Chlorite
6:Mixture
7:Ankerite +

Figure 1K.38: Sample G-24 6045(2) (SEM) site 36. Cuttings made up of chlorite and siderite (3-5).



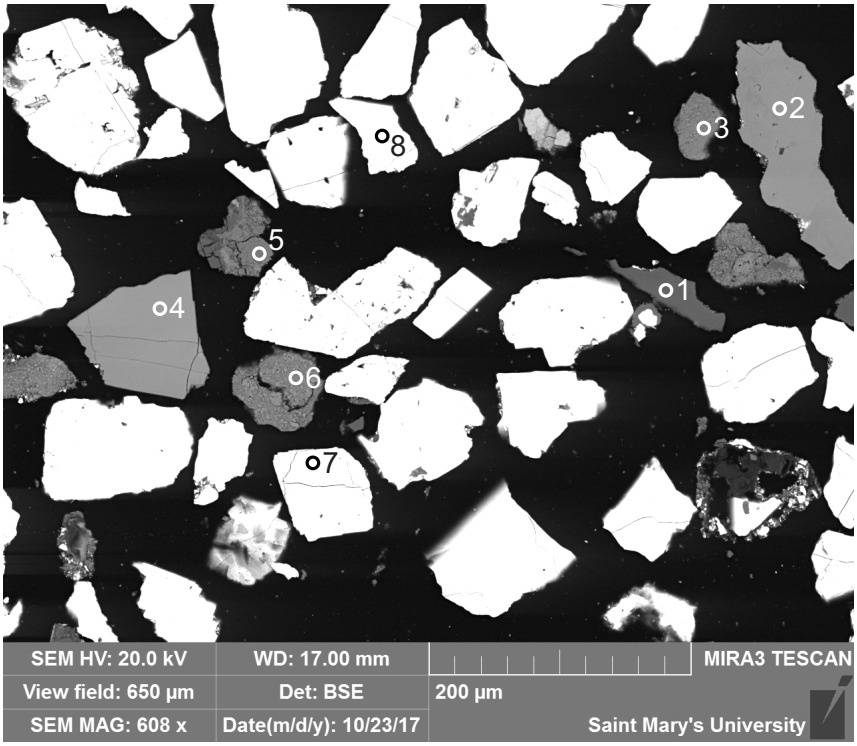
1:Quartz
2:Barite
3:K-feldspar +
4:Magnetite
5:Quartz
6:Siderite +
7:TiO_2 + Quartz
8:Barite

Figure 1K.39: Sample G-24 6045(2) (SEM) site 37. Cuttings made up of: quartz (1) and barite (2); K-feldspar (3) and magnetite (4).



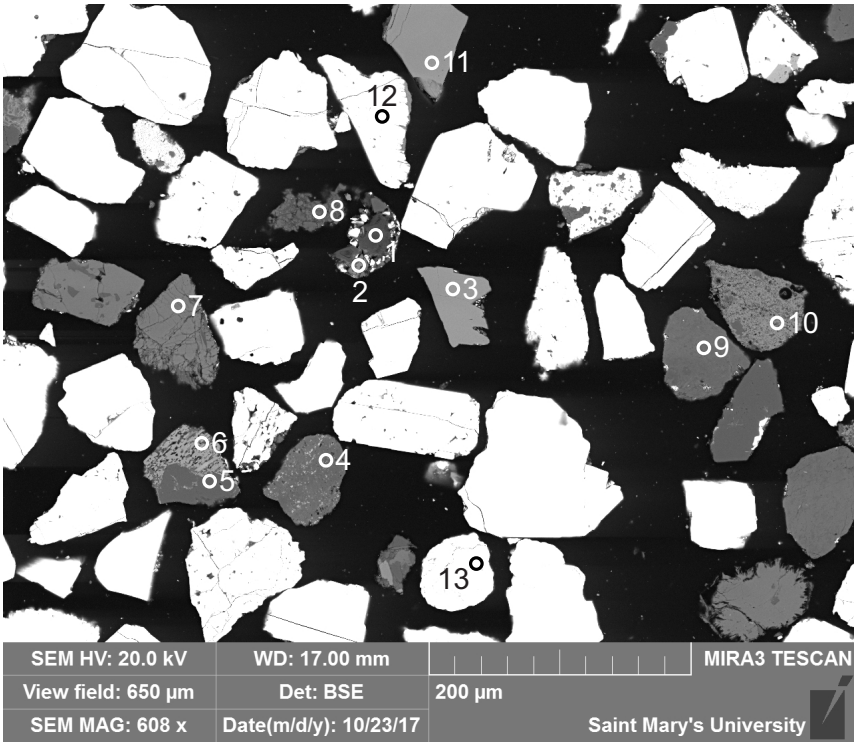
1:Quartz
2:Limonite +
3:K-feldspar
4:K-feldspar +
5:Barite
6:Albite
7:Ankerite +
8:Siderite + Chlorite
9:Barite
10:Siderite +

Figure 1K.40: Sample G-24 6045(2) (SEM) site 38. Cuttings made up of: K-feldspar (4) and barite (5); albite (6) and ankerite (7).



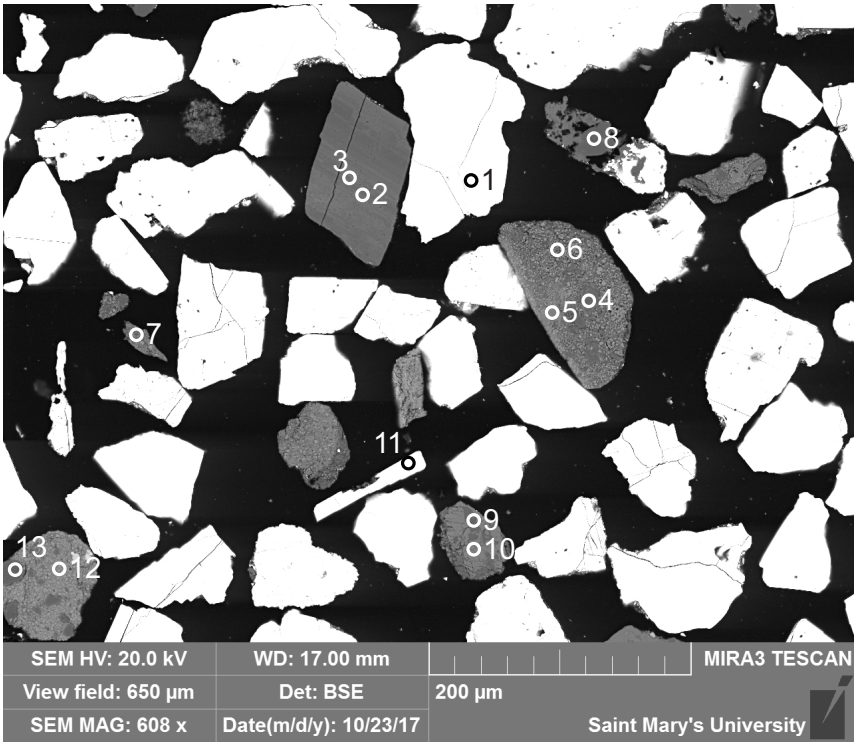
1:Quartz
2:Siderite
3:Chlorite
4:Fluorite
5:Ankerite
6:Chlorite
7:Barite
8:Barite

Figure 1K.41: Sample G-24 6045(2) (SEM) site 39. A cutting made up of ankerite (5) and quartz (?).



1:Mixture
2:Mixture
3:Siderite
4:Ankerite
5:Quartz
6:TiO_2
7:Ankerite
8:Albite
9:Ankerite +
10:Siderite +
11:Fluorite
12:Barite
13:Barite

Figure 1K.42: Sample G-24 6045(2) (SEM) site 40. A cutting made up of quartz (5) and TiO_2 (6) in which TiO_2 appears to be diagenetic.



1:Barite
2:Ankerite
3:Ankerite
4:Quartz
5:Chlorite
6:Siderite +
7:Chlorite
8:Quartz
9:Albite
10:Ankerite +
Chlorite
11:Barite
12:Siderite +
Chlorite
13:Quartz

Figure 1K.43: Sample G-24 6045(2) (SEM) site 41. Cuttings made up of: quartz (4), siderite (6), and chlorite (5); albite (9) and ankerite (10); quartz (13) and siderite and chlorite (12).

Table 1K.1 SEM-EDS chemical analyses of minerals from sample G-24 6045(2).

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	CuO	ZnO	As_2O_3	SrO	ZrO_2	BaO	WO_3	Total	Actual Total
1	1	Brt											36.63								1.77		61.65		100	112
1	2	Fl							47.06					52.94											100	168
1	3	Ank				6.27	0.69	19.41	29.64																56	57
1	4	Lm +	3.12		0.77	89.07			0.87			1.46						0.85	0.92	2.94					100	77
1	6	Brt											37.17										62.91		100	111
1	7	Brt											37.20								2.21		60.60		100	114
1	8	Ank	0.57			4.68	0.47	20.62	29.67																56	59
1	9	Chl +	34.93		13.07	31.61	0.31	4.44	0.64																85	81
1	10	Brt											36.85										63.18		100	114
1	11	Brt											36.63								1.41		61.97		100	114
1	12	Brt											36.88										63.25		100	116
1	13	Sd +	5.51		3.14	37.40	0.94	6.83	1.86		0.32														56	60
1	14	Qz +	77.33		3.79	1.54		0.59	1.87	0.78			0.72	9.49									1.53	2.38	100	69
2	1	Brt											36.85										63.36		100	114
2	2	Kfs	65.45		18.04						15.37												1.13		100	116
2	3	Ab	67.92		19.98				0.45	10.81	0.84														100	118
2	4	Brt											37.11										63.04		100	115
2	5	Sd + Chl	3.80		2.32	75.93	1.71	12.81	3.13		0.30														100	60
2	6	Sd + Chl	8.83		5.70	67.95	1.22	9.25	5.33		0.77	0.95													100	56
2	7	Brt											36.71										63.41		100	115
2	8	Mix	12.02		3.59	47.93	0.81	9.08	6.74		0.51	3.49	5.46										10.37		100	69
2	9	Qz	100.00																						100	117
2	10	Brt											36.76								2.66		60.63		100	114
2	11	Brt											36.74								3.38		59.87		100	117
2	12	Kfs	66.47		17.77						15.76														100	117
3	1	Chl	26.30		21.70	27.83		9.16																	85	96
3	2	Kfs+ Ab + Chl	59.32	0.39	26.90	4.31		1.46	0.28	4.04	3.30														100	84
3	3	Chl +	26.70		21.53	31.17		5.16	0.44																85	95
3	4	Brt											36.66								1.15		62.31		100	115
3	5	Qz	99.05			0.95																			100	117
3	6	Sd + Chl	4.23		2.90	77.14	1.59	11.13	3.00																100	59
3	7	Ank +	3.80		1.71	5.16	1.74	15.57	27.33		0.69														56	62
3	8	Fl							46.86					53.14											100	167
3	9	Lm +	2.81			96.25			0.94																100	85
3	10	Bt	39.06	2.41	21.84	19.64		4.05	2.10		6.05	0.84													96	81
3	11	Brt											36.82								1.41		61.85		100	118
3	12	Fl							47.17					52.83											100	165
3	13	Chl	30.44	0.61	17.31	17.74		18.67			0.23														85	98
3	14	Brt											36.66										63.42		100	113
4	1	Ab	67.56		20.27				0.81	10.78	0.57														100	117
4	2	Brt											36.67								0.99		62.43		100	115
4	3	Sd +	11.34	3.21	7.31	59.74	1.15	8.76	2.29		1.12													5.08	100	67
4	4	Brt											37.10								2.16		60.81		100	115

Table 1K.1 SEM-EDS chemical analyses of minerals from sample G-24 6045(2).

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	CuO	ZnO	As_2O_3	SrO	ZrO_2	BaO	WO_3	Total	Actual Total
4	5	Mix	48.76		11.46	4.37		1.26	3.50	0.63				16.56	0.28								4.17	9.00	100	63
4	6	Qz + Ms	90.71		5.94	0.96		0.40			1.99														100	116
4	7	Brt											37.10								1.02		62.00		100	114
4	8	Ank + Ab	17.51		5.06	22.56	0.86	12.20	37.88	3.94															100	71
4	9	Chl	21.19	0.65	17.21	38.70	0.46	5.96	0.83																85	75
4	10	Ank				5.94	1.85	17.90	30.30																56	59
4	11	Brt											36.56								1.42		62.02		100	115
4	12	Ms	52.33	0.65	26.06	4.03		1.95			9.99														95	103
4.1	1	Qz	99.64			0.36																			100	121
4.1	2	Lm +	11.10		6.64	75.44			0.63		1.66							0.61		3.92					100	84
4.1	3	Ms	45.08		26.13	12.96		1.71			9.12														95	101
5	1	Ank				5.71	2.01	18.37	29.91																56	59
5	2	Brt											37.01								2.80		60.37		100	116
5	3	Ank	0.48		0.39	17.17	0.65	9.54	27.78																56	62
5	4	Qz	99.24		0.62						0.13														100	122
5	5	Brt	2.73										36.09								1.57		59.66		100	116
5	6	Ank				7.31	1.71	17.43	29.54																56	60
5	7	Mix	19.41		5.73	29.21	0.48	3.15	17.85	0.71	0.57			22.89											100	101
5	8	Qz	99.60			0.40																			100	122
5	9	Brt											37.06								1.95		61.07		100	119
5	10	Brt											37.00										63.05		100	116
6	1	Brt											36.97								2.09		61.03		100	112
6	2	Kfs	66.60		17.23	0.44					15.74														100	114
6	3	Qz	99.45		0.54						0.02														100	116
6	4	Ab	68.75		18.68	0.26			0.39	11.91															100	118
6	5	Ank				15.09	0.97	8.46	31.48																56	59
6	6	Qz	99.73	0.27																					100	119
6	7	Chl + Ms	36.31	0.59	25.09	25.87	0.47	3.99	1.66	1.09	4.92														100	85
6	8	Ank				8.70	2.18	15.99	28.97						0.16										56	59
6	9	Ank				6.89	1.95	17.43	29.72																56	58
6	10	Chl	25.07		20.30	33.08		5.00	0.50														1.05		85	76
6	11	Ank +	1.64	3.54	1.42	15.54	0.51	7.82	25.54																56	63
6	12	Ms +	48.46	2.44	27.52	6.73		2.72			7.13														95	101
6	13	Sd + Chl	10.21		6.79	67.37	1.60	10.10	2.82		1.11														100	53
6	14	Ank				5.12	1.45	19.18	30.25																56	56
6	15	Chl +	24.23	0.89	16.72	33.11	0.59	4.82	2.87		1.77														85	78
6	16	Brt											36.85										63.23		100	113
6	17	Brt											37.10										63.07		100	113
7	1	Qz	100.00																						100	120
7	2	Brt											37.37								1.36		61.28		100	115
7	3	Sd +	11.30		5.98	67.44	1.66	9.86	2.70		1.07														100	54
7	4	Sd +	1.43		0.91	44.33	1.02	6.51	1.62		0.17														56	58
7	5	Ank				16.19	0.76	9.12	29.14			0.79													56	61

Table 1K.1 SEM-EDS chemical analyses of minerals from sample G-24 6045(2).

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	CuO	ZnO	As_2O_3	SrO	ZrO_2	BaO	WO_3	Total	Actual Total
7	6	Sd + Chl	9.47	0.48	4.95	68.13	1.52	11.50	3.30		0.67														100	63
7	7	Qz	98.78			0.63		0.35	0.24																100	123
7	8	Ank				6.71	1.83	17.96	29.50																56	60
7	9	Ank				8.55	2.78	16.00	28.67																56	60
7	10	Ank				5.70	0.57	19.62	30.12																56	58
7	11	Brt											36.45								1.15		62.60		100	113
8	1	Fl							47.22					52.78											100	170
8	2	Chl	24.65		19.98	32.55		5.07	0.85		0.39													1.51	85	76
8	3	Kln +	43.37	1.41	36.17	6.49		8.57	1.66	2.08						0.25									100	99
8	4	Brt											36.88										63.15		100	113
8	5	Ank				14.78	0.61	9.54	31.06																56	60
8	6	Fl				0.21		0.81	45.84					53.14											100	129
8	7	Kfs +	74.18		14.93	1.20		0.48			9.20														100	120
8	8	Brt											36.95								1.07		62.04		100	117
8	9	Lm				96.52	0.41		1.73						1.34										100	73
8	10	Qz	100.00																						100	120
8	11	Brt											36.97				0.09				1.47		61.47		100	116
9	1	Fl							47.27					52.73											100	169
9	2	Qz	100.00																						100	122
9	3	Brt											36.77								1.83		61.53		100	115
9	4	Qz	99.51		0.49																				100	119
9	5	Lm +	8.45		0.81	87.86	1.06		0.94									0.88							100	79
9	6	Qz	100.00																						100	121
10	1	Brt											36.80								1.28		61.91		100	116
10	2	Mix	51.66	2.46	9.38	8.91		0.80	5.84	1.31			0.57	11.78	0.28									7.01	100	82
10	3	Mix	73.38		8.08	0.95		0.54	3.05	0.49				8.15	0.31								1.87	3.18	100	61
10	4	Qz	99.21		0.79																				100	119
10	5	Kfs	66.75		17.72					1.79	13.74														100	117
10	6	Ank				10.11	0.91	16.37	28.61																56	60
10	7	Mix	13.92	0.77	10.63	62.34	1.31	9.42	1.62																100	71
10	8	Brt											36.70										63.38		100	114
11	1	Fl							47.27					52.73											100	170
11	2	Brt											36.64								1.78		61.72		100	116
11	3	Ank				13.64	1.44	9.07	31.85																56	60
11	4	Brt											37.02								1.16		61.90		100	116
11	5	Feld +	66.90		18.95	6.04		1.84	0.63	0.75	2.35		0.65		0.24								1.64		100	54
11	6	Fl							46.57					53.43											100	167
11	7	Sd +	5.28		2.76	33.31	0.75	3.75	3.77		0.33	2.29											0.59	3.17	56	63
11	8	Ms + Chl	58.44		27.86	5.44		1.28	0.56	0.32	3.53													2.56	100	100
11	9	Ank +	2.32		0.78	15.09	0.52	8.36	28.92																56	62
11	10	Fl							47.85					52.15											100	172
11	11	Brt											36.88										63.14		100	115
11	12	Brt											36.97								1.31		61.76		100	115

Table 1K.1 SEM-EDS chemical analyses of minerals from sample G-24 6045(2).

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	CuO	ZnO	As_2O_3	SrO	ZrO_2	BaO	WO_3	Total	Actual Total
12	1	Ank	0.74			16.34	0.74	9.55	28.64																56	60
12	2	Ab	66.81		21.37	1.29				10.53															100	114
12	3	Sd + Chl	21.80	2.48	10.05	52.86	1.31	6.85	3.04		1.61														100	63
12	4	Fl			0.25				45.46				0.71	53.58											100	171
12	5	Py				28.84			0.41				70.49					0.26							100	207
12	6	Ab	69.06		18.50	0.37				12.07															100	118
12	7	Sd + Chl	5.62		3.23	70.03	0.58	8.26	6.10	0.72	0.27	1.23											1.24	2.71	100	71
12	8	Brt											36.66								1.65		61.82		100	114
12	9	Brt											36.64								1.57		61.80		100	116
12	10	Sd				46.25	1.08	7.50	1.17																56	62
12	11	Ap + Ab +	28.86	1.04	10.09	4.70		0.69	24.91	5.80	0.17	23.74													100	108
12	12	Brt											36.95										63.13		100	112
13	1	Chl	29.43		18.75	17.54	0.21	18.85			0.22														85	99
13	2	Mag	1.18	1.74		97.08																			100	91
13	3	Ab	68.81		18.32	0.36				11.34	1.17														100	121
13	4	Sd				44.83	0.76	7.18	2.34			0.89													56	62
13	5	Ab	59.59		16.01	4.25		1.74	7.62	10.78															100	106
13	6	Brt											36.82								2.03		61.31		100	117
13	7	Brt											36.59				0.01				1.22		62.18		100	117
13	8	Qz	100.00																						100	122
13	9	Contaminant	3.02		78.08	0.32			4.54				2.33	9.49	0.34								1.89		100	76
13	10	Mix	6.87	2.88	14.47	26.26	0.85	3.12	45.55																100	90
13	11	Brt	2.59		1.72	0.54		0.48	0.34				33.98										60.35		100	111
14	1	Qz	100.00																						100	120
14	2	Sd +	2.71		1.41	48.69	0.84	0.55	1.00			0.80													56	77
14	3	Qz +	95.29		2.91	0.49		0.25			1.05														100	118
14	4	Ank				8.94	0.92	16.91	29.23																56	57
14	5	Sd + Chl	9.98		6.25	62.98	0.83	9.09	6.64	0.62	0.74	0.92												1.94	100	65
14	6	Sd + Chl	8.44		5.54	67.16	1.54	10.15	2.90		0.60													3.67	100	58
14	7	Brt											36.58								1.34		62.09		100	115
14	8	Fl							47.08					52.92											100	169
14	9	Ank	0.49			16.73	0.71	9.17	28.90																56	61
14	10	Brt											36.40				0.03				1.14		62.43		100	115
14	11	Py				29.41							69.19											1.40	100	206
14	12	Qz +	83.05	0.27	7.29	4.96					4.43														100	121
14	13	Brt	1.52										36.31										60.21	2.01	100	120
14	14	Qz	99.66			0.34																			100	124
14	15	Mix	19.14		10.87	47.05	1.40	6.13	6.80	0.53	1.52	3.89	1.02										1.65		100	75
14	16	Qz	99.29			0.71																			100	121
14	17	Ms	55.25		26.33	1.87		1.01		1.90	8.65														95	116
15	1	Ank				5.75	1.15	19.58	29.52																56	58
15	2	Brt											36.69								1.68		61.70		100	116
15	3	Kfs + Ab	63.84		23.54	0.55			0.51	4.72	4.58			2.26											100	109

Table 1K.1 SEM-EDS chemical analyses of minerals from sample G-24 6045(2).

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	CuO	ZnO	As_2O_3	SrO	ZrO_2	BaO	WO_3	Total	Actual Total
15	4	Sd +	3.66		2.59	41.02	0.87	5.97	1.41		0.48														56	63
15	5	Brt											36.77								1.05		62.23		100	117
15	6	Al-phosphate +	9.05		30.79	2.50			1.52		1.61	30.33						1.26					22.94		100	92
15	7	Bt +	41.56	6.79	21.76	15.97		1.32			8.59														96	101
15	8	Brt											37.34										62.87		100	114
16	1	Brt											36.86										63.24		100	113
16	2	Ank				8.70	0.85	17.25	29.20																56	59
16	3	Sd				46.35	1.08	7.03	1.55																56	60
16	4	Lm +	10.20		1.73	81.34			0.93			0.86			0.35				3.99	0.60					100	80
16	5	Brt											37.01										63.04		100	112
16	6	Qz +	90.23		5.02	0.37					4.38														100	120
17	1	Fl							47.43					52.57											100	172
17	2	Fl							47.23					52.77											100	172
17	3	Mix (Mn+Al)	11.58		27.21	2.43	42.55	2.59	0.84		1.35			8.43				1.52					1.49		100	92
17	4	Brt											36.98										63.07		100	114
17	5	Ank				7.62	2.01	16.69	29.68																56	59
17	6	Qz	99.59		0.41																				100	120
17	7	Brt											36.75								1.40		62.00		100	116
17	8	Mix (Mn+Al)	3.98		24.63	10.15	43.96	5.76	0.65	0.68	0.47			7.69				1.17					0.88		100	85
17	9	Sd	0.91			34.34	0.65	7.36	12.73																56	70
18	1	Brt											36.70				0.03				2.19		61.09		100	116
18	2	Qz	100.00																						100	122
18	3	Sd +	15.01		7.17	56.12	0.46	7.81	3.55		0.80		1.18										2.59	5.31	100	65
18	4	Chl	26.15		21.53	31.64		5.12	0.57																85	85
18	5	Chl	27.08		22.58	30.72		4.62																	85	79
18	6	Chl	22.76		17.81	36.85		5.89	1.69																85	84
18	7	Brt											36.97								1.68		61.38		100	116
19	1	Brt											36.77								1.49		61.86		100	114
19	2	Chl	24.63		19.07	34.54		6.09	0.65																85	83
19	3	Ank				6.09	0.73	19.44	29.74																56	58
19	4	Sd +	13.45		8.35	59.86	1.42	8.61	4.93		1.24	2.14													100	62
19	5	Qz	99.16		0.46	0.38																			100	121
19	6	Sd +	10.88		2.45	64.43	1.26	14.34	4.67		0.33	1.65													100	67
19	7	Sd				46.67	0.96	7.36	1.02																56	62
19	8	Qz	100.00																						100	126
19	9	Ank +	20.33		5.29	23.26	0.89	12.19	34.83	2.34		0.87													100	73
19	10	Brt											36.78				0.03						63.19		100	114
19	11	Ank				17.20	0.77	9.34	28.70																56	59
20	1	Ank + Chl	3.95		2.99	29.83	1.16	15.29	46.77																100	62
20	2	Qz	100.00																						100	119
20	3	Brt											36.69								1.07		62.40		100	115
20	4	Ank +	2.49		0.65	13.34	1.29	7.87	29.85		0.50														56	62
20	5	Qz	100.00																						100	122

Table 1K.1 SEM-EDS chemical analyses of minerals from sample G-24 6045(2).

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	CuO	ZnO	As_2O_3	SrO	ZrO_2	BaO	WO_3	Total	Actual Total
20	6	Chl	22.10	0.37	18.63	36.73	0.31	6.11	0.75																85	87
20	7	Ank				5.65	1.65	17.85	30.68						0.18										56	59
20	8	Ank				5.77	0.91	19.23	30.09																56	60
20	9	Mix	55.95	0.91	26.53	8.47		1.78	0.66	0.77	4.94														100	80
20	10	Mix	39.29	0.65	23.71	24.43	0.47	3.18	1.10	0.56	3.19													3.43	100	77
20	11	Fl							47.65					52.35											100	168
20	12	Brt											36.55										63.57		100	115
21	1	Fl							47.30					52.70											100	168
21	2	Ank				0.27		22.80	32.64						0.29										56	56
21	3	Kfs	64.45		18.30	1.68		1.17		0.66	13.74														100	118
21	4	Mix	8.17		4.63	44.92	0.73	6.88	18.56	0.56	0.57	14.97													100	71
21	5	Ank + Chl	12.12		7.67	24.70	0.92	13.91	38.87		1.81														100	67
21	6	Brt											37.03				0.08				1.58		61.31		100	116
21	7	Sd +	3.39		1.89	38.06	0.91	6.44	3.35		0.50	1.47													56	66
21	8	Qz +	95.07		0.60	0.52		1.36	2.45																100	113
21	9	Ank				5.22	1.45	19.25	30.09																56	58
21	10	Brt											36.93								1.67		61.47		100	116
21	11	Qz +	95.51		2.69	0.29					1.27				0.24										100	120
22	1	Ank +	4.35		3.23	16.00	0.54	8.01	23.46		0.41														56	66
22	2	Ank + Qz	52.63			13.95	0.48	6.11	26.84																100	82
22	3	Ab	67.71		19.73	0.25			1.24	11.08															100	120
22	4	Qz	100.00																						100	121
22	5	Chl	27.05		21.80	30.80		5.35																	85	93
22	6	Ank	0.45			7.34	1.37	17.83	29.01																56	58
22	7	Qz	100.00																						100	117
22	8	Fl +				1.99	0.30	1.38	53.76	0.41				42.15											100	102
22	9	Brt											36.79										63.25		100	115
22	10	Brt											36.84				0.04						63.12		100	115
23	1	Brt											36.89								2.34		60.96		100	114
23	2	Qz	100.00																						100	122
23	3	Brt											36.72								2.75		60.66		100	117
23	4	Sd				44.97	1.08	7.79	2.16																56	61
23	5	Zincite +				0.51	0.48	5.85	1.63										91.54						100	65
23	6	Sd + Chl	14.55	0.65	7.59	60.05	1.44	7.36	4.66	0.60	0.90	2.20													100	65
23	7	Qz +	92.45		2.30	4.11		0.33	0.42		0.38														100	113
23	8	Ank				16.67	0.71	9.23	29.40																56	60
23	9	Brt											36.98								2.30		60.75		100	118
24	1	Ank				5.10	0.88	19.85	30.18																56	57
24	2	Ank +	4.56		2.49	4.56	0.81	16.50	26.32		0.59				0.18										56	62
24	3	Ms	49.92	0.55	27.48	4.50		2.02			10.52														95	104
24	4	Ab	69.18	0.53	18.57				0.48	11.24															100	116
24	5	Ank				9.77	1.64	14.87	29.72																56	56
24	6	Qz +	78.14		11.74	4.01		1.05	0.41	1.34	0.71		1.76										0.84		100	100

Table 1K.1 SEM-EDS chemical analyses of minerals from sample G-24 6045(2).

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	CuO	ZnO	As_2O_3	SrO	ZrO_2	BaO	WO_3	Total	Actual Total
24	7	Brt											37.15								2.13		60.86		100	113
24	8	Brt											36.59								1.25		62.25		100	116
24	9	Fl							47.04					52.96											100	170
24	10	Brt											36.64								1.80		61.67		100	114
25	1	Lm	1.81			96.58	0.86		0.74																100	77
25	2	Kln +	53.89		36.36	0.64		0.73	0.43	0.38	2.24			5.34											100	89
25	3	TiO_2	2.17	93.83	1.00	0.82			0.99		0.23	0.97													100	102
25	4	Sd +	23.13	0.40	12.57	50.76	0.58	5.86	4.30		1.27	1.12													100	68
25	5	Qz	99.22		0.77						0.01														100	120
25	6	Qz	99.48		0.51						0.01														100	121
25	7	Ank				6.08	1.06	18.80	30.06																56	59
25	8	Qz	99.65		0.35																				100	121
25	9	Brt											36.79										63.37		100	110
25	10	Kfs +	60.67	6.80	17.72	0.46		0.37			13.97														100	115
25	11	Brt											37.01				0.03				2.31		60.65		100	115
25	12	Brt											36.75				0.03						63.22		100	113
26	1	Brt											37.10										62.97		100	114
26	2	Ank	0.55			17.39	0.83	9.09	28.13																56	60
26	3	Qz	99.32		0.68																				100	119
26	4	Ank				9.66	1.15	16.07	29.12																56	58
26	5	Chl	27.26		22.69	30.00		5.05																	85	92
26	6	Brt											36.54										63.54		100	114
26	7	Lm				98.07	0.52		0.83						0.58										100	75
26	8	Qz	100.00																						100	119
26	9	Qz	99.73			0.27																			100	123
26	10	Mix	11.76	2.06	4.74	77.86		1.03	1.63						0.37			0.55							100	84
26	11	Brt											37.04								2.27		60.80		100	116
27	1	Qz	100.00																						100	122
27	2	Qz	100.00																						100	122
27	3	Zrn	31.21																			68.79			100	121
27	4	Chl	26.39	0.52	19.00	31.93		5.85	0.74		0.58														85	85
27	5	Ank +	1.63		1.15	6.55	1.18	17.86	27.64																56	63
27	6	Chl	26.76	0.31	20.23	31.46		5.80	0.44																85	93
27	7	Qz +	83.53	0.27	10.44	1.21		0.87			3.68														100	119
27	8	Brt											36.92										63.17		100	115
28	1	Chl	28.01		18.99	20.32		17.69																	85	96
28	2	Qz	100.00																						100	121
28	3	Brt											37.00								1.06		62.02		100	114
28	4	Brt											36.88										63.22		100	114
28	5	Mix	65.16		9.02	20.51	0.47	2.25	1.05		1.53														100	97
28	6	Qz +	93.38		2.94	2.67		0.63	0.27		0.11														100	108
28	7	Mix	21.01		17.58	51.07	0.86	8.07	1.42																100	72
28	8	Brt											37.05								3.56		59.49		100	114

Table 1K.1 SEM-EDS chemical analyses of minerals from sample G-24 6045(2).

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	CuO	ZnO	As_2O_3	SrO	ZrO_2	BaO	WO_3	Total	Actual Total
29	1	Brt											36.85								1.85		61.38		100	114
29	2	Ms +	52.80	0.88	24.42	4.65		1.48			10.77														95	110
29	3	Chl	24.87	1.12	19.17	37.55		1.94			0.36														85	98
29	4	Kfs	65.16	0.42	18.24	0.34				0.90	14.95														100	115
29	5	Qz	100.00																						100	121
29	6	Sd + Chl	16.02		13.55	55.19	1.38	5.98	7.87																100	76
29	7	Chl	22.71		18.10	36.74	0.26	6.17	1.01																85	86
29	8	Ank				6.18	0.82	19.22	29.77																56	59
30	1	Qz	100.00																						100	120
30	2	Brt											36.78								1.45		61.81		100	115
30	3	Ms + Kln	61.53	0.25	31.35	1.06		0.57			3.98			1.25											100	99
30	4	Sd + Chl	4.04		2.88	73.33	1.52	14.33	3.91																100	55
30	5	Ank				6.73	1.14	18.59	29.54																56	50
30	6	Qz	99.70			0.30																			100	122
30	7	Sd + Chl	12.63		10.86	64.18	1.06	8.92	2.35																100	64
30	8	Sd + Chl	18.92		11.95	55.47	1.23	8.58	2.38		1.47														100	68
30	9	Sd + Chl	7.63	1.09	4.55	54.24	0.74	13.34	10.98		0.55	6.88													100	71
30	10	Brt											36.61								1.03		62.43		100	118
30	11	Brt											36.72								1.54		61.85		100	115
31	1	Brt											36.84				0.09						63.08		100	113
31	2	Chl	26.20	0.48	15.80	33.85	0.77	4.30	1.89		1.71														85	65
31	3	Kfs	66.15		17.25	0.71				1.10	14.80														100	119
31	4	Ank				9.80	2.81	14.76	28.63																56	59
31	5	Ank				4.21	0.32	20.76	30.70																56	55
31	6	Kfs + Lm	33.73	1.95	9.65	47.70				1.30	5.67														100	110
32	1	Ank				6.60	0.68	19.18	29.53																56	59
32	2	Qz	100.00																						100	120
32	3	Sd +	15.21		9.45	60.48	1.48	10.16	2.35		0.87														100	62
32	4	Brt											36.75								1.78		61.47		100	116
32	5	Chl	27.62		23.06	29.42		4.35			0.55														85	91
32	6	Brt											37.13								2.85		60.02		100	115
32	7	Brt											36.71								1.81		61.48		100	117
33	1	Chl	26.94	0.35	20.35	30.86		6.15	0.36																85	92
33	2	Qz	100.00																						100	122
33	3	Brt											36.14										63.90		100	113
33	4	Fl							47.06					52.94											100	170
33	5	Chl + Sd	18.50	0.68	11.80	52.40	1.15	9.14	3.32		1.81	1.19													100	69
33	6	Chl + Sd	26.11		11.20	32.84	0.59	4.69	2.26	0.46	1.50	0.93	0.63										1.16	2.63	85	70
33	7	Qz	99.62			0.38																			100	121
33	8	Sd + Chl	2.13		0.76	42.38	0.73	8.09	1.91																56	62
33	9	Sd +	5.36		3.00	39.03	0.24	2.28	4.71		0.58	0.80													56	72
33	10	Sd + Chl	21.22		15.28	50.95	1.04	7.03	3.11		1.37														100	63
33	11	Chl	20.82	0.39	11.98	39.73	1.05	6.11	2.06		2.86														85	61

Table 1K.1 SEM-EDS chemical analyses of minerals from sample G-24 6045(2).

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	CuO	ZnO	As_2O_3	SrO	ZrO_2	BaO	WO_3	Total	Actual Total
33	12	Brt											36.73								1.87		61.49		100	115
34	1	Ank				5.81	1.99	18.07	30.13																56	58
34	2	Lm +	5.41		1.74	84.67			0.86			2.53						1.14	1.02	2.63					100	81
34	3	Ank +	11.94			25.31	1.19	14.05	46.73			0.79													100	68
34	4	Ank				18.00	0.99	8.79	28.22																56	60
34	5	Chl	22.85		18.32	37.52		5.55	0.77																85	87
34	6	Qz +	92.87	0.29	4.31	1.57		0.37			0.59														100	110
34	7	Qz	99.74			0.26																			100	121
34	8	Mix	20.53		16.81	52.92	0.67	7.41	1.66																100	74
34	9	Chl	23.94	0.48	15.89	34.89	0.59	7.46	1.33		0.40														85	76
34	10	Brt											36.81										63.28		100	113
34	11	Ab	68.98		19.10				0.65	11.27															100	119
34	12	Brt											36.92								1.88		61.32		100	116
34	13	Mix	35.36	0.73	11.39	8.30	0.30	2.01	9.63	1.29			1.24	18.97									3.28	7.49	100	93
34	14	Mix	67.63	1.48	5.63	2.58		2.96	4.36	0.50				9.24	0.46									5.15	100	56
35	1	Brt											36.46								1.24		62.37		100	116
35	2	Qz	99.84						0.16																100	109
35	3	Ank +	0.82		0.69	17.28	0.62	9.40	27.19																56	60
35	4	Sd +	15.31	0.84	6.58	56.87	1.28	8.11	5.97	0.93	0.71	3.42													100	66
35	5	Brt +	5.84		2.72	1.17			0.33		0.70		30.59										56.38	2.50	100	93
35	6	Qz + Kfs	76.67	0.23	12.13	0.44					10.52														100	120
35	7	Ab +	55.15		19.15	13.09		2.17	1.23	8.72	0.49														100	79
35	8	Ank				16.55	0.64	10.63	28.17																56	60
35	9	Sd +	15.79		13.55	56.03	0.80	11.65	2.17																100	76
35	10	Brt											36.97								3.52		59.62		100	119
36	1	Qz	100.00																						100	122
36	2	Brt											37.34								1.41		61.52		100	117
36	3	Sd + Chl	17.56		14.29	57.20	1.05	8.20	1.70																100	64
36	4	Sd + Chl	4.51	0.51	2.47	74.94	1.28	12.25	3.64		0.41														100	59
36	5	Sd + Chl	22.98		19.50	47.62	0.32	7.37	2.21																100	84
36	6	Mix	61.49	2.00	22.00	7.34		2.14	0.57	0.79	2.58		1.08												100	99
36	7	Ank +	4.23		1.44	5.28	0.64	17.09	26.63		0.68														56	65
37	1	Qz	100.00																						100	120
37	2	Brt											36.50										63.55		100	114
37	3	Kfs +	66.24		14.36	0.99					11.77		1.95										4.70		100	114
37	4	Mag	1.81	0.41	0.86	95.94														0.98					100	90
37	5	Qz	99.65		0.35																				100	124
37	6	Sd +	3.79		3.49	40.59	0.66	6.03	1.44																56	63
37	7	TiO_2 + Qz	62.79	34.07	2.44	0.19					0.52														100	116
37	8	Brt											37.06								2.74		60.36		100	115
38	1	Qz	100.00																						100	122
38	2	Lm +				92.50			1.18				3.20		3.12										100	74
38	3	Kfs	65.76		18.60	0.33					15.31														100	113

Table 1K.1 SEM-EDS chemical analyses of minerals from sample G-24 6045(2).

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	CuO	ZnO	As_2O_3	SrO	ZrO_2	BaO	WO_3	Total	Actual Total
38	4	Kfs +	59.80		23.32	1.97		2.32			12.58														100	109
38	5	Brt											37.02								1.55		61.51		100	115
38	6	Ab	69.51		18.71					11.78															100	120
38	7	Ank + Ab	3.19		1.16	15.94	0.78	8.35	25.49	1.10															56	64
38	8	Sd + Chl	18.67	0.49	13.73	55.39	0.88	9.02	1.81																100	71
38	9	Brt											36.76								1.01		62.31		100	118
38	10	Sd +	12.91		7.69	66.47	1.49	7.84	2.30		1.30														100	53
39	1	Qz	100.00																						100	121
39	2	Sd				48.22	3.03	2.23	2.53																56	60
39	3	Chl	23.61	0.34	18.99	35.14		6.31	0.61																85	87
39	4	Fl							46.43					53.57											100	170
39	5	Ank				15.72	0.64	8.97	30.67																56	59
39	6	Chl	23.25		20.18	34.74	0.26	5.92	0.65																85	88
39	7	Brt											36.72								2.07		61.38		100	115
39	8	Brt											36.88				0.03						63.09		100	113
40	1	Mix	72.86	0.79	6.73	2.72		0.37	3.17	0.51				8.88										3.97	100	67
40	2	Mix	31.71	2.51	7.49	41.19	0.88	1.69	12.58	0.64			1.32												100	72
40	3	Sd				48.72	3.19	1.81	2.28																56	61
40	4	Ank				3.74	0.84	19.54	31.88																56	59
40	5	Qz	100.00																						100	122
40	6	TiO_2	3.75	93.09	2.19	0.97																			100	106
40	7	Ank				15.77	0.76	9.19	30.28																56	60
40	8	Ab	68.98		19.15	0.23				11.65															100	114
40	9	Ank +	14.23		6.66	9.47	1.37	25.63	40.12		2.52														100	68
40	10	Sd +	1.14		0.63	38.99	0.58	7.82	2.29				4.55												56	66
40	11	Fl							47.10					52.90											100	167
40	12	Brt											36.51										63.64		100	114
40	13	Brt											36.54				0.03				1.29		62.14		100	119
41	1	Brt											36.57										63.46		100	115
41	2	Ank				5.43	0.66	19.87	30.04																56	58
41	3	Ank				12.08	1.70	13.97	28.25																56	60
41	4	Qz	98.21		1.05	0.62					0.12														100	121
41	5	Chl	28.76		18.03	25.85		12.36																	85	98
41	6	Sd +	21.50		12.30	54.96	1.04	6.41	1.81		1.99														100	59
41	7	Chl	26.55	0.78	19.67	29.01		6.72	1.29			0.99													85	85
41	8	Qz	98.72		0.74	0.29		0.25																	100	121
41	9	Ab	68.92		18.77	0.27			0.63	11.41															100	123
41	10	Ank + Chl	2.84		1.53	28.52	1.38	15.21	50.52																100	61
41	11	Brt											36.53								1.21		62.34		100	118
41	12	Sd + Chl	14.22		7.98	53.70	0.64	8.33	11.68	0.70	1.24	1.53													100	72
41	13	Qz	99.68			0.32																			100	122

Balvenie B-79 well

Scanning Electron Microscope (SEM) Backscattered Electron (BSE) images and Energy Dispersive Spectroscopy (EDS) mineral analyses from Balvenie B-79 well

Appendix 2A: SEM-BSE images and EDS mineral analyses for sample B-79 3610

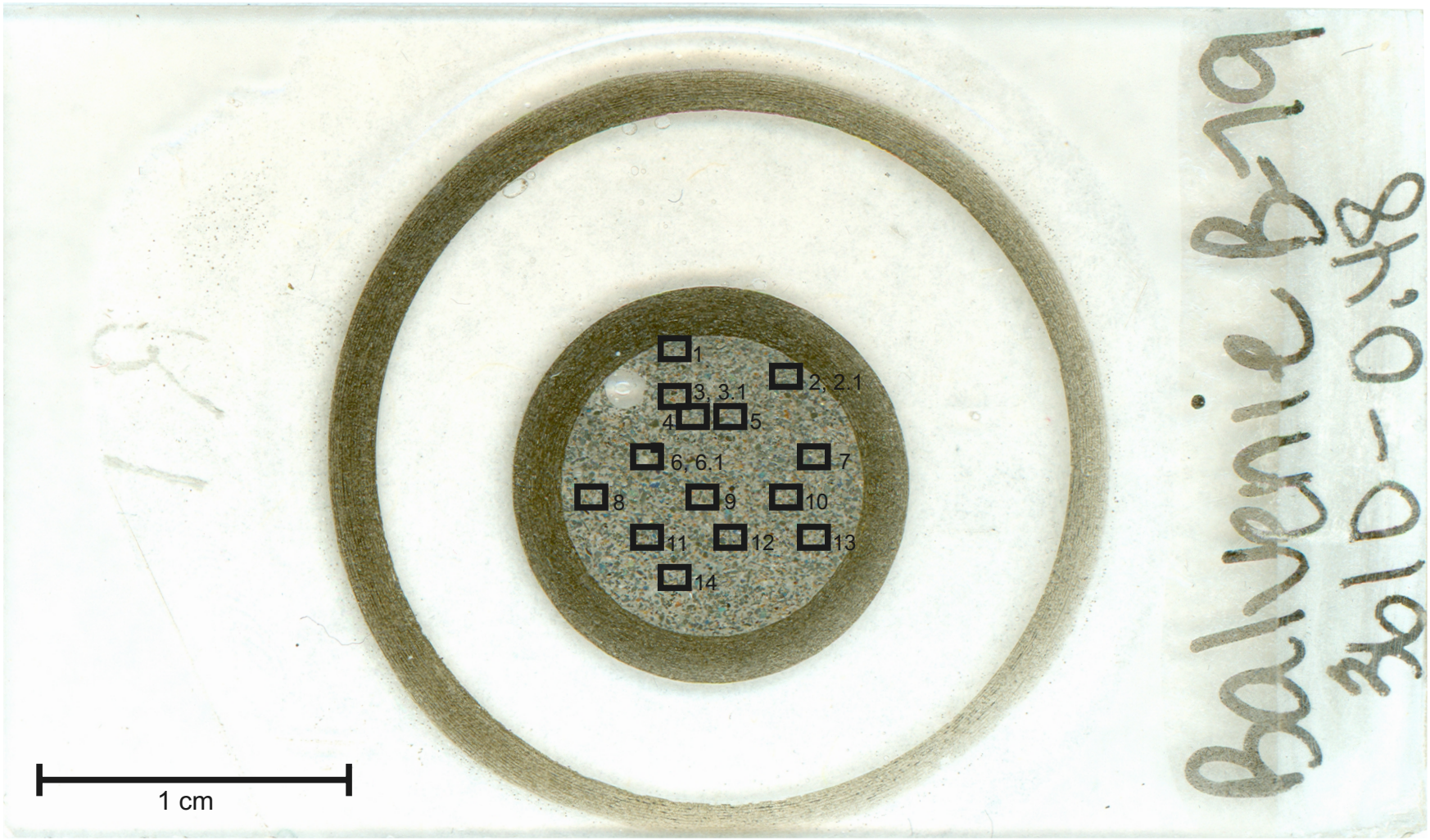
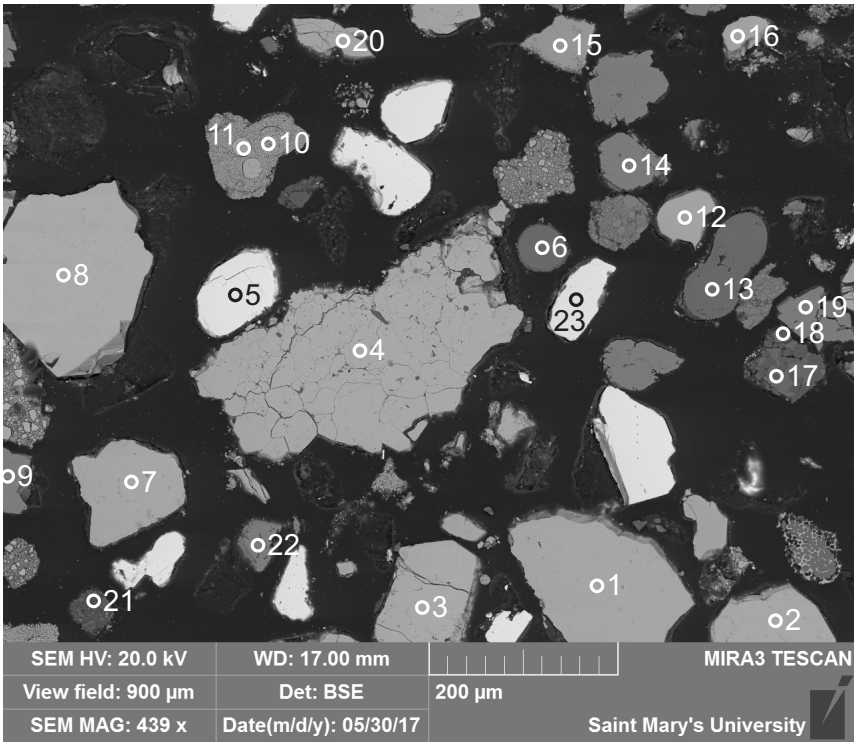
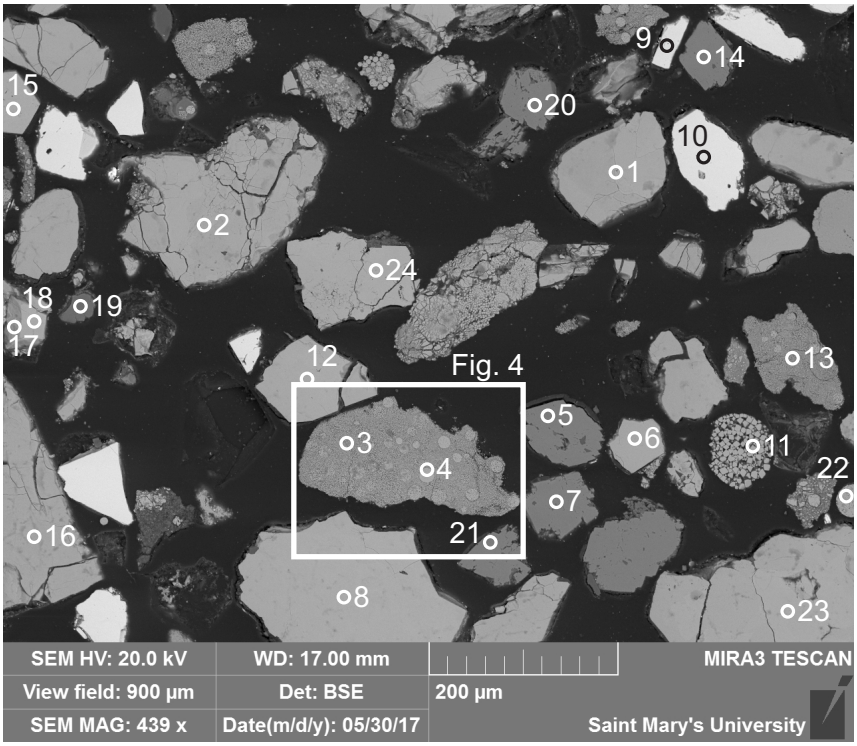


Figure 2A.1: Scanned thin section of sample B-79 3610 showing the location of analysed sites. The numbers correspond to sites analyzed.



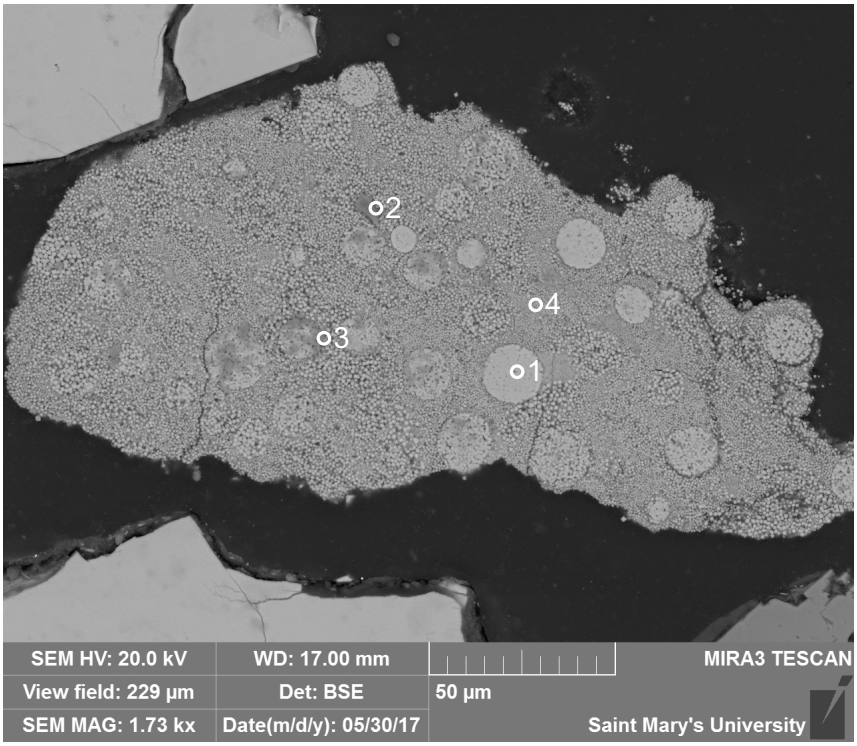
1:Pyrite
2:Pyrite
3:Pyrite
4:Pyrite
5:Barite
6:Calcite +
7:Pyrite
8:Pyrite
9:Chlorite + Siderite
10:Pyrite
11:Pyrite
12:Pyrite
13:Calcite +
14:Siderite
15:Feohy +
16:Pyrite
17:Calcite + Quartz +
18:Quartz
19:Siderite
20:Pyrite
21:Illite +
22:Siderite
23:Barite

Figure 2A.2: Balvenie B-79 3610 m site 1. A cutting made up of quartz (18) and calcite (18).



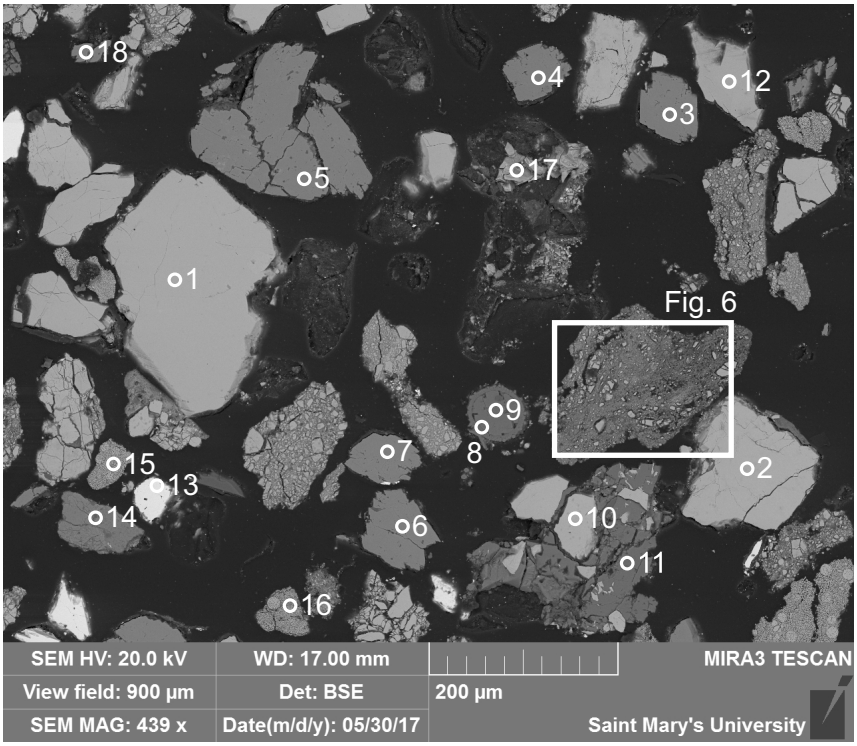
1:Pyrite +
2:Pyrite
3:Pyrite
4:Pyrite
5:Siderite
6:Pyrite
7:Siderite
8:Pyrite
9:Barite
10:Barite
11:Pyrite
12:Pyrite
13:Pyrite
14:Siderite
15:Pyrite
16:Pyrite
17:Pyrite
18:Pyrite
19:Calcite
20:Siderite
21:Siderite
22:Pyrite
23:Pyrite
24:Pyrite +

Figure 2A.3: Balvenie B-79 3610 m site 2. Framboidal pyrite (3,4,11).



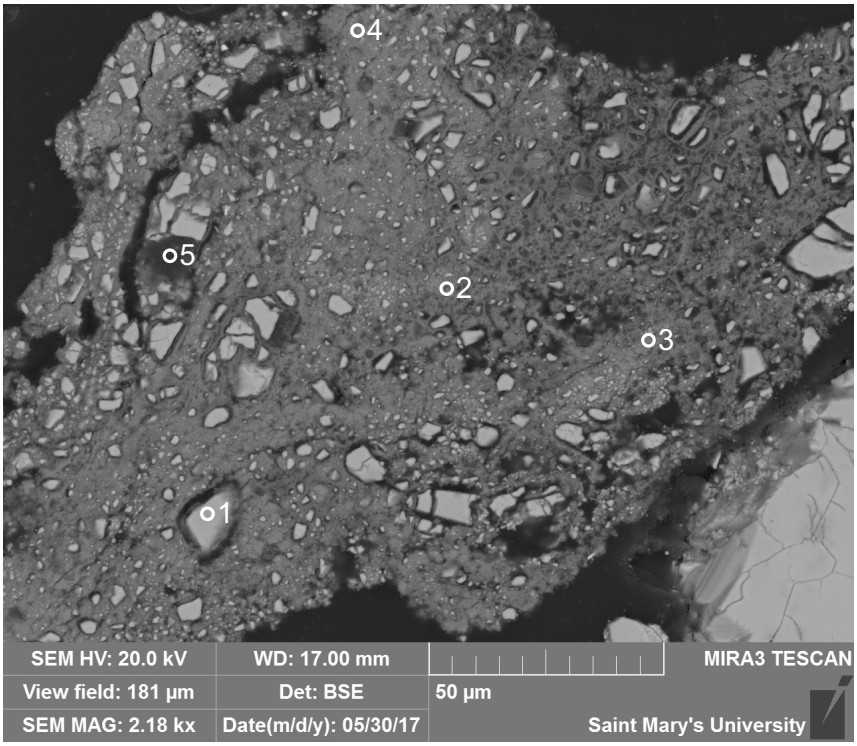
1:Pyrite
2:Pyrite + Quartz
3:Pyrite
4:Pyrite

Figure 2A.4: Balvenie B-79 3610 m site 2.1. Piece of pyrite nodule with minor quartz (2) and pyrite spheres (1).



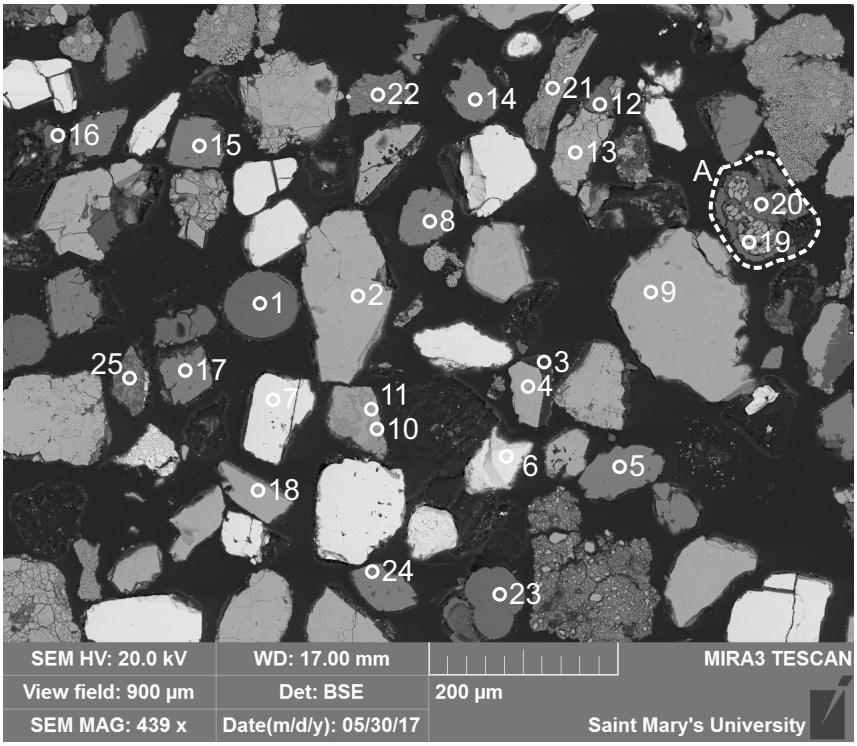
1:Pyrite
2:Pyrite
3:Siderite
4:Siderite
5:Siderite
6:Siderite
7:Siderite
8:Calcite
9:Calcite
10:Pyrite
11:Calcite +
12:Pyrite
13:Barite
14:Apatite +
15:Pyrite
16:Pyrite
17:Pyrite
18:Siderite

Figure 2A.5: Balvenie B-79 3610 m site 3. A possible infilled bioclast made up of calcite (8,9).



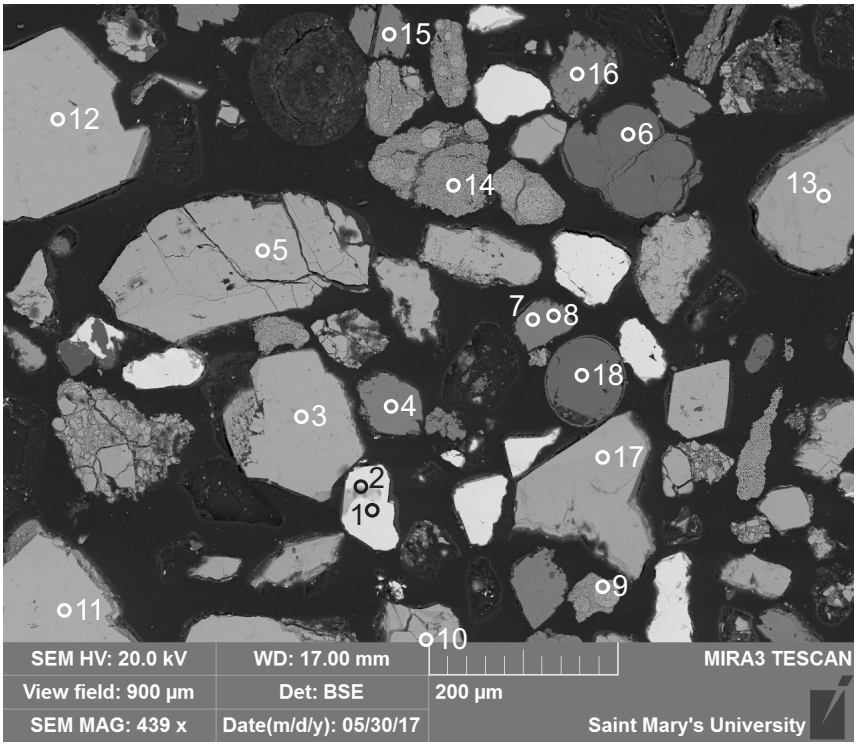
1:Pyrite
2:Pyrite +
3:Pyrite
4:Pyrite +
5:Pyrite +

Figure 2A.6: Balvenie B-79 3610 m site 3.1. Piece of pyrite nodule.



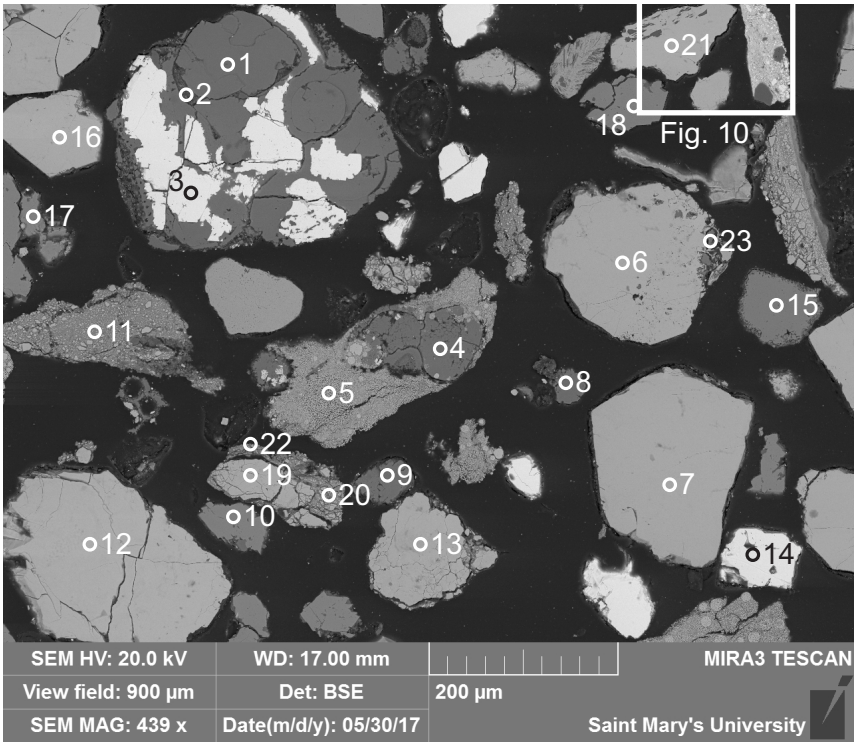
1:Calcite +
2:Pyrite
3:Hole
4:Pyrite
5:Siderite +
6:Barite
7:Barite
8:Siderite
9:Pyrite
10:Feohy +
11:Feohy +
12:K-feldspar +
13:Pyrite
14:Siderite +
15:Siderite
16:Calcite +
17:Siderite
18:Pyrite
19:Pyrite
20:Calcite
21:Pyrite + Quartz
22:Chlorite + Siderite
23:Calcite
24:Siderite
25:Quartz + Feohy

Figure 2A.7: Balvenie B-79 3610 m site 4. Calcite nodules (1). A bioclast (A) made up of calcite (20) and infilled with pyrite (19). Feohy (25) is associated with quartz (25) and appears to be diagenetic.



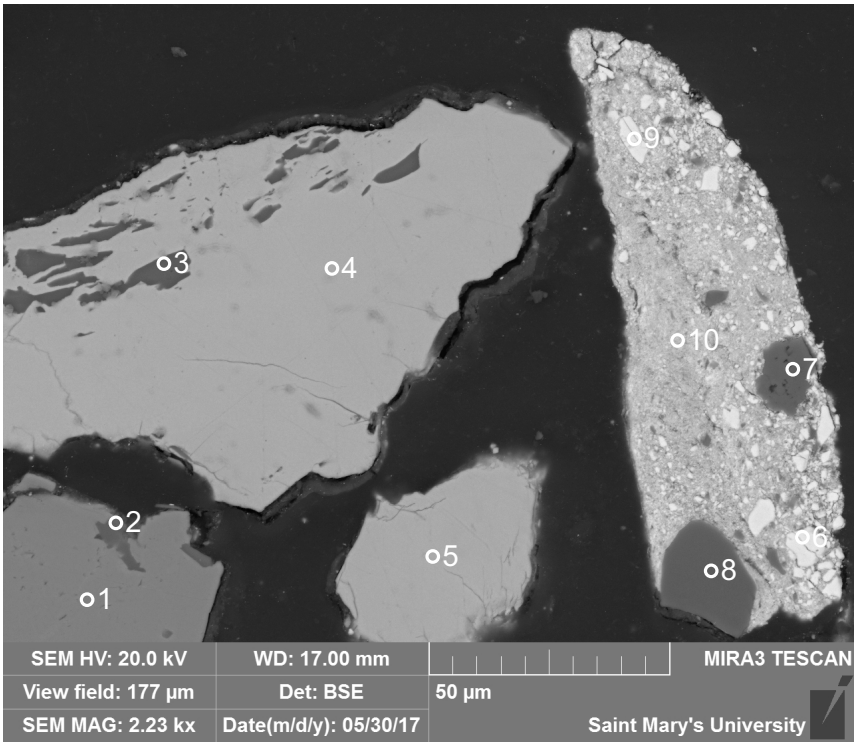
1:Barite
2:Barite + Quartz
3:Pyrite
4:Siderite
5:Pyrite
6:Calcite
7:Siderite
8:Siderite + Quartz
9:Pyrite
10:Pyrite
11:Pyrite
12:Pyrite
13:Pyrite
14:Pyrite +
15:Siderite
16:Siderite
17:Pyrite
18:Calcite +

Figure 2A.8: Balvenie B-79 3610 m site 5. A nodule or bioclast made up of calcite (18).



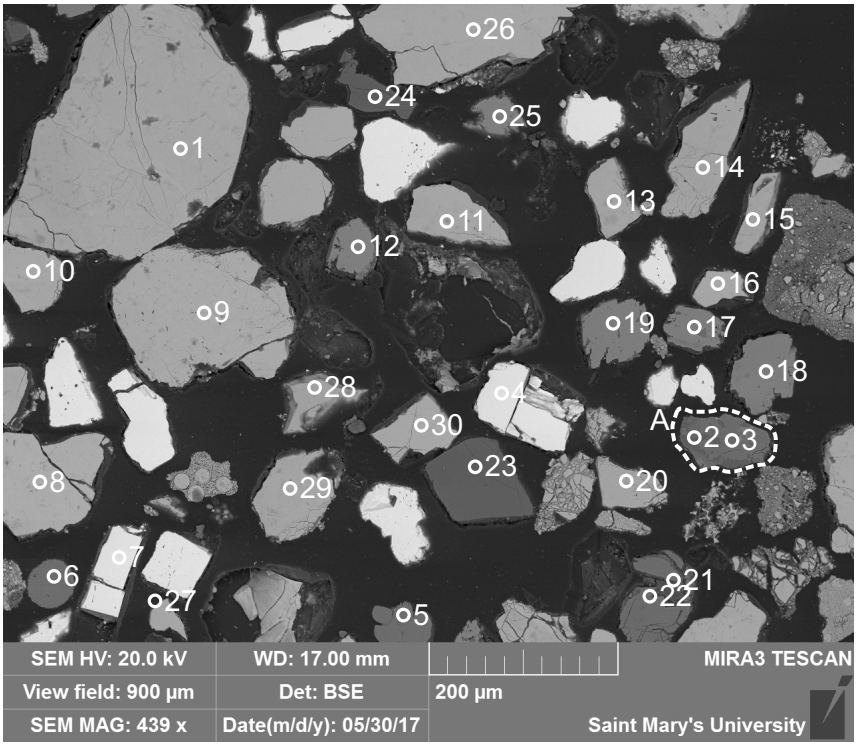
1:Calcite
2:Mix
3:Barite
4:Calcite +
5:Pyrite
6:Pyrite
7:Pyrite
8:Calcite
9:Calcite
10:Siderite
11:Pyrite
12:Pyrite
13:Pyrite
14:Barite
15:Apatite +
16:Pyrite
17:Siderite
18:Siderite
19:Pyrite
20:Pyrite
21:Pyrite
22:Pyrite +
23:Mix

Figure 2A.9: Balvenie B-79 3610 m site 6. A cutting made up of calcite (1) and barite (3) in which barite appears to postdate calcite.



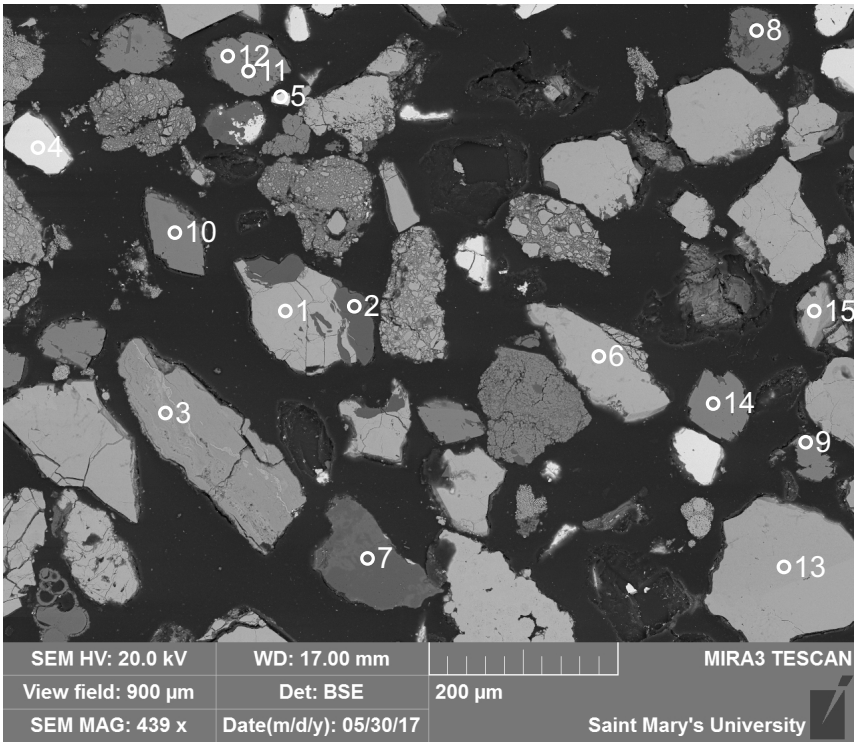
1:Siderite
2:Quartz +
3:Quartz
4:Pyrite
5:Pyrite
6:Barite
7:Dolomite
8:Quartz
9:Barite
10:Barite

Figure 2A.10: Balvenie B-79 3610 m site 6.1. Siderite (1) cemented mudstone (2), or a piece of siderite nodule with some quartz. Piece of pyrite nodule with some quartz (3). Piece of drilling mud (6-10).



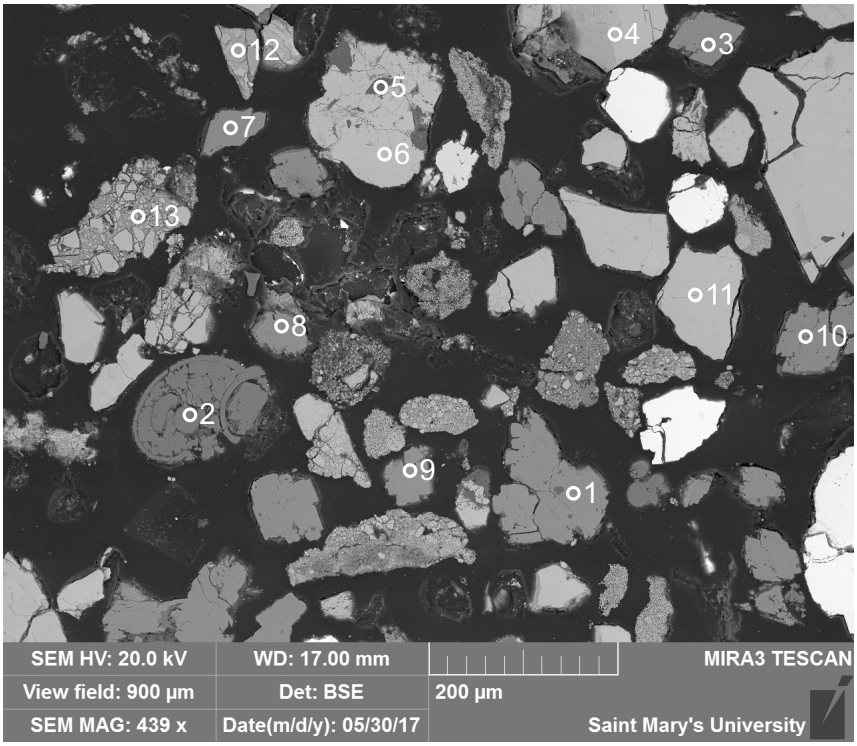
1:Pyrite
2:Albite
3:Epidote
4:Barite
5:Calcite
6:Calcite
7:Barite
8:Pyrite
9:Pyrite
10:Pyrite
11:Pyrite +
12:Siderite
13:Pyrite
14:Pyrite
15:Pyrite
16:Pyrite
17:Siderite
18:Siderite
19:Siderite
20:Pyrite
21:Mix
22:Calcite
23:Quartz
24:Quartz
25:Siderite
26:Pyrite
27:Pyrite
28:Pyrite
29:Pyrite
30:Pyrite

Figure 2A.11: Balvenie B-79 3610 m site 7. Lithic clast (A) made up of albite (2) and epidote (3).



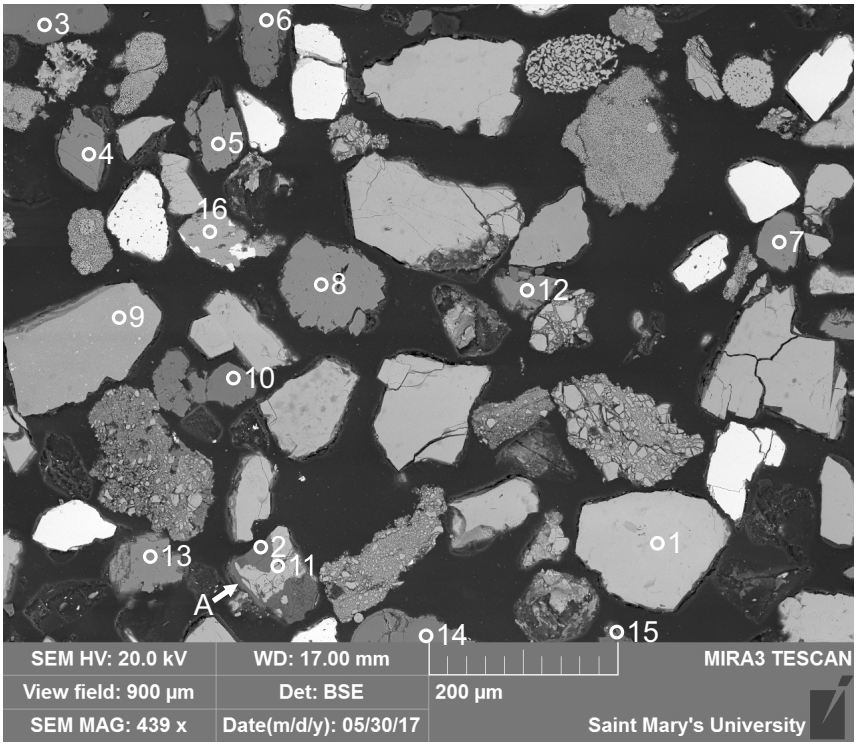
1:Pyrite
2:Quartz
3:Mix
4:Barite
5:Barite
6:Pyrite
7:Quartz
8:Calcite
9:Siderite
10:Siderite
11:Siderite +
12:Siderite
13:Pyrite
14:Siderite
15:Pyrite

Figure 2A.12: Balvenie B-79 3610 m site 8. A mixture (3) containing Fe and W is likely a contaminant.



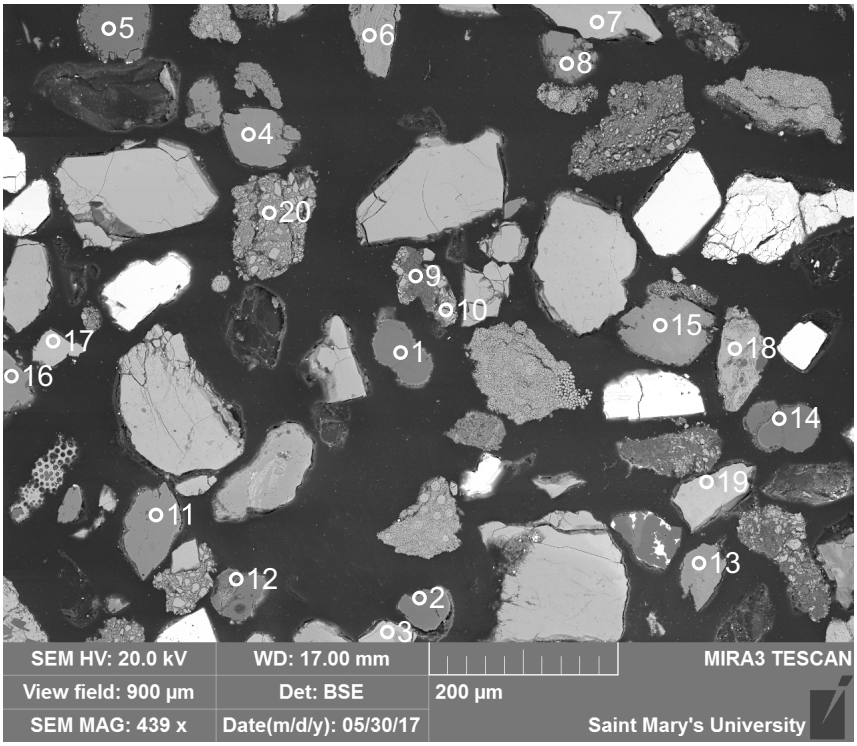
1:Siderite
2:Calcite
3:Siderite
4:Pyrite
5:Quartz
6:Pyrite
7:Siderite
8:Siderite +
9:Siderite
10:Chlorite
11:Pyrite
12:Siderite +
13:Pyrite

Figure 2A.13: Balvenie B-79 3610 m site 9. Calcite concretion (2). Chlorite (10) is associated with siderite.



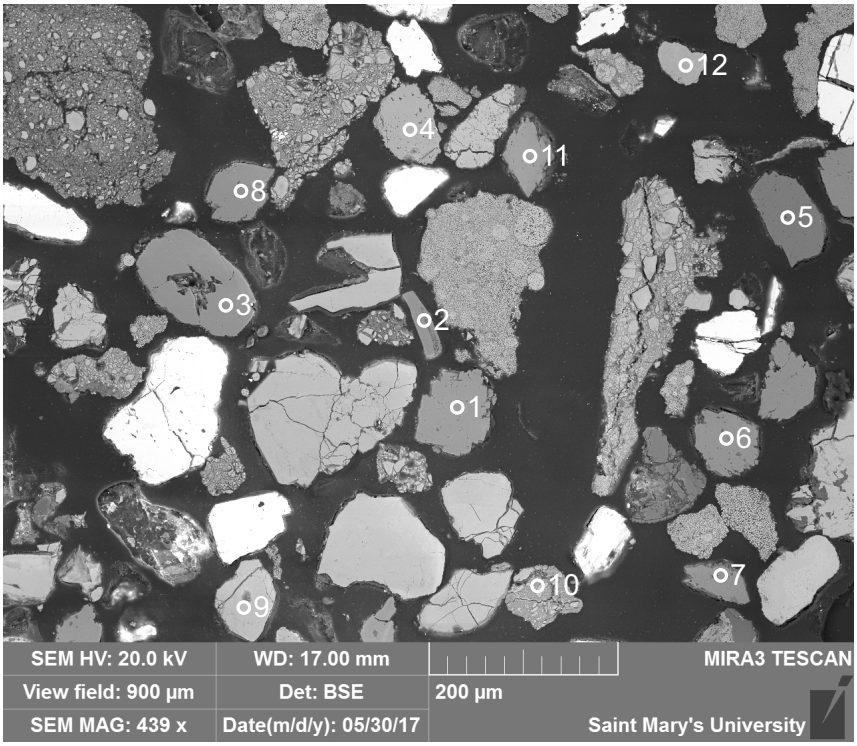
1:Pyrite
2:K-feldspar
3:Calcite
4:Siderite
5:Siderite
6:Calcite
7:Siderite
8:Siderite
9:Chlorite +
10:Calcite
11:Pyrite
12:Chlorite +
13:Siderite
14:Calcite +
15:Quartz
16:Feohy +

Figure 2A.14: Balvenie B-79 3610 m site 10. A fragment of the host rock which contains K-felsdpar (2), pyrite (11), and what is likely muscovite (A).



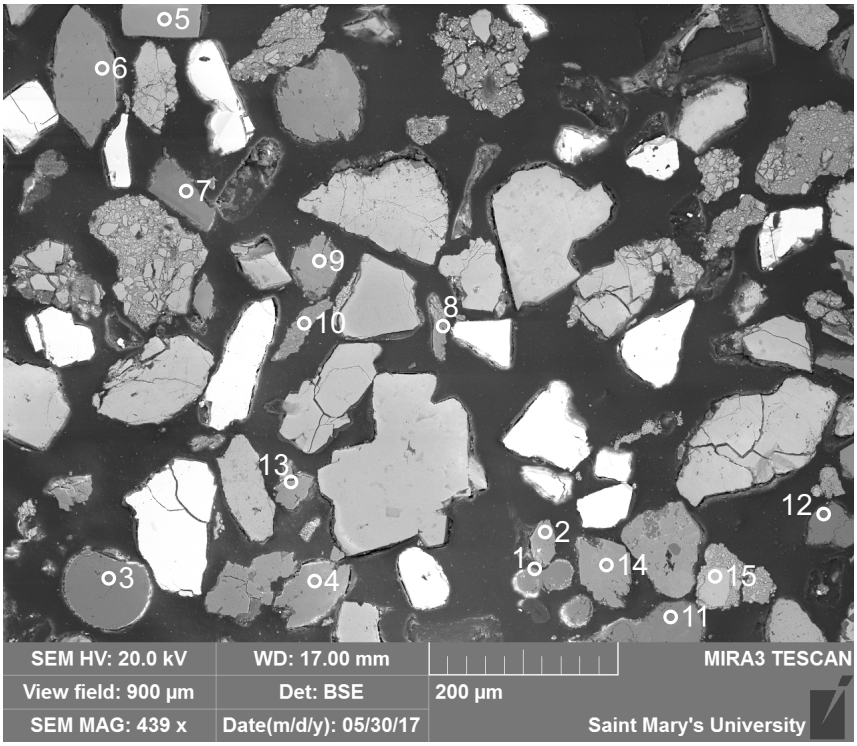
1:Calcite
2:Calcite
3:Pyrite
4:Siderite +
5:Calcite
6:Siderite +
7:Pyrite
8:Siderite
9:Illite + Pyrite
10:Pyrite
11:Siderite
12:Calcite + Chlorite
13:Siderite
14:Calcite
15:Siderite
16:Siderite
17:Pyrite
18:Mnohy + (Fe+Mn)
19:Pyrite
20:Pyrite

Figure 2A.15: Balvenie B-79 3610 m site 11.



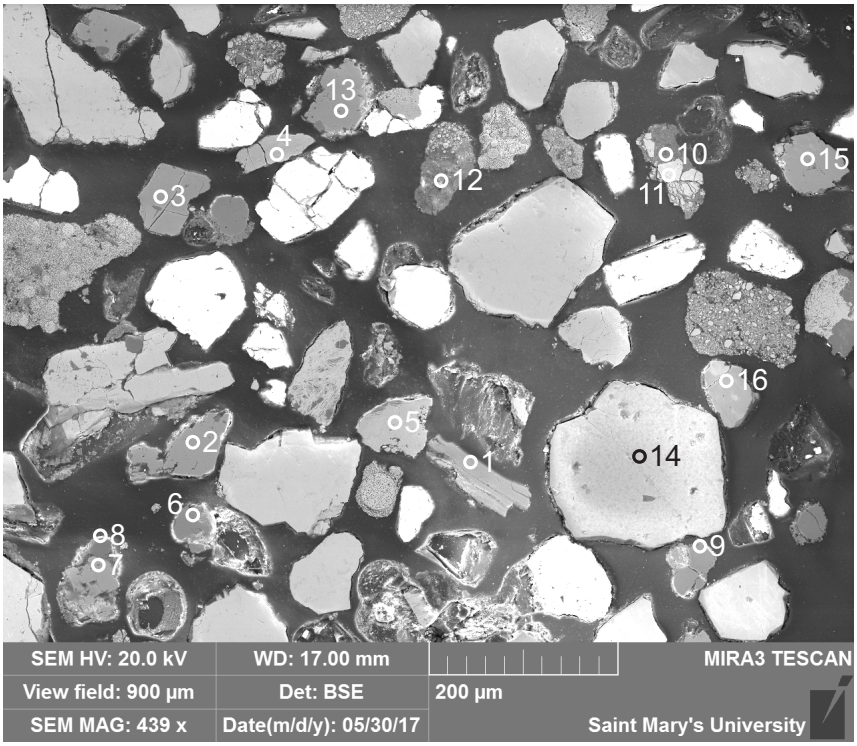
1:Siderite
2:Apatite +
3:Siderite
4:Siderite +
5:Siderite
6:Siderite
7:Siderite
8:Siderite
9:Pyrite
10:Pyrite
11:Hole
12:Hole

Figure 2A.16: Balvenie B-79 3610 m site 12.



1:Hole
2:Hole
3:Calcite +
4:Siderite
5:Fluorite
6:Siderite
7:Dolomite
8:Mix
9:Siderite
10:Chlorite +
11:Calcite
12:Mix
13:Siderite
14:Siderite +
15:Pyrite

Figure 2A.17: Balvenie B-79 3610 m site 13. Fluorite (6) has straight crystal outlines and appears to be diagenetic.



1:Biotite +
2:Siderite
3:Siderite
4:Hole
5:Hole
6:Calcite +
7:Siderite
8:Quartz +
9:Calcite
10:Quartz +
Chlorite +
11:Pyrite
12:Mix
13:Siderite +
14:Pyrite
15:Siderite +
Chlorite
16:Fluorite

Figure 2A.18: Balvenie B-79 3610 m site 14. Site appears to show minor charging.

Table 2A.1: SEM-EDS chemical analyses of minerals from sample B-79 3610.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	CoO	CuO	ZnO	As_2O_3	SrO	ZrO_2	BaO	WO_3	Total	Actual Total
1	1	Py				27.64							72.36											100	217
1	2	Py				27.66							72.34											100	219
1	3	Py				27.79							72.21											100	218
1	4	Py				27.72							71.51						0.77					100	210
1	5	Brt											37.77			-0.10				2.12		60.21		100	106
1	6	Cal +				1.36			46.55					8.09										56	59
1	7	Py				27.72							72.28											100	209
1	8	Py	0.14			27.47							72.39											100	209
1	9	Chl + Sd	19.26			63.55	3.31	7.54	6.34															100	63
1	10	Py	0.53			29.37							70.10											100	162
1	11	Py				29.54				0.35			70.11											100	183
1	12	Py	0.14			27.71							72.15											100	206
1	13	Cal +				1.16			46.86					7.99										56	59
1	14	Sd				44.32	1.27	6.24	4.16															56	54
1	15	Feohy +	4.09			93.18			0.66										2.07					100	70
1	16	Py				27.60							72.40											100	206
1	17	Cal + Qz +	27.84		0.78	1.81	0.31	0.60	51.20					17.46										100	80
1	18	Qz	99.60			0.40																		100	116
1	19	Sd	0.52			43.22	2.67	5.36	4.23															56	56
1	20	Py	0.56			27.08		0.39		0.37			71.60											100	191
1	21	Ilt +	57.11	0.35	19.19	5.68		3.07	0.86	0.92	2.02		0.82											90	82
1	22	Sd	0.77			44.13	0.76	6.30	4.03															56	55
1	23	Brt											37.01			-0.05				1.25		61.79		100	104
2	1	Py +	2.50		0.76	27.04			0.21	0.34			69.15											100	173
2	2	Py				27.63				0.25			72.12											100	203
2	3	Py	0.30			29.62							68.67										1.41	100	163
2	4	Py	0.20			27.42							72.38											100	207
2	5	Sd				43.63	1.59	5.84	4.94															56	53
2	6	Py				27.24							72.76											100	210
2	7	Sd	0.64			43.16	1.39	5.59	5.21															56	54
2	8	Py				27.35							72.65											100	210
2	9	Brt				0.64							37.23			0.08				0.97		61.08		100	100
2	10	Brt											37.53			-0.03						62.50		100	99
2	11	Py				28.45							71.55											100	201
2	12	Py	0.13			27.29							72.58											100	203
2	13	Py				30.27							68.35										1.38	100	151
2	14	Sd				42.97	1.84	6.02	5.17															56	51
2	15	Py				27.78							72.22											100	199
2	16	Py				26.97				0.28			71.56								1.19			100	199
2	17	Py	0.26			26.58							73.16											100	206

Table 2A.1: SEM-EDS chemical analyses of minerals from sample B-79 3610.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	CoO	CuO	ZnO	As_2O_3	SrO	ZrO_2	BaO	WO_3	Total	Actual Total
2	18	Py				27.59				0.22			72.19											100	199
2	19	Cal	0.54			1.53			44.92					9.01										56	57
2	20	Sd				44.03	1.22	5.97	4.79															56	51
2	21	Sd				44.47	0.94	5.96	4.63															56	53
2	22	Py				27.47				0.25			72.28											100	205
2	23	Py				27.42				0.24			72.34											100	212
2	24	Py +	2.46			26.85							70.69											100	195
2.1	1	Py				27.33							72.67											100	207
2.1	2	Py + Qz	72.37		0.85	6.64		1.66	0.34				18.14											100	157
2.1	3	Py	0.54			27.20			2.41	1.24			68.61											100	144
2.1	4	Py	0.48			29.96							68.29										1.27	100	159
3	1	Py				27.29							72.71											100	208
3	2	Py				27.38							72.62											100	214
3	3	Sd				38.14	1.90	4.05	11.91															56	51
3	4	Sd				43.63	1.47	6.40	4.50															56	53
3	5	Sd				43.00	1.75	5.85	5.40															56	52
3	6	Sd				43.48	1.62	5.86	5.04															56	54
3	7	Sd				44.06	1.28	5.98	4.68															56	54
3	8	Cal				0.37			43.61				0.35	11.66										56	63
3	9	Cal	0.50			1.28			43.07					11.16										56	63
3	10	Py				27.51				0.44			72.05											100	208
3	11	Cal +				1.42		0.39	46.67					7.52										56	57
3	12	Py				27.63							72.37											100	201
3	13	Brt											37.80			-0.11						62.31		100	105
3	14	Ap +	10.66		4.86	5.21	4.64	0.60	33.80	0.96	0.37	27.55	3.52	7.84										100	93
3	15	Py	0.59			30.60			0.20				68.61											100	145
3	16	Py	1.79			29.78			0.20				68.23											100	147
3	17	Py	0.94			44.61			0.36				50.59		0.56								2.94	100	77
3	18	Sd				44.60	0.69	6.76	3.94															56	51
3.1	1	Py	0.12			28.04				0.19			71.65											100	199
3.1	2	Py +	1.01			43.85			0.71	2.09	0.57		49.07										2.70	100	70
3.1	3	Py	0.95			39.30			0.64	1.41	0.48		55.10										2.12	100	87
3.1	4	Py +	0.95			43.43			0.88	1.59	0.63		50.39										2.13	100	83
3.1	5	Py +	18.31		4.05	25.23		1.06	2.57				48.22		0.56									100	38
4	1	Cal +				1.23			43.17					11.60										56	60
4	2	Py				27.13							72.87											100	200
4	3	Hole	42.59		9.13	7.67		1.87	6.86	2.52	0.57		16.11	12.70										100	25
4	4	Py	0.20			25.81		0.94		0.33			72.72											100	195
4	5	Sd +	1.27			41.30	3.96	5.24	4.23															56	51
4	6	Brt											38.43			-0.08				1.47		60.18		100	102

Table 2A.1: SEM-EDS chemical analyses of minerals from sample B-79 3610.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	CoO	CuO	ZnO	As_2O_3	SrO	ZrO_2	BaO	WO_3	Total	Actual Total
4	7	Brt											37.87			-0.14				1.72		60.55		100	100
4	8	Sd	1.12			42.30	1.65	5.89	5.05															56	52
4	9	Py				27.07							72.93											100	205
4	10	Feohy +	1.53		10.08	82.27							1.96				2.27		1.89					100	64
4	11	Feohy +	1.69		1.50	50.43						0.74					0.72		0.91					56	71
4	12	Kfs +	59.34		10.93	17.28		3.81			8.64													100	89
4	13	Py				27.25				0.31			72.44											100	197
4	14	Sd +	1.56		0.66	43.41	1.07	5.86	3.44															56	53
4	15	Sd				44.44	0.86	5.76	4.94															56	50
4	16	Cal +				1.47			47.48					7.05										56	53
4	17	Sd				43.70	1.32	5.91	5.07															56	50
4	18	Py				27.13							72.87											100	196
4	19	Py	0.75			36.23			0.41	1.47			61.14											100	126
4	20	Cal				0.53			48.31				0.63	6.54										56	54
4	21	Py + Qz	56.29			19.29			0.61	0.51	0.46		17.39										5.45	100	90
4	22	Chl + Sd	12.77		5.54	48.78	9.43	4.89	4.99	1.03	0.70		3.33										8.53	100	57
4	23	Cal	1.06			1.12		0.41	39.04				0.80	13.56										56	61
4	24	Sd				43.21	1.32	6.27	5.20															56	50
4	25	Qz + Feohy	76.87			22.61											0.52							100	88
5	1	Brt											37.67			0.04				2.02		60.27		100	101
5	2	Brt + Qz	39.94			0.39							23.76			0.01						35.90		100	112
5	3	Py				27.41							72.59											100	199
5	4	Sd				43.70	1.62	5.48	5.20															56	49
5	5	Py				27.09							72.91											100	196
5	6	Cal				0.96			46.97					8.08										56	54
5	7	Sd				43.28	1.97	6.36	4.39															56	50
5	8	Sd + Qz	65.43			28.86	1.19	1.99	2.53															100	84
5	9	Py	0.19			28.24				0.24			71.33											100	187
5	10	Py				27.31							72.69											100	206
5	11	Py				27.26							72.74											100	195
5	12	Py				27.20							72.80											100	197
5	13	Py				27.01				0.31			72.68											100	193
5	14	Py +	2.60		0.75	35.24			0.39				61.02											100	119
5	15	Sd	1.11			41.93	2.05	5.55	5.35															56	49
5	16	Sd				43.85	0.74	7.44	3.97															56	49
5	17	Py				27.39							72.61											100	195
5	18	Cal +				1.57		0.53	43.61					10.29										56	58
6	1	Cal				0.83	0.26		47.01					7.90										56	53
6	2	Mix	73.43		9.58	1.67		1.73	4.67	0.80	1.00		0.90	6.22										100	83
6	3	Brt											37.37			-0.01						62.64		100	97

Table 2A.1: SEM-EDS chemical analyses of minerals from sample B-79 3610.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	CoO	CuO	ZnO	As_2O_3	SrO	ZrO_2	BaO	WO_3	Total	Actual Total
6	4	Cal +	0.43			1.18		0.30	41.81					12.28										56	59
6	5	Py	0.74			28.28			0.21				70.77											100	150
6	6	Py				27.03							72.97											100	194
6	7	Py				26.63							73.37											100	194
6	8	Cal	0.43			1.50		0.41	42.21					11.45										56	58
6	9	Cal				1.28			43.05					11.66										56	57
6	10	Sd	1.00			42.36	1.25	5.63	5.02			0.73												56	49
6	11	Py				34.53				1.10	0.32		64.05											100	110
6	12	Py				26.77							73.23											100	195
6	13	Py				27.05				0.31			72.64											100	190
6	14	Brt											38.40			-0.09				2.24		59.45		100	99
6	15	Ap +				0.35		0.45	46.13	1.20		38.11	1.31	10.84									1.62	100	99
6	16	Py				27.15							72.85											100	192
6	17	Sd				44.45	0.62	6.98	3.95															56	47
6	18	Sd	0.66		0.51	44.09	1.86	6.47	2.40															56	49
6	19	Py				26.94							73.06											100	193
6	20	Py				28.01				0.41			71.58											100	170
6	21	Py	0.12			26.93							72.95											100	194
6	22	Py +	1.69			30.57			0.61	1.62	0.21		61.74										3.56	100	94
6	23	Mix	2.71			4.86	4.03	0.70	45.57				21.49									16.02	4.62	100	39
6.1	1	Sd				42.57	2.11	5.78	5.54															56	49
6.1	2	Qz +	81.40		3.35	12.21		1.34	1.17		0.53													100	93
6.1	3	Qz	97.40			1.02							1.58											100	101
6.1	4	Py				27.13							72.87											100	197
6.1	5	Py				27.20							72.80											100	192
6.1	6	Brt				0.55							37.53			-0.06				1.18		60.80		100	99
6.1	7	Dol				0.64	0.52	23.57	29.27															54	48
6.1	8	Qz	100.00																					100	104
6.1	9	Brt				0.70							37.55			-0.04				1.87		59.92		100	97
6.1	10	Brt	1.22			1.87			1.09				37.08			0.01						55.58	3.15	100	85
7	1	Py				26.54							73.46											100	179
7	2	Ab	67.39		19.17	0.21			0.51	12.36	0.36													100	107
7	3	Ep	42.97		25.13	5.94		2.34	20.62															97	88
7	4	Brt											38.93			-0.01				2.16		58.92		100	92
7	5	Cal				0.80			43.74					11.46										56	53
7	6	Cal				0.88			43.32					11.79										56	51
7	7	Brt											38.83			-0.01				1.81		59.37		100	92
7	8	Py				26.23							73.77											100	174
7	9	Py				26.51							73.49											100	184
7	10	Py				26.34							73.66											100	178

Table 2A.1: SEM-EDS chemical analyses of minerals from sample B-79 3610.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	CoO	CuO	ZnO	As_2O_3	SrO	ZrO_2	BaO	WO_3	Total	Actual Total
7	11	Py +	6.33	0.42	2.70	22.40		3.25		0.43	1.23		63.24											100	154
7	12	Sd				42.74	1.38	6.78	5.10															56	43
7	13	Py				25.43				0.25			74.32											100	171
7	14	Py				26.15				0.36			73.49											100	176
7	15	Py				26.34							73.66											100	181
7	16	Py				26.01				0.42			73.57											100	177
7	17	Sd	0.91		0.64	40.55	1.60	6.98	5.32															56	45
7	18	Sd				43.98	1.40	6.59	4.04															56	42
7	19	Sd	0.88			42.31	1.57	6.62	4.61															56	43
7	20	Py				26.05				0.28			73.67											100	176
7	21	Mix	61.28		13.38	4.50		2.90	6.61	0.78	1.47		1.03	8.05										100	68
7	22	Cal	2.49			0.44	0.24		41.92					10.91										56	53
7	23	Qz	100.00																					100	102
7	24	Qz	100.00																					100	97
7	25	Sd	0.86	0.45		43.06	0.89	6.56	4.17															56	42
7	26	Py				26.17							73.83											100	175
7	27	Py	0.67			24.62		0.54		0.50			73.67											100	169
7	28	Py				26.74							73.26											100	180
7	29	Py				26.27				0.26			73.47											100	177
7	30	Py				26.91							73.09											100	185
8	1	Py				26.55							73.45											100	185
8	2	Qz	99.53			0.47																		100	102
8	3	Mix			0.78	83.03	1.44		1.71				0.91										12.13	100	55
8	4	Brt											38.62			-0.04				1.72		59.70		100	91
8	5	Brt				1.09							38.01			-0.15						61.05		100	91
8	6	Py				26.10							73.90											100	183
8	7	Qz	100.00																					100	99
8	8	Cal				1.30	0.63		43.19					10.88										56	50
8	9	Sd				42.19	1.31	7.17	5.33															56	44
8	10	Sd				42.58	1.06	7.53	4.83															56	43
8	11	Sd +	1.84		1.27	32.22	1.01	3.47	16.18															56	42
8	12	Sd	0.82			43.17	1.39	6.60	4.02															56	43
8	13	Py				25.82							74.18											100	178
8	14	Sd				42.33	1.58	6.69	5.40															56	43
8	15	Py				25.89							74.11											100	175
9	1	Sd				42.02	1.60	7.11	5.26															56	41
9	2	Cal				0.61			46.04					9.35										56	46
9	3	Sd				43.25	0.96	6.79	5.00															56	40
9	4	Py				25.32							74.68											100	176
9	5	Qz	99.39			0.61																		100	94

Table 2A.1: SEM-EDS chemical analyses of minerals from sample B-79 3610.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	CoO	CuO	ZnO	As_2O_3	SrO	ZrO_2	BaO	WO_3	Total	Actual Total
9	6	Py				25.67							74.33											100	169
9	7	Sd	0.99		0.74	41.74	1.98	6.37	4.18															56	41
9	8	Sd +	3.20		1.32	39.94	0.77	6.33	4.45															56	39
9	9	Sd				43.00	0.91	8.01	4.08															56	40
9	10	Chl	18.19		8.99	44.26	0.71	7.94	3.89		1.02													85	54
9	11	Py				25.84							74.16											100	172
9	12	Sd +	0.54			50.73	0.89	0.81	0.81				2.22											56	48
9	13	Py	1.10			38.38			0.27				58.29										1.96	100	82
10	1	Py				24.97							75.03											100	176
10	2	Kfs	66.90		18.24	0.70				0.46	13.70													100	91
10	3	Cal				1.08			46.71					8.21										56	43
10	4	Sd	0.67			43.09	1.69	6.60	3.95															56	39
10	5	Sd				41.74	1.39	7.57	5.30															56	39
10	6	Cal				0.83			43.78					11.38										56	46
10	7	Sd	1.01		0.82	41.37	2.04	6.65	4.09															56	40
10	8	Sd	0.95	0.38		41.22	1.98	6.23	5.24															56	40
10	9	Chl +	30.21		5.34	42.85		1.11	1.06	1.04	1.56		0.92					0.93						85	76
10	10	Cal	0.81			1.13			40.31					13.76										56	49
10	11	Py				26.39							73.61											100	137
10	12	Chl +	29.11		12.52	31.34	0.42	4.81	3.59	0.79	1.61		0.82											85	57
10	13	Sd				41.69	1.05	8.54	4.72															56	36
10	14	Cal +				1.27			41.12					13.61										56	48
10	15	Qz	99.72			0.28																		100	93
10	16	Feohy +	2.80			52.80	0.40																	56	50
11	1	Cal				0.92			44.03					11.04										56	43
11	2	Cal				1.35			42.61					12.04										56	43
11	3	Py				23.62				1.04			75.34											100	152
11	4	Sd +	3.54		1.83	39.71	0.96	5.02	4.01		0.27		0.66											56	40
11	5	Cal				1.11			41.34					13.55										56	45
11	6	Sd +				53.40	0.58		0.62				1.41											56	42
11	7	Py				24.85							75.15											100	154
11	8	Sd				41.80	0.70	8.95	4.55															56	36
11	9	Ilt + Py	52.64		12.20	10.20		1.83		1.30	1.90		9.93											90	65
11	10	Py	0.52		0.33	26.45			0.30	3.81	0.31		66.10										2.18	100	98
11	11	Sd				41.43	1.51	7.60	5.46															56	33
11	12	Cal + Chl	17.70		8.38	1.76		1.64	54.65	1.11	0.40			14.36										100	48
11	13	Sd				40.94	1.30	8.27	5.48															56	34
11	14	Cal				0.32			39.79					15.89										56	46
11	15	Sd				39.14	2.04	7.96	6.87															56	34
11	16	Sd				41.97	0.83	8.54	4.67															56	34

Table 2A.1: SEM-EDS chemical analyses of minerals from sample B-79 3610.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	CoO	CuO	ZnO	As_2O_3	SrO	ZrO_2	BaO	WO_3	Total	Actual Total
11	17	Py				23.37				1.10			75.53											100	150
11	18	Mnohy + (Fe+Mn)	4.94		1.85	37.13	46.78		0.44		0.42											8.44		100	48
11	19	Py	0.22			19.68		4.44	3.16	0.85			71.65											100	128
11	20	Py				26.37				1.15			72.48											100	123
12	1	Sd				40.48	1.91	7.73	5.89															56	34
12	2	Ap +				0.83		0.59	42.56	2.07		39.06	3.04	9.94									1.90	100	76
12	3	Sd				40.41	1.55	8.55	5.49															56	32
12	4	Sd +	3.37			52.21	0.43																	56	41
12	5	Sd				16.05	1.46	11.37	26.90						0.22									56	35
12	6	Sd				40.15	2.00	7.47	6.38															56	33
12	7	Sd	0.76			40.81	0.87	9.03	4.54															56	33
12	8	Sd	0.76			41.15	1.79	6.78	5.52															56	37
12	9	Py				23.94							76.06											100	145
12	10	Py	0.96			39.34				1.16	0.35		58.19											100	69
12	11	Hole				73.23	2.79	14.64	9.34															100	33
12	12	Hole	8.38		1.31	89.26										1.05								100	42
13	1	Hole	1.18			1.82		0.96	69.33					26.71										100	42
13	2	Hole				70.47	1.48	18.60	9.45															100	29
13	3	Cal +	0.98		0.53	1.04		0.44	39.30					13.71										56	41
13	4	Sd				39.29	1.72	8.57	6.42															56	29
13	5	Fl							38.34					61.66										100	115
13	6	Sd				40.29	1.48	8.22	6.01															56	32
13	7	Dol				6.74	1.23	20.49	25.53															54	35
13	8	Mix	17.27		4.48	45.29	8.36	12.65	9.64		0.45		1.87											100	36
13	9	Sd				41.04	0.82	8.68	5.47															56	30
13	10	Chl +	17.03		7.08	33.52	6.13	6.15	3.77	1.43	0.71		1.34										7.84	85	39
13	11	Cal				0.94	0.50		39.00					15.56										56	40
13	12	Mix	18.15		3.85	2.51		3.05	57.47	0.76	0.28		1.19	12.74										100	46
13	13	Sd				43.41	2.07	6.81	3.71															56	30
13	14	Sd +	1.44			39.74	1.68	7.90	5.24															56	30
13	15	Py	0.35			25.47			0.57	1.32			70.03										2.26	100	104
14	1	Bt +	45.09	4.38	16.27	15.23		9.89		0.95	7.91				0.27									100	66
14	2	Sd				36.17	1.47	8.94	9.42															56	25
14	3	Sd				39.78	1.95	9.19	5.08															56	27
14	4	Hole	1.36			93.11	1.19		0.96				3.38											100	30
14	5	Hole	9.56			89.02	0.71		0.71															100	31
14	6	Cal +				1.40		0.71	44.70					9.18										56	30
14	7	Sd				39.09	0.62	11.54	4.75															56	24
14	8	Qz +	95.46		0.81	1.14			0.47	0.52			1.60											100	58
14	9	Cal				0.48			46.68					8.84										56	39

Table 2A.1: SEM-EDS chemical analyses of minerals from sample B-79 3610.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	CoO	CuO	ZnO	As_2O_3	SrO	ZrO_2	BaO	WO_3	Total	Actual Total
14	10	Qz + Chl +	84.88		7.25	3.47		1.12	0.24	0.66	0.55		1.83											100	55
14	11	Py				21.17							78.83											100	121
14	12	Mix	56.83	1.07	17.69	9.95		3.51			3.44		7.51											100	39
14	13	Sd +	1.97			39.06	0.92	9.47	4.58															56	27
14	14	Py				23.21							76.79											100	132
14	15	Sd + Chl	4.66		3.02	66.68	2.37	14.02	8.67		0.58													100	27
14	16	Fl							35.20					64.80										100	116

Appendix 2B: SEM-BSE images and EDS mineral analyses for sample B-79 3645

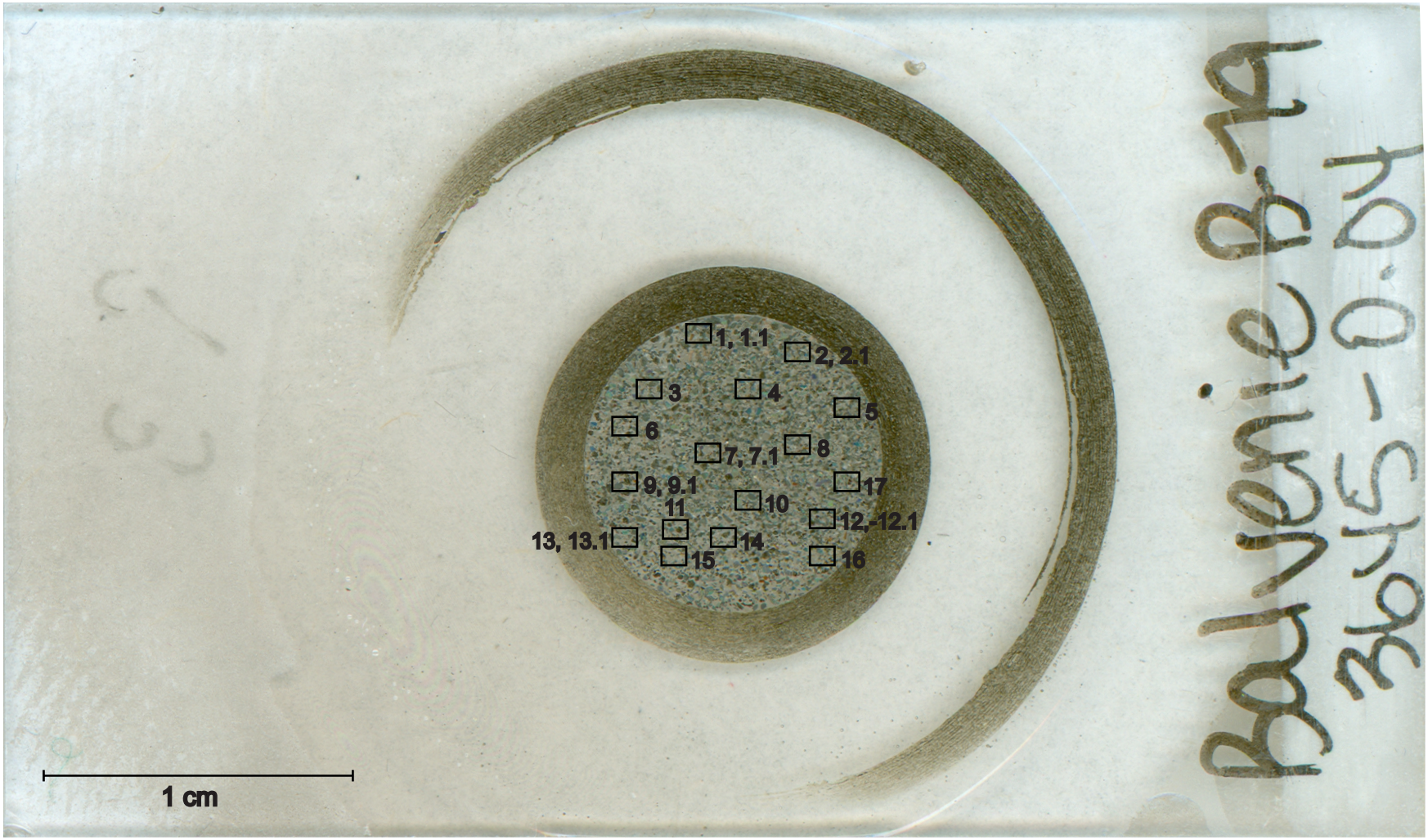
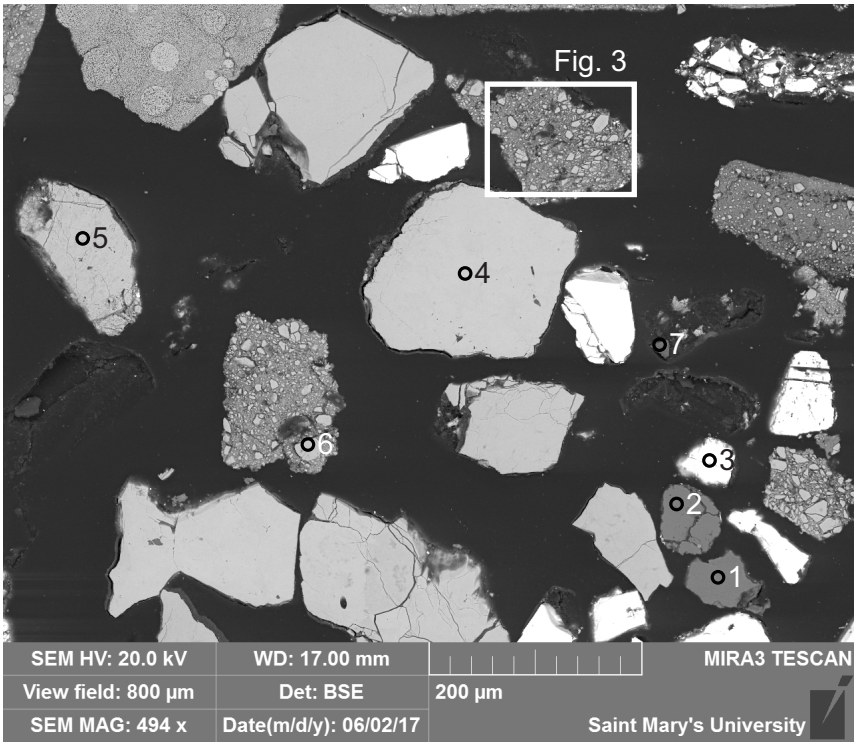
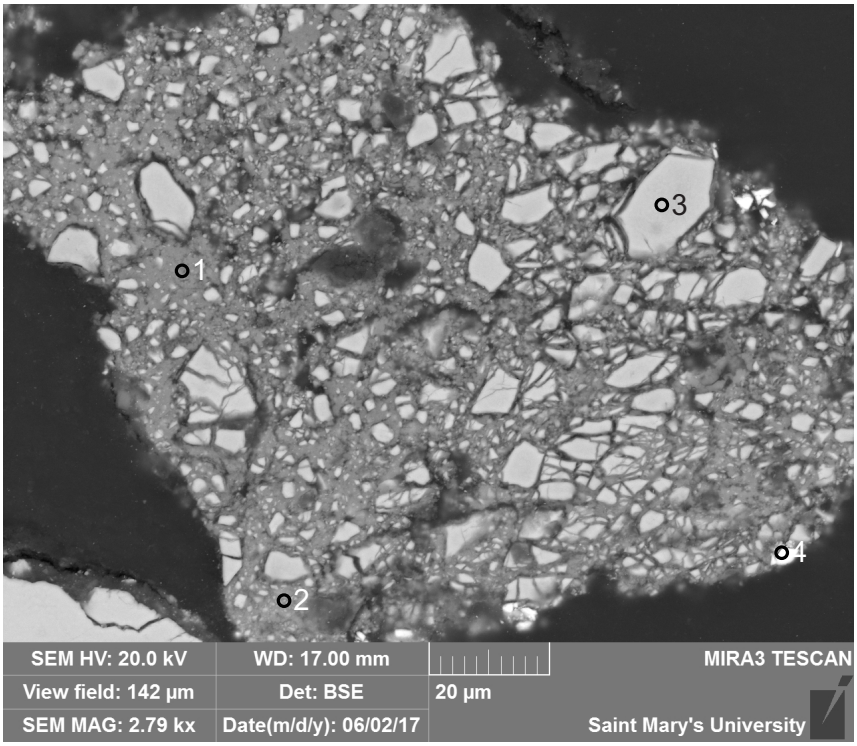


Figure 2B.1: Scanned thin section of sample B-79-3645 showing the location of analysed sites. The numbers correspond to sites analysed.



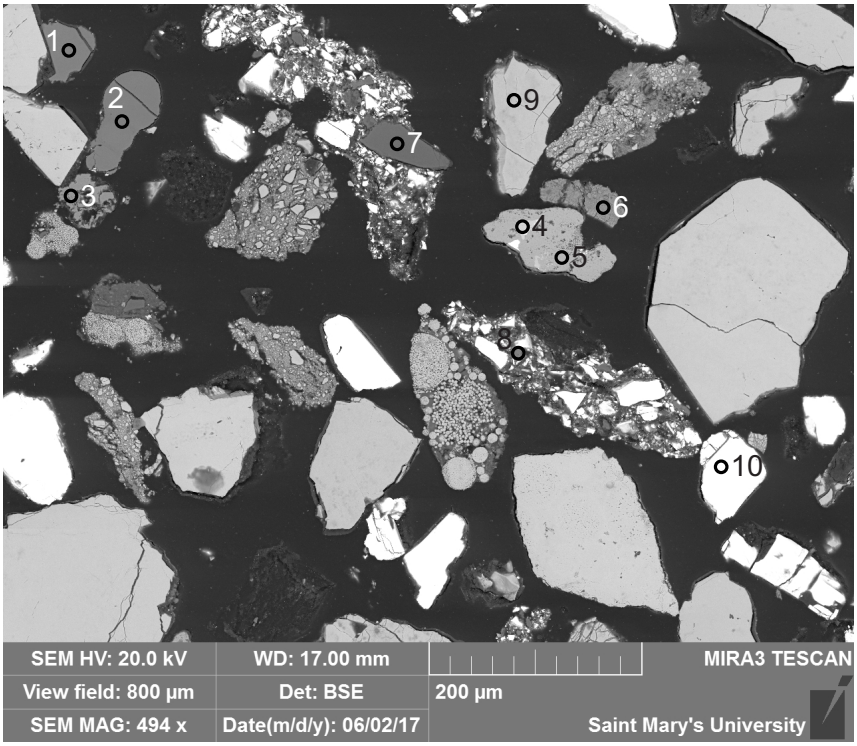
1:Muscovite + Chlorite
2:Calcite
3:Barite
4:Pyrite
5:Pyrite
6:Pyrite
7:Quartz

Figure 2B.2: Balvenie B-79 3645m site 1. Muscovite partly altered to chlorite (1).



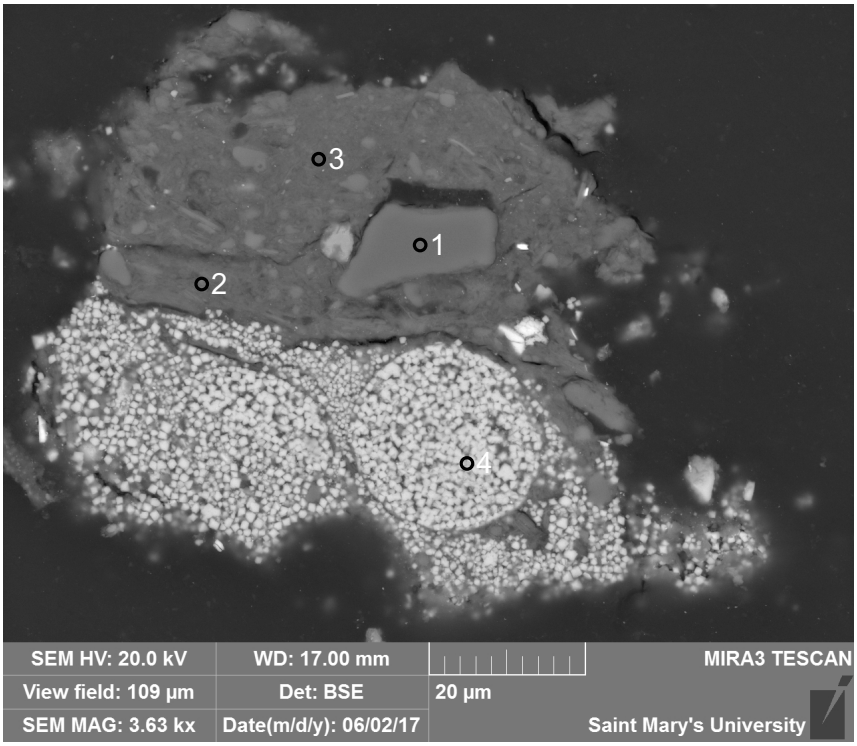
1:Pyrite +
2:Pyrite
3:Pyrite
4:Barite

Figure 2B.3: Balvenie B-79 3645m site 1.1. The whole grain appears to be a piece of drilling mud (barite+pyrite).



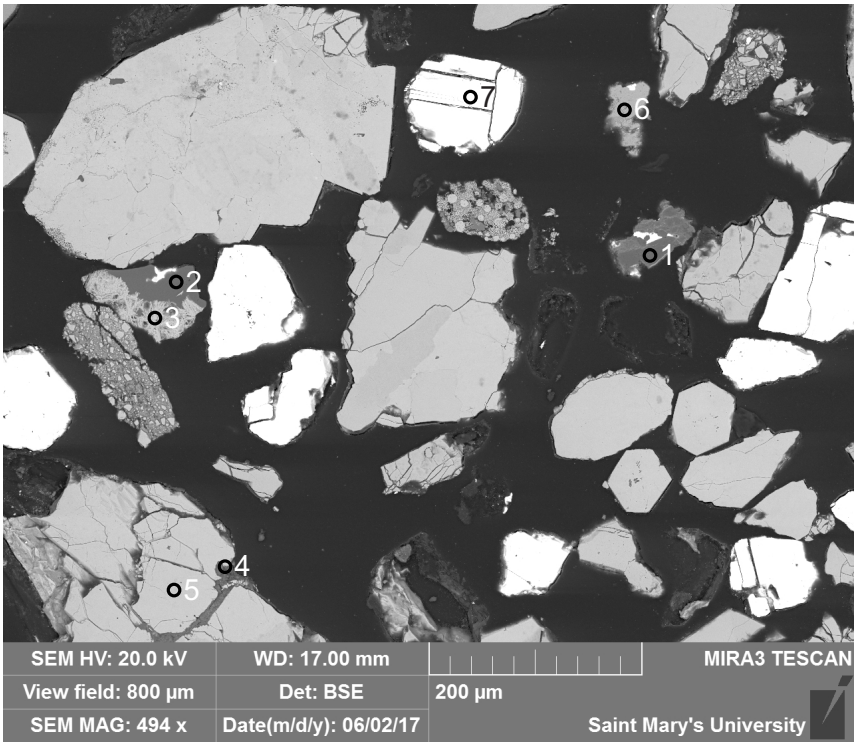
1:Calcite
2:Calcite
3:Siderite +
4:Mnohy (Mn)
5:Feohy +
6:Siderite +
7:Quartz
8:Muscovite +
9:Pyrite
10:Barite

Figure 2B.4: Balvenie B-79 3645m site 2. A cutting made up of Mnohy (4) and Feohy (5) is likely a contaminant.



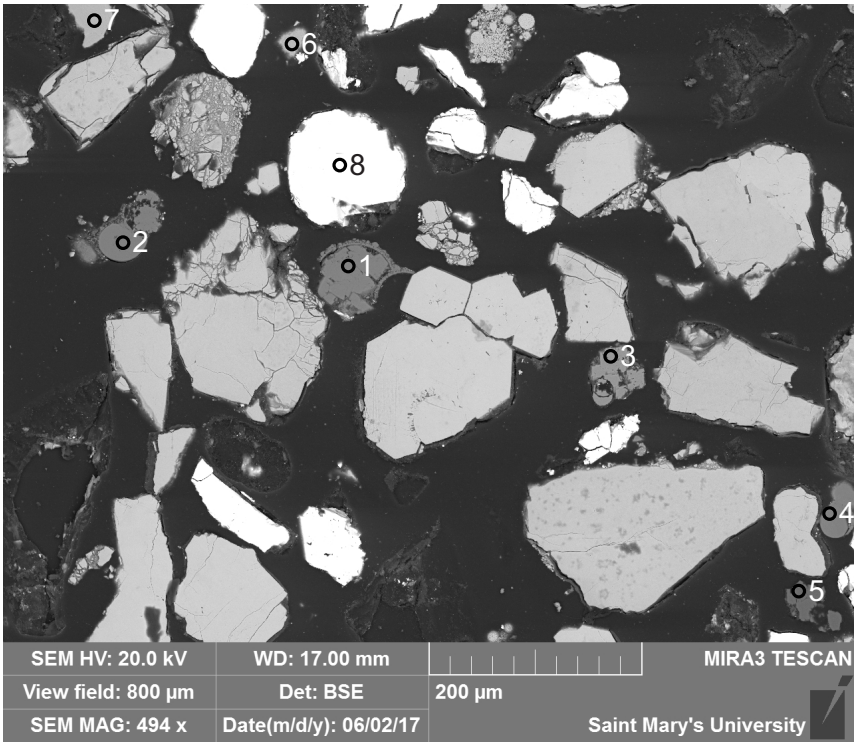
1:Quartz
2:Clay
3:Clay
4:Pyrite

Figure 2B.5: Balvenie B-79 3645m site 2.1. Probably an altered detrital K-feldpsar (2, 3) with quartz inclusions (1) and in contact with pyrite spherules (4).



1:Quartz
2:Quartz
3:Feohy +
4:Clay
5:Pyrite
6:Feohy +
7:Barite

Figure 2B.6: Balvenie B-79 3645m site 3. Probably a cutting made up of quartz (2) and hematite (3).



1:Calcite
2:Calcite
3:Siderite
4:Calcite
5:Quartz
6:Feohy +
7:Feohy +
8:Barite

Figure 2B.7: Balvenie B-79 3645m site 4. Calcite concretions or microfossils (1,2).

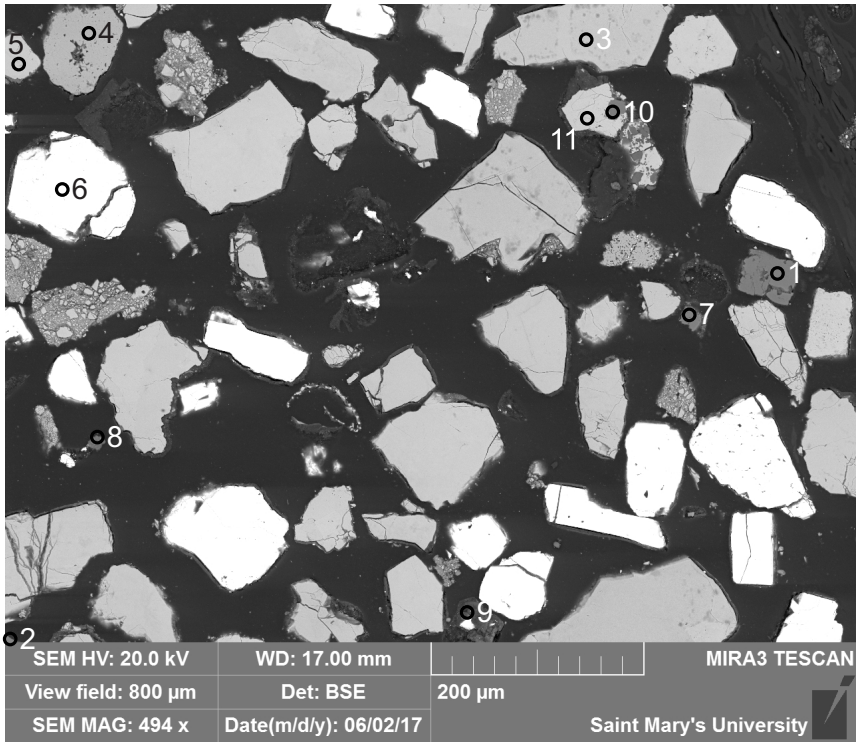


Figure 2B.8: Balvenie B-79 3645m site 5. A cutting made up of K-feldpsar (10) and pyrite (11).

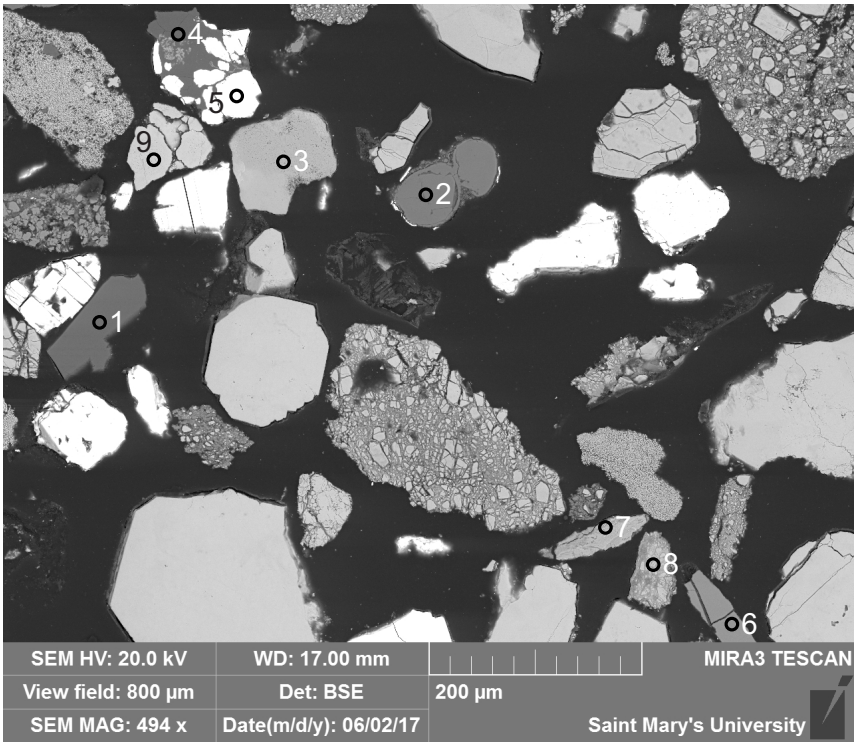
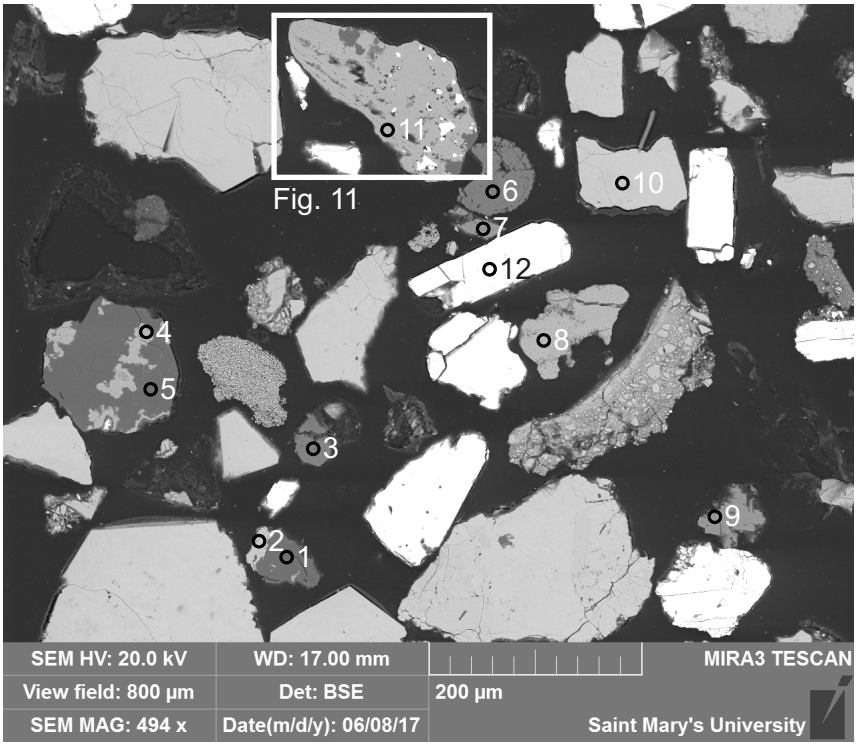
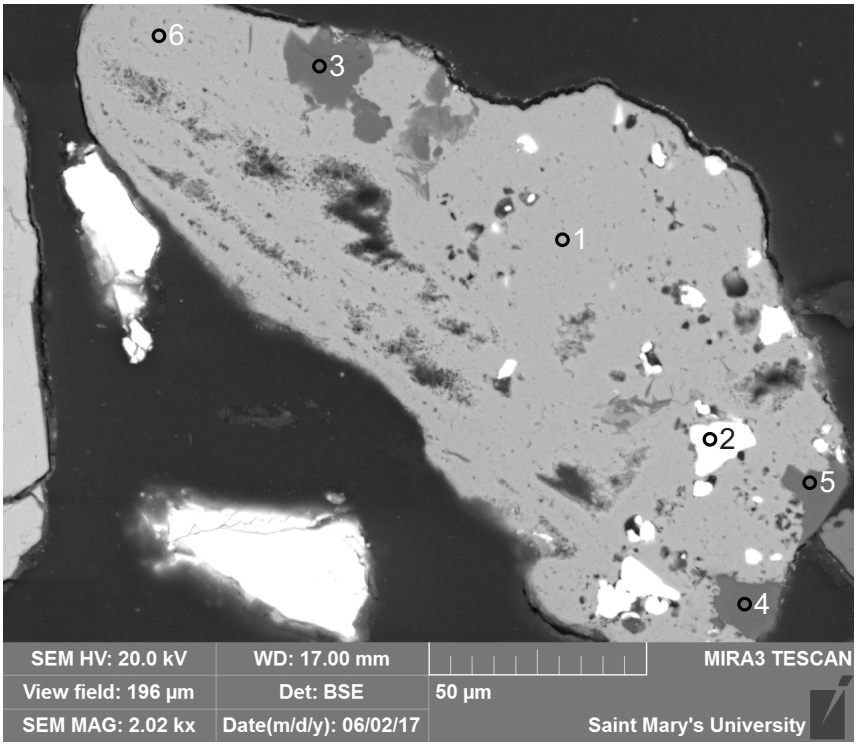


Figure 2B.9: Balvenie B-79 3645m site 6. A cutting made up of quartz (4) and barite (5) in which barite appears to be diagenetic. A bioclast infilled with calcite (2).



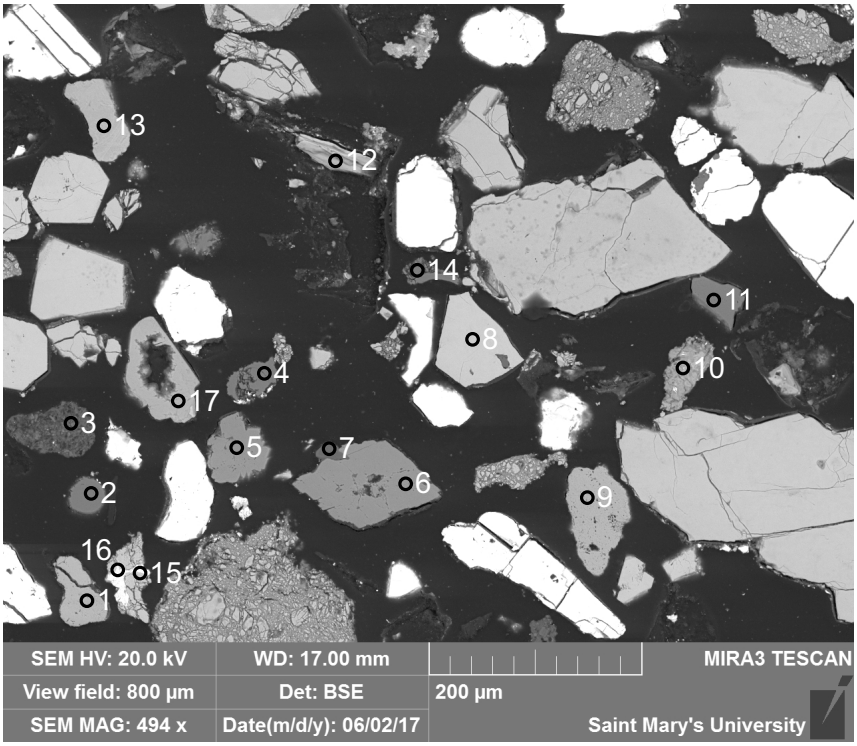
1:Quartz
2:Feohy +
3:Calcite
4:Feohy +
5:Quartz
6:Calcite
7:Siderite
8:Feohy +
9:Siderite
10:Pyrite
11:Feohy +
12:Barite

Figure 2B.10: Balvenie B-79 3645m site 7. Feohy (4) is associated with quartz (5) and appears to be diagenetic.



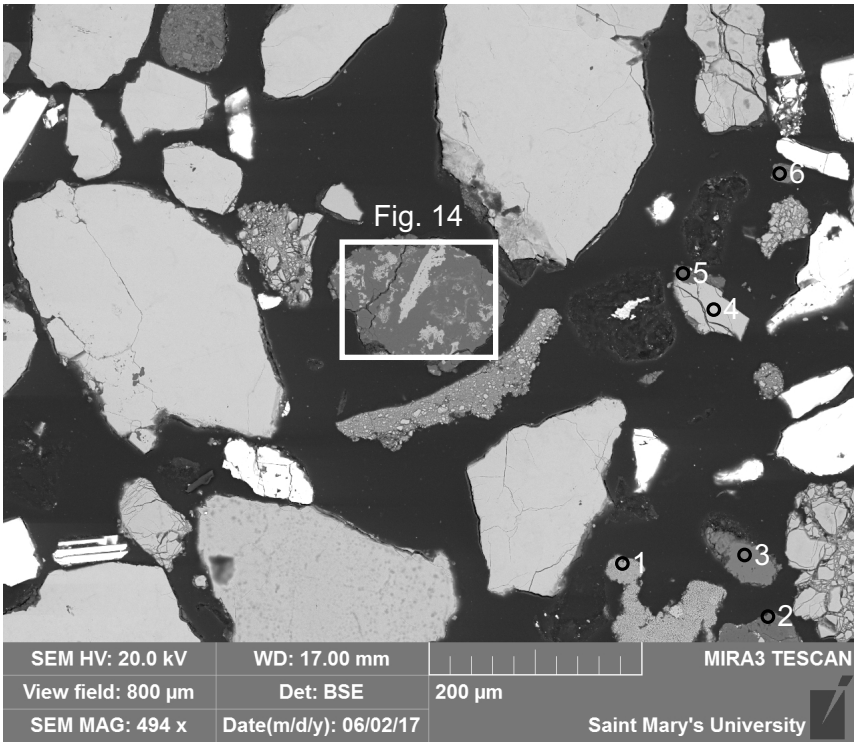
1:Feohy +
2:Barite
3:Quartz +
4:Quartz
5:Quartz
6:Feohy +

Figure 2B.11: Balvenie B-79 3645m site 7.1. A contaminant or a cutting made up of Feohy (1, 6), quartz inclusions (3, 5), and barite (2) appearing to fill voids.



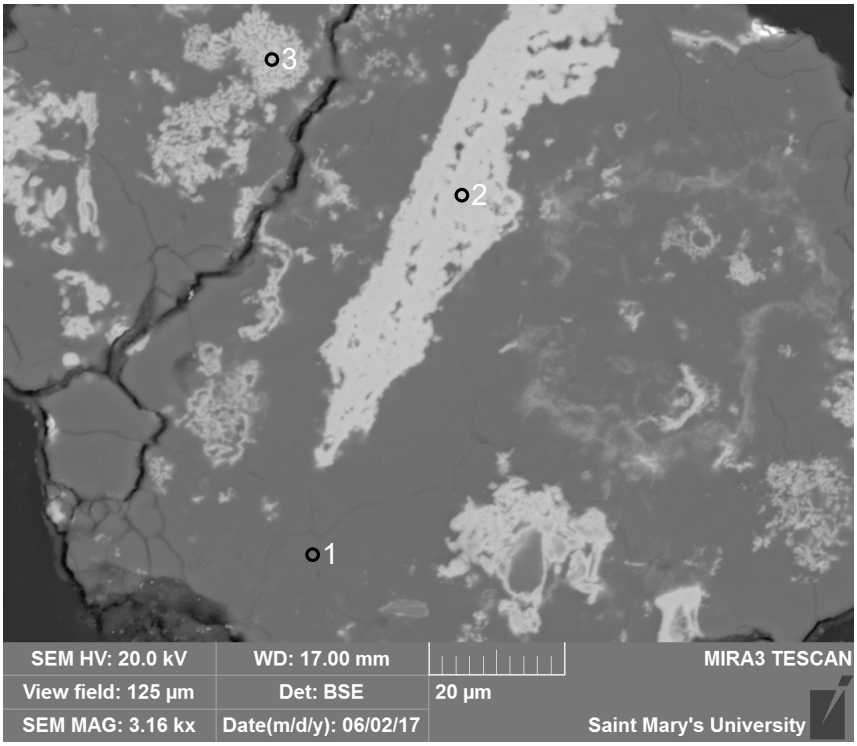
1:Feohy +
2:Calcite
3:Mix
4:Calcite
5:Siderite +
6:Siderite +
7:Quartz
8:Pyrite
9:Feohy +
10:Feohy +
11:Calcite + Siderite
12:Bad analysis
13:Feohy +
14:Calcite
15:Pyrite
16:Barite
17:Feohy +

Figure 2B.12: Balvenie B-79 3645m site 8. A contaminant or a piece of Feohy (possibly an altered detrital mineral) (9,10,13,17).



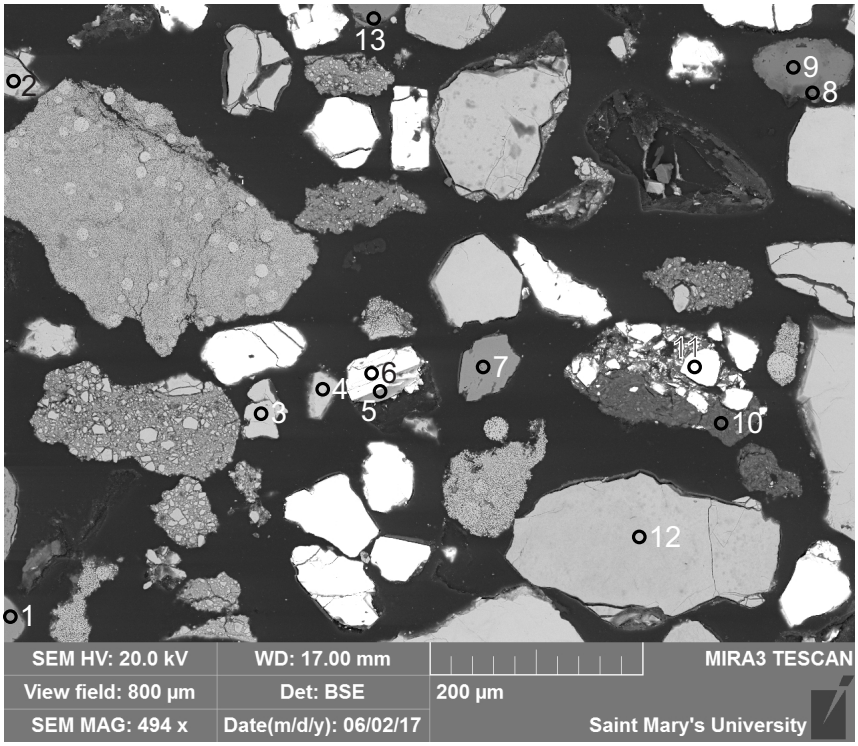
1:Pyrite
2:Quartz +
3:Calcite
4:Pyrite
5:Quartz
6:Calcite

Figure 2B.13: Balvenie B-79 3645m site 9.



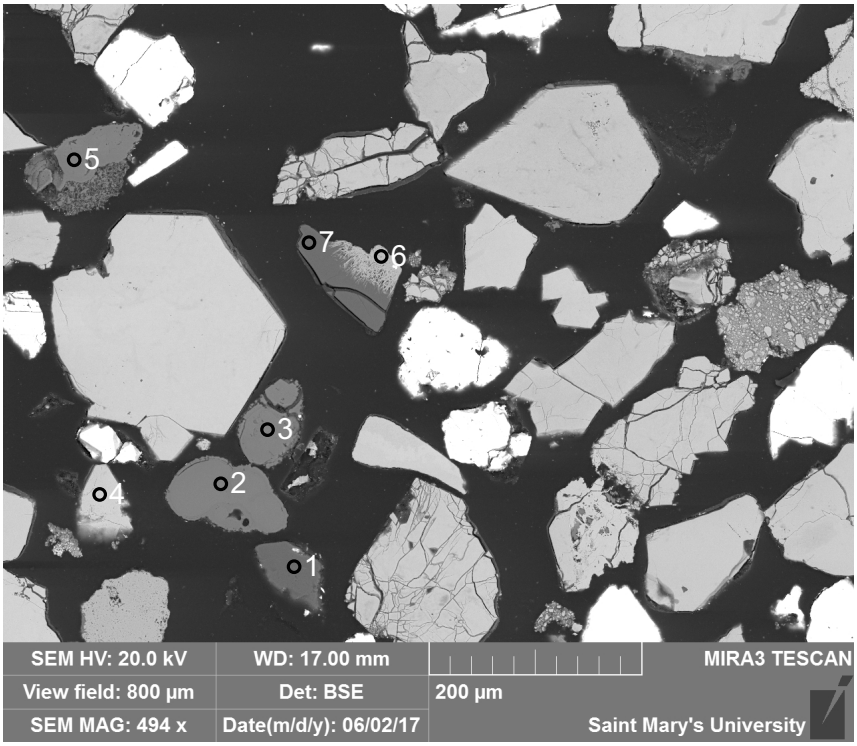
1:Quartz
2:Feohy +
3:Feohy +

Figure 2B.14: Balvenie B-79 3645m site 9.1. Similare to Fig. 2B.11.



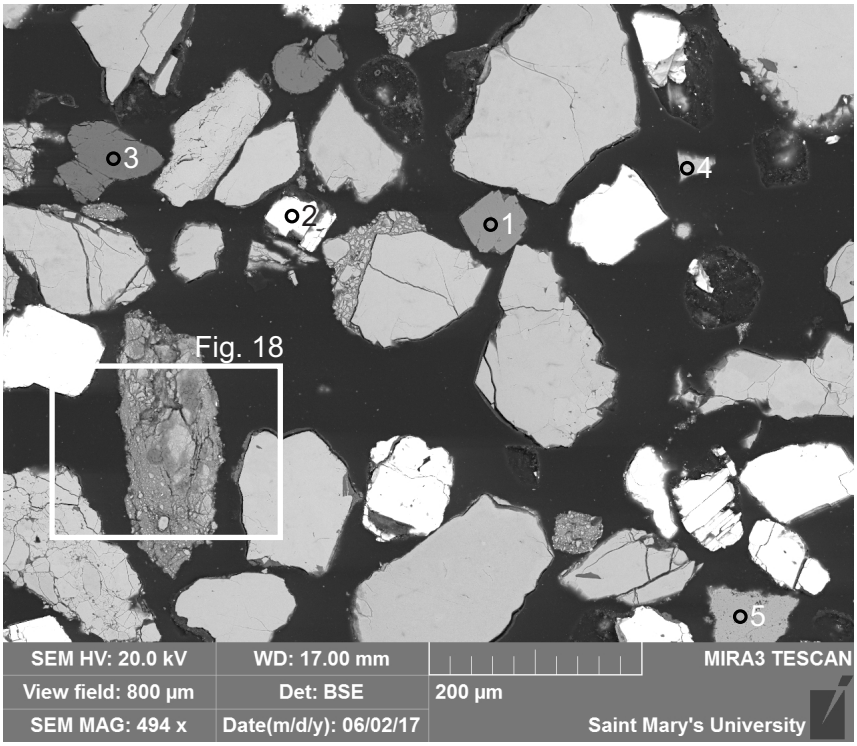
1:Apatite
2:Pyrite
3:Pyrite
4:Pyrite
5:Bad analysis
6:Barite
7:Siderite
8:Mix
9:Calcite
10:Clay
11:Barite
12:Pyrite
13:Calcite

Figure 2B.15: Balvenie B-79 3645m site 10. A cutting made up of clay rich matrix (10) mixed with drilling mud (11).



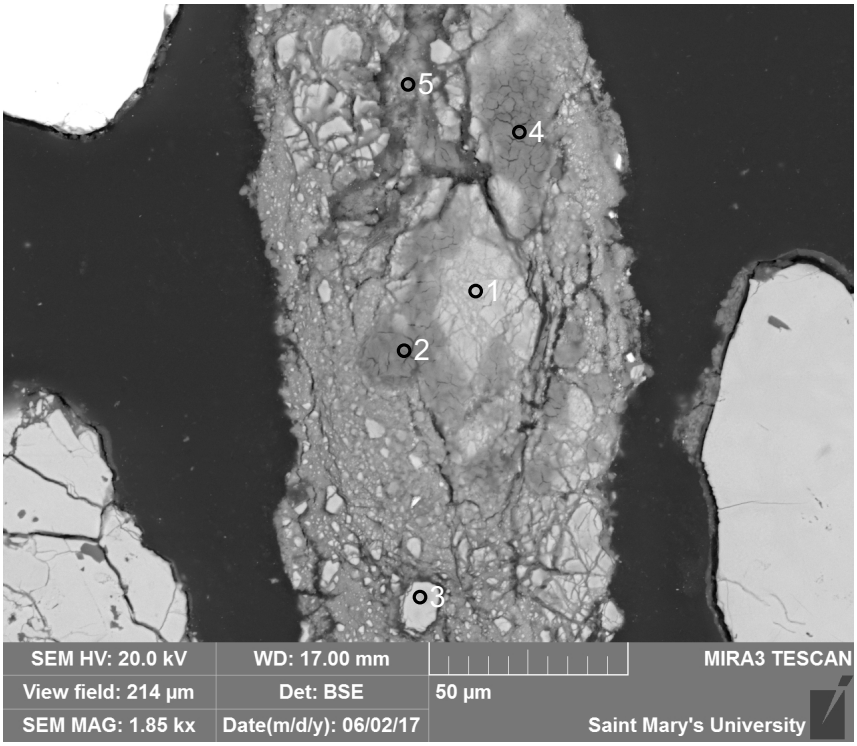
1:Quartz
2:Calcite
3:Calcite
4:Pyrite
5:Calcite
6:Feohy +
7:Quartz

Figure 2B.16: Balvenie B-79 3645m site 11. A cutting made up of quartz (7) and probably a detrital grain altered to Feohy.



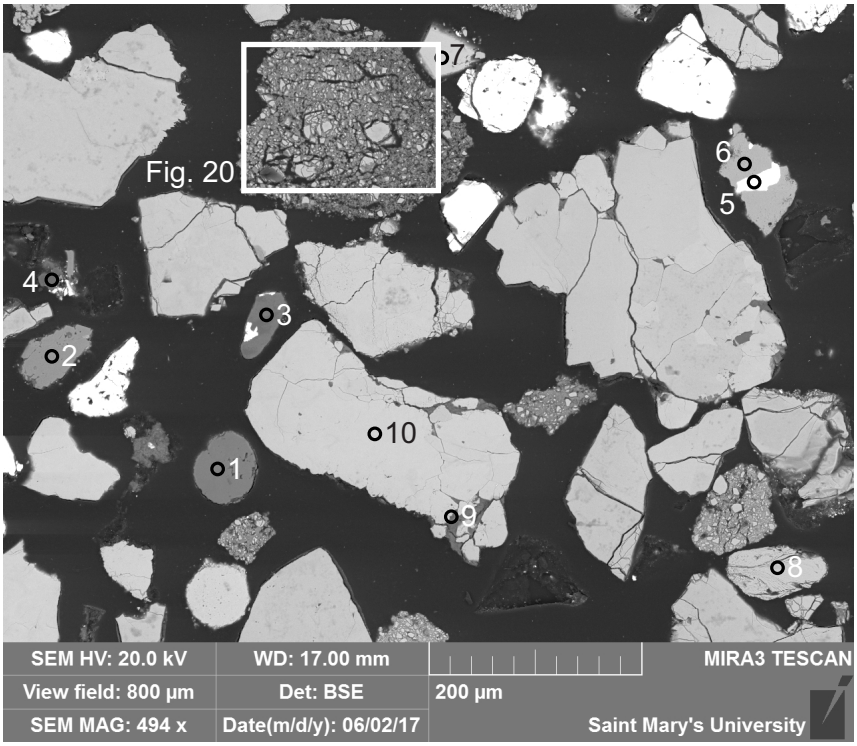
1:Siderite +
2:Barite
3:Ankerite
4:Pyrite
5:Feohy +

Figure 2B.17: Balvenie B-79 3645m site 12.



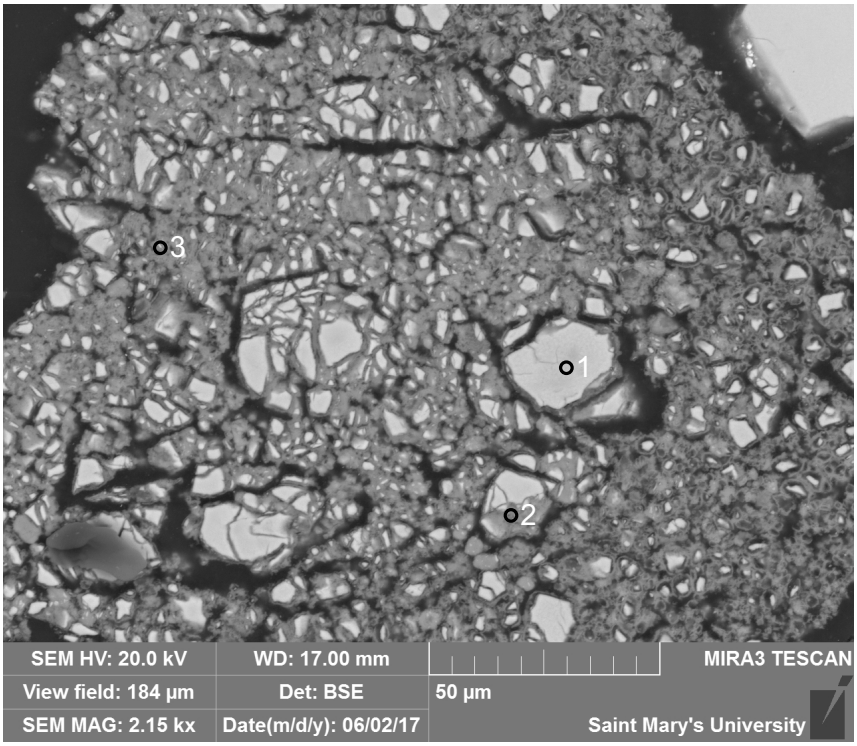
1:Pyrite
2:Pyrite
3:Pyrite
4:Pyrite
5:Pyrite

Figure 2B.18: Balvenie B-79 3645m site 12.1. A pyrite contaminant?



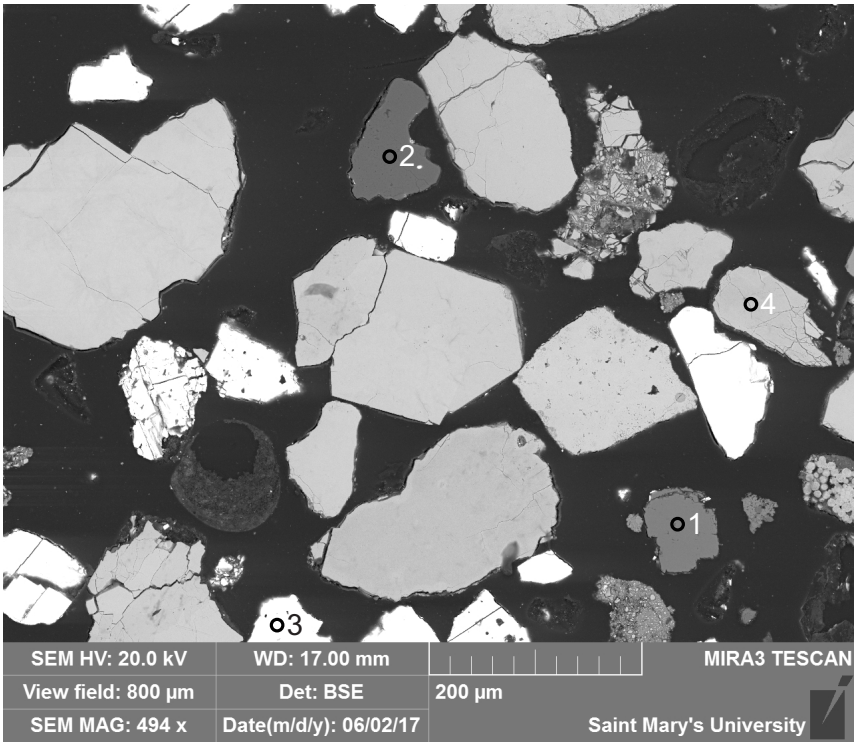
1:Calcite
2:Siderite +
3:Quartz +
K-feldspar
4:Quartz
5:Barite
6:Feohy +
7:Pyrite
8:Magnetite +
9:Clay +
10:Pyrite

Figure 2B.19: Balvenie B-79 3645m site 13. A contaminant or a fragment of diagenetic pyrite (6) cut by diagenetic barite (5)?. A contaminant or a cutting of diagenetic pyrite (10) in contact with diagenetic clay (9, kaolinite+chlorite probably after K-feldspar), most probably the latter.



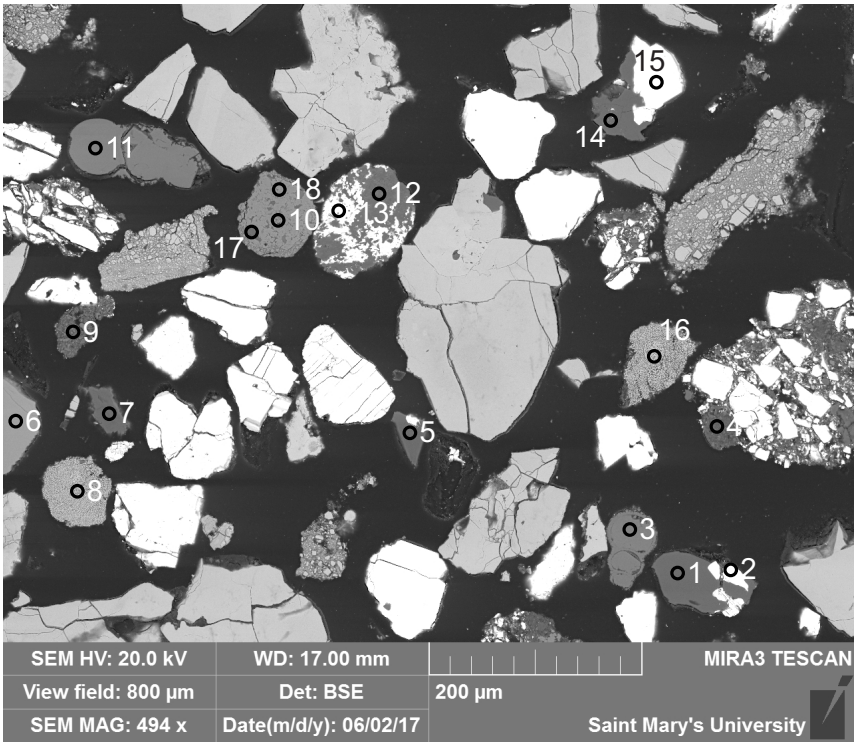
1:Pyrite
2:Pyrite
3:Pyrite

Figure 2B.20: Balvenie B-79 3645m site 13.1. A contaminant?



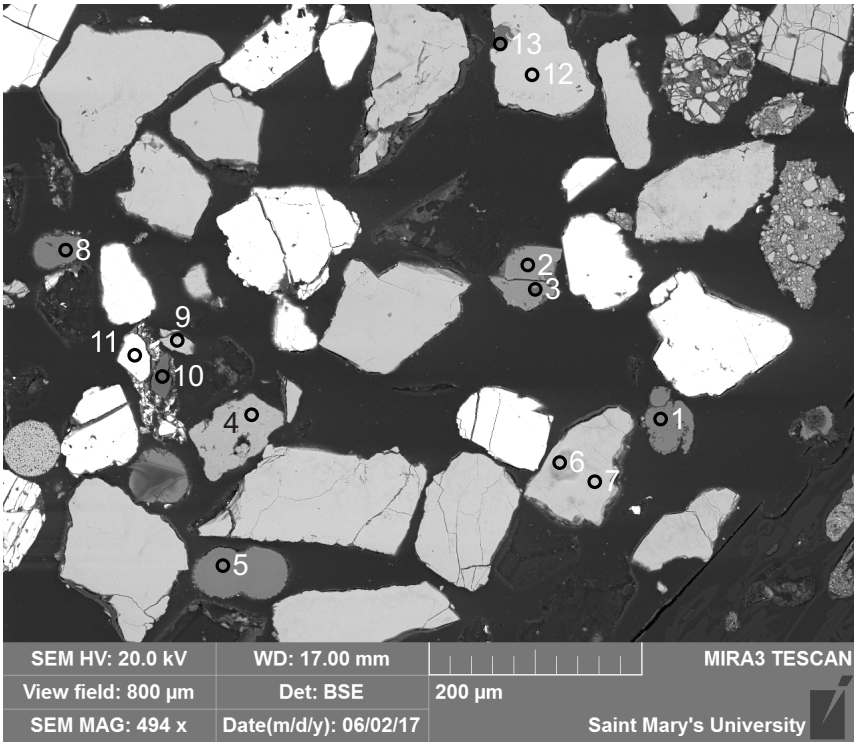
1:Calcite
2:Quartz
3:Barite
4:Pyrite

Figure 2B.21: Balvenie B-79 3645m site 14.



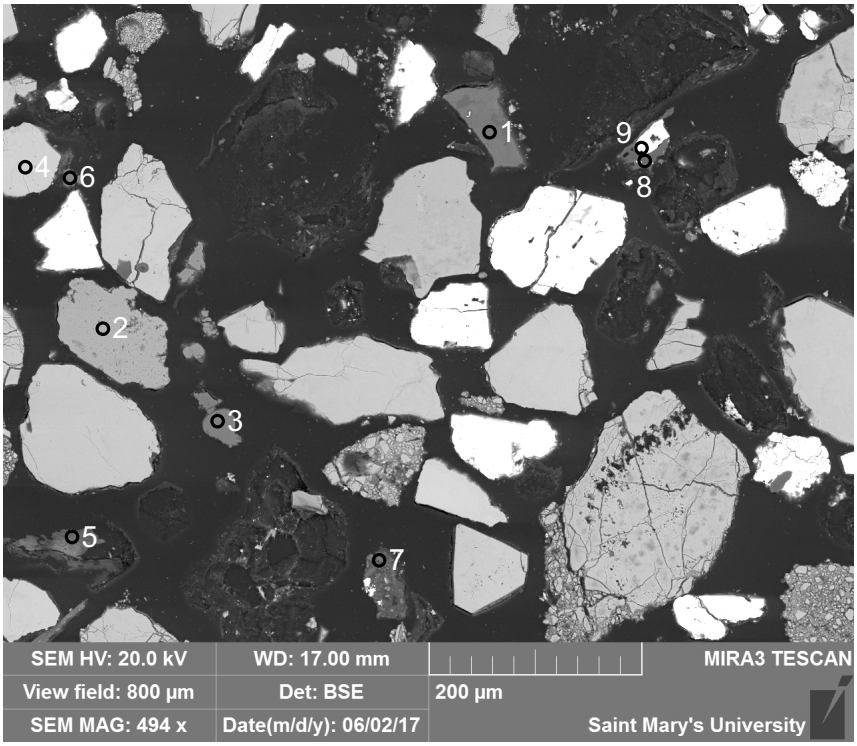
1:Quartz
2:Barite
3:Calcite
4:Clay
5:Quartz +
6:Fluorite
7:Quartz
8:Pyrite
9:Calcite
10:Siderite +
11:Calcite
12:Quartz +
13:Barite
14:Quartz +
15:Barite
16:Pyrite
17:Quartz
18:Siderite

Figure 2B.22: Balvenie B-79 3645m site 15. A cutting made up of quartz (12) and diagenetic barite (13) and a similar one (14,15). Altered albite (4). An apparent bioclast made of calcite (11).



1:Calcite
2:Siderite +
3:Quartz +
4:Feohy +
5:Calcite
6:Pyrite
7:Pyrite
8:Calcite
9:Pyrite
10:Quartz
11:Barite
12:Pyrite
13:Quartz

Figure 2B.23: Balvenie B-79 3645m site 16. A cutting made up of quartz (13) and pyrite (12).



1:K-feldspar
2:Feohy +
3:Calcite
4:Pyrite
5:Hole
6:Calcite
7:Clay
8:Quartz
9:Barite

Figure 2B.24: Balvenie B-79 3645m site 17. A cutting made up of quartz (8) and diagenetic barite (9). A detrital K-feldspar grain (1). ?Altered K-feldspar (7) grain (kaolinite+chlorite).

Table 2B.1: SEM-EDS chemical analyses of minerals from sample B-79 3645.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	CoO	NiO	CuO	ZnO	As_2O_3	SrO	Sb_2O_3	BaO	Yb_2O_3	WO_3	PbO	Total	Actual Total
1	1	Ms + Chl	56.34		11.36	19.50		3.74	0.78		8.28																100	103
1	2	Cal				1.14			48.27					6.60													56	65
1	3	Brt											35.60			-0.06					1.89		62.57				100	106
1	4	Py	0.09			28.86							71.05														100	225
1	5	Py				28.39							71.61														100	216
1	6	Py				29.18							70.82														100	224
1	7	Qz	98.89			0.38							0.73														100	152
1.1	1	Py +	1.49		0.59	45.04				1.68	0.49		48.92												1.78		100	83
1.1	2	Py				42.11				1.33	0.27		56.29														100	109
1.1	3	Py				29.38							70.62														100	225
1.1	4	Brt				2.61							37.42			0.08					3.13		56.76				100	108
2	1	Cal				0.68			49.88					5.44													56	60
2	2	Cal				1.00		0.31	45.81					8.89													56	65
2	3	Sd +	4.00		0.93	41.87	0.71	4.53	3.80		0.16																56	63
2	4	Mnohy (Mn)				2.35	76.94																20.71				100	83
2	5	Feohy +	4.55			93.95	1.50																				100	78
2	6	Sd +	2.11		0.78	35.59	6.40	4.42	5.18	0.31			1.21														56	63
2	7	Qz	100.00																								100	117
2	8	Ms +	50.55	1.53	24.56	4.73		1.34		0.29	11.20		0.80														95	89
2	9	Py				28.54							71.46														100	218
2	10	Brt											36.43			0.07							63.50				100	116
2.1	1	Qz	99.63			0.37																					100	120
2.1	2	Clay	60.79	1.66	25.79	5.24		2.11	0.95		2.81		0.65														100	92
2.1	3	Clay	64.91	1.74	22.85	4.21		2.08	0.99	0.28	2.43		0.51														100	92
2.1	4	Py	0.43			31.81			0.16				67.60														100	198
3	1	Qz	99.74			0.26																					100	118
3	2	Qz	99.57			0.43																					100	119
3	3	Feohy +	1.21			92.74																			6.05		100	88
3	4	Clay	68.18	0.60	15.46	7.52		2.24	1.17		2.45		2.37														100	75
3	5	Py				28.82							71.18														100	227
3	6	Feohy +	2.58			97.42																					100	74
3	7	Brt											36.95			-0.08					2.48		60.65				100	113
4	1	Cal				1.42		0.29	47.66					6.64													56	63
4	2	Cal				1.24		0.36	48.05					6.34													56	63
4	3	Sd				45.42	0.88	4.99	4.71																		56	61
4	4	Cal				0.31			50.06					5.63													56	65
4	5	Qz	99.73			0.27																					100	123
4	6	Feohy +	2.14		0.70	96.02	0.42						0.72														100	76
4	7	Feohy +	6.32			92.17													1.51								100	78
4	8	Brt											36.47			-0.01					1.24		62.30				100	113
5	1	Cal +	17.77		3.06	1.22			69.18		0.24			8.53													100	70
5	2	Cal				1.58		0.29	47.37					6.76													56	63

Table 2B.1: SEM-EDS chemical analyses of minerals from sample B-79 3645.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	CoO	NiO	CuO	ZnO	As_2O_3	SrO	Sb_2O_3	BaO	Yb_2O_3	WO_3	PbO	Total	Actual Total
5	3	Py	0.12			29.24							70.64														100	212
5	4	Feohy +	2.89			96.34	0.77																				100	75
5	5	Py				28.72				0.45			70.83														100	213
5	6	Brt											37.10			0.09					1.91		60.90				100	113
5	7	Cal				1.28		0.30	48.57					5.85													56	62
5	8	Qz +	83.08		9.55	1.95		0.57			4.51		0.34														100	102
5	9	Brt				0.90							35.66			-0.09					1.19		62.34				100	111
5	10	Kfs	65.65		17.56	0.63				0.60	15.56																100	110
5	11	Py				29.13				0.19			70.68														100	221
6	1	Qz	100.00																								100	117
6	2	Cal				1.33			44.20					10.47													56	68
6	3	Feohy +	5.33			93.37	1.30																				100	79
6	4	Qz	99.72			0.28																					100	119
6	5	Brt											36.32			0.01							63.67				100	111
6	6	Ap				0.59			48.56	0.79		39.26	0.62	8.54											1.64		100	113
6	7	Feohy +	0.77			94.44	0.53	0.97	0.83				2.18		0.28												100	83
6	8	Py	0.25			30.08			0.45				69.22														100	206
6	9	Py				25.66							70.58				2.99			0.77							100	220
7	1	Qz	99.68			0.32																					100	121
7	2	Feohy +	1.35			98.65																					100	92
7	3	Cal				1.53			46.86					7.61													56	66
7	4	Feohy +	7.95		0.68	89.28											0.49	1.60									100	77
7	5	Qz	99.73			0.27																					100	119
7	6	Cal				1.08			45.60					9.32													56	67
7	7	Sd	0.60		0.39	43.62	0.91	5.72	4.76																		56	62
7	8	Feohy +	3.77			94.84	1.39																				100	80
7	9	Sd	15.74		6.12	65.49	1.01	5.25	5.15		0.59		0.65														100	69
7	10	Py				28.66							71.34														100	248
7	11	Feohy +	5.89			93.58	0.53																				100	77
7	12	Brt											36.50			0.01					1.85		61.64				100	115
7.1	2	Brt				2.34							35.95			0.09					2.10		59.52				100	116
7.1	3	Qz +	93.85		3.55	1.68					0.92																100	115
7.1	4	Qz	99.39			0.61																					100	120
7.1	5	Qz	99.38			0.62																					100	120
7.1	6	Feohy +	6.64			92.91	0.45																				100	78
8	1	Feohy +	5.12			94.88																					100	78
8	2	Cal				1.13			42.46					12.40													56	71
8	3	Mix	31.75		10.01	2.94		1.50	37.82		1.67		0.78	13.53													100	64
8	4	Cal	2.80		0.78	1.24		0.30	40.60		0.13			10.15													56	71
8	5	Sd +	0.69			45.78	0.88	6.10	2.54																		56	61
8	6	Sd +	5.16		2.37	40.75	0.92	2.88	2.81		0.50		0.60														56	70
8	7	Qz	99.36			0.64																					100	121

Table 2B.1: SEM-EDS chemical analyses of minerals from sample B-79 3645.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	CoO	NiO	CuO	ZnO	As_2O_3	SrO	Sb_2O_3	BaO	Yb_2O_3	WO_3	PbO	Total	Actual Total
8	8	Py				28.86							71.14														100	224
8	9	Feohy +	2.94			96.56	0.50																				100	80
8	10	Feohy +	1.95			89.80	0.74	0.70	1.21	0.78			2.73		0.25										1.84		100	76
8	11	Cal + Sd				34.11	2.94	14.88	48.08																		100	59
8	12	BA*	1.17			77.94			0.26				20.05										0.58				100	31
8	13	Feohy +	6.32			91.68			0.36										1.64								100	78
8	14	Cal							45.73					10.27													56	68
8	15	Py				30.85							69.15														100	200
8	16	Brt				4.85							37.14										58.01				100	111
8	17	Feohy +	9.23			73.88			0.49				1.87					14.53									100	79
9	1	Py	0.48			33.10							66.42														100	172
9	2	Qz +	90.84		3.39	2.96		2.58			0.23																100	114
9	3	Cal				1.49	0.21		44.65					9.66													56	69
9	4	Py	0.13			28.90							70.97														100	225
9	5	Qz	99.51			0.49																					100	119
9	6	Cal				1.10			41.56				0.43	12.91													56	71
9.1	1	Qz	99.67			0.33																					100	120
9.1	2	Feohy +	5.56			80.60			0.61			1.76							4.50	3.13						3.84	100	79
9.1	3	Feohy +	8.38			81.33			0.62			1.26							4.39	2.43		1.59					100	79
10	1	Ap				0.50		0.33	48.55	0.91		39.03	0.91	8.23											1.54		100	110
10	2	Py				29.01				0.55			70.44														100	204
10	3	Py				29.06							70.94														100	224
10	4	Py	0.12			28.72							71.16														100	228
10	5	BA*	1.10			5.08							9.75										84.07				100	12
10	6	Brt											37.07			-0.09					1.94		61.08				100	117
10	7	Sd				43.84	1.91	5.11	5.14																		56	61
10	8	Mix	64.25		0.56	0.48			27.82					6.89													100	101
10	9	Cal				1.02	0.20		44.37					10.40													56	69
10	10	Clay	62.16	0.72	22.38	6.44		3.16	1.02	0.55	3.07		0.50														100	90
10	11	Brt											36.82			-0.03					1.58		61.63				100	117
10	12	Py	0.48			28.88							70.64														100	218
10	13	Cal	0.38			1.23	0.31		45.26					8.81													56	66
11	1	Qz	99.99																					0.01			100	119
11	2	Cal				1.18		0.41	45.23					9.18													56	69
11	3	Cal				1.56			44.53					9.91													56	69
11	4	Py				28.98							71.02														100	229
11	5	Cal				1.10			47.80					7.10													56	64
11	6	Feohy +	2.04			96.53			0.26											1.17							100	77
11	7	Qz	99.79			0.21																					100	122
12	1	Sd +	1.85		0.73	39.97	5.52	4.12	3.82																		56	62
12	2	Brt											37.04										62.96				100	113
12	3	Ank				10.30	1.53	15.51	28.66																		56	58

Table 2B.1: SEM-EDS chemical analyses of minerals from sample B-79 3645.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	CoO	NiO	CuO	ZnO	As_2O_3	SrO	Sb_2O_3	BaO	Yb_2O_3	WO_3	PbO	Total	Actual Total
12	4	Py				29.15							70.85														100	219
12	5	Feohy +	10.10			87.20	1.10		0.33									1.27									100	82
12.1	1	Py	0.59		0.29	28.88							70.24														100	247
12.1	2	Py	0.62			29.44				0.50			69.44														100	114
12.1	3	Py				28.73				0.41			70.86														100	219
12.1	4	Py				29.31							70.69														100	163
12.1	5	Py	1.05			33.96				0.61	0.30		61.61												2.47		100	114
13	1	Cal				0.61			49.03					6.36													56	65
13	2	Sd +				44.32	1.45	5.43	4.80																		56	61
13	3	Qz + Kfs	82.55		8.96	0.36					8.13																100	115
13	4	Qz	98.82		0.72	0.25					0.21																100	118
13	5	Brt				1.12							36.09			-0.05					1.90		60.94				100	117
13	6	Feohy +	5.77			92.81	1.42																				100	81
13	7	Py				28.78							71.22														100	224
13	8	Mag +	1.46			98.54																					100	95
13	9	Clay +	54.68	0.47	14.95	18.68		2.24	0.93		2.56		2.21		0.40										2.88		100	86
13	10	Py				28.66							71.34														100	235
13.1	1	Py				28.35				0.40			71.25														100	226
13.1	2	Py				41.72							56.25												2.03		100	102
13.1	3	Py				36.84			0.47	0.51	0.19		59.08												2.91		100	105
14	1	Cal	0.68		0.28	1.04			43.41	0.28				10.32													56	72
14	2	Qz	100.00																								100	118
14	3	Brt											36.83			0.05							63.12				100	111
14	4	Py				29.00				0.23			70.77														100	218
15	1	Qz	100.00																								100	123
15	2	Brt											36.30			-0.12					1.20		62.62				100	114
15	3	Cal				1.65			47.20					7.15													56	65
15	4	Clay	65.48	0.45	22.37	4.37		2.24	0.97	0.83	2.77		0.53														100	94
15	5	Qz +	85.64			14.36																					100	120
15	6	Fl							47.54					52.46													100	165
15	7	Qz	100.00																								100	116
15	8	Py	0.41			32.07							67.52														100	181
15	9	Cal	2.45		0.89	0.60			43.42					8.63													56	59
15	10	Sd +	2.74		1.15	33.15	4.65	5.72	7.92	0.66																	56	63
15	11	Cal				0.35			48.21					7.44													56	65
15	12	Qz +	90.21		5.27	0.42					4.10																100	116
15	13	Brt				0.36							36.91			-0.03					1.33		61.43				100	113
15	14	Qz +	93.13										2.99					3.88									100	108
15	15	Brt											36.57			-0.10					1.75		61.78				100	112
15	16	Py	0.33			30.29							69.38														100	197
15	17	Qz	99.10			0.90																					100	118
15	18	Sd	0.84			43.56	1.93	6.64	3.03																		56	60

Table 2B.1: SEM-EDS chemical analyses of minerals from sample B-79 3645.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	CoO	NiO	CuO	ZnO	As_2O_3	SrO	Sb_2O_3	BaO	Yb_2O_3	WO_3	PbO	Total	Actual Total
16	1	Cal				1.30			48.73					5.98													56	62
16	2	Sd +				44.62	1.90	5.77	3.71																		56	61
16	3	Qz +	97.86			1.94			0.20																		100	112
16	4	Feohy +	1.95			95.71	2.34																				100	78
16	5	Cal				0.53			51.02					4.46													56	63
16	6	Py	0.13			28.26							71.61														100	219
16	7	Py				28.88			0.25				70.87														100	230
16	8	Cal				0.84	0.24		47.65					7.27													56	64
16	9	Py	0.08			29.74				0.52			69.66														100	216
16	10	Qz	100.00																								100	116
16	11	Brt											37.59			-0.12					1.94		60.59				100	115
16	12	Py				28.90							71.10														100	224
16	13	Qz	99.35			0.65																					100	118
17	1	Kfs	66.19		17.65					0.44	15.72																100	113
17	2	Feohy +	7.00			92.57	0.43																				100	75
17	3	Cal				0.98			49.95					5.07													56	62
17	4	Py				28.67							71.33														100	222
17	5	Hole	4.22		0.99	87.90			1.38				5.04		0.47												100	23
17	6	Cal				1.31			47.33				0.36	7.01													56	63
17	7	Clay	60.64	0.87	18.40	5.65		3.13	1.21	0.36	2.71		3.01										4.02				100	95
17	8	Qz	100.00																								100	118
17	9	Brt											36.53			-0.13							63.60				100	113

Crimson F-81 well

Scanning Electron Microscope (SEM) Backscattered Electron (BSE) images and Energy Dispersive Spectroscopy (EDS) mineral analyses from Crimson F-81 well

Appendix 3A: SEM-BSE images and EDS mineral analyses for sample F-81 6415

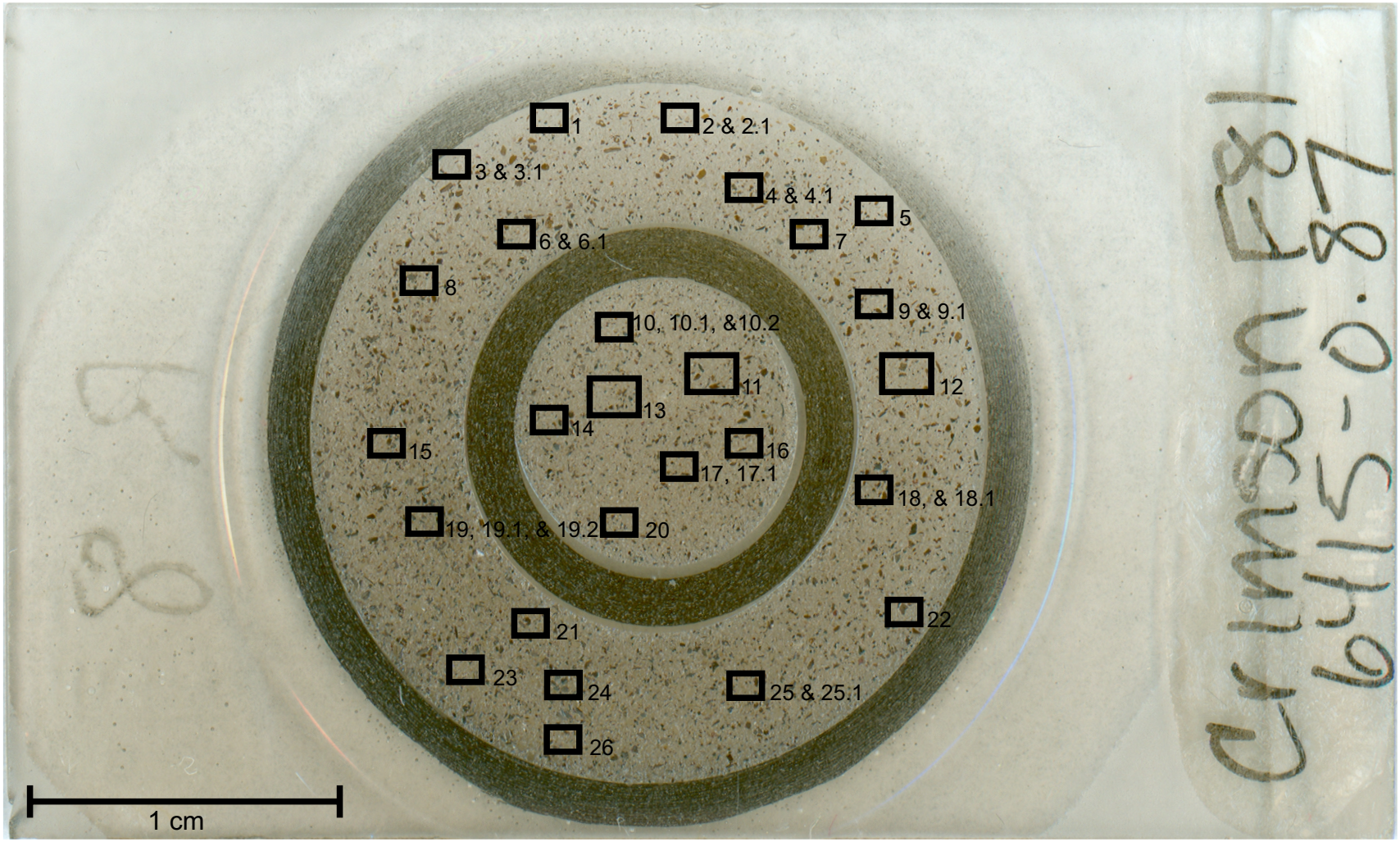
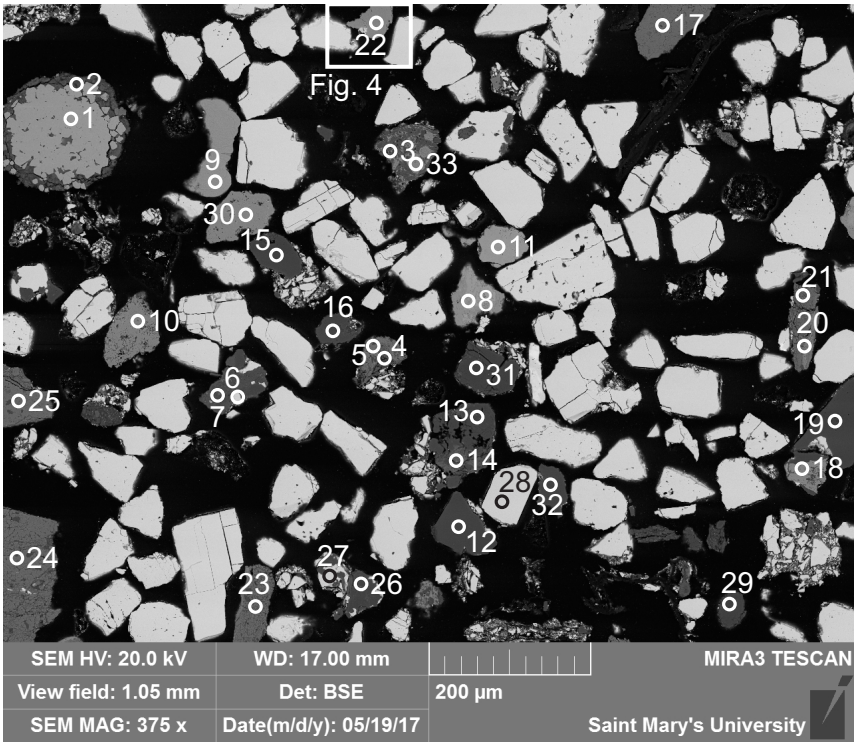
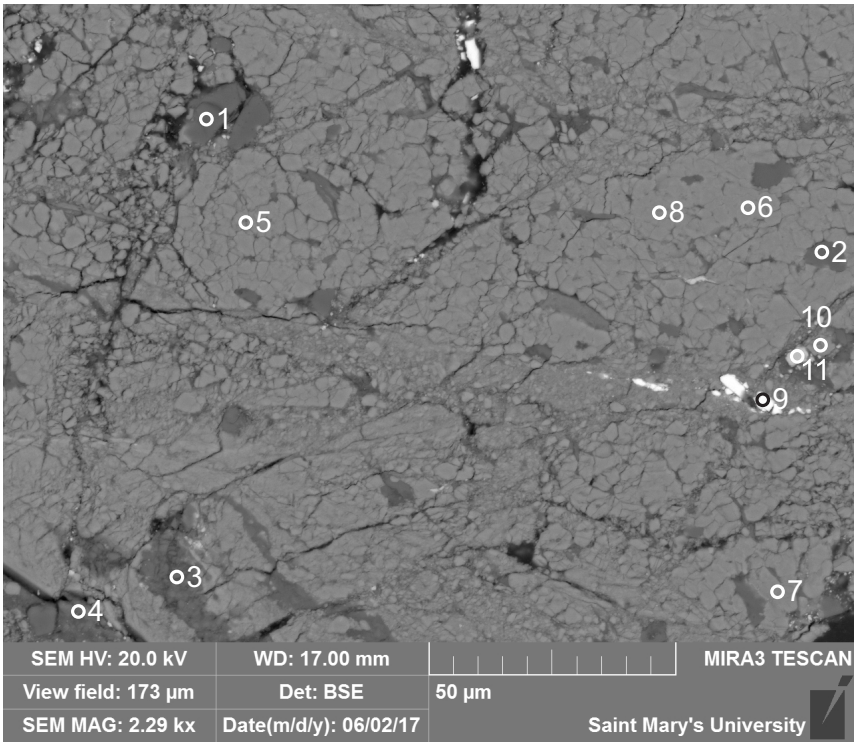


Figure 3A.1: Scanned thin section of sample F-81 6415 showing the location of analysed sites.



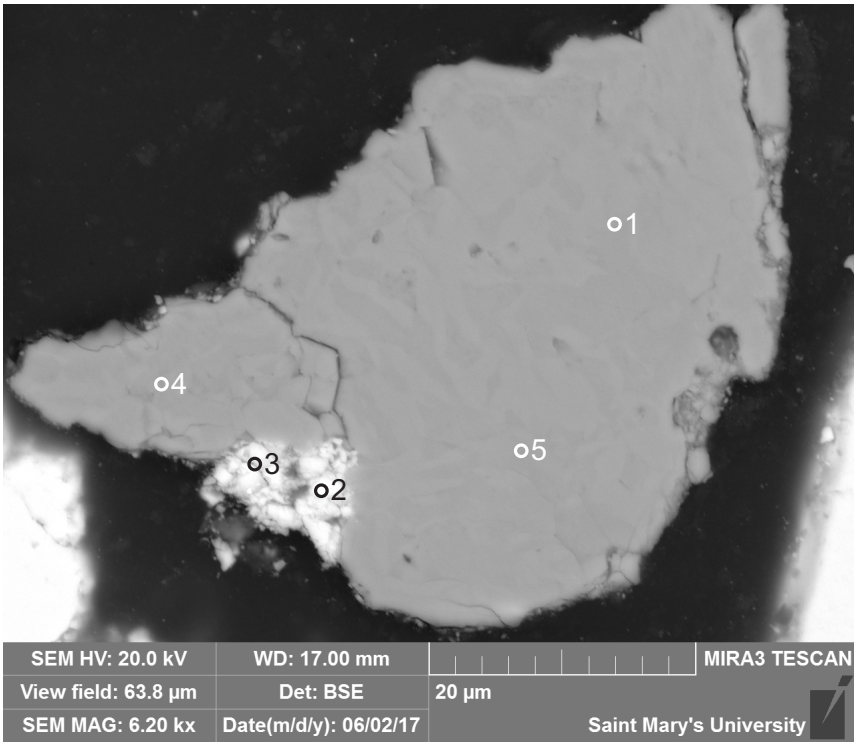
1:Pyrite
2:Quartz +
3:Muscovite + Chlorite
4:Chlorite +
5:Chlorite +
6:Barite
7:Muscovite +
8:Mnohy (Fe + Mn)
9:Feohy +
10:?Siderite +
11:Pyrite
12:Quartz
13:Albite
14:Chlorite
15:Quartz
16:Quartz
17:Siderite
18:Feohy + Quartz
19:Quartz
20:Siderite + Chlorite + Apatite +
21:Mix
22:Feohy + (Fig. 4)
23:Siderite +
24:Siderite + Chlorite
25:Apatite + Siderite
26:Quartz +
27:Barite
28:Barite
29:Quartz
30:Feohy +
31:Quartz
32:Quartz
33:Feohy +

Figure 3A.2: Crimson F-81 6415m site 1. (Table 3A.1). A cutting made up of muscovite and chlorite (3), and Feohy (33) of which the latter is likely a contaminant in other spots (22). A cutting made up of albite (13) and probably detrital chlorite (14).



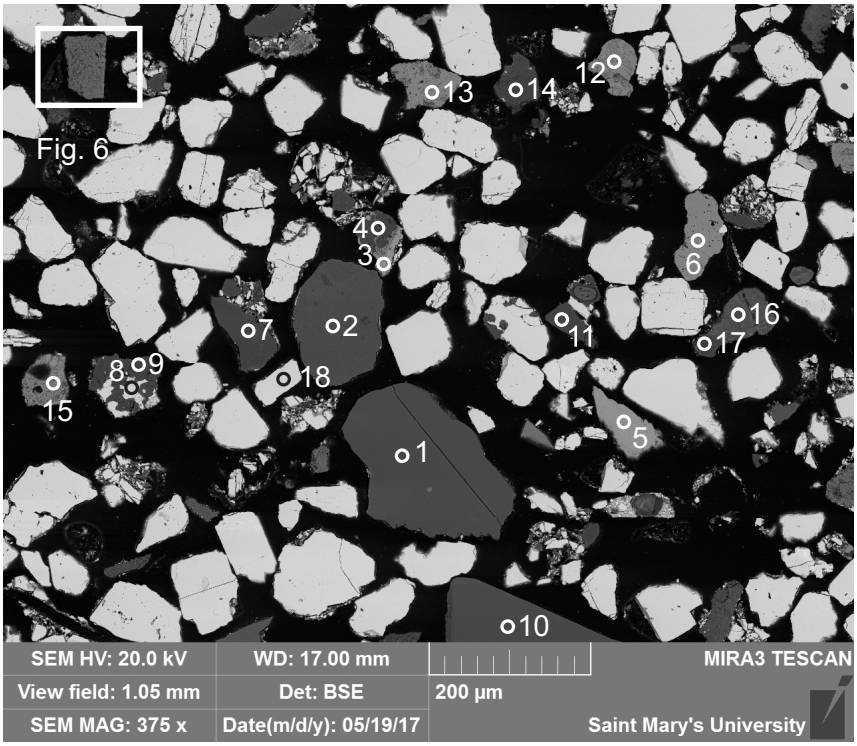
1:Quartz
2:Quartz +
3:Quartz +
4:Illite
5:Siderite +
6:Siderite + Chlorite
7:Siderite + Chlorite
8:Siderite + Chlorite
9:Barite +
10:Siderite
11:Pyrite

Figure 3A.3: Crimson F-81 6415m site 1.1. (Table 3A.2). A cutting made up of siderite (5-8,10) quartz (1-3), illite (4), chlorite (6-8), barite (9), and pyrite (11).



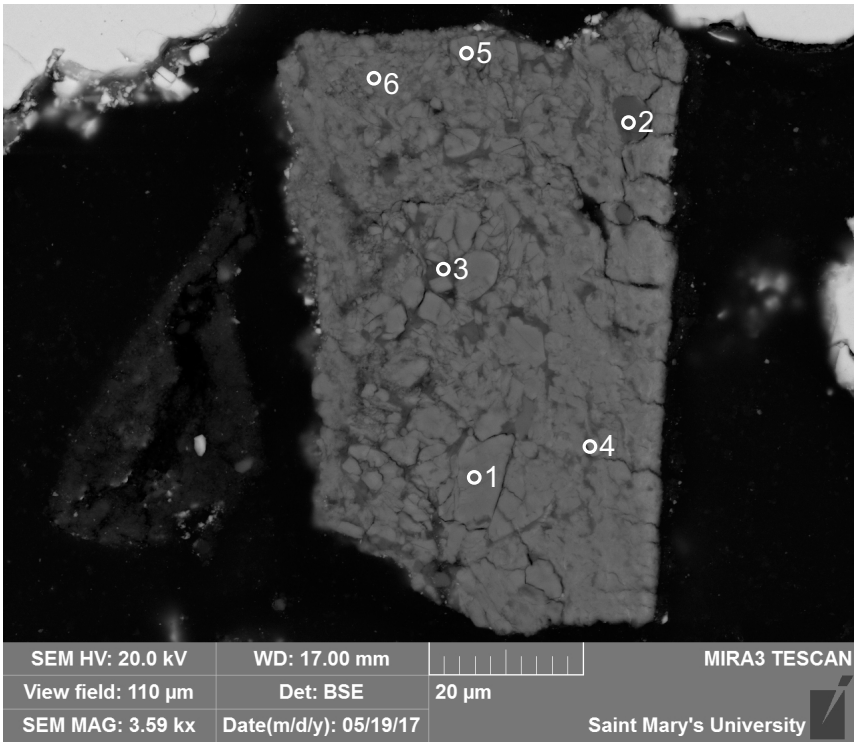
1:Feohy +
2:Barite
3:Barite
4:Feohy +
5:Feohy +

Figure 3A.4: Crimson F-81 6415m site 1.2. (Table 3A.2). A cutting of drilling mud made of Feohy (1,4,5) and barite (2,3).



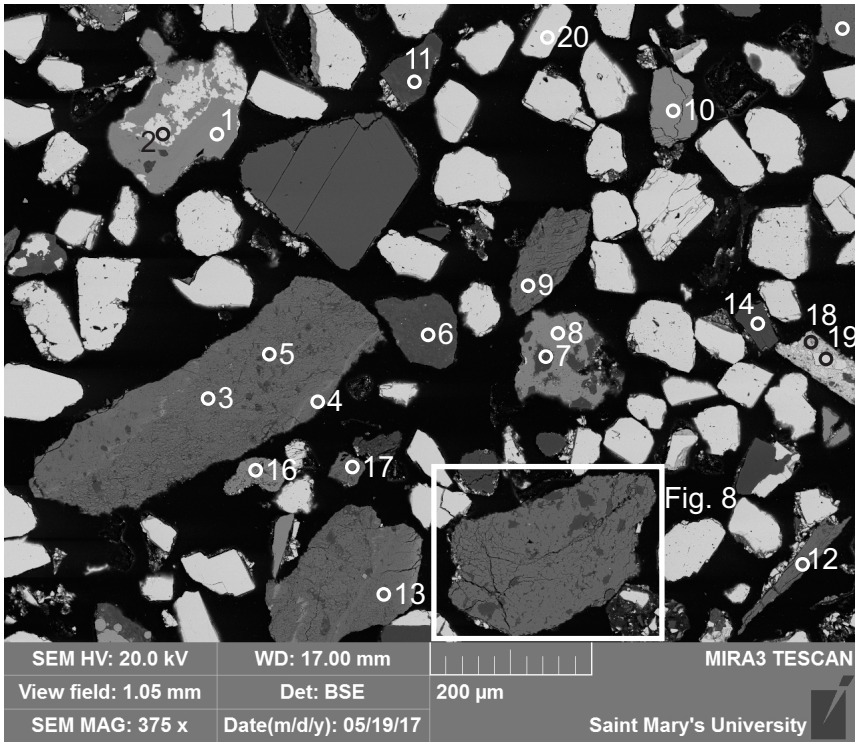
1:Tremolite
2:Ankerite
3:Feohy
4:Quartz + Feohy
5:Magnetite
6:Hem
7:Quartz
8:Barite
9:Quartz
10:Tremolite
11:Quartz
12:Mnohy
(Mn + Ba + F)
13:Feohy + Chlorite
14:Quartz
15:Mix
16:Muscovite +
17:Quartz
18:Barite

Figure 3A.5: Crimson F-81 6415m site 2. (Table 3A.1). A large grain of tremolite (1) is probably a contaminant.



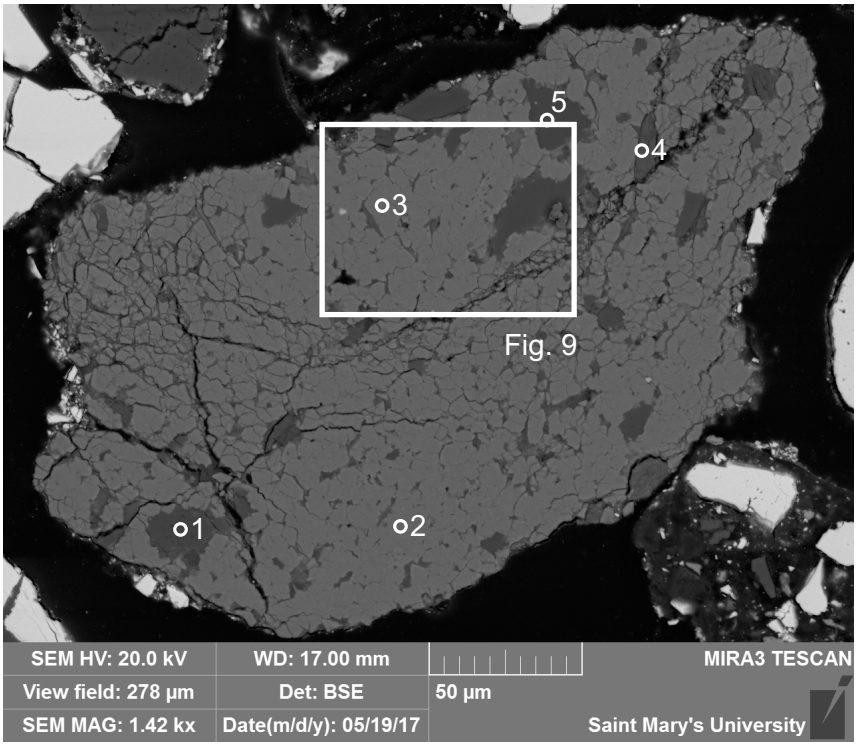
1:Siderite
2:Quartz +
3:Chlorite +
4:TiO2 +
5:Siderite +
6:Siderite + Chlorite

Figure 3A.6: Crimson F-81 6415m site 2.1. (Table 3A.1). A cutting made of siderite (1,5,6) with chlorite (3,6).



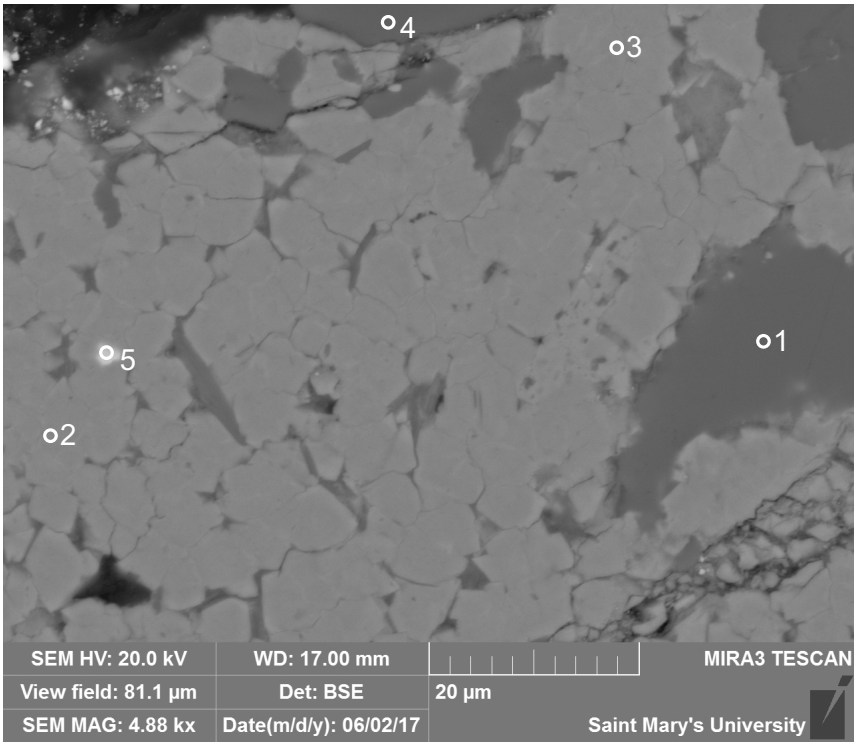
1:Feohy +
2:Barite
3:Siderite + Chlorite
4:Siderite +
5:Albite + Siderite
6:Quartz + K-feldspar
7:Quartz
8:Feohy +
9:Siderite +
10:Feohy +
11:Quartz
12:Siderite + Chlorite
13:Siderite + Chlorite
14:Quartz
15:Siderite + Chlorite
16:Feohy +
17:Siderite +
18:Barite + Quartz
19:Barite
20:Barite

Figure 3A.7: Crimson F-81 6415m site 3. (Table 3A.1). A cutting made up of Feohy (1) and barite (2) which are likely contaminants.



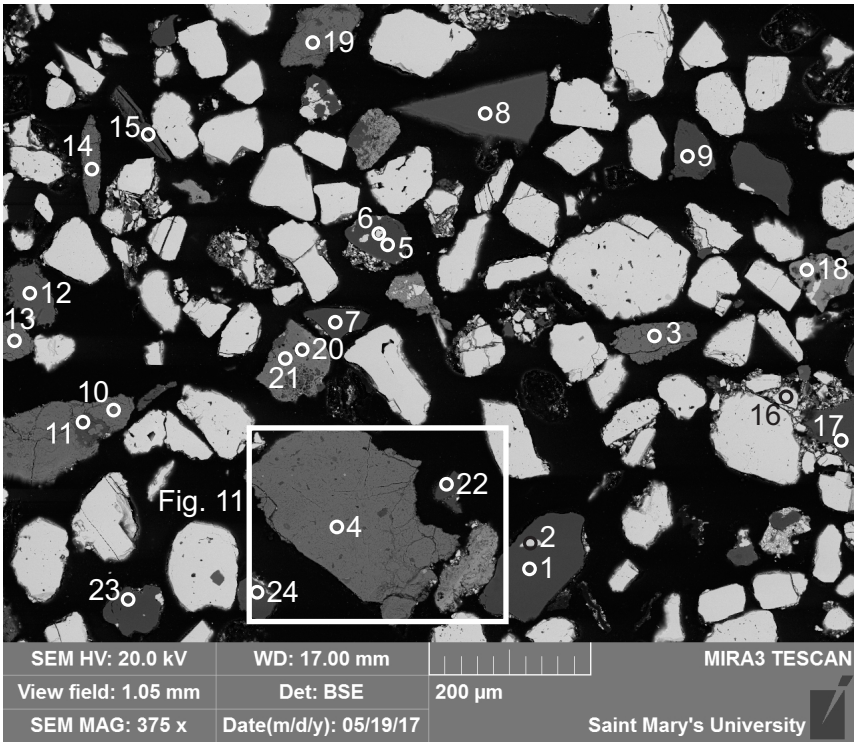
1:Albite
2:Siderite
3:Siderite + Chlorite
4:Muscovite
5:Albite

Figure 3A.8: Crimson F-81 6415m site 3.1. (Table 3A.1). A cutting made up of siderite (2,3), chlorite (3), albite (1), and muscovite (4), in which siderite appears to be partly replacing albite and muscovite.



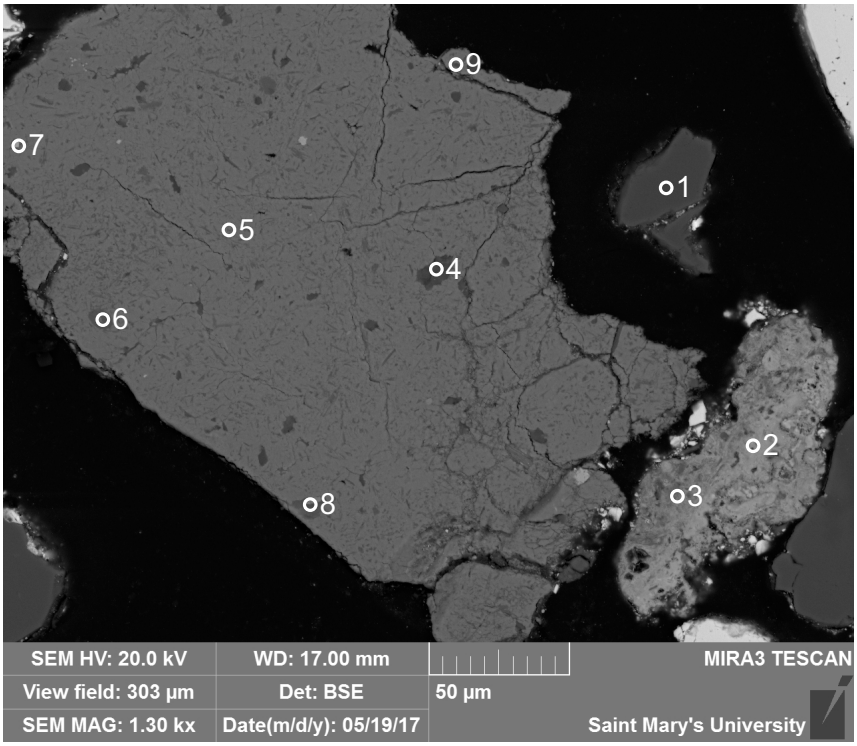
1:Quartz
2:Siderite +
3:Siderite +
4:Quartz
5:Pyrite

Figure 3A.9: Crimson F-81 6415m site 3.2. (Table 3A.2). Similar to Fig. 3A.8).



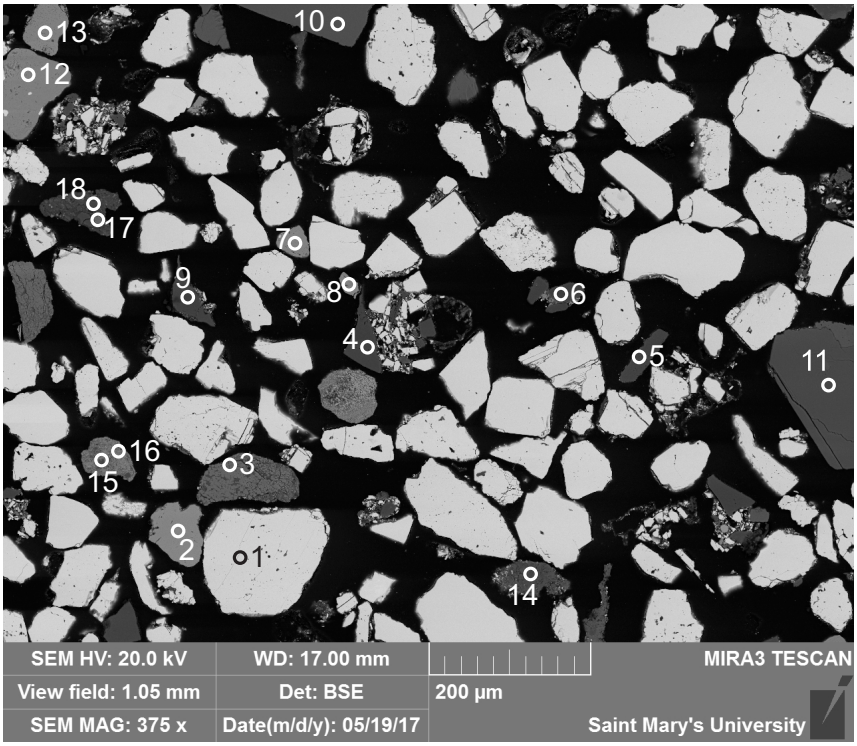
1:Quartz
2:Barite
3:Siderite
4:Siderite + Chlorite
5:Quartz
6:Barite
7:Quartz
8:Tremolite
9:Quartz
10:Siderite
11:Muscovite
12:Calcite
13:Siderite + Apatite + Chlorite
14:Siderite + Calcite + Apatite
15:Tremolite
16:Barite
17:Quartz
18:Feohy +
19:Siderite +
20:Quartz
21:Mix
22:Quartz
23:Quartz
24:Quartz +

Figure 3A.10: Crimson F-81 6415m site 4. (Table 3A.1). Cuttings made up of quartz (1,5) and barite (2,6) in which barite appears to be diagenetic.



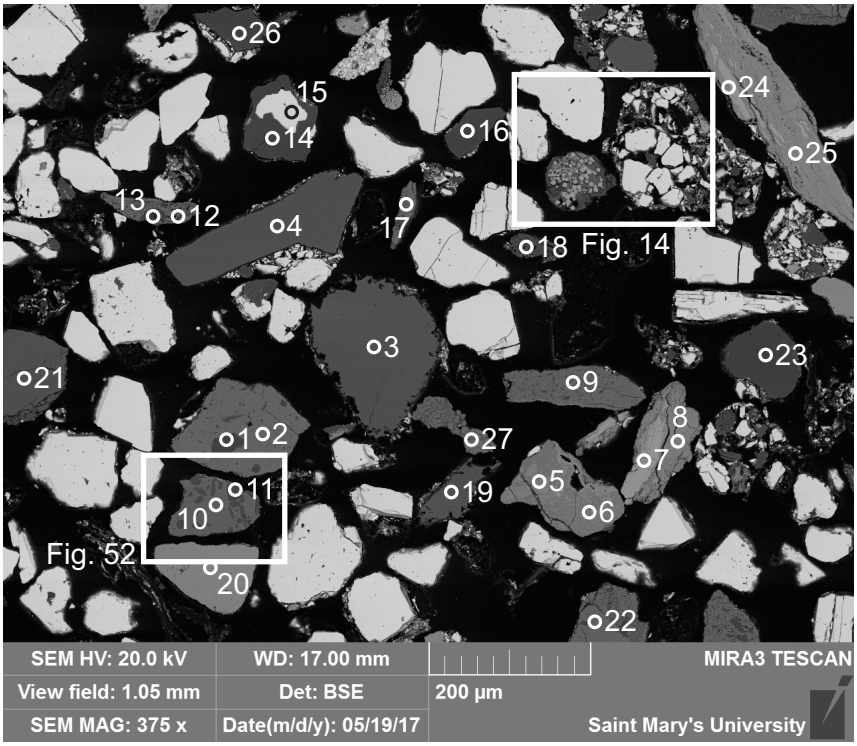
1:Quartz
2:Mnohy (Mn + Al + Fe)
3:Mnohy (Mn + Al + Si)
4:Quartz +
5:Siderite + Chlorite
6:Fe-Calcite
7:Pyrite
8:Mix
9:Siderite +

Figure 3A.11: Crimson F-81 6415m site 4.1. (Table 3A.1). A cutting made up of siderite (5,9) and quartz (4).



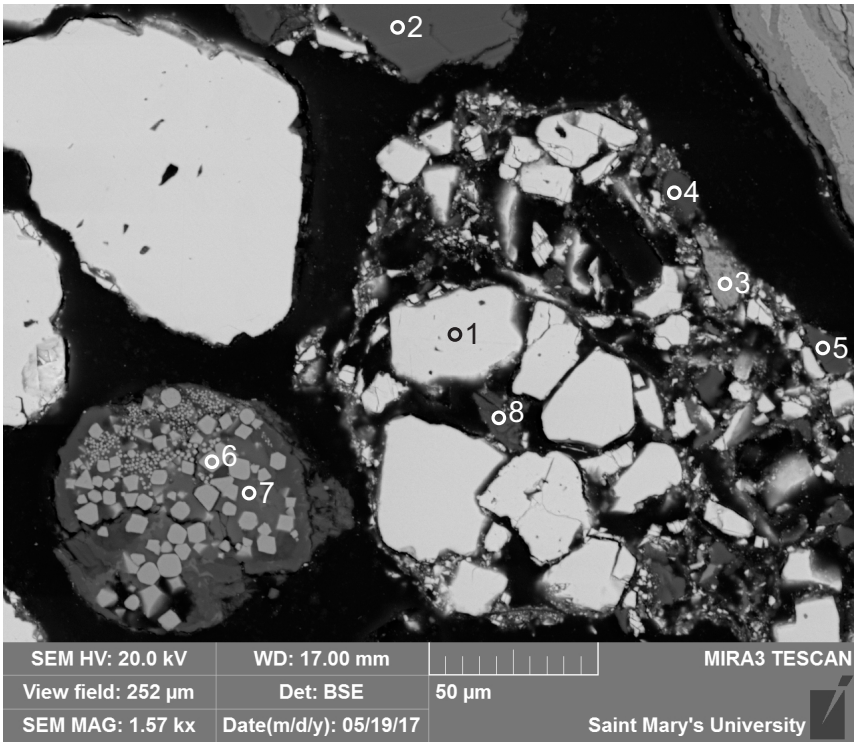
1:Barite
2:Feohy +
3:Siderite +
4:Quartz
5:Quartz
6:Quartz
7:Feohy +
8:Feohy +
9:Quartz
10:Calcite
11:Tremolite
12:Siderite +
13:Feohy +
14:Quartz + Muscovite
15:Quartz
16:Chlorite + Feohy
17:Siderite +
18:Albite

Figure 3A.12: Crimson F-81 6415m site 5. (Table 3A.1). A grain of tremolite (11) is either detrital or diagenetic.



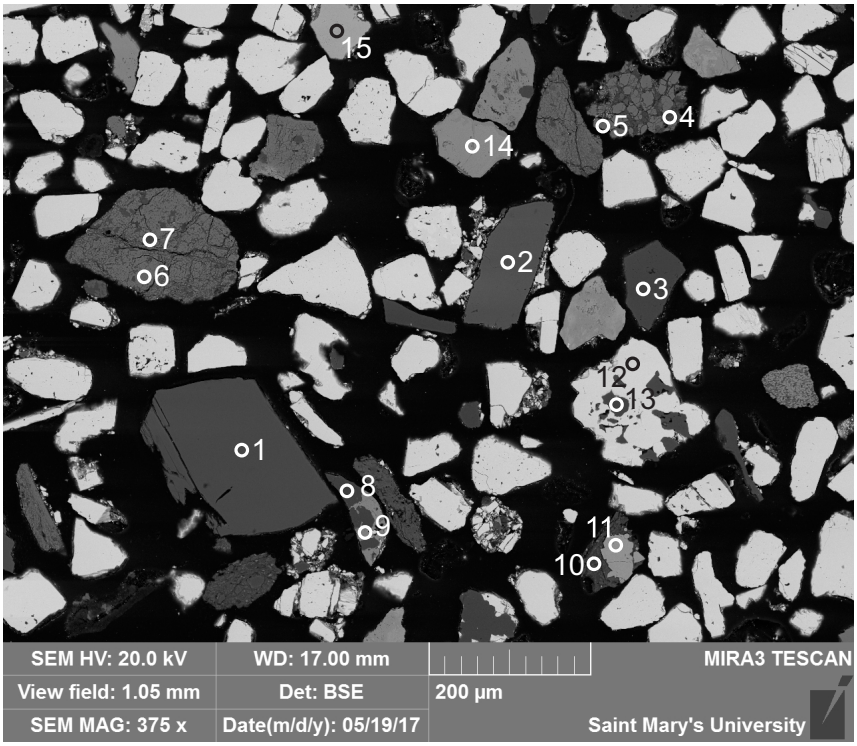
1:Quartz
2:Siderite +
3:Calcite
4:Calcite
5:Mix
6:Mix
7:Feohy (Cont)
8:Feohy (Cont) +
9:Siderite + Chlorite
10:Aegirine-Augite
11:Nepheline
12:Mix
13:Quartz
14:Quartz
15:Barite
16:Quartz
17:Mix
18:Mix
19:Calcite
20:Feohy +
21:Clinopyroxene (Diopside)
22:Siderite
23:Quartz
24:Feohy (Cont)
25:Feohy (Cont) +
26:Quartz
27:Siderite +

Figure 3A.13: Crimson F-81 6415m site 6. (Table 3A.1). A contaminant made up of aegirine-augite (10) and nephaline (11). A grain of diopside (21) is either detrital or diagenetic.



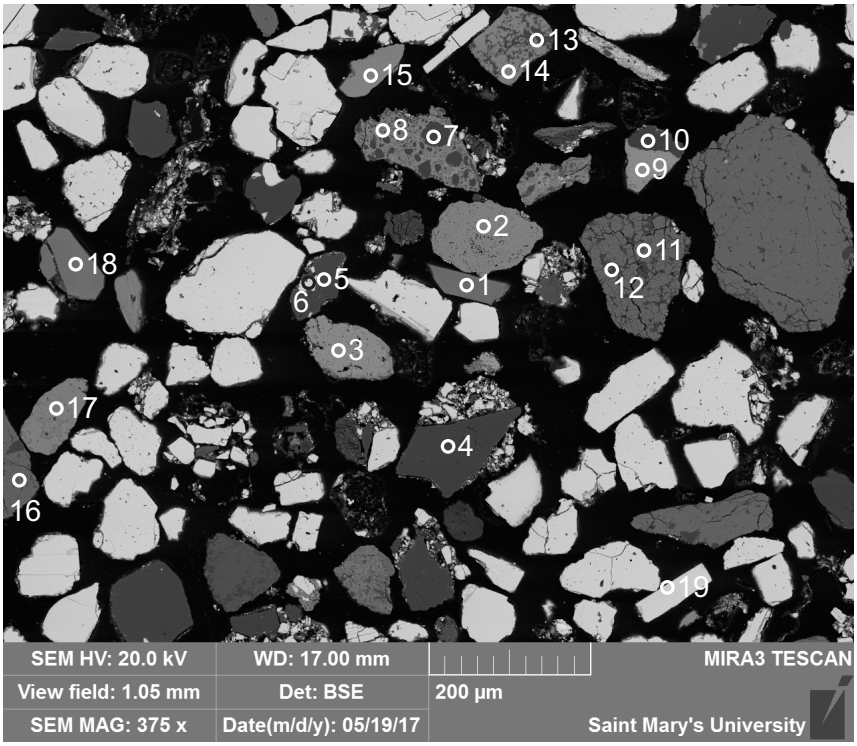
1:Barite
2:Calcite
3:Mnohy
(Mn + Fe + Ba)
4:Quartz
5:Albite
6:Pyrite
7:Calcite
8:Mix

Figure 3A.14: Crimson F-81 6415m site 6.1. (Table 3A.1). A nodule made up of calcite (7) and framboidal pyrite (6).



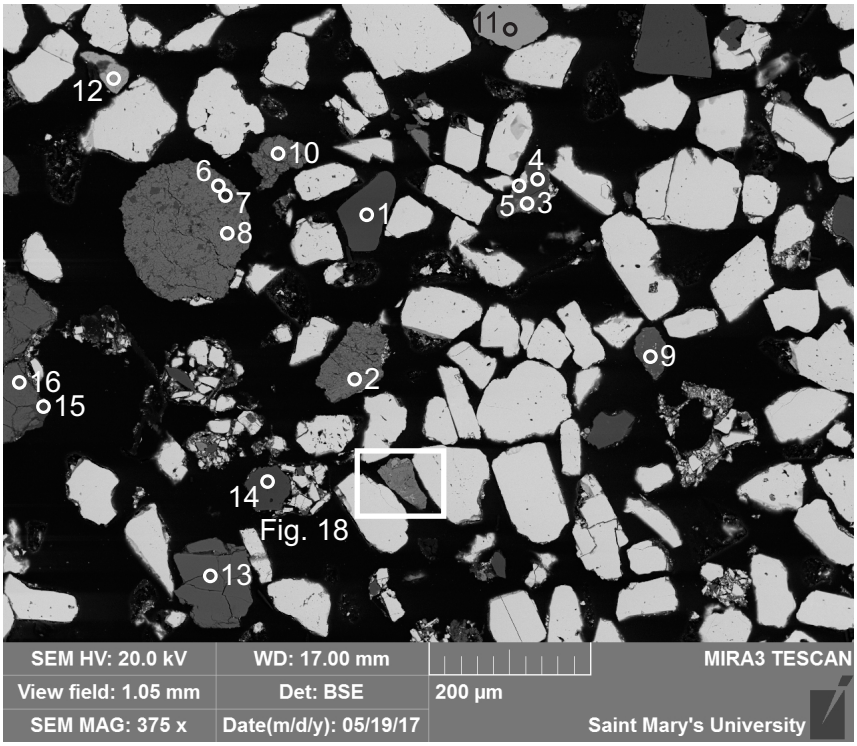
1:Tremolite
2:Calcite
3:Quartz
4:Quartz +
5:Siderite + Chlorite
6:Siderite + Chlorite
7:Quartz
8:Quartz
9:Feohy +
10:K-feldspar +
11:Pyrite
12:Barite
13:Quartz
14:Feohy +
15:Mnohy
(Mn + Ba + Pb)

Figure 3A.15: Crimson F-81 6415m site 7. (Table 3A.1). A cutting made up of barite (12) and quartz (13).



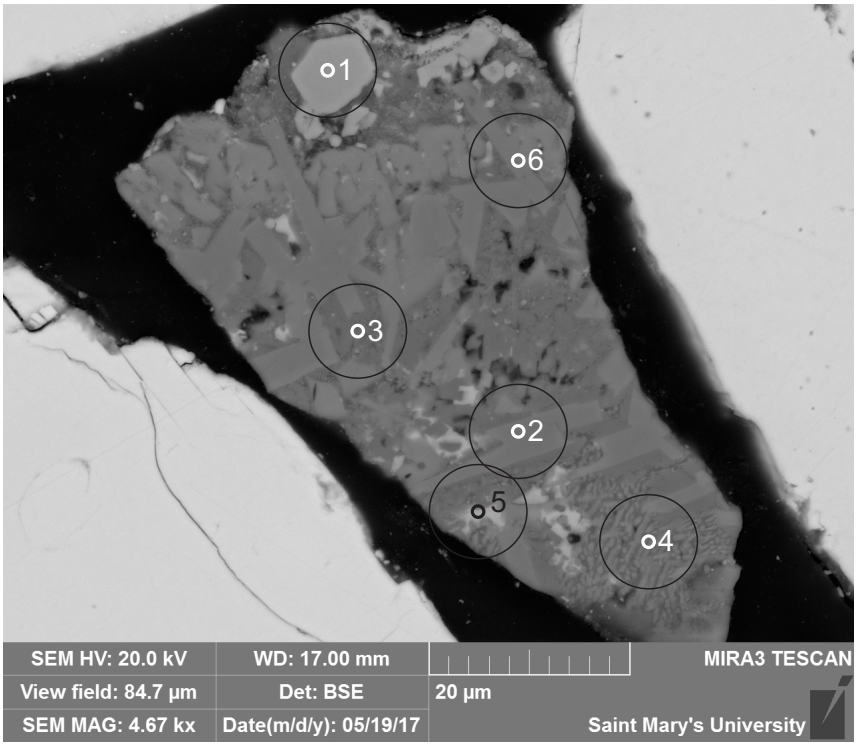
1:Fluorite
2:Feohy +
3:Feohy +
4:Quartz
5:Quartz
6:Barite
7:Quartz
8:Chlorite +
9:Feohy +
10:Quartz +
11:Siderite
12:Mix
13:Quartz
14:Quartz + Feohy
15:Feohy +
16:Siderite +
17:Feohy +
18:Fluorite
19:Barite

Figure 3A.16: Crimson F-81 6415m site 8. (Table 3A.1). A cutting made up of quartz (10) and Feohy (9) in which Feohy appears to be diagenetic.



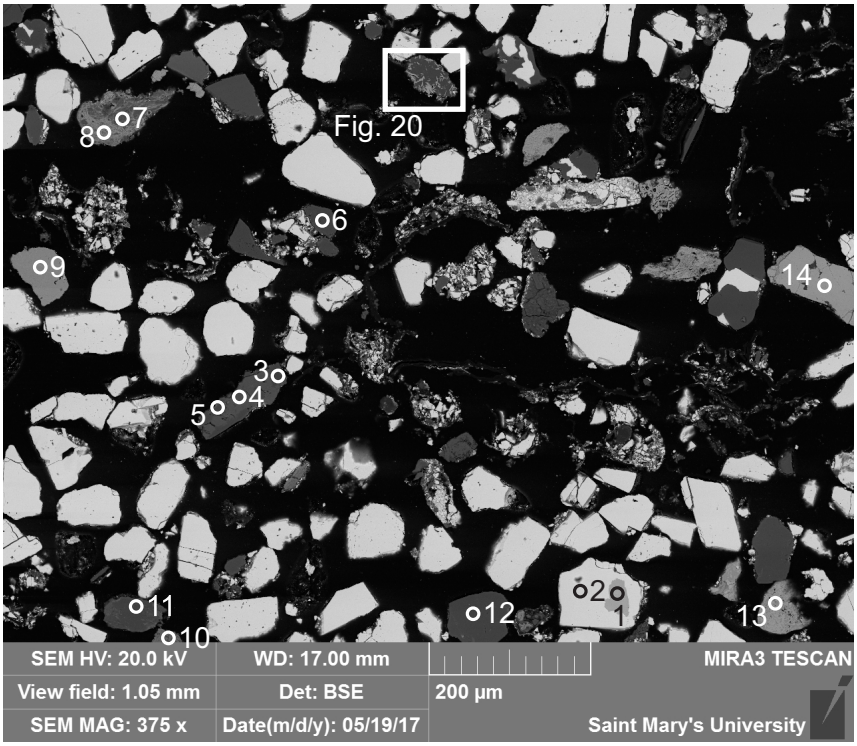
1:Quartz
2:Mix
3:Mix
4:Quartz
5:Mix
6:Mix
7:Mix
8:Siderite +
9:K-feldspar
10:Siderite +
11:Feohy
12:Mnohy
(Mn + Ba)
13:Calcite
14:Quartz
15:Kaolinite
16:Calcite

Figure 3A.17: Crimson F-81 6415m site 9. (Table 3A.1). Mnohy (12) is a contaminant.



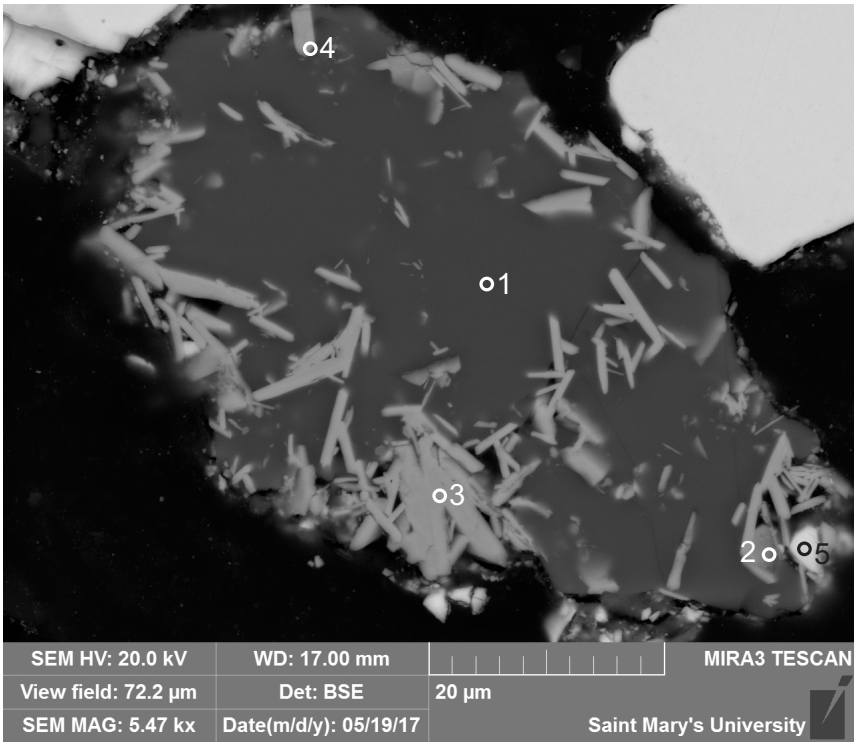
1:Feohy +
2:Mix
3:Mix
4:Mix
5:Pyrite +
6:Mix

Figure 3A.18: Crimson F-81 6415m site 9.1. Note: SEM Analysed spots down to 10 microns yielded mixtures for the above site. (Circles show area covered by the spectrum). (Table 3A.1). Mudstone cutting.



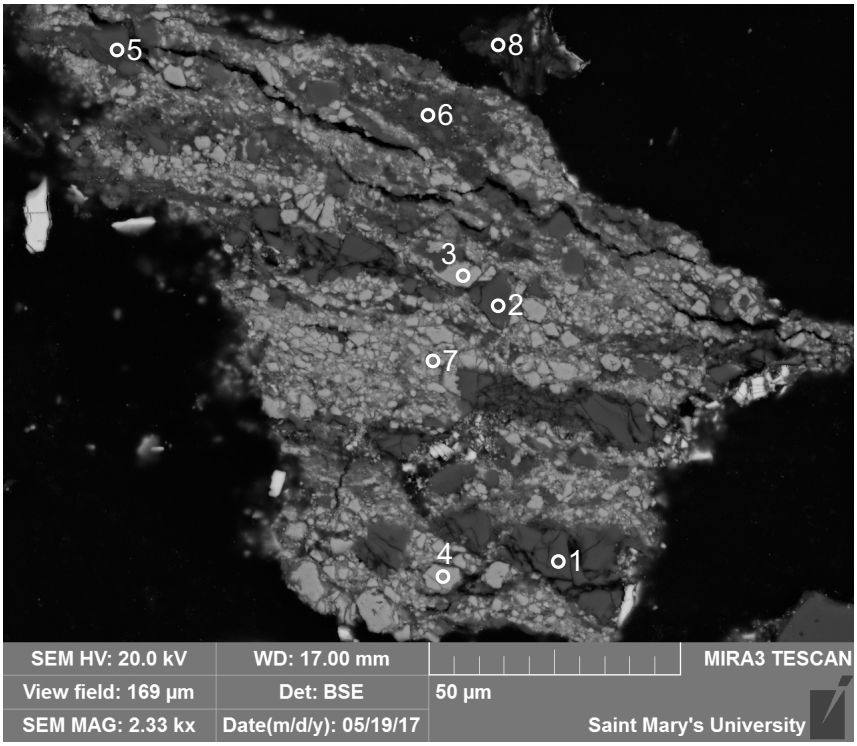
1:Strontianite
2:Barite
3:Quartz
4:K-feldspar
5:Quartz
6:Albite
7:Muscovite + TiO_2
8:Siderite +
9:Feohy
10:Siderite +
11:Quartz
12:Quartz
13:Mnohy
(Mn + Fe +
Al + Pb)
14:Pyrite

Figure 3A.19: Crimson F-81 6415m site 10. (Table 3A.1). Strontianite (1) and barite (2) are likely a contaminant.



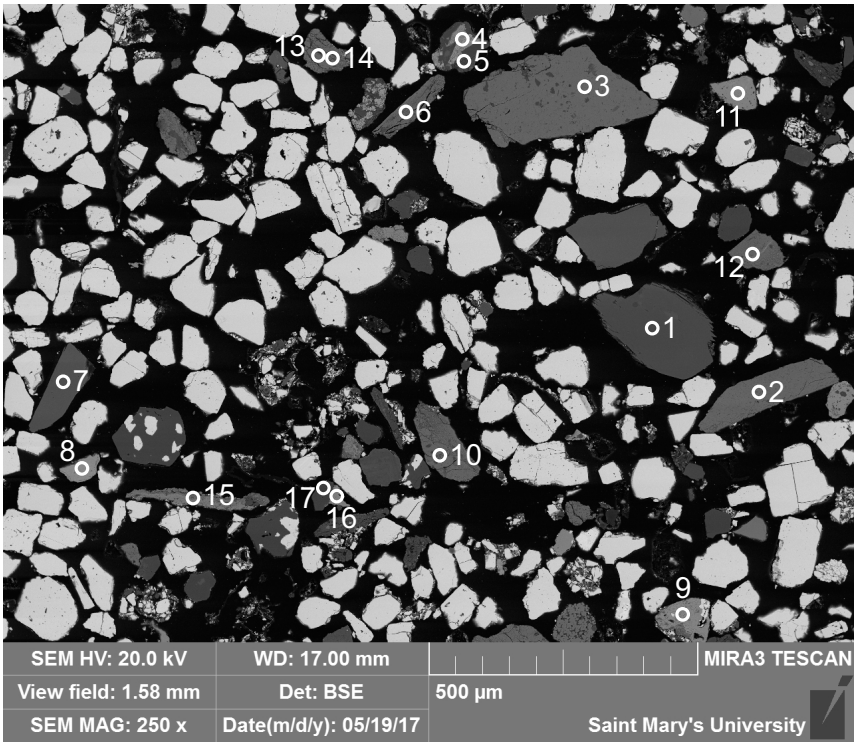
1:Quartz
2:Feohy +
3:Feohy
4:Feohy +
5:Barite

Figure 3A.20: Crimson F-81 6415m site 10.1. (Table 3A.1). A lithic clast made up of quartz (1) and Feohy (2-4).



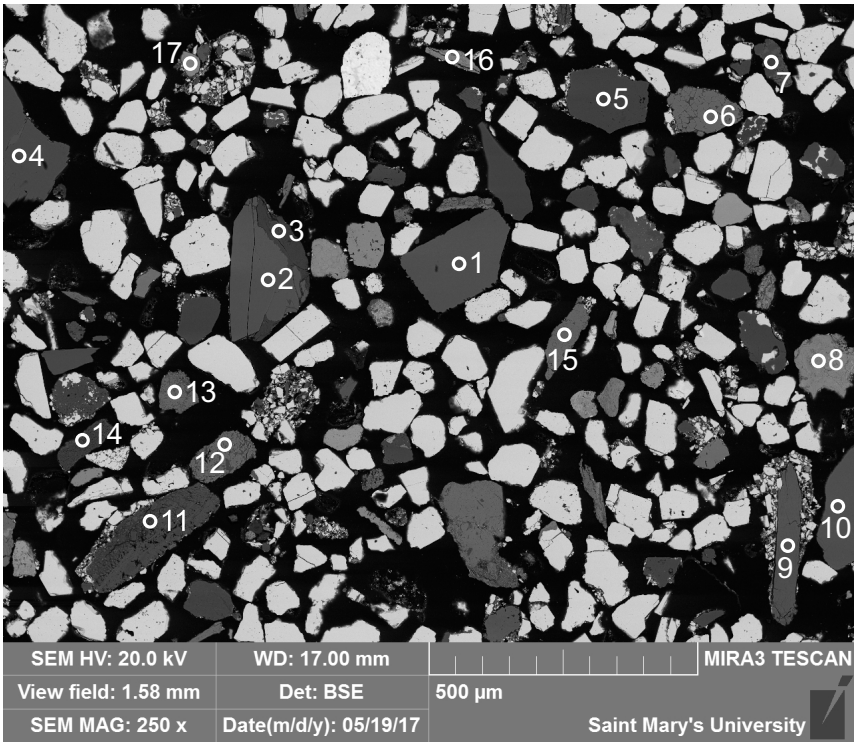
1:Albite
2:Quartz + Pyrite
3:Pyrite
4:Pyrite
5:Quartz
6:Mix
7:Pyrite
8:Hole

Figure 3A.21: Crimson F-81 6415m site 10.2. (Table 3A.1). A cutting made up of pyrite (2-4,7), albite (1), and quartz (2).



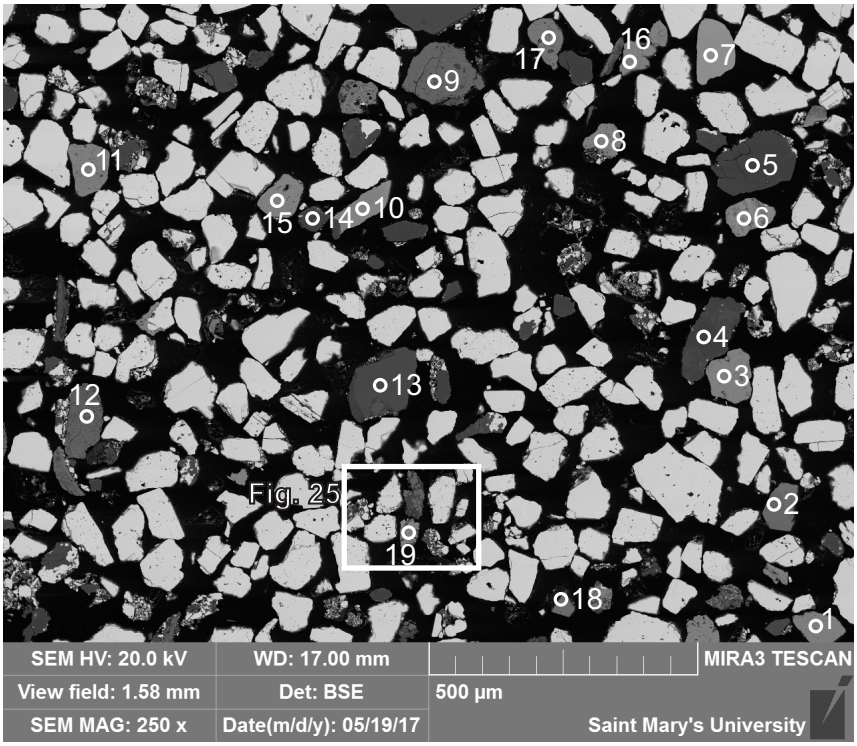
1:Tremolite
2:Siderite
3:Siderite +
4:Pyrite
5:Quartz +
6:Siderite +
7:Calcite
8:Feohy +
9:Feohy +
10:Siderite +
11:Feohy +
12:Mix
13:Siderite +
Chlorite
14:Siderite +
15:Feohy (Cont) +
16:Feohy +
17:Quartz

Figure 3A.22: Crimson F-81 6415m site 11. (Table 3A.1). Feohy grain (15) is a contaminant.



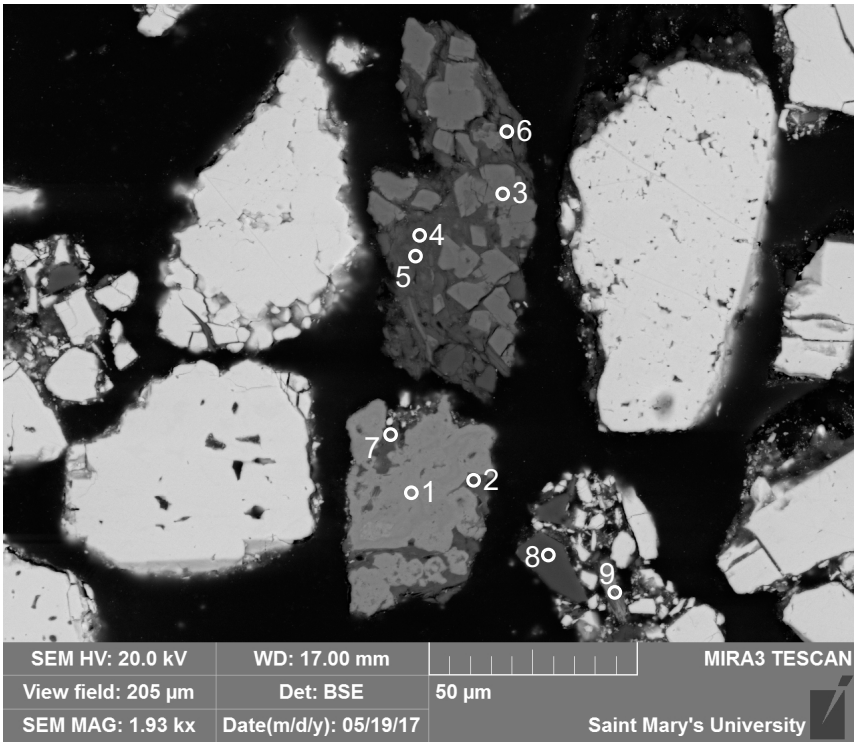
1:Calcite
2:Clinopyroxene
(Diopside)
3:Quartz +
4:Tremolite
5:Quartz
6:Siderite +
7:Quartz
8:Feohy +
9:Calcite
10:Calcite
11:Quartz + Albite
12:Mix
13:Siderite +
14:Corundum
15:Siderite
16:Feohy
17:(Fe+Cu+Si)

Figure 3A.23: Crimson F-81 6415m site 12. (Table 3A.1). A grain made up of quartz (3) and diopside (2) is probably a contaminant.



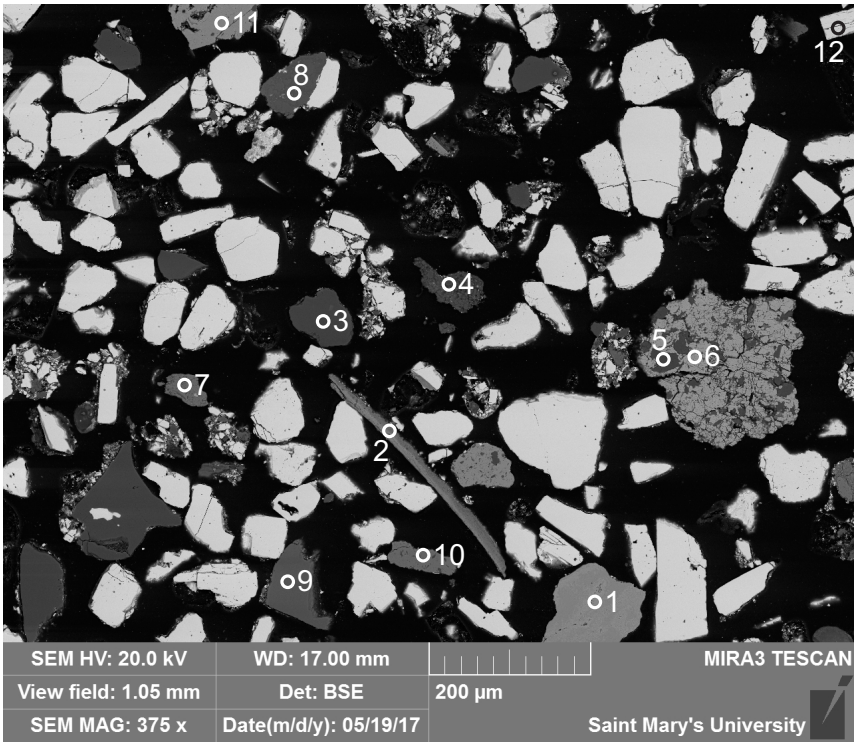
1:Feohy
2:Fluorite
3:Feohy +
4:Quartz
5:Quartz
6:Magnetite +
7:Magnetite
8:Feohy +
9:Siderite +
10:Feohy +
11:Feohy +
12:Siderite + Apatite
+
13:Tremolite
14:Quartz
15:Siderite +
16:Siderite +
17:Siderite + Chlorite
18:Fluorite
19:Feohy + Chlorite

Figure 3A.24: Crimson F-81 6415m site 13. (Table 3A.1).



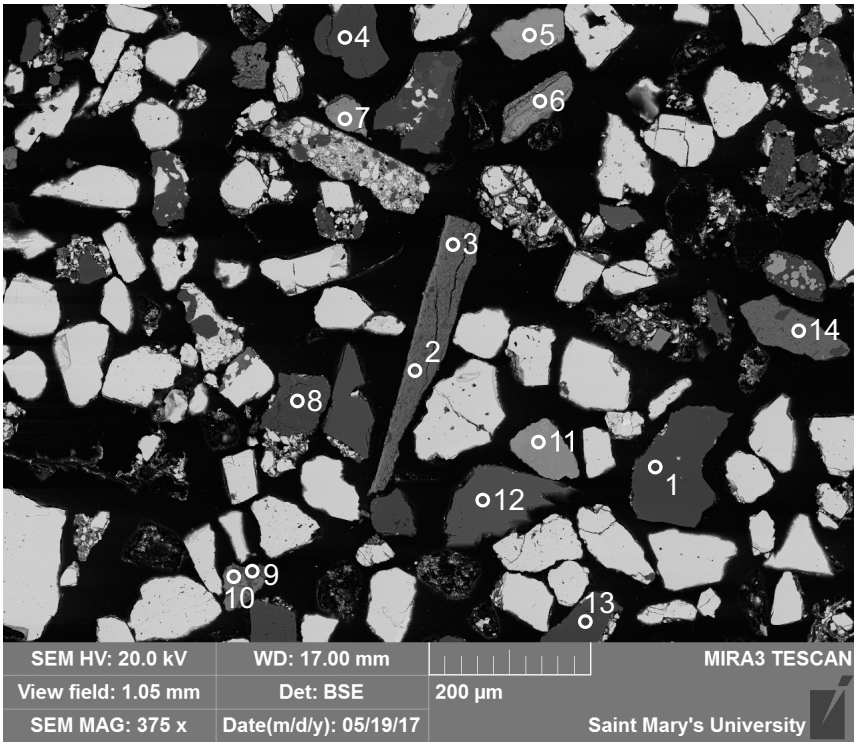
1:Feohy + Chlorite
2:Muscovite
3:Siderite + Chlorite
4:Muscovite +
5:Quartz +
6:Quartz +
7:Muscovite
8:Quartz
9:Mnohy
(Mn + Fe + Al + Si)

Figure 3A.25: Crimson F-81 6415m site 13.1. (Table 3A.1). Sandstone cutting made up of quartz and muscovite and cemented by siderite and chlorite (3-6). A contaminant grain (8,9).



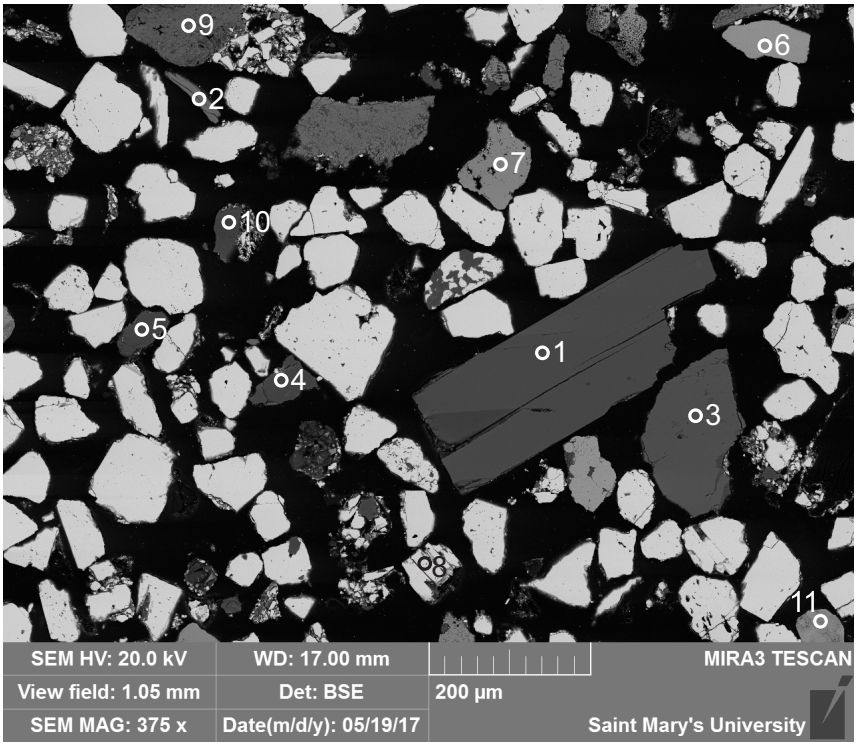
1:Feohy + Chlorite
2:Chlorite +
3:Quartz
4:Quartz +
5:Quartz
6:Pyrite
7:Siderite +
8:Muscovite +
9:Calcite
10:Siderite +
11:Feohy +
12:Barite

Figure 3A.26: Crimson F-81 6415m site 14. (Table 3A.1).



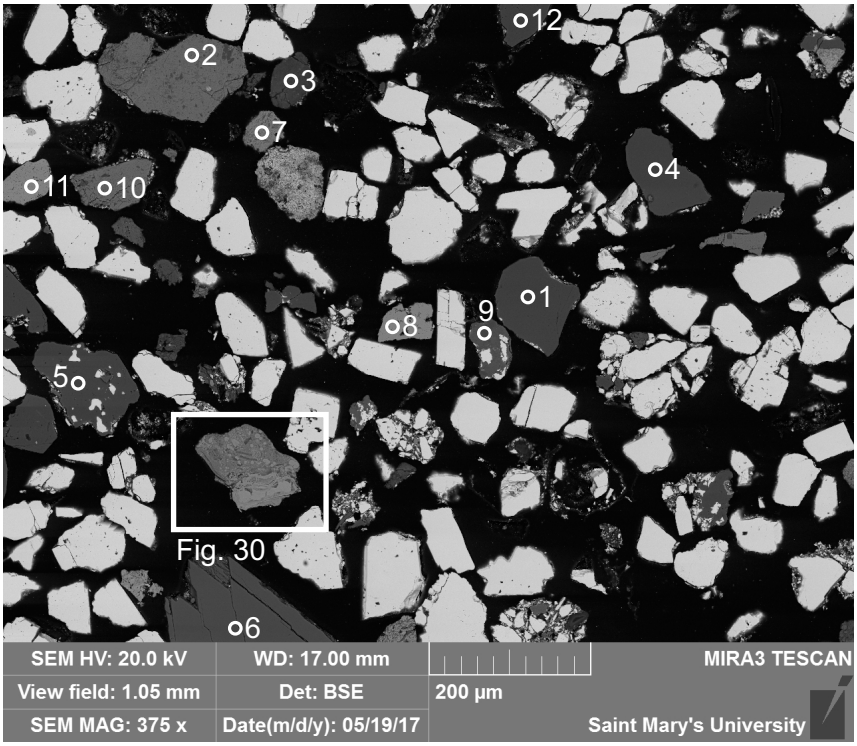
1:Quartz
2:EPOXY
3:Mix
4:Quartz
5:Feohy
6:Feohy (Cont)
7:Feohy
8:Quartz +
9:Quartz +
10:TiO_2 +
11:Feohy +
12:Clinopyroxene (Diopside)
13:Quartz
14:Mix

Figure 3A.27: Crimson F-81 6415m site 15. (Table 3A.1). Feohy (6) is a contaminant. Diopside (12) is also a contaminant.



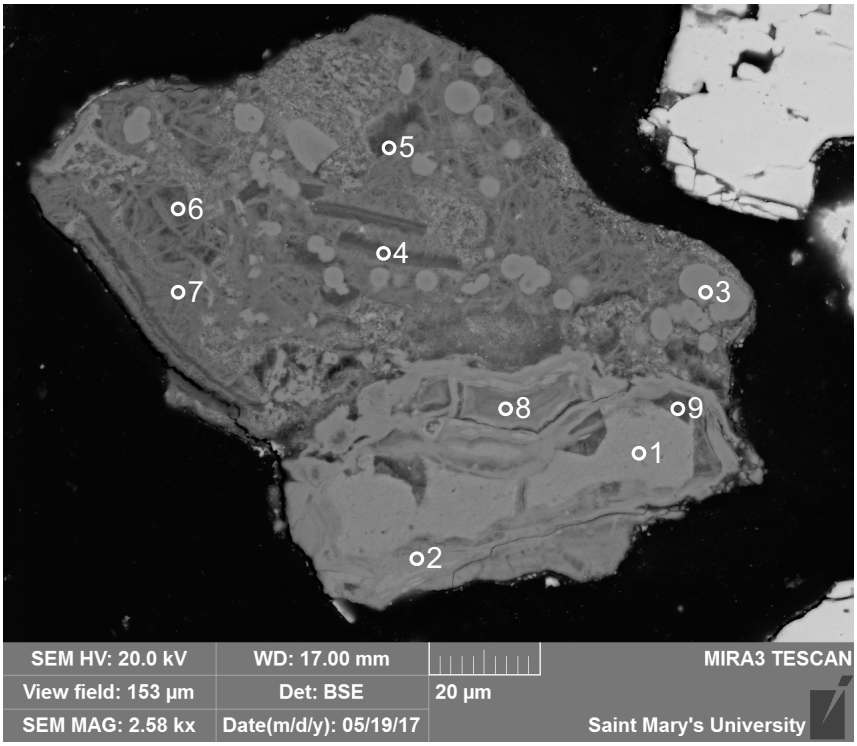
1:Tremolite
2:Biotite
3:Clinopyroxene (Diopside)
4:Quartz
5:Quartz +
6:Feohy
7:Feohy +
8:Barite
9:Mix
10:Quartz
11:Feohy +

Figure 3A.28: Crimson F-81 6415m site 16. (Table 3A.1). Tremolite (1) and diopside (3) are likely contaminants.



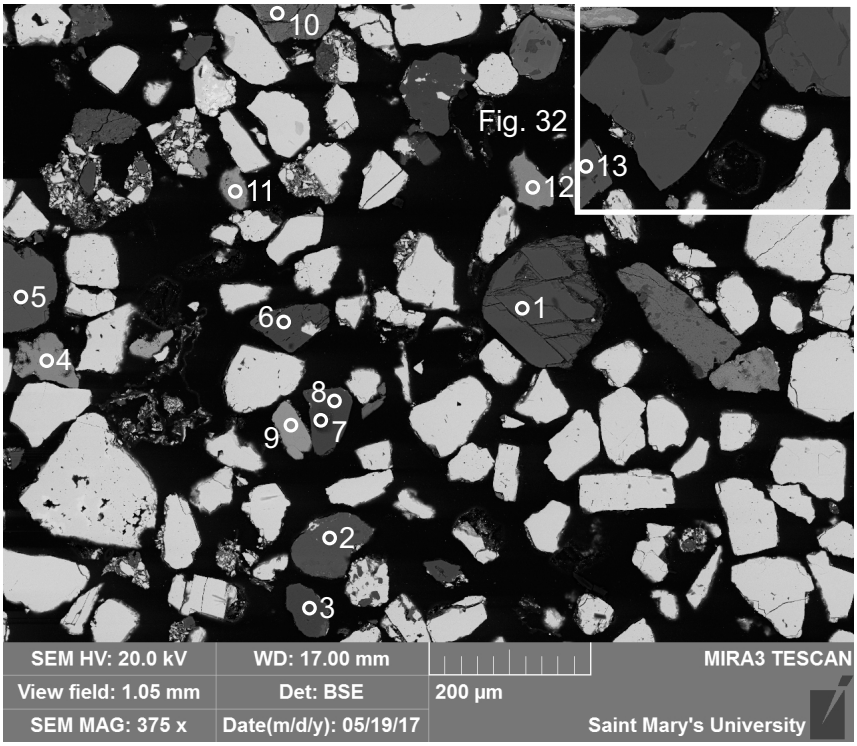
1:Quartz
2:Siderite +
3:Montmorillonite
4:Quartz
5:Quartz
6:Tremolite
7:Chlorite +
8:Feohy +
9:Quartz +
10:Siderite + Apatite + TiO_2
11:Feohy +
12:Quartz

Figure 3A.29: Crimson F-81 6415m site 17. (Table 3A.1).



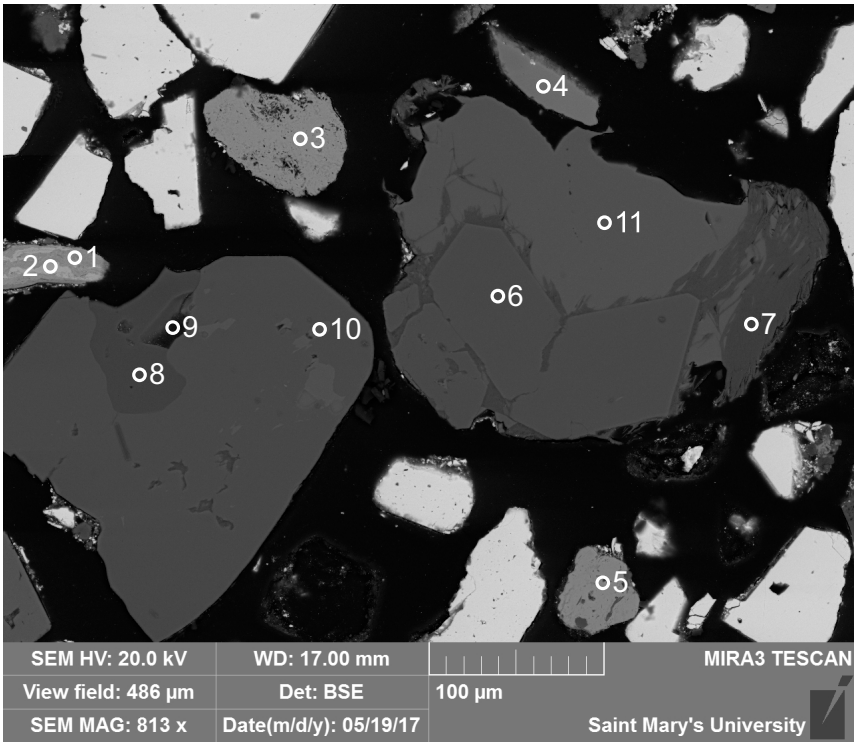
1:Feohy +
2:Feohy +
3:Feohy +
4:Mnohy (Mn + Fe + Al)
5:Mnohy (Mn + Fe + Al)
6:Mnohy (Mn + Fe + Al)
7:Mnohy (Mn + Fe + Al)
8:Mnohy (Mn + Fe + Al)
9:Mnohy (Mn + Fe + Al)

Figure 3A.30: Crimson F-81 6415m site 17.1. (Table 3A.1). A cutting made up of Feohy (1-3) and Mnohy (4-9) is likely a drilling mud contaminant.



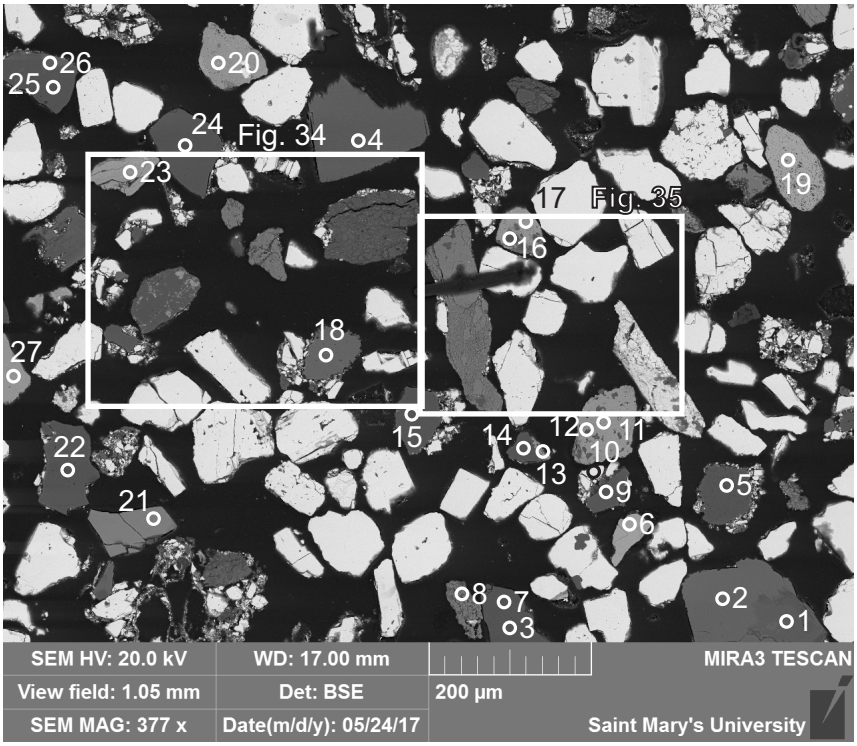
1:Tremolite
2:K-feldspar
3:Quartz
4:Feohy +
5:Calcite
6:Dolomite +
7:Quartz
8:Quartz
9:Feohy
10:Siderite + Apatite
11:Feohy
12:Feohy +
13:Calcite

Figure 3A.31: Crimson F-81 6415m site 18. (Table 3A.1).



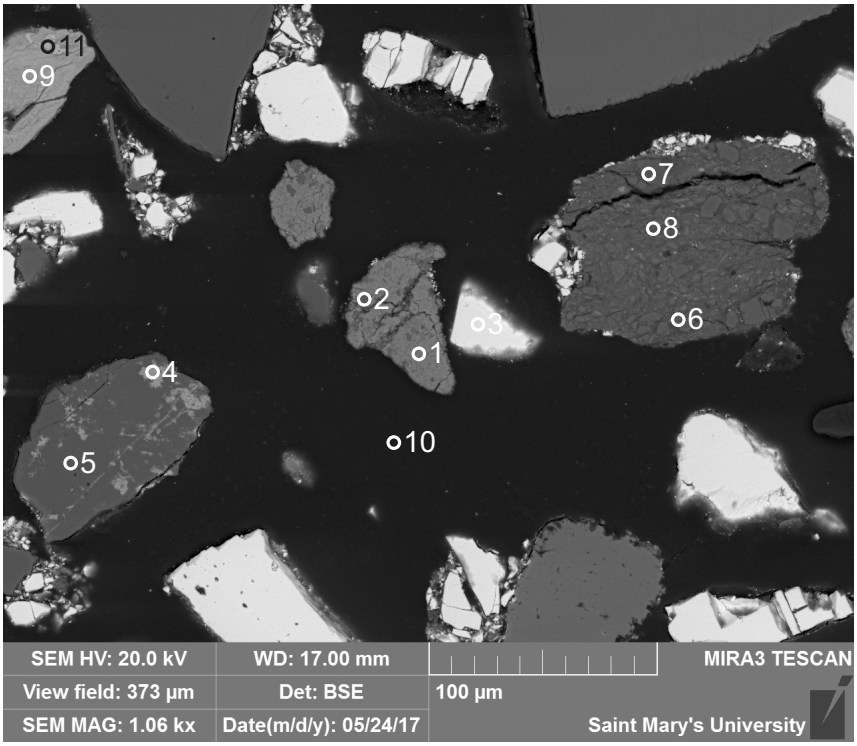
1:Mnohy (Mn + Al + Si + Ba)
2:Mnohy (Mn + Ba)
3:Feohy +
4:Fluorite
5:Feohy +
6:Tremolite
7:Talc
8:Quartz
9:Quartz +
10:Clinopyroxene (Diopside)
11:Calcite

Figure 3A.32: Crimson F-81 6415m site 18.1. (Table 3A.1). An igneous lithic clast made up of quartz (8,9) and diopside (10) is likely a contaminant. Another lithic clast appears to be sedimentary and made up of detrital tremolite (6) with talc (7) and calcite (11), also a likely contaminant.



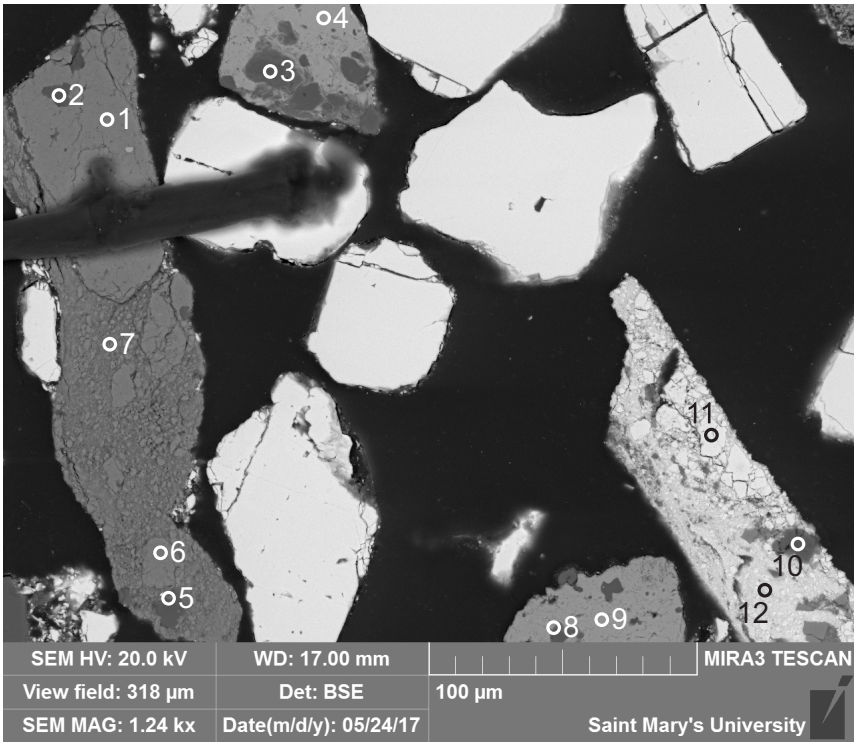
1:Tremolite
2:Calcite
3:Dolomite
4:Tremolite
5:Quartz
6:Feohy
7:Dolomite
8:Siderite + Apatite
9:Quartz
10:Barite
11:Feohy +
12:Quartz
13:Feohy + Chlorite +
14:Quartz
15:Quartz
16:Quartz
17:Feohy + Chlorite +
18:Calcite
19:Feohy
20:Feohy +
21:Fluorite
22:Quartz
23:Mix
24:Quartz
25:Quartz
26:K-feldspar
27:Feohy +

Figure 3A.33: Crimson F-81 6415m site 19. (Table 3A.1). A cutting made up of Feohy and chlorite (17) and quartz (16) in which Feohy and chlorite are diagenetic. A cutting of tremolite (1) and calcite (2) which is likely a contaminant. Fluorite (21) shows sharp crystal outlines and is likely diagenetic.



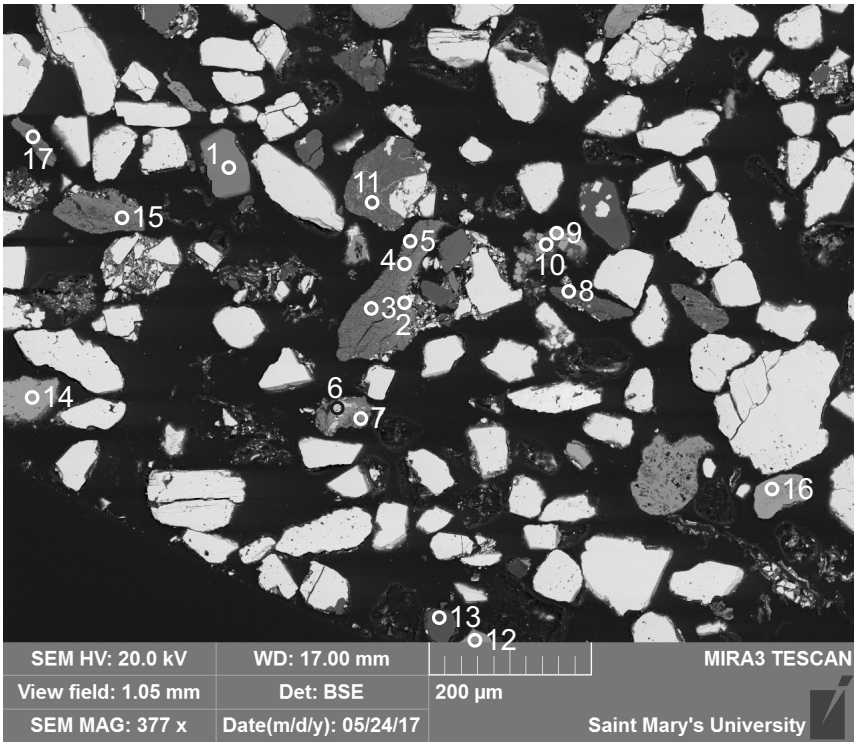
1:Mix
2:Albite
3:Barite
4:Feohy +
5:Quartz
6:Quartz
7:Quartz
8:Kaolinite +
9:Feohy (Cont) +
Calcite
10:EPOXY
11:Feohy (Cont)

Figure 3A.34: Crimson F-81 6415m site 19.1. (Table 3A.1). A cutting made up of quartz (5) and Feohy (4) in which Feohy appears to be diagenetic. Another cutting made up of Feohy (9,11) and calcite (9), probably a piece of cement.



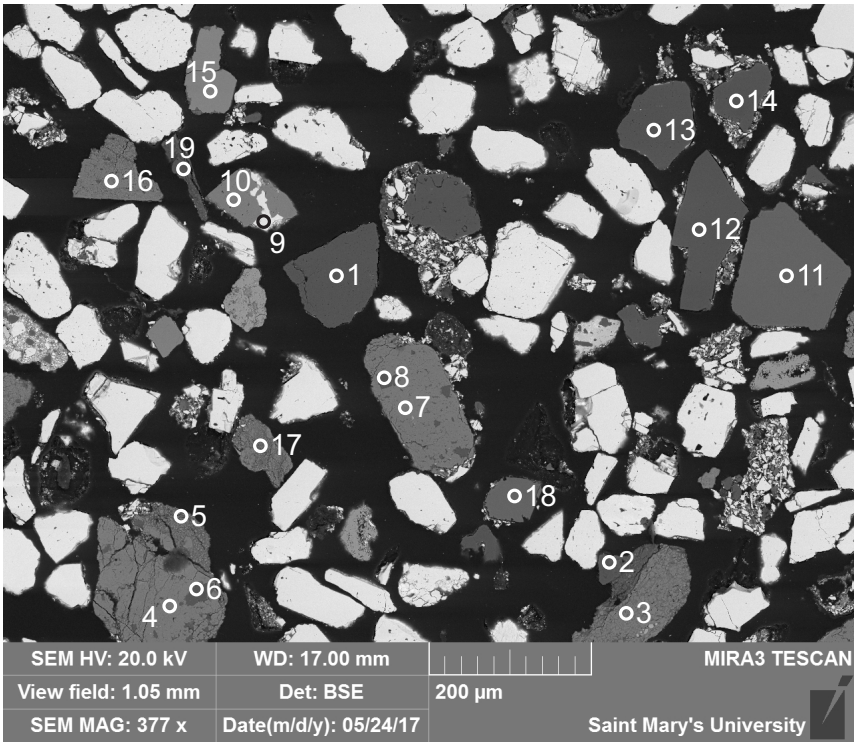
1:Siderite +
2:Quartz +
3:Quartz +
4:Feohy + Chlorite
5:Quartz
6:Siderite +
7:Siderite +
8:Quartz +
9:Feohy +
10:Quartz
11:Barite
12:Barite

Figure 3A.35: Crimson F-81 6415m site 19.2. (Table 3A.1). A cutting made up of diagenetic siderite (1,6,7) and quartz (2,5).



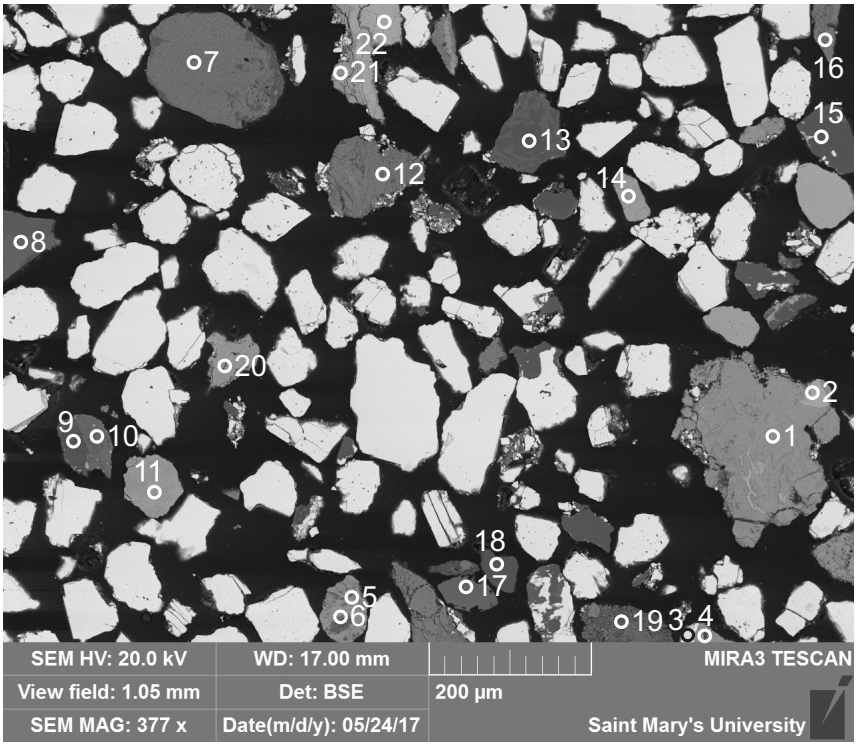
1:Fluorite
2:Mix
3:Siderite + Barite +
4:Siderite +
5:Siderite +
6:Feohy (Cont)
7:Mix
8:Albite +
9:Pyrite
10:?Muscovite
11:Quartz +
12:Feohy +
13:Quartz
14:Feohy +
15:Siderite +
Chlorite
16:Feohy +
17:Siderite +

Figure 3A.36: Crimson F-81 6415m site 20. (Table 3A.1). Fluorite (1) has sharp crystal outline and is likely diagenetic.



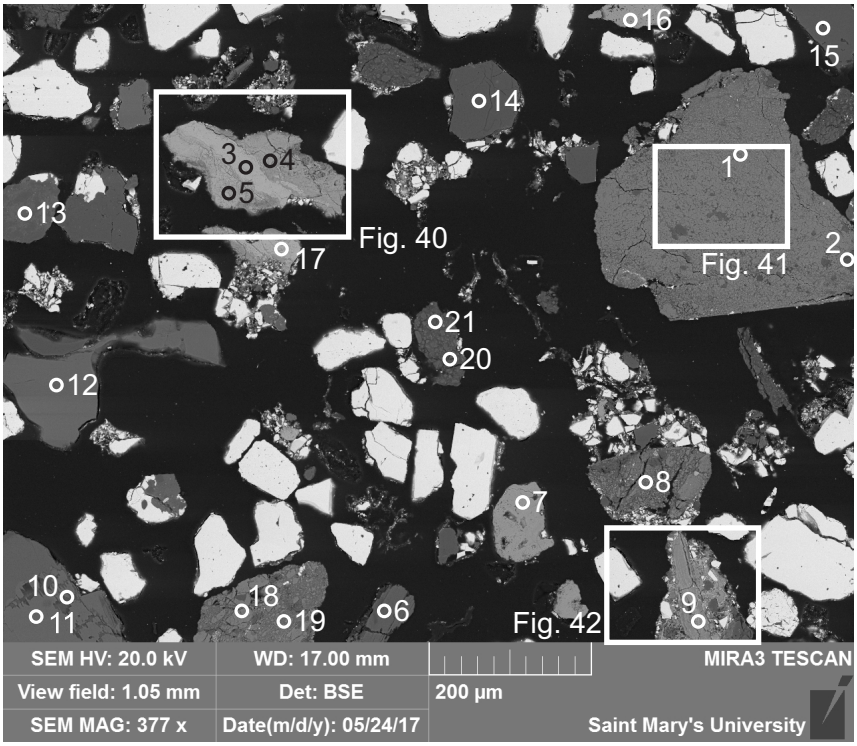
1:Dolomite +
2:Quartz +
3:Siderite + Chlorite
+
4:Siderite + Chlorite
+
5:Siderite + Chlorite
+
6:Quartz
7:Siderite
8:Quartz
9:Barite
10:Siderite
11:Calcite
12:Quartz
13:Quartz
14:Quartz
15:TiO_2
16:Siderite +
17:Siderite +
Chlorite
18:Calcite
19:Quartz

Figure 3A.37: Crimson F-81 6415m site 21. (Table 3A.1). Siderite (10) appears to be crosscut by diagenetic barite (9).



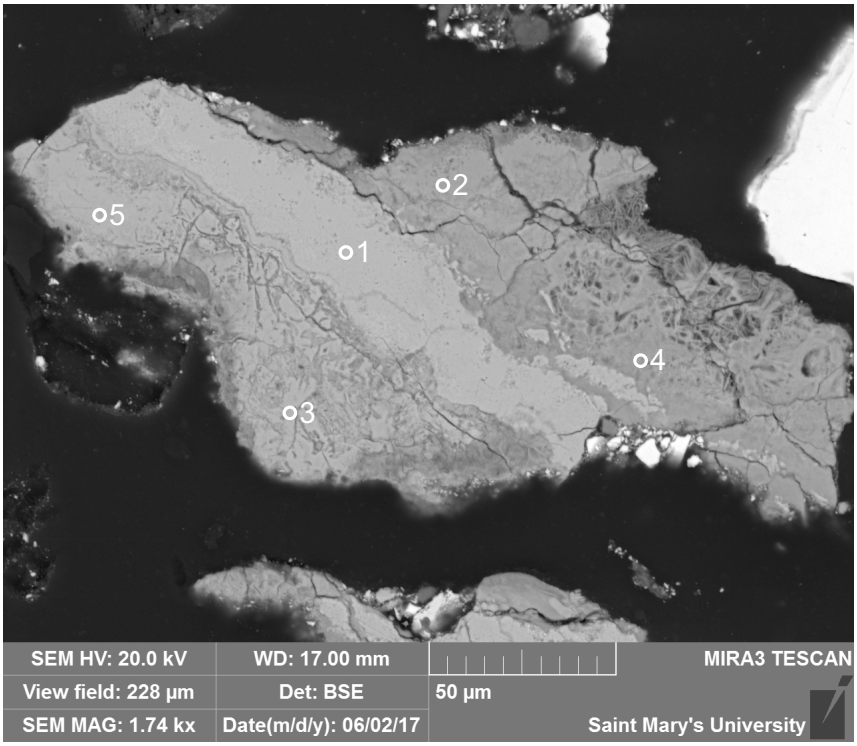
1:Feohy +
2:Magnetite
3:Barite
4:Feohy +
5:Mix
6:Quartz +
7:Chlorite
8:Clinopyroxene (Diopside)
9:Quartz +
10:Mix
11:Mnho (Mn + Fe)
12:Mix
13:Quartz
14:Feohy +
15:Quartz
16:Siderite + Chlorite
17:Calcite
18:Quartz
19:Mix /Chlorite
20:Feohy +
21:Feohy (Cont) +
22:Feohy (Cont)

Figure 3A.38: Crimson F-81 6415m site 22. (Table 3A.1). A likely contaminant made up of Feohy (1) and magnetite (2).



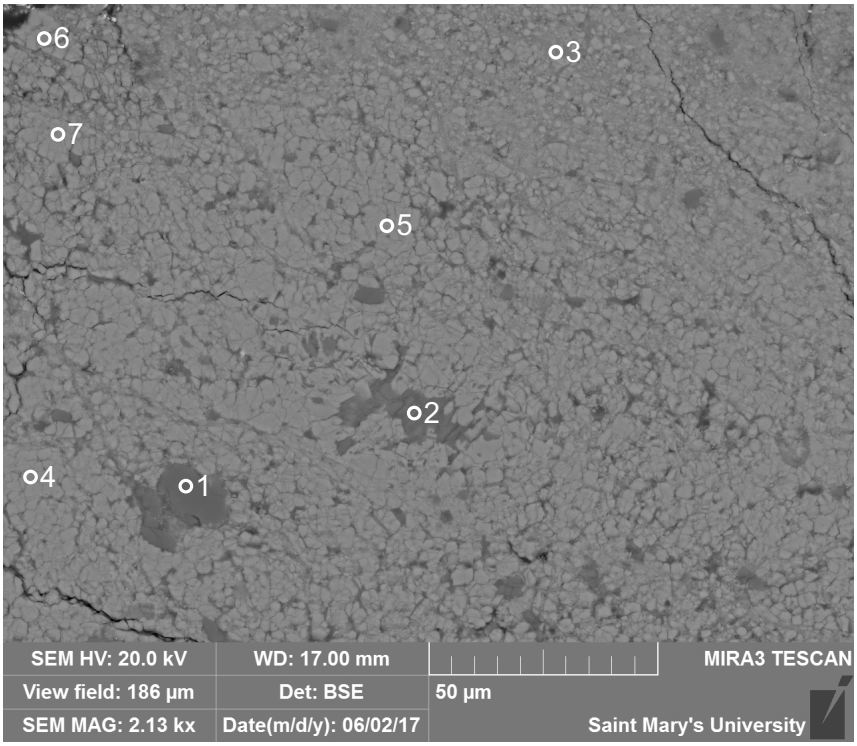
1:Siderite + Chlorite +
2:Quartz
3:Hematite (Cont)
4:Hematite (Cont)
5:Hematite (Cont)
6:Tremolite
7:Feohy +
8:Siderite + Chlorite +
9:Feohy (Cont) + Chromite
10:Talc
11:Clinopyroxene (Diopside)
12:Clinopyroxene (Diopside)
13:Muscovite +
14:Quartz
15:Quartz
16:Feohy +
17:Feohy (Cont) +
18:Siderite + Chlorite + Calcite + Apatite
19:Siderite + Chlorite + Calcite + Apatite
20:Quartz
21:Mix

Figure 3A.39: Crimson F-81 6415m site 23. (Table 3A.1). Diopside (11) likely sourced from drilling mud is altering to talc (10)



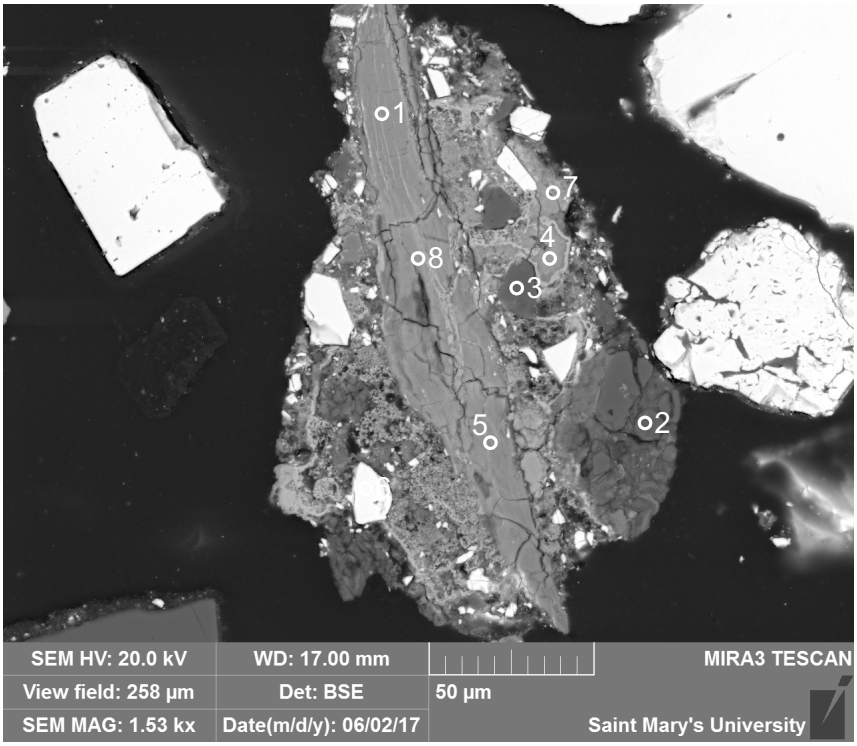
1:Hematite
2:Hematite
3:Hematite
4:Siderite +
5:Feohy

Figure 3A.40: Crimson F-81 6415m site 23.1. (Table 3A.2). Contaminant.



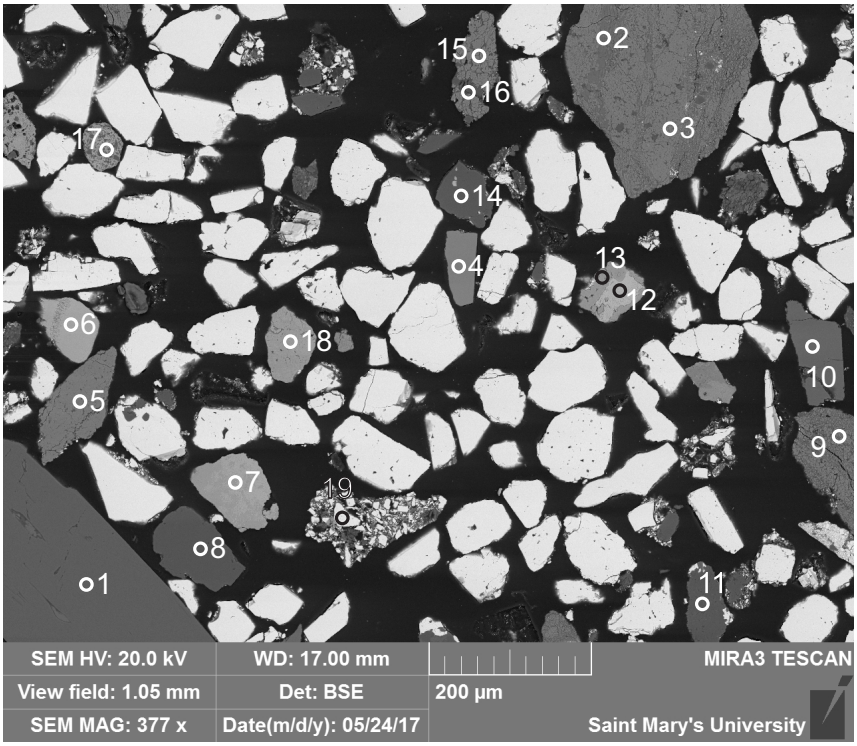
1:Albite
2:Albite
3:Siderite + Quartz
4:Siderite +
5:Siderite +
6:Siderite +
7:Siderite +

Figure 3A.41: Crimson F-81 6415m site 23.2. (Table 3A.2). Siderite (3-7) appears to be replacing albite (1,2) and quartz (3).



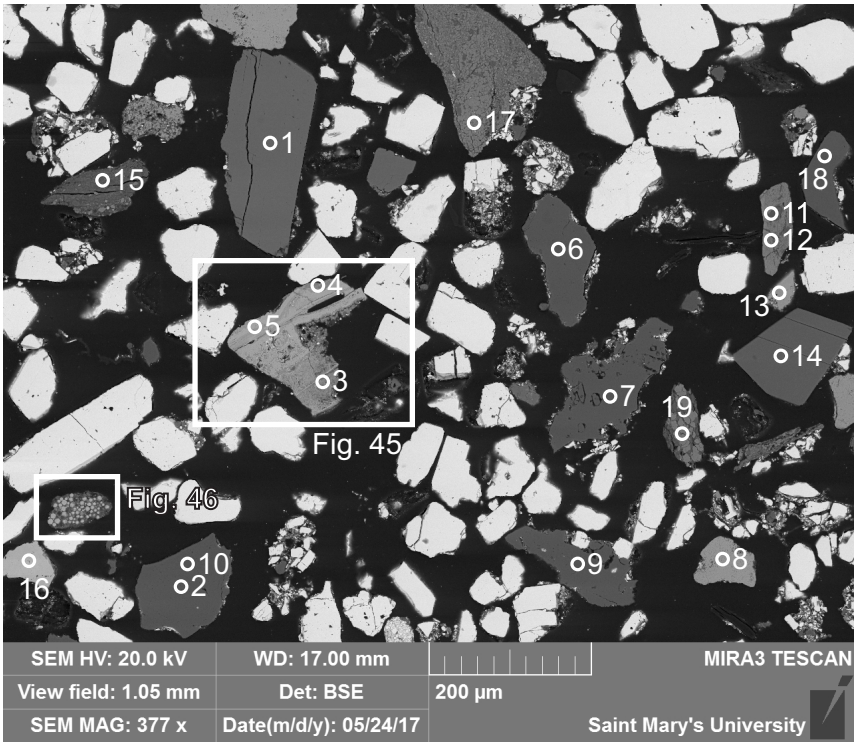
1:Feohy + Chromite +
2:Quartz +
3:Quartz
4:Siderite +
5:Feohy + Chromite +
6:Barite
7:Siderite +
8:Feohy + Chromite +

Figure 3A.42: Crimson F-81 6415m site 23.3. (Table 3A.2). Contaminant.



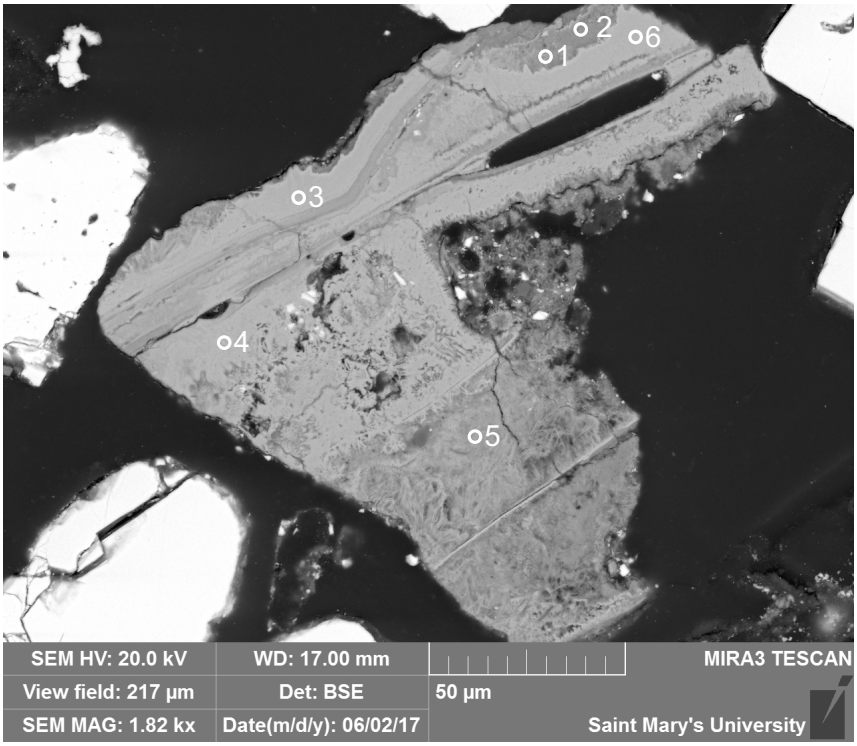
1:Tremolite
2:Fluorite +
3:Siderite +
4:Fluorite
5:Siderite + Chlorite
6:Feohy
7:Feohy
8:Quartz
9:Mix
10:Calcite
11:Quartz
12:Mnohy
(Mn + Ba)
13:Feohy +
14:Quartz
15:Siderite + Quartz
16:Quartz
17:Feohy + Quartz
18:Feohy +
19:Barite

Figure 3A.43: Crimson F-81 6415m site 24. (Table 3A.1). A cutting made up of fluorite (2) and siderite (3) in which fluorite appears to crosscut siderite.



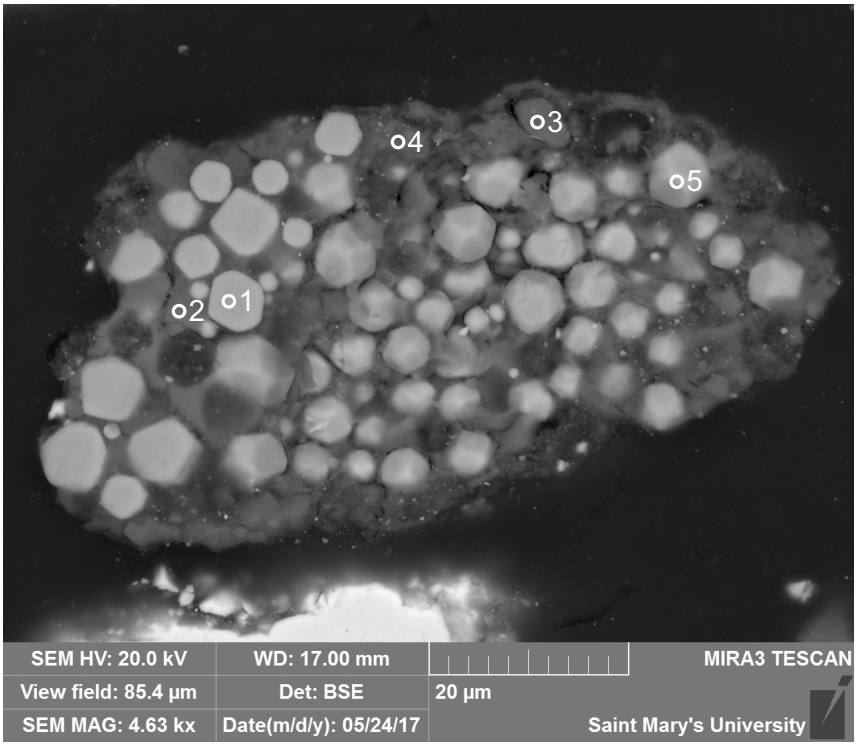
1:Calcite
2:Quartz
3:Feohy (Cont) +
4:Feohy (Cont) +
5:Feohy (Cont) +
6:Quartz
7:Quartz
8:Feohy +
9:Quartz
10:Quartz
11:Quartz
12:Siderite +
13:Smithsonite
14:Tremolite
15:Mix
16:Strontianite
17:Siderite +
Chlorite
18:Quartz
19:Siderite

Figure 3A.44: Crimson F-81 6415m site 25 (Table 3A.1). Smithsonite (13), strontianite (16), and tremolite (14) are likely contaminants.



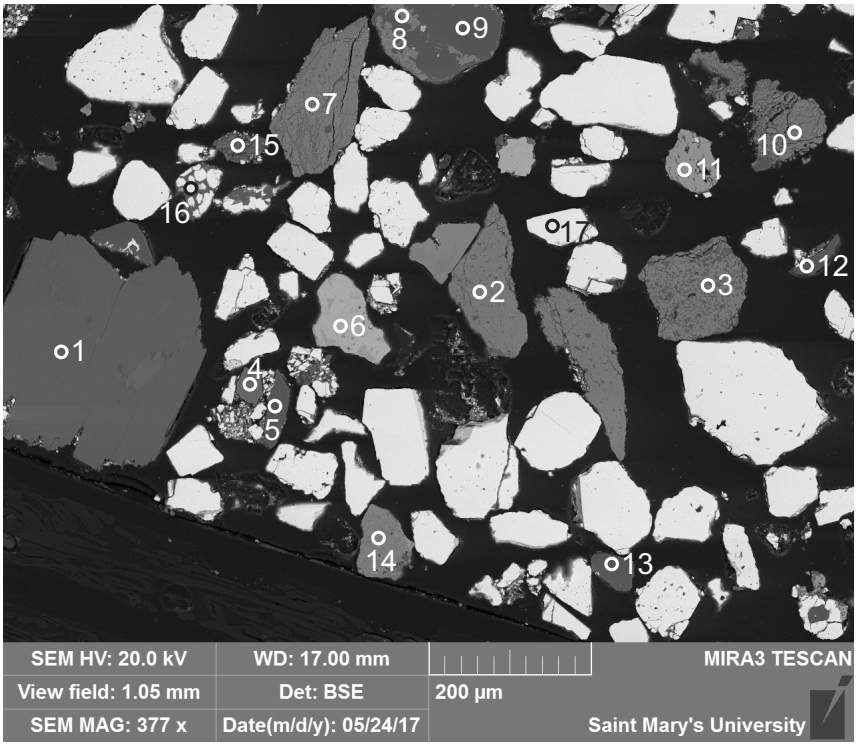
1:Feohy
2:Feohy
3:Feohy
4:Feohy
5:Feohy +
6:Feohy

Figure 3A.45: Crimson F-81 6415m site 25.1 (Table 3A.2). Contaminant.



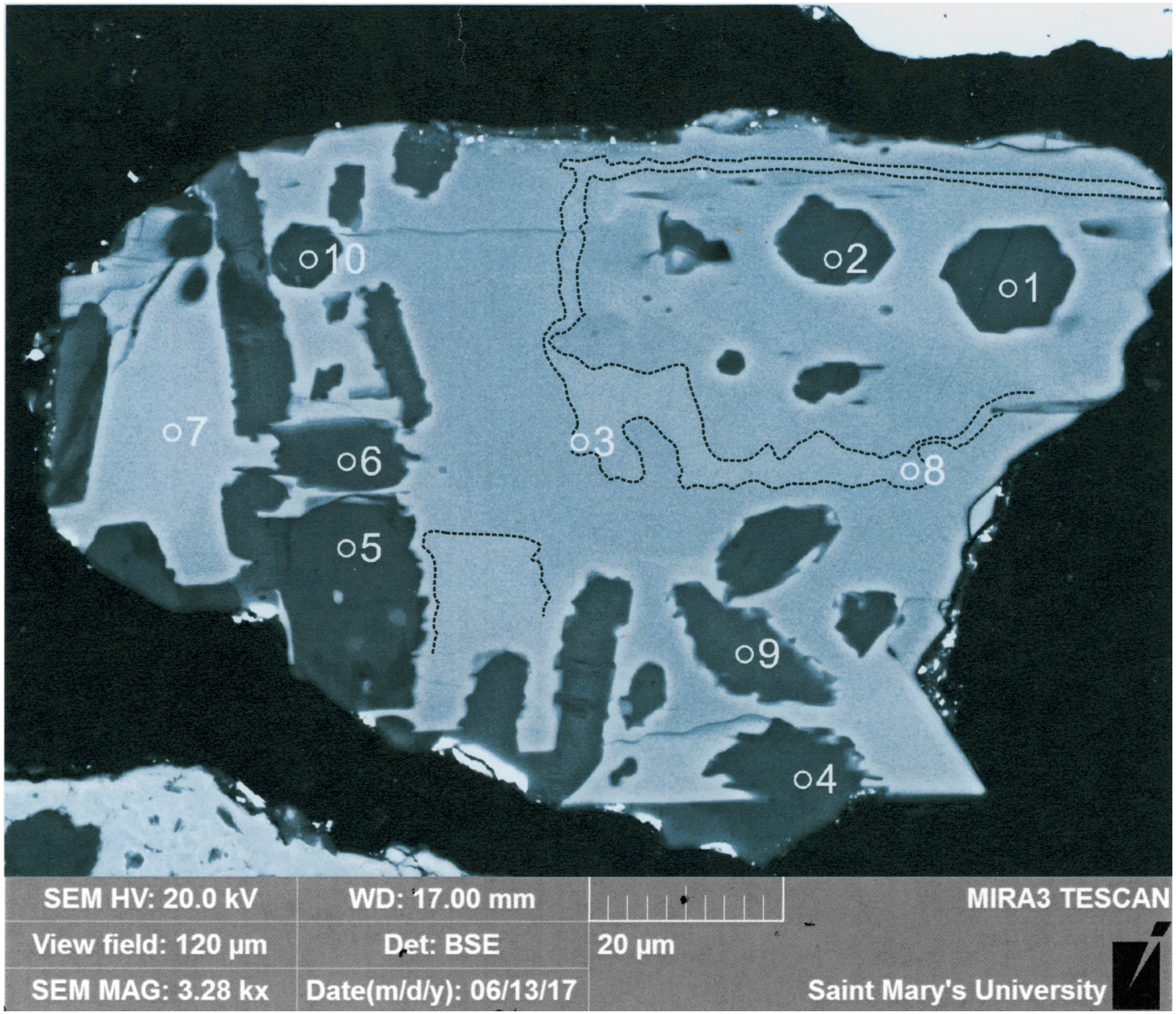
1:Pyrite
2:Calcite +
3:Mix
4:Illite
5:Pyrite

Figure 3A.46: Crimson F-81 6415m site 25.2. (Table 3A.1). Contaminant.



1:Tremolite
2:Siderite +
3:Siderite + Chlorite
4:Calcite
5:Quartz
6:Feohy +
7:Siderite + Chlorite
8:Siderite +
9:Quartz
10:Siderite +
11:Feohy +
12:Quartz
13:Quartz
14:Mix
15:Mix
16:Barite
17:Barite

Figure 3A.47: Crimson F-81 6415m site 26. (Table 3A.1). A cutting made up of quartz (9) and diagenetic siderite (8).



1:Sodalite
2:Sodalite
3:Augite
4:Sodalite
5:Nepheline
6:Nepheline
7:Aegirine-Augite
8:Augite
9:K-feldspar
10:Sodalite

Figure 3A.48: Sample F-81 6415m site 6.2 (Table 3A.3). BSE image with high contrast. Veining outlined in black, made mostly of various contaminants.

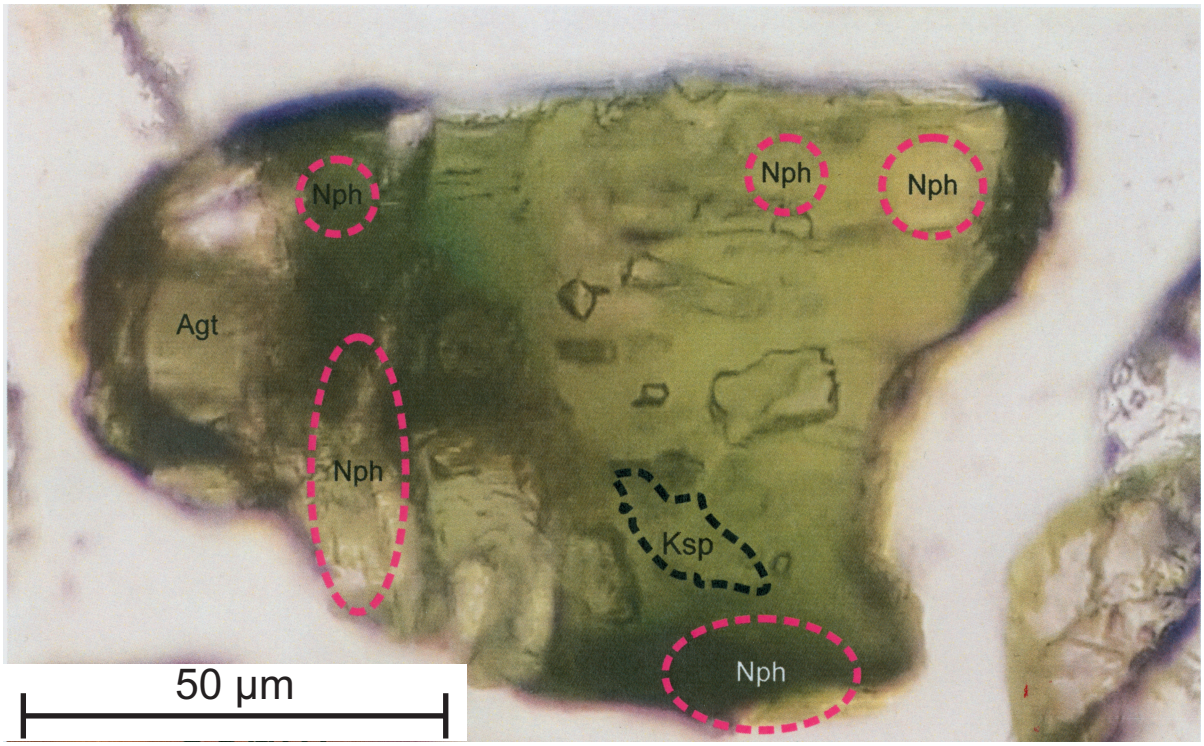


Figure 3A.49: Microphotograph of Fig. 3A.13. Sample F-81 6415m site 6. Transmitted light, ppl, 40x. In the pink circles the nepheline is seen.

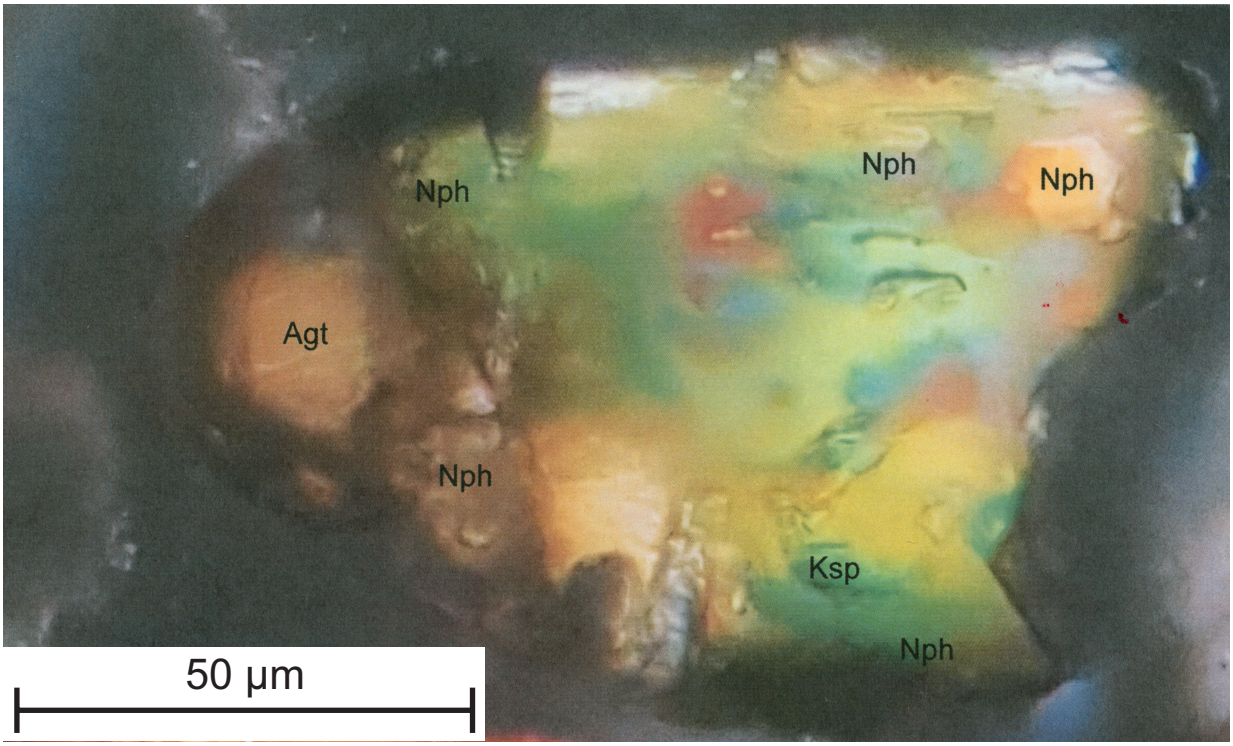


Figure 3A.50: Microphotograph of Fig. 3A.13. Sample F-81 6415m site 6. Transmitted light, xpl, 40x.

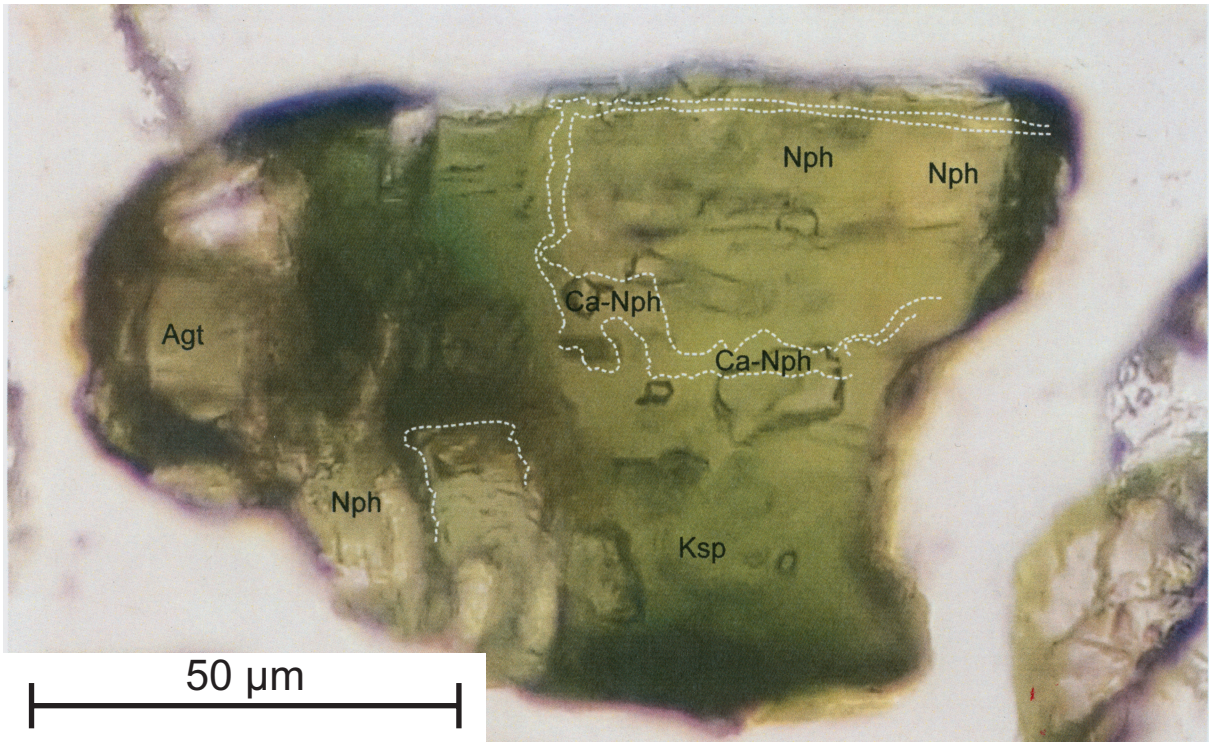


Figure 3A.51: Microphotograph of Fig. 3A.13. Sample F-81 6415m site 6. Transmitted light, ppl, 40x. The white outline indicates veining seen in the BSE figure (Fig. 3A.52).

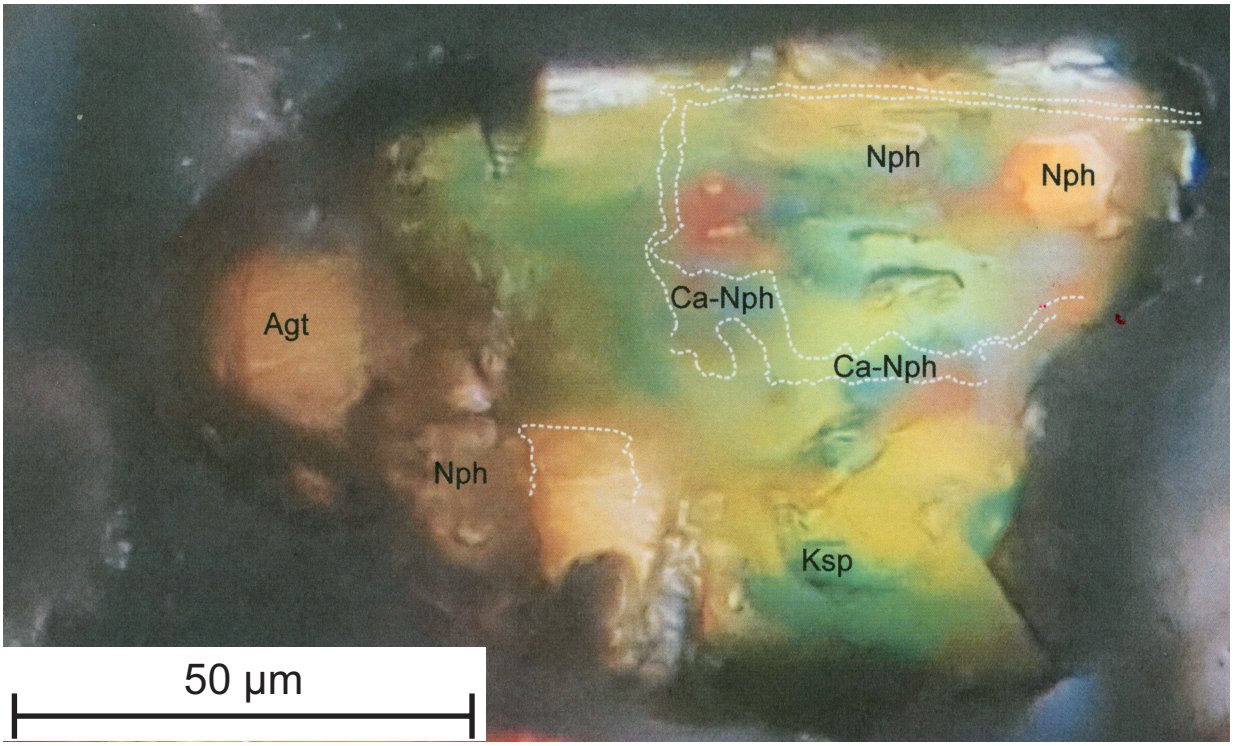


Figure 3A.52: Microphotograph of Fig. 3A.13. Sample F-81 6415m site 6. Transmitted light, xpl, 40x. The white outline indicates veining seen in the BSE figure (Fig. 3A.52)(nepheline).

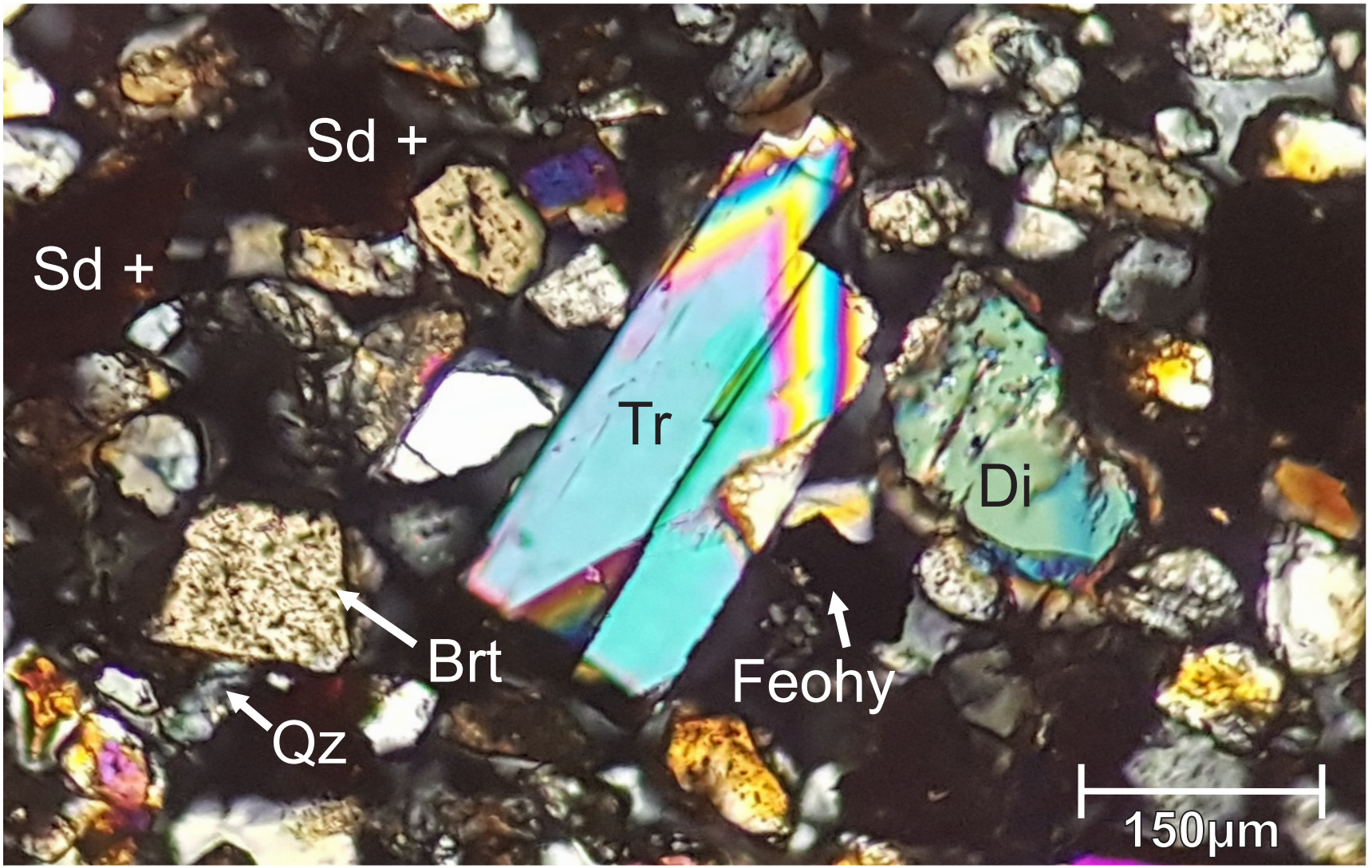


Figure 3A.53. Microphotograph of Fig. 3A.28. Sample F-81 6415 site 16. Transmitted light, xpl, 10x. Grains of tremolite, diopside, Feohy, siderite, barite, and minor quartz.

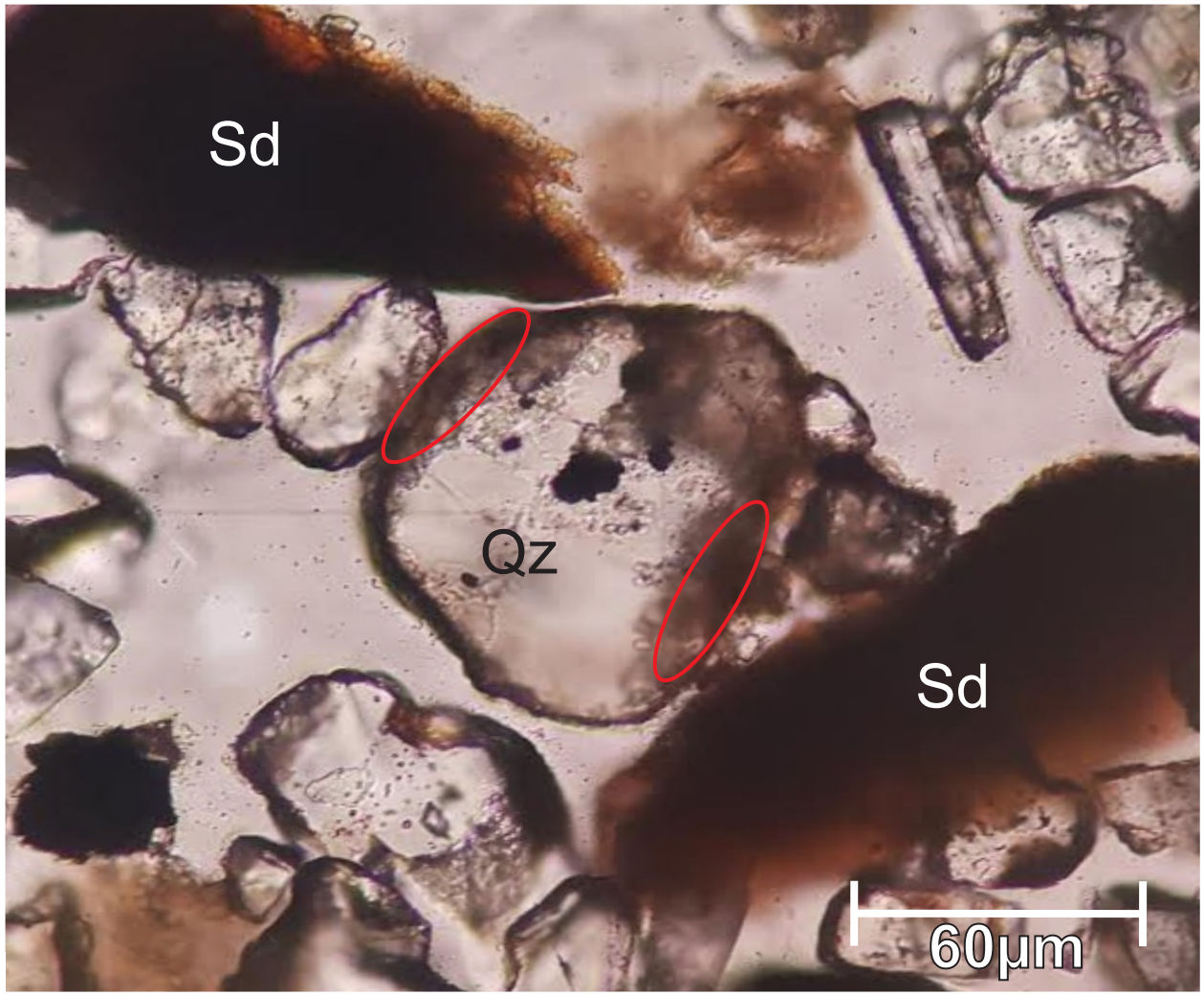


Figure 3A.54. Microphotograph. Sample F-81 6415. Transmitted light, ppl, 100x. Detrital quartz in center with sideritic rim (shown in red) and adjacent siderite.

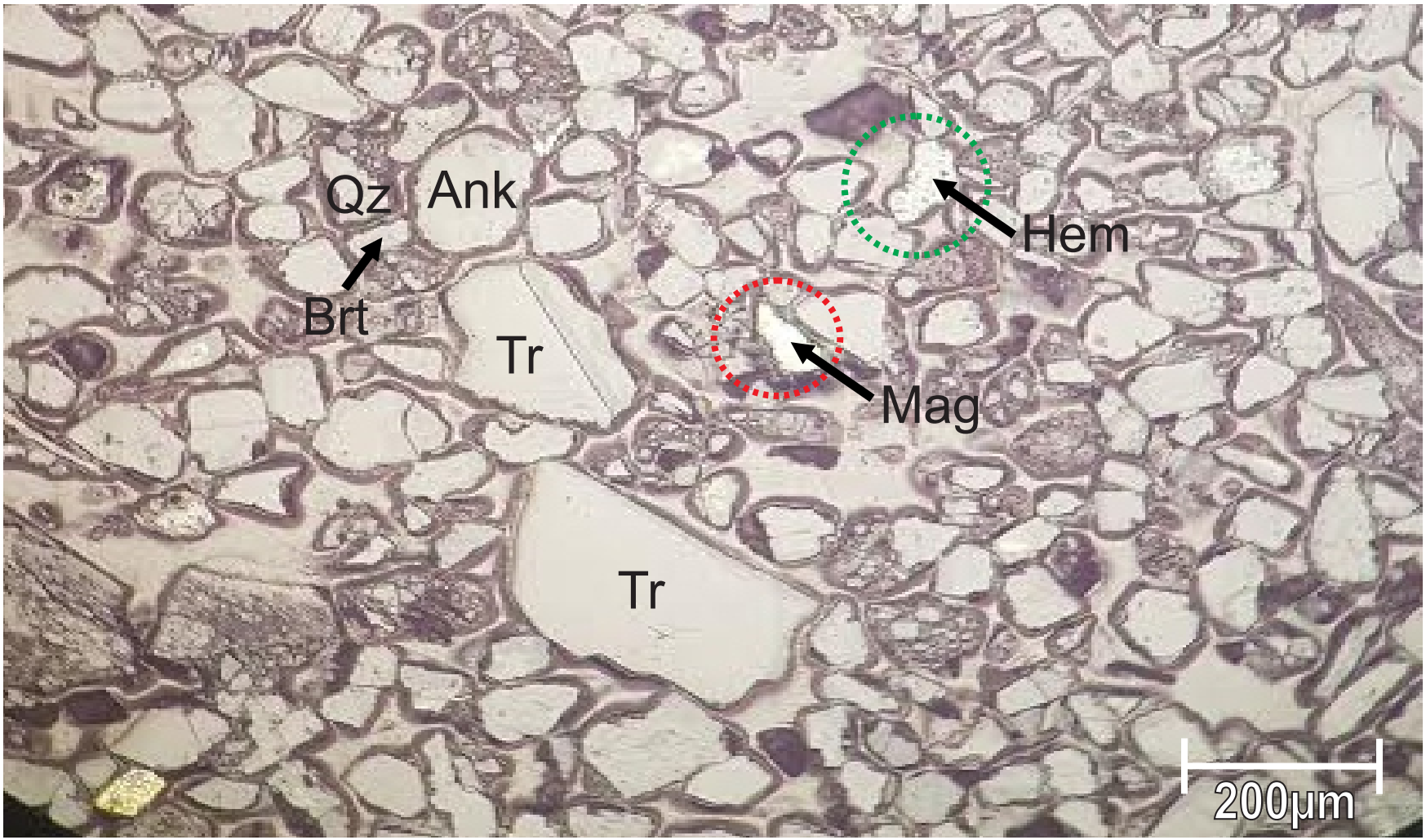


Figure 3A.55. Microphotograph of Fig. 3A.5. Sample F-81 6415 site 2. Reflected light, ppl, 100x. Mineral in red circle is magnetite (very reflective); mineral in the green circle is hematite with quartz inclusions (stipples).

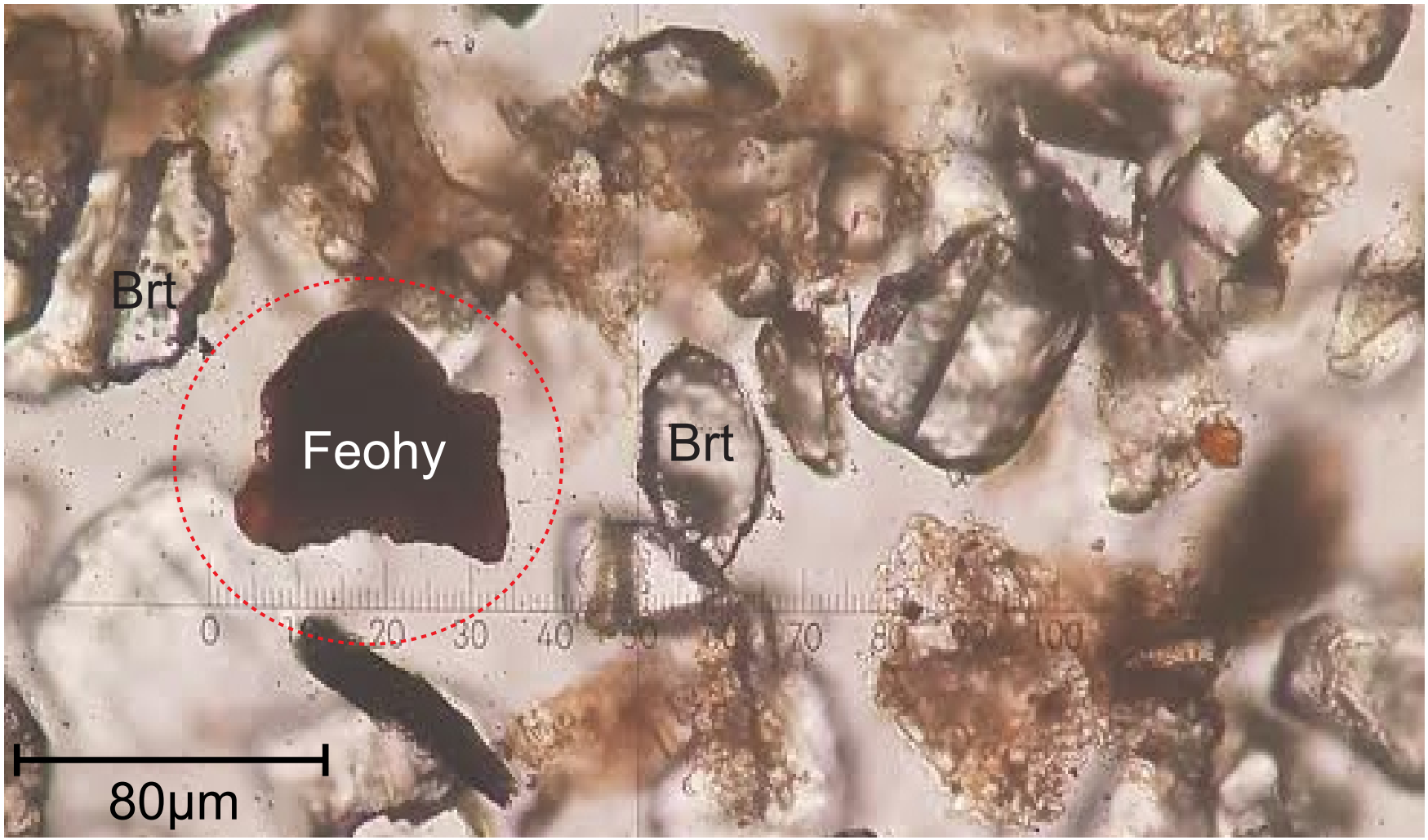


Figure 3A.56. Microphotograph of Fig. 3A.44. Sample F-81 6415 site 25. Transmitted light, ppl, 100x. The mineral in the red circle is Feohy.

Table 3A.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6415 depth.

Site	Position	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	Cl	V2O5	Cr2O3	CoO	NiO	CuO	ZnO	As2O3	SrO	Sb2O3	BaO	Yb2O3	WO3	PbO	Total	Actual Total
1	1	Py	0.12			28.72							71.16																100	222
1	2	Qz +	85.93		7.22	1.42		0.68	3.46		1.28																		100	119
1	3	Ms + Chl	44.67	0.57	27.35	12.50		1.67	0.47		7.76																		95	97
1	4	Chl +	29.50	0.77	14.80	25.56		4.11	4.00	0.99	1.94	0.53															2.82		85	67
1	5	Chl +	26.21	0.57	11.22	33.90		4.80	5.55	0.62	1.28		0.85																85	102
1	6	Brt											36.52					-0.08					1.13		62.43				100	116
1	7	Ms +	53.08	3.00	23.49	4.24		1.64			9.11		0.44																95	113
1	8	Mnohy (Fe + Mn)	2.84			68.14	23.80		0.62											0.94					3.67				100	85
1	9	Feohy +	2.58		0.66	96.75																							100	90
1	10	?Sd +	13.71		10.44	71.19	0.49	0.65	1.48		1.81				0.24														100	84
1	11	Py	0.13			28.70							71.17																100	231
1	12	Qz	100.00																										100	126
1	13	Ab	60.87		16.71	0.51			11.39	10.51																			100	111
1	14	Chl	35.36	0.62	19.19	25.06		3.51	0.55		0.71																		85	92
1	15	Qz	100.00																										100	122
1	16	Qz	100.00																										100	123
1	17	Sd	0.90			44.46		5.23	4.86			0.56																	56	60
1	18	Feohy + Qz	26.44			72.55	1.01																						100	91
1	19	Qz	100.00																										100	126
1	20	Sd + Chl + Ap +	6.39		3.12	61.51	0.71	5.45	13.15		0.30	7.05															2.33		100	80
1	21	Mix	14.93		3.26	54.73	0.58	6.87	12.11	0.50	0.41	6.61																	100	70
1	22	Feohy +	2.73		0.73	96.15	0.40																						100	78
1	23	Sd +	3.15		2.14	38.83	0.49	7.08	4.07		0.25																		56	67
1	24	Sd + Chl	6.60		4.80	71.99	0.93	11.03	4.38		0.27																		100	66
1	25	Ap + Sd	4.52		2.87	59.15	0.67	6.15	17.73		0.38	8.54																	100	69
1	26	Qz +	93.51	0.87	2.74	1.45		0.33			1.09																		100	121
1	27	Brt											36.66					0.01					2.17		61.16				100	120
1	28	Brt											36.52					0.01					3.15		60.32				100	121
1	29	Qz	100.00																										100	127
1	30	Feohy +	3.64			95.38	0.64		0.33																				100	81
1	31	Qz	99.78	0.22																									100	124
1	32	Qz	100.00																										100	126
1	33	Feohy +	2.76		3.59	92.35			1.30																				100	81
2	1	Tr	60.74		0.46	0.35		25.11	12.95	0.39																			100	120
2	2	Ank	1.79		1.44	8.10	0.85	15.72	28.11																				56	62
2	3	Feohy	1.33		0.60	97.20							0.87																100	89
2	4	Qz + Feohy	72.95		0.44	26.61																							100	110
2	5	Mag				100.00																							100	95
2	6	Hem	5.12			93.78	0.55		0.55																				100	81
2	7	Qz	100.00																										100	121
2	8	Brt											36.58					0.09							63.33				100	117
2	9	Qz	99.51		0.49																								100	122
2	10	Tr	61.25			0.44		25.00	13.31																				100	121
2	11	Qz	100.00																										100	124
2	12	Mnohy (Mn + Ba + F)				6.62	71.19	2.48	3.53		0.59			6.39						1.79					7.40				100	77
2	13	Feohy + Chl	11.41		5.72	80.99		0.85			1.04																		100	86
2	14	Qz	100.00																										100	125
2	15	Mix	14.93		13.99	66.84		0.53	0.89		2.82																		100	90
2	16	Ms +	52.40	0.52	24.58	9.32		0.90		0.34	6.94																		95	109
2	17	Qz	100.00																										100	125
2	18	Brt											36.46					0.04					1.42		62.07				100	118
2.1	1	Sd				38.61	0.24	9.26	7.90																				56	61
2.1	2	Qz +	93.41	1.08	1.21	2.89		0.75	0.66																				100	117

Table 3A.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6415 depth.

Site	Position	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	Cl	V2O5	Cr2O3	CoO	NiO	CuO	ZnO	As2O3	SrO	Sb2O3	BaO	Yb2O3	WO3	PbO	Total	Actual Total
2.1	3	Chl +	32.50	0.36	20.44	21.92		3.71	4.18	0.47	1.43																		85	90
2.1	4	TiO_2 +	14.06	66.46	4.46	10.31		2.29	1.69		0.72																		100	96
2.1	5	Sd +	1.52		1.01	36.26	0.26	9.91	7.03																				56	65
2.1	6	Sd + Chl	9.41	1.91	5.31	59.84		12.91	10.19		0.42																		100	69
3	1	Feohy +	3.95			96.05																							100	77
3	2	Brt				0.62							36.16					0.03							63.19				100	114
3	3	Sd + Chl	20.28	0.39	12.76	53.32	0.47	6.27	4.36	0.75	1.40																		100	77
3	4	Sd +	2.35	1.09	1.07	41.19		4.81	5.11	0.38																			56	64
3	5	Ab + Sd	49.43		16.72	20.33		2.15	2.77	8.29	0.32																		100	97
3	6	Qz + Kfs	87.79		5.90	1.05					5.26																		100	119
3	7	Qz	96.85			3.15																							100	120
3	8	Feohy +	7.40			91.81	0.41		0.38																				100	83
3	9	Sd +	10.07		8.21	50.00	0.52	5.43	24.41	0.56		0.80																	100	69
3	10	Feohy +	2.10			97.90																							100	79
3	11	Qz	97.60		1.62						0.78																		100	118
3	12	Sd + Chl	9.96		5.98	61.97	0.49	9.33	9.27	0.62	0.55	0.97													0.86				100	71
3	13	Sd + Chl	2.69		1.41	74.32	0.68	9.48	9.87			1.54																	100	64
3	14	Qz	100.00																										100	123
3	15	Sd + Chl	5.39		3.62	71.29	0.42	11.36	6.45		0.45	1.02																	100	65
3	16	Feohy +	4.53		1.34	86.33	4.88	0.76	1.07			1.08																	100	76
3	17	Sd +	11.97		1.68	65.38	0.83	7.11	11.38		0.26	1.38																	100	70
3	18	Brt + Qz	38.92		0.48				0.31				23.40					-0.06							36.94				100	101
3	19	Brt											35.06					-0.08							65.02				100	106
3	20	Brt											36.86					-0.01							63.15				100	112
3.1	1	Ab	68.39		18.95	0.90			0.46	11.31																			100	122
3.1	2	Sd	0.73			43.53	0.38	6.19	4.61			0.55																	56	63
3.1	3	Sd + Chl	11.85		6.87	65.12	0.85	8.23	6.05		1.04																		100	68
3.1	4	Ms	47.36		34.05	2.90		0.36		0.77	9.56																		95	106
3.1	5	Ab	69.29		18.65	1.17				10.89																			100	116
4	1	Qz	100.00																										100	125
4	2	Brt											36.42					-0.01					1.15		62.44				100	119
4	3	Sd	0.78		0.45	42.70	0.39	4.38	6.61			0.69																	56	63
4	4	Sd + Chl	4.10		2.51	67.14	0.60	8.48	15.48		0.38	1.31																	100	65
4	5	Qz	100.00																										100	120
4	6	Brt	3.45										34.38					0.03							62.14				100	113
4	7	Qz	100.00																										100	120
4	8	Tr	60.92		0.35	2.04		23.79	12.90																				100	115
4	9	Qz	99.85								0.15																		100	118
4	10	Sd	0.91		0.62	39.32	0.41	6.19	7.86			0.69																	56	62
4	11	Ms	49.78	0.34	34.78	1.77		0.62	0.42	0.69	6.60																		95	102
4	12	Cal						0.45	50.32					4.06									1.17						56	62
4	13	Sd + Ap + Chl	2.98		1.63	60.17	0.71	9.37	16.80			8.35																	100	68
4	14	Sd + Cal + Ap	3.16		1.76	45.25	0.56	6.20	37.29			5.79																	100	63
4	15	Tr	61.30		0.36	0.95		24.86	12.53																				100	118
4	16	Brt											37.19					-0.09							62.90				100	119
4	17	Qz	100.00																										100	123
4	18	Feohy +	3.79			91.68	4.04		0.49																				100	78
4	19	Sd +	23.91		16.69	46.40	0.39	5.46	4.94		1.22		1.00																100	77
4	20	Qz	98.23		0.60	1.03					0.15																		100	124
4	21	Mix	23.91		21.89	50.13		0.89	0.68		2.49																		100	93
4	22	Qz	100.00																										100	125
4	23	Qz	100.00																										100	122
4	24	Qz +	92.24		5.25	0.41		0.35			1.75																		100	117

Table 3A.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6415 depth.

Site	Position	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	Cl	V2O5	Cr2O3	CoO	NiO	CuO	ZnO	As2O3	SrO	Sb2O3	BaO	Yb2O3	WO3	PbO	Total	Actual Total
4.1	1	Qz	100.00																										100	123
4.1	2	Mnohy (Mn + Al + Fe)	5.23		13.69	14.47	44.69		3.42		0.55			5.09											6.18			6.67	100	85
4.1	3	Mnohy (Mn + Al + Si)	16.97		20.40	15.09	31.05	0.63	1.98		1.68			3.22											4.07			4.91	100	96
4.1	4	Qz +	79.61		10.78	6.02		2.98	0.38		0.23																		100	119
4.1	5	Sd + Chl	2.62		1.46	65.72	0.44	9.04	19.54			1.19																	100	64
4.1	6	Fe-Cal				9.76		2.31	43.46				0.47																56	59
4.1	7	Py	1.01		0.53	30.43		0.55	0.72				66.75																100	203
4.1	8	Mix	32.39	3.55	20.37	24.98		17.41	1.32																				100	94
4.1	9	Sd +	3.19		0.36	41.06	0.27	5.26	4.95			0.90																	56	65
5	1	Brt											36.48					0.07					1.61		61.84				100	118
5	2	Feohy +	3.42			86.37			0.92											3.52	0.89	4.88							100	80
5	3	Sd +	2.74		1.54	41.01	0.45	4.80	4.71		0.17	0.57																	56	65
5	4	Qz	99.28		0.52	0.19																							100	119
5	5	Qz	100.00																										100	122
5	6	Qz	100.00																										100	123
5	7	Feohy +	5.21			94.79																							100	79
5	8	Feohy +	3.66	0.61	1.44	92.43			1.53						0.33														100	71
5	9	Qz	99.37		0.63																								100	117
5	10	Cal						0.50	53.07					2.44															56	60
5	11	Tr	61.30			0.36		25.03	12.86	0.45																			100	118
5	12	Sd +	3.20			49.03	0.87	0.30	2.36						0.24														56	76
5	13	Feohy +	3.69			95.17	1.14																						100	77
5	14	Qz + Ms	79.30		10.73	0.44					9.53																		100	117
5	15	Qz	98.57		0.32	1.12																							100	121
5	16	Chl + Feohy	4.79		3.35	91.22		0.65																					100	74
5	17	Sd +	1.58		0.72	41.43	0.65	5.39	5.57			0.65																	56	61
5	18	Ab	68.20		19.70	0.43				11.29	0.38																		100	117
6	1	Qz	97.27		1.47	0.85					0.42																		100	123
6	2	Sd +	1.78		1.19	42.50	0.55	5.09	4.14			0.76																	56	64
6	3	Cal						0.41	49.61					5.98															56	66
6	4	Cal						0.78	50.43					4.79															56	63
6	5	Mix	14.22		11.95	70.60		0.49	0.56		1.62						0.55												100	98
6	6	Mix	13.88	0.42	13.73	68.33	0.46	0.47	0.67		1.62						0.40												100	95
6	7	Feohy (Cont)	1.97			93.96	0.50										3.57												100	99
6	8	Feohy (Cont) +				97.34			2.66																				100	82
6	9	Sd + Chl	3.67		1.75	74.57	0.74	11.99	6.04			1.24																	100	65
6	10	Aegirine-Augite	53.32	0.58	0.69	16.29	1.16	6.94	17.46	3.57																			100	115
6	11	Nepheline	46.86		30.18	1.84				17.33	3.79																		100	118
6	12	Mix	14.21		8.86	56.42	0.69	9.90	8.64	0.52	0.76																		100	67
6	13	Qz	99.01		0.63	0.36																							100	104
6	14	Qz	100.00																										100	119
6	15	Brt											36.77					-0.07							63.30				100	114
6	16	Qz	100.00																										100	120
6	17	Mix	12.99		7.31	58.73	0.52	10.49	7.81	0.64	1.52																		100	69
6	18	Mix	53.12	0.94	21.13	10.28		2.00	2.41	1.13	2.85		5.95		0.19														100	104
6	19	Cal				0.24		0.94	50.24					4.59															56	65
6	20	Feohy +	5.28			92.48	1.04		0.95						0.25														100	81
6	21	Cpx (Di)	57.03			0.93		18.00	24.04																				100	115
6	22	Sd	0.78			43.27	0.40	6.09	4.82			0.63																	56	64
6	23	Qz	100.00																										100	124
6	24	Feohy (Cont)	1.34			96.04	0.46										2.16												100	94
6	25	Feohy (Cont) +				97.80			2.20																				100	76
6	26	Qz	98.48		1.31						0.21																		100	117

Table 3A.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6415 depth.

Site	Position	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	Cl	V2O5	Cr2O3	CoO	NiO	CuO	ZnO	As2O3	SrO	Sb2O3	BaO	Yb2O3	WO3	PbO	Total	Actual Total
6	27	Sd +	12.30	0.38	6.77	58.77	0.52	8.35	9.06		0.70	3.15																	100	78
6.1	1	Brt											36.93					0.01					1.19		61.87				100	116
6.1	2	Cal						0.59	49.51					5.90															56	65
6.1	3	Mnohy (Mn + Fe + Ba)	2.78			34.72	47.38	0.59	0.59											1.20		0.01			12.73				100	82
6.1	4	Qz	99.75			0.25																							100	119
6.1	5	Ab	67.84		19.49	0.32			0.73	11.47	0.16																		100	124
6.1	6	Py	0.11			28.80			0.22				70.87																100	229
6.1	7	Cal	0.62		0.55	2.66	0.28	0.49	43.57				0.75	7.08															56	68
6.1	8	Mix	45.34		21.24	4.38		2.31	14.87	0.40	3.04		1.36	5.01											2.05				100	85
7	1	Tr	61.14		0.51	0.67		24.75	12.92																				100	117
7	2	Cal							51.89					4.11															56	63
7	3	Qz	100.00																										100	122
7	4	Qz +	81.20	0.50	11.94	2.01		0.81	1.68	0.32	1.55																		100	107
7	5	Sd + Chl	3.58		2.17	71.81	0.62	5.89	14.51		0.32	1.10																	100	63
7	6	Sd + Chl	2.78		1.49	76.39	0.74	5.94	11.12			1.54																	100	62
7	7	Qz	99.24			0.76																							100	122
7	8	Qz	99.81			0.19																							100	123
7	9	Feohy +	8.97		0.57	86.76	0.79		0.82												2.09								100	82
7	10	Kfs +	62.46	0.88	22.72	2.99		1.52	1.73	3.49	3.23		0.98																100	99
7	11	Py				28.71				0.23			71.06																100	236
7	12	Brt											36.37					0.14							63.48				100	119
7	13	Qz	100.00																										100	124
7	14	Feohy +	4.49			91.30			2.20						0.26					1.75									100	83
7	15	Mnohy (Mn + Ba + Pb)					74.67													1.07		0.45			20.63			3.19	100	82
8	1	Fl				0.21			47.07					52.73															100	170
8	2	Feohy +	2.10			97.10	0.80																						100	79
8	3	Feohy +	4.03			95.46			0.51																				100	88
8	4	Qz	99.28		0.72																								100	121
8	5	Qz	100.00																										100	119
8	6	Brt											36.35					0.03							63.62				100	114
8	7	Qz	98.50		0.87	0.44					0.18																		100	120
8	8	Chl +	23.93	0.31	8.76	49.76					2.24																		85	100
8	9	Feohy +	2.39		0.94	95.67																		1.00					100	90
8	10	Qz +	93.52		4.81	0.43					1.24																		100	119
8	11	Sd	0.85			43.58	0.45	5.43	5.06			0.63																	56	61
8	12	Mix	57.02	1.64	26.46	6.43		1.99	2.16	0.46	3.85																		100	91
8	13	Qz	99.46			0.54																							100	116
8	14	Qz + Feohy	41.99			56.92			0.54											0.55									100	93
8	15	Feohy +	3.88			94.85	0.76		0.51																				100	77
8	16	Sd +	1.27		0.59	43.04	0.44	6.10	3.90			0.66																	56	61
8	17	Feohy +	4.96		2.98	84.98			2.51			2.12			0.34					0.65		1.45							100	77
8	18	Fl							46.50					53.50															100	169
8	19	Brt											36.48					0.03					0.88		62.61				100	120
9	1	Qz	100.00																										100	120
9	2	Mix	21.05		8.55	54.37	0.76	6.83	6.77	0.49	1.17																		100	81
9	3	Mix	28.07		16.54	46.96	0.81	0.57	0.46		4.05		0.59												1.94				100	93
9	4	Qz	99.34		0.66																								100	117
9	5	Mix	23.34		16.91	33.29	20.96	0.52	0.76																4.23				100	89
9	6	Mix	20.36		12.46	46.00	0.58	5.44	5.77	6.10	1.75		0.85		0.68														100	70
9	7	Mix	8.08		1.19	31.55		4.20	5.10	14.60	17.32		2.45		15.52														100	57
9	8	Sd +	4.37	0.22	2.31	39.35	0.39	5.85	3.05		0.46																		56	64
9	9	Kfs	63.94		19.82	0.72		0.57			14.95																		100	116
9	10	Sd +	2.81		1.47	40.22	0.62	6.65	4.05		0.17																		56	61

Table 3A.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6415 depth.

Site	Position	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	Cl	V2O5	Cr2O3	CoO	NiO	CuO	ZnO	As2O3	SrO	Sb2O3	BaO	Yb2O3	WO3	PbO	Total	Actual Total
9	11	Feohy		0.37		99.19										0.44													100	94
9	12	Mnohy (Mn + Ba)	0.87			2.10	75.25																		21.79				100	82
9	13	Cal						0.81	51.61					3.58															56	63
9	14	Qz	100.00																										100	123
9	15	Kln	47.39		35.78	0.56			0.82					1.16													0.28		86	88
9	16	Cal	0.56		0.46	3.21	0.24	0.99	45.45					5.09															56	62
9.1	1	Feohy +	1.24	0.54	3.57	92.97			0.47												1.21								100	96
9.1	2	Mix	26.81	6.72	19.21	31.92		2.39	12.94																				100	112
9.1	3	Mix	42.74	0.46	13.16	21.35			17.60	0.37	1.72		2.60																100	114
9.1	4	Mix	38.98	0.52	10.09	26.01	0.24	0.46	17.38	0.50	3.04		2.79																100	116
9.1	5	Py +	9.52		1.69	40.78			6.06		0.14		41.13							0.68									100	167
9.1	6	Mix	33.32	1.01	3.93	38.36		1.70	21.67																				100	111
10	1	Strontianite*							0.94														96.83		2.23				100	82
10	2	Brt											36.37					-0.12							63.75				100	120
10	3	Qz	100.00																										100	121
10	4	Kfs	66.93		17.55						15.52																		100	120
10	5	Qz	99.50		0.50																								100	124
10	6	Ab	66.05		21.17				2.82	9.96																			100	118
10	7	Ms + TiO_2	48.14	3.44	29.42	8.98		1.68			8.33																		100	104
10	8	Sd +	10.02	2.08	8.88	76.56	0.42	0.49	0.60		0.95																		100	83
10	9	Feohy	1.38			97.78	0.39		0.45																				100	78
10	10	Sd +	2.36		1.23	41.47	0.32	7.49	2.92		0.20																		56	64
10	11	Qz	100.00																										100	121
10	12	Qz	100.00																										100	126
10	13	Mnohy (Mn + Fe + Al + Pb)	2.22		10.33	33.13	39.94		1.06						0.33										4.31			8.68	100	87
10	14	Py				29.05							70.95																100	229
10.1	1	Qz	99.56			0.44																							100	124
10.1	2	Feohy +	15.21			81.92							0.86												2.01				100	82
10.1	3	Feohy	1.87			97.09																		1.04					100	92
10.1	4	Feohy +	15.02			83.99																			0.98				100	102
10.1	5	Brt				3.15							35.57												58.38		2.91		100	115
10.2	1	Ab	69.30		18.82	0.45			0.29	11.13																			100	121
10.2	2	Qz + Py	94.26			1.75							4.00																100	121
10.2	3	Py	0.81		0.37	29.26					0.17		69.39																100	223
10.2	4	Py	0.72		0.35	28.69					0.14		70.11																100	227
10.2	5	Qz	99.18		0.40	0.42																							100	126
10.2	6	Mix	60.97	0.24	22.10	3.50		0.71	0.85	4.77	1.10		5.76																100	105
10.2	7	Py	2.56		1.16	30.48			0.26	0.38	0.33		63.50														1.34		100	177
10.2	8	Hole	3.47			1.33			42.13				14.84	5.51	1.33										25.69		5.69		100	11
11	1	Tr	61.12			1.52		24.20	13.16																				100	117
11	2	Sd	1.06			41.90	0.35	4.59	6.66	0.35		1.10																	56	65
11	3	Sd +	12.97		3.66	66.19	1.43	9.35	4.33	2.07																			100	67
11	4	Py	2.49		1.62	29.24				0.20	0.17		66.28																100	195
11	5	Qz +	92.54		4.77	1.37		0.46	0.16		0.70																		100	111
11	6	Sd +	4.37		2.48	30.83	0.34	5.10	12.62		0.27																		56	64
11	7	Cal						0.66	45.42					9.92															56	69
11	8	Feohy +	3.28			88.37			0.94				0.87		0.27					5.13		1.14							100	83
11	9	Feohy +	4.67		5.26	79.33			1.16		0.83											5.92		2.85					100	85
11	10	Sd +	1.87		1.13	34.16	0.66	3.58	13.94			0.67																	56	66
11	11	Feohy +	4.95			94.68			0.36																				100	77
11	12	Mix	30.24		8.15	44.68		4.68	6.22	5.21		0.82																	100	78
11	13	Sd + Chl	2.45		1.28	73.23	1.01	12.40	8.71			0.91																	100	60
11	14	Sd +	1.67		0.90	39.77	0.48	6.14	6.34			0.71																	56	58

Table 3A.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6415 depth.

Site	Position	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	Cl	V2O5	Cr2O3	CoO	NiO	CuO	ZnO	As2O3	SrO	Sb2O3	BaO	Yb2O3	WO3	PbO	Total	Actual Total
11	15	Feohy (Cont) +	7.21		4.14	71.10	0.92	8.06	6.93		0.64	1.00																	100	76
11	16	Feohy +	5.32			91.70	1.32	1.13	0.54																				100	80
11	17	Qz	99.35		0.65																								100	122
12	1	Cal						0.92	50.62					4.45															56	64
12	2	Cpx (Di)	56.64		0.63	0.53		18.03	23.83	0.34																			100	117
12	3	Qz +	82.60		2.34	0.41		13.48	1.18																				100	110
12	4	Tr	60.79		0.67	0.41		24.89	12.88	0.36																			100	111
12	5	Qz	100.00																										100	119
12	6	Sd +	1.07		0.53	42.62	0.25	6.50	4.40			0.64																	56	61
12	7	Qz	99.71		0.29																								100	115
12	8	Feohy +	1.80			87.80	0.55		3.96				0.89				5.00												100	81
12	9	Cal							47.55					8.45															56	72
12	10	Cal						0.53	49.25					6.22															56	69
12	11	Qz + Ab	61.23	1.10	22.30	2.88		1.47	1.30	1.90	3.54		0.97	3.33															100	52
12	12	Mix	45.82	0.36	26.37	18.36		3.75	2.56	0.31	1.87	0.59																	100	89
12	13	Sd +	2.07		1.11	37.58	0.44	5.95	7.81		0.15	0.90																	56	64
12	14	Cm	0.60	1.71	96.90	0.79																							100	104
12	15	Sd	1.12		0.76	39.52	0.44	6.57	7.58																				56	63
12	16	Feohy	1.74			83.64	1.14	0.90	2.01				1.68				1.25								1.13		6.50		100	73
12	17	(Fe+Cu+Si)	13.46			63.32			1.35						1.05					20.81									100	81
13	1	Feohy	1.99			96.69	1.32																						100	85
13	2	Fl							46.74					53.26															100	178
13	3	Feohy +	2.36			96.18	1.12		0.34																				100	80
13	4	Qz	100.00																										100	123
13	5	Qz	100.00																										100	118
13	6	Mag +	2.88		0.91	95.81	0.40																						100	87
13	7	Mag	0.68			99.32																							100	88
13	8	Feohy +	4.09			94.03	1.08		0.80																				100	78
13	9	Sd +	3.11	0.25	1.90	39.57	0.53	5.99	3.77		0.20	0.69																	56	62
13	10	Feohy +	5.14			92.08		0.95	0.54											1.28									100	79
13	11	Feohy +	8.60		4.29	85.85			0.52		0.74																		100	78
13	12	Sd + Ap +	2.79		1.72	56.69	0.65	9.39	19.54			9.24																	100	68
13	13	Tr	61.51			0.33		25.00	13.17																				100	117
13	14	Qz	100.00																										100	119
13	15	Sd +	1.55			53.17	0.98		0.30																				56	77
13	16	Sd +	3.31			49.68			1.02			0.71								0.55		0.73							56	76
13	17	Sd + Chl	12.81		7.67	76.50	0.44	0.52	0.78		1.28																		100	77
13	18	Fl							47.11					52.89															100	180
13	19	Feohy + Chl	5.65		2.50	88.27			0.52								0.46			1.16	1.44								100	81
13.1	1	Feohy + Chl	4.93		3.07	88.74			0.74								0.52			0.88	1.13								100	81
13.1	2	Ms	43.42	0.47	28.49	8.63		1.24		0.24	9.10			3.41															95	103
13.1	3	Sd + Chl	11.63		7.49	61.93	0.72	13.94	3.97		0.32																		100	72
13.1	4	Ms +	53.76	0.35	28.60	3.66		1.90	1.93	0.36	4.44																		95	102
13.1	5	Qz +	90.55	0.44	6.14	0.75		0.55	0.60		0.96																		100	118
13.1	6	Qz +	71.20	1.17	17.39	4.03		1.83	0.92	0.28	3.17																		100	113
13.1	7	Ms	46.46	0.73	28.24	8.40		1.61			8.98		0.58																95	101
13.1	8	Qz	100.00																										100	124
13.1	9	Mnohy (Mn + Fe + Al + Si)	21.07		19.16	23.12	27.32	0.61	0.56		0.24		0.88						0.50	1.10					5.45				100	82
14	1	Feohy + Chl	2.42		1.78	92.98		0.93	1.89																				100	86
14	2	Chl +	16.61		7.21	46.57	0.44	4.21	6.03		0.79	0.83	0.59		0.49										1.23				85	101
14	3	Qz	100.00																										100	121
14	4	Qz +	79.24	0.55	13.02	2.65		0.83	1.25	0.53	1.93																		100	109
14	5	Qz	99.47			0.53																							100	124

Table 3A.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6415 depth.

Site	Position	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	Cl	V2O5	Cr2O3	CoO	NiO	CuO	ZnO	As2O3	SrO	Sb2O3	BaO	Yb2O3	WO3	PbO	Total	Actual Total
14	6	Py	1.17		0.62	28.98					0.17		69.06																100	219
14	7	Sd +	4.78		3.39	33.65	0.41	3.01	9.51		0.50	0.74																	56	65
14	8	Ms +	53.70	5.14	21.54	1.74		1.08			11.80																		95	109
14	9	Cal						0.94	49.56					5.50															56	65
14	10	Sd +	13.17		0.63	71.72	0.82	6.91	5.72			1.04																	100	68
14	11	Feohy +	4.17			91.08	2.65		1.62						0.48														100	77
14	12	Brt											36.42					0.04					1.51		62.04				100	112
15	1	Qz	100.00																										100	125
15	2	EPOXY				20.59								54.90	24.51														100	1
15	3	Mix	11.36		6.25	35.58	0.47	7.36	19.38	1.02	0.84			17.74															100	83
15	4	Qz	100.00																										100	118
15	5	Feohy	1.52		0.56	94.10																2.56		1.25					100	87
15	6	Feohy (Cont)				94.31	0.65	1.73	2.47				0.84																100	74
15	7	Feohy	1.35			95.88	1.16		0.64											0.97									100	76
15	8	Qz +	93.59		4.03	0.55		0.37			1.46																		100	121
15	9	Qz +	95.91	0.57	1.28	0.58		0.57	0.71		0.39																		100	120
15	10	TiO_2 +	7.49	88.85	0.93	1.41		1.01	0.31																				100	108
15	11	Feohy +	3.55			94.54			0.35												1.65	-0.09							100	79
15	12	Cpx (Di)	56.76			0.22		18.59	24.43																				100	120
15	13	Qz	100.00																										100	125
15	14	Mix	2.07		1.45	25.38	0.51	2.41	38.29	1.29	0.28	26.15															2.17		100	85
16	1	Tr	60.96		0.87	0.68		24.52	12.97																				100	117
16	2	Bt	36.06	4.60	12.91	27.28	0.36	5.63		0.77	8.09				0.30														96	101
16	3	Cpx (Di)	57.12			0.53		18.28	24.07																				100	120
16	4	Qz	100.00																										100	121
16	5	Qz +	95.08		1.06	1.89	0.20		1.76																				100	114
16	6	Feohy	0.67			98.21																		1.12					100	90
16	7	Feohy +	2.34			96.83	0.83																						100	80
16	8	Brt											36.93					-0.05							63.12				100	119
16	9	Mix	56.76	0.69	17.80	15.56		2.80	1.80	0.72	3.05		0.82																100	107
16	10	Qz	100.00																										100	121
16	11	Feohy +	6.23			91.52	0.93	1.31																					100	85
17	1	Qz	100.00																										100	123
17	2	Sd +	2.79		0.90	35.89	0.57	3.61	10.66		0.16	1.41																	56	64
17	3	Montmorillonite	58.98	0.36	21.77	1.76		2.37	4.50	0.27	0.24			8.66													1.11		100	97
17	4	Qz	100.00																										100	121
17	5	Qz	100.00																										100	120
17	6	Tr	61.31			0.33		25.18	13.18																				100	117
17	7	Chl +	19.92	0.31	13.61	47.38		0.64	0.86		2.28																		85	94
17	8	Feohy +	2.70			94.08	0.99	0.57	0.66																1.00				100	80
17	9	Qz +	96.59		2.36	0.26					0.79																		100	121
17	10	Sd + Ap + TiO_2	2.54	5.99	1.29	66.45	0.41	9.62	9.50			4.21																	100	66
17	11	Feohy +	6.56			92.56	0.46		0.43																				100	79
17	12	Qz	100.00																										100	119
17.1	1	Feohy +	2.63		2.04	92.71	1.58		1.03																				100	82
17.1	2	Feohy +	2.39		5.79	86.46	2.35		1.70											1.31									100	79
17.1	3	Feohy +	2.35		8.82	74.73	8.21		2.61						1.01					1.07					1.20				100	79
17.1	4	Mnohy (Mn + Fe + Al)	1.20		16.98	25.61	47.52		3.93	0.58					0.38							0.16			3.64				100	68
17.1	5	Mnohy (Mn + Fe + Al)	1.37		14.45	24.50	42.59		3.97	0.55				8.42	0.44										3.71				100	69
17.1	6	Mnohy (Mn + Fe + Al)			32.76	4.54	57.51		2.25	1.55										0.52					0.87				100	78
17.1	7	Mnohy (Mn + Fe + Al)			31.18	5.78	57.30		2.49						0.36					0.75	0.52				1.62				100	77
17.1	8	Mnohy (Mn + Fe + Al)	1.52		12.66	66.37	15.68		3.78																				100	78
17.1	9	Mnohy (Mn + Fe + Al)	4.05		13.02	62.81	11.27		3.35	1.13			1.73		0.30										2.33				100	69

Table 3A.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6415 depth.

Site	Position	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	Cl	V2O5	Cr2O3	CoO	NiO	CuO	ZnO	As2O3	SrO	Sb2O3	BaO	Yb2O3	WO3	PbO	Total	Actual Total
18	1	Tr	61.55			0.67		24.87	12.90																				100	119
18	2	Kfs	63.66		19.87	0.88		0.58			15.02																		100	118
18	3	Qz	100.00																										100	122
18	4	Feohy +	5.06			89.59	0.67		1.34													3.34							100	79
18	5	Cal						0.65	48.98					6.37															56	65
18	6	Dol +				2.33	1.46	19.75	30.29						0.17														54	58
18	7	Qz	98.44			0.24				0.41			0.75		0.15														100	106
18	8	Qz	100.00																										100	122
18	9	Feohy	1.26			96.99																		1.74					100	93
18	10	Sd + Ap	8.59		4.22	61.75	0.68	6.80	11.32	0.81	0.62	5.20																	100	67
18	11	Feohy	1.43			91.79	4.97		0.63																1.19				100	79
18	12	Feohy +	4.66			93.12		0.61	1.30						0.31														100	84
18	13	Cal							49.38					6.62															56	66
18.1	1	Mnohy (Mn + Al + Si + Ba)	14.44		13.86	9.42	40.91	0.69	1.65		2.09			3.38											8.20			5.35	100	95
18.1	2	Mnohy (Mn + Ba)	1.86		7.49	2.22	64.19		3.10		0.41				0.55										12.63			7.55	100	85
18.1	3	Feohy +	3.38			96.23	0.39																						100	80
18.1	4	Fl							48.43					51.57															100	170
18.1	5	Feohy +	4.58		0.67	92.17	0.87	0.98	0.72																				100	82
18.1	6	Tr	61.24		0.60	0.77		24.36	13.04																				100	117
18.1	7	Tlc	67.32			0.81		31.87																					100	115
18.1	8	Qz	100.00																										100	123
18.1	9	Qz +	84.70			1.26		0.71	0.80	0.71			4.51	2.24	0.37										4.71				100	51
18.1	10	Cpx (Di)	57.22			0.23		18.59	23.97																				100	119
18.1	11	Cal							49.67					6.33															56	67
19	1	Tr	61.46			0.60		24.55	13.18						0.21														100	118
19	2	Cal						0.67	44.34					10.99															56	75
19	3	Dol				0.33		21.86	30.96					0.84															54	59
19	4	Tr	60.48		0.65	0.55		24.60	12.69	0.32				0.71															100	113
19	5	Qz	100.00																										100	117
19	6	Feohy		3.27		93.83	1.09	1.81																					100	95
19	7	Dol				0.26		22.55	30.55					0.64															54	58
19	8	Sd + Ap	1.45		0.88	70.76	0.48	10.50	13.17			2.77																	100	62
19	9	Qz	100.00																										100	122
19	10	Brt											37.00					-0.05							63.05				100	120
19	11	Feohy +	6.94	1.18	1.29	87.27	2.18		1.14																				100	81
19	12	Qz	96.87		0.55	2.34					0.24																		100	121
19	13	Feohy + Chl +	8.75		3.58	85.14	1.08		0.55		0.91																		100	77
19	14	Qz	99.71			0.29																							100	122
19	15	Qz	100.00																										100	121
19	16	Qz	97.09		1.73	0.70					0.48																		100	120
19	17	Feohy + Chl +	5.23		3.46	88.27		0.57													2.47								100	79
19	18	Cal						0.34	43.23					12.43															56	74
19	19	Feohy	1.18			97.97																0.84							100	89
19	20	Feohy +	3.02			95.31	1.07		0.59																				100	76
19	21	Fl							47.71					52.29															100	167
19	22	Qz	100.00																										100	118
19	23	Mix	2.04			85.82			7.71						0.39		4.05												100	77
19	24	Qz	100.00																										100	117
19	25	Qz	98.96		0.82						0.22																		100	114
19	26	Kfs	66.07		17.55					0.29	15.40														0.70				100	112
19	27	Feohy +	3.03			95.58	0.58		0.81																				100	76
19.1	1	Mix	36.25		2.36	38.22	0.72	3.92	15.14		0.41	2.99																	100	75
19.1	2	Ab	70.86		16.20	2.31			0.51	9.89	0.23																		100	113

Table 3A.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6415 depth.

Site	Position	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	Cl	V2O5	Cr2O3	CoO	NiO	CuO	ZnO	As2O3	SrO	Sb2O3	BaO	Yb2O3	WO3	PbO	Total	Actual Total
19.1	3	Brt											36.79					0.04					1.43		61.74				100	115
19.1	4	Feohy +	4.98			93.21	1.81																						100	78
19.1	5	Qz	100.00																										100	120
19.1	6	Qz	100.00																										100	118
19.1	7	Qz	100.00																										100	122
19.1	8	Kln +	63.05	0.45	19.19	5.38		1.35	2.47	0.34	3.14		1.49	3.15															100	95
19.1	9	Feohy (Cont) + Cal	1.83			84.81	0.54		8.19						0.63		3.99												100	79
19.1	10	EPOXY				16.35								62.89	20.75														100	2
19.1	11	Feohy (Cont)				98.05	0.39		0.73								0.84												100	91
19.2	1	Sd +	1.48		0.79	42.20	0.36	5.53	4.73		0.18	0.73																	56	62
19.2	2	Qz +	83.45		3.86	10.17		0.97	0.77	0.31	0.47																		100	111
19.2	3	Qz +	95.36		2.97	0.76					0.91																		100	120
19.2	4	Feohy + Chl	5.04		3.53	89.11															2.32								100	78
19.2	5	Qz	99.32			0.68																							100	121
19.2	6	Sd +	0.83		0.54	43.55	0.32	5.86	4.19			0.69																	56	62
19.2	7	Sd +	2.14		1.23	41.21	0.33	4.98	4.86	0.41	0.22	0.62																	56	59
19.2	8	Qz +	90.27		0.69	8.38	0.19				0.47																		100	118
19.2	9	Feohy +	6.08		0.65	91.22	1.42		0.63																				100	78
19.2	10	Qz	96.33		0.99	0.49		0.53					0.51												1.15				100	118
19.2	11	Brt											37.02					-0.15							63.13				100	115
19.2	12	Brt	2.21		0.77				1.75		0.46		35.26					-0.04							59.59				100	110
20	1	Fl							46.97					53.03															100	163
20	2	Mix	7.62		4.39	69.06	0.54	8.08	5.11		0.26	0.96	2.31												1.68				100	91
20	3	Sd + Brt +	5.83		2.38	53.77	0.47	6.76	7.24	0.80	0.29		8.80												13.67				100	69
20	4	Sd +	3.44		2.07	38.39	0.36	4.98	5.37	0.35	0.41	0.63																	56	63
20	5	Sd +	13.07		2.31	61.98	0.77	8.87	12.09	0.91																			100	64
20	6	Feohy (Cont)	0.47			97.39	1.00										1.14												100	137
20	7	Mix	3.51			84.22	0.57		2.35				2.72		0.28										3.97		2.38		100	65
20	8	Ab +	63.94	1.27	18.89	4.05		1.00	1.19	4.46	1.53			3.67															100	114
20	9	Py	0.18			28.04				0.27			71.51																100	219
20	10	?Ms	64.50	0.56	24.27	3.32		1.44	0.62	1.81	3.49																		100	103
20	11	Qz +	73.02	0.25	10.47	10.06		0.55			5.65																		100	112
20	12	Feohy +	4.60			93.24	1.13		1.03																				100	78
20	13	Qz	100.00																										100	125
20	14	Feohy +	3.08			94.81	0.63													1.48									100	85
20	15	Sd + Chl	11.06	0.55	7.04	60.56	0.61	6.90	10.71	0.98	0.56	1.03																	100	64
20	16	Feohy +	5.47		1.82	92.40			0.30																				100	90
20	17	Sd +	5.11	0.32	2.14	37.09	0.41	5.11	4.34	0.87		0.61																	56	61
21	1	Dol +				0.60	0.33	19.37	30.92					2.53	0.24														54	56
21	2	Qz +	86.41		9.21	0.92		0.56		1.39	1.51																		100	118
21	3	Sd + Chl +	4.24		3.35	72.56	0.93	10.61	7.44			0.86																	100	67
21	4	Sd + Chl +	2.04		1.35	75.45	0.62	9.40	9.66			1.47																	100	63
21	5	Sd + Chl +	5.65		2.84	73.25	0.68	6.69	9.64			1.25																	100	51
21	6	Qz	98.92			1.01																				0.07			100	118
21	7	Sd	1.13		0.70	41.64	0.46	6.54	4.87			0.61									0.04								56	63
21	8	Qz	99.30			0.70																							100	123
21	9	Brt				1.09							36.20					0.16					1.27		61.28				100	114
21	10	Sd				47.20	4.80	3.13	0.88																				56	60
21	11	Cal						0.39	47.87					7.74															56	67
21	12	Qz	100.00																										100	120
21	13	Qz	100.12																							-0.12			100	118
21	14	Qz	100.00																										100	117
21	15	TiO_2		100.00																									100	104

Table 3A.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6415 depth.

Site	Position	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	Cl	V2O5	Cr2O3	CoO	NiO	CuO	ZnO	As2O3	SrO	Sb2O3	BaO	Yb2O3	WO3	PbO	Total	Actual Total
21	16	Sd +	18.67		4.17	60.95	1.05	8.99	2.94	1.36	1.85																		100	68
21	17	Sd + Chl	5.71		2.79	74.48	0.75	6.76	7.32	0.65	0.35	1.19																	100	52
21	18	Cal						0.67	44.57					10.75															56	73
21	19	Qz	95.91	0.46	2.93	0.42					0.29																		100	115
22	1	Feohy +	1.19			85.71	0.53		5.18	1.10			1.18				5.10												100	81
22	2	Mag				98.90											1.10												100	94
22	3	Brt				0.47							36.57												62.97				100	118
22	4	Feohy +	1.74			97.17			1.10																				100	77
22	5	Mix	15.44	0.53	9.43	69.93	1.45		0.51	0.64	2.07																		100	89
22	6	Qz +	92.66		4.17	0.97	1.18				1.02																		100	116
22	7	Chl	31.57		10.99	31.33	0.23	3.19	6.86	0.34	0.49																		85	85
22	8	Cpx (Di)	57.15			0.43		18.62	23.80																				100	112
22	9	Qz +	93.59	1.21	3.90	0.27					1.03																		100	113
22	10	Mix	22.02	0.49	34.74	31.90	7.15	3.70																					100	99
22	11	Mnho (Mn + Fe)	0.93			44.92	47.99		0.84					2.14						2.17					1.01				100	82
22	12	Mix	27.55		3.78	50.70	0.53	7.36	7.12	0.67	0.47	1.83																	100	75
22	13	Qz	100.00																										100	116
22	14	Feohy +	5.99			92.00															2.00								100	81
22	15	Qz	100.00																										100	116
22	16	Sd + Chl	7.76		3.53	67.25	0.65	9.78	8.99	0.66		1.38																	100	63
22	17	Cal							48.41					7.59															56	67
22	18	Qz	100.00																										100	122
22	19	Mix /Chl	29.12	0.61	10.42	43.92	0.54	4.24	5.21	0.45	1.35																4.17		100	69
22	20	Feohy +	3.22			94.01	0.79	1.44	0.55																				100	75
22	21	Feohy (Cont) +	1.36			94.84			2.45				0.79				0.55												100	76
22	22	Feohy (Cont)				99.40	0.60																						100	90
23	1	Sd + Chl +	2.75		1.59	72.27	0.68	10.29	9.84	0.92		1.67																	100	63
23	2	Qz	99.23			0.77																							100	123
23	3	Hematite (Cont)	1.71			94.09											3.72				0.47								100	95
23	4	Hematite (Cont)				86.08	0.50		12.08				1.02								0.32								100	78
23	5	Hematite (Cont)	1.52			84.17	0.46		6.00				0.91		0.57		5.97				0.40								100	84
23	6	Tr	60.26			0.54		24.01	13.89	0.32				0.64							0.34								100	108
23	7	Feohy +	5.83		0.54	92.41		0.50	0.71																				100	80
23	8	Sd + Chl +	12.50		4.84	65.06	0.94	8.53	6.77	0.76	0.61																		100	66
23	9	Feohy (Cont) + Chr	7.84		1.28	63.58	1.73		2.74				2.74				18.76				0.38				0.95				100	85
23	10	Tlc	66.21		0.46	0.42		32.52	0.39																				100	106
23	11	Cpx (Di)	57.23			0.33		19.00	23.44																				100	118
23	12	Cpx (Di)	56.96		0.45	0.28		18.30	23.60	0.40																			100	117
23	13	Ms +	52.73	2.17	24.73	3.36		1.57			10.45																		95	108
23	14	Qz	100.00																										100	119
23	15	Qz	99.48		0.52																								100	116
23	16	Feohy +	6.52			92.59	0.81														0.08								100	78
23	17	Feohy (Cont) +	1.12			95.14	0.69										2.95				0.11								100	92
23	18	Sd + Chl + Cal + Ap	2.76		2.05	62.04	0.96	7.21	23.24			1.48									0.27								100	63
23	19	Sd + Chl + Cal + Ap	3.65		1.71	68.60	0.67	7.35	14.58	1.11		1.49	0.84																100	60
23	20	Qz	100.00																										100	122
23	21	Mix	61.80	1.45	25.63	2.54		1.34	0.85	2.18	4.22																		100	94
24	1	Tr	58.38		2.30	0.50		24.11	12.61	0.62	0.34			1.14															100	118
24	2	Fl +	0.69			3.86	0.41	0.62	57.58	0.39				36.45															100	90
24	3	Sd +	3.49		2.24	36.96	0.40	7.64	4.83		0.27										0.17								56	63
24	4	Fl							47.35					52.47							0.18								100	169
24	5	Sd + Chl	2.24		1.21	75.98	0.65	11.08	7.90			0.93																	100	61
24	6	Feohy	0.70			95.37															0.45	3.48							100	89

Table 3A.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6415 depth.

Site	Position	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	Cl	V2O5	Cr2O3	CoO	NiO	CuO	ZnO	As2O3	SrO	Sb2O3	BaO	Yb2O3	WO3	PbO	Total	Actual Total
24	7	Feohy	1.90		0.62	97.20															0.28								100	88
24	8	Qz	100.00																										100	121
24	9	Mix	22.21		14.41	51.21	0.60	5.48	4.14		1.87										0.08								100	72
24	10	Cal						0.70	42.67					12.63															56	77
24	11	Qz	100.00																										100	125
24	12	Mnohy (Mn + Ba)					76.06														0.53				23.40				100	85
24	13	Feohy +	5.08			89.11	4.26		1.03												0.52								100	78
24	14	Qz	100.00																										100	119
24	15	Sd + Qz	10.28	0.41	3.64	65.23	0.77	11.58	6.98	0.70	0.41																		100	68
24	16	Qz	99.74			0.26																							100	117
24	17	Feohy + Qz	16.56		4.29	77.66			0.37		0.98										0.13								100	91
24	18	Feohy +	3.13		1.76	90.69			1.61								1.94			0.52	0.35								100	85
24	19	Brt											35.98								0.75				63.28				100	116
25	1	Cal				0.63	0.22	0.57	45.34					8.82	0.41														56	68
25	2	Qz	100.00																										100	120
25	3	Feohy (Cont) +	0.97			93.39			2.83												0.60						2.21		100	68
25	4	Feohy (Cont) +				96.09			0.64																		3.26		100	71
25	5	Feohy (Cont) +	0.87			96.86			1.72						0.28						0.27								100	78
25	6	Qz	100.00																										100	119
25	7	Qz	99.44		0.56																								100	121
25	8	Feohy +	7.01			91.29	0.85		0.37												0.48								100	84
25	9	Qz	99.80																		0.20								100	124
25	10	Qz	100.00																										100	120
25	11	Qz	99.60			0.40																							100	121
25	12	Sd +	2.23		0.84	39.74	0.49	4.47	6.94	0.35		0.56									0.38								56	62
25	13	Smithsonite							0.89												99.11								100	59
25	14	Tr	60.93		0.59	0.58		24.71	13.19																				100	115
25	15	Mix	68.49	0.22	11.38	2.66		1.54	9.05	0.48	1.28			4.89															100	103
25	16	Strontianite							5.43					1.76									89.78		3.03				100	78
25	17	Sd + Chl	5.24		2.82	68.80	0.82	11.21	10.25		0.42										0.44								100	60
25	18	Qz	100.00																										100	117
25	19	Sd	0.80		0.39	40.85	0.44	8.63	4.64												0.25								56	62
25.2	1	Py	0.12			27.85				0.15			71.61								0.26								100	227
25.2	2	Cal +	2.03		1.06	4.01	0.21	0.67	36.84				6.68	4.51															56	76
25.2	3	Mix	61.73	1.03	22.42	3.13		1.11	0.56	5.04	3.55		1.42																100	107
25.2	4	Illite	47.54	0.86	22.20	5.25		1.89	6.87		3.49		1.58								0.32								90	86
25.2	5	Py	0.37		0.19	27.98							71.17								0.28								100	220
26	1	Tr	60.21		0.52	0.35		24.84	12.61		0.16			0.80							0.51								100	116
26	2	Sd +	0.81		0.50	41.53	0.38	4.78	5.75			1.65									0.62								56	65
26	3	Sd + Chl	5.38		3.22	67.37	0.60	7.51	12.87		0.35	1.87									0.83								100	66
26	4	Cal					0.81	0.35	45.92					8.62							0.30								56	68
26	5	Qz	99.59																		0.41								100	122
26	6	Feohy +	3.35			90.22															2.03							4.40	100	91
26	7	Sd + Chl	9.83		6.78	64.68	0.64	10.61	5.11		0.72	1.02									0.61								100	68
26	8	Sd +	3.62			41.98	1.16	6.63	2.22												0.39								56	64
26	9	Qz	99.62																		0.38								100	118
26	10	Sd +	5.34	0.26	3.93	27.33	0.26	2.92	9.60	1.00	0.25	5.11																	56	68
26	11	Feohy +	5.58			85.34	4.37	2.92	0.63												1.15								100	79
26	12	Qz	99.52																		0.48								100	122
26	13	Qz	99.62																		0.38								100	123
26	14	Mix	20.00		20.34	54.81		0.83	1.25		2.10										0.67								100	90
26	15	Mix	36.55	0.70	14.85	4.58		1.87	32.87	0.73	1.95		0.90	4.22	0.24						0.54								100	83
26	16	Brt											36.47					0.04			0.89				62.60				100	116

Table 3A.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6415 depth.

Site	Position	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	Cl	V2O5	Cr2O3	CoO	NiO	CuO	ZnO	As2O3	SrO	Sb2O3	BaO	Yb2O3	WO3	PbO	Total	Actual Total
26	17	Brt											36.48					0.04			1.04				62.43				100	115
*Strontianite inclusion found in a grain of Barite and as an independent grain (site 25).																														
9.1: The sites were too small to aquire analyses without excesive mixing, therefore are unreliable.																														
Mnohy refers to the compostion of what is thought to be Contaminants.																														
(Cont)=Contaminant; hematite (elongated streaky appearance) that was used to increase the density of the drilling mud.																														

Table 3A.2: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6415 depth.

Site	Position	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	Cl	Cr2O3	CoO	NiO	ZnO	As2O3	SrO	BaO	WO3	Total	Actual Total
1.1	1	Qz	98.89			0.98					0.13												100	122
1.1	2	Qz +	94.7		1.22	3.22		0.32	0.23		0.31												100	118
1.1	3	Qz +	89.46		5.631	1.29			0.4	1.08	0.82		0.49	0.83									100	112
1.1	4	Ilt	53.02	1.31	18.88	7.021		1.836	1.224	0.909	3.18		0.558	0.5								1.57	90	89
1.1	5	Sd +	17.42		7.15	59.21	0.72	7.94	5.45	0.61	0.62	0.88											100	72
1.1	6	Sd + Chl	5.03		3.42	73.21	0.91	10.44	6.17			0.82											100	65
1.1	7	Sd + Chl	2.73		1.53	73.24	0.83	11.85	8.66			1.16											100	63
1.1	8	Sd + Chl	2.51		1.43	75.76	0.88	11.95	6.341		0.27	0.86											100	64
1.1	9	Brt +	0.86			5.371		0.71	0.74				34.21			-0.07				2.44	55.74		100	109
1.1	10	Sd	0.745			42.63	0.6	7.415	3.859				0.75										56	61
1.1	11	Py	0.73		0.55	28.44		0.23	0.18	0.23			69.32				0.32						100	219
1.2	1	Feohy +	2.69		0.68	96.23	0.4																100	78
1.2	2	Brt			0.5	1.04			0.37				36.11			-0.01					59.46	2.53	100	105
1.2	3	Brt	1.07		0.66	0.97			0.33				34.94								62.03		100	104
1.2	4	Feohy +	2.82			95.46															1.72		100	77
1.2	5	Feohy +	2.52		0.92	96.15	0.41																100	78
23.1	1	Hem (Cont)	1.57			94.55									3.45			0.43					100	95
23.1	2	Hem (Cont)				97.75	0.49		1.4					0.36									100	75
23.1	3	Hem (Cont)	1.13			95.24			1.68				0.75		0.95			0.25					100	89
23.1	4	Sd +				49.59	0.47		5.186				0.75										56	78
23.1	5	Hem (Cont)	1.6			94.95			1.98					0.42	0.72			0.33					100	88
23.2	1	Ab	69.01		18.63	1.03				11.33													100	119
23.2	2	Plag (And)	54.64		28.24	3.33			8.3	5.34	0.15												100	114
23.2	3	Sd + Qz	12.04		7.04	61.44	0.6	9.21	7.61	0.92		1.14											100	68
23.2	4	Sd +	2.044		1.008	42.17	0.43	5.706	3.472		0.21	0.963											56	63
23.2	5	Sd +	1.047		0.65	42.52	0.52	6.053	4.261			0.829						0.13					56	62
23.2	6	Sd +	1.551		0.806	41.69	0.39	5.689	4.642			1.125						0.1					56	62
23.2	7	Sd +	1.73		0.991	40.86	0.43	5.068	5.841	0.431		0.644											56	64
23.3	1	Feohy (Cont) + Cr +	6.471		1.24	62.98	2.11		5.631				3.05		16.59		0.45				1.48		100	82
23.3	2	Qz +	97.27		1.4	0.53		0.32			0.26							0.22					100	112
23.3	3	Qz	99.1			0.63												0.27					100	120
23.3	4	Feohy				96.34	0.88		1.36									0.42			1		100	76
23.3	5	Feohy (Cont) + Cr +	8.34		1.15	61.14	2.54		3.67				2.9		19.96			0.3					100	79
23.3	6	Brt				0.89							35.79			-0.03					63.35		100	115
23.3	7	Feohy	3.06		0.94	90.08	0.8		1.08				1.34					0.18			2.52		100	78
23.3	8	Feohy (Cont) + Cr +	8.858		0.93	69.31	1.53		2.35				2.44		14.27			0.32					100	82
25.1	1	Feohy				99.17			0.43									0.4					100	72
25.1	2	Feohy				99.54			0.46														100	74
25.1	3	Feohy	0.68			97.99			0.54					0.26				0.53					100	89
25.1	4	Feohy				99.19			0.47									0.34					100	89
25.1	5	Feohy +	2.12			94.68	0.54		1.62				0.71					0.33					100	80
25.1	6	Feohy				98.87	0.45		0.35									0.33					100	90
25.2	1	Qz	99.02			0.98																	100	122

Table 3A.2: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6415 depth.

Site	Position	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	Cl	Cr2O3	CoO	NiO	ZnO	As2O3	SrO	BaO	WO3	Total	Actual Total
25.2	2	Sd +	3.657		2.167	40.71	0.33	5.108	3.736		0.29												56	66
25.2	3	Sd +	0.778		0.381	43.68	0.34	6.188	4.138			0.498											56	62
25.2	4	Qz	99.25			0.75																	100	123
25.2	5	Py	0.26			29.87		0.45	0.67				68.46						0.29				100	213
		Cont=Contaminant: hematite (elongated streaky appearance) that was used to increase the density of the drilling mud																						

Table 3A.3: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6415 depth.

Site	Position	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	Cl	Total	Actual Total
6.2	Fig. 52, 1	Sdl	37.45		28.28	1.23				24.25	0.44		0.53	0.78	7.04	100	145
6.2	Fig. 52, 2	Sdl	37.04		27.88	1.31			0.23	23.97	0.37		0.51	1.89	6.79	100	146
6.2	Fig. 52, 3	Aug	53.69	0.56	0.64	15.56	1.13	7.38	17.63	3.41						100	139
6.2	Fig. 52, 4	Sdl	37.80		27.60	1.87			0.38	23.55			0.35	1.69	6.77	100	141
6.2	Fig. 52, 5	Nph	48.64		29.62	1.74				16.76	3.24					100	139
6.2	Fig. 52, 6	Nph	47.42		27.44	3.40			1.29	17.16	3.28					100	143
6.2	Fig. 52, 7	Agt*	54.86	0.94	0.53	22.94	0.92	2.21	8.79	8.80						100	136
6.2	Fig. 52, 8	Aug	53.22	0.71	1.10	15.72	1.18	7.15	17.53	3.40						100	137
6.2	Fig. 52, 9	Kfs	66.68		17.52	1.21			0.55	4.87	9.17					100	141
6.2	Fig. 52, 10	Sdl	37.72		25.91	1.82			1.38	23.03	0.14	0.66	0.56	2.56	6.22	100	146

*Agt: Aegirine-augite

Appendix 3B: SEM-BSE images and EDS mineral analyses for sample F-81 6425

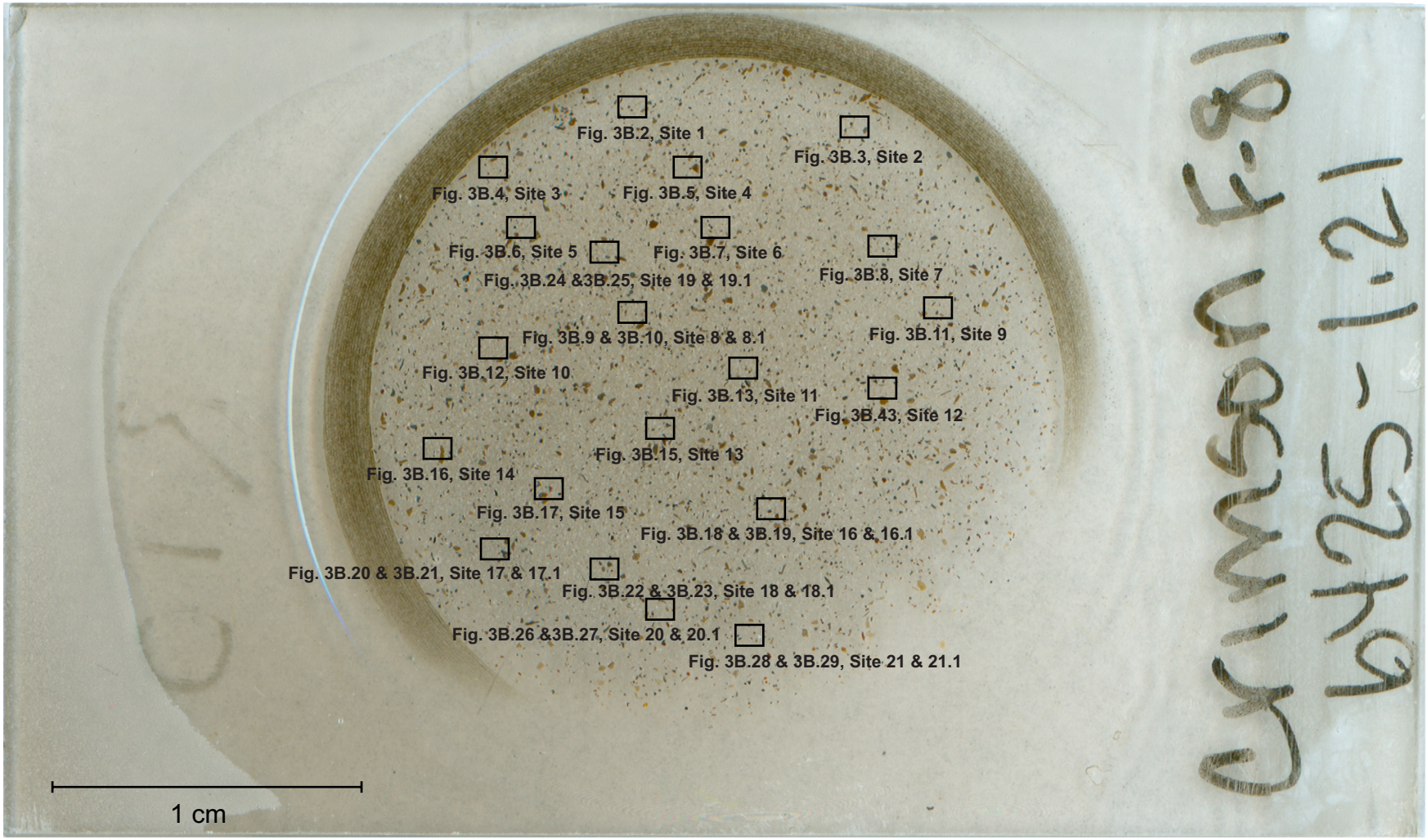
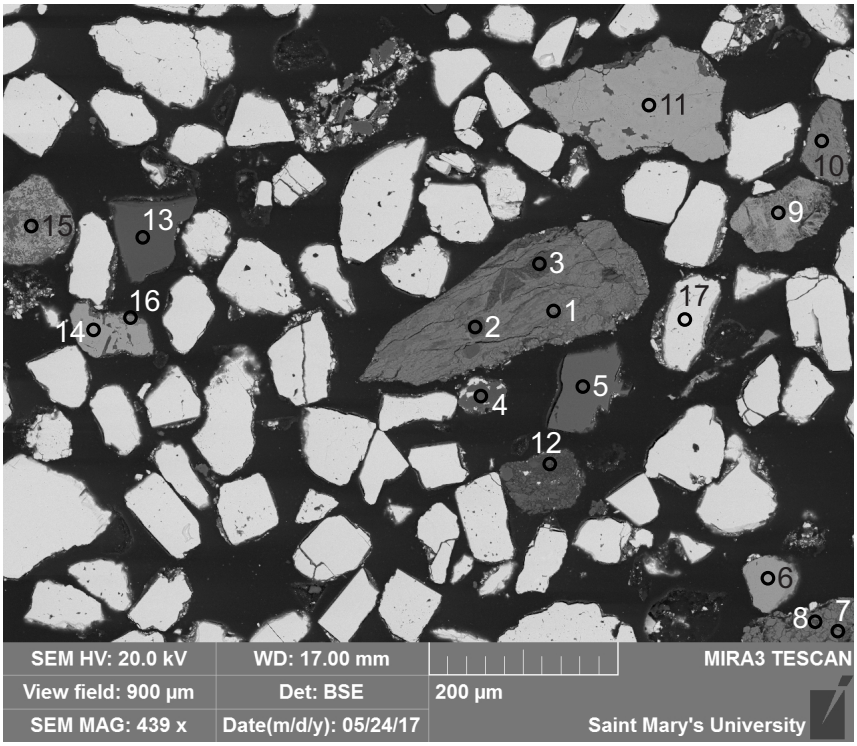
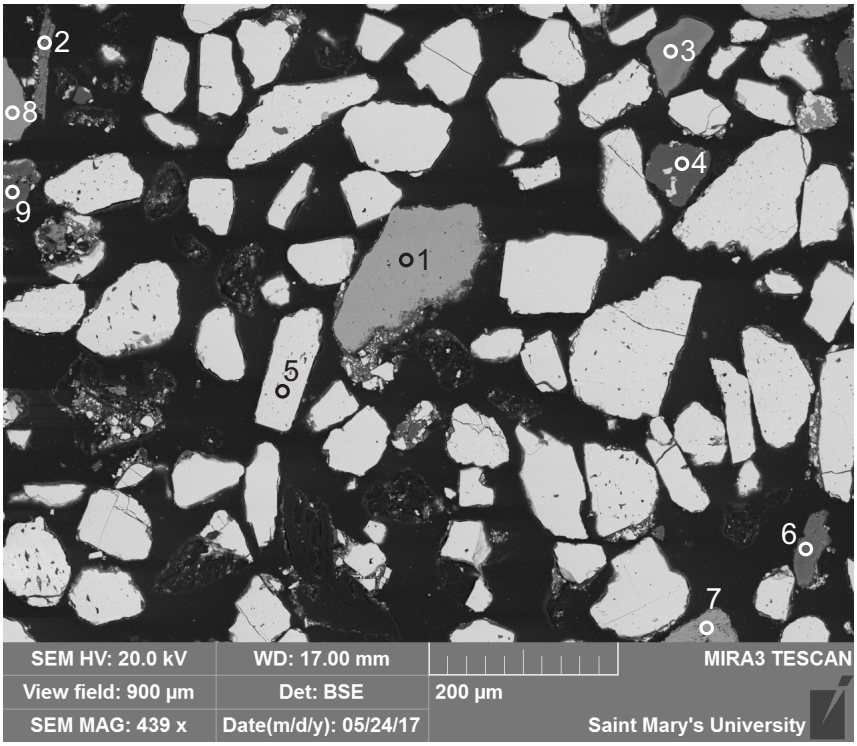


Figure 3B.1: Scanned thin section of sample F-81 6425 showing the location of analysed sites.



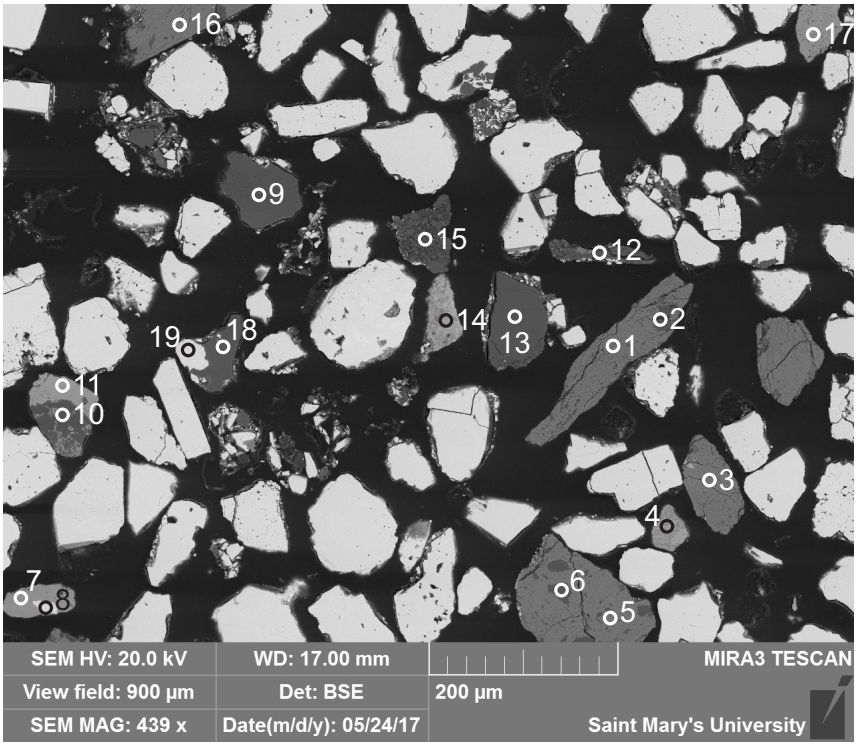
1: Siderite + Apatite +
2: Quartz
3: Quartz
4: Quartz +
5: Clinopyroxene (Diopside)
6: Feohy
7: Mix
8: Siderite + Chlorite
9: Feohy +
10: Chlorite +
11: Pyrite
12: Quartz +
13: Quartz
14: Feohy
15: Feohy + Quartz
16: TiO2 +
17: Barite

Figure 3B.2: Crimson F-81 6425m site 1. Siderite-apatite cemented mudstone.



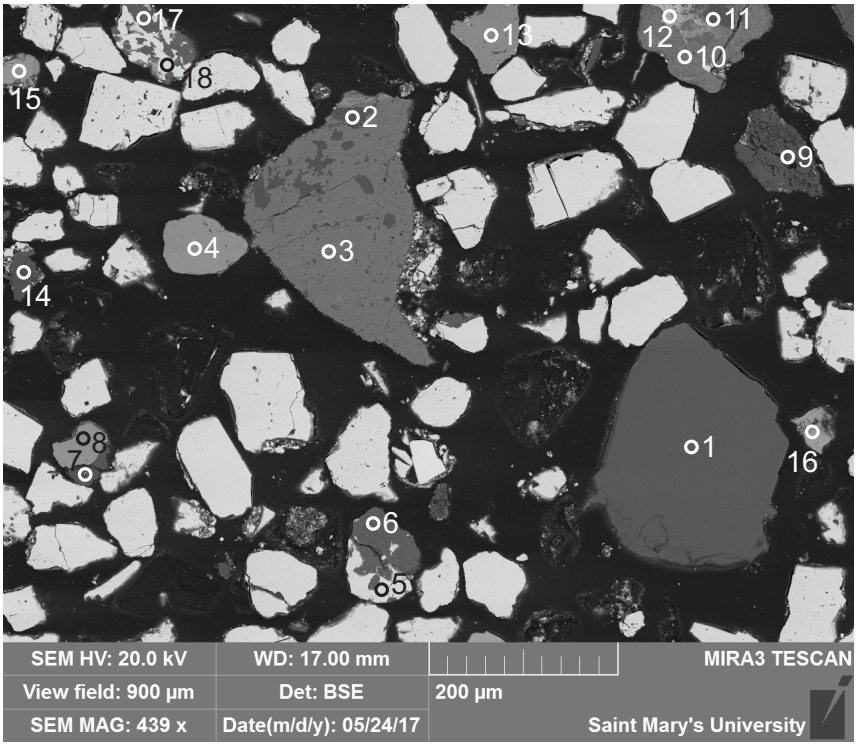
1: Pyrite
2: Feohy + Apatite +
3: Fluorite
4: Quartz
5: Barite
6: K-feldspar
7: Magnetite
8: Feohy +
9: Quartz

Figure 3B.3: Crimson F-81 6425m site 2. Magnetite (7) appears to be fibrous and may be a contaminant.



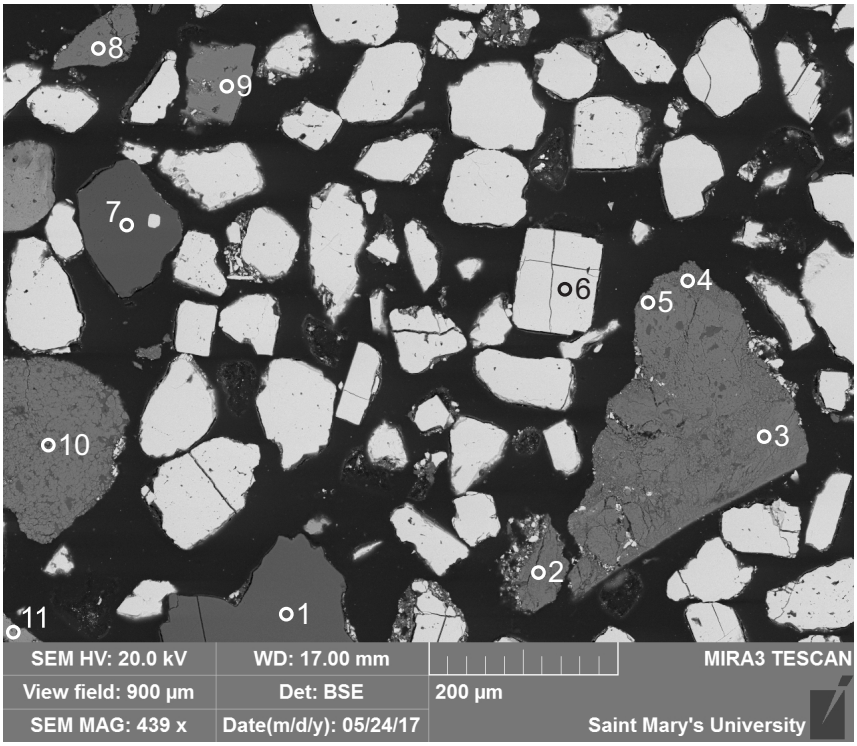
1: Siderite +
2: Quartz
3: Siderite + Apatite +
4: Feohy +
5: Siderite +
6: Quartz
7: Feohy +
8: Barite
9: Quartz +
10: Quartz
11: Feohy +
12: Illite +
13: Quartz
14: Mnohy (Mn + Al)
15: Quartz + Chlorite
16: Siderite + Chlorite
17: Feohy
18: Quartz
19: Barite

Figure 3B.4: Crimson F-81 6425m site 3. Mn-cemented mudstone cutting (14).



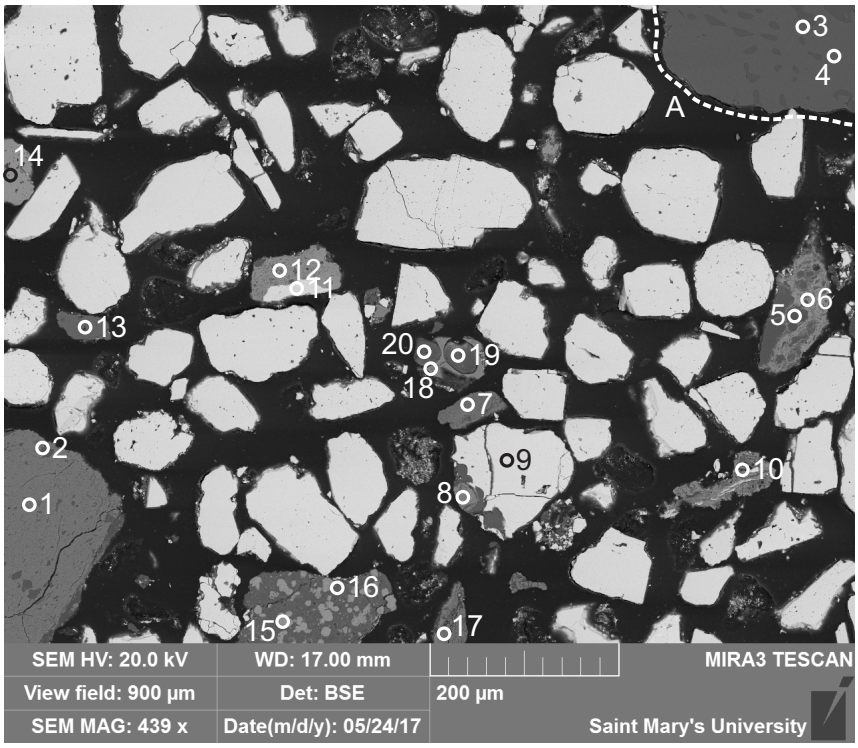
1: Tremolite
2: Quartz
3: Siderite +
4: Feohy
5: Barite
6: Quartz +
7: Quartz
8: Ilmenite
9: Chlorite + (Fig. 34)
10: Mnohy (Mn + Al)
11: Muscovite
12: Mnohy (Mn + Al)
13: Feohy +
14: Quartz
15: Feohy +
16: Feohy +
17: K-feldspar
18: Barite

Figure 3B.5: Crimson F-81 6425m site 4. Mn-cemented mudstone (10-12). Mudstone cutting made up of quartz and chlorite (9, Fig. 3B.34). Cutting made up of quartz and illite (6) cut by barite (5).



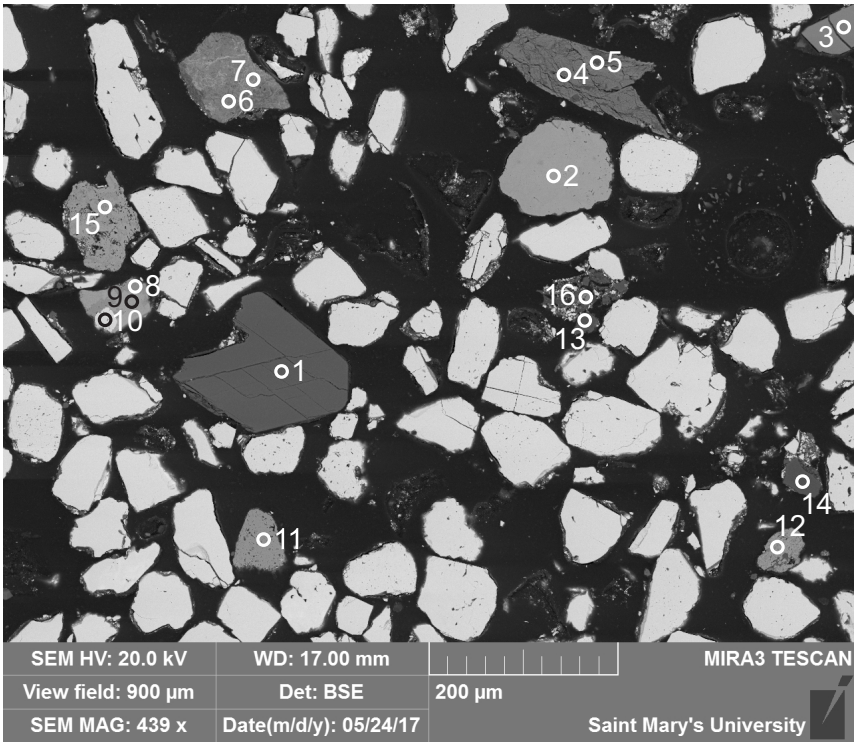
1: Tremolite
2: Siderite +
3: Siderite +
4: Siderite +
5: Quartz
6: Barite
7: Quartz
8: Siderite
9: Siderite
10: Siderite + Chlorite
11: Feohy +

Figure 3B.6: Crimson F-81 6425m site 5. Cuttings made up of siderite (3-5,10) and chlorite (10). Tremolite (1) is likely a contaminant.



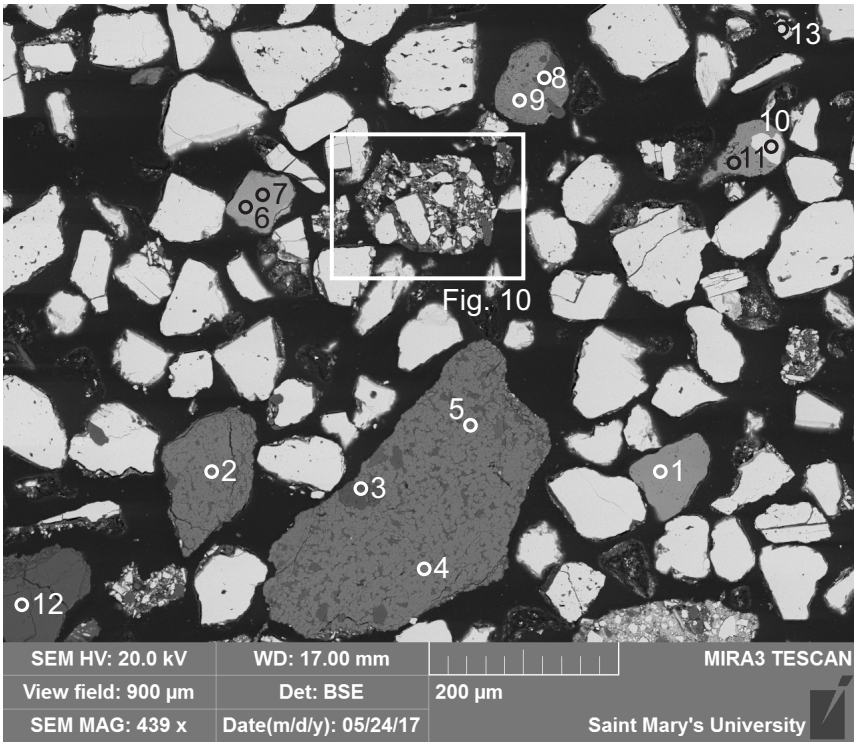
1: Siderite +
2: Albite
3: Quartz
4: Tremolite
5: Quartz
6: Chlorite
7: Siderite + Chlorite
8: Siderite
9: Barite
10: Feohy + Barite +
11: Barite
12: Feohy +
13: Calcite
14: Feohy +
15: Feohy +
16: Muscovite
17: Siderite +
18: Mix
19: Quartz +
20: Quartz +

Figure 3B.7: Crimson F-81 6425m site 6. A lithic clast made up of quartz (3) and tremolite (4) is likely a drilling contaminant. A cutting made up of quartz (19,20) cemented by probably ankerite (18).



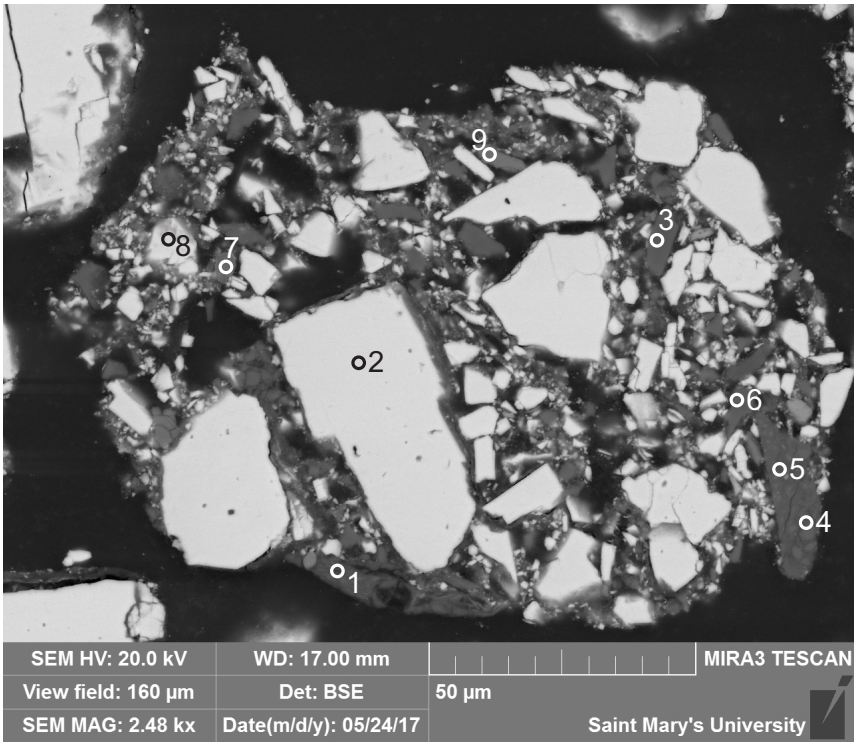
1: Tremolite
2: Pyrite
3: Fluorite
4: Siderite + (Fig. 38)
5: Illite? (Fig. 38)
6: Mix
7: Mnohy (Fe + Mn)
8: Feohy +
9: Mnohy (Mn + Ba)
10: Barite +
11: Feohy +
12: Feohy +
13: Quartz
14: Quartz
15: Feohy +
16: Mix

Figure 3B.8: Crimson F-81 6425m site 7. A cutting of drilling mud made up of Feohy (8), Mnohy (9), and barite (10). Fluorite (3) appears to have sharp crystal outlines and is likely diagenetic.



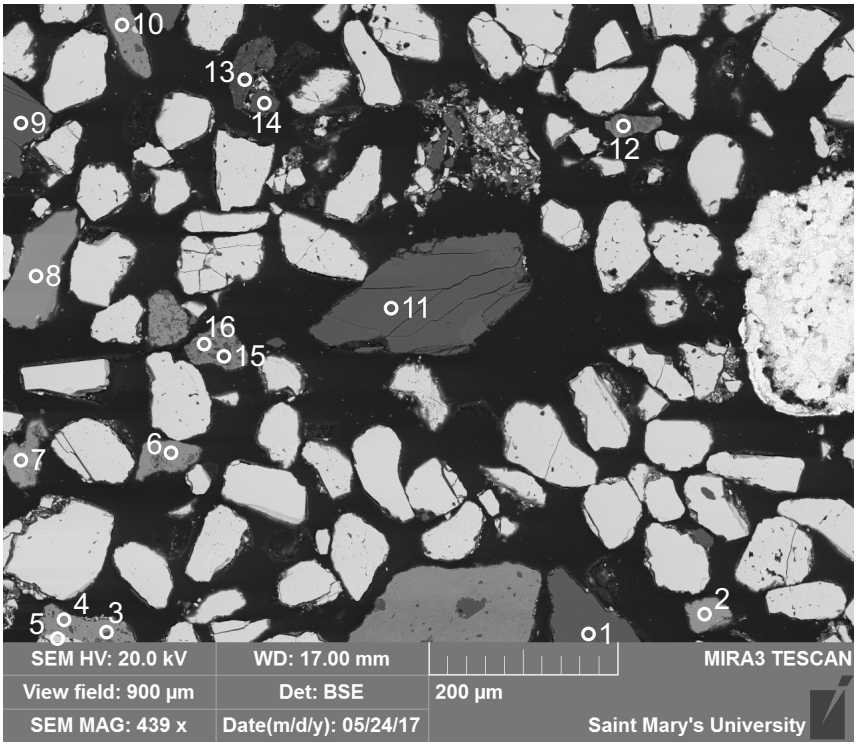
1: Feohy +
2: Siderite +
3: Quartz
4: Siderite + Chlorite +
5: Siderite +
6: Feohy +
7: Feohy +
8: Quartz
9: Chlorite +
10: Barite
11: Bad analysis
12: Quartz +
13: Barite

Figure 3B.9: Crimson F-81 6425m site 8. A cutting of quartz (8) and diagenetic chlorite (9).



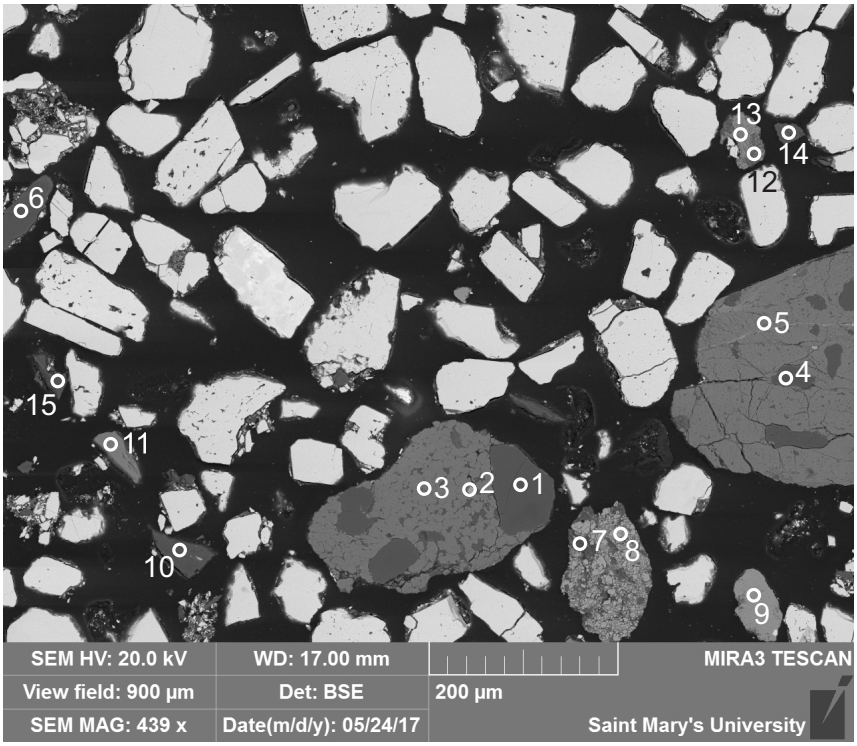
1: Hole
2: Barite
3: Quartz
4: Mix
5: Mix
6: Quartz
7: Mix
8: Barite +
9: Siderite +

Figure 3B.10: Crimson F-81 6425m site 8.1. A cutting of drill mud made up of barite (2), quartz (3,6), and siderite (9).



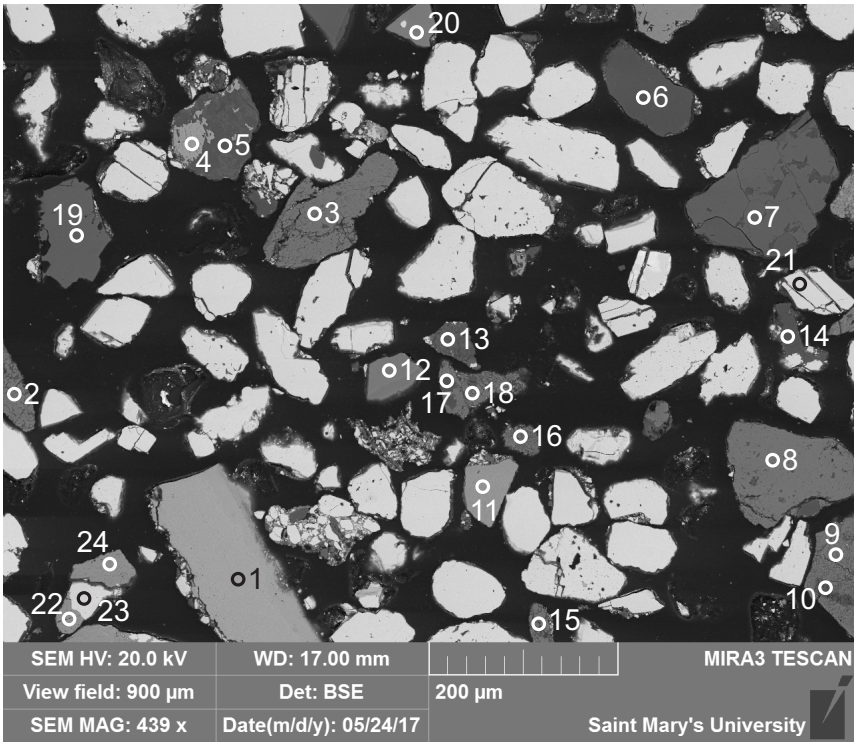
1: Tremolite
2: Feohy +
3: Quartz
4: Feohy +
5: Barite
6: Feohy +
7: Mnohy (Fe + Mn)
8: Feohy +
9: Tremolite
10: Feohy +
11: Tremolite
12: Biotite
13: Albite
14: Quartz
15: Quartz
16: Feohy +

Figure 3B.11: Crimson F-81 6425m site 9. Mn-cemented mudstone (7). Cuttings made up of quartz (3), Feohy (4,16), and barite (5) in which Feohy and barite appear to be diagenetic.



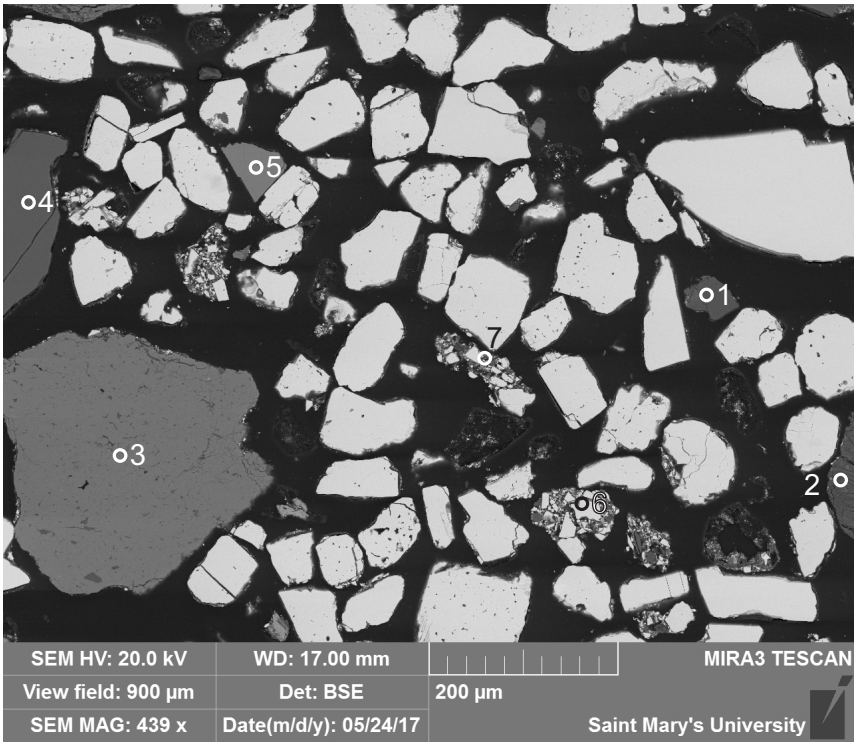
1: Quartz
2: Pyrite
3: Siderite
4: Quartz
5: Siderite +
6: Quartz
7: Muscovite +
8: Pyrite
9: Feohy +
10: Quartz
11: Fluorite
12: Muscovite + Chlorite
13: Chlorite
14: Chlorite + (Fig. 36)
15: Quartz

Figure 3B.12: Crimson F-81 6425m site 10. Cuttings made up of quartz (1,4), pyrite (2), and siderite cemented mudstone (3,5). Fluorite (11) has an apparent fibrous habit and is likely diagenetic.



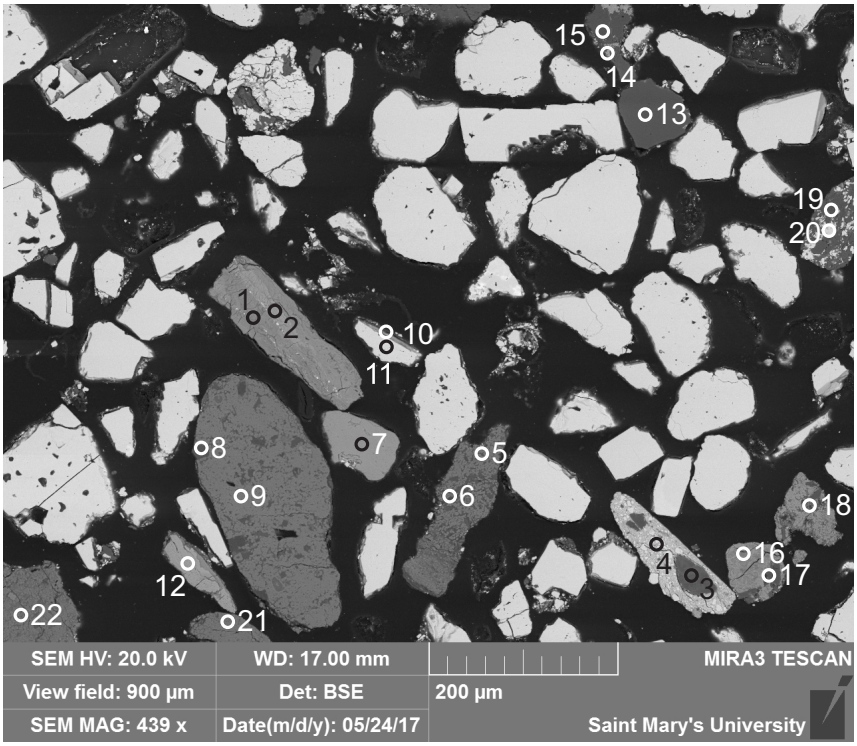
1: Feohy
2: Siderite +
3: Chlorite + Siderite
4: Feohy +
5: Quartz
6: Quartz
7: Calcite
8: Siderite
9: Siderite +
10: Quartz
11: Feohy +
12: Fluorite
13: K-feldspar
14: Quartz
15: Siderite +
16: Siderite +
17: Quartz
18: Siderite +
19: Calcite
20: Fluorite
21: Barite
22: Feohy +
23: Barite
24: Feohy +

Figure 3B.13: Crimson F-81 6425m site 11. A cutting made up of quartz (5) and Feohy (4) in which Feohy appears to be diagenetic.



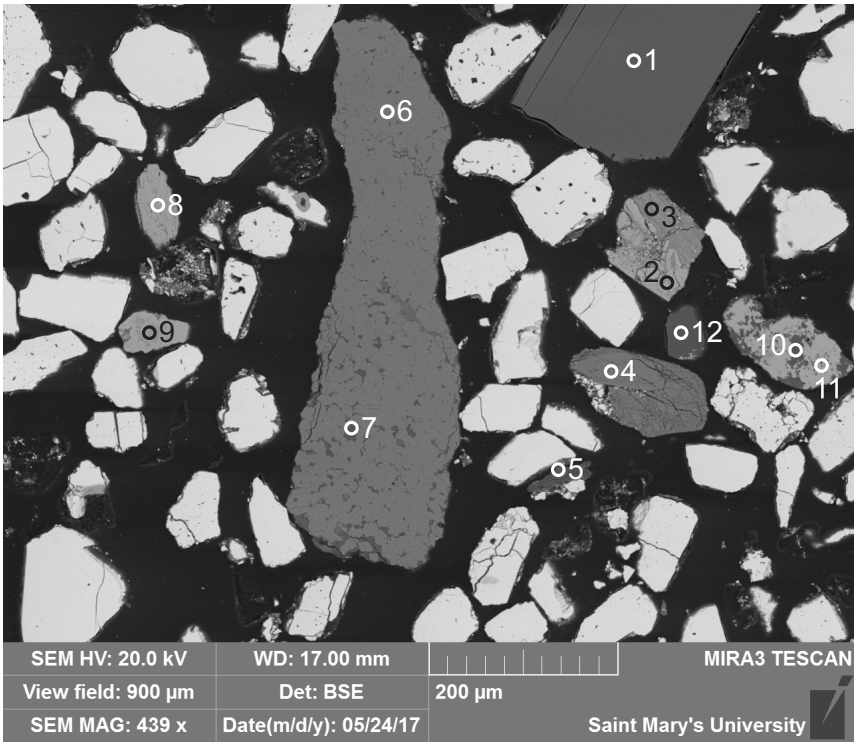
1: Quartz
2: Illite (Fig. 32)
3: Siderite
4: Tremolite
5: Siderite
6: Barite
7: Barite +

Figure 3B.14: Crimson F-81 6425m site 12.



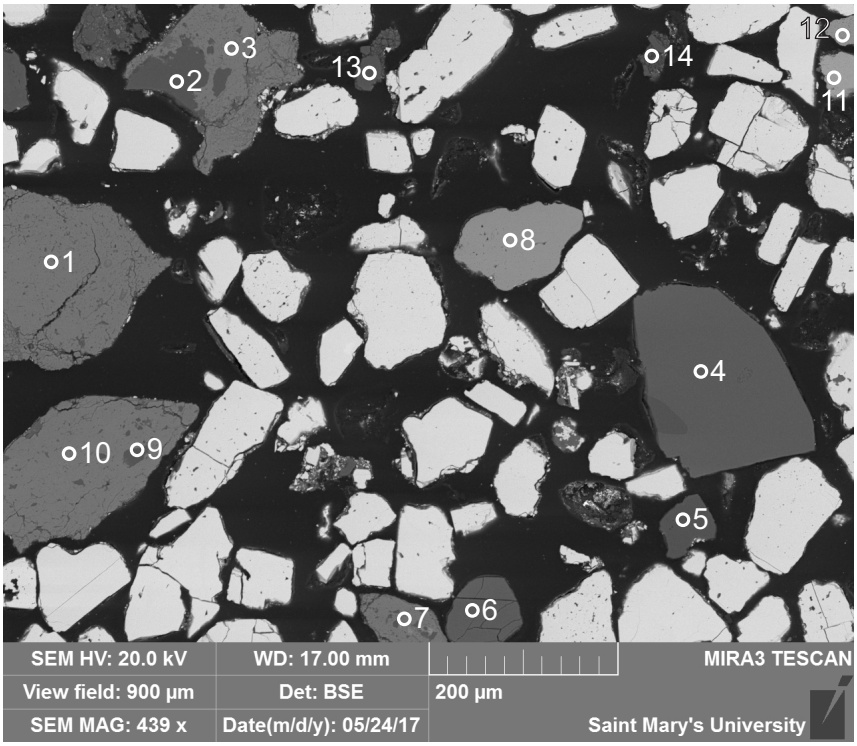
1: Feohy +
2: Feohy
3: Quartz +
4: Barite
5: Chlorite + Siderite +
6: Muscovite + Chlorite
7: Feohy +
8: Quartz
9: Siderite +
10: Barite
11: Barite
12: Feohy +
13: Quartz
14: Mix
15: Quartz
16: Feohy +
17: Quartz
18: Feohy +
19: Muscovite
20: Muscovite + Barite
21: Siderite + Chlorite +
22: Siderite +

Figure 3B.15: Crimson F-81 6425m site 13. Feohy (1,2) appears to be a contaminant. Chlorite (5,6) and siderite (5) cemented mudstone containing muscovite (6).



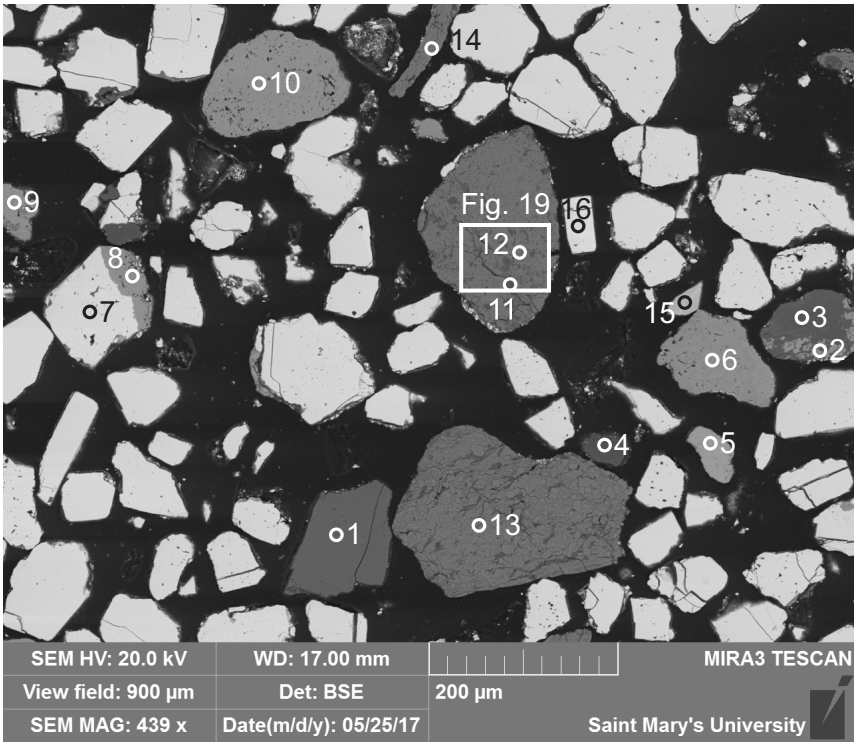
1: Tremolite
2: Feohy
3: Feohy +
4: Siderite +
5: Quartz
6: Siderite +
7: Quartz
8: Feohy +
9: Mnohy (Mn + Fe)
10: Quartz
11: Psilomelane?
12: Quartz

Figure 3B.16: Crimson F-81 6425m site 14. Mn-cmented mudstone (6,7).



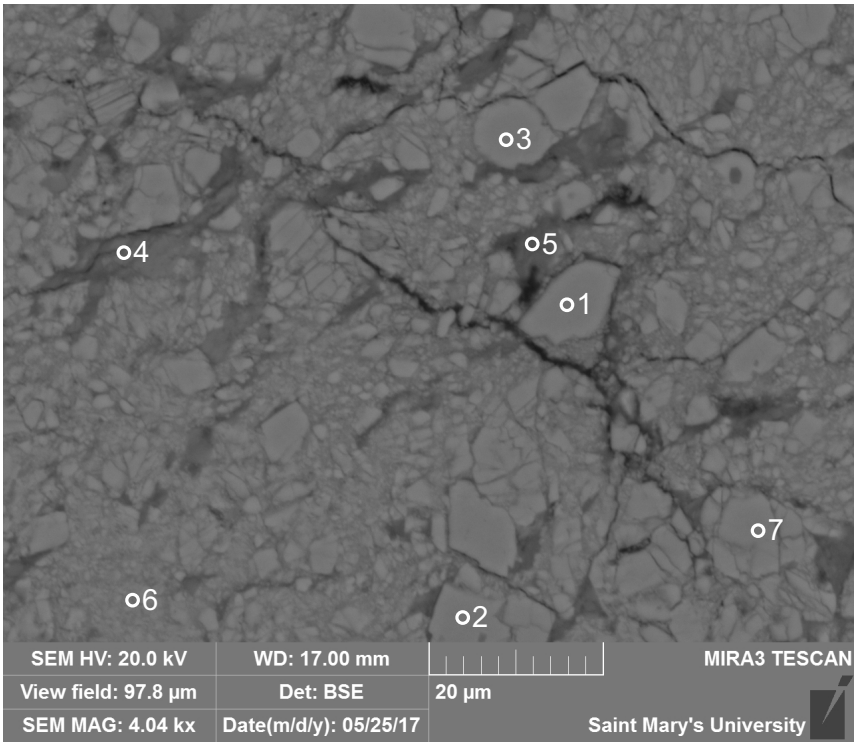
1: Siderite +
2: Quartz
3: Siderite + Calcite
4: Tremolite
5: Quartz
6: Tremolite
7: Siderite + Pyrite
8: Feohy +
9: Albite
10: Siderite +
11: Feohy
12: Feohy +
13: Albite
14: Quartz

Figure 3B.17: Crimson F-81 6425m site 15.



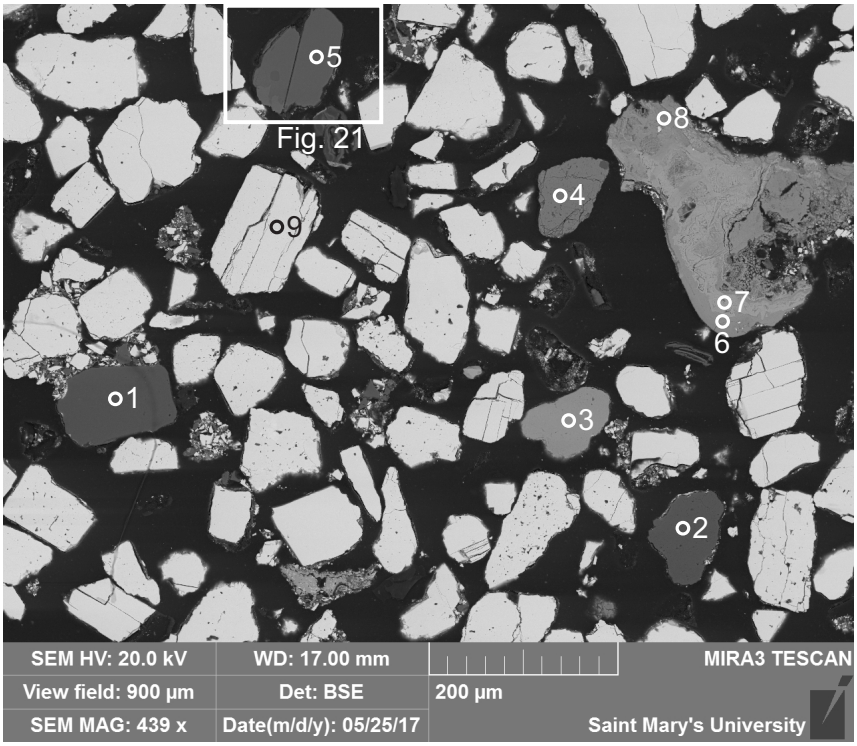
1: Clinopyroxene (Diopside)
2: Chlorite +
3: Muscovite
4: Quartz
5: Feohy
6: Feohy +
7: Barite
8: Feohy +
9: Feohy +
10: Feohy +
11: Muscovite
12: Chlorite + Siderite
13: Siderite +
14: Siderite +
15: Pyrite
16: Barite

Figure 3B.18: Crimson F-81 6425m site 16. A cutting made up of muscovite (3) and chlorite (2) in which muscovite appears to be altering to chlorite.



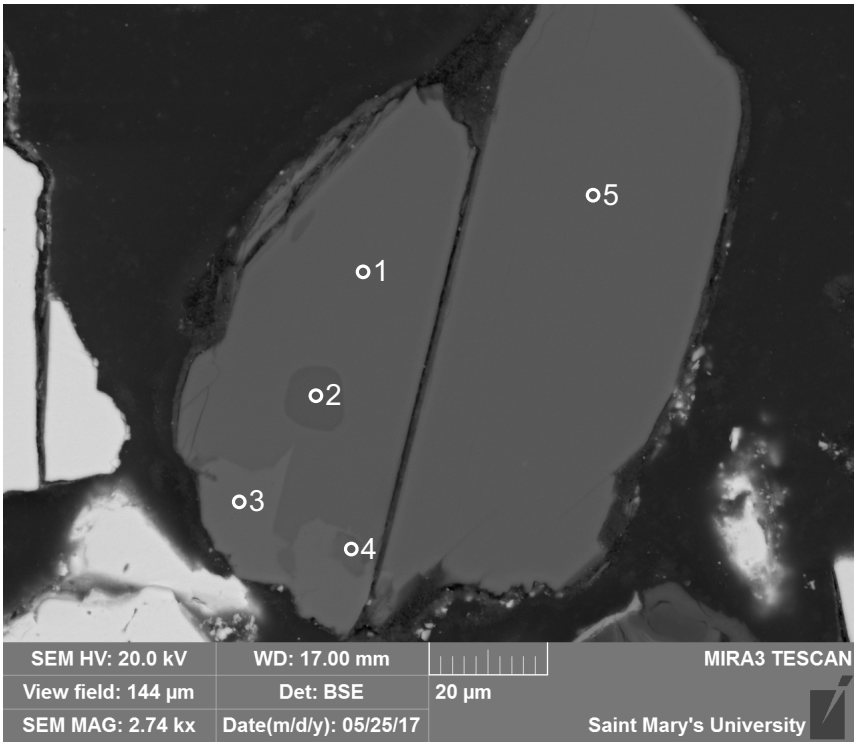
1: Siderite
2: Siderite
3: Siderite
4: ?Garnet
5: Mix
6: Siderite
7: Siderite

Figure 3B.19: Crimson F-81 6425m site 16.1. Cutting of siderite nodule.



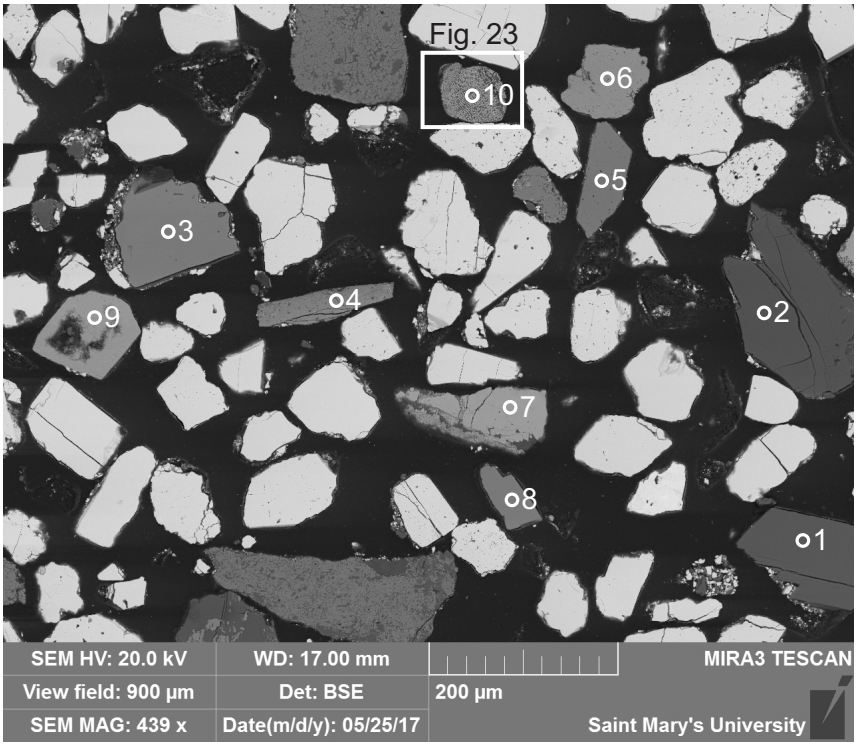
1: Quartz
2: Dolomite
3: Feohy +
4: Siderite +
5: Tremolite
6: Feohy
7: Feohy
8: Feohy
9: Barite

Figure 3B.20: Crimson F-81 6425m site 17. A fragment of drilling contaminant made up of Feohy (6-8).



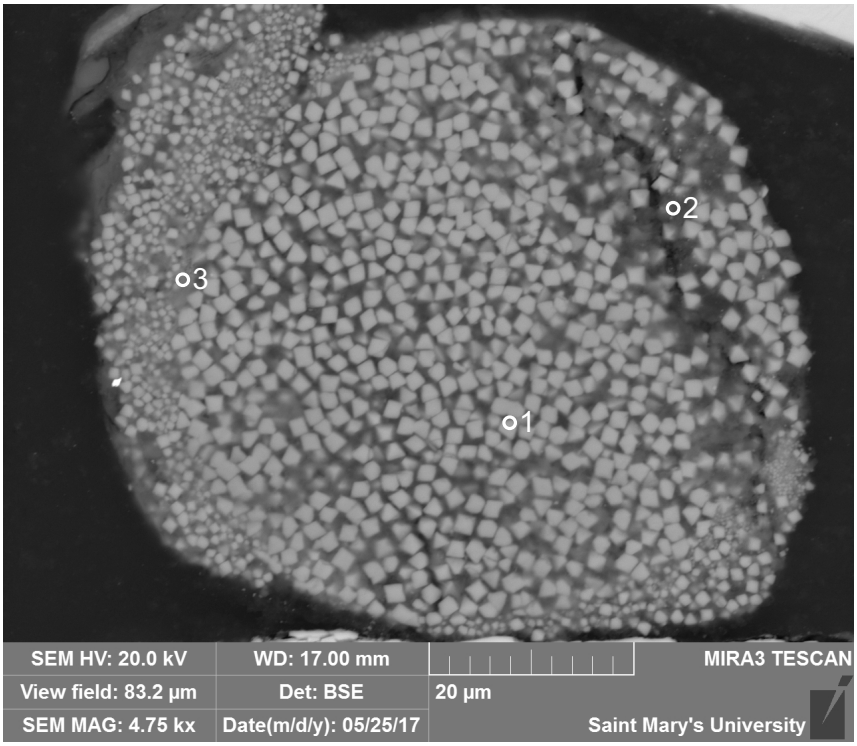
1: Tremolite
2: Quartz
3: Clinopyroxene (Diopside)
4: Tremolite
5: Tremolite

Figure 3B.21: Crimson F-81 6425m site 17.1. A lithic clast made up of tremolite (1,4,5), diopside (3), and quartz (2). Likely a contaminant.



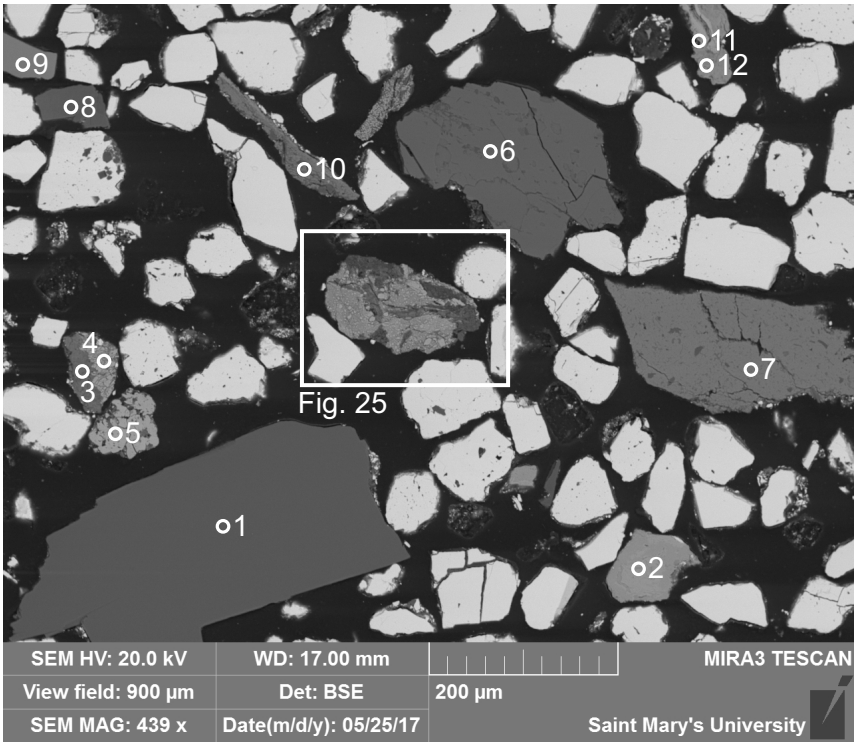
1: Tremolite
2: Quartz
3: Fluorite
4: Mix
5: Siderite
6: Feohy +
7: Pyrite
8: Fluorite
9: Feohy +
10: Pyrite +

Figure 3B.22: Crimson F-81 6425m site 18. Fluorite (3) appears to be diagenetic.



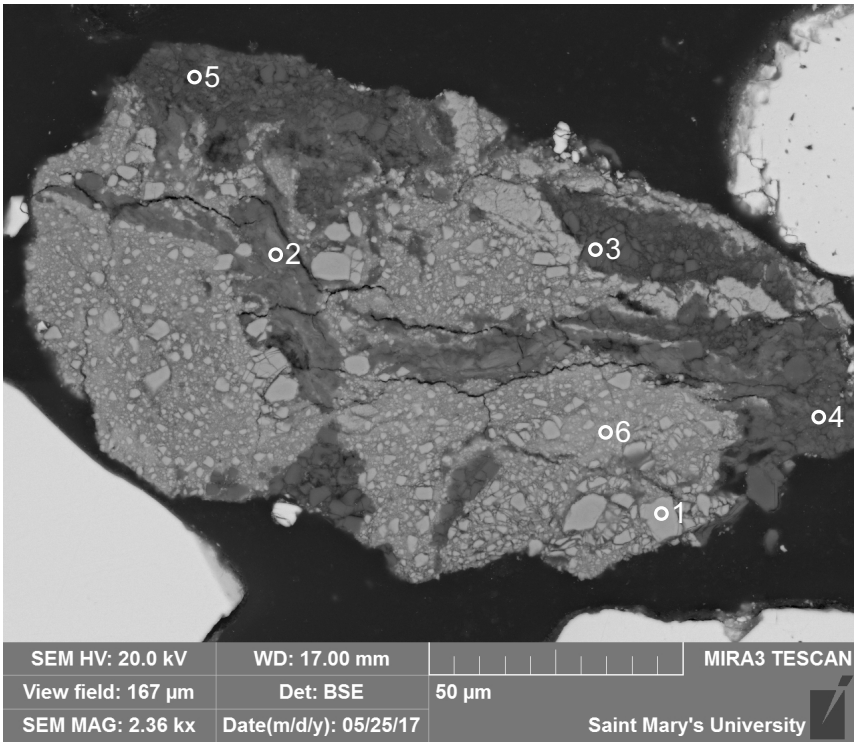
1: Pyrite
2: Pyrite
3: Pyrite

Figure 3B.23: Crimson F-81 6425m site 18.1. Pyrite framboid.



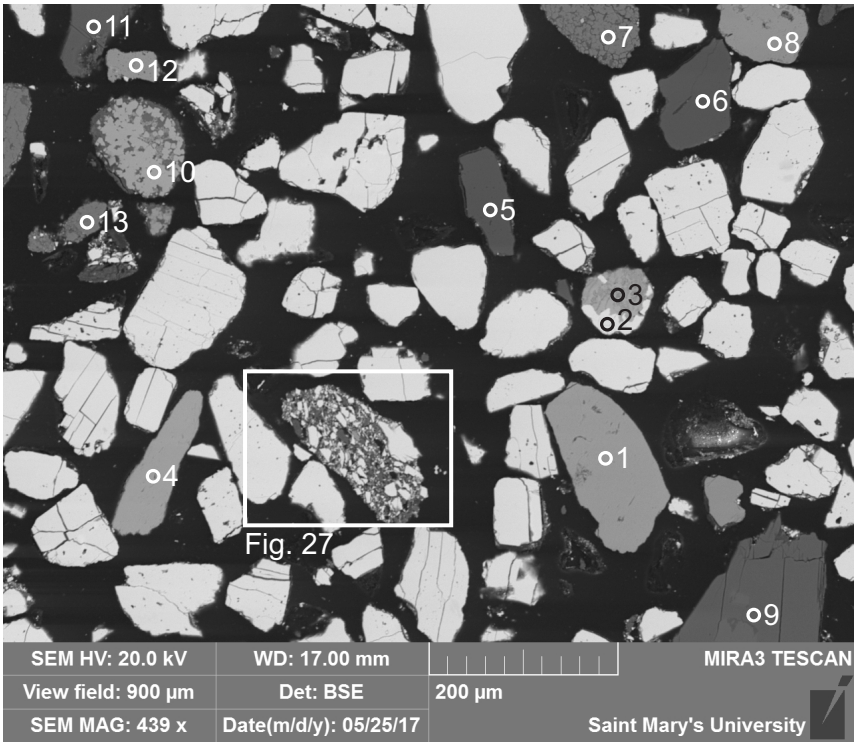
1: Tremolite
2: Feohy +
3: Chlorite + Siderite (Fig. 30)
4: Pyrite (Fig. 30)
5: Pyrite
6: Clinopyroxene (Diopside)
7: Siderite +
8: Tourmaline
9: Fluorite
10: Siderite +
11: Feohy +
12: Feohy +

Figure 3B.24: Crimson F-81 6425m site 19. A fragment of chlorite (3) and siderite (3) cemented mudstone and pyrite (4).



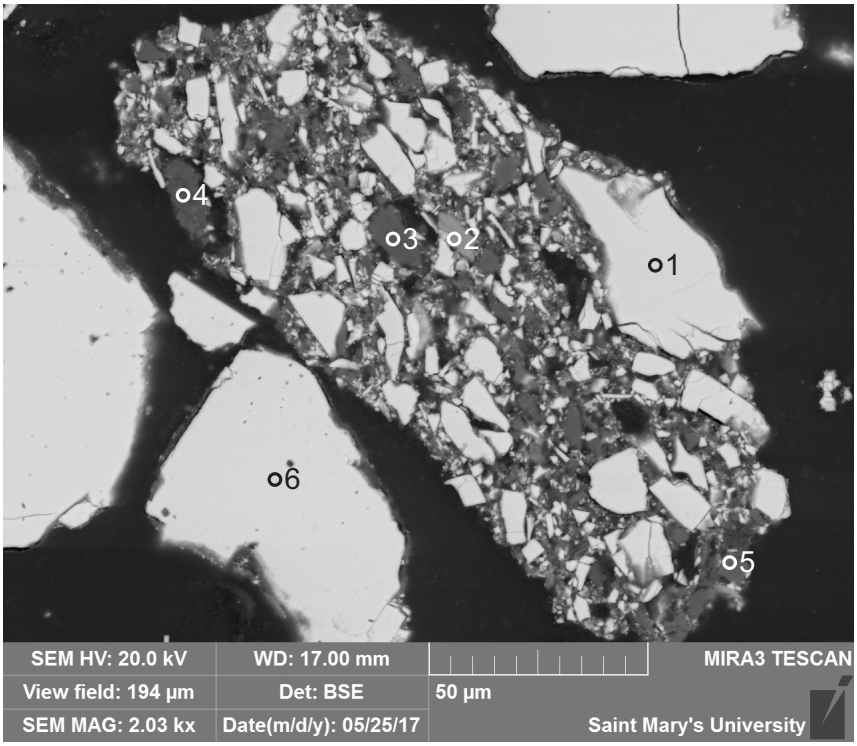
1: Pyrite
2: Mix
3: Quartz
4: Illite +
5: Albite
6: Pyrite

Figure 3B.25: Crimson F-81 6425m site 19.1. Fractured siltstone injected by drilling mud.



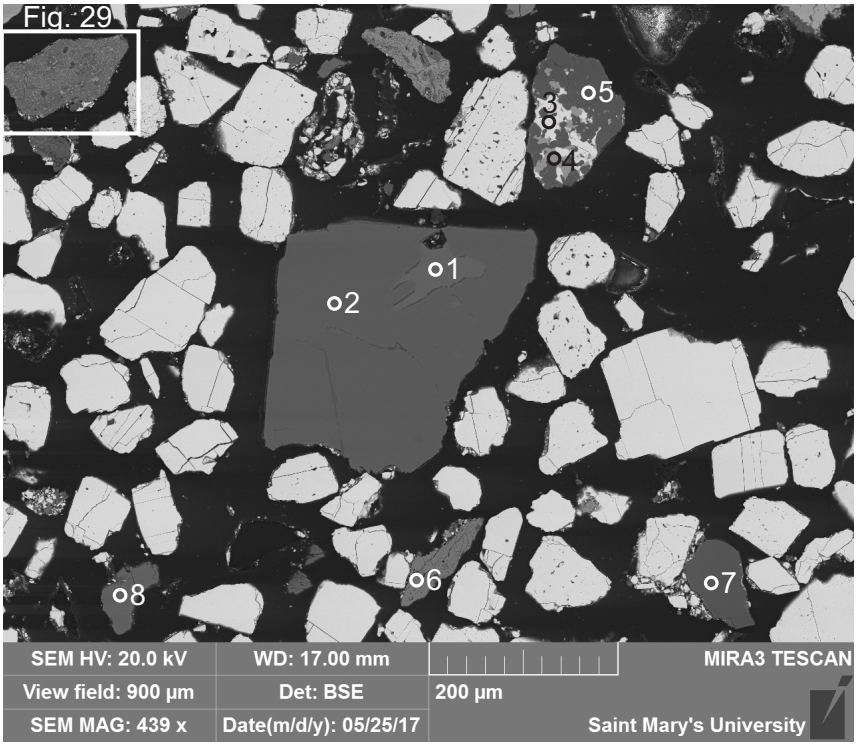
1: Feohy +
2: Barite
3: Mnohy (Mn + Fe)
4: Feohy
5: Quartz
6: Quartz
7: Siderite +
8: Feohy +
9: Tremolite
10: Pyrite
11: Tremolite
12: Feohy +
13: Siderite

Figure 3B.26: Crimson F-81 6425m site 20. Pyrite framboid (10). Barite in contact with Mnohy (2,3) is likely a drilling mud contaminant.



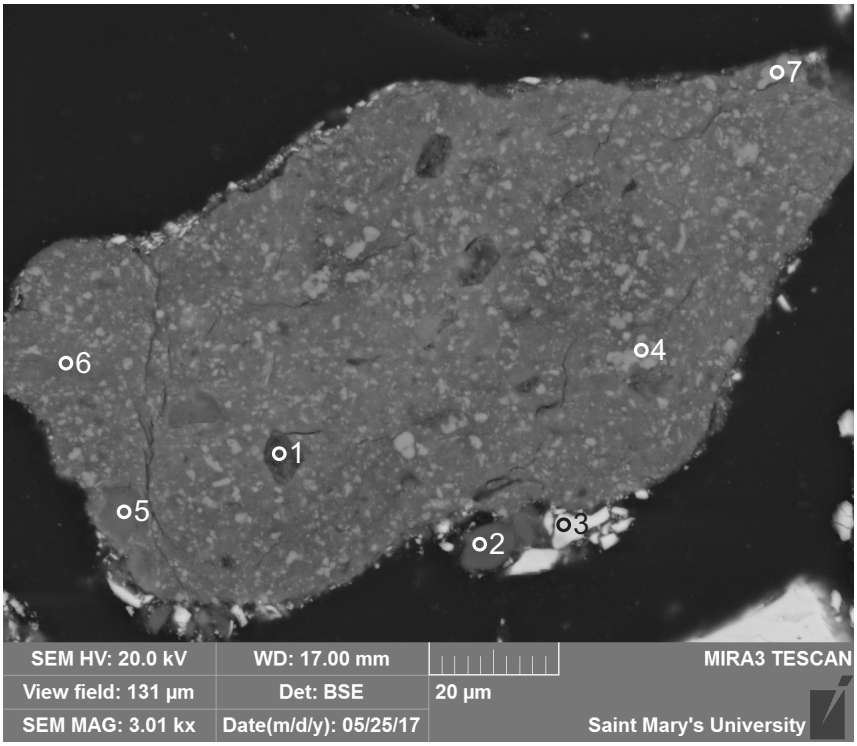
1: Barite
2: Feohy +
3: Quartz
4: Hydromuscovite
5: Dolomite
6: Barite

Figure 3B.27: Crimson F-81 6425m site 20.1. Drilling mud fragment that has picked up a little bit of quartz (3) and mica (4).



1: Calcite
2: Tremolite
3: Barite +
4: Feohy +
5: Quartz
6: Siderite +
Chlorite
7: Quartz
8: Calcite

Figure 3B.28: Crimson F-81 6425m site 21. A cutting made up of quartz (5), Feohy (4), and barite (3) in which both barite and Feohy appear to be diagenetic.



1: Mnohy (Mn + Fe)
2: Quartz
3: Barite
4: Feohy +
5: Mnohy
(Mn + Fe + Al)
6: Chlorite + Mn
7: Mix

Figure 3B.29: Crimson F-81 6425m site 21.1. A shale fragment with diagenetic manganese cementation.

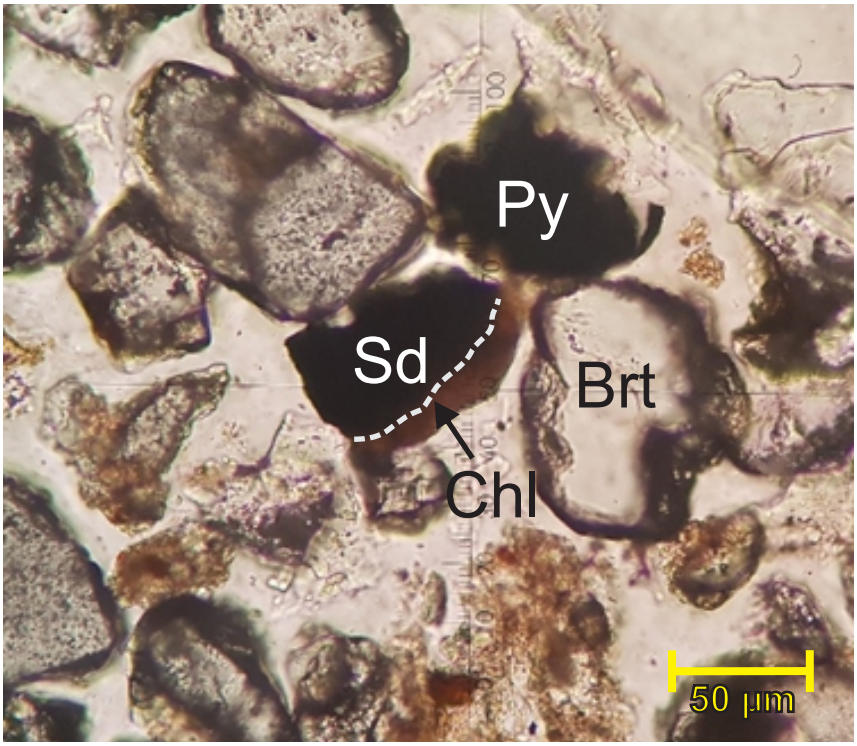


Fig. 3B.30: Microphotograph of Fig. 3B.24. Sample 6425 site 19. Transmitted light, ppl, 40x. Grain in center is either a coated grain of siderite with a chlorite rim or probably a siderite concretion with a bertherine (precursor of chamosite) rim.

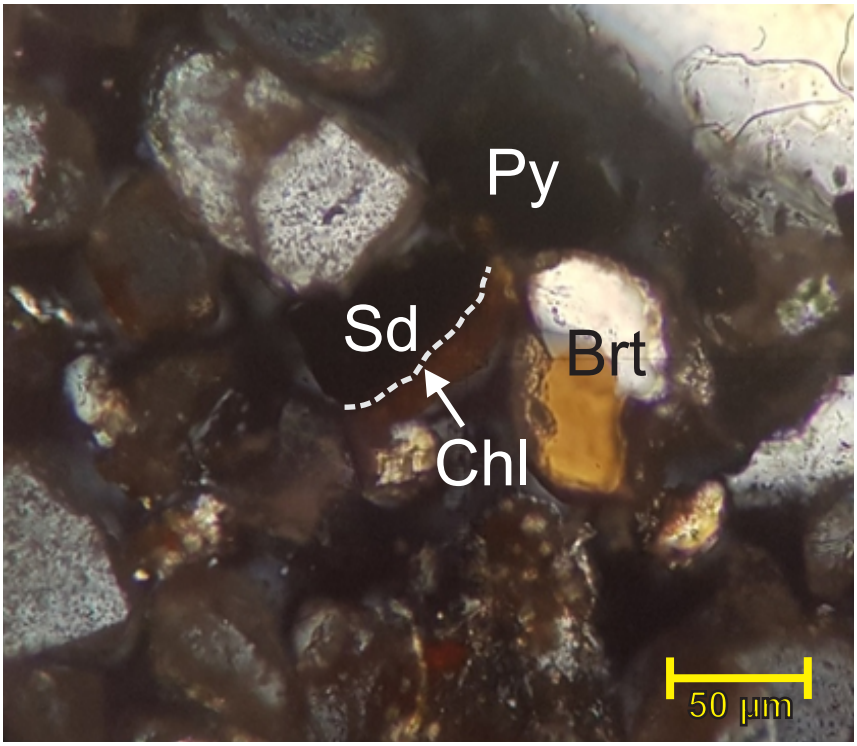


Fig. 3B.31: Microphotograph of Fig. 3B.24. Sample 6425 site 19. Transmitted light, xpl, 40x. Grain in center is siderite with a chlorite rim.



Fig. 3B.32: Microphotograph of Fig. 3B.14. Sample 6425 site 12. Transmitted light, ppl, 10x. In red circle the altered grain is cericitized detrital grain (?feldspar)



Fig. 3B.33: Microphotograph of Fig. 3B.14. Sample 6425 site 12. Transmitted light, xpl, 10x. In red circle the altered grain is cericitized detrital grain (?feldspar)

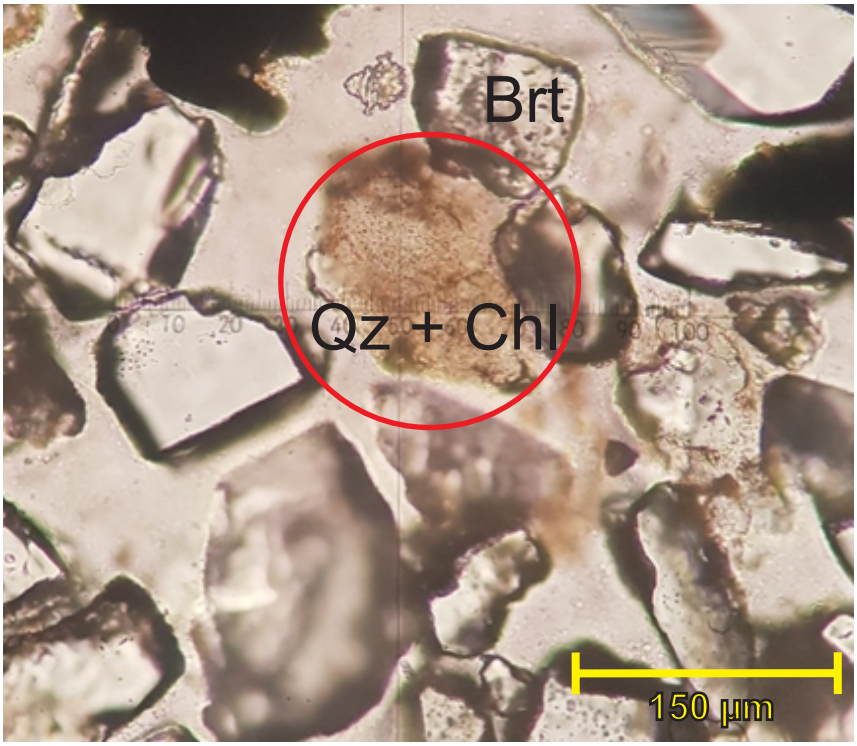


Fig. 3B.34: Microphotograph of Fig. 3B.5. Sample 6425 site 4. Transmitted light, ppl, 40x. In red circle the grain is a mixture of quartz and chlorite (mudstone cutting).

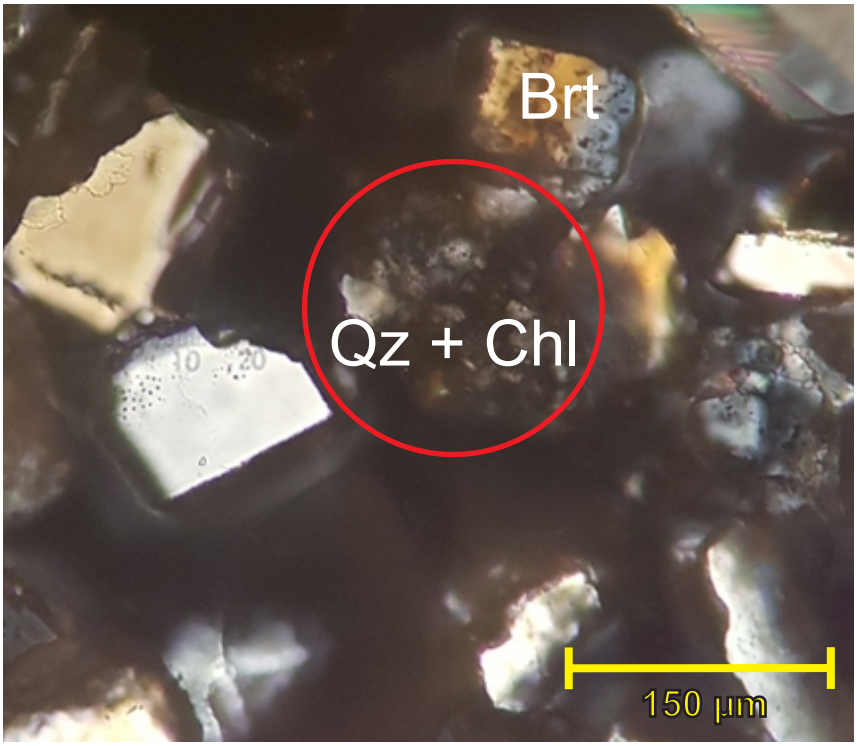


Fig. 3B.35: Microphotograph of Fig. 3B.5. Sample 6425 site 4. Transmitted light, xpl, 40x. In red circle the grain is a mixture of quartz and chlorite (mudstone cutting).

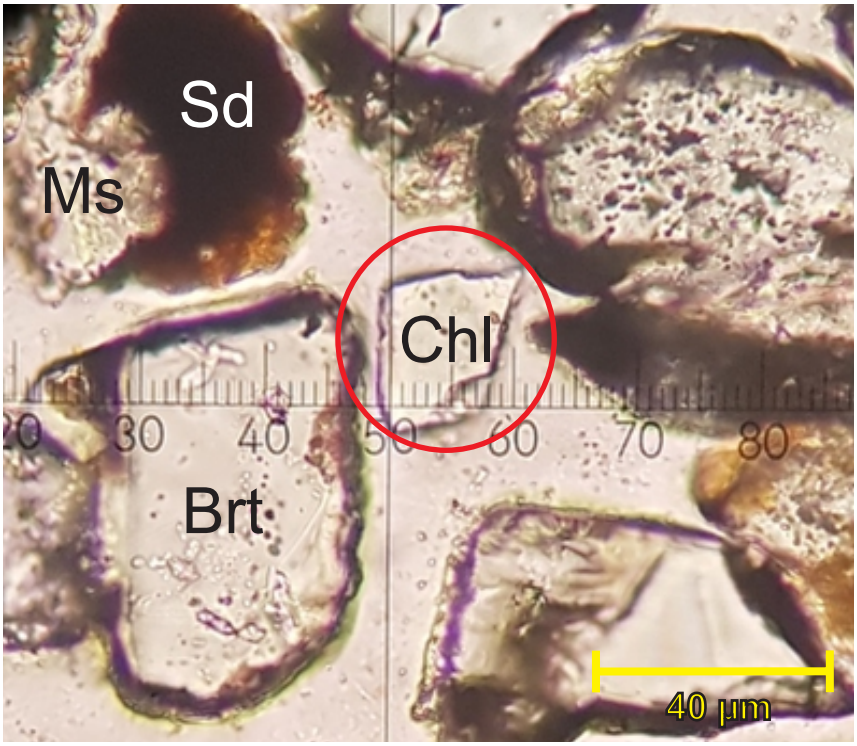


Fig. 3B.36: Microphotograph of Fig. 3B.12. Sample 6425 site 10. Transmitted light, ppl, 40x. In red circle colorless chlorite developed from an unknown protolith.

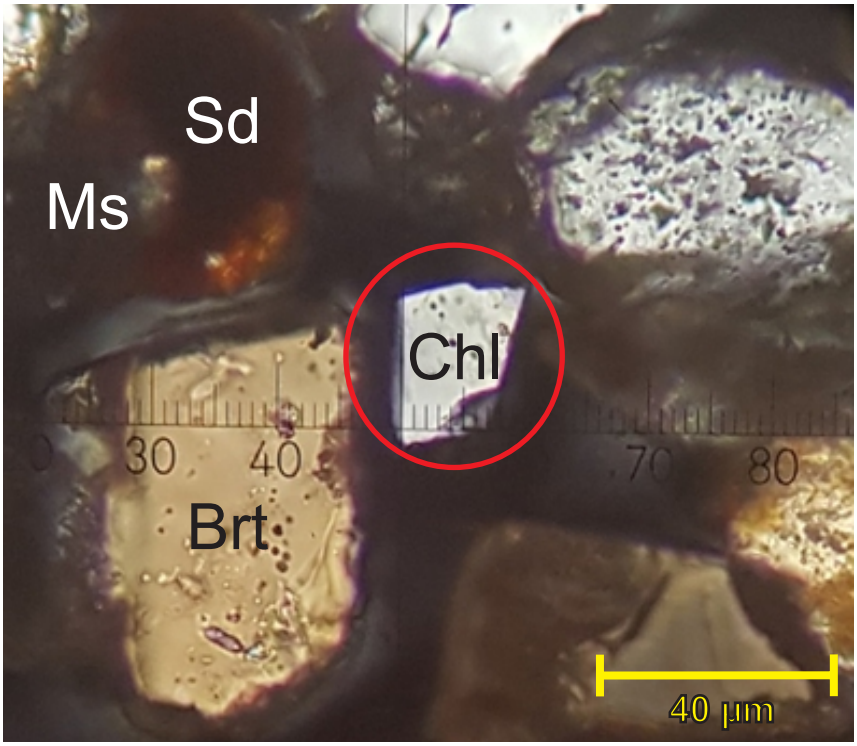


Fig. 3B.37: Microphotograph of Fig. 3B.12. Sample 6425 site 10. Transmitted light, xpl, 40x. In red circle colorless chlorite developed from an unknown protolith.

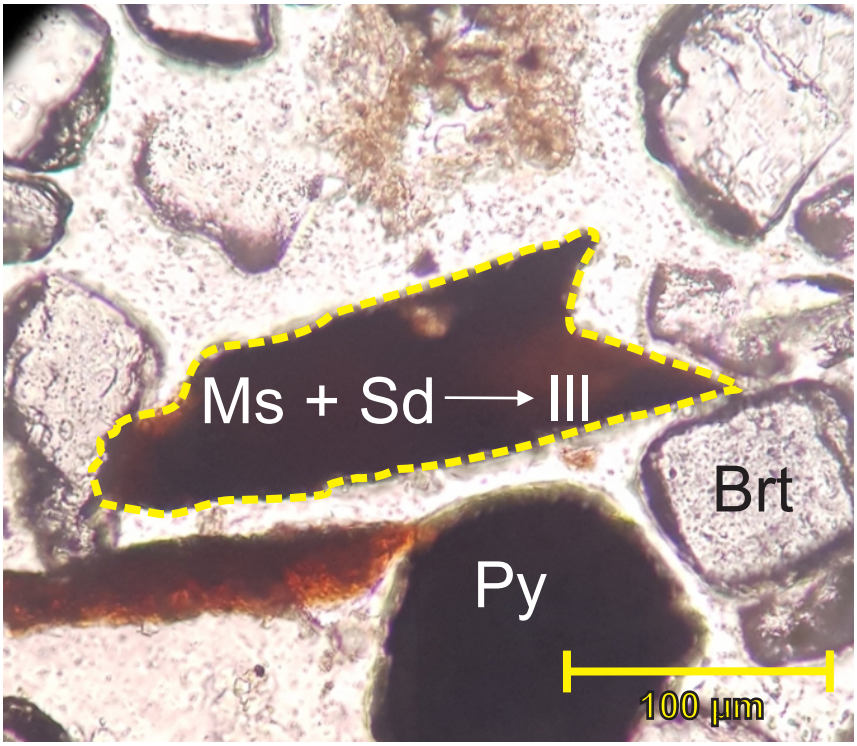


Fig. 3B.38: Microphotograph of Fig. 3B.8. Sample 6425 site 7. Transmitted light, ppl, 40x.The grain with dashed yellow outline is a mixture of siderite and illite (mudstone cutting cemented with siderite).

Table 3B.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6425 depth.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	Sb_2O_3	BaO	Yb_2O_3	Ta_2O_5	WO_3	PbO	Total	Actual Total
1	1	Sd + Ap +	3.88		2.10	66.85	0.89	8.04	12.94			5.30																		100	65
1	2	Qz	99.44			0.56																								100	121
1	3	Qz	99.50			0.34			0.16																					100	105
1	4	Qz +	92.61		4.37	0.77		0.35			1.90																			100	118
1	5	Cpx (Di)	57.10			0.22		18.62	24.06																					100	117
1	6	Feohy	1.64			98.36																								100	93
1	7	Mix	44.93	16.21	20.85	3.69		1.70	8.50		3.56	0.57																		100	87
1	8	Sd + Chl	6.38		3.94	68.98	0.71	14.13	5.41		0.45																			100	65
1	9	Feohy +	6.26		0.48	89.05	0.47		0.55	1.58	0.47		0.73		0.41															100	75
1	10	Chl +	21.69	0.37	18.51	39.34	0.37	0.94	0.87		2.92																			85	93
1	11	Py				28.82							71.18																	100	218
1	12	Qz +	89.58	1.81	4.99	1.02			0.54	2.06																				100	97
1	13	Qz	100.00																											100	118
1	14	Feohy		2.56		94.52	1.66	1.26																						100	91
1	15	Feohy + Qz	36.12			63.88																								100	78
1	16	TiO_2 +	3.17	91.90	1.20	3.06		0.67																						100	104
1	17	Brt											36.52				-0.12					1.25			62.35					100	115
2	1	Py				28.80							71.20																	100	220
2	2	Feohy + Ap +	2.67		1.81	65.23	0.76	5.68	12.03			6.38													0.96			4.48		100	54
2	3	Fl							46.21					53.79																100	166
2	4	Qz	97.58		1.62						0.80																			100	117
2	5	Brt											37.17				-0.04								62.87					100	114
2	6	Kfs	65.50	0.35	13.45	1.62		1.58	0.66	2.44	14.40																			100	121
2	7	Mag				100.00																								100	90
2	8	Feohy +	2.36			97.64																								100	75
2	9	Qz	98.53		0.97						0.50																			100	111
3	1	Sd +	1.92		1.03	40.74	0.39	6.40	4.89			0.63																		56	63
3	2	Qz	99.00			1.00																								100	102
3	3	Sd + Ap +	2.95		1.51	66.95	0.47	7.89	15.40		0.27	4.56																		100	66
3	4	Feohy +	4.31			95.69																								100	88
3	5	Sd +	1.57		0.81	43.22	0.38	5.41	3.97		0.17	0.46																		56	64
3	6	Qz	99.27			0.73																								100	127
3	7	Feohy +	4.09			92.01														3.90										100	80
3	8	Brt				1.10							36.47				0.09					3.08			59.26					100	117
3	9	Qz +	95.05						4.95																					100	114
3	10	Qz	99.55			0.45																								100	121
3	11	Feohy +	8.42			79.85			0.46		0.38									3.83	2.23								4.83	100	79
3	12	Ilt +	58.53	1.26	20.04	4.27		1.00	1.26	1.01	1.86		0.77																	90	93
3	13	Qz	100.00																											100	122
3	14	Mnohy (Mn + Al)	1.35		15.59		57.91		0.77		0.25	0.73		3.57					2.34						3.96				13.53	100	87
3	15	Qz + Chl	86.17		5.41	6.48		1.30	0.36		0.28																			100	90
3	16	Sd + Chl	16.17		7.13	58.43	0.55	7.68	7.49	0.93	0.81	0.81																		100	68
3	17	Feohy	1.55			97.97	0.48																							100	75
3	18	Qz	100.00																											100	120
3	19	Brt											37.03				0.11								62.86					100	116
4	1	Tr	60.43		0.66			24.78	12.61	0.45				1.07																100	119
4	2	Qz	98.61		0.59	0.66					0.14																			100	118
4	3	Sd +	1.30		0.69	43.49	0.36	5.70	3.88			0.58																		56	62
4	4	Feohy	1.02			98.65														0.33										100	78
4	5	Brt											36.61				-0.16					1.17			62.38					100	117
4	6	Qz +	87.00	0.32	7.98	0.98		0.50			3.22																			100	116

Table 3B.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6425 depth.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	Sb_2O_3	BaO	Yb_2O_3	Ta_2O_5	WO_3	PbO	Total	Actual Total
4	7	Qz	95.37		1.85	2.11					0.67																			100	117
4	8	Ilm		47.49		50.84	0.47	1.20																						100	99
4	9	Chl +	31.95		21.55	25.42		4.28	0.81	0.99																				85	81
4	10	Mnohy (Mn + Al)	1.69		26.46		57.95		0.56					5.69			0.83		4.06										2.76	100	75
4	11	Ms	50.44		33.86		0.55	0.79	0.34		7.52			1.49																95	99
4	12	Mnohy (Mn + Al)	5.86		14.71	2.39	47.01		1.34		0.66			4.18							0.84				1.51				21.50	100	89
4	13	Feohy +	10.27		1.35	84.92	0.41	0.84	0.90			1.31																		100	79
4	14	Qz	100.00																											100	118
4	15	Feohy +	3.32		1.71	91.95		0.79	1.55										0.68											100	77
4	16	Feohy +	6.90			82.36	0.58									10.16														100	99
4	17	Kfs	66.41		17.58						16.01																			100	113
4	18	Brt											36.56				0.03					1.20			62.21					100	111
5	1	Tr	61.47			0.69		24.88	12.96																					100	118
5	2	Sd +	3.01		1.68	38.87	0.39	6.05	5.68		0.32																			56	62
5	3	Sd +	2.68		1.41	41.18	0.39	6.26	3.33		0.16	0.59																		56	65
5	4	Sd +	4.52		2.41	36.75	0.34	6.15	4.40		0.31		0.46												0.66					56	61
5	5	Qz	99.57			0.43																								100	125
5	6	Brt											36.75				0.04					1.24			61.97					100	117
5	7	Qz	100.00																											100	120
5	8	Sd	0.96		0.62	41.50	0.40	5.64	6.10			0.78																		56	61
5	9	Sd				46.69	2.03	4.47	2.81																					56	61
5	10	Sd + Chl	8.28		5.05	65.05	0.67	11.65	8.60		0.70																			100	67
5	11	Feohy +	4.94			92.68	0.83	0.80	0.75																					100	79
6	1	Sd +	10.20		5.51	64.76	0.68	11.75	6.42		0.68																			100	67
6	2	Ab	65.32		20.08	3.72		0.35	0.60	9.93																				100	117
6	3	Qz	100.00																											100	117
6	4	Tr	60.66		0.74	0.92		24.44	12.96	0.28																				100	112
6	5	Qz	98.70		0.66	0.64																								100	121
6	6	Chl	20.64		12.08	48.17		0.44			3.00	0.66																		85	93
6	7	Sd + Chl	8.76		5.31	63.76	0.78	12.87	8.06		0.46																			100	67
6	8	Sd	0.98		5.31	44.19			0.57										0.35		2.96			1.05	0.60					56	77
6	9	Brt											36.26				0.03								63.71					100	118
6	10	Feohy + Brt +	5.20			82.95			4.02				3.06			0.49									4.28					100	77
6	11	Brt											37.33				-0.03					4.98			57.72					100	117
6	12	Feohy +	16.15		9.39	71.19					2.26														1.01					100	88
6	13	Cal	0.97					2.68	43.59				0.59	8.16																56	59
6	14	Feohy +	5.44			94.56																								100	79
6	15	Feohy +	3.81		1.84	91.66		0.52	1.86							0.31														100	83
6	16	Ms	46.56	0.47	29.09	8.25		1.74			8.90																			95	106
6	17	Sd +	1.78		0.48	42.02	0.49	6.92	4.32																					56	60
6	18	Mix	6.60	1.20	17.04	21.88	0.41	3.86	48.37				0.64																	100	104
6	19	Qz +	82.07	0.71	3.52	2.58			3.22																			7.90		100	85
6	20	Qz +	83.10	0.44	2.99	2.35			2.75																			8.37		100	95
7	1	Tr	60.72			0.44		24.77	12.86	0.27				0.94																100	117
7	2	Py				28.87							71.13																	100	220
7	3	Fl							46.87					53.13																100	164
7	4	Sd +	1.88		1.20	39.02	0.41	6.31	6.70			0.49																		56	63
7	5	Ilt?	50.69		15.23	16.36		2.46	1.99	0.49	2.78																			90	100
7	6	Mix	13.47		15.05	62.12	4.16	0.86	0.90	0.51	1.88				0.23										0.82					100	79
7	7	Mnohy (Fe + Mn)	11.13		14.05	42.62	20.68	0.54	2.00		1.62				0.25						0.19				3.56				3.37	100	84
7	8	Feohy +	3.71			92.66	1.97		0.61																1.05					100	78

Table 3B.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6425 depth.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	Sb_2O_3	BaO	Yb_2O_3	Ta_2O_5	WO_3	PbO	Total	Actual Total
7	9	Mnohy (Mn + Ba)					76.97	0.96	2.82																19.25					100	78
7	10	Brt +					24.44	0.44	0.38				23.16				0.01								51.57					100	90
7	11	Feohy +	1.99			98.01																								100	81
7	12	Feohy +	4.22		0.80	93.67																			1.31					100	88
7	13	Qz	99.18		0.82																									100	119
7	14	Qz	100.00																											100	120
7	15	Feohy +	2.04			95.11													0.83	2.02										100	79
7	16	Mix	8.64	1.31	16.21	25.87	0.42	3.93	43.62																					100	105
8	1	Feohy +	4.49			94.58	0.55		0.38																					100	82
8	2	Sd +	4.51		1.49	38.74	0.36	6.32	3.70		0.30	0.58																		56	66
8	3	Qz	99.49			0.51																								100	124
8	4	Sd + Chl +	9.77		4.99	64.86	0.66	8.85	8.42	1.00	0.57	0.88																		100	70
8	5	Sd +	11.17		3.56	65.97	0.75	11.04	7.13		0.38																			100	69
8	6	Feohy +	3.44			70.43			0.64			4.17							3.39	2.19	4.51								11.23	100	83
8	7	Feohy +	4.71			79.57			0.70			0.82							2.57	3.25	3.35								5.03	100	81
8	8	Qz	99.24			0.76																								100	123
8	9	Chl +	18.02		15.09	48.96		0.54	0.59		1.78																			85	91
8	10	Brt				0.69							36.42				0.07								62.82					100	117
8	11	BA*	1.78			93.03			0.46	2.07	1.53				1.13															100	37
8	12	Qz +	83.00		9.82					7.18																				100	123
8	13	Brt											36.38				-0.01					1.11			62.52					100	112
8.1	1	Hole	56.64	1.10	26.28	4.35		2.28	1.31	0.44	4.48		1.07												2.05					100	61
8.1	2	Brt											36.34				0.04					1.13			62.49					100	117
8.1	3	Qz	99.42																						0.58					100	122
8.1	4	Mix	72.30	1.01	16.39	3.73		1.33	0.89	1.41	2.11		0.83																	100	99
8.1	5	Mix	51.48	11.23	25.28	4.38		1.74	1.62	0.69	2.84		0.74																	100	97
8.1	6	Qz	99.40																						0.60					100	118
8.1	7	Mix	21.10		12.47	14.54	15.07	1.09	3.08	2.26	2.71		7.57	9.29	0.49						-0.04				10.39					100	70
8.1	8	Brt +	4.64		3.68	1.20		0.92			0.29		33.34												53.25			2.68		100	122
8.1	9	Sd +	1.18		0.66	35.33	0.74	15.74	0.49				0.49												1.38					56	63
9	1	Tr	61.03			0.31		25.19	12.83					0.64																100	118
9	2	Feohy +	1.30		0.85	96.64							1.21																	100	91
9	3	Qz	99.00			1.00																								100	121
9	4	Feohy +	3.00			97.00																								100	79
9	5	Brt				0.94							36.43												62.63					100	116
9	6	Feohy +	7.32		0.82	88.89	0.80		0.46						0.39				0.62	0.70										100	78
9	7	Mnohy (Fe + Mn)	3.30			48.20	37.67		0.80																10.04					100	79
9	8	Feohy +	7.64			89.67	0.88		0.96											0.85										100	76
9	9	Tr	59.61		0.97	0.65		24.45	12.75	0.41	0.21			0.95																100	112
9	10	Feohy +	7.61		2.15	89.28	0.45		0.51																					100	75
9	11	Tr	60.76		0.79	0.46		24.80	12.47	0.57	0.15																			100	115
9	12	Bt	39.07		25.32	27.15		0.91	0.86		5.72	0.96																		100	93
9	13	Ab	69.40		18.68					11.92																				100	113
9	14	Qz	100.00																											100	114
9	15	Qz	99.45			0.55																								100	121
9	16	Feohy +	17.55	0.45	9.17	68.49	0.84	0.49	0.68		2.33																			100	84
10	1	Qz	99.71			0.29																								100	125
10	2	Py				28.63							71.37																	100	236
10	3	Sd	1.80		0.87	40.79	0.49	7.40	3.64	0.49		0.53																		56	66
10	4	Qz	99.16			0.84																								100	125
10	5	Sd +	3.35		2.21	38.55	0.44	4.44	5.40	0.46	0.28	0.86																		56	68

Table 3B.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6425 depth.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	Sb_2O_3	BaO	Yb_2O_3	Ta_2O_5	WO_3	PbO	Total	Actual Total
10	6	Qz	100.00																											100	119
10	7	Ms +	57.00	1.13	25.30	4.46		1.34	0.86	0.30	3.18		0.95															0.48		95	95
10	8	Py	5.75		2.79	32.33		0.22	0.49		0.39		57.13												0.90					100	115
10	9	Feohy +	3.25			94.75	1.61		0.39																					100	82
10	10	Qz	100.00																											100	121
10	11	Fl							46.39					53.61																100	170
10	12	Ms + Chl	43.57	0.83	27.22	18.98		1.55	0.55		7.30																			100	99
10	13	Chl	16.46		13.05	50.76		0.67	0.97		2.28														0.81					85	93
10	14	Chl +	41.28		16.85	21.76		3.38	0.49		0.41														0.83					85	87
10	15	Qz	100.00																											100	120
11	1	Feohy				99.49	0.51																							100	101
11	2	Sd +	4.13		2.49	39.42	0.60	5.55	3.00		0.30	0.51																		56	66
11	3	Chl + Sd	21.17		13.33	52.36	0.50	5.25	5.10	0.48	1.81																			100	71
11	4	Feohy +	1.18	1.75	0.77	95.29		1.01																						100	90
11	5	Qz	96.25		1.29	0.60		0.90	0.96																					100	113
11	6	Qz	100.09																							-0.09				100	117
11	7	Cal	2.00					1.18	47.07					5.75																56	66
11	8	Sd	0.77		0.47	45.12	0.56	4.87	3.53			0.68																		56	63
11	9	Sd +	11.62		7.98	62.15	0.69	9.68	5.67	0.80	0.56	0.84																		100	71
11	10	Qz	96.49			2.79		0.41	0.31																					100	100
11	11	Feohy +	2.77		1.96	92.91			2.05						0.31															100	85
11	12	Fl							47.64					52.36																100	168
11	13	Kfs	69.94		15.75	0.39					13.92																			100	112
11	14	Qz	100.00																											100	120
11	15	Sd +	5.33		4.04	34.30	0.35	5.57	4.58	0.46	0.29	0.55													0.53					56	70
11	16	Sd +	3.20	1.00	1.42	39.41	0.54	5.47	4.78		0.18																			56	60
11	17	Qz	99.41			0.59																								100	122
11	18	Sd +	12.92	0.49	8.22	60.82	0.79	10.19	5.51		1.06																			100	68
11	19	Cal						0.60	49.38					6.03																56	63
11	20	Fl							47.36					52.64																100	165
11	21	Brt											36.82				0.08								63.10					100	114
11	22	Feohy +	3.92			95.43	0.65																							100	80
11	23	Brt				0.42							36.83				-0.04					2.58			60.21					100	115
11	24	Feohy +	3.86			93.37	0.70		1.19																0.88					100	80
12	1	Qz	100.00																											100	121
12	2	Ilt	54.02	0.62	23.47	2.15		1.22	4.61	0.24	3.67																			90	102
12	3	Sd	0.98		0.59	45.10	0.40	4.26	3.98			0.68																		56	62
12	4	Tr	60.56		0.76	0.49		25.02	12.59	0.32	0.26																			100	112
12	5	Sd				50.25	3.16	1.72	0.87																					56	59
12	6	Brt											36.58				0.07					1.07			62.28					100	117
12	7	Brt +	4.62		2.00	0.83			0.27				34.51				0.05								57.72					100	92
13	1	Feohy +	5.46		0.78	81.84			4.54				1.85		0.29	4.18									1.06					100	76
13	2	Feohy	0.72			96.74	0.52		2.02																					100	83
13	3	Qz +	90.67		4.97						4.36																			100	122
13	4	Brt											36.01				-0.05					1.27			62.77					100	104
13	5	Chl + Sd +	22.67		14.18	50.82	1.07	5.37	3.73		2.16																			100	79
13	6	Ms + Chl	45.94	1.20	24.96	19.34	0.39	3.16	1.61	0.33	3.08																			100	102
13	7	Feohy +	5.62			87.17														3.01	0.44								3.76	100	83
13	8	Qz	99.45			0.55																								100	123
13	9	Sd +	3.38		2.17	40.25	0.41	3.49	5.16		0.31	0.82																		56	66
13	10	Brt	1.22										34.98				-0.05								63.85					100	80

Table 3B.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6425 depth.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	Sb_2O_3	BaO	Yb_2O_3	Ta_2O_5	WO_3	PbO	Total	Actual Total
13	11	Brt											36.89				-0.09								63.20					100	116
13	12	Feohy +	1.28			95.00			0.61							3.11														100	94
13	13	Qz	100.00																											100	120
13	14	Mix	56.81		5.87	17.79			0.28	0.31	4.05		5.93												8.96					100	85
13	15	Qz	100.00																											100	118
13	16	Feohy +	9.85			74.65			2.15				1.81						0.58	4.99	5.97									100	75
13	17	Qz	97.96			2.04																								100	118
13	18	Feohy +	7.37	0.86	3.75	87.29					0.73																			100	75
13	19	Ms	50.26		31.43			1.05			8.91		1.24												2.11					95	102
13	20	Ms + Brt	42.64		28.53	0.76		1.05	0.30		6.84		6.58												13.31					100	114
13	21	Sd + Chl +	14.53		8.47	57.36	0.67	8.98	7.40	0.55	2.04																			100	68
13	22	Sd +	4.63		2.09	36.63	0.34	5.87	4.97	0.99		0.48																		56	67
14	1	Tr	60.76		0.62	0.51		24.93	12.75	0.43																				100	115
14	2	Feohy	1.17			95.20	0.51									3.12														100	97
14	3	Feohy +				93.84	0.38		4.50				0.97		0.31															100	74
14	4	Sd +	3.67		2.15	39.41	0.31	5.90	3.63		0.27	0.65																		56	67
14	5	Qz	98.83		0.90						0.27																			100	123
14	6	Sd +	1.50		0.83	44.29	0.31	5.82	2.76			0.49																		56	63
14	7	Qz	98.85			1.15																								100	125
14	8	Feohy +	1.70			96.51																		1.79						100	88
14	9	Mnohy (Mn + Fe)			2.57	6.36	65.25	3.21	3.07						0.31		1.93	5.59	0.91						10.80					100	81
14	10	Qz	99.30																						0.70					100	119
14	11	Psi?	35.40		25.86						0.37						0.03								38.34					100	112
14	12	Qz	99.81			0.19																								100	121
15	1	Sd +	1.18		0.59	41.46	0.37	6.83	5.01			0.56																		56	62
15	2	Qz	100.00																											100	120
15	3	Sd + Cal	1.79		0.92	49.17	0.60	4.59	41.78			1.15																		100	60
15	4	Tr	60.37		1.22	0.81		24.18	12.76	0.45	0.21																			100	119
15	5	Qz	100.22																							-0.22				100	124
15	6	Tr	60.20			0.52		24.32	13.54					1.42																100	110
15	7	Sd + Py	1.03			63.79	0.79	8.26	7.56			0.87	17.70																	100	80
15	8	Feohy +	4.05			93.95	1.57		0.43																					100	80
15	9	Ab	67.21		19.47	1.08			0.70	11.12	0.42																			100	121
15	10	Sd +	3.53		2.49	39.51	0.33	4.93	4.35		0.26	0.59																		56	66
15	11	Feohy	0.83			96.62															1.07			1.48						100	90
15	12	Feohy +	6.56			92.31	0.76		0.37																					100	78
15	13	Ab	74.33		15.55					10.12																				100	118
15	14	Qz	95.26		1.72	2.16		0.42					0.44																	100	79
16	1	Cpx (Di)	57.15			0.55		18.46	23.58	0.26																				100	121
16	2	Chl +	19.55	0.54	15.49	61.58					2.84																			100	105
16	3	Ms	48.78		32.09	3.33		0.69			10.11																			95	111
16	4	Qz	100.00																											100	126
16	5	Feohy				99.53	0.47																							100	94
16	6	Feohy +	3.77		2.95	90.58	0.46	0.76	1.12							0.36														100	79
16	7	Brt											36.96				-0.01								63.05					100	115
16	8	Feohy +	1.88			98.12																								100	80
16	9	Feohy +	5.76		1.24	91.70	0.67	0.63																						100	81
16	10	Feohy +	4.71			95.29																								100	79
16	11	Ms	44.38	0.32	29.26	9.28		1.63	4.10	0.32	5.70																			95	96
16	12	Chl + Sd	21.32		13.89	49.84	0.42	6.59	7.49		0.44																			100	77
16	13	Sd +	1.37		0.63	43.03	0.27	5.45	4.61			0.62																		56	64

Table 3B.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6425 depth.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	Sb_2O_3	BaO	Yb_2O_3	Ta_2O_5	WO_3	PbO	Total	Actual Total
16	14	Sd +	1.64		1.09	41.66	0.29	6.30	4.46			0.56																		56	62
16	15	Py				22.20							53.40						24.40											100	200
16	16	Brt											36.89												63.11					100	116
16.1	1	Sd	0.62			43.58	0.28	5.92	5.02			0.58																		56	60
16.1	2	Sd	0.49			44.06	0.23	6.47	4.75																					56	60
16.1	3	Sd	0.55			44.15	0.27	6.26	4.13			0.63																		56	61
16.1	4	?Grt	31.61	0.34	17.18	10.56		2.39	35.40	0.52	1.30		0.71																	100	81
16.1	5	Mix	53.08	0.27	28.82	10.67		2.35	1.40	0.48	2.93																			100	92
16.1	6	Sd	1.08			42.88	0.29	6.20	5.56																					56	62
16.1	7	Sd	0.88			43.37	0.37	5.87	4.88			0.63																		56	61
17	1	Qz	100.00																											100	120
17	2	Dol				0.39	0.38	22.17	31.05																					54	57
17	3	Feohy +	2.89			97.11																								100	80
17	4	Sd +	1.83		1.25	44.21	0.49	3.62	3.93			0.67																		56	62
17	5	Tr	61.66			0.28		25.25	12.81																					100	112
17	6	Feohy	1.09			97.34	0.88		0.69																					100	76
17	7	Feohy				98.16	0.95		0.89																					100	88
17	8	Feohy	1.70			93.29	0.84		4.17																					100	73
17	9	Brt											36.88				0.04					2.39			60.69					100	114
17.1	1	Tr	61.49			0.34		25.30	12.87																					100	117
17.1	2	Qz	100.00																											100	121
17.1	3	Cpx (Di)	57.22			0.22		18.69	23.87																					100	118
17.1	4	Tr	61.87			0.78		24.56	12.79																					100	115
17.1	5	Tr	61.57			0.26		25.20	12.97																					100	115
18	1	Tr	59.65		1.16	0.31		24.73	12.85	0.32	0.19			0.79																100	120
18	2	Qz	100.00																											100	123
18	3	Fl							47.46					52.54																100	167
18	4	Mix	23.91		6.89	48.84	0.66	7.65	6.45	0.45	1.07	0.58	1.19		0.31										1.99					100	98
18	5	Sd				48.51	2.93	4.34	0.22																					56	61
18	6	Feohy +	5.10			92.82	1.35		0.73																					100	78
18	7	Py	0.09			28.62							71.29																	100	223
18	8	Fl							48.38					51.62																100	169
18	9	Feohy +	6.94			83.36														2.73	1.50								5.47	100	80
18	10	Py +	7.61		4.54	25.14		0.23		0.21	0.57		61.70																	100	168
18.1	1	Py	1.82		0.99	28.62					0.16		68.41																	100	208
18.1	2	Py	10.57		6.87	20.26			0.87		0.43		59.51												1.49					100	108
18.1	3	Py	3.51		2.52	27.49		0.23	1.51				64.74																	100	172
19	1	Tr	61.29		0.48	0.38		24.78	12.70	0.37																				100	114
19	2	Feohy +	3.41		1.28	90.97			1.48										1.86		1.00									100	83
19	3	Chl + Sd	27.53		21.61	39.77		5.60	4.84				0.64																	100	79
19	4	Py	0.45		0.30	28.98			0.54		0.11		66.93										1.20					1.49		100	176
19	5	Py	0.25			28.26	0.25						71.24																	100	220
19	6	Cpx (Di)	56.96			0.92		18.23	23.89																					100	113
19	7	Sd +	1.76		0.91	40.02	0.40	3.92	7.81		0.18	0.99																		56	63
19	8	Tur	38.55	0.90	32.70	7.46		5.25	0.20	1.95																				87	96
19	9	Fl							45.50					54.50																100	162
19	10	Sd +	3.37		2.36	38.31	0.24	8.72	2.74		0.26																			56	62
19	11	Feohy +	1.33			94.58	0.55		0.54							3.00														100	88
19	12	Feohy +	1.93			91.29			3.80				1.85												1.13					100	62
19.1	1	Py				29.43							70.35														0.22			100	217
19.1	2	Mix	75.49	0.78	10.90	7.13		1.72	0.58		2.19		1.21																	100	109

Table 3B.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6425 depth.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	Sb_2O_3	BaO	Yb_2O_3	Ta_2O_5	WO_3	PbO	Total	Actual Total
19.1	3	Qz	98.95			0.63							0.42																	100	123
19.1	4	Ilt +	55.30		14.31	8.16		1.51	0.96	2.11	1.85		3.50												0.92			1.37		90	88
19.1	5	Ab	67.17		18.32	3.85			0.60	8.03	0.24		1.79																	100	93
19.1	6	Py	0.88		0.37	34.64			0.45				59.27															4.39		100	161
20	1	Feohy +	2.37			83.54			0.76			0.88							0.60	6.47	0.81								4.57	100	83
20	2	Brt											35.92				0.03					0.98			63.07					100	118
20	3	Mnohy (Mn + Fe)	2.26		1.03	11.15	63.93		2.15		0.28			5.63											13.57					100	88
20	4	Feohy				100.00																								100	95
20	5	Qz	98.82		0.91						0.27																			100	125
20	6	Qz	100.00																											100	124
20	7	Sd +	1.77		1.20	39.94	0.40	8.40	4.29																					56	64
20	8	Feohy +	6.07			92.43	0.98		0.52																					100	81
20	9	Tr	58.94		1.92	0.44		24.39	12.81	0.67				0.83																100	126
20	10	Py	0.24			28.40							71.36																	100	232
20	11	Tr	61.51			0.62		24.76	13.11																					100	116
20	12	Feohy +	2.14			97.86																								100	79
20	13	Sd	3.77		2.55	38.84	0.34	5.71	3.74		0.26	0.78																		56	66
20.1	1	Brt											36.84				0.01					2.45			60.70					100	117
20.1	2	Feohy +	5.69			89.35	2.25		0.98																1.73					100	78
20.1	3	Qz	100.00																											100	121
20.1	4	Hms	56.16	1.26	23.65	2.78		1.60	0.97	0.50	5.09																			92	100
20.1	5	Dol	0.79			6.90	0.77	18.15	26.99				0.40																	54	61
20.1	6	Brt											36.59				0.12					1.17			62.12					100	116
21	1	Cal						0.68	51.86					3.46																56	62
21	2	Tr	61.01			0.45		25.05	12.61					0.88																100	118
21	3	Brt +	1.68										36.46				-0.01					3.21			58.66					100	117
21	4	Feohy +	10.40			89.07													0.53											100	82
21	5	Qz	100.00																											100	120
21	6	Sd + Chl	8.94		5.58	59.76	0.63	8.97	10.57		0.59	4.73								0.23										100	69
21	7	Qz	100.00																											100	126
21	8	Cal	1.15		0.66			0.32	48.89		0.15			4.82																56	65
21.1	1	Mnohy (Mn + Fe)	14.54		19.37	20.23	30.45	0.61	4.01		0.80		2.77	3.89	0.40										2.94					100	52
21.1	2	Qz	97.72	0.55	1.27					0.24	0.22																			100	114
21.1	3	Brt											36.68				-0.03					0.86			62.49					100	113
21.1	4	Feohy +	7.42		9.23	71.88	7.57	1.11	2.18		0.30				0.31															100	77
21.1	5	Mnohy (Mn + Fe + Al)	6.98		15.09	16.79	41.05		3.18	0.71	0.26			9.93	0.26										3.18				2.58	100	71
21.1	6	Chl + Mn	29.43	0.67	26.33	25.49	10.55	0.83	1.46	0.44	1.84																	2.97		100	80
21.1	7	Mix	9.55		11.42	66.34	7.80	1.07	2.14		0.41				0.30										0.97					100	80
		Notes																													
		Sd + usually is indicative of the presence of SiO_2 intermixed.																													

Appendix 3C: SEM-BSE images and EDS mineral analyses for sample F-81 6450

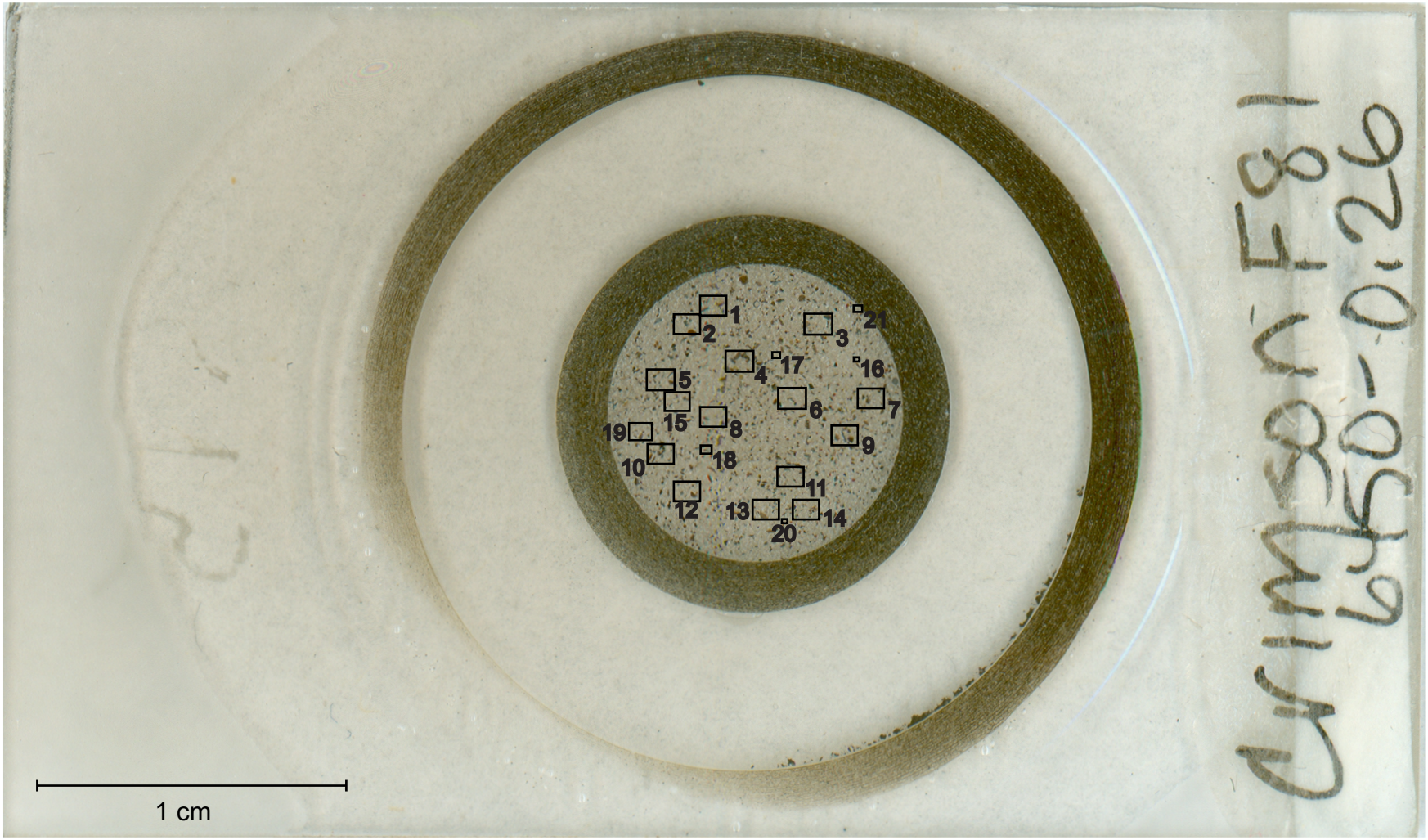
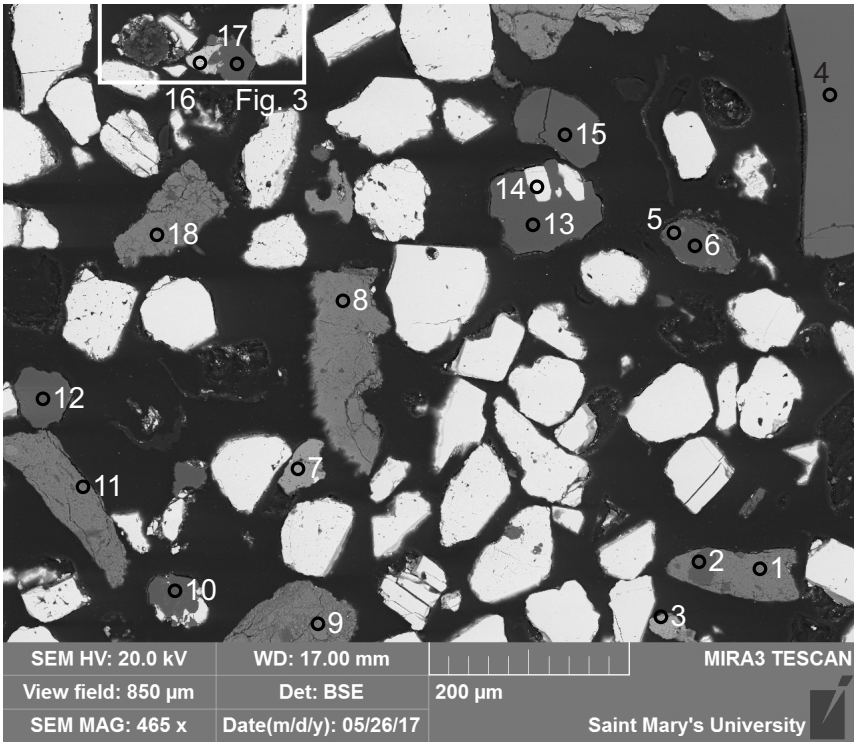
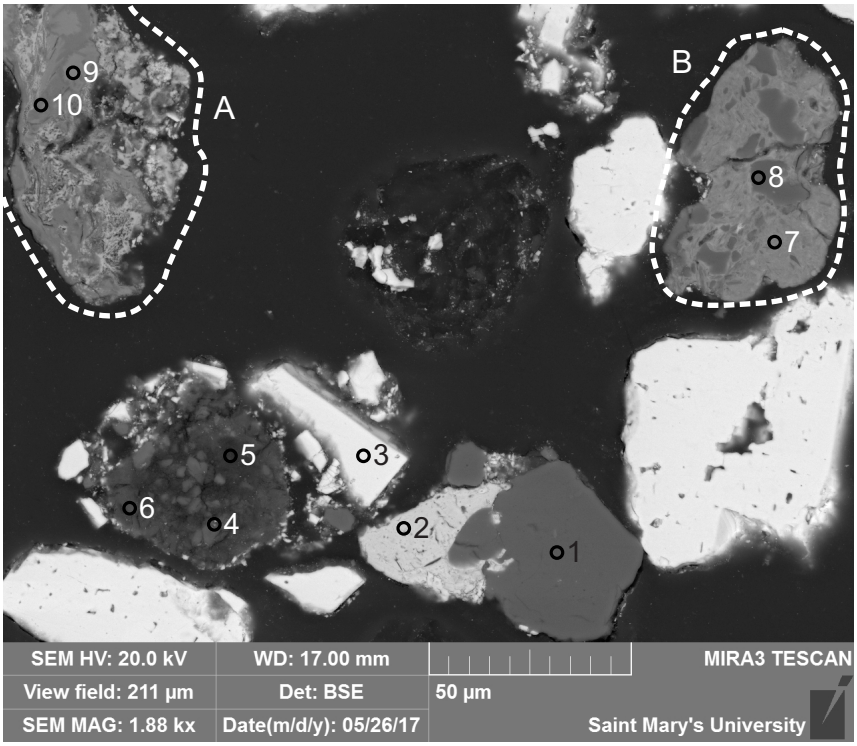


Figure 3C.1: Scanned thin section of sample F-81 6450 showing the location of analysed sites.



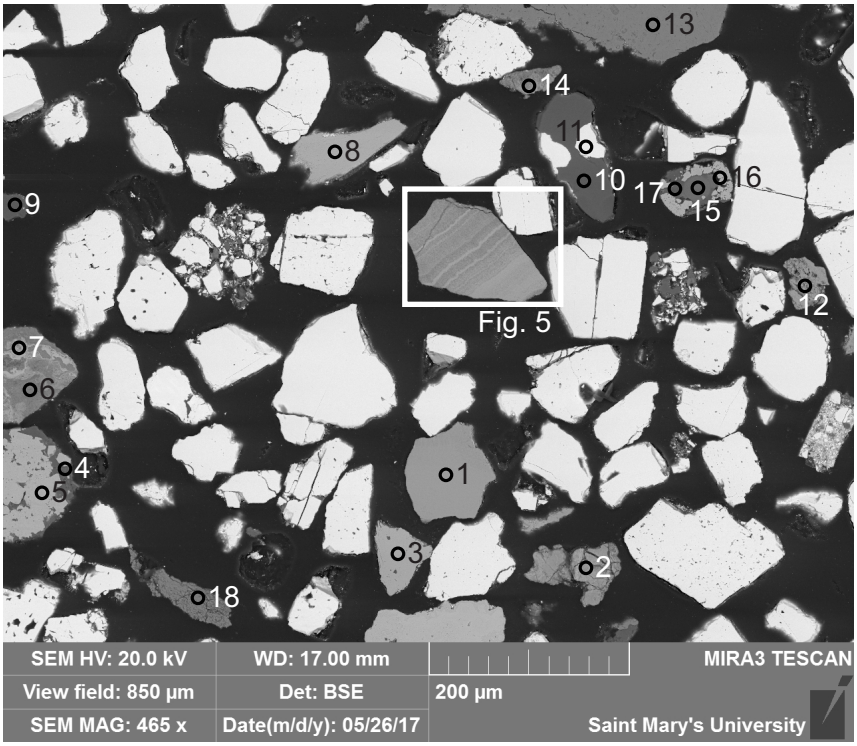
1:Siderite +
2:Quartz
3:Feohy + Chlorite
4:Diopside
5:Chlorite
6:Quartz
7:Feohy +
8:Siderite +
9:Siderite +
10:Quartz
11:Siderite +
12:Quartz
13:Quartz
14:Barite
15:Quartz
16:Covelite
17:Quartz
18:Apatite +

Figure 3C.2: Crimson F-81 6450m site 1. (Table 3C.1). A cutting made up of quartz (13) and barite (14) in which barite appears to be diagenetic.



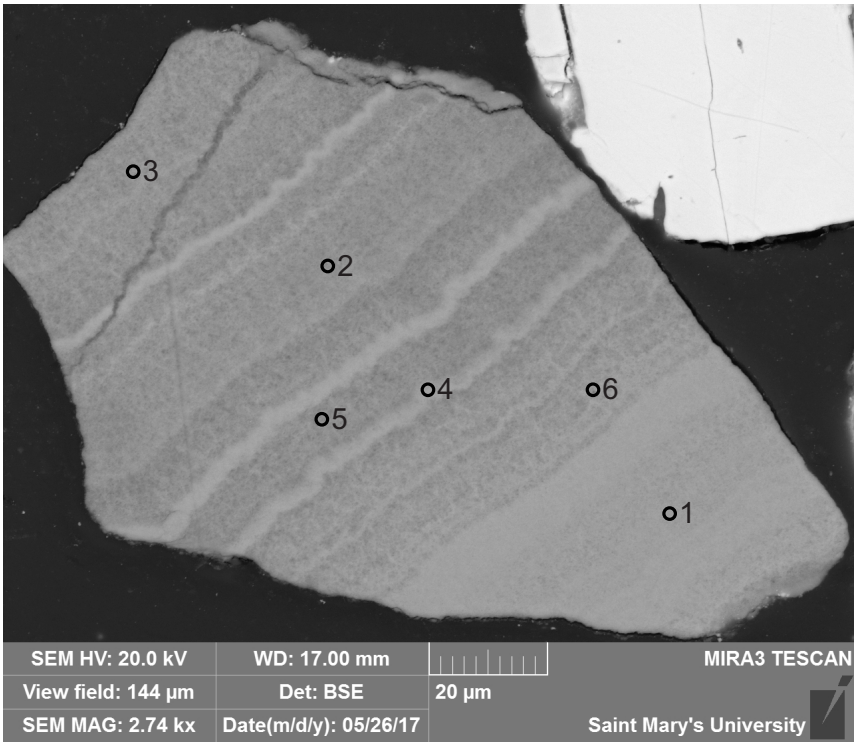
1:Quartz
2:Covelite
3:Barite
4:Bad Analysis
5:Bad Analysis
6:Bad Analysis
7:Chlorite +
8:Quartz
9:K-feldspar
10:Mix

Figure 3C.3: Crimson F-81 6450m site 1.1. (Table 3C.1)
Lithic clast made up of K-feldspar and chlorite (A) and quartz and chlorite (B).



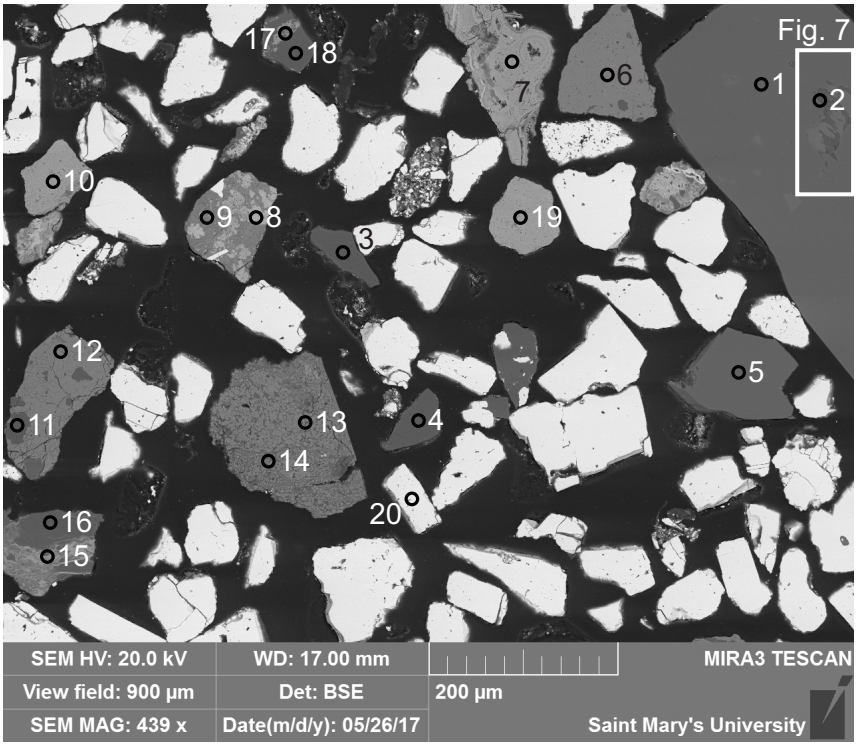
1:Feohy +
2:Feohy +
3:Magnetite
4:Quartz +
5:Pyrite
6:Mix
7:Mix
8:Feohy
9:Quartz
10:Quartz
11:Barite
12:Feohy +
13:Siderite +
14:Mnohy (Mn + Fe + Al)
15:F-Calcite
16:Pyrite
17:Mix
18:Siderite +

Figure 3C.4: Crimson F-81 6450m site 2. (Table 3C.1). A cutting made up of F-calcite (15) and pyrite (16) in which both are diagenetic and pyrite appears to postdate F-calcite.



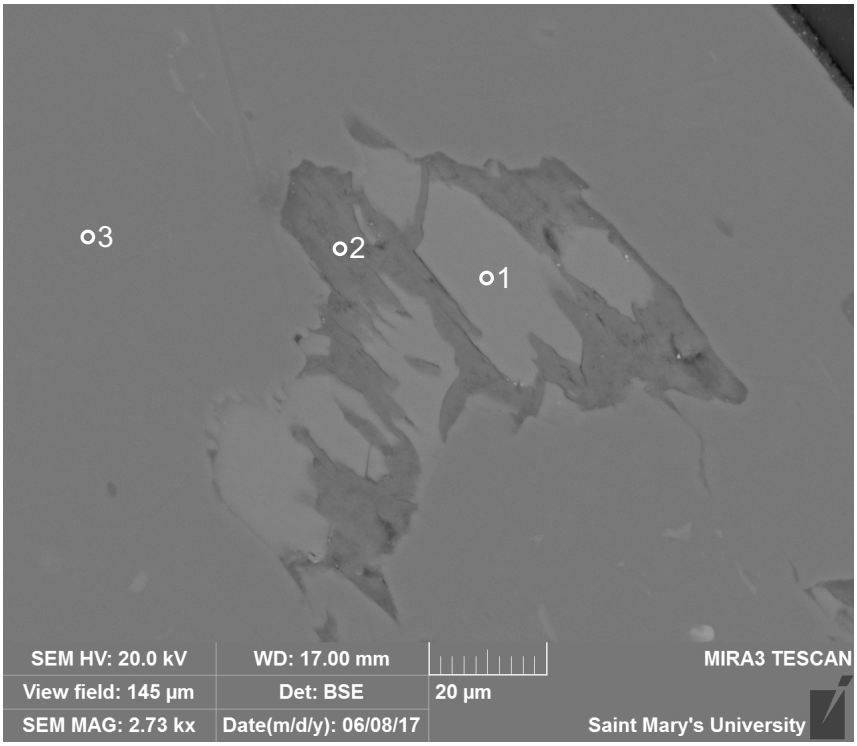
1:Mnohy (Mn + Al + Ba + F)
2:Mnohy (Mn + Al + Ba + F)
3:Mnohy (Mn + Al + Ba + F)
4:Mnohy (Mn + Al + Ba + F)
5:Mnohy (Mn + Al + Ba + F)
6:Mnohy (Mn + Al + Ba + F)

Figure 3C.5: Crimson F-81 6450m site 2.1. (Table 3C.1). Contaminant.



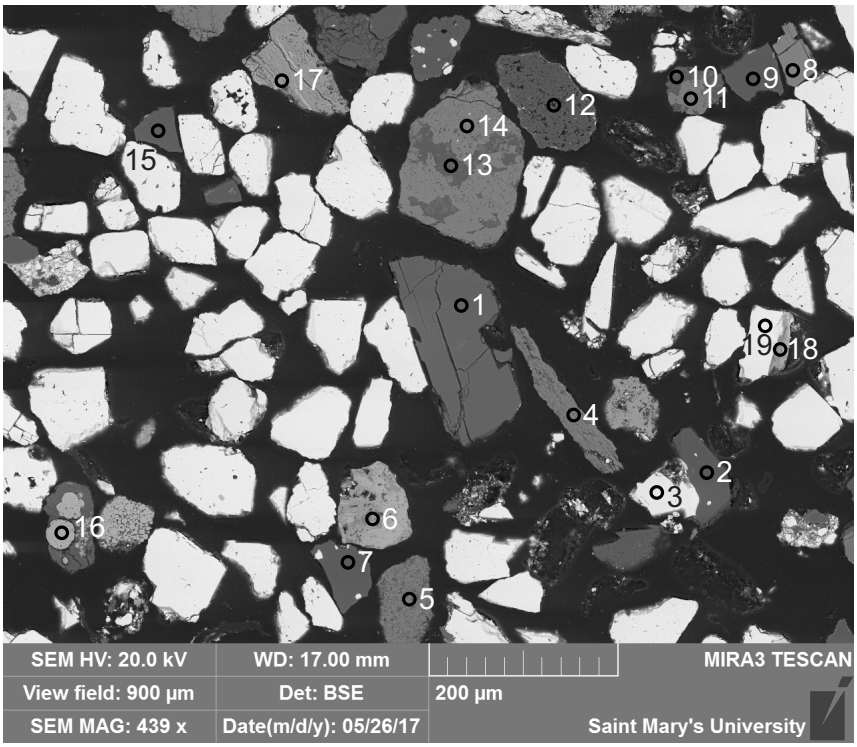
1:Tremolite (Fig. 7)
2:Mix
3:Quartz
4:Quartz
5:Tremolite
6:Siderite + other
7:Feohy +
8:Mnohy (Mn + Ba)
9:Mix
10:Siderite +
11:Quartz
12:Siderite +
13:Siderite +
14:Mix
15:Chlorite +
16:Quartz
17:Mix
18:Quartz
19:Feohy +
20:Barite

Figure 3C.6: Crimson F-81 6450m site 3. (Table 3C.1)



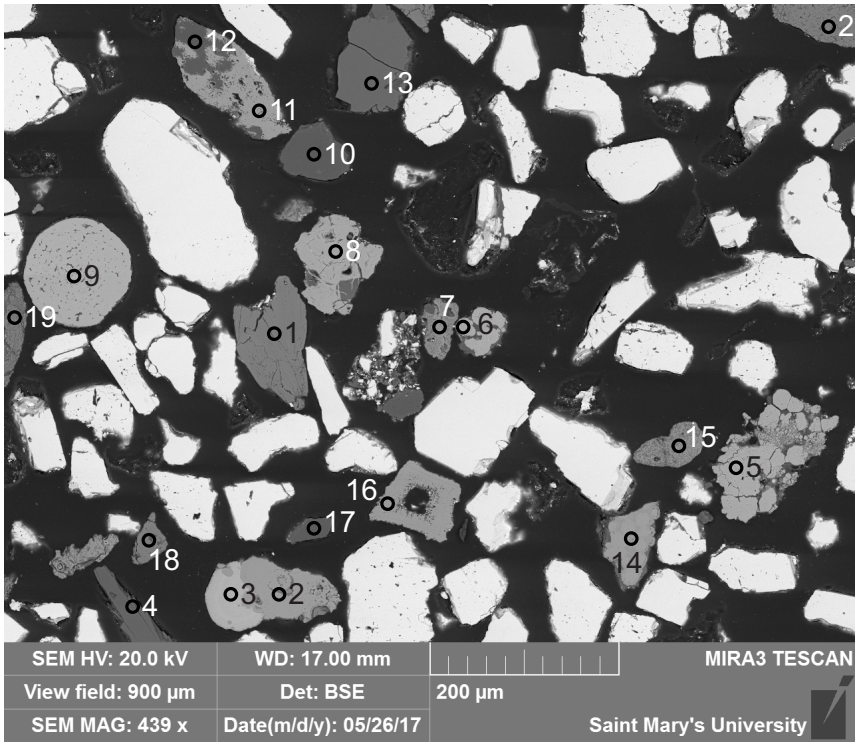
1:Calcite
2:Mix
3:Tremolite

Figure 3C.7: Crimson F-81 6450m site 3.1. (Table 3C.2). Tremolite partly replaced by calcite and a Mg-rich mineral, probably chlorite.



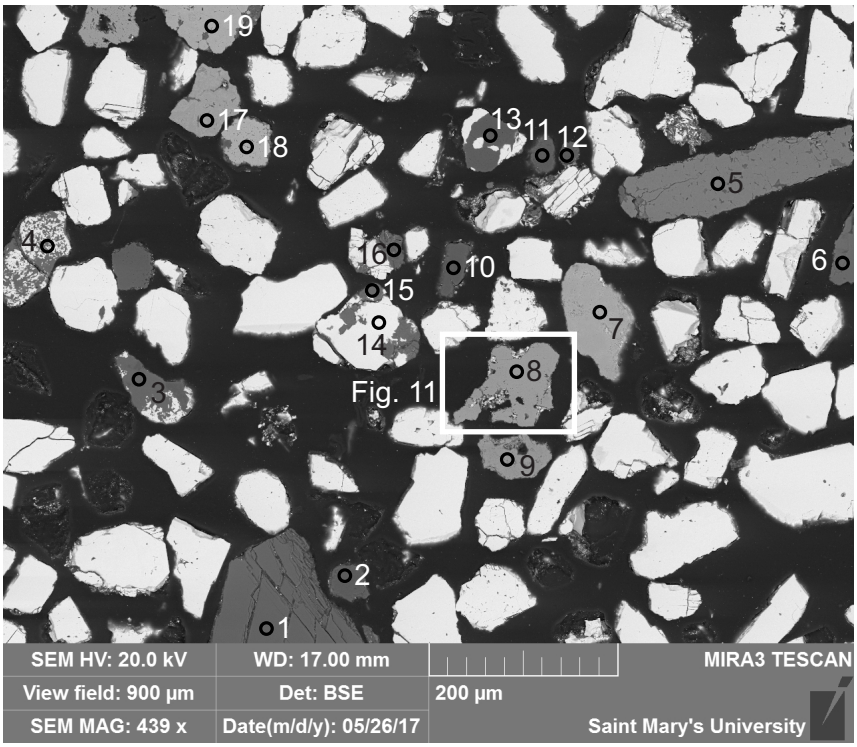
1:Tremolite
2:Quartz
3:Barite
4:Siderite +
5: Mix
6:Mnohy (Mn + Fe + Al)
7:Quartz
8:Siderite +
9:Quartz
10:Quartz
11:Siderite +
12:Corundum
13:Albite
14:Siderite +
15:Albite
16:Pyrite
17:Siderite
18:Hole
19:Barite

Figure 3C.8: Crimson F-81 6450m site 4. (Table 3C.1). Corundum (12) is likely a contaminant.



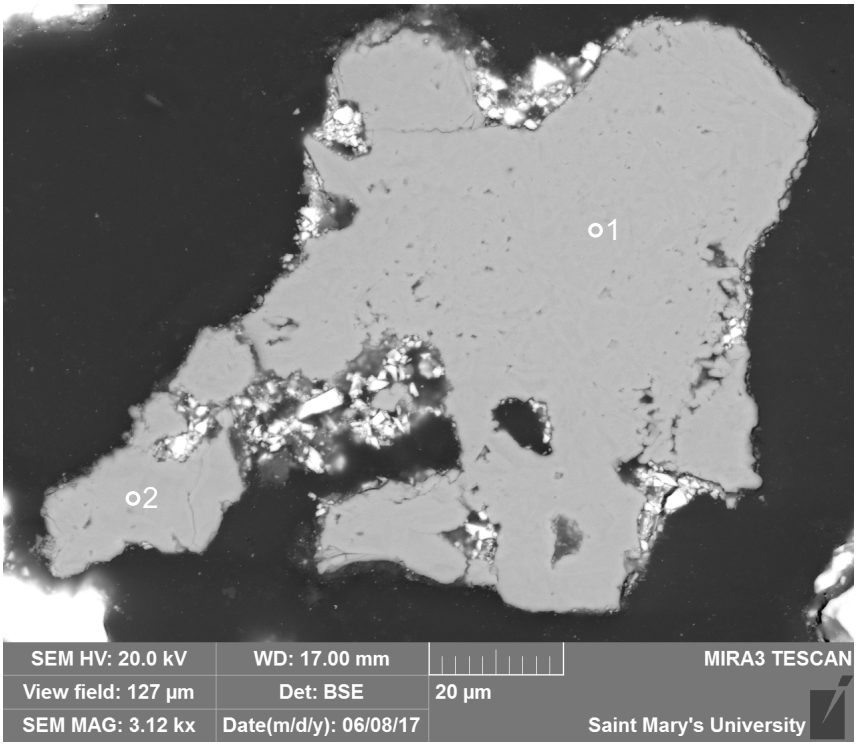
1:Chlorite
2:Feohy +
3:Mnho (Mn + Ba)
4:Tremolite
5:Pyrite
6:Pyrite
7:Feohy +
8:Feohy +
9:Pyrite
10:Quartz
11:Feohy +
12:Quartz
13:Diopside
14:Feohy +
15:Chlorite +
16:Feohy +
17:Quartz
18:Tourmaline
19:Siderite +
20:Siderite +

Figure 3C.9: Crimson F-81 6450m site 5. (Table 3C.1). Chlorite (1) is possibly detrital.



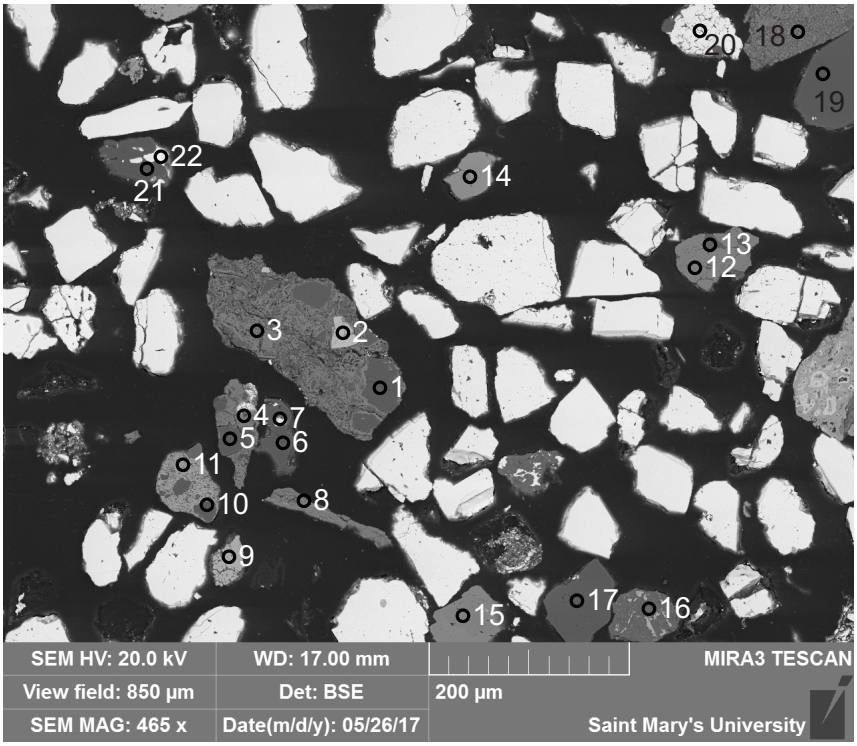
1:Tremolite
2:Quartz
3:K-feldspar
4:Barite +
5:Siderite
6:Diopside
7:Feohy +
8:Feohy (Fig. 11)
9:Feohy +
10:Quartz
11:Quartz
12:Quartz
13:Quartz
14:Barite
15:K-feldspar
16:Muscovite
17:Feohy +
18:Pyrite
19:Pyrite

Figure 3C.10: Crimson F-81 6450m site 6. (Table 3C.1)



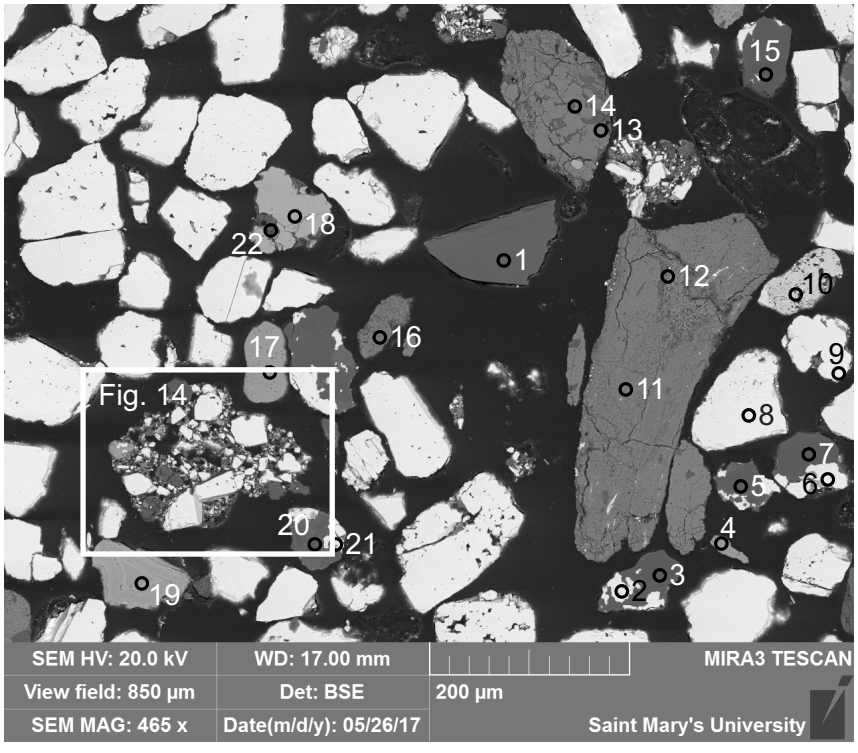
1:Feohy
2:Feohy

Figure 3C.11: Crimson F-81 6450m site 6.1. (Table 3C.2).
Siderite cemented mudstone.



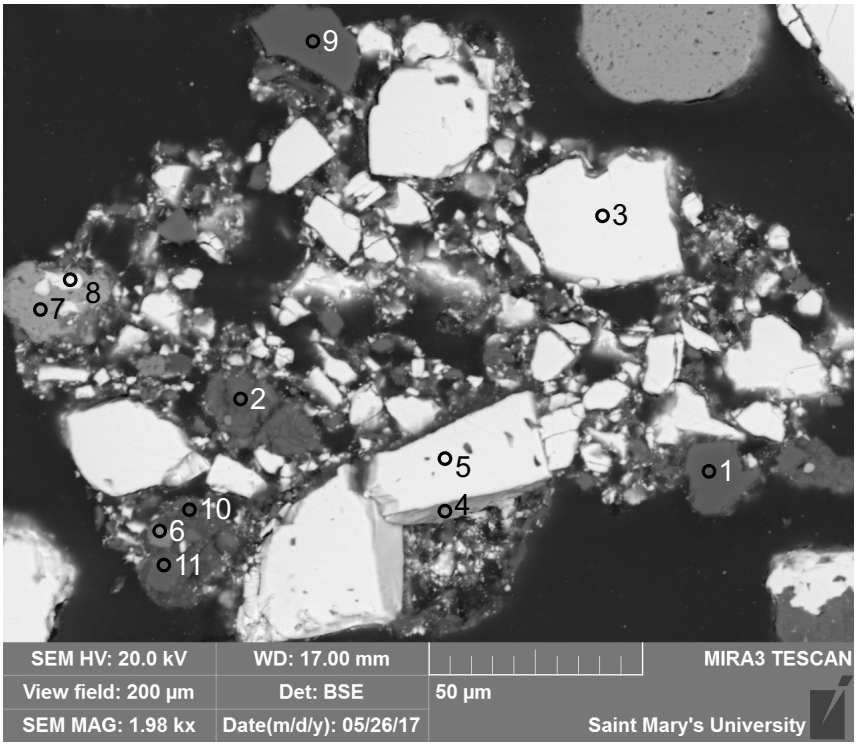
1:Albite
2:Zircon
3:Siderite +
4:Siderite +
5:Albite
6:Quartz
7:Barite
8:Siderite +
9:Pyrite
10:Albite
11:Feohy +
12:Siderite
13:Albite
14:Feohy +
15:Siderite
16:Biotite
17:Quartz
18:Chlorite +
19:Quartz
20:Barite
21:Quartz
22:Barite

Figure 3C.12: Crimson F-81 6450m site 7. (Table 3C.1). Albite (5,10,13) appears to be surrounded and replaced by siderite (4,12) and Feohy (11).



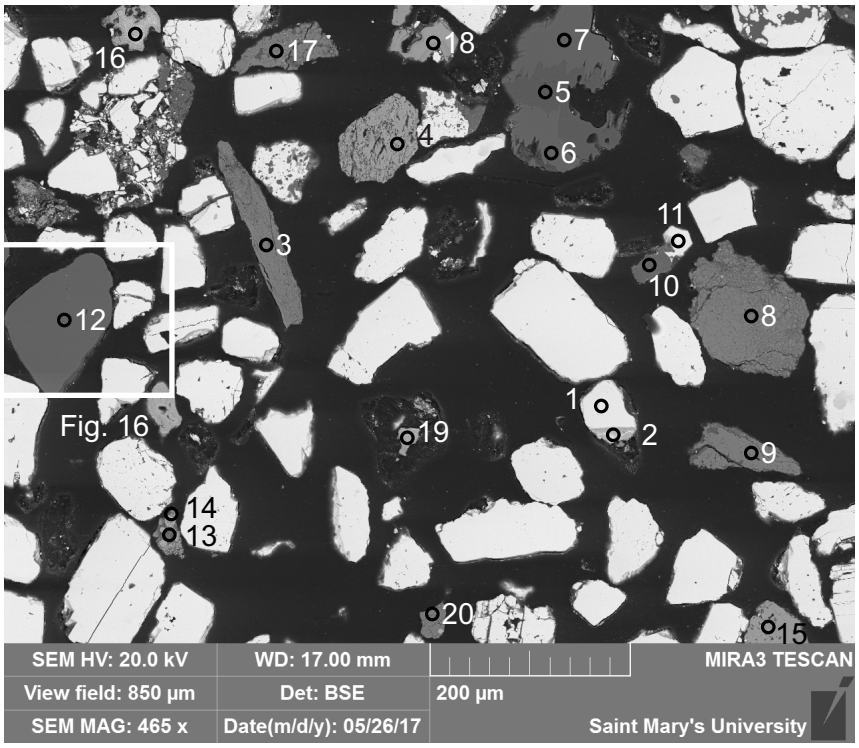
1:Tremolite
2:Barite
3:Quartz
4:Feohy +
5:Quartz
6:Barite
7:Quartz
8:Barite
9:Barite
10:Covelite
11:Siderite +
12:Bad Analysis
13:Albite
14:Siderite +
15:Quartz
16:Siderite +
17:Feohy +
18:Pyrite
19:Feohy +
20:K-feldspar
21:Barite
22:Illite

Figure 3C.13: Crimson F-81 6450m site 8. (Table 3C.1). A cutting made up of diagenetic illite (22) and pyrite (18) in which pyrite appears to postdate illite.



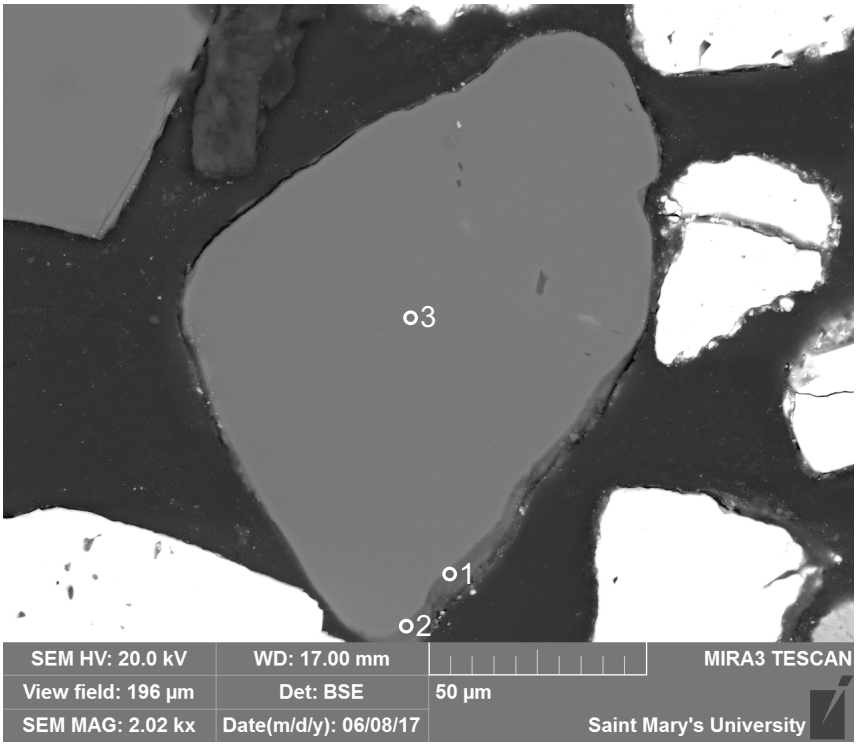
1:Quartz
2:Illite +
3:Barite
4:Hole
5:Barite
6:Siderite +
7:Feohy
8:Barite
9:Quartz
10:Muscovite +
11:Quartz

Figure 3C.14: Crimson F-81 6450m site 8.1. (Table 3C.1). Barite drilling mud.



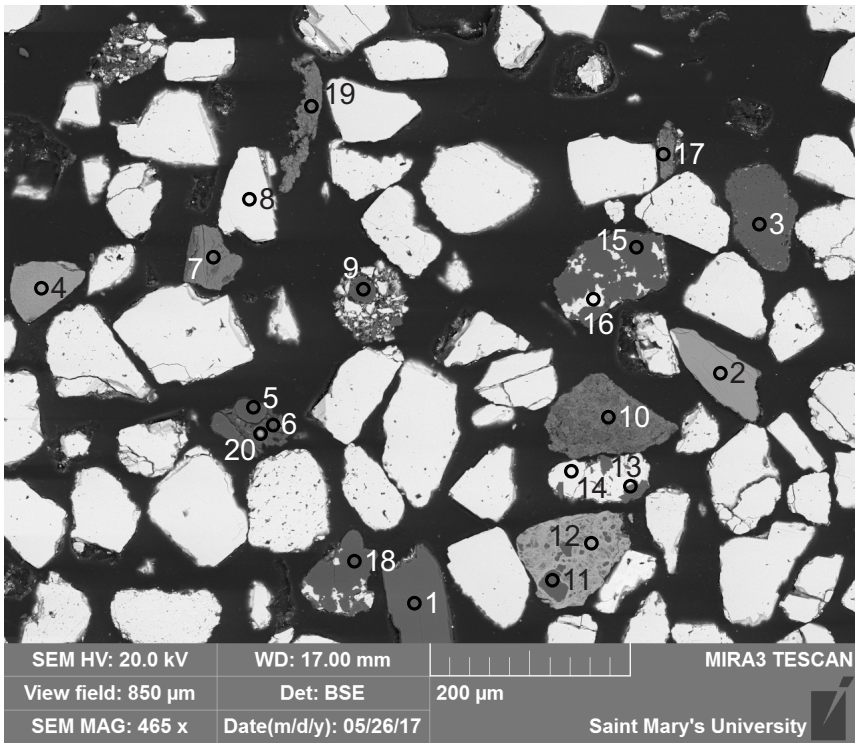
1:Barite
2:Hole
3:Siderite +
4:Feohy +
5:Quartz
6:Tremolite
7:Tremolite
8:Chlorite +
9:Siderite +
10:K-feldspar
11:Barite
12:Tourmaline (Fig. 16)
13:Chlorite
14:Pyrite
15:Feohy +
16:Mnho (Mn + Fe + Ba)
17:Ca-Siderite +
18:Feohy +
19:Feohy
20:Siderite +

Figure 3C.15: Crimson F-81 6450m site 9. (Table 3C.1). A cutting made up of K-feldspar (10) and barite (11) in which barite appears to be diagenetic and replacing K-feldspar.



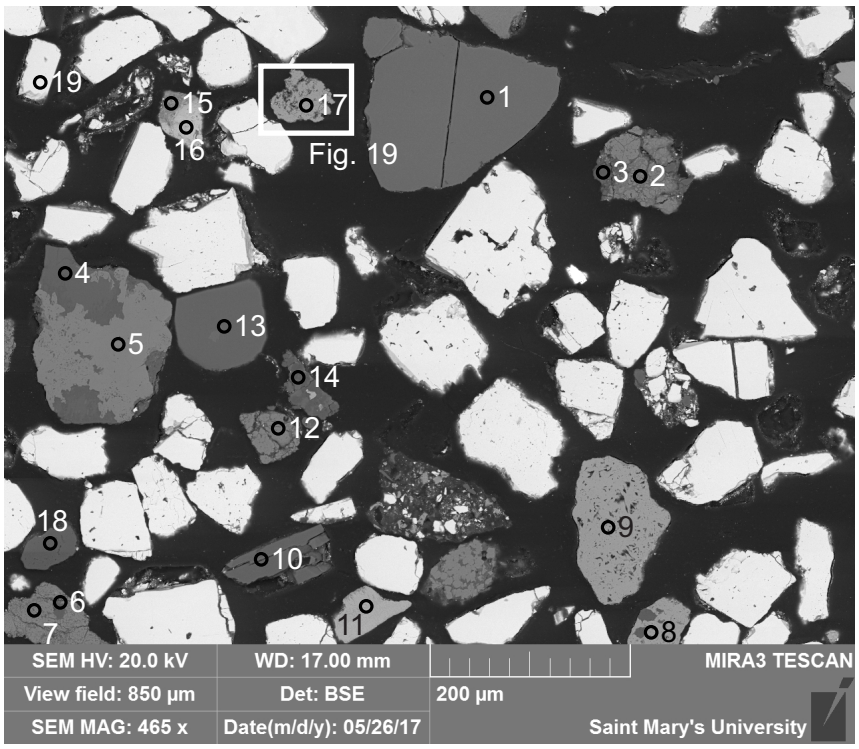
1:Bad Analysis
2:Bad Analysis
3:Tourmaline

Figure 3C.16: Crimson F-81 6450m site 9.1. (Table 3C.2). Detrital tourmaline grain.



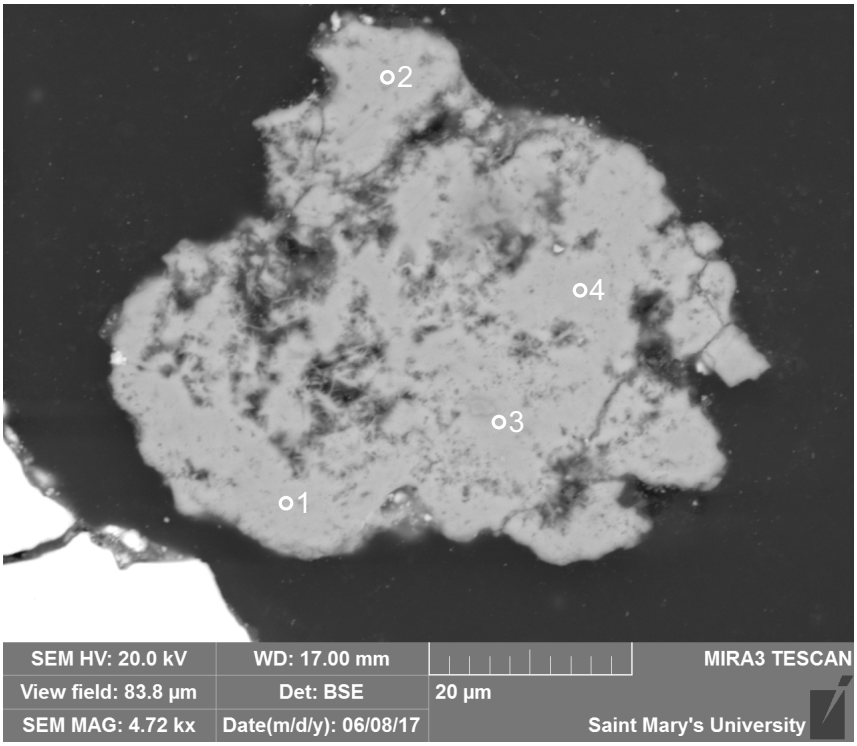
1:Tremolite
2:Feohy +
3:Dolomite
4:Mnohy (Mn + Cu + Ba)
5:Quartz
6:Quartz +
7:Siderite +
8:Barite
9:Quartz
10:Mix
11:Quartz
12:Mnohy (Mn + Ba + S)
13:Muscovite
14:Barite
15:Quartz
16:Barite
17:Siderite + Chlorite
18:Quartz
19:Siderite +
20:Pyrite

Figure 3C.17: Crimson F-81 6450m site 10. (Table 3C.1)



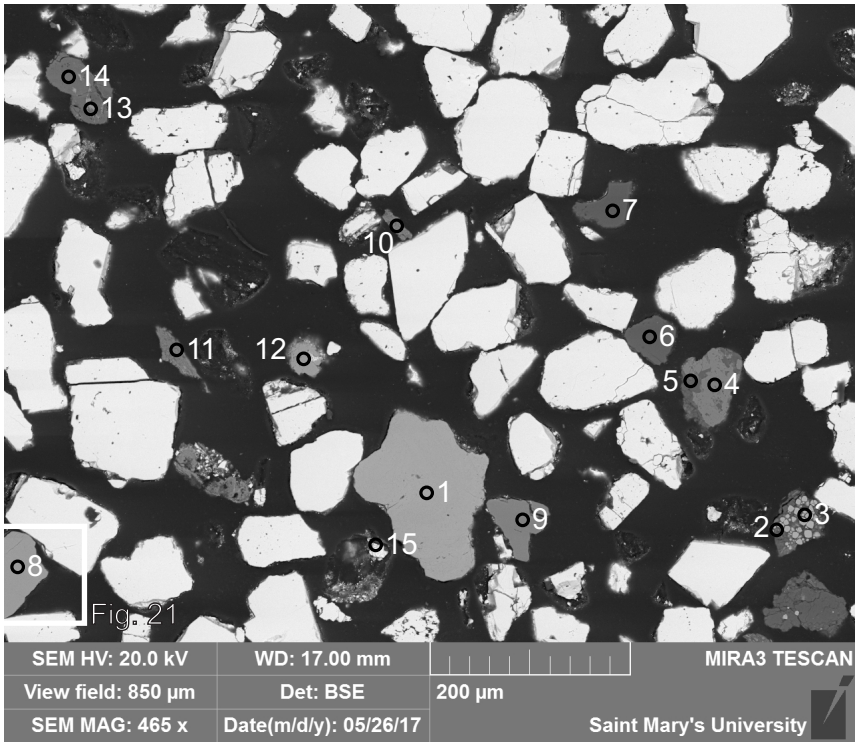
1:F-Calcite
2:Chlorite +
3:Quartz
4:Oligoclase
5:Siderite +
6:Quartz
7:Siderite + Chlorite +
8:Feohy +
9:Feohy +
10:Tremolite
11:Feohy
12:Siderite +
13:Tremolite
14:K-feldspar +
15:Chlorite +
16:Mnohy (Mn + Fe + Pb)
17:Feohy + (Fig. 19)
18:Quartz
19:Barite

Figure 3C.18: Crimson F-81 6450m site 11. (Table 3C.1). ?Detrital tremolite grains (10,13). Siderite (5) is surrounding and partly replacing oligoclase (4).



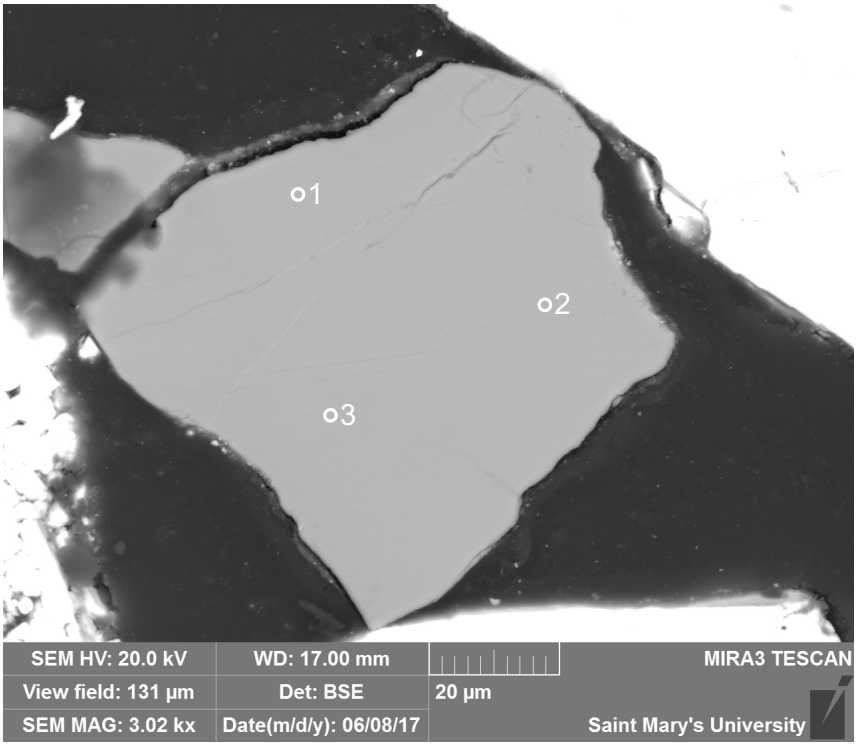
1:Feohy +
2:Feohy +
3:Feohy +
4:Feohy +

Figure 3C.19: Crimson F-81 6450m site 11.1. (Table 3C.2). Contaminant Feohy.



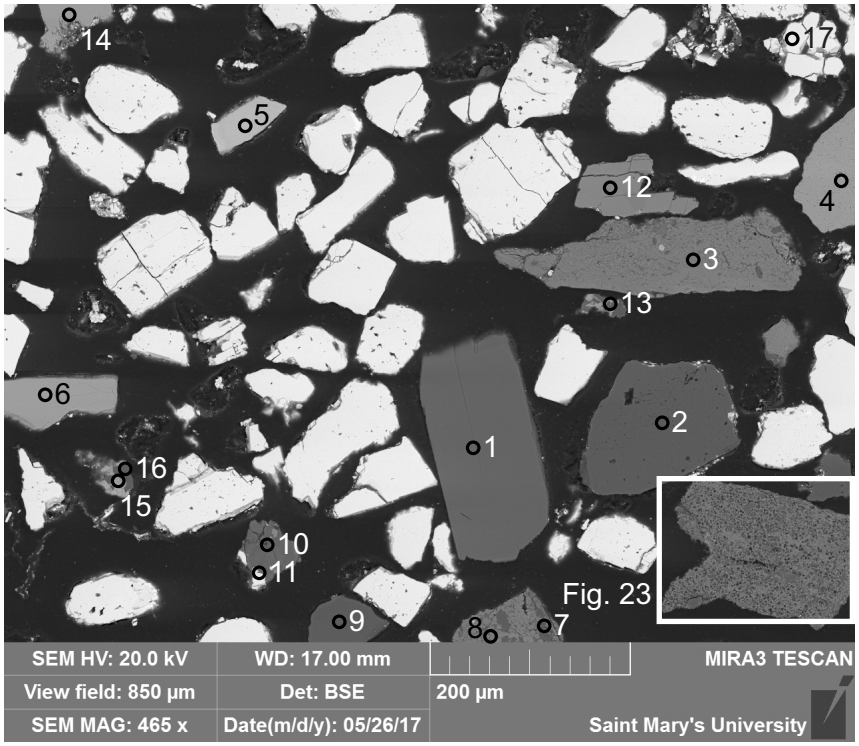
1:Feohy +
2:Albite +
3:Pyrite
4:Mix
5:Albite
6:Albite
7:Quartz
8:Feohy + (Fig. 21)
9:Siderite
10:Siderite + Chlorite
11:Siderite + Chlorite
12:Feohy
13:Ca-Siderite +
14:Calcite
15:Barite

Figure 3C.20: Crimson F-81 6450m site 12. (Table 3C.1). Pyrite (3) appears to be either replacing or filling dissolution voids in albite (2).



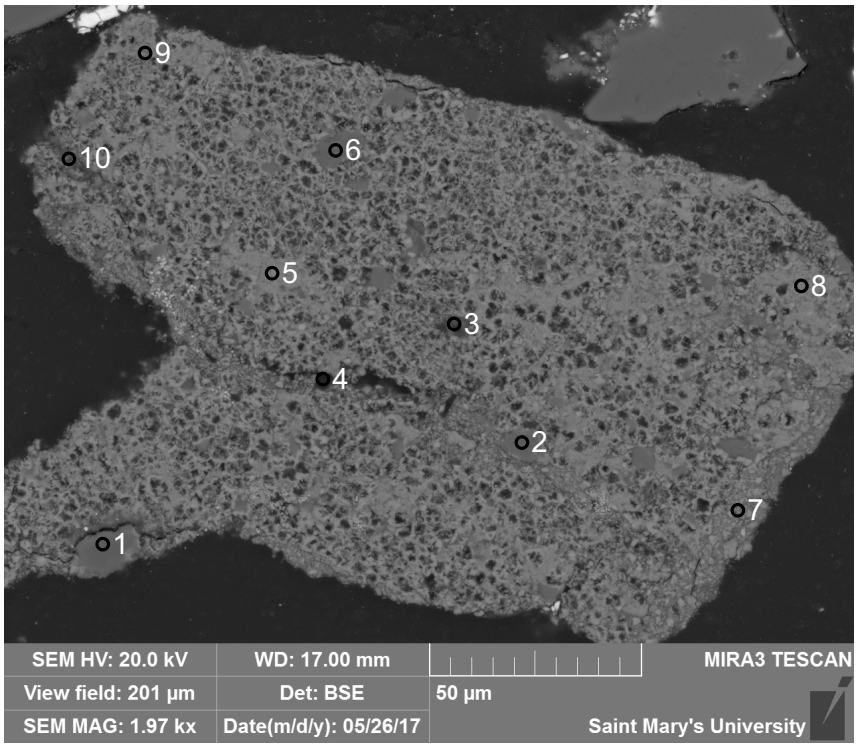
1:Feohy +
2:Feohy +
3:Feohy +

Figure 3C.21: Crimson F-81 6450m site 12.1. (Table 3C.2). Detrital Feohy grain.



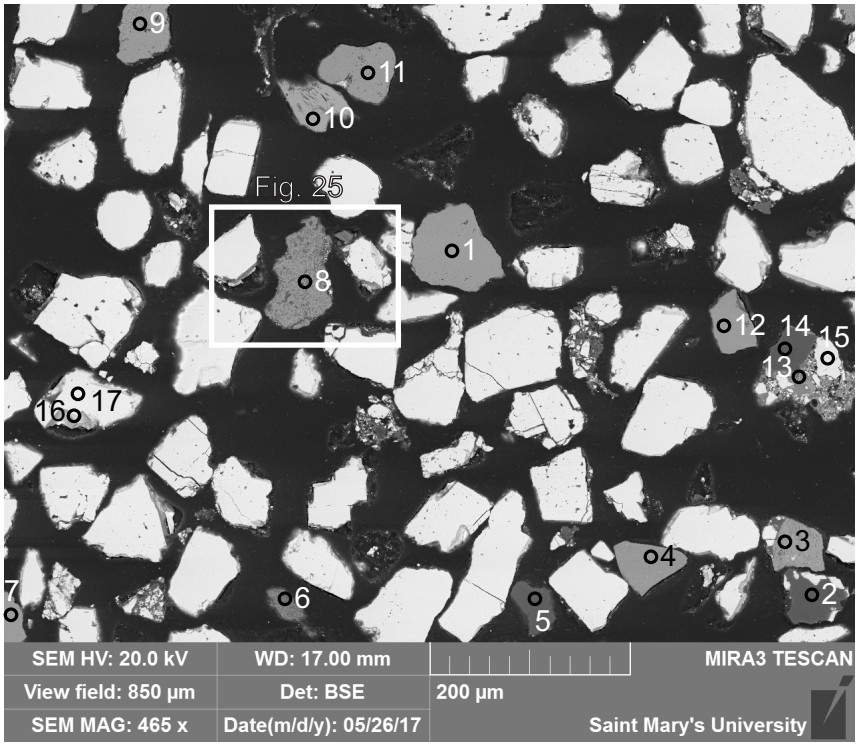
1:Tremolite
2:Quartz
3:Siderite + Apatite +
4:Feohy +
5:Mnohy (Mn + Ba + Pb)
6:Feohy +
7:Albite
8:Siderite + Chlorite
9:Quartz
10:K-feldspar +
11:Barite
12:Siderite
13:Quartz
14:Smithsonite
15:Feohy + Chlorite
16:Quartz
17:Barite

Figure 3C.22: Crimson F-81 6450m site 13. (Table 3C.1). Smithsonite (14) and tremolite (1) are likely contaminants.



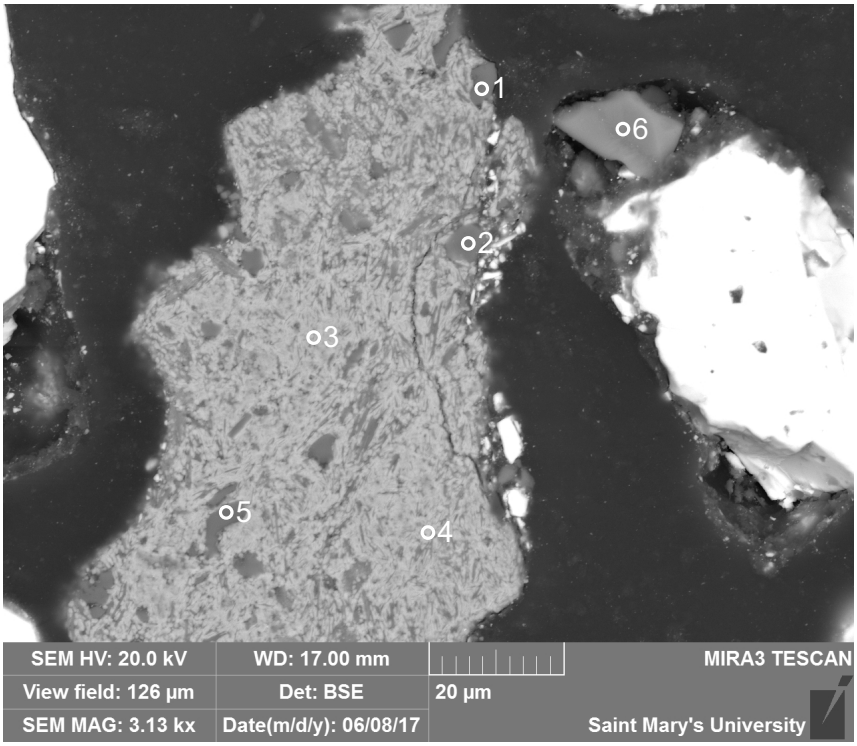
1:Quartz
2:Quartz +
3:Bad Analysis
4:Bad Analysis
5:Apatite +
6:Quartz +
7:Siderite +
8:Apatite +
9:Apatite +
10:Siderite + Hole

Figure 3C.23: Crimson F-81 6450m site 13.1. (Table 3C.1). Cutting made up of quartz (1,21), siderite (7), and apatite (5,8,9). Mudstone.



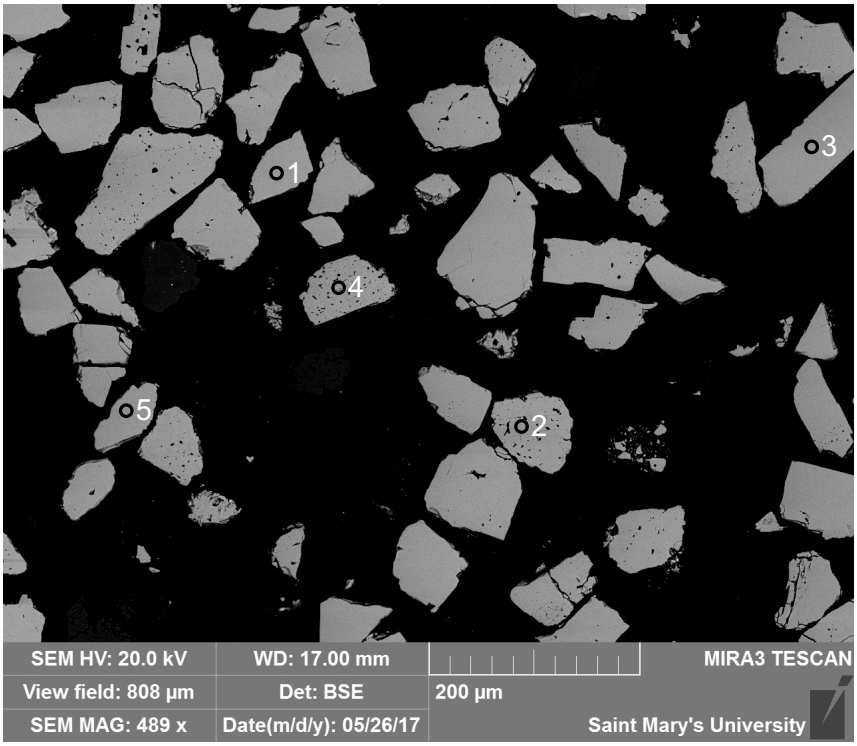
1:Feohy +
2:Quartz
3:Feohy +
4:Mix
5:Quartz
6:Mix
7:Feohy +
8:Chlorite +
(Fig. 25)
9:Mnohy (Mn + Ba + F)
10:Feohy
11:Siderite +
12:Siderite +
13:Siderite +
14:Quartz
15:Barite
16:Barite
17:Barite

Figure 3C.24: Crimson F-81 6450m site 14. (Table 3C.1)



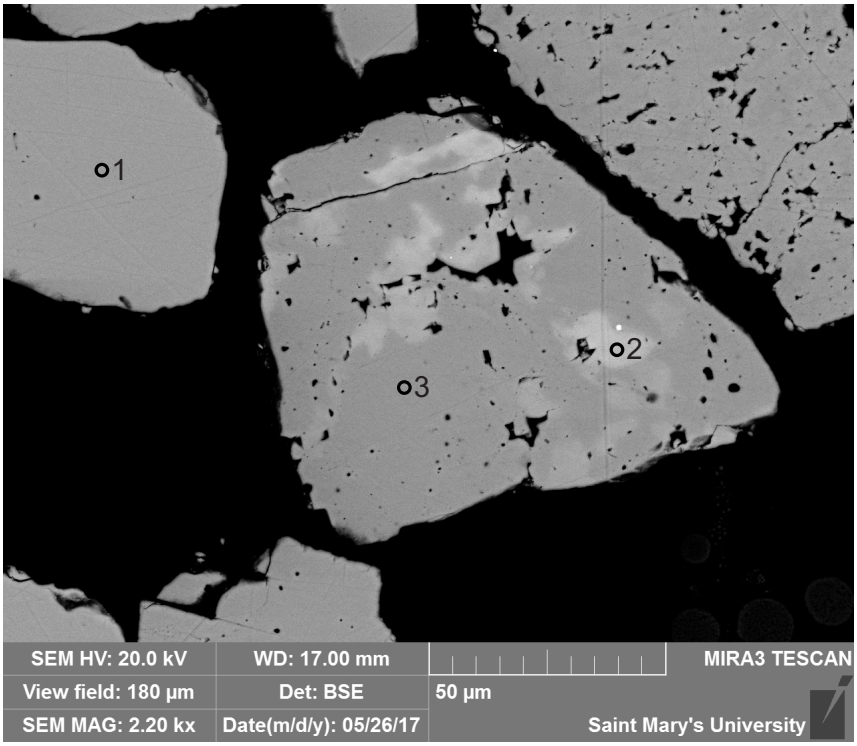
1:Quartz +
2:Quartz +
3:Feohy +
4:Feohy +
5:Quartz +
6:Quartz

Figure 3C.25: Crimson F-81 6450m site 14.1. (Table 3C.2). A cutting of mudstone cemented by Feohy (3,4) with detrital quartz (1,2,5).



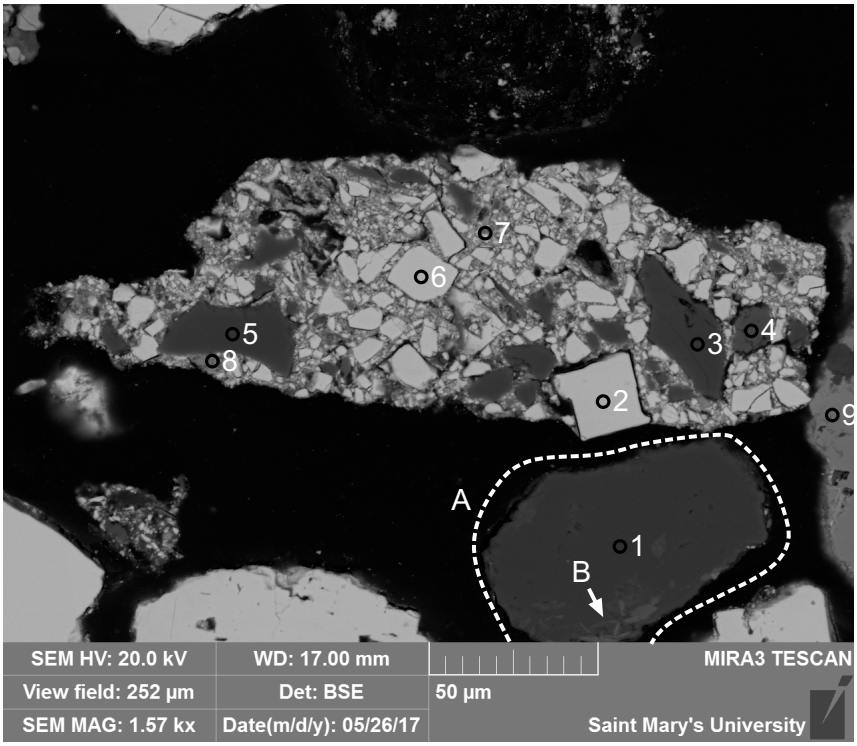
1:Barite
2:Barite
3:Barite
4:Barite
5:Barite

Figure 3C.26: Crimson F-81 6450m site 15. (Table 3C.1). An image of barite (1-5) sourced from drilling mud at low brightness.



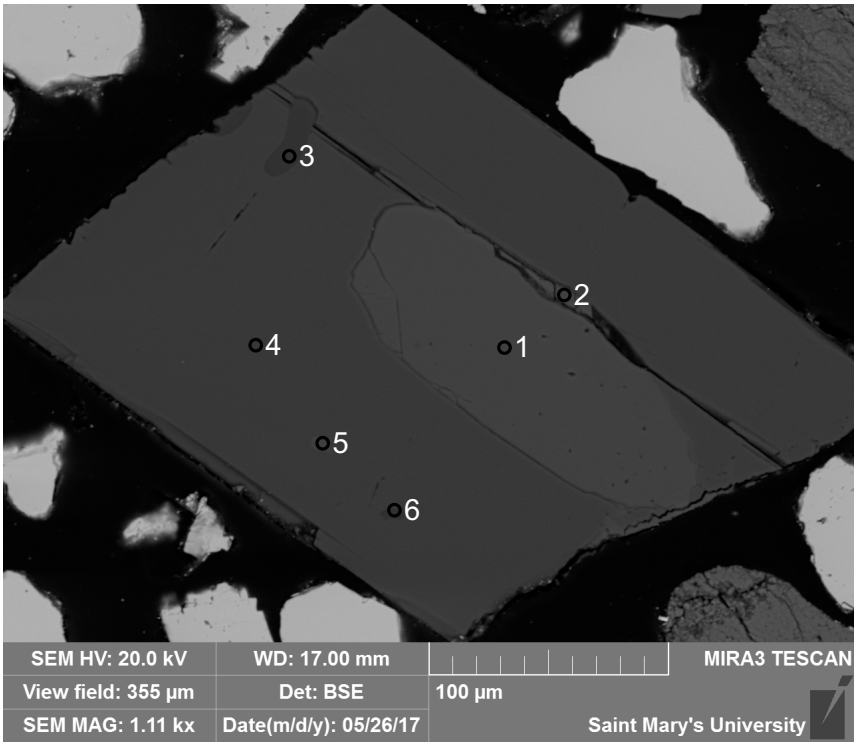
1:Barite
2:Barite
3:Barite

Figure 3C.27: Crimson F-81 6450m site 16. (Table 3C.1). A grain of barite (2,3) with dark patches containing Sr (~2.5 wt%).



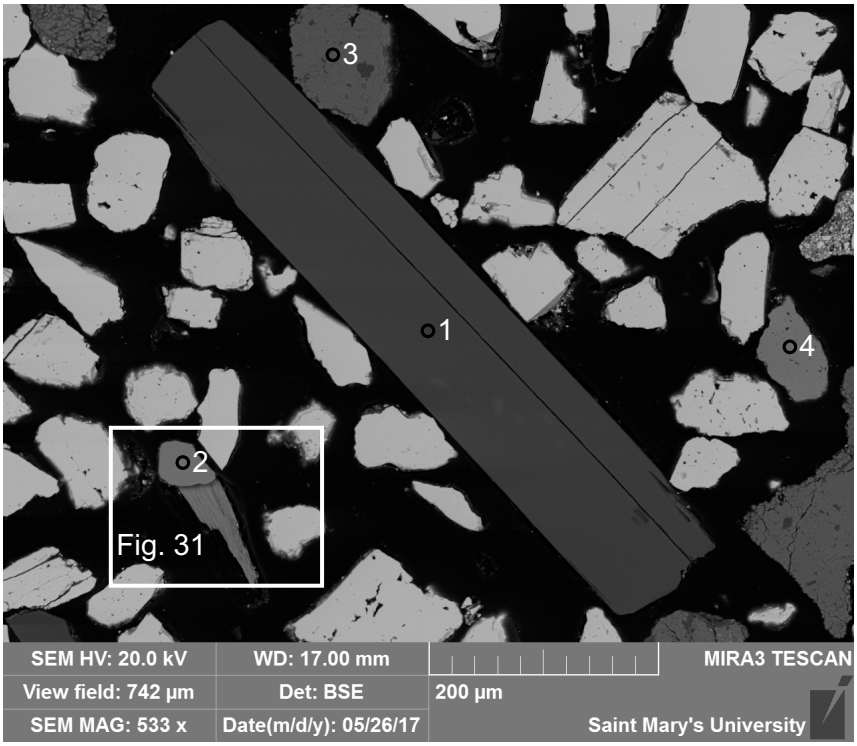
1:Quartz
2:Barite
3:Quartz
4:F-Calcite
5:Quartz
6:Barite
7:Barite +
8:Feohy + Chlorite
9:Feohy +

Figure 3C.28: Crimson F-81 6450m site 17. (Table 3C.1). A cutting of drilling mud mixed with siltstone. A lithic clast (A) made up of quartz (1) and probably muscovite (B).



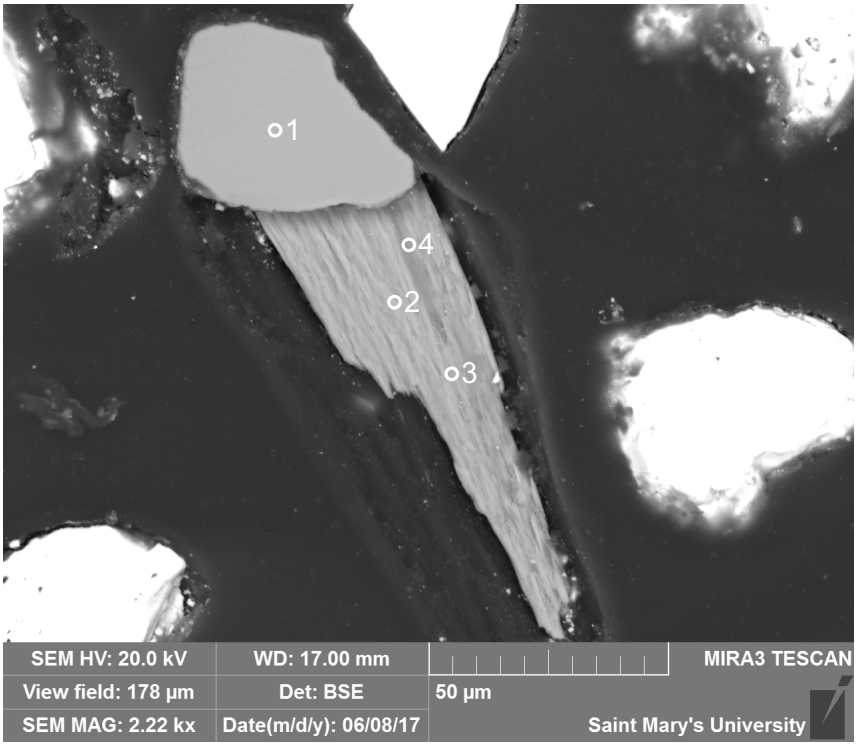
1:F-Calcite
2:F-Calcite
3:Quartz
4:Tremolite
5:Diopside
6:Quartz

Figure 3C.29: Crimson F-81 6450m site 18. (Table 3C.1). A grain of tremolite (4) with inclusions of quartz (3,6) and diopside (5) either altering to form F-calcite (1,2) or with F-calcite filling a dissolution void. This grain is likely a contaminant.



1:Tremolite
2:Feohy + (Fig. 31)
3:Siderite +
4:Feohy +

Figure 3C.30: Crimson F-81 6450m site 19. (Table 3C.1). A large grain of tremolite (1) which is likely a contaminant.



1:Feohy +
2:Feohy +
3:Feohy +
4:Feohy

Figure 3C.31: Crimson F-81 6450m site 19.1. (Table 3C.2). Feohy (1-4) appears to be a contaminant.

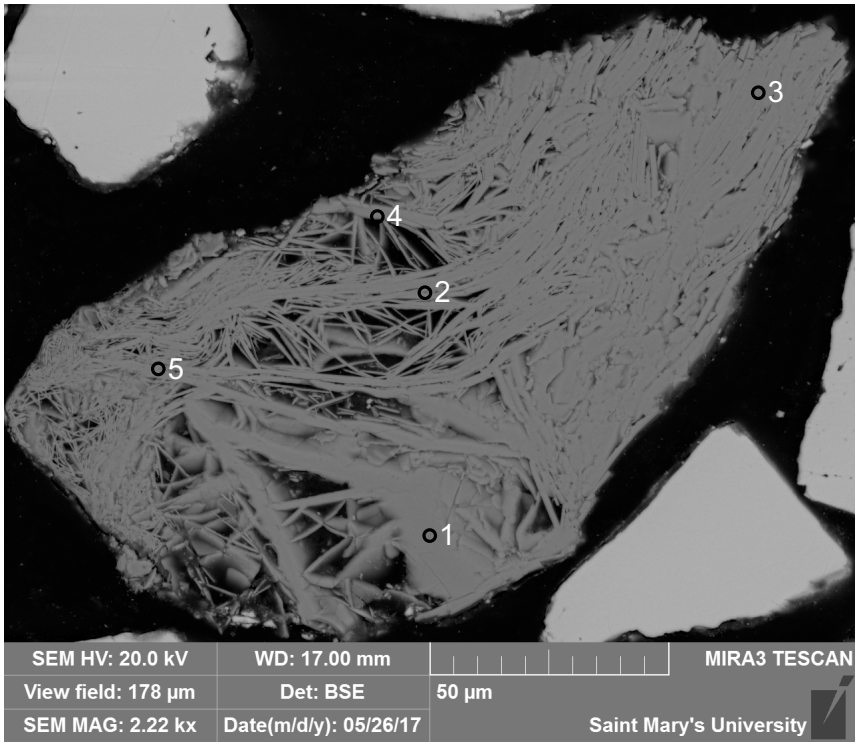


Figure 3C.32: Crimson F-81 6450m site 20. (Table 3C.1). Contaminant.

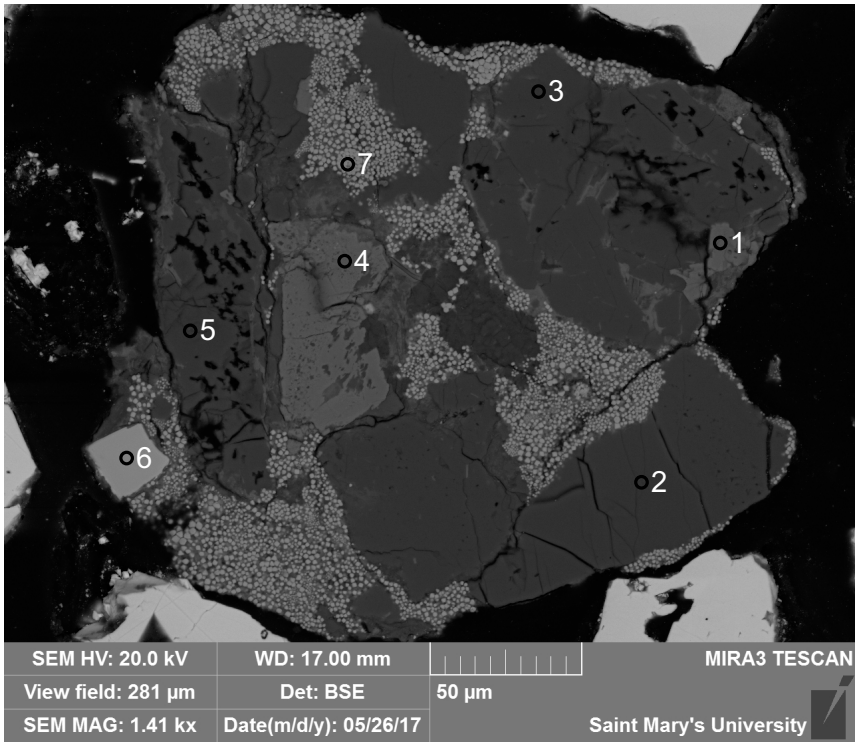


Figure 3C.33: Crimson F-81 6450m site 21. (Table 3C.1). Cutting made up of quartz (2,3), albite (5), zircon (6) cemented with siderite (4) and pyrite (7). Sandstone.

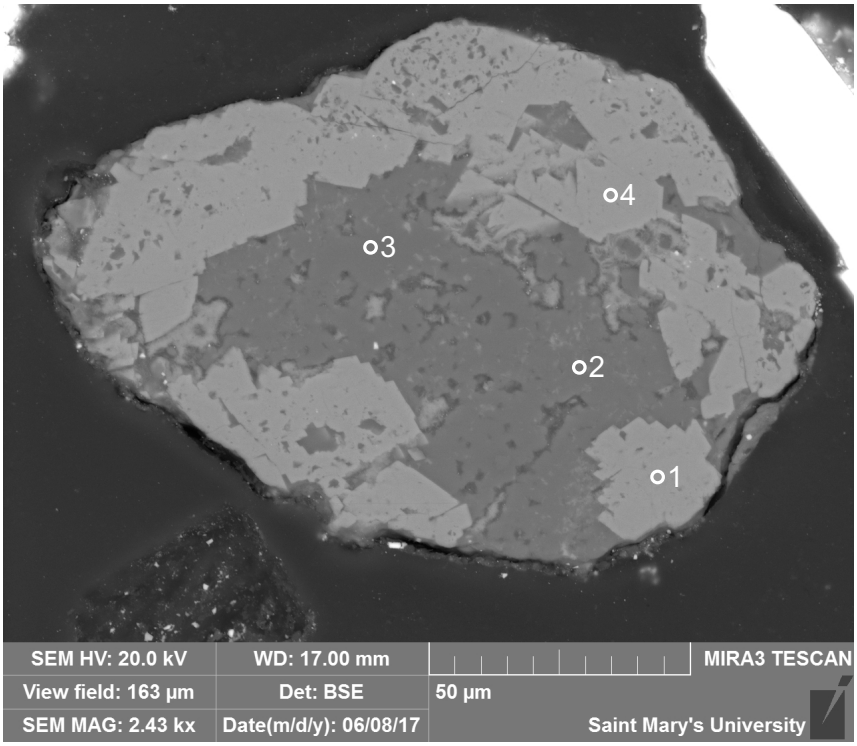


Figure 3C.34: Crimson F-81 6450m site 22. (Table 3C.2). Detrital K-feldspar (2,3) partly replaced by siderite (1,4).

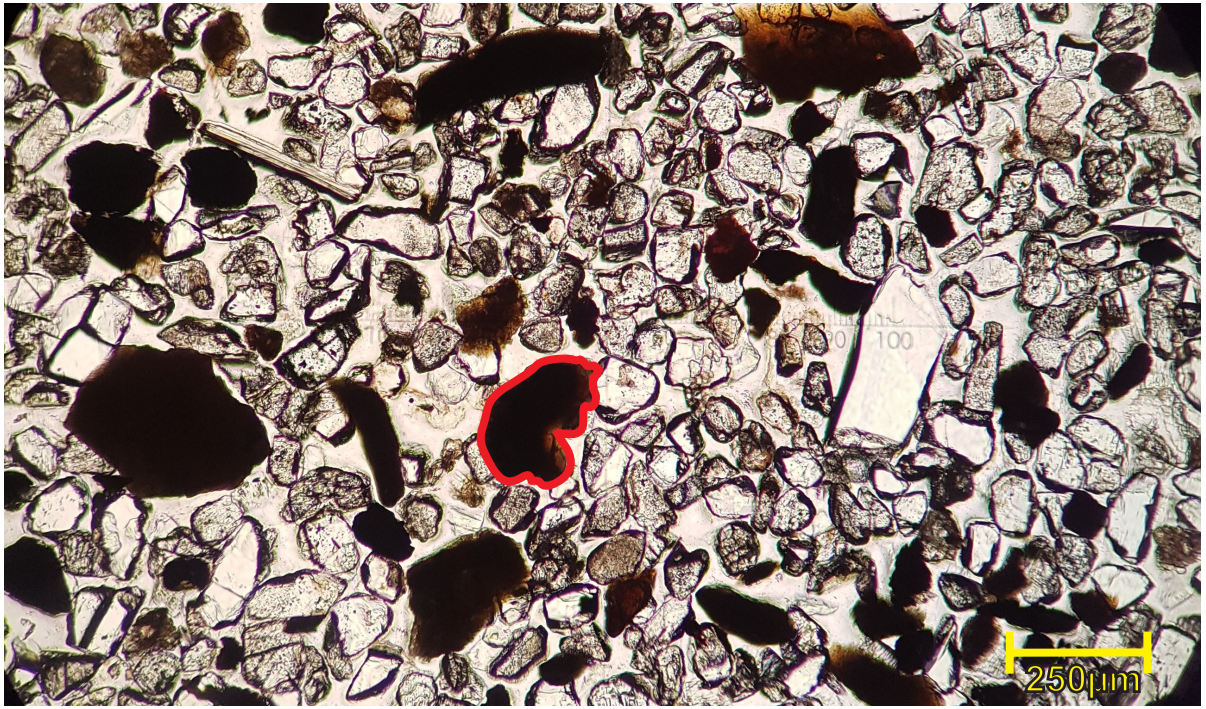


Figure 3C.35. Microphotograph of Fig. 3C.2. Sample 6450 site 1. Transmitted light, ppl, 10x. Outlined in red, Feohy rich siderite can be seen.

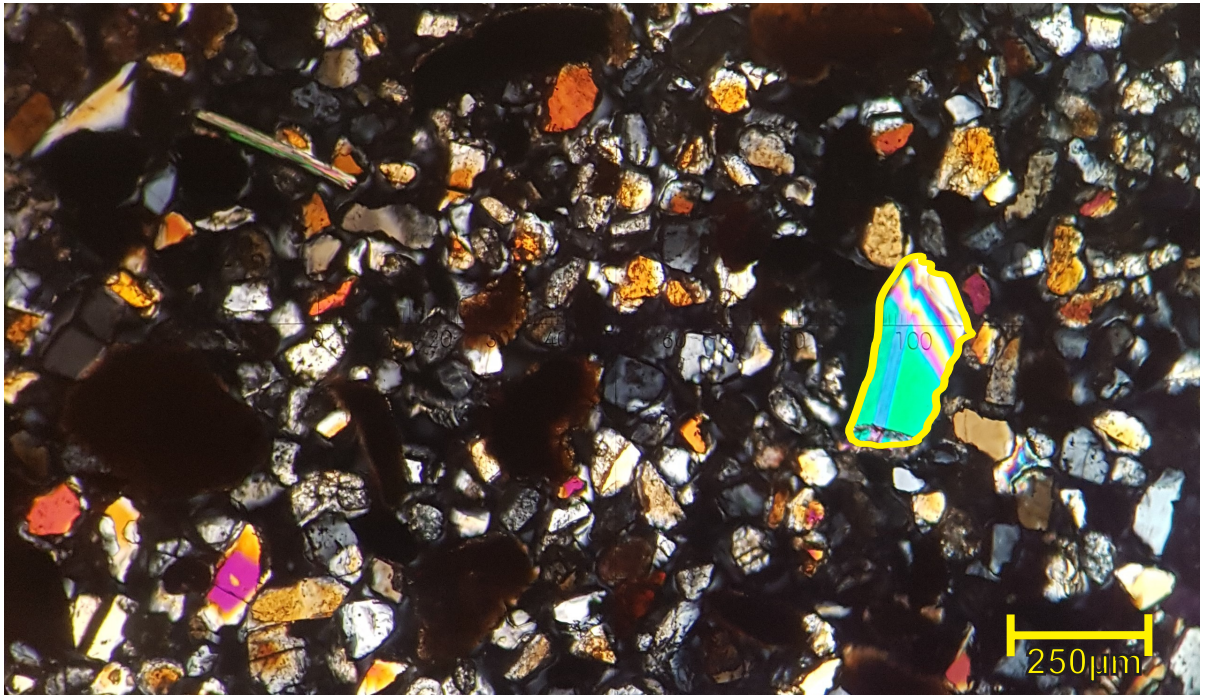


Figure 3C.36: Microphotograph of Fig. 3C.2. Sample 6450 site 1. Transmitted light, xpl, 10x. The grain of high birefringence with yellow outline is tremolite.



Figure 3C.37: Microphotograph of Fig. 3C.6. Sample 6450 site 3. Transmitted light, ppl, 10x. Outlined in red, a large grain of Tremolite with inclusions.

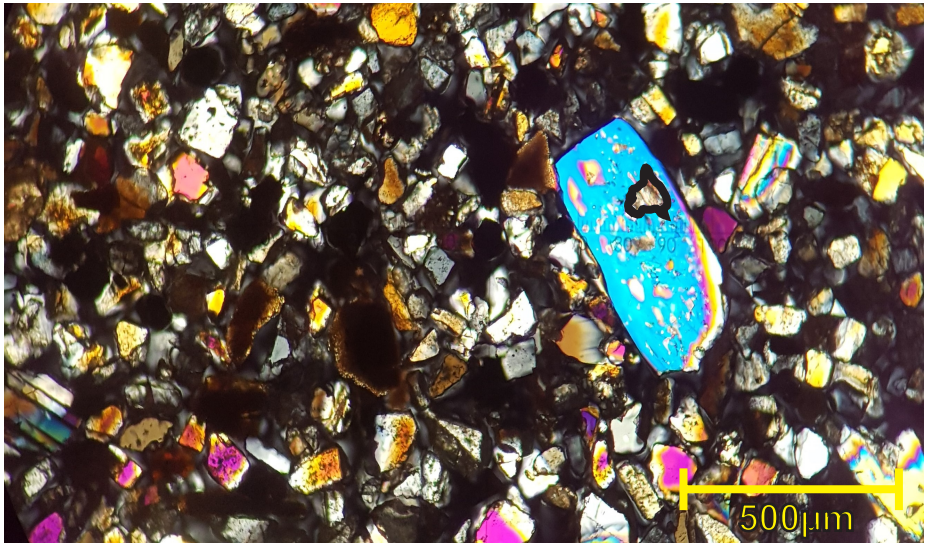


Figure 3C.38: Microphotograph of Fig. 3C.6. Sample 6450 site 3. Transmitted light, xpl, 10x. High birefringence tremolite, with inclusion in black outline.

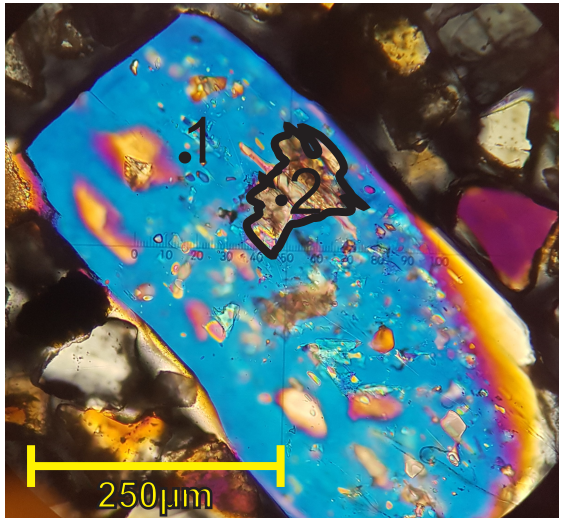
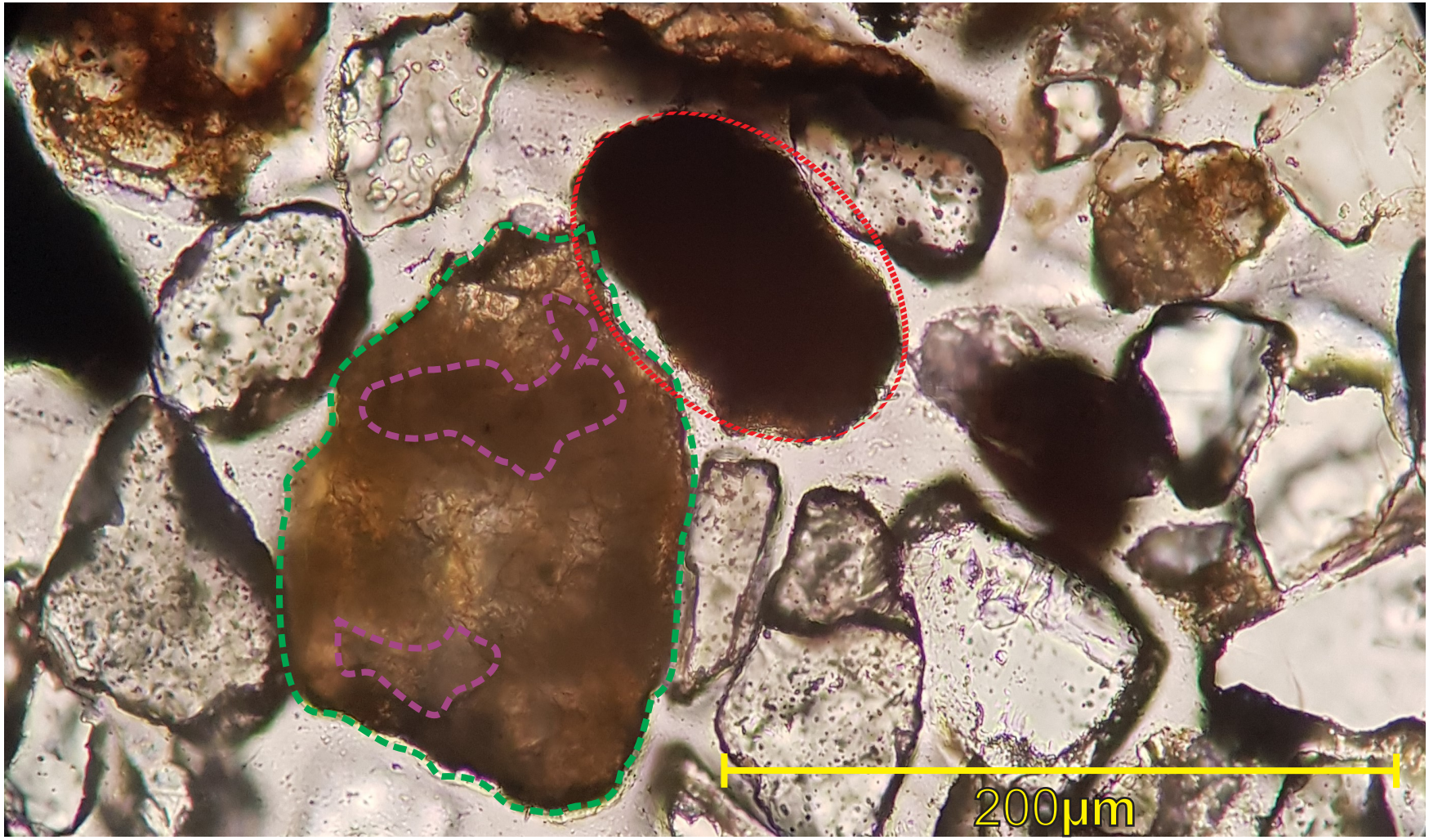


Figure 3C.39: Microphotograph of Fig. 3C.6. Sample 6450 site 3. Transmitted light, xpl, 40x. Zoom in on Tremolite grain. The point analysis corresponding to this grain is labelled according to the BSE image analysis.



3C.40: Microphotograph of Fig. 3C.8. Sample 6450 site 4. Transmitted light, ppl, 40x. The grain outlined by red ellipse is Corundum. The mineral with green outline is siderite with the purple outlined areas being mixtures of albite and siderite.

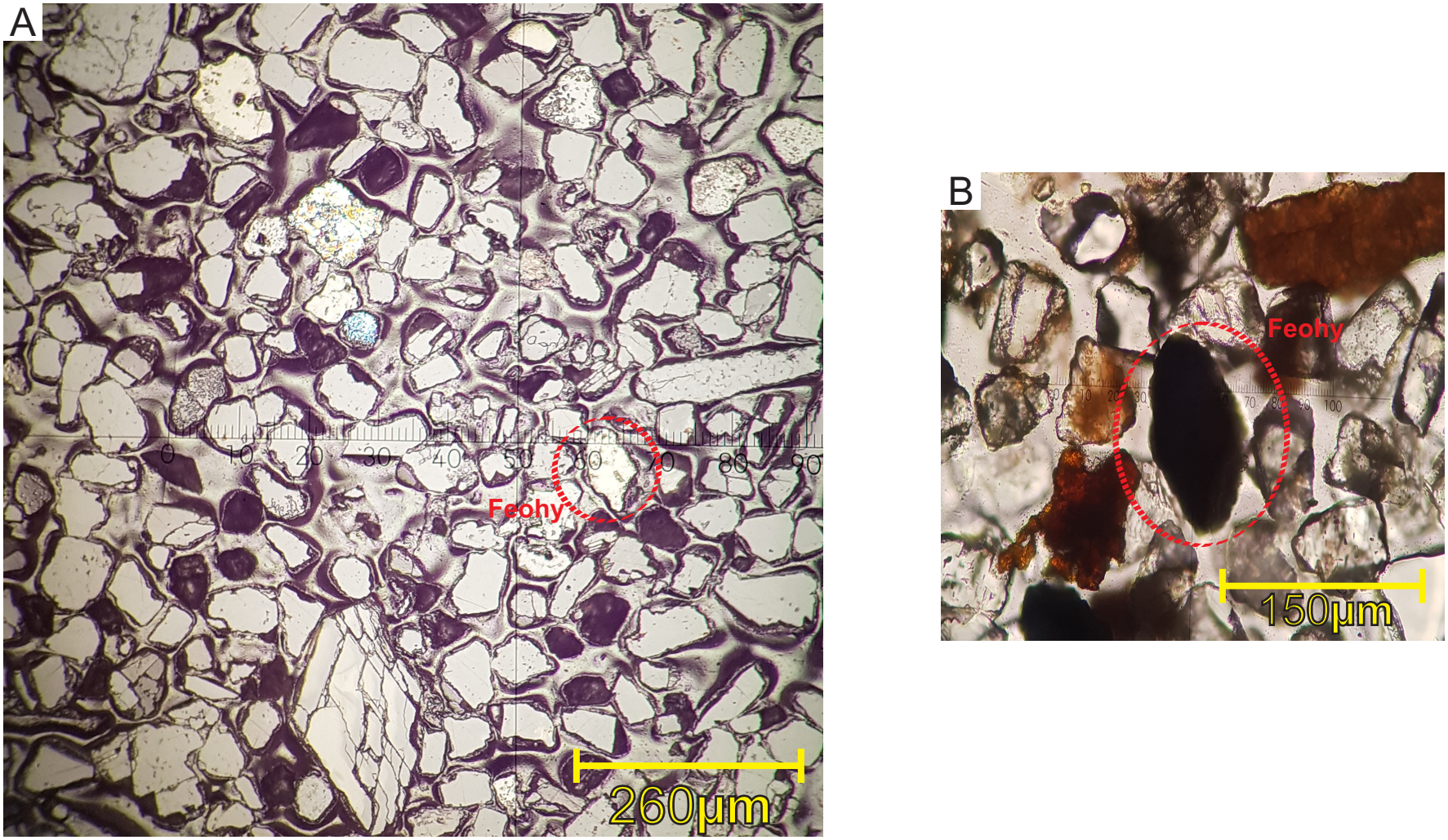


Figure 3C.41: Microphotographs of Fig. 3C.10 Sample 6450 site 6. **A:** Showing a grain of Feohy (outlined by red circle) in Reflected light, ppl, 10x. **B:** Transmitted light, ppl, 40x where it can be seen to be opaque.

Table 3C.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6450 depth.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Sc_2O_3	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	BaO	HfO_2	WO_3	PbO	Total	Actual Total
1	1	Sd +	2.79		1.57	37.70	0.51	5.45	6.98		0.39	0.60																	56	65
1	2	Qz	99.49			0.51																							100	124
1	3	Feohy + Chl	9.54		6.06	82.47					1.07														0.86				100	94
1	4	Di	57.17			0.50		18.48	23.85																				100	114
1	5	Chl	26.62		20.98	26.64	0.42	10.34																					85	99
1	6	Qz	100.00																										100	119
1	7	Feohy +	4.59			93.50	1.42		0.49																				100	78
1	8	Sd +	0.72			40.12	0.41	5.25	8.80			0.71																	56	62
1	9	Sd +	0.44			41.28	0.36	4.37	7.78			1.76																	56	63
1	10	Qz	96.01		2.69	0.33					0.97																		100	118
1	11	Sd +	3.62		2.02	38.40	0.60	6.33	4.08		0.26	0.69																	56	63
1	12	Qz	100.00																										100	118
1	13	Qz	100.00																										100	117
1	14	Brt											36.49					-0.04							63.55				100	112
1	15	Qz	100.00																										100	116
1	16	Cv											51.99							48.01									100	179
1	17	Qz	98.50		1.16						0.34																		100	115
1	18	Ap +	18.39		10.89	33.22	0.70	2.94	16.54	0.42	1.97	14.92																	100	82
1.1	1	Qz	100.00																										100	119
1.1	2	Cv											52.31							47.69									100	190
1.1	3	Brt											36.81					-0.03							63.22				100	115
1.1	4	BA*	9.71		68.18	0.51			4.64	1.25			3.07	10.76	0.26										1.62				100	69
1.1	5	BA*	28.76		37.89	2.89		0.83	5.11	1.63			7.71	6.91	0.60										7.67				100	30
1.1	6	BA*	19.09		30.73	0.58		0.55	3.90	3.77	0.34		3.77	32.20	0.34										4.72				100	88
1.1	7	Chl +	23.18		17.69	39.63		0.51	0.53		2.59														0.88				85	89
1.1	8	Qz	99.57			0.43																							100	119
1.1	9	Kfs	57.47		6.69	2.43	3.85	2.34	2.28	2.05	15.46										0.56				6.87				100	108
1.1	10	Mix	42.88	0.42	15.88	3.34	6.23	7.13	6.09	0.42	17.20										0.42								100	108
2	1	Feohy +	4.66			95.02			0.32																				100	79
2	2	Feohy +				94.74	1.87		2.48																0.91				100	77
2	3	Mag				100.00																							100	91
2	4	Qz +	95.34		3.17	0.91		0.36			0.22																		100	113
2	5	Py				28.40	0.21			0.34	0.10		70.95																100	221
2	6	Mix	19.88		23.87	16.42	24.70	0.49	3.12		1.91			5.48	0.22										1.31			2.60	100	87
2	7	Mix	1.70		15.91	17.79	44.12		4.64					3.34	0.65										3.19			8.67	100	83
2	8	Feohy	0.77			99.23																							100	88
2	9	Qz	100.00																										100	110
2	10	Qz	100.00																										100	117
2	11	Brt											36.40					0.03					1.02		62.55				100	112
2	12	Feohy +	4.27		0.66	93.13	0.85	0.71	0.38																				100	72
2	13	Sd +	13.36		2.83	68.45	0.79	8.38	5.19	1.00																			100	66
2	14	Mnohy (Mn + Fe + Al)	1.51		25.95	16.62	46.87		0.54					4.09						1.45	0.58				2.39				100	79
2	15	F-Cal				2.74	0.44	0.48	40.04					12.31															56	72
2	16	Py				28.62			0.39				70.99																100	210
2	17	Mix	54.94		0.82	8.91			15.41				19.92																100	120
2	18	Sd +	2.00		0.92	38.42	0.48	7.14	5.28	0.36	0.16	0.53													0.71				56	63
2.1	1	Mnohy (Mn + Al + Ba + F)	1.14		13.65		61.54		1.91					7.29	0.22					0.79					13.46				100	86
2.1	2	Mnohy (Mn + Al + Ba + F)	1.03		18.27		59.16		1.55	0.68				7.61						1.67					10.03				100	86
2.1	3	Mnohy (Mn + Al + Ba + F)	1.11		15.82		60.74		2.14					7.27						1.21					11.71				100	83
2.1	4	Mnohy (Mn + Al + Ba + F)	0.92		14.83		60.72		1.94					7.79	0.25					0.68					12.87				100	88

Table 3C.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6450 depth.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Sc_2O_3	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	BaO	HfO_2	WO_3	PbO	Total	Actual Total
2.1	5	Mnohy (Mn + Al + Ba + F)	0.78		21.90		57.89		1.36					7.82					0.42	2.75					7.08				100	85
2.1	6	Mnohy (Mn + Al + Ba + F)	1.18		14.68		61.57		1.70					7.40						0.95					12.52				100	86
3	1	Tr	61.37			0.80		24.84	12.99																				100	111
3	2	Mix	44.81		12.43	5.86		33.44	3.46																				100	96
3	3	Qz	100.00																										100	117
3	4	Qz	99.20		0.62						0.18																		100	119
3	5	Tr	61.27			0.26		25.29	12.83	0.35																			100	115
3	6	Sd +	0.99		0.55	43.94	0.49	5.14	4.03			0.85																	56	60
3	7	Feohy (cont) +				96.55			2.22				1.23																100	73
3	8	Mnohy (Mn + Ba)	0.81		4.40	4.41	66.13		0.77					4.49						1.60					17.39				100	84
3	9		15.98		26.75	4.84	35.41	0.82	0.54		1.99			6.62				1.15		4.22					1.67				100	93
3	10	Sd +	3.12		0.85	50.27	0.56	0.32	0.58											0.30									56	76
3	11	Qz	99.55			0.45																							100	119
3	12	Sd +	2.02		1.38	42.32	0.26	6.28	3.52		0.22																		56	61
3	13	Sd +	16.69		8.08	57.05	0.70	9.25	6.27	1.13	0.83																		100	68
3	14	Mix	37.60	0.55	5.67	42.56	0.48	7.42	4.93		0.79																		100	73
3	15	Chl +	26.74		12.06	39.03	0.68	0.89	0.59		3.83									1.17									85	94
3	16	Qz	99.78			0.22																							100	118
3	17	Mix	63.78			33.67	2.16		0.39																				100	97
3	18	Qz	100.00																										100	114
3	19	Feohy +	4.14			93.57	0.40														1.89								100	77
3	20	Brt											34.18												65.82				100	103
4	1	Tr	61.52			0.79		24.59	13.10																				100	114
4	2	Qz	100.00																										100	121
4	3	Brt											36.62					0.03					2.11		61.24				100	117
4	4	Sd +	2.08		0.42	40.54	0.27	7.71	4.54			0.45																	56	63
4	5	Mix	31.95		9.45	26.92	0.40	3.88	25.95	0.61	0.83																		100	80
4	6	Mnohy (Mn + Fe + Al)	5.91		14.24	47.69	23.89		1.18		0.65														3.91			2.53	100	83
4	7	Qz	100.00																										100	121
4	8	Sd +				48.80	3.47	2.20	1.53																				56	59
4	9	Qz	100.00																										100	117
4	10	Qz	99.77			0.23																							100	118
4	11	Sd +	10.02		2.44	68.53	1.58	11.02	5.66	0.75																			100	63
4	12	Cm	5.03	1.10	92.19	0.79					0.89																		100	99
4	13	Ab	67.14		19.09	2.37			0.49	10.76	0.15																		100	113
4	14	Sd +	3.51		0.91	41.58	0.92	5.34	2.83		0.21	0.68																	56	64
4	15	Ab	68.58		18.41				0.20	11.53				1.28															100	117
4	16	Py	0.13			28.93			0.31				70.63																100	219
4	17	Sd	0.35			54.48	0.34		0.82																				56	71
4	18	Hole	7.20		3.18			2.18					4.19												83.25				100	6
4	19	Brt											36.62					0.07							63.31				100	115
5	1	Chl	24.98		20.14	34.83		5.05																					85	98
5	2	Feohy +	2.87			95.47	1.22		0.44																				100	79
5	3	Mnohy (Mn + Ba)					79.95			0.59															19.46				100	83
5	4	Tr	58.54			0.33		24.37	16.76																				100	112
5	5	Py				30.15			0.25				69.60																100	202
5	6	Py	0.36			31.05					0.10		68.49																100	184
5	7	Feohy +	8.98	0.37	10.01	78.00			0.85		1.04	0.75																	100	86
5	8	Feohy +	3.65		1.04	90.85			1.08												3.38								100	87
5	9	Py	0.28			29.55				0.18			69.99																100	214

Table 3C.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6450 depth.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Sc_2O_3	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	BaO	HfO_2	WO_3	PbO	Total	Actual Total
5	10	Qz	99.75			0.25																							100	119
5	11	Feohy +	1.68			97.76														0.56									100	74
5	12	Qz	99.57			0.43																							100	117
5	13	Di	57.18			0.32		18.53	23.97																				100	114
5	14	Feohy +	3.29		1.59	93.58			0.66			0.88																	100	83
5	15	Chl +	27.25	0.55	16.55	34.93		1.22	0.53		3.97																		85	96
5	16	Feohy +	3.90			96.10																							100	80
5	17	Qz	99.59			0.41																							100	121
5	18	Tur	41.41		24.10	15.70	0.31	2.11	0.91	2.28	0.17																		87	83
5	19	Sd +	4.08		3.52	36.47	0.49	5.46	5.46			0.53																	56	66
5	20	Sd +	2.29		1.11	41.53	0.40	5.28	5.14		0.26																		56	61
6	1	Tr	61.35			0.66		25.06	12.93																				100	117
6	2	Qz	100.00																										100	121
6	3	Kfs	66.72		17.41						15.87																		100	115
6	4	Brt +	25.76		8.17						4.85		22.52					-0.02							38.72				100	127
6	5	Sd	0.47			43.88	0.30	7.03	3.75			0.57																	56	61
6	6	Di	57.29			0.35		18.59	23.77																				100	116
6	7	Feohy +	2.33			84.56	7.65													3.84	1.62								100	85
6	8	Feohy	3.20			96.39	0.41																						100	79
6	9	Feohy +	5.14		2.34	79.13	8.34		3.82			1.23																	100	76
6	10	Qz	100.00																										100	119
6	11	Qz	100.00																										100	117
6	12	Qz	100.00																										100	116
6	13	Qz	100.00																										100	117
6	14	Brt											36.64					0.03					1.39		61.94				100	114
6	15	Kfs	66.12		17.77						15.47														0.64				100	118
6	16	Ms	50.78		29.11	1.02		1.82	0.49	0.25	8.10			3.43															95	100
6	17	Feohy +	2.56		1.41	94.48			0.45								1.10												100	80
6	18	Py	0.12			28.96							70.92																100	220
6	19	Py	0.12			28.89							70.99																100	213
7	1	Ab	69.30		18.73	0.22				11.75																			100	117
7	2	Zrn	31.68		8.64	14.15		1.28	0.41							0.47								43.38					100	99
7	3	Sd +	4.25		2.03	33.07	0.67	3.79	10.40		0.32	1.45																	56	58
7	4	Sd +	1.09		0.49	34.73	0.37	4.41	8.86			0.84	1.79												3.42				56	63
7	5	Ab	68.87		19.07	0.30			0.47	11.29																			100	118
7	6	Qz	100.00																										100	118
7	7	Brt	1.10										36.07					0.01					2.74		60.08				100	114
7	8	Sd +	4.22		2.94	38.94	0.50	5.20	3.68	0.30	0.21																		56	63
7	9	Py	0.12			29.44							70.44																100	213
7	10	Ab	69.09		18.67	0.61				11.63																			100	117
7	11	Feohy +	19.25	0.40	5.82	71.79					2.74																		100	99
7	12	Sd	0.41			46.27	0.99	5.95	2.37																				56	60
7	13	Ab	63.91		21.38	4.42		0.70	0.57	7.18	1.84																		100	111
7	14	Feohy	4.70		9.40	77.06			2.06				0.69							6.09									100	75
7	15	Sd				45.98	3.00	6.73	0.29																				56	62
7	16	Bt	42.69	3.41	20.40	20.40		2.29	0.72		9.55	0.55																	100	83
7	17	Qz	100.00																										100	121
7	18	Chl +	18.09		13.08	39.84	0.62	5.32	4.73	0.72	1.71	0.88																	85	68
7	19	Qz	100.00																										100	118
7	20	Brt	2.17		1.40						0.34		35.09					-0.01							61.01				100	109

Table 3C.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6450 depth.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Sc_2O_3	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	BaO	HfO_2	WO_3	PbO	Total	Actual Total
7	21	Qz	100.00																										100	116
7	22	Brt											36.46					0.07							63.47				100	110
8	1	Tr	60.99			0.38		24.76	12.98					0.89															100	116
8	2	Brt											36.94					-0.01							63.07				100	120
8	3	Qz	100.00																										100	123
8	4	Feohy +	4.40			92.71	0.75	0.50	0.59																1.05				100	81
8	5	Qz	97.24		1.70	0.19					0.87																		100	121
8	6	Brt											36.20					0.10							63.70				100	115
8	7	Qz	99.52		0.48																								100	122
8	8	Brt											36.73					-0.03					1.73		61.57				100	117
8	9	Brt											36.44					-0.01					1.10		62.47				100	115
8	10	Cv				0.28							50.62							49.10									100	180
8	11	Sd +	2.60		1.16	37.30	0.52	5.63	7.72	0.36	0.20	0.52																	56	66
8	12	BA*	1.89		0.89	82.56	1.11	1.39	5.26		0.97		2.42												3.51				100	36
8	13	Ab	69.10		18.68	0.80				11.42																			100	114
8	14	Sd +	1.66		0.95	40.51	0.36	7.80	4.71																				56	61
8	15	Qz	100.00																										100	117
8	16	Sd +	5.38	0.76	2.60	37.18	0.58	4.31	4.30		0.39	0.51																	56	60
8	17	Feohy +	5.01			94.99																							100	74
8	18	Py				27.92	0.30			0.19			71.59																100	221
8	19	Feohy +	2.67			97.33																							100	79
8	20	Kfs	63.92		18.88	5.69		0.99			10.52																		100	112
8	21	Kfs									0.39		36.83					-0.01							62.79				100	112
8	22	Ilt	55.70	0.58	22.75	3.13		1.53	1.02	0.45	3.96		0.87																90	93
8.1	1	Qz	100.00																										100	118
8.1	2	Ilt +	66.44	0.48	14.90	2.09		1.18	0.49	1.15	2.57																0.71		90	90
8.1	3	Brt											36.60					-0.03							63.43				100	115
8.1	4	Hole	6.96		3.01	2.06		0.95			0.32		6.88												79.82				100	13
8.1	5	Brt											36.19					-0.04							63.85				100	113
8.1	6	Sd +	2.06	0.46	0.64	44.14	0.87	6.40	1.23		0.20																		56	62
8.1	7	Feohy	0.97			97.12	0.70																		1.21				100	78
8.1	8	Brt				1.70							37.07					0.01					1.15		60.07				100	119
8.1	9	Qz	99.46		0.54																								100	120
8.1	10	Ms +	54.54	0.54	19.25	3.90		1.53	2.21	0.96	2.93		1.56	2.62											2.34		2.62		95	73
8.1	11	Qz	99.78			0.22																							100	119
9	1	Brt											36.40					-0.04					2.11		61.53				100	113
9	2	Hole	1.90		0.73	0.95							3.35												93.07				100	18
9	3	Sd +	1.94		0.78	39.60	0.54	7.12	5.49			0.52																	56	61
9	4	Feohy +	5.27			89.82	0.81		0.46											0.79	2.85								100	76
9	5	Qz	100.00																										100	117
9	6	Tr	60.95		0.72	0.67		24.64	13.02																				100	112
9	7	Tr	60.01		1.12	0.55		24.50	12.67	0.27				0.88															100	114
9	8	Chl +	25.36	0.41	18.28	33.46		5.58	1.67		0.26																		85	84
9	9	Sd +	3.13		1.90	37.74	0.60	5.89	5.10		0.25	1.39																	56	63
9	10	Kfs	65.13		18.81	0.27					15.79																		100	112
9	11	Brt											36.54					-0.01					1.13		62.34				100	114
9	12	Tur	37.68	0.52	33.29	11.10		2.36		2.05																			87	97
9	13	Chl	31.84	0.37	18.36	22.54	0.27	3.10	5.36	0.31	2.35		0.50																85	85
9	14	Py	2.23		1.33	28.19				0.35	0.18		67.72																100	201
9	15	Feohy +	2.91		6.99	86.21	1.48		1.87						0.54														100	81

Table 3C.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6450 depth.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Sc_2O_3	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	BaO	HfO_2	WO_3	PbO	Total	Actual Total
9	16	Mnohy (Mn + Fe + Ba)	2.17	1.22	2.16	10.60	64.28		1.58					2.19							0.52				13.31		1.97		100	86
9	17	Ca + Sd +	2.30		1.45	57.17	0.82	7.73	29.56			0.97																	100	59
9	18	Feohy +	3.69		2.40	90.17			0.66								3.08												100	81
9	19	Feohy	1.05			96.32																1.64			0.99				100	88
9	20	Sd + Chl	13.66		8.47	58.84	0.49	10.82	4.63	0.50	0.64	0.86													1.09				100	72
10	1	Tr	60.90		0.43	0.62		24.68	13.07	0.30																			100	117
10	2	Feohy +	5.38			93.52	0.53		0.57																				100	81
10	3	Dol				0.35		22.18	31.47																				54	55
10	4	Mnohy (Mn + Cu + Ba)	1.17		0.94	1.15	66.23		2.01		0.44			7.08						7.09					13.89				100	82
10	5	Qz	100.00																										100	121
10	6	Qz +	81.59	0.34	8.70	5.08	0.26	0.87	0.57	1.19	1.40																		100	103
10	7	Sd + Chl	18.11		9.72	53.01	0.65	7.06	8.70	0.86	1.14	0.75																	100	71
10	8	Brt											36.67												63.33				100	112
10	9	Qz	100.00																										100	118
10	10	Mix	26.94		2.25	53.51	0.92	5.68	10.28		0.42																		100	62
10	11	Qz	99.22				0.26																		0.52				100	122
10	12	Mnohy (Mn + Ba + S)	14.65		9.78		49.40	0.59	0.63		2.60			4.98				0.99		2.66					13.72				100	101
10	13	Ms	46.21		34.53			0.60		0.24	10.23			1.97											1.23				95	111
10	14	Brt											36.85					-0.12					2.45		60.82				100	117
10	15	Qz	100.00																										100	120
10	16	Brt											36.69					-0.03							63.34				100	115
10	17	Sd + Chl	11.36		4.36	68.13	1.00	7.40	5.25		0.70	0.77													1.03				100	65
10	18	Qz	99.17		0.83																								100	121
10	19	Sd +	3.03	0.33	1.58	38.57	0.40	6.50	3.81	0.62	0.16	0.59	0.40																56	63
10	20	Py	1.02		0.44	27.97	0.21			0.43			69.93																100	218
11	1	F-Cal							35.12					20.88															56	92
11	2	Chl +	17.51	0.77	10.86	43.39	0.54	5.70	3.58		0.22																2.42		85	68
11	3	Qz	96.90		1.94	0.59		0.22			0.35																		100	113
11	4	Olig	64.12		22.87	0.63			3.07	8.47	0.84																		100	113
11	5	Sd +	0.99		0.71	43.24	0.91	8.44	1.72																				56	63
11	6	Qz	99.63			0.37																							100	120
11	7	Sd + Chl +	16.03		10.64	55.57	0.73	8.14	7.14		0.98	0.77																	100	71
11	8	Feohy	4.84			94.74	0.42																						100	83
11	9	Feohy	5.10			94.10	0.80																						100	82
11	10	Tr	61.55			0.41		25.24	12.80																				100	120
11	11	Feohy	1.74			98.26																							100	91
11	12	Sd +	1.74		0.99	41.06	0.40	5.00	5.88		0.22	0.71																	56	62
11	13	Tr	61.39			0.82		24.60	13.19																				100	114
11	14	Kfs +	79.14		11.47	0.24				2.36	6.79																		100	117
11	15	Chl +	16.15	0.32	17.04	36.46	7.39	0.64	1.06	1.09	2.29																	2.57	85	84
11	16	Mnohy (Mn + Fe + Pb)	4.09		6.87	10.03	51.55		3.28	0.46	0.62			3.55	0.64										8.07			10.84	100	87
11	17	Feohy +	5.89		1.15	87.43	4.54		0.99																				100	74
11	18	Qz	100.00																										100	119
11	19	Brt											36.21					-0.05					2.10		61.74				100	110
12	1	Feohy +	2.04		2.21	90.38			1.29						0.45		1.23			0.81		1.59							100	85
12	2	Ab +	61.27	0.25	18.72	1.33			3.44	10.65	0.57	2.89	0.88																100	128
12	3	Py	14.06		11.34	22.26				0.22			52.12																100	143
12	4	Mix	23.67		5.88	57.20	1.23	7.67	1.38	2.97																			100	73
12	5	Ab	67.58		19.03	1.48			0.40	10.86	0.65																		100	121
12	6	Ab	69.97		18.35					11.68																			100	118

Table 3C.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6450 depth.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Sc_2O_3	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	BaO	HfO_2	WO_3	PbO	Total	Actual Total
12	7	Qz	100.00																										100	120
12	8	Feohy +	8.04		1.18	84.18	4.23		0.78						0.38						1.21								100	80
12	9	Sd				47.04	2.06	4.56	2.35																				56	63
12	10	Sd + Chl	7.36		4.36	68.77	0.61	7.18	7.35	0.56	0.44	1.88													1.49				100	64
12	11	Sd + Chl	7.52		4.28	64.03	0.60	11.25	10.03		0.61	1.68																	100	65
12	12	Feohy	1.19			98.81																							100	80
12	13	Ca-Sd +	4.33			58.56	0.96	4.44	31.71																				100	68
12	14	F-Cal				0.18		1.40	37.24					17.18															56	82
12	15	Brt				1.40							36.39					0.09					3.40		58.72				100	118
13	1	Tr	60.66		0.66	0.97		24.39	13.06	0.26																			100	116
13	2	Qz	100.00																										100	122
13	3	Sd + Ap +	12.00		6.15	53.30	0.73	8.54	11.84	0.80	0.58	6.06																	100	73
13	4	Feohy +	4.67			94.04	0.90		0.39																				100	80
13	5	Mnohy (Mn + Ba + Pb)			2.04		73.61		0.45											0.65					18.24			5.01	100	84
13	6	Feohy +	4.82			93.94	0.63		0.61																				100	79
13	7	Ab	70.13		17.59	0.63				11.21			0.44																100	118
13	8	Sd + Chl	14.90		6.92	55.48	0.89	10.65	10.26		0.90																		100	71
13	9	Qz	100.00																										100	122
13	10	Kfs +	58.80	0.37	24.12	2.45	0.54	1.45			12.27																		100	116
13	11	Brt											36.96					-0.09					1.18		61.95				100	117
13	12	Sd				48.79	3.18	1.71	2.32																				56	61
13	13	Qz	98.09		1.03	0.66					0.22																		100	118
13	14	Smt							1.14												98.86								100	61
13	15	Feohy + Chl	3.87		1.72	93.26	0.49													0.66									100	80
13	16	Qz	98.62		0.83	0.55																							100	120
13	17	Brt											36.33					-0.13							63.80				100	111
13.1	1	Qz	99.20			0.80																							100	114
13.1	2	Qz	93.94			5.13		0.38	0.55																				100	113
13.1	3	BA*	14.35		5.75	62.13	1.09	6.84	5.81		0.80	3.23																	100	31
13.1	4	BA*	6.03		3.19	59.71	1.16	5.55	13.29		0.69	10.38																	100	43
13.1	5	Ap +	10.69		1.22	1.33			40.96	0.30	0.21	36.20		9.09															100	118
13.1	6	Qz +	93.48		4.00	0.98		0.21	0.41		0.92																		100	119
13.1	7	Sd +	2.68		1.52	33.29	0.67	4.47	6.19		0.32	5.34															1.52		56	65
13.1	8	Ap +	7.70		4.31	2.72		0.61	43.05	0.29	0.72	36.36		4.24															100	107
13.1	9	Ap +	8.91		5.17	2.32		0.52	40.30		1.15	35.10		6.54															100	107
13.1	10	Sd + Hole	10.79	0.59	3.47	61.56	1.28	8.84	6.64	0.98	0.57	4.06	1.22																100	51
14	1	Feohy +	3.17			96.83																							100	79
14	2	Qz	100.00																										100	118
14	3	Feohy +	3.24			94.15	0.44													0.98	1.19								100	80
14	4	Mix	34.58	0.36	5.51	51.95		1.06	1.18	1.24	2.02		0.60							0.72	0.78								100	112
14	5	Qz	100.00																										100	122
14	6	Mix	24.49		19.75	52.34	0.34	0.60	0.59	0.41	1.48																		100	94
14	7	Feohy +	5.16			94.38			0.46																				100	78
14	8	Chl +	16.66		12.29	53.27		0.60			2.18																		85	94
14	9	Mnohy (Mn + Ba + F)				6.78	70.58	0.59	2.46	0.61	1.53			9.16											8.29				100	82
14	10	Feohy	1.57			98.43																							100	87
14	11	Sd +	3.42			51.59	0.41		0.58																				56	78
14	12	Sd +	4.11		1.57	48.13	0.21		0.32						0.35					0.48	0.82								56	79
14	13	Sd +	4.69		0.91	45.39	0.48	0.87	0.90				1.19		0.20										1.37				56	73
14	14	Qz	99.73			0.27																							100	120

Table 3C.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6450 depth.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Sc_2O_3	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	BaO	HfO_2	WO_3	PbO	Total	Actual Total
14	15	Brt											36.74					0.04					2.54		60.68				100	115
14	16	Brt											34.11					0.01			0.23		1.85		63.80				100	87
14	17	Brt											36.62					0.03					1.60		61.75				100	114
15	1	Brt											36.46					-0.07							63.61				100	113
15	2	Brt											36.86					-0.15					1.74		61.55				100	116
15	3	Brt											36.66					-0.03					2.45		60.92				100	115
15	4	Brt	0.65										33.88												65.47				100	102
15	5	Brt											36.76					-0.05							63.29				100	113
16	1	Brt											37.01					-0.08							63.07				100	114
16	2	Brt											36.86					-0.01							63.15				100	115
16	3	Brt											36.98					0.07					2.37		60.58				100	115
17	1	Qz	100.00																										100	121
17	2	Brt											36.84					-0.05					2.52		60.69				100	116
17	3	Qz	100.00																										100	120
17	4	F-Cal	0.31			0.24		0.31	35.21					19.94															56	92
17	5	Qz	100.00																										100	121
17	6	Brt											36.59					-0.01					0.99		62.43				100	115
17	7	Brt +	8.21		2.76	15.77		2.21	2.09		0.49		23.70												40.83		3.93		100	87
17	8	Feohy + Chl	7.23		3.19	69.65	2.75	0.85	1.09			2.25	3.63							2.89					6.47				100	77
17	9	Feohy +	7.89		2.77	87.85					0.35									1.14									100	82
18	1	F-Cal						0.62	34.72					20.67															56	95
18	2	F-Cal	0.97					0.32	35.07					19.64															56	94
18	3	Qz	100.00																										100	122
18	4	Tr	61.02		0.49	0.47		24.80	12.85	0.37																			100	116
18	5	Di	57.52		0.46	0.37		18.91	22.44	0.30																			100	119
18	6	Qz	99.25					0.55	0.20																				100	119
19	1	Tr	60.06		0.95	1.13		24.08	12.85	0.30				0.63															100	117
19	2	Feohy +	5.30			93.79	0.51		0.40																				100	80
19	3	Sd +	0.80		0.47	43.48	0.30	5.64	4.61			0.71																	56	60
19	4	Feohy +	4.56			94.46	0.39		0.59																				100	82
20	1	Feohy	1.74			97.09																1.17							100	89
20	2	Feohy	1.31			98.69																							100	88
20	3	Feohy	1.09			98.91																							100	90
20	4	Feohy	1.53			98.47																							100	87
20	5	Feohy	1.02			98.98																							100	88
21	1	Sd +	0.57			44.08	0.95	7.43	2.97																				56	59
21	2	Qz	99.77			0.23																							100	119
21	3	Qz	95.61		2.31	0.38				1.70																			100	120
21	4	Sd +	2.50	0.54	1.19	41.32	0.96	5.83	3.08		0.17		0.41																56	64
21	5	Ab	69.29		18.70	0.32				11.69																			100	117
21	6	Zrn	30.68			0.47																		67.66		1.19			100	123
21	7	Py	1.31		0.87	29.23		0.24		0.25			68.10																100	211
Notes:																														
Mnohy refers to the compostion of what is thought to be Contaminants. Smt=smithsonite, Cm=corundom																														
*BA refers to "Bad Analysis", in this case the point analysis came in contact with epoxy or hole.																														
Ilt may be Hydromuscovite																														

Table 3C.2: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6450 depth.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	ZnO	BaO	Total	Actual Total
3.1	1	F-Cal							35.12					20.88				56	95
3.1	2	Mix	42.78		11.41	4.08		31.92	3.80	0.24				5.76				100	95
3.1	3	Tr	61.44			0.63		24.77	13.16									100	115
6.1	1	Feohy	2.52			96.97	0.51											100	80
6.1	2	Feohy	2.71			95.53	0.44										1.32	100	80
9.1	1	BA*	17.55	3.29	20.73	55.19	1.10	0.87					1.27					100	17
9.1	2	BA*	20.52	3.75	23.13	49.38		1.15	0.78				1.30					100	19
9.1	3	Tur	37.78	0.57	33.13	11.01		2.43		2.09								87	100
11.1	1	Feohy +	6.12		0.66	88.33	3.53		0.60								0.76	100	81
11.1	2	Feohy +	5.85		1.90	85.47	4.91		0.94			0.93						100	79
11.1	3	Feohy +	6.31		1.19	87.96	3.73		0.81									100	76
11.1	4	Feohy +	5.91		1.24	87.59	4.54		0.72									100	79
12.1	1	Feohy +	8.35		1.30	85.01	3.33		0.58						0.29	1.14		100	80
12.1	2	Feohy +	8.15		1.23	85.11	3.44		0.59						0.33	1.15		100	81
12.1	3	Feohy +	7.91		1.16	84.79	3.83		0.77						0.39	1.15		100	80
14.1	1	Qz +	97.15		1.04	1.53					0.28							100	109
14.1	2	Qz +	96.89	0.26		2.46							0.39					100	115
14.1	3	Feohy +	13.50		10.57	73.69		0.54			1.70							100	93
14.1	4	Feohy +	12.40		11.02	73.81		0.47	0.52		1.78							100	92
14.1	5	Qz +	95.13			4.87												100	111
14.1	6	Qz	99.87			0.13												100	313
19.1	1	Feohy +	5.41			93.62	0.57		0.40									100	79
19.1	2	Feohy +	8.18			89.87			0.48		0.31						1.16	100	82
19.1	3	Feohy +	5.25			92.97			0.53								1.25	100	77
19.1	4	Feohy	0.37			97.57	0.50		0.34								1.22	100	64
22	1	Sd +	2.22		1.74	43.37	0.90	5.55	2.22									56	64
22	2	Kfs	65.85		19.76	4.19		0.48		9.23	0.49							100	116
22	3	Kfs	69.47		18.77	0.53				11.23								100	120
22	4	Sd	0.40			43.99	1.05	7.51	3.05									56	63

Table 3C.2: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6450 depth.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	ZnO	BaO	Total	Actual Total
		Notes:																	
		*BA refers to a bad analysis, in this case due to low totals, these analysis are unreliable.																	

Appendix 3D: SEM-BSE images and EDS mineral analyses for sample F-81 6470(1)

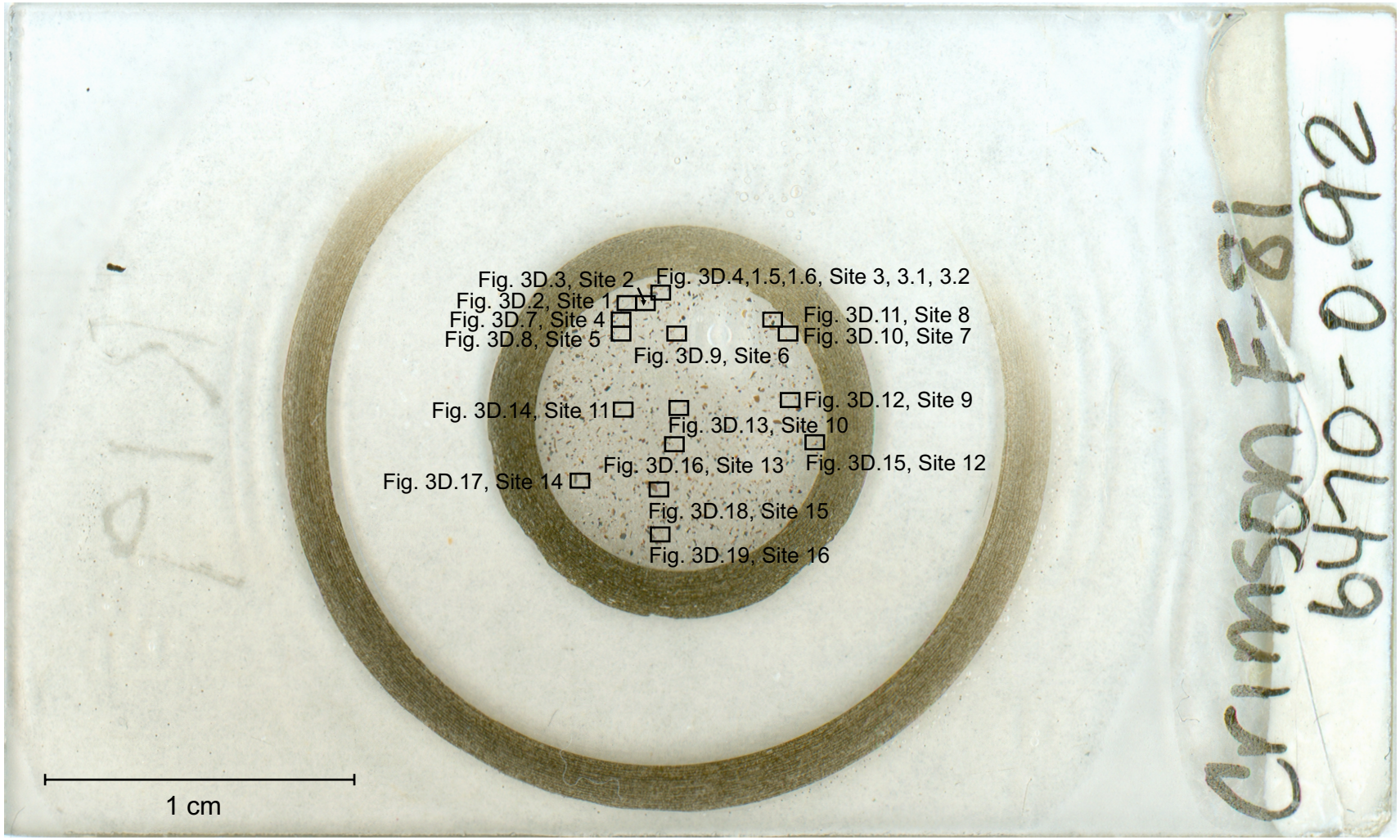
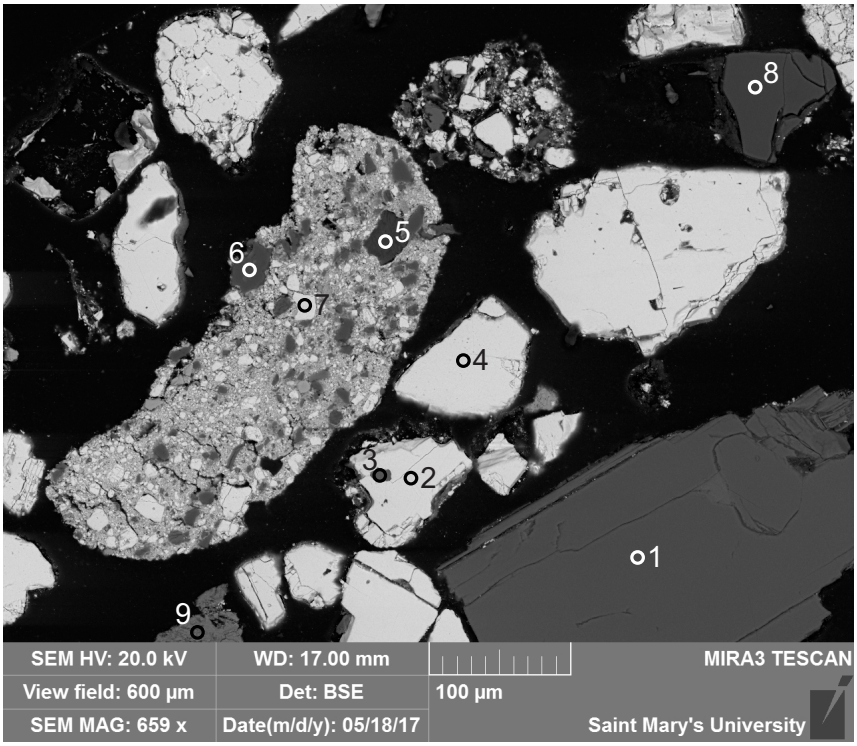
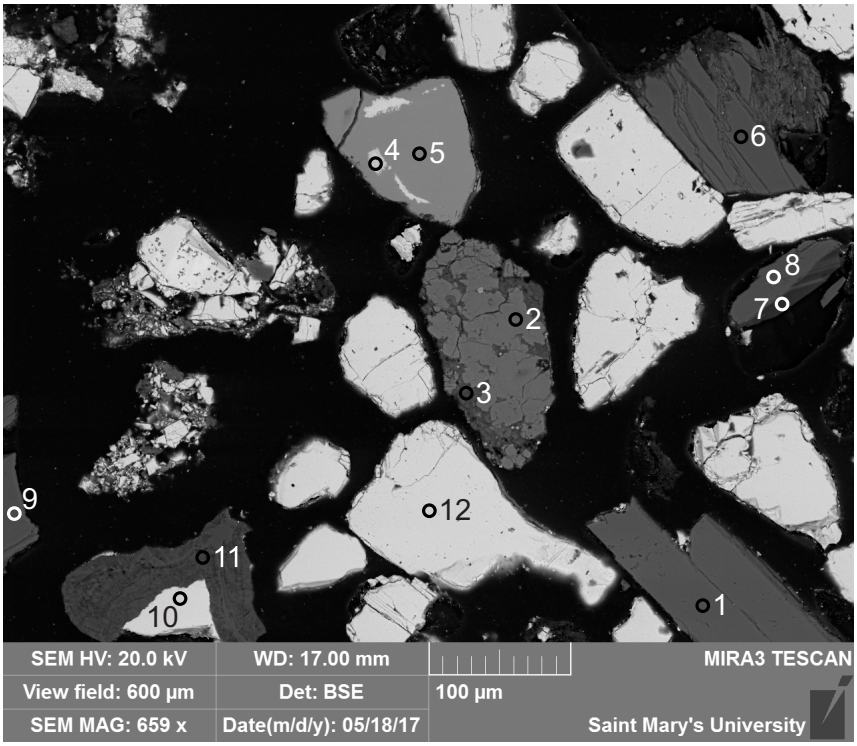


Figure 3D.1: Scanned thin section of sample F-81 6470(1) showing the location of analysed sites.



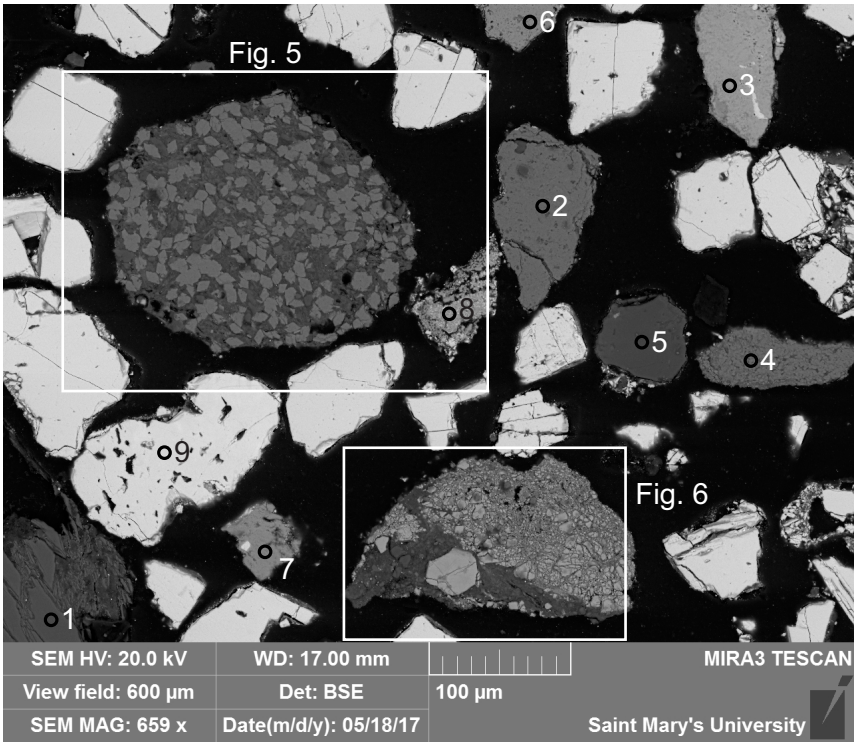
1:Tremolite
2:Barite
3:Calcite
4:Barite
5:Quartz +
6:Quartz +
7:Barite
8:Tourmaline
9:Siderite +

Figure 3D.2: Crimson F-81 6470(1) site 1. Subhedral grain of detrital tourmaline (8); subhedral grain of tremolite (2). Cuttings are composed of mud and a mixture of fine cuttings and drilling mud. (5,6,7).



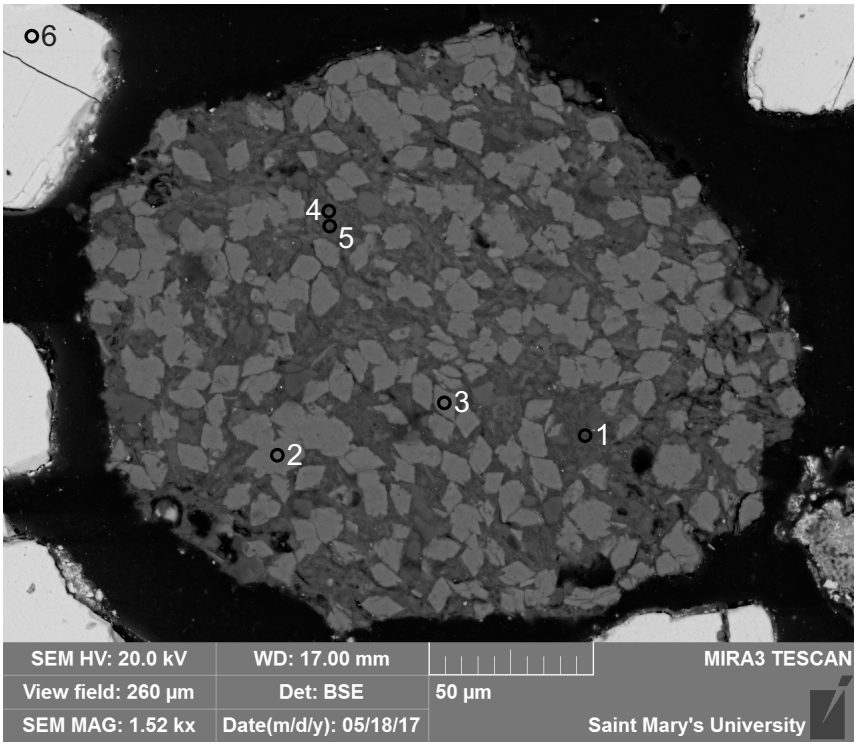
1:Clinopyroxene
(Diopside)
2:Siderite +
3:Mix
4:Mnohy (Mn+Pb)
5:Smithsonite
6:Tremolite
7:Hole
8:Tremolite
9:Tremolite
10:Barite
11:Quartz +
12:Barite

Figure 3D.3: Crimson F-81 6470(1) site 2. Mnohy (4) appear associated with smithsonite (5). A mudstone cutting made up of siderite (2), and illite (3).



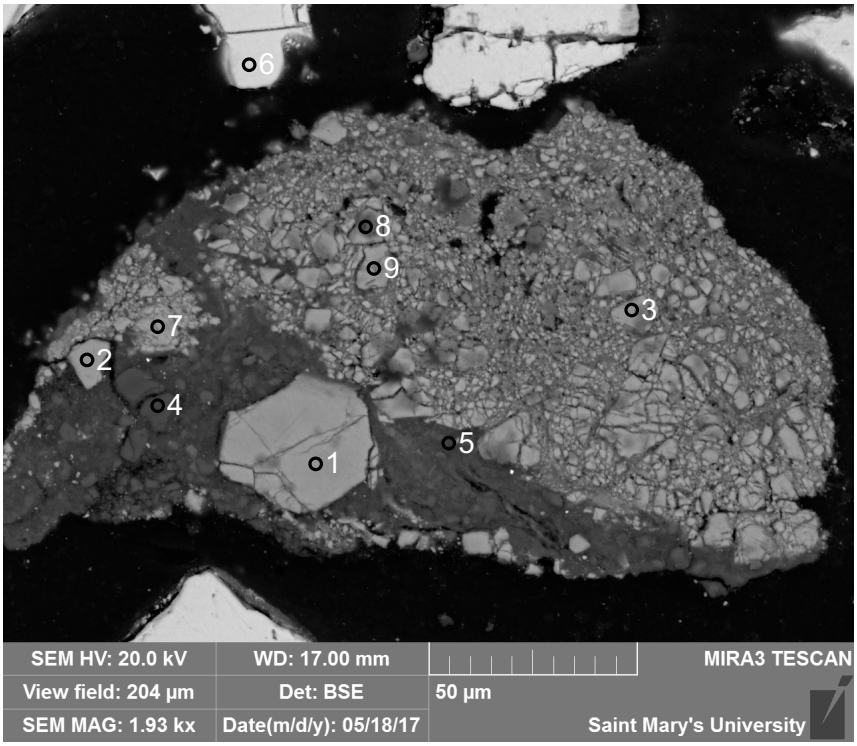
1:Tremolite
2:Siderite
3:Mnohy (Mn+Fe)
4:Siderite +
5:Quartz +
6:Feohy +
7:Feohy +
8:Mnohy (Mn+Ca+Ba)
9:Barite

Figure 3D.4: Crimson F-81 6470(1) site 3. The Mnohy (8) is not associated with barite.



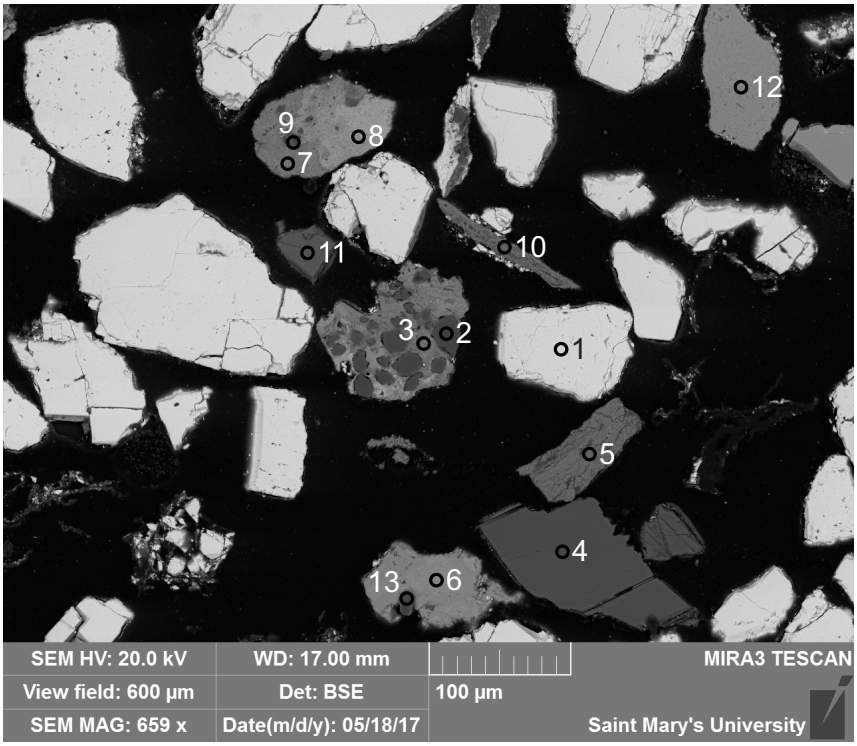
1:Mix
2:Siderite
3:Siderite
4:Epidote +
5:Epidote +
6:Barite

Figure 3D.5: Crimson F-81 6470(1) site 3.1. Siderite concretion intermixed with illite (4,5).



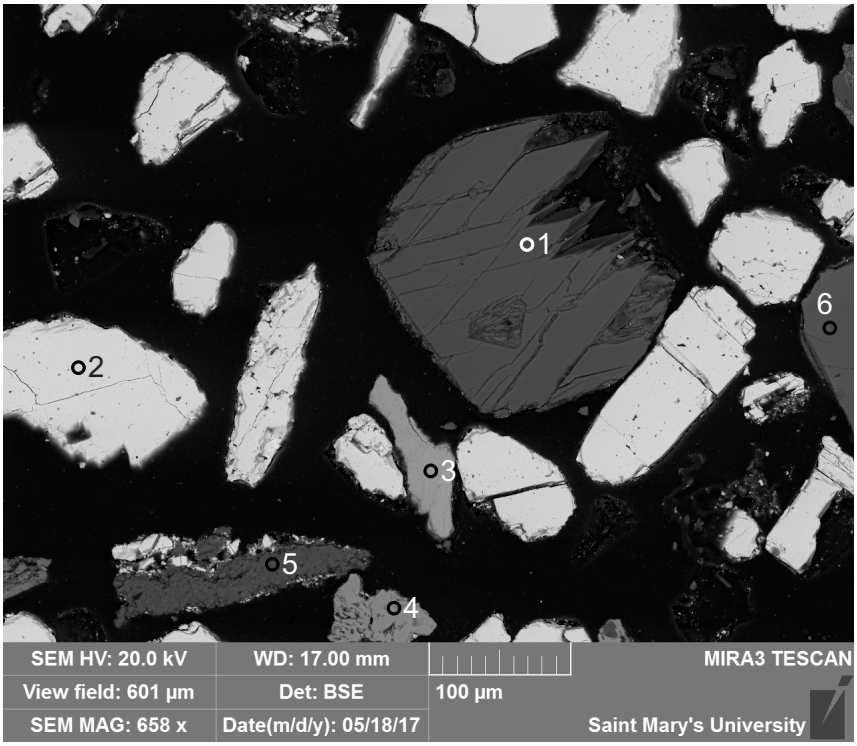
1:Pyrite
2:Pyrite
3:Pyrite
4:Quartz +
5:Mix
6:Barite
7:Pyrite
8:Pyrite
9:Pyrite

Figure 3D.6: Crimson F-81 6470(1) site 3.2. A cutting made up of pyrite (1-3,7-9) and quartz (4) is likely a piece of pyrite cemented mudstone.



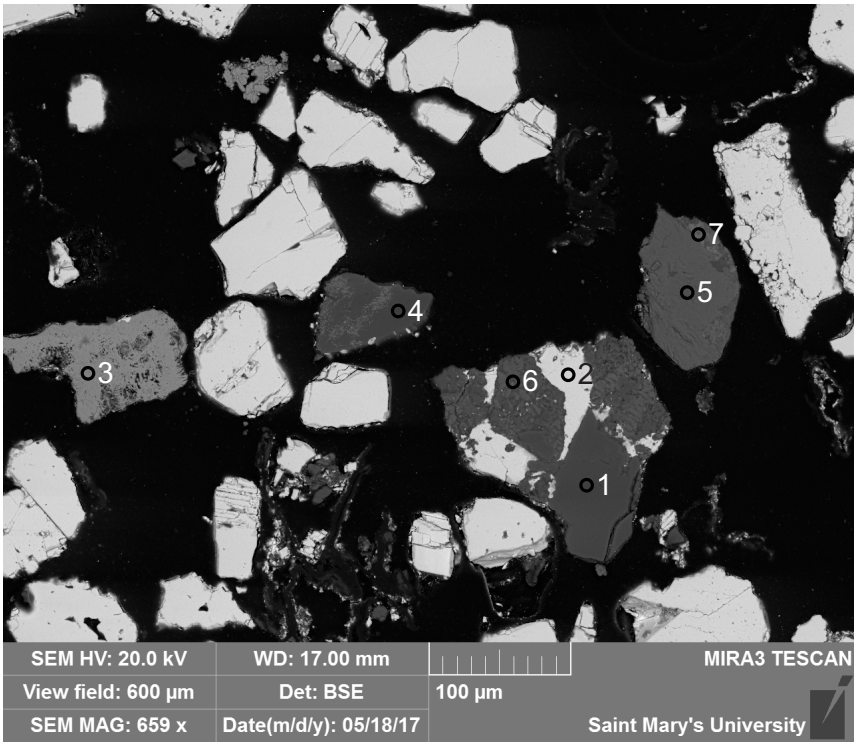
1:Barite
2:Quartz
3:Muscovite +
Siderite
4:Tremolite
5:Siderite
6:Feohy +
7:Chlorite + Siderite
+
8:Mnohy (Mn+Ba)
9:Quartz + Mn
10:Siderite +
Chlorite
11:Clinopyroxene
(Diopside)
12:Feohy +
13:Quartz

Figure 3D.7: Crimson F-81 6470(1) site 4. Neither tremolite or diopside are associated with barite. The Mnohy (8) is associated with quartz (9), illite, siderite, and probably chlorite (7). A mudstone cutting is made up of quartz (2), illite, and siderite (3).



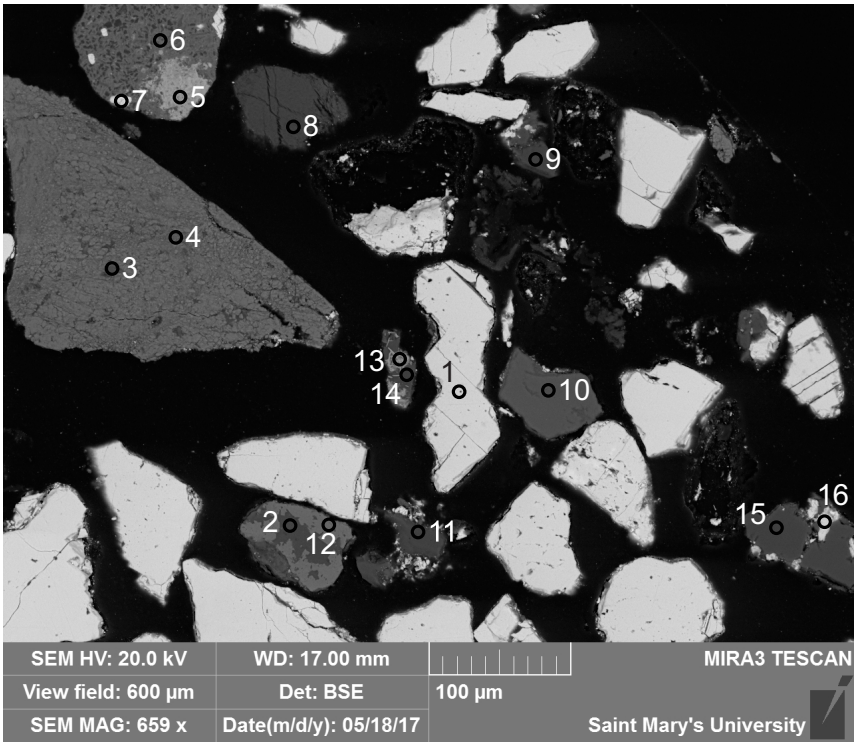
1:Tremolite
2:Barite
3:Feohy +
4:Feohy +
5:Muscovite +
6:Clinopyroxene (Diopside)

Figure 3D.8: Crimson F-81 6470(1) site 5. Tremolite (1) is likely a component of the drilling mud.



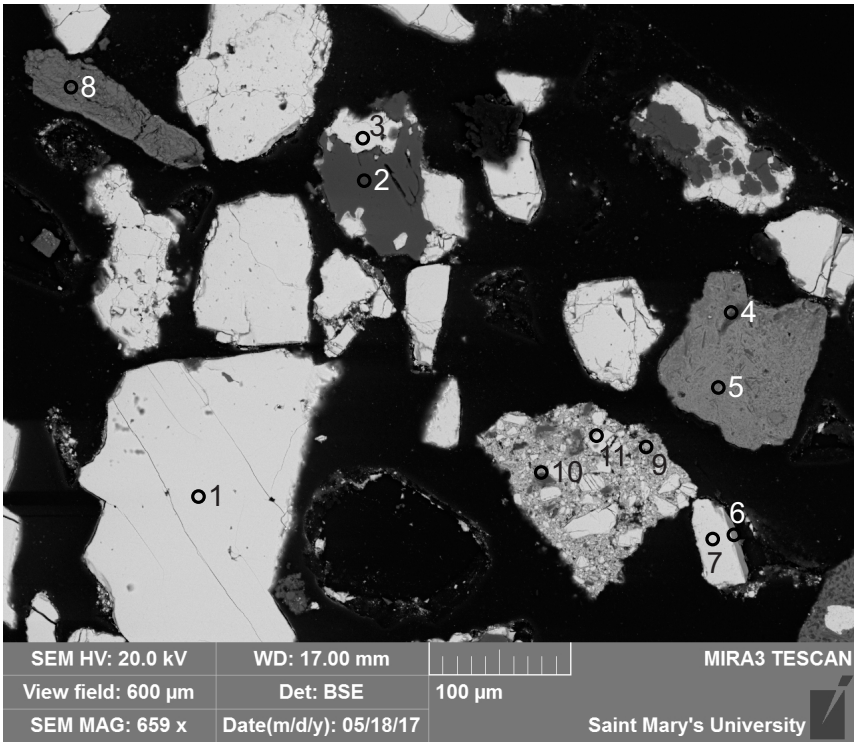
1:Quartz
2:Barite
3:Feohy +
4:Quartz
5:Epidote
6:K-feldspar
7:Titanite

Figure 3D.9: Crimson F-81 6470(1) site 6. A cutting, probably of sandstone, that consists of quartz (1), K-feldspar (6) cut by diagenetic barite (2). A likley lithic clast made up of titanite (7) and epidote (5).



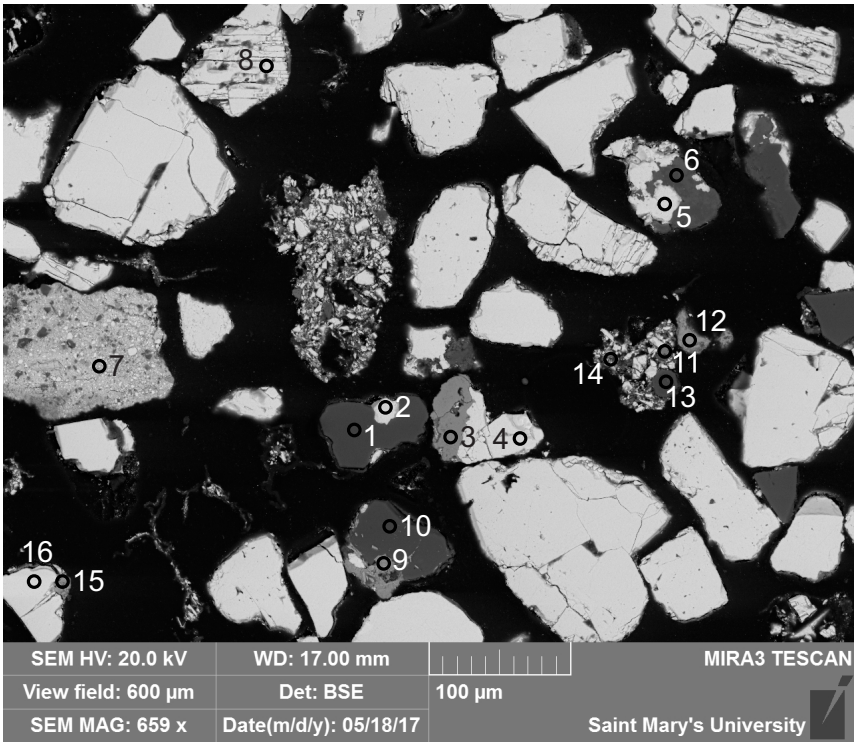
1:Barite
2:Albite
3:Quartz
4:Siderite +
5:Mnohy
(Mn+Al+Pb)
6:Mix
7:Barite
8:Talc
9:Quartz
10:K-feldspar
11:Quartz
12:Siderite
13:Feohy +
14:Quartz
15:Quartz
16:Barite

Figure 3D.10: Crimson F-81 6470(1) site 7. Cutting made up of albite (2) and siderite (12).



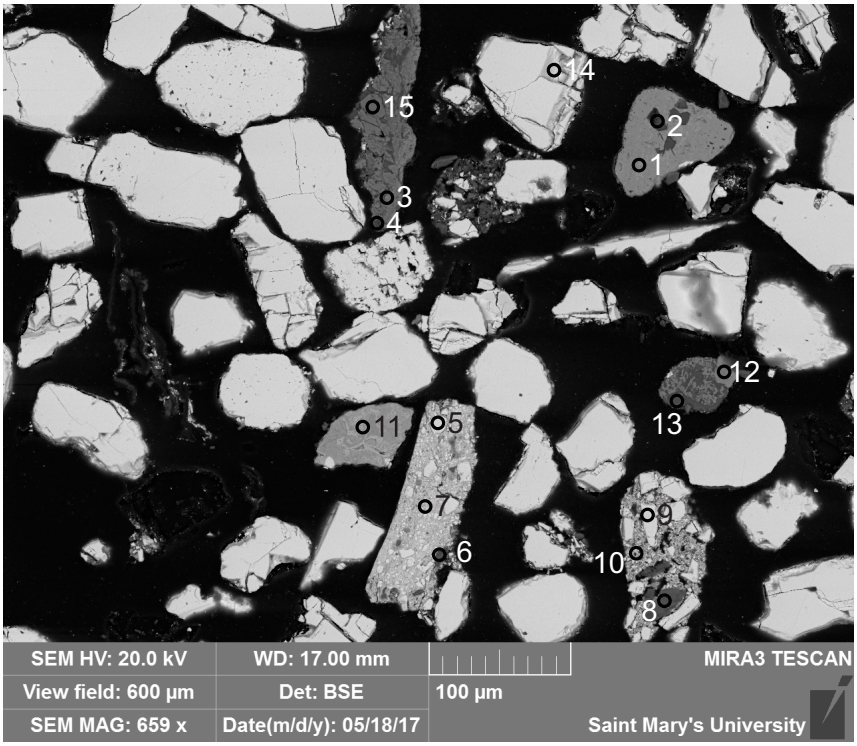
1:Barite
2:Quartz
3:Barite
4:Mix
5:Feohy +
6:Quartz + Barite
7:Barite
8:Chlorite +
9:Feohy +
10:Quartz
11:Barite

Figure 3D.11: Crimson F-81 6470(1) site 7. Cutting made up of chlorite and illite (4) and Feohy.



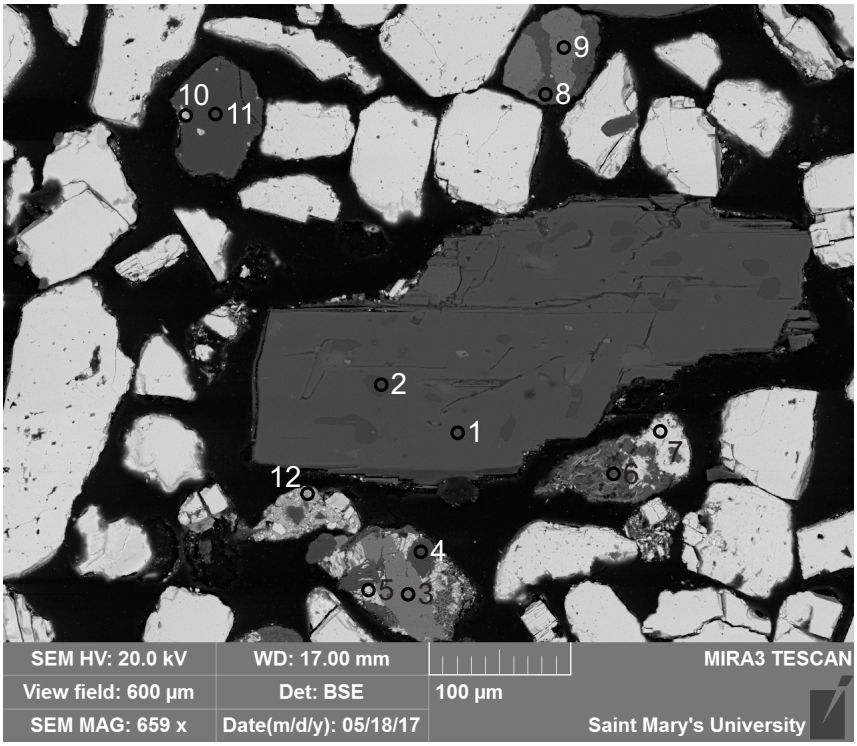
1:Quartz
2:Barite
3:Feohy +
4:Barite
5:Barite
6:Quartz + K-feldspar
7:Barite
8:Barite
9:Feohy +
10:Quartz
11:TiO2
12:Feohy +
13:Quartz + Calcite
14:Barite
15:Feohy +
16:Barite

Figure 3D.12: Crimson F-81 6470(1) site 9. Cutting made up of barite (5) and quartz + K-feldspar (6). Feohy (3) associated with barite (4); Feohy (9) is associated with quartz (10); Feohy (12) is associated with TiO_2 (11), quartz (13), and barite (14).



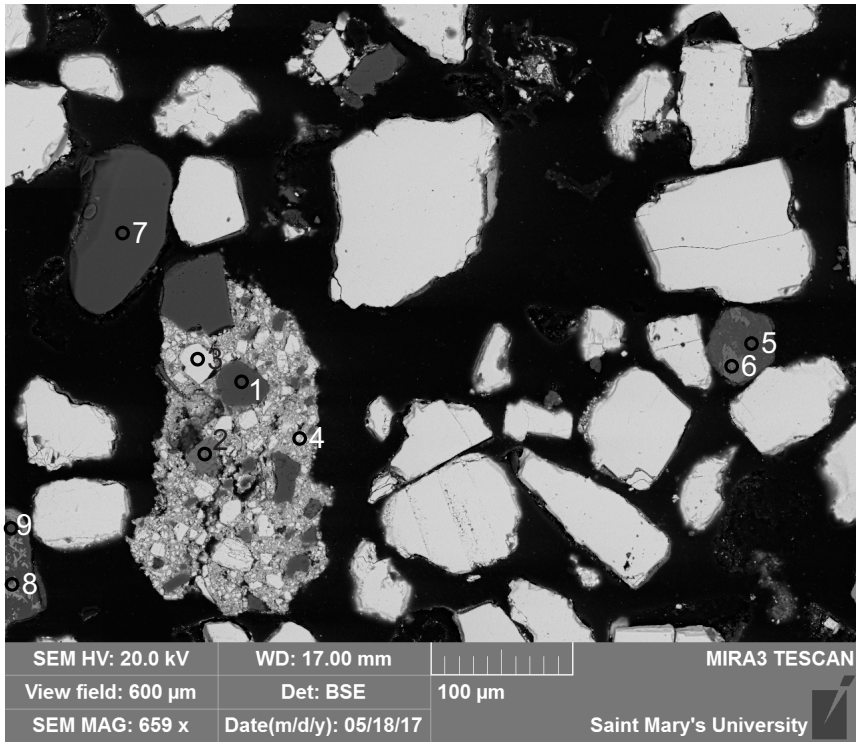
1:Feohy +
2:Quartz + Chlorite
3:Mix
4:Mix
5:Barite
6:Quartz
7:Barite
8:K-feldspar
9:Barite
10:Barite
11:Fe+Cu+As
12:TiO2 + Al-Phosphate
13:Muscovite
14:BAD ANALYSIS
15:Siderite

Figure 3D.13: Crimson F-81 6470(1) site 10. Cutting made up of muscovite (13), Al-phosphate and TiO_2 (12).



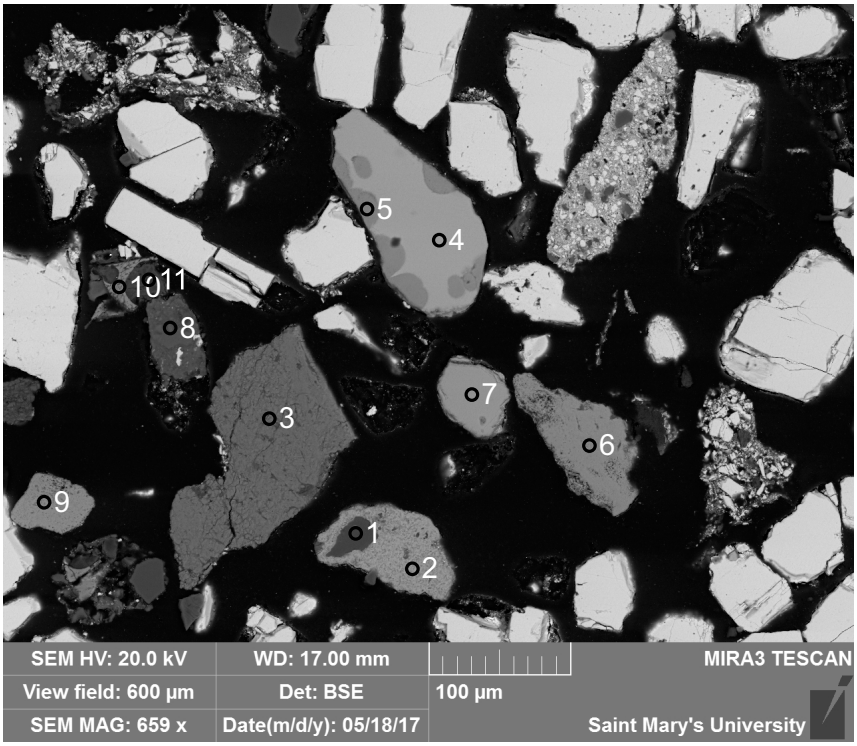
1:Tremolite
2:Quartz
3:TiO2
4:Albite
5:Barite + TiO2
6:K-feldspar
7:Barite
8:Albite
9:Siderite +
10:Barite +
11:Quartz
12:Barite

Figure 3D.14: Crimson F-81 6470m site 11. Tremolite (1) is associated with quartz (2), Cutting made up of albite (4), TiO_2 (3), and diagenetic barite (5). Cutting made up of K-feldspar (6) and diagenetic barite (7). Detrital quartz (11) with voids filled with diagenetic barite (10).



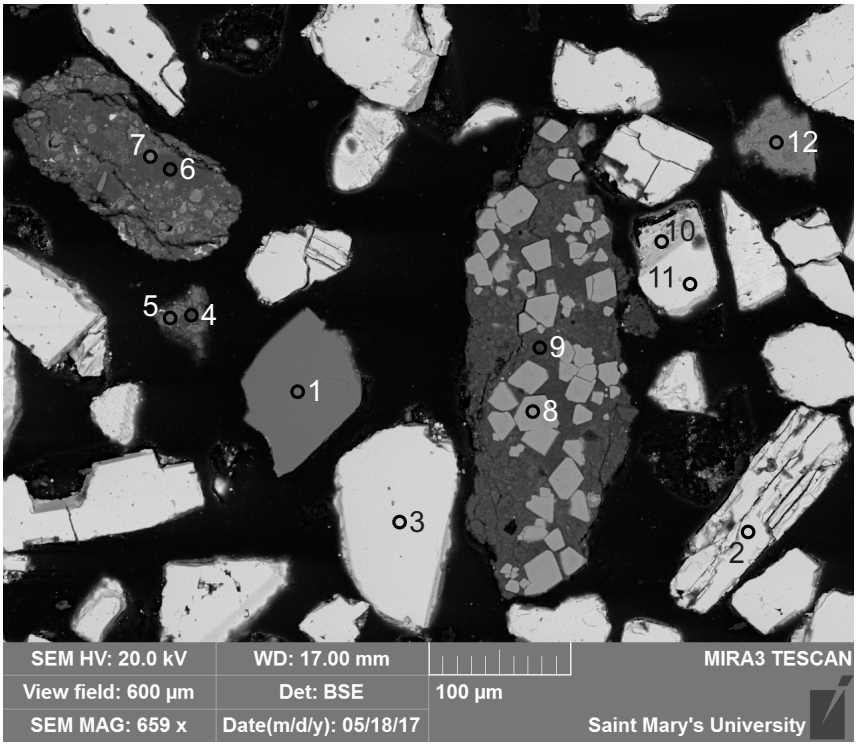
1:Albite
2:Siderite + Apatite + Muscovite + Chlorite
3:Barite
4:Barite
5:Albite
6:Siderite + Chlorite
7:Quartz
8:Feohy +
9:Quartz

Figure 3D.15: Crimson F-81 6470(1) site 12. Cutting made up of albite (5) and siderite (6). Fine-grained sandstone made up of albite (1), quartz, chlorite (2) and abundant barite (3,4).



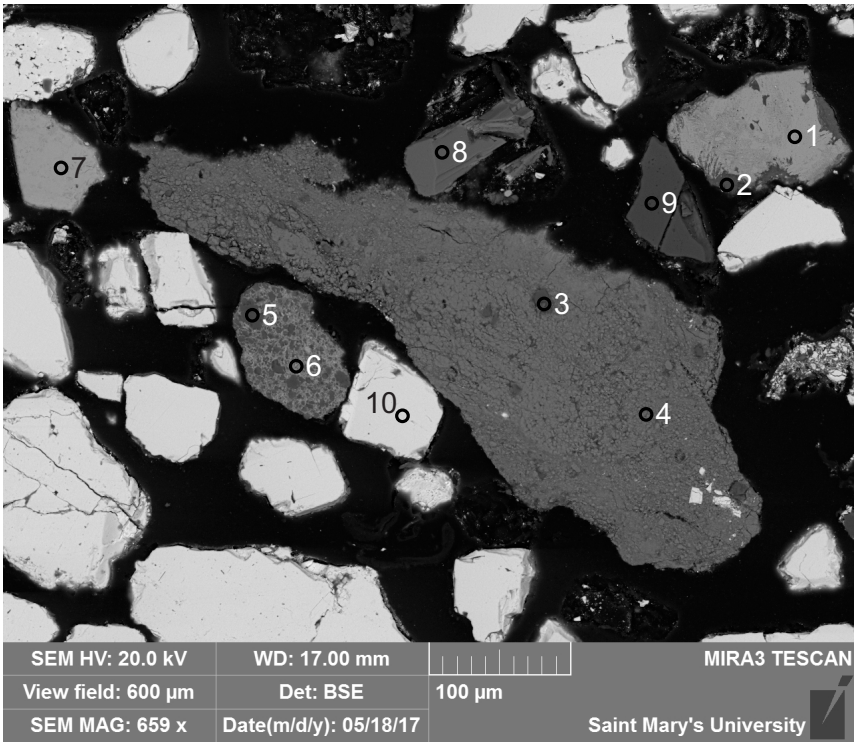
1:Quartz
2:Feohy +
3:Siderite +
4:Mnohy (Mn+Ba)
5:Feohy +
6:Feohy +
7:Feohy +
8:K-feldspar
9:Feohy +
10:Mix
11:Quartz +

Figure 3D.16: Crimson F-81 6470(1) site 13. Feohy (2) associated with quartz (1) and with Mnohy (4,5).



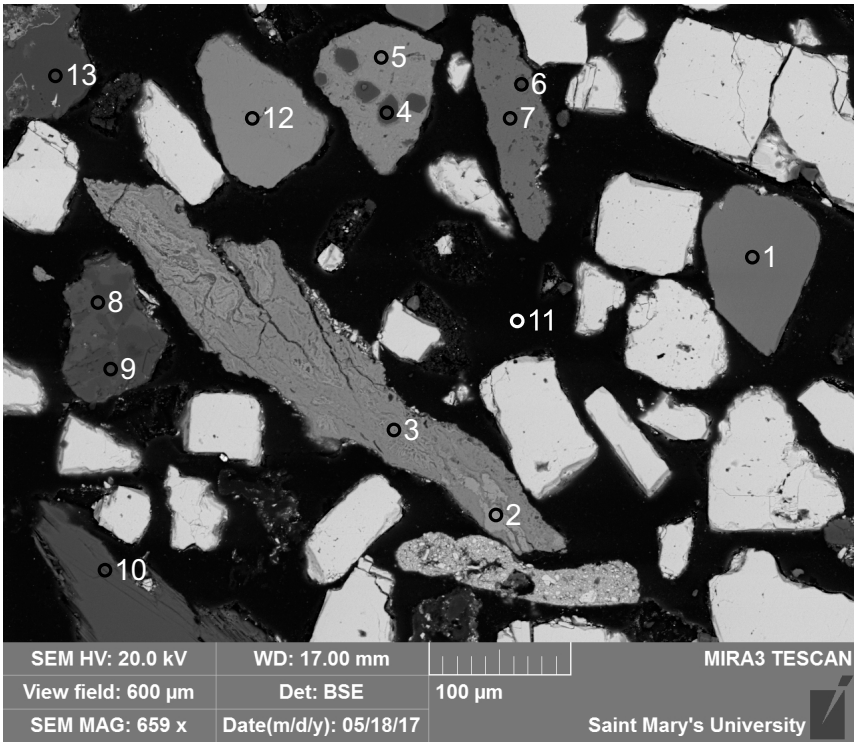
1:Siderite
2:Barite
3:Barite
4:Muscovite + Siderite
5:Siderite +
6:Muscovite
7:Siderite + Muscovite
8:Pyrite
9:Illite + Kaolinite + Siderite
10:Barite
11:Barite
12:Feohy +

Figure 3D.17: Crimson F-81 6470(1) site 14. A mudstone cutting made up of illite, kaolinite, and siderite (9) and diagenetic pyrite (8). A siderite-cemented silty mudstone (7) with detrital muscovite (6).



1:Feohy + TiO2
2:Muscovite +
3:Quartz
4:Siderite +
5:Quartz
6:Illite + Feohy +
7:Mnohy (Mn+Ba)
8:Hornblende
9:Quartz
10:Barite

Figure 3D.18: Crimson F-81 6470(1) site 15. The cuttings in this site consist of: a) fine sandstone probably of altered Ti-Magnetite (1) and muscovite (2); b) siderite-cemented mudstone (3,4); c) siltstone of quartz (5), illite and Feohy (6). The detrital minerals include quartz and hornblende (8).



1:Siderite
2:Feohy +
3:Feohy +
4:Quartz
5:Feohy +
6:Quartz
7:Siderite +
8:K-feldspar
9:Quartz +
K-feldspar
10:Tremolite
11:EPOXY
12:Feohy +
13:Quartz

Figure 3D.19: Crimson F-81 6470(1) site 16. The cuttings in this site consist of: a) K-feldspar (8) and quartz (9); b) siderite (1); quartz (4) and Feohy (5); d) siderite (7) - cemented mudstone (6); e) streaky Feohy (2,3) may be drilling mud; and f) tremolite (10) grains.

Table 3D.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6470(1) depth.

Site	Position	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	Cl	Cr2O3	CoO	CuO	ZnO	As2O3	SrO	Sb2O3	BaO	WO3	PbO	Total	Actual Total
1	1	Tr	61.35			0.26		25.21	13.18																	100	118
1	2	Brt											36.53				0.03						63.44			100	114
1	3	Cal				0.50	0.82		54.68																	56	56
1	4	Brt											36.74				0.15				1.51		61.60			100	117
1	5	Qz +	77.44	0.36	8.58	0.96			4.42	0.83				2.32										5.09		100	75
1	6	Qz +	97.29		0.36				2.35																	100	119
1	7	Brt											36.57										63.43			100	115
1	8	Tur	38.38	0.48	27.96	0.17		13.92	3.05	1.35				1.70												87	104
1	9	Sd +	10.40		4.88	56.22	0.70	8.50	11.97	0.59	0.89	5.85														100	68
2	1	Cpx (Di)	57.09			0.51		18.42	23.98																	100	121
2	2	Sd +	1.01		0.41	42.76	0.40	7.24	3.55			0.63														56	61
2	3	Mix	60.77		23.11	3.74		1.95	2.25	1.10	3.64		1.60										1.84			100	73
2	4	Mnohy (Mn+Pb)					60.17		0.48										6.85						32.50	100	89
2	5	Smt					1.48												98.52							100	63
2	6	Tr	61.63			0.31		25.06	13.00																	100	116
2	7	Hole	40.63			3.97		3.89	50.54				0.97													100	12
2	8	Tr	61.54			0.49		24.94	13.03																	100	118
2	9	Tr	61.40			0.26		25.33	13.01																	100	116
2	10	Brt											36.76				-0.04				1.06		62.22			100	117
2	11	Qz +	100.00																							100	111
2	12	Brt											36.48				0.04				1.25		62.23			100	118
3	1	Tr	61.33			0.38		25.23	13.06																	100	116
3	2	Sd	0.98		0.58	42.61	0.24	6.76	4.19			0.64														56	62
3	3	Mnohy (Mn+Fe)	1.63		0.85	27.46	55.76		1.19														13.11			100	83
3	4	Sd +	1.62		0.96	41.35	0.46	6.73	4.14		0.17	0.57														56	63
3	5	Qz +	97.20		1.84	0.20					0.76															100	122
3	6	Feohy +	3.95		0.76	94.82	0.47																			100	79
3	7	Feohy +	4.71			91.72	2.43	0.70	0.44																	100	80
3	8	Mnohy (Mn+Ca+Ba)	1.00		0.78	1.57	53.02		21.59				8.07										13.97			100	101
3	9	Brt											36.67				-0.03				0.98		62.38			100	118
3.1	1	Mix	72.23		12.67	4.24		1.37	1.09	0.50	2.10		2.72		0.16								2.92			100	103
3.1	2	Sd	0.74		0.37	42.66	0.32	6.10	5.16			0.64														56	61
3.1	3	Sd	0.91			43.56	0.30	6.55	4.17			0.51														56	60
3.1	4	Ep +	36.67		20.34	16.04		3.08	18.51	0.33	2.03															97	87
3.1	5	Ep +	36.57		20.37	16.32		2.99	18.75		2.01															97	88
3.1	6	Brt											37.05								2.53		60.42			100	115
3.2	1	Py	0.11			28.59							71.30													100	227
3.2	2	Py				28.21							71.79													100	224
3.2	3	Py				28.25				0.30			71.45													100	230
3.2	4	Qz +	99.72			0.28																				100	125
3.2	5	Mix	54.58	1.17	26.86	9.20		1.52	0.42	0.27	3.03		1.65											1.30		100	83
3.2	6	Brt											36.86				-0.03						63.17			100	116
3.2	7	Py	0.23			28.51			0.23				71.03													100	225
3.2	8	Py				23.91		0.76	0.33	2.85			72.15													100	125
3.2	9	Py	0.15			26.46			1.96	0.66			70.77													100	202
4	1	Brt											36.52				-0.09				1.81		61.76			100	117
4	2	Qz	99.10		0.57	0.33																				100	123

Table 3D.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6470(1) depth.

Site	Position	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	Cl	Cr2O3	CoO	CuO	ZnO	As2O3	SrO	Sb2O3	BaO	WO3	PbO	Total	Actual Total
4	3	Ms + Sd	24.03		16.38	54.62	0.34	1.29	0.50		2.84															100	92
4	4	Tr	60.41		0.81	0.39		25.06	12.71	0.62																100	119
4	5	Sd	1.01		0.45	42.07	0.39	6.58	5.50																	56	63
4	6	Feohy +	3.65		1.84	90.78			2.49						0.40	0.84										100	83
4	7	Chl + Sd +	16.78		11.10	68.66	0.53	0.53	0.95		1.45															100	84
4	8	Mnohy (Mn+Ba)	5.95		5.19		70.67		0.78		0.80												16.61			100	88
4	9	Qz + Mn	93.69		0.54	0.75	3.89																1.13			100	119
4	10	Sd + Chl	15.46		11.70	59.71	0.67	5.58	6.88																	100	69
4	11	Cpx (Di)	57.10			0.31		18.89	23.70																	100	119
4	12	Feohy +	2.31			97.69																				100	79
4	13	Qz	99.56			0.44																				100	224
5	1	Tr	61.46			0.34		25.27	12.93																	100	116
5	2	Brt											36.70				-0.09				1.60		61.79			100	117
5	3	Feohy +	3.61			86.51			0.40									2.58		1.57					5.33	100	86
5	4	Feohy +	7.21		1.45	85.15			0.31						0.47			1.68	3.73							100	80
5	5	Ms +	62.29	0.45	22.19	3.99		1.85	0.46	0.65	3.13															95	114
5	6	Cpx (Di)	57.01		0.55	0.26		18.35	23.47	0.36																100	121
6	1	Qz	100.00																							100	124
6	2	Brt											36.89				0.05						63.06			100	115
6	3	Feohy +	4.65			94.15	0.54		0.66																	100	79
6	4	Qz	100.00																							100	122
6	5	Ep	40.61		25.49	5.49		2.25	22.81						0.34											97	105
6	6	Kfs	64.61		18.08	4.24					13.07															100	107
6	7	Ttn	34.31	19.77	9.30	8.93		2.54	23.37			1.79														100	105
7	1	Brt											36.78				0.07				1.59		61.56			100	118
7	2	Ab	69.22		18.64	0.43			0.21	11.50																100	118
7	3	Qz	98.06			1.42		0.36	0.16																	100	124
7	4	Sd +	2.83		1.37	41.17	0.45	6.20	3.34			0.64														56	56
7	5	Mnohy (Mn+Al+Pb)	5.95		15.02	7.42	50.30		1.73		0.58												3.42		15.58	100	81
7	6	Mix	18.21	0.75	30.54	7.05	37.91	0.82	0.89		2.71							1.12								100	80
7	7	Brt											36.21				-0.03						63.82			100	108
7	8	Tlc	67.22			0.72		32.06																		100	107
7	9	Qz	100.00																							100	126
7	10	Kfs	65.92		17.93						16.15															100	117
7	11	Qz	100.00																							100	123
7	12	Sd				45.21	0.88	8.51	1.40																	56	62
7	13	Feohy +	1.95		0.60	96.48																	0.97			100	89
7	14	Qz	99.19		0.35	0.46																				100	123
7	15	Qz	100.00																							100	124
7	16	Brt	0.69										36.78				-0.04				1.53		61.04			100	117
8	1	Brt											36.95				-0.05				1.94		61.16			100	117
8	2	Qz	99.67		0.33																					100	120
8	3	Brt											37.26				-0.08						62.82			100	116
8	4	Mix	31.78	1.47	15.65	23.76		9.69	5.38	2.79	1.95		7.07		0.45											100	46
8	5	Feohy +	11.90		12.88	73.19			0.83		1.20															100	88
8	6	Qz + Brt	62.77										1.34										35.89			100	52
8	7	Brt											36.75				0.05						63.20			100	119

Table 3D.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6470(1) depth.

Site	Position	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	Cl	Cr2O3	CoO	CuO	ZnO	As2O3	SrO	Sb2O3	BaO	WO3	PbO	Total	Actual Total
8	8	Chl +	21.17		11.52	38.05		4.94	5.59	1.05	1.39	1.28														85	73
8	9	Feohy +	8.79			81.12			0.59				0.78					4.96	1.63				2.13			100	85
8	10	Qz	98.76										0.40										0.84			100	131
8	11	Brt											36.97				-0.09				1.43		61.69			100	117
9	1	Qz	100.00																							100	122
9	2	Brt											36.64				0.01						63.35			100	117
9	3	Feohy +	4.45			93.05	0.96		0.34											1.20						100	79
9	4	Brt											36.10				0.05						63.85			100	117
9	5	Brt	6.08		2.06						0.97		34.05				0.03						56.81			100	121
9	6	Qz + Kfs	94.80		2.90						2.30															100	122
9	7	Brt	2.13		1.11	1.90		2.03	1.66				33.30				-0.05						55.13	2.79		100	109
9	8	Brt	1.91		0.48	0.87							31.37				-0.01						65.38			100	97
9	9	Feohy +	2.94			96.51	0.55																			100	81
9	10	Qz	99.39		0.40	0.21																				100	123
9	11	TiO2	1.97	97.23	0.51	0.29																				100	109
9	12	Feohy +	4.42			84.64													3.41	1.63		2.35			3.55	100	80
9	13	Qz + Cal	95.12		0.38				2.99				0.58										0.93			100	120
9	14	Brt	13.70		6.95	2.11		0.83	0.93	0.43	0.81		21.99										52.25			100	52
9	15	Feohy +	1.92			96.79																	1.29			100	81
9	16	Brt											36.74				0.05				1.45		61.76			100	116
10	1	Feohy +	3.29			95.88	0.41		0.42																	100	83
10	2	Qz + Chl	95.35		2.93	1.14					0.58															100	122
10	3	Mix	23.19		11.81	43.45	0.44	8.90	7.45	0.56	1.73		2.27		0.20											100	98
10	4	Mix	48.39	0.71	26.65	14.15		2.94	3.05	0.68	2.84		0.58													100	81
10	5	Brt											36.57								1.00		62.43			100	118
10	6	Qz	98.40										0.69										0.91			100	126
10	7	Brt			0.72	1.60			0.77				35.34				-0.08						58.81	2.84		100	113
10	8	Kfs	65.96		18.30						15.74															100	122
10	9	Brt											36.92				0.07				1.17		61.84			100	122
10	10	Brt	8.16		1.54	1.26			0.52				31.79				0.05						53.45	3.23		100	88
10	11	Fe+Cu+As				35.51			0.75									39.30		24.44						100	90
10	12	TiO2 + Al-Phos		63.71	15.13				0.87		0.26	17.73												2.30		100	89
10	13	Ms	52.66	0.61	28.24	1.81		2.19			9.49															95	113
10	14	BA*											22.48				-0.09						77.61			100	33
10	15	Sd	0.83			40.66	0.28	7.40	6.83																	56	61
11	1	Tr	61.46		0.40	0.47		24.55	13.12																	100	118
11	2	Qz	99.36					0.28	0.36																	100	124
11	3	TiO2		99.49												0.51										100	111
11	4	Ab	69.23	0.24	19.03				0.48	11.02																100	116
11	5	Brt + TiO2		38.81	0.53	0.34							22.01				0.04						38.27			100	113
11	6	Kfs	60.75		16.53	6.88		1.22			14.62															100	110
11	7	Brt				0.39							36.75								2.27		60.59			100	117
11	8	Ab	67.34	0.49	19.59	1.08			0.60	10.14	0.76															100	118
11	9	Sd +	1.15	0.30		44.59	0.84	7.93	1.19																	56	63
11	10	Brt +	8.47		0.60								34.08				-0.12		0.02				56.95			100	118
11	11	Qz	100.00																							100	122
11	12	Brt	5.51		1.23	7.70		0.44	1.03				30.70										49.78	3.61		100	106

Table 3D.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6470(1) depth.

Site	Position	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	Cl	Cr2O3	CoO	CuO	ZnO	As2O3	SrO	Sb2O3	BaO	WO3	PbO	Total	Actual Total
12	1	Ab	68.54		19.37	0.33			0.47	10.98	0.31															100	118
12	2	Sd + Ap + Ms + Chl	10.40		5.70	54.20	0.67	7.87	12.03		1.39	6.66											1.08			100	71
12	3	Brt											36.07				-0.01				1.55		62.39			100	116
12	4	Brt	3.69		1.40	2.83			7.94		0.29		30.02										53.83			100	96
12	5	Ab	63.38		19.26	4.35		0.33	1.30	10.15	0.43	0.80														100	120
12	6	Sd + Chl	5.92		4.09	72.28	1.46	13.52	2.73																	100	67
12	7	Qz	100.00																							100	122
12	8	Feohy +	2.89		0.57	96.54																				100	79
12	9	Qz	99.53			0.47																				100	123
13	1	Qz	99.13			0.87																				100	126
13	2	Feohy +	2.89			94.34														1.09		1.68				100	90
13	3	Sd +	2.02		0.96	39.81	0.34	6.75	4.65	0.51		0.96														56	65
13	4	Mnohy (Mn+Ba)					77.84		0.80														21.36			100	84
13	5	Feohy +	7.12			89.55	1.60		0.64											1.09						100	81
13	6	Feohy +	4.89			94.29													0.82							100	83
13	7	Feohy +	1.21			97.65														1.14						100	93
13	8	Kfs	65.63		18.23	0.22				0.47	15.45															100	123
13	9	Feohy +	6.66			89.83	0.49		1.08											1.94						100	80
13	10	Mix	7.61	1.09	16.23	24.37	0.34	6.97	43.39																	100	99
13	11	Qz +	85.19	0.44	3.46	1.27			3.53					3.55										2.56		100	75
14	1	Sd				48.87	3.06	2.28	1.80																	56	64
14	2	Brt											36.90				0.05				2.29		60.76			100	122
14	3	Brt											37.05				-0.08				1.81		61.22			100	119
14	4	Ms + Sd	54.08	0.54	28.40	7.70		3.06	0.77	0.45	5.00															100	96
14	5	Sd +	2.83		1.08	41.58	1.01	6.51	2.78		0.20															56	66
14	6	Ms	51.88		32.20	0.96		1.29			8.67															95	113
14	7	Sd + Ms	10.98		12.53	64.34					1.97							0.78		2.04		7.36				100	74
14	8	Py				28.45				0.35			71.20													100	232
14	9	Ilt + Kln + Sd	51.91		29.29	9.29		2.15	0.80	0.33	3.32		1.59										1.32			100	104
14	10	Brt											39.63				-0.02				2.24		58.15			100	125
14	11	Brt											36.58				0.07				1.94		61.41			100	119
14	12	Feohy +	9.04		8.77	78.39	0.54		0.87	0.63	0.58					1.18										100	81
15	1	Feohy + TiO2		10.38	1.11	88.51																				100	96
15	2	Ms +	52.65	0.42	24.61	4.23		2.96			10.13															95	108
15	3	Qz	98.55			1.45																				100	123
15	4	Sd +	4.35		2.55	37.59	0.30	7.22	3.05		0.27	0.67														56	68
15	5	Qz	98.32		0.96	0.47					0.25															100	124
15	6	Ilt + Feohy +	36.68	0.34	5.90	55.18			0.38		1.52															100	103
15	7	Mnohy (Mn+Ba)				8.75	69.26		0.49		0.28							6.08					15.14			100	84
15	8	Hbl	45.92	1.72	8.97	16.66	0.75	11.49	11.72	1.54	1.24															100	103
15	9	Qz	98.91		0.57	0.39					0.13															100	123
15	10	Brt											36.94				-0.07				1.66		61.47			100	119
16	1	Sd				49.27	2.92	2.40	1.42																	56	64
16	2	Feohy +	3.21			91.88	0.45			1.00			1.26			2.20										100	100
16	3	Feohy +				95.89	0.58		2.33				1.20													100	76
16	4	Qz	98.49		0.36	1.15																				100	124
16	5	Feohy +	2.43			95.51	1.34		0.72																	100	79

Table 3D.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6470(1) depth.

Site	Position	Mineral	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	F	Cl	Cr2O3	CoO	CuO	ZnO	As2O3	SrO	Sb2O3	BaO	WO3	PbO	Total	Actual Total
16	6	Qz	97.11		1.19	1.70																				100	118
16	7	Sd +	1.59		0.87	42.17	0.47	3.54	6.60			0.77														56	63
16	8	Kfs	66.27		17.81						15.92															100	121
16	9	Qz + Kfs	73.87		14.18					3.78	8.17															100	118
16	10	Tr	61.65			0.42		24.92	13.01																	100	116
16	11	EPOXY												52.99	23.88								23.13			100	1
16	12	Feohy +	2.46		1.26	95.65		0.63																		100	81
16	13	Qz	100.00																							100	121

Appendix 3E: SEM-BSE images and EDS mineral analyses for sample F-81 6470(2)

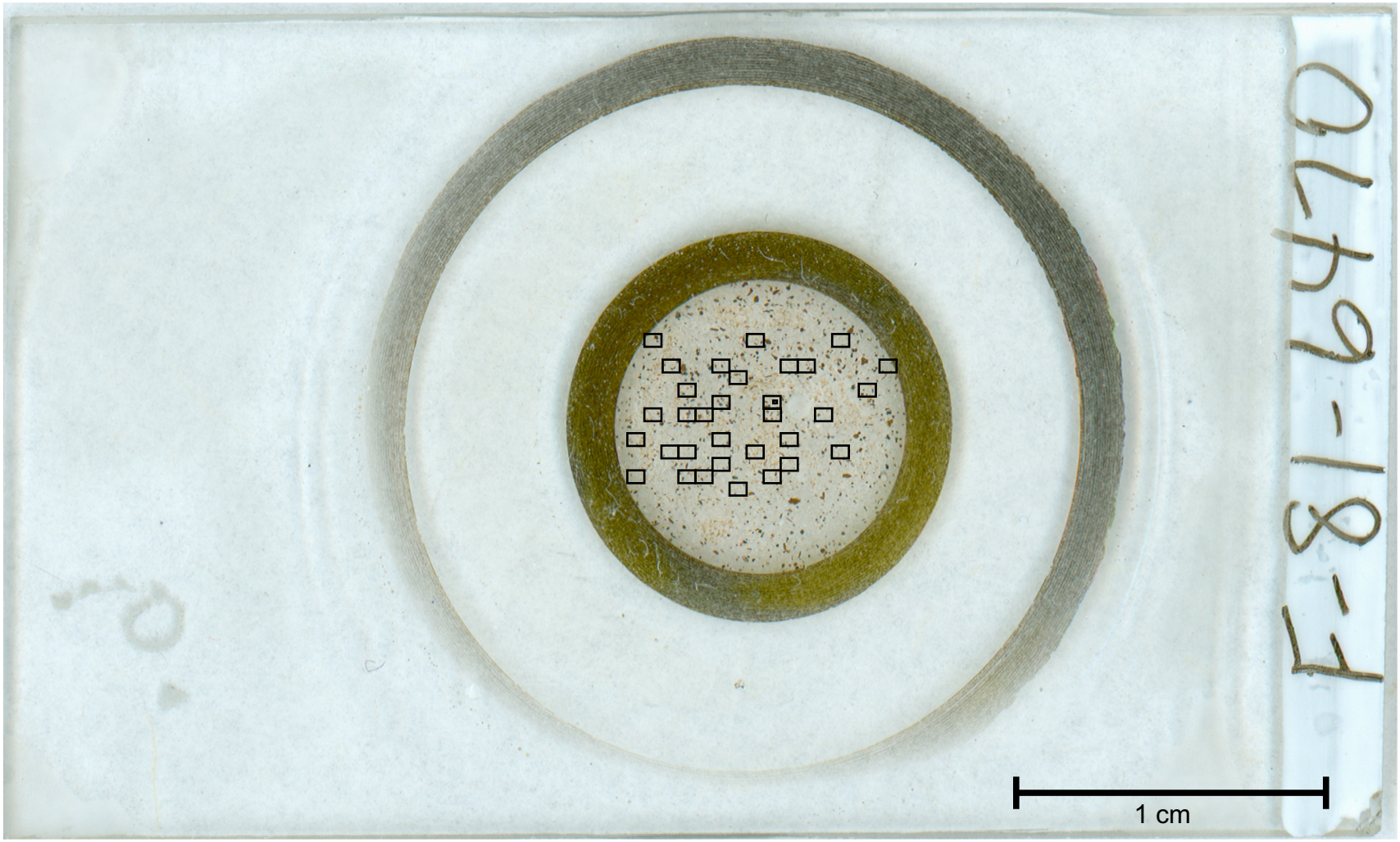
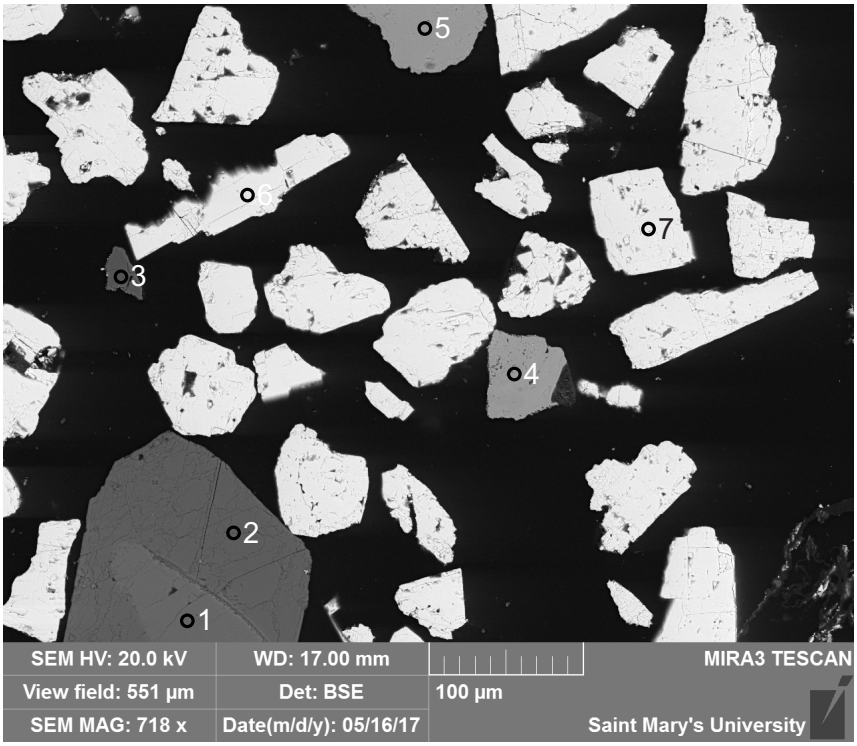
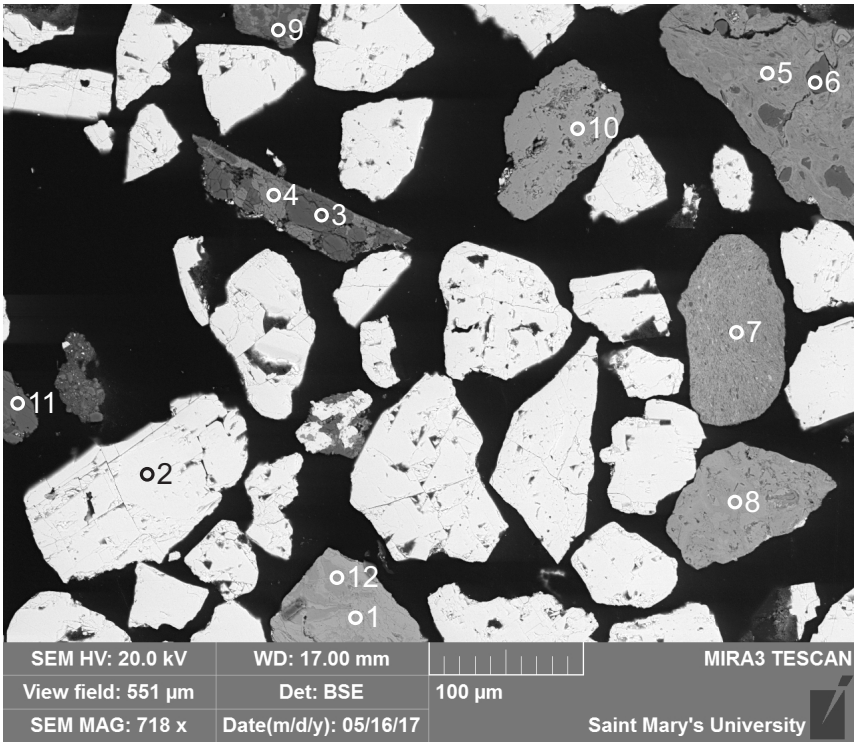


Figure 3E.1:Thin Section for Crimson F-81 well at 6470m depth.



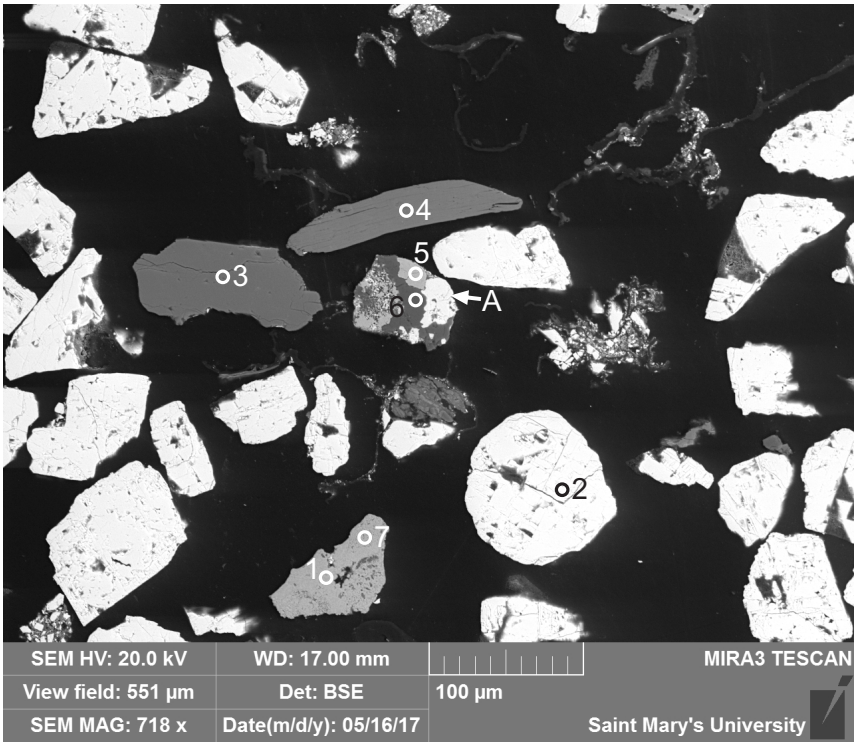
1: Fluorite
2: Actinolite
3: Quartz
4: Zincite
5: Feohy + Quartz
6: Barite
7: Barite

Figure 3E.2: Crimson F-81 6470m site 1. Actinolite (2) contains either a large fluorite (1) inclusion, or has fluorite filling a dissolution void. Zincite (4) is a contaminant.



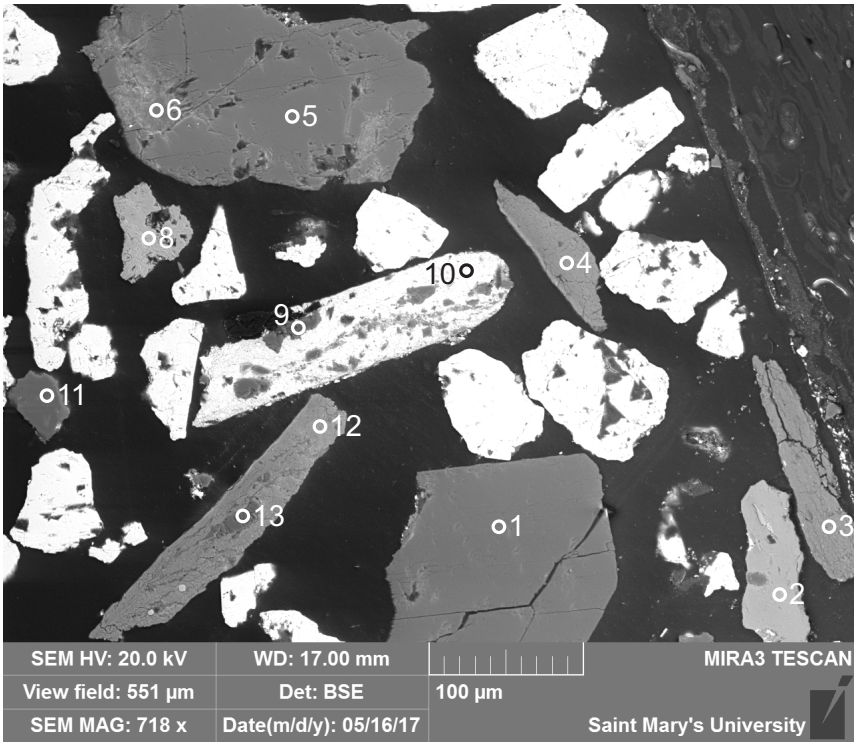
1: Siderite
2: Barite
3: Quartz
4: Mix
5: Mix
6: Quartz
7: Mix
8: Siderite +
9: Oligoclase
10: Siderite + Quartz
11: Actinolite
12: Siderite + Quartz

Figure 3E.3: Crimson F-81 6470m site 2. A cutting made up of quartz (3) and a mixture (4) of siderite and albite, in which siderite appears to be replacing albite. A grain of oligoclase (9).



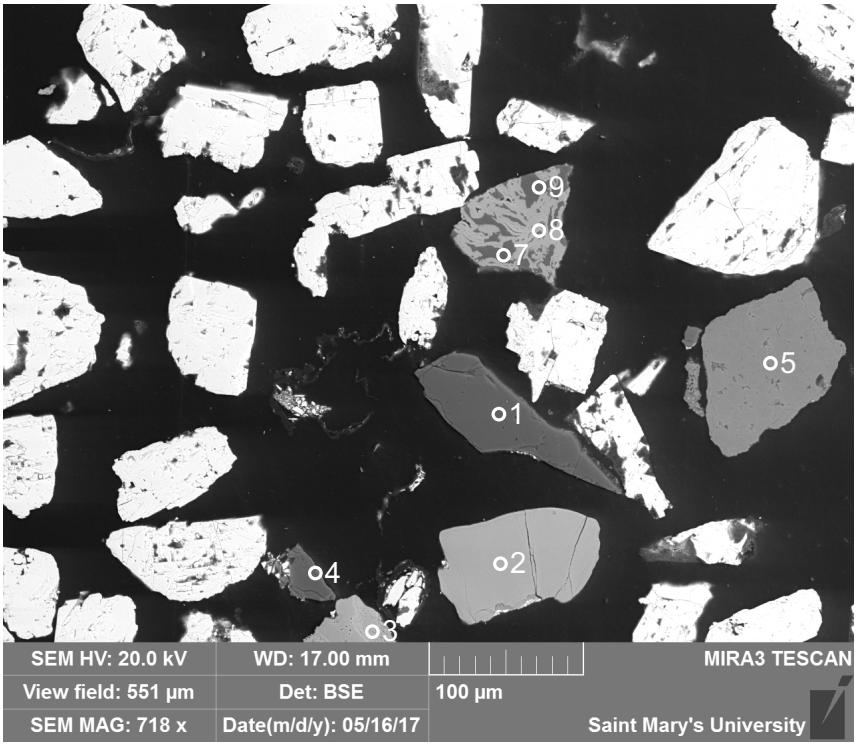
1: Siderite
2: Barite
3: Clinopyroxene (Diopside)
4: Biotite
5: Pyrite
6: Quartz
7: Siderite + Quartz

Figure 3E.4: Crimson F-81 6470m site 3. A cutting made up of quartz (6) and diagenetic pyrite (5) which appears to be surrounded by barite (A). Diopside (3) and biotite (4) are contaminants.



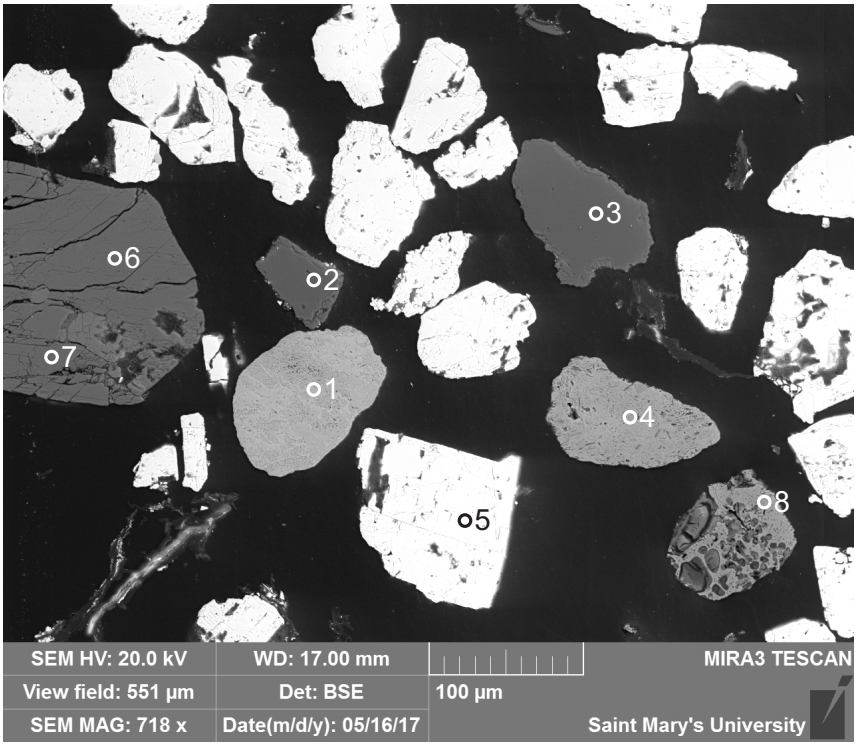
1: Actinolite
2: Siderite +
3: Siderite +
4: Ilmenite +
5: Clinopyroxene (Diopside)
6: Orthopyroxene
7: Barite
8: Siderite +
9: Quartz
10: Barite
11: Quartz
12: Siderite +
13: Quartz

Figure 3E.5: Crimson F-81 6470m site 4. Grains of actinolite (1), diopside (5), and orthopyroxene (6) are likely contaminants. A cutting of barite (10) surrounding quartz (9).



1: Quartz
2: Siderite + Quartz
3: Feohy + Quartz
4: Quartz
5: Siderite
6: Barite
7: Quartz
8: Quartz + Siderite
9: Quartz

Figure 3E.6: Crimson F-81 6470m site 5. A cutting made up of quartz (7,9) and a mixture (8) of detrital quartz and siderite.



1: Feohy +
2: Quartz
3: Quartz
4: Chlorite + Siderite
5: Barite
6: Actinolite
7: Actinolite
8: Mix

Figure 3E.7: Crimson F-81 6470m site 6. A cutting of siderite (4) cemented mudstone containing chlorite (4). Free grains of contaminant actinolite (6,7) and barite (5).

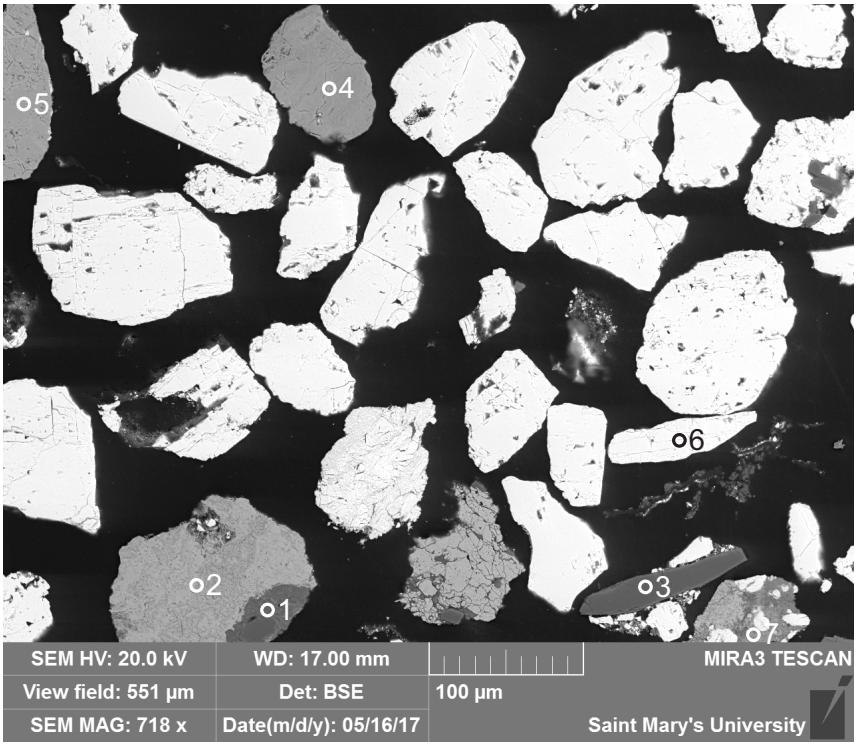


Figure 3E.8: Crimson F-81 6470m site 7. Cuttings of Siderite (2,5) cemented mudstone with chlorite (2,5)

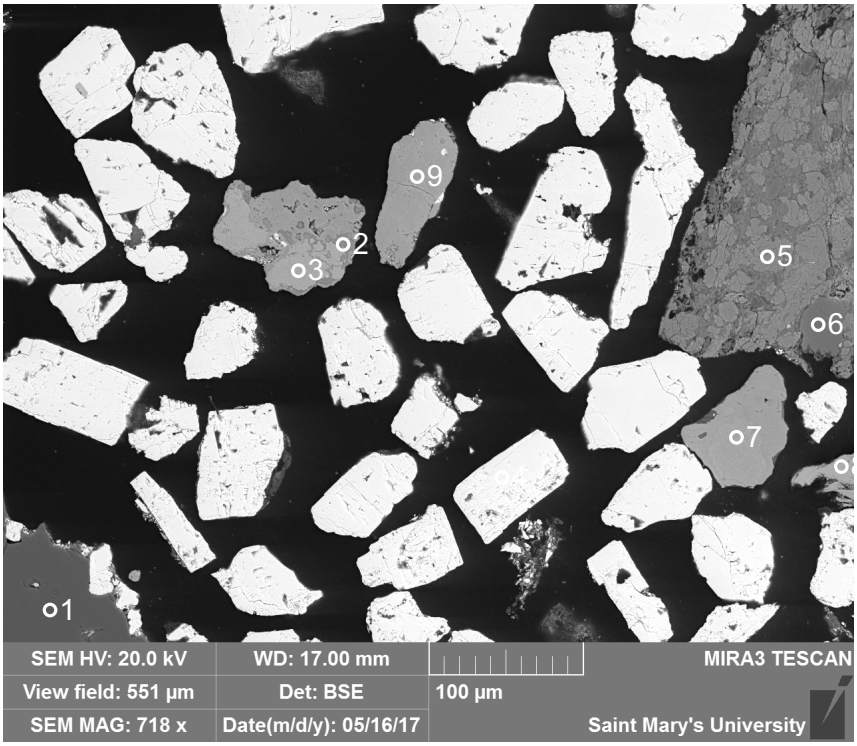
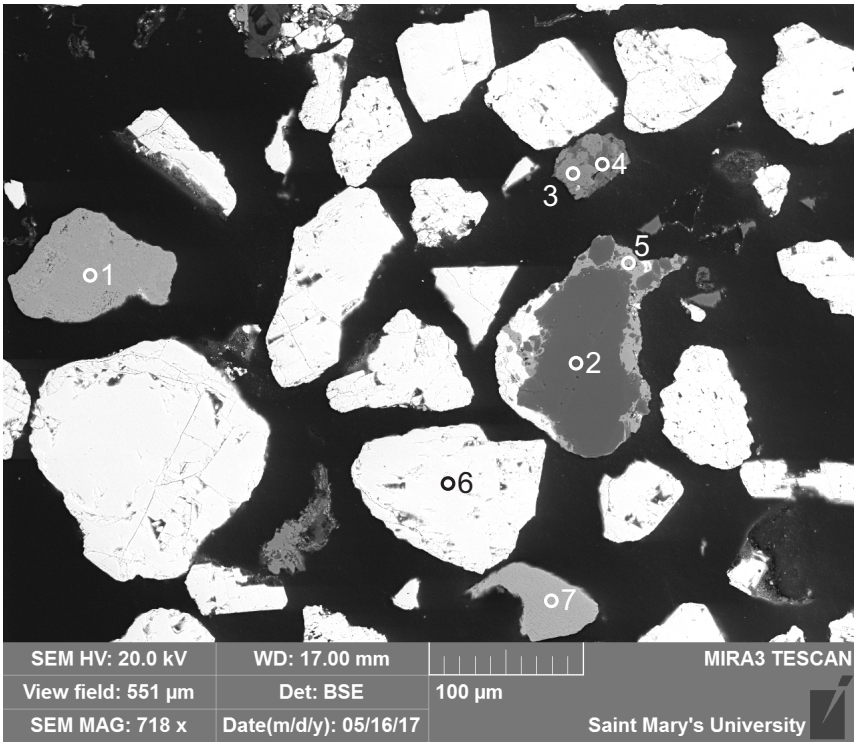
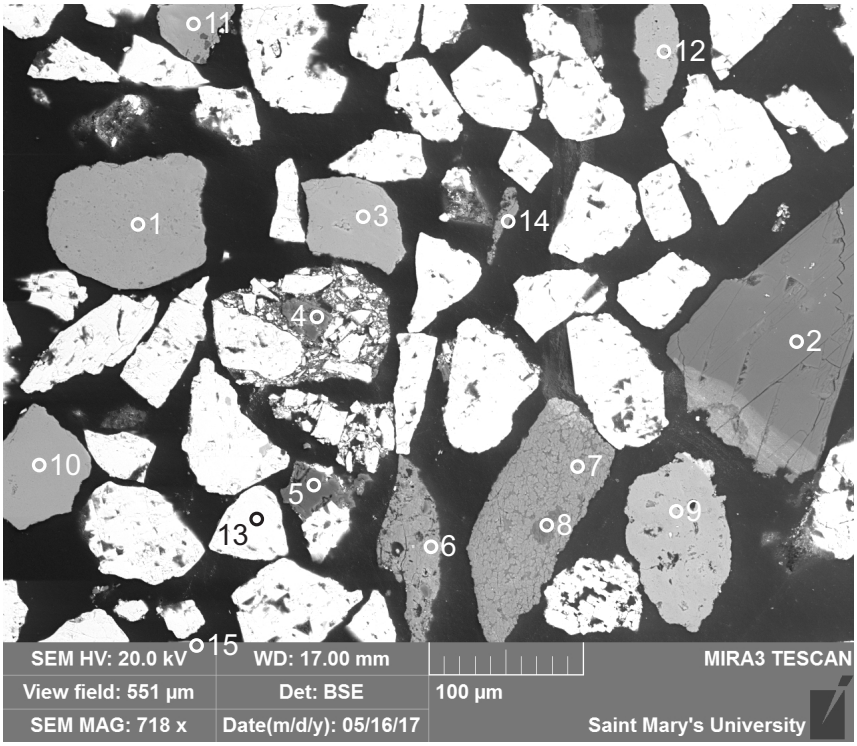


Figure 3E.9: Crimson F-81 6470m site 8. A cutting of siderite (5) cemented mudstone containing fluorite (6). Fluorite (6) shows rounded edges and may be detrital and appears to be partly replaced by siderite.



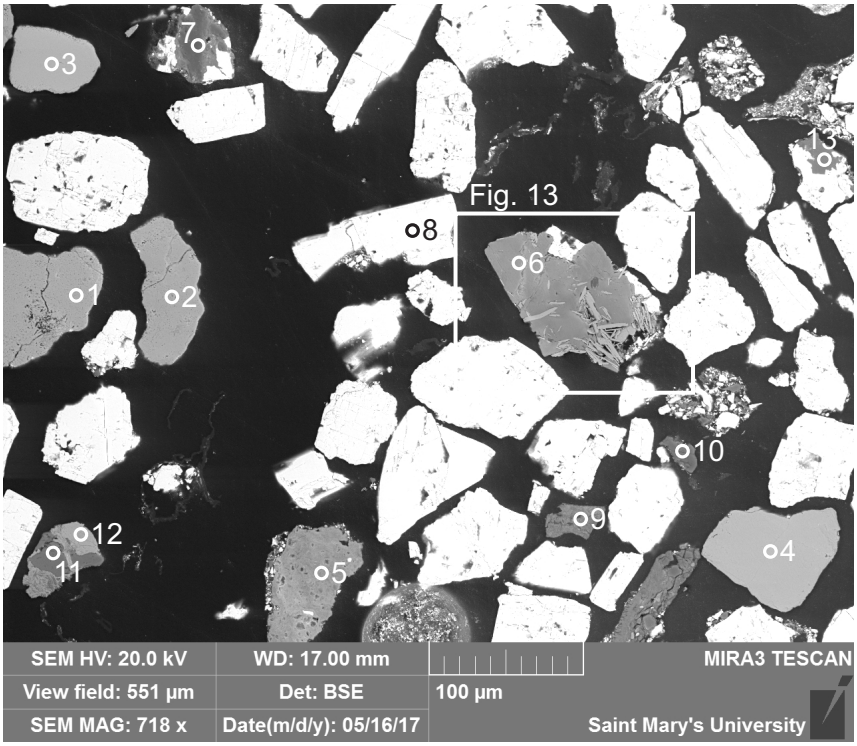
1: Feohy +
2: Quartz
3: Siderite +
4: Albite
5: Feohy +
6: Barite
7: Feohy +

Figure 3E.10: Crimson F-81 6470m site 9. Siderite (3) is replacing albite (4). Quartz (2) rimmed by diagenetic Feohy (5) and barite.



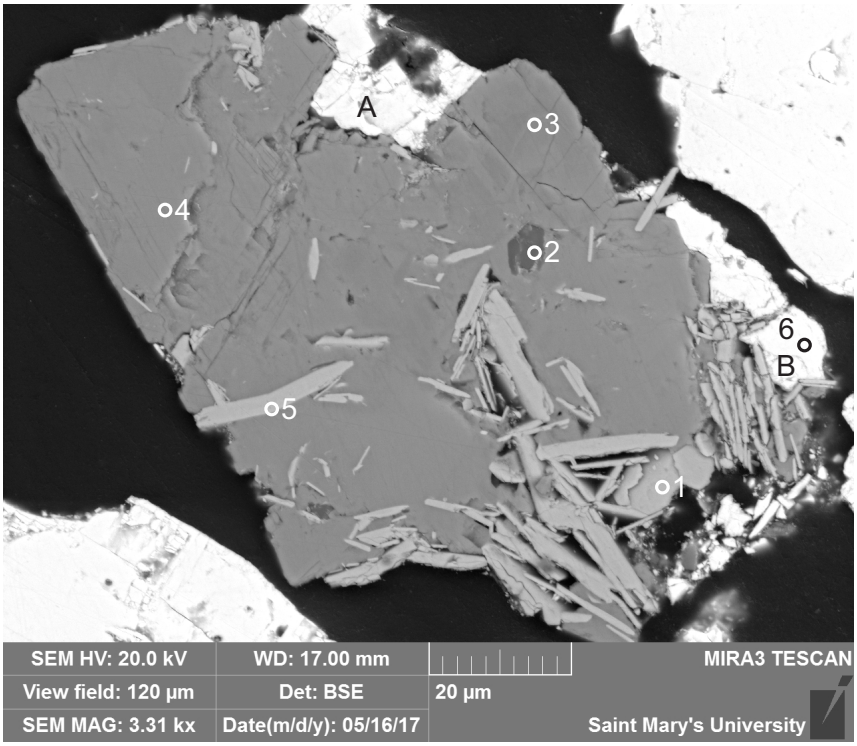
1: Siderite +
2: Actinolite
3: Siderite + Quartz
4: Quartz
5: Quartz
6: Siderite +
7: Siderite +
8: Albite
9: Siderite +
10: Feohy +
11: Feohy +
12: Siderite +
13: Barite
14: Mix
15: Siderite

Figure 3E.11: Crimson F-81 6470m site 10. Siderite (7) is replacing albite (8).



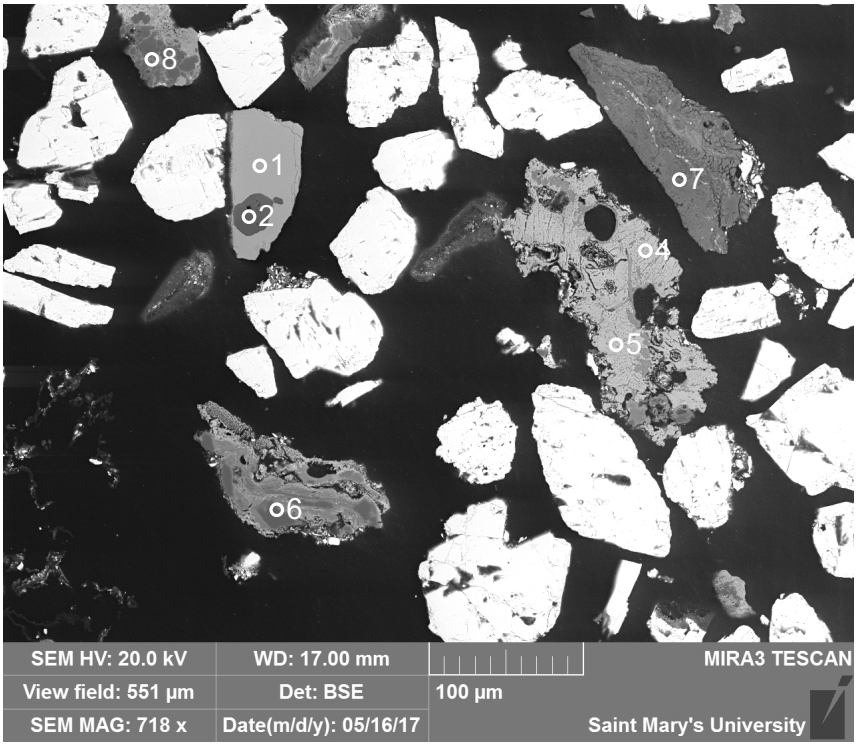
1: Feohy +
2: Siderite +
3: Feohy +
4: Siderite +
5: Chlorite
6: Siderite + Siderite (Fig. 13)
7: Quartz +
8: Barite
9: Kaolinite +
10: Quartz
11: K-feldspar
12: Feohy +
13: K-feldspar

Figure 3E.12: Crimson F-81 6470m site 11. K-feldspar (11,13) appears to be replaced by barite and Feohy (12). A piece of chlorite (5) and kaolinite (9) cements. Relics of detrital K-feldspar (11,13) partly replaced by Feohy (12) or barite.



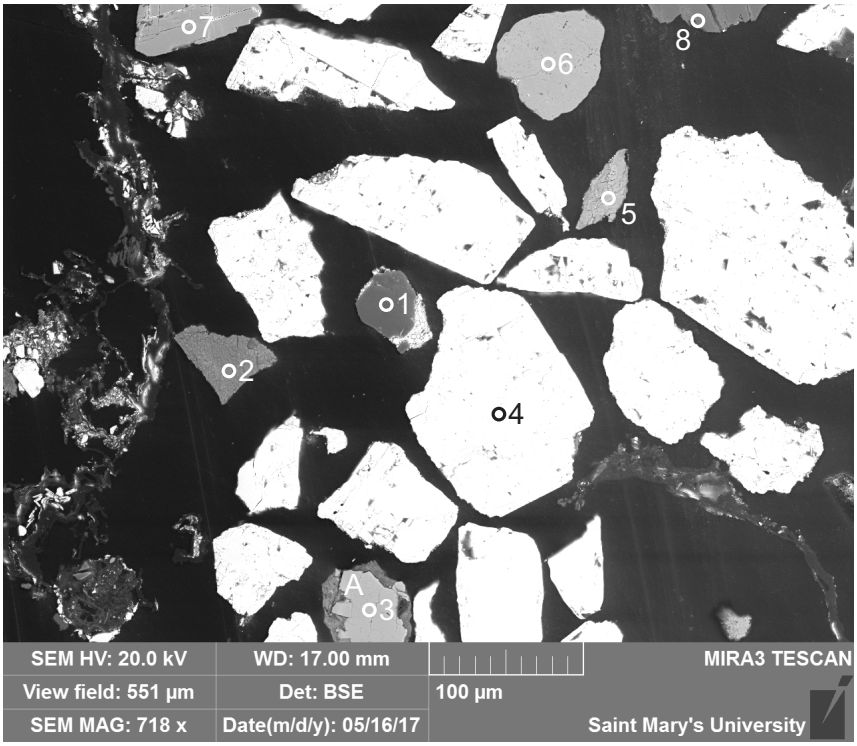
1: Feohy
2: Quartz + Siderite
3: Feohy
4: Siderite
5: Feohy
6: Barite

Figure 3E.13: Crimson F-81 6470m site 11.1. A cutting made up of diagenetic siderite (4) which is cut by later Feohy (1,3,5) and contains quartz (2). Barite (6, position A) surrounds the cuttting and is probably diagenetic with interlocking texture (position B).



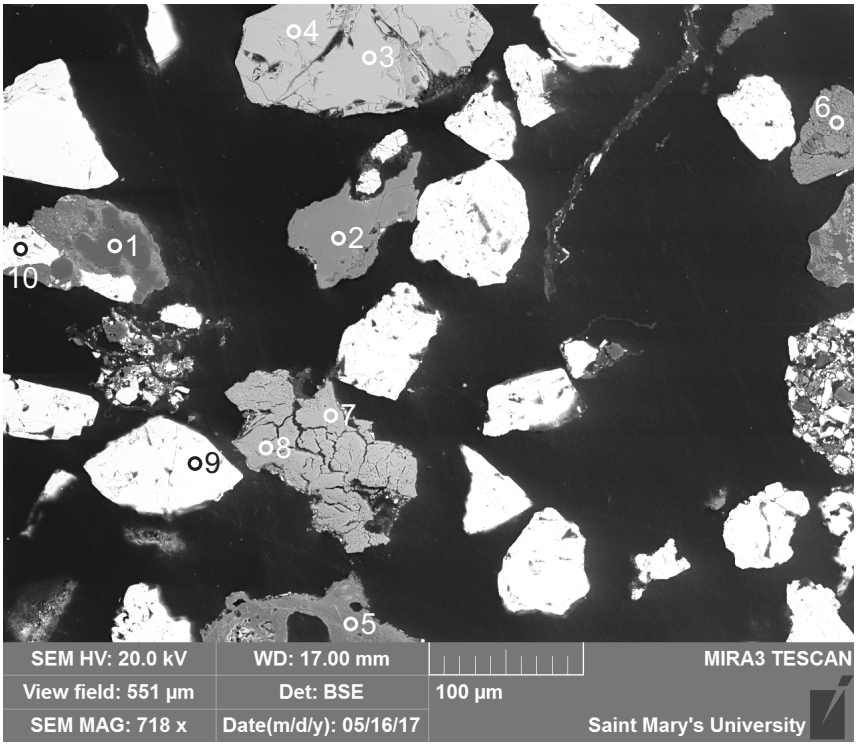
1: Mnohy
2: Quartz
3: Barite
4: Mnohy +
5: Mnohy +
6: Quartz
7: Quartz
8: Quartz +

Figure 3E.14: Crimson F-81 6470m site 12. Mnohy (4,5) is likely a contaminant.



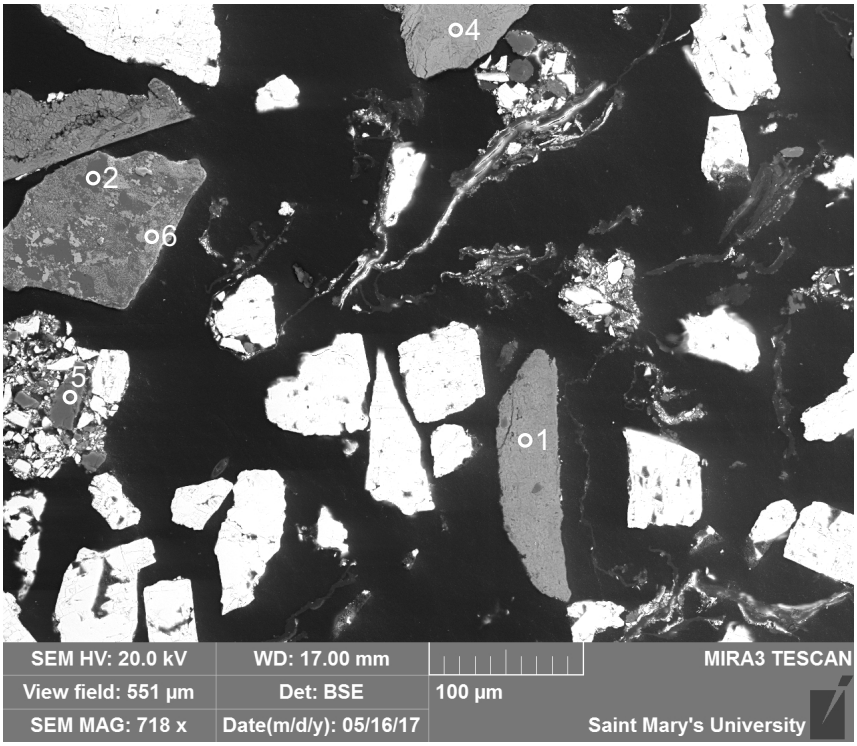
1: Quartz
2: Chlorite +
3: Pyrite
4: Barite
5: Siderite + Quartz
6: Siderite + Quartz
7: Znohy +
8: Actinolite

Figure 3E.15: Crimson F-81 6470m site 13. Multiple drilling mud contaminants including barite (4), Znohy (7), and actinolite (8). Diagenetic pyrite (3) appears to be associated with quartz (position A).



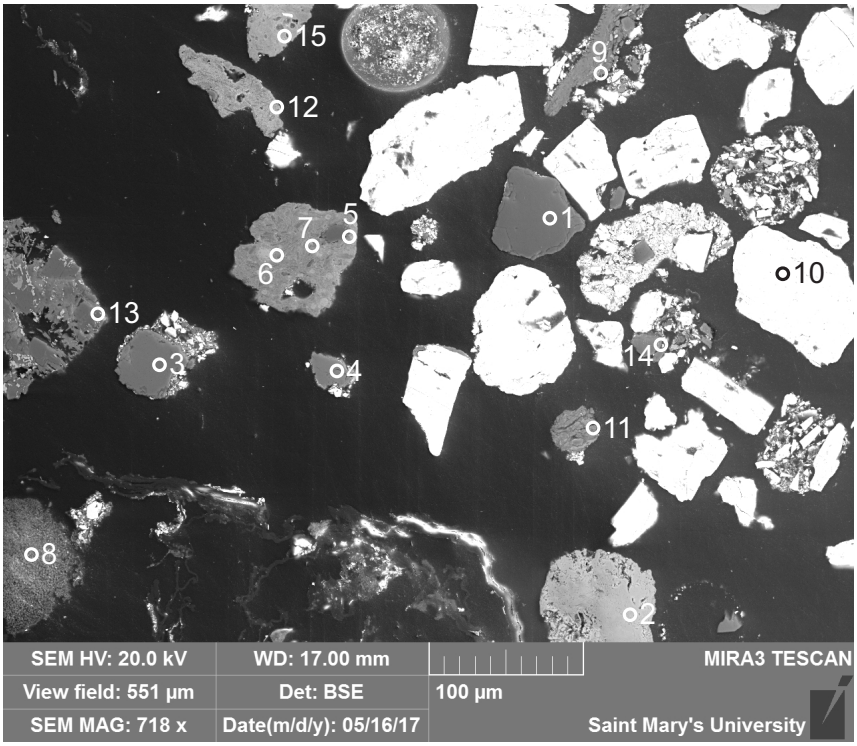
1: Quartz
2: Siderite
3: Pyrite
4: Pyrite
5: Muscovite
6: Siderite +
7: Mnohy +
8: Mnohy +
9: Barite
10: Barite

Figure 3E.16: Crimson F-81 6470m site 14. Diagenetic barite (10) invading a cutting of mudstone containing quartz (1).



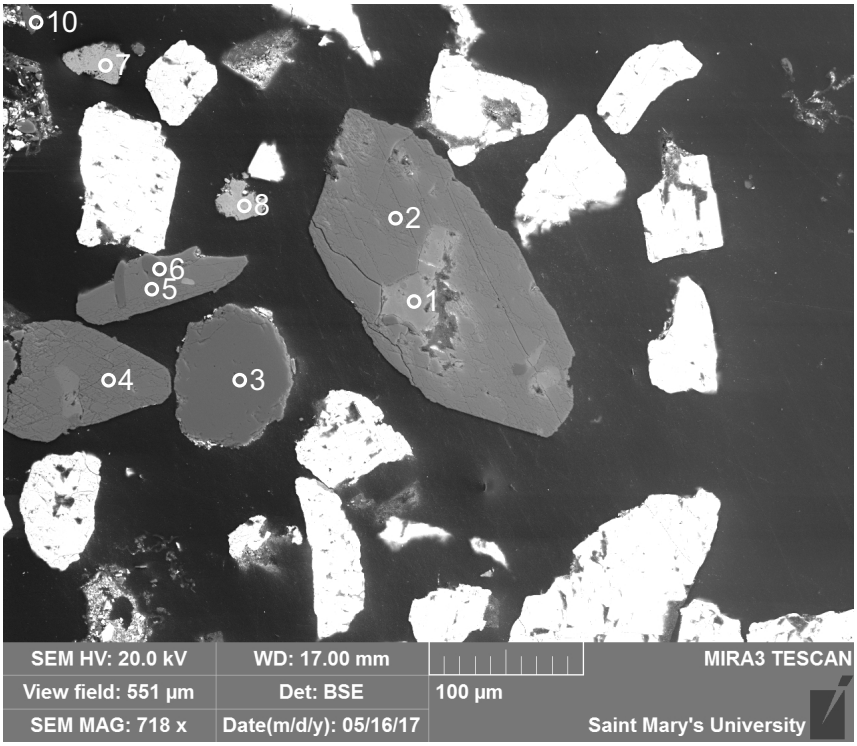
1: Calcite +
2: Quartz
3: Barite
4: Siderite + Quartz
5: Quartz
6: Quartz + Siderite

Figure 3E.17: Crimson F-81 6470m site 15. A cutting of siderite (6) cemented mudstone containing quartz (2,6)



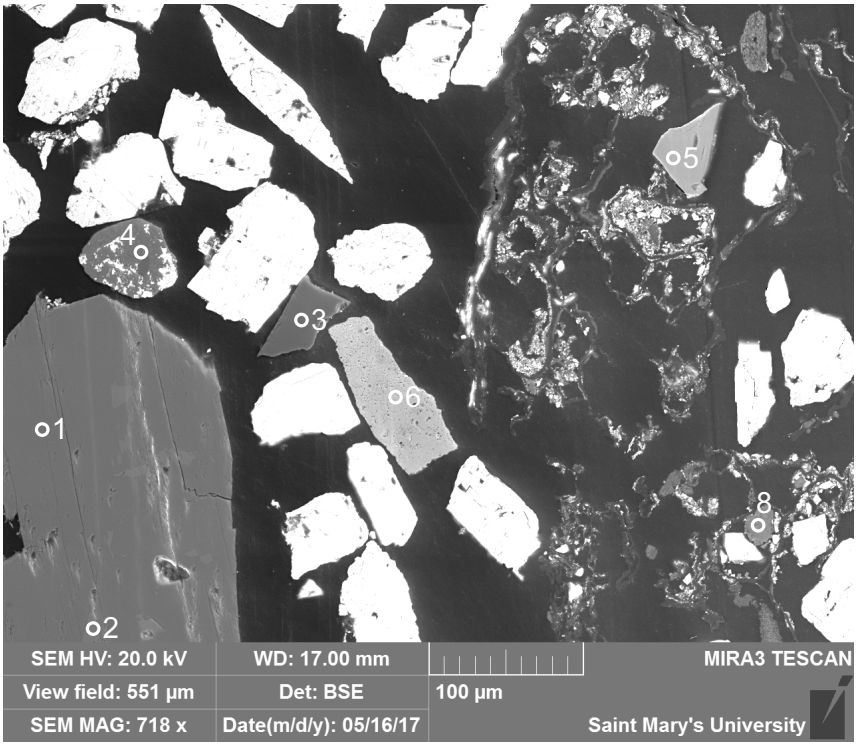
1: Quartz
2: Siderite +
3: K-feldspar
4: Calcite
5: Biotite
6: Biotite
7: Biotite
8: Fluorite
9: Pyrite +
K-feldspar
10: Barite
11: Albite
12: Biotite
13: Albite +
14: Quartz
15: Chlorite

Figure 3E.18: Crimson F-81 6470m site 16. A free grain of biotite (5-7) with quartz inclusions.



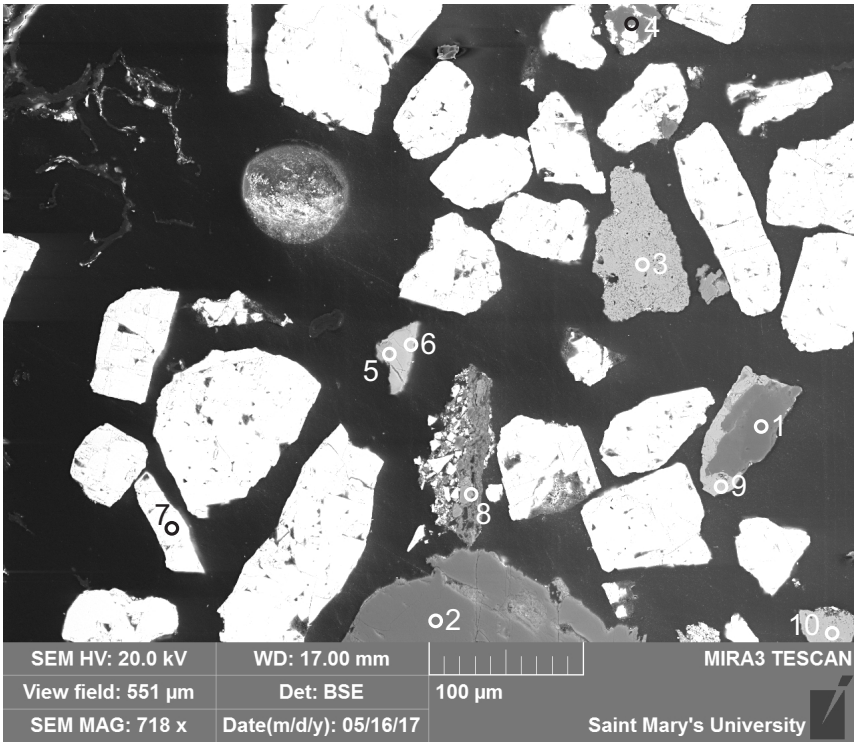
1: Fluorite
2: Actinolite
3: Quartz
4: Actinolite
5: Actinolite
6: Quartz
7: Feohy +
8: Siderite +
9: Barite
10: Calcite

Figure 3E.19: Crimson F-81 6470m site 17. Actinolite (2,4,5) with inclusions of quartz (6) and fluorite (1) filling a dissolution void. Actinolite is likely a contaminant in this sample.



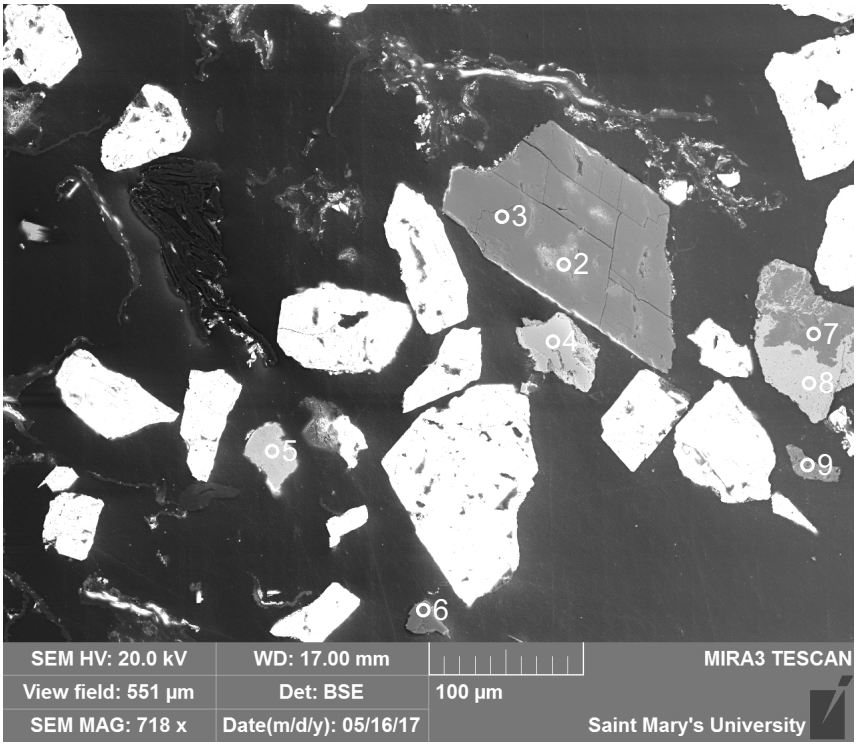
1: Actinolite
2: Clinopyroxene (Diopside)
3: Quartz
4: K-feldspar
5: Fluorite
6: Siderite +
7: Barite +
8: Quartz +

Figure 3E.20: Crimson F-81 6470m site 18. A grain of actinolite (1) with inclusions of diopside (2). K-feldspar (4) appears to have dissolution voids filled with barite.



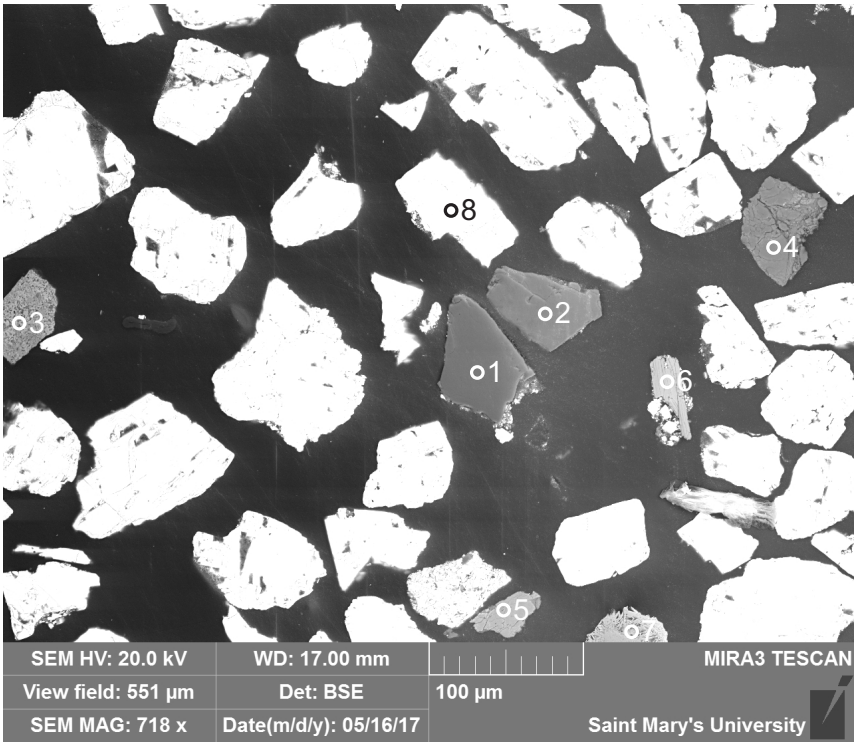
1: Quartz
2: Actinolite
3: Feohy +
4: Quartz
5: Mix
6: Mix
7: Barite
8: Mix
9: Siderite +
10: Siderite +

Figure 3E.21: Crimson F-81 6470m site 19. Quartz (1) is surrounded by diagenetic siderite (9).



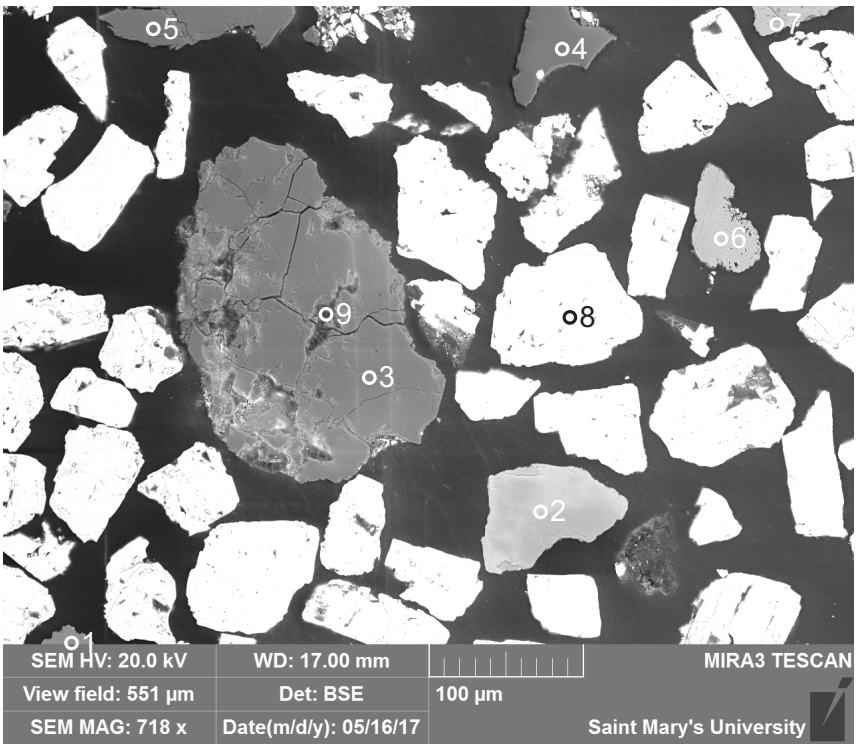
1: Barite
2: Mix
3: Actinolite
4: Feohy
5: Siderite +
6: Quartz
7: Quartz
8: Feohy +
9: Muscovite + Kaolinite

Figure 3E.22: Crimson F-81 6470m site 20. Actinolite (3) is likely a contaminant. Siderite cement (8) is surrounding quartz (7).



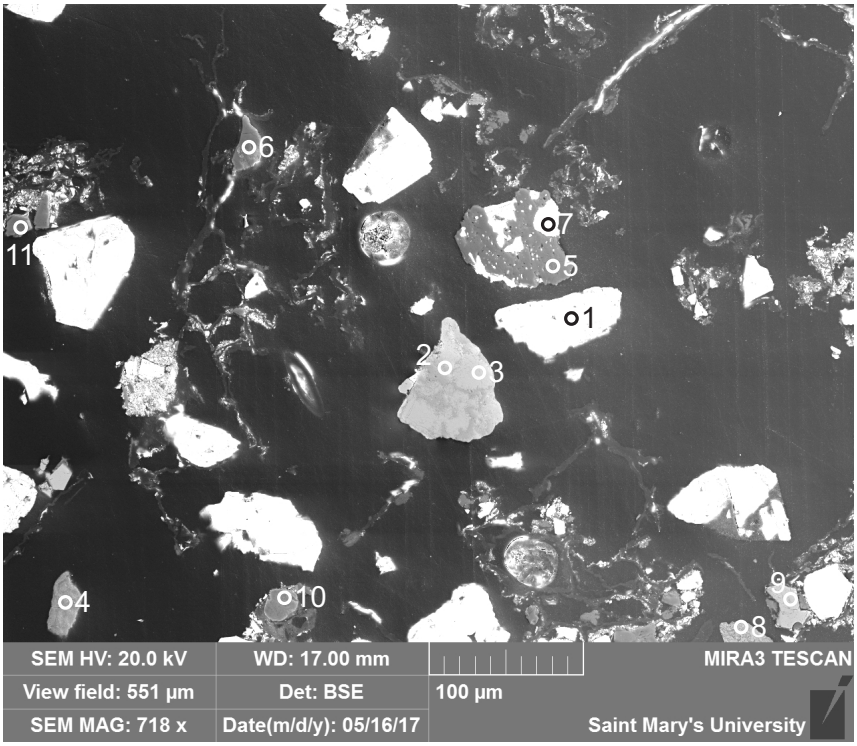
1: Quartz
2: Quartz
3: Siderite +
4: Quartz
5: Siderite
6: Feohy + Quartz
7: Feohy + Quartz
8: Barite

Figure 3E.23: Crimson F-81 6470m site 21. Siderite cemented mudstone (3).



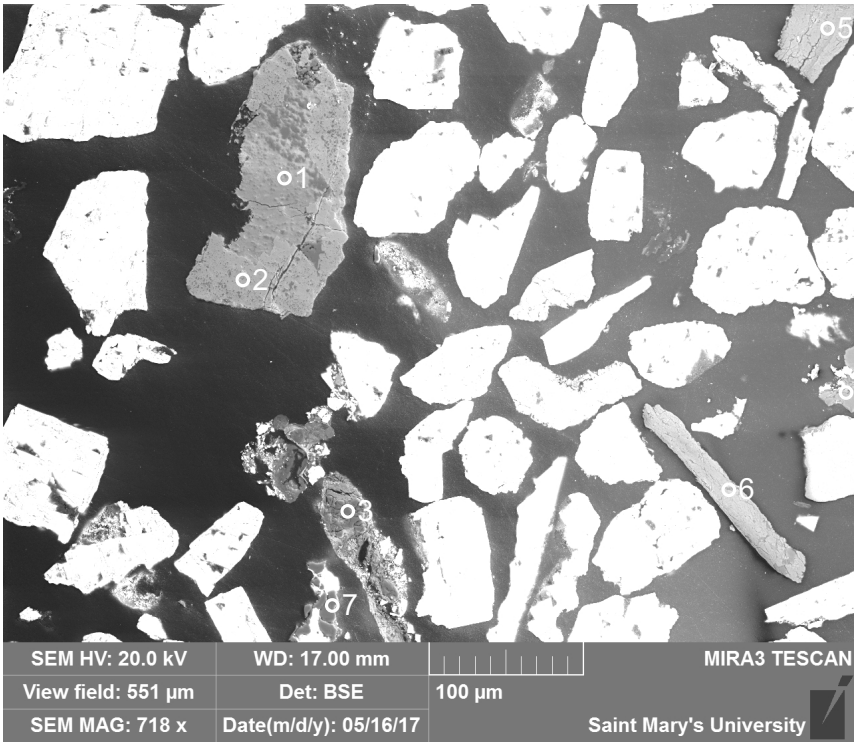
1: Apatite
2: Siderite +
3: Clinopyroxene (Diopside)
4: Quartz
5: Actinolite
6: Feohy +
7: Siderite +
8: Barite
9: Hole

Figure 3E.24: Crimson F-81 6470m site 22. Diopside (3) and actinolite (5) are likely contaminants.



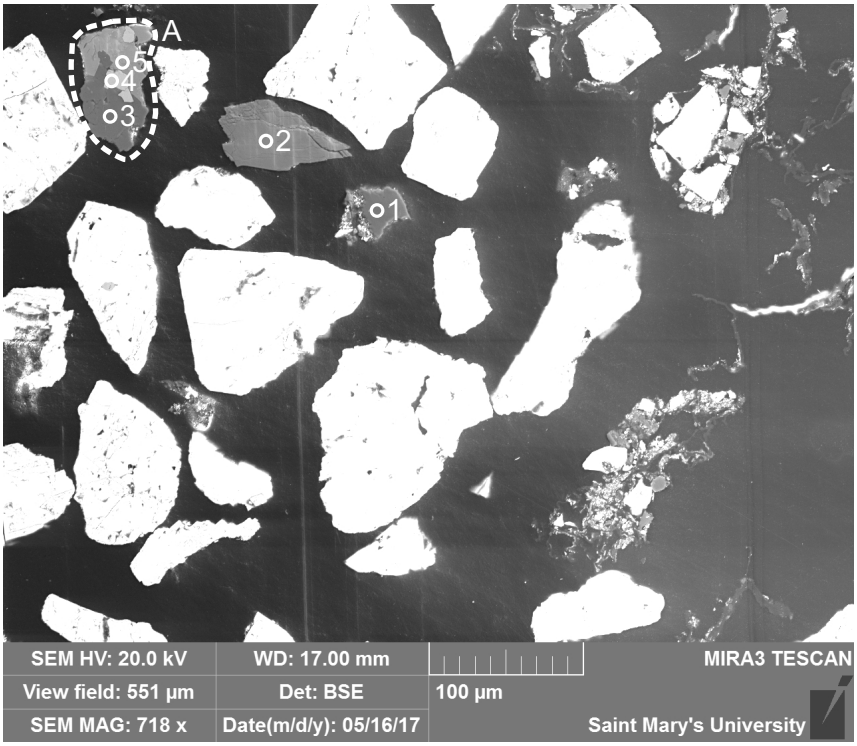
1: Barite
2: Siderite (Fe+Mn) +
3: Mnohy (Mn+Ba)
4: Biotite +
5: Quartz
6: Quartz +
7: Barite
8: Siderite + Chlorite
9: Mix
10: Kaolinite + Ilmenite +
11: Quartz

Figure 3E.25: Crimson F-81 6470m site 23. Barite (7) is associated with quartz (5) and is diagenetic. Diagenetic kaolinite associated with ilmenite (10).



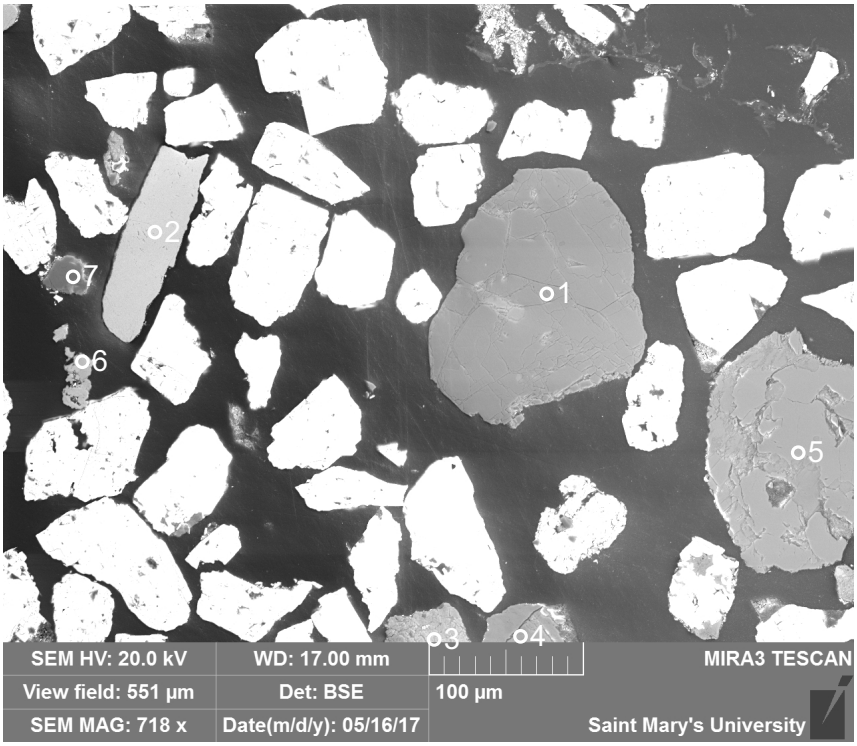
1: Mix
2: Albite + Siderite
3: Quartz
4: Siderite +
5: Siderite + Chlorite
6: Siderite + Chlorite
7: Quartz + Barite
8: Siderite +
9: Barite
10: Muscovite + Barite

Figure 3E.26: Crimson F-81 6470m site 24. Site exhibits charging. Siderite (2) appears to be replacing albite (2) and be associated with chlorite (6).



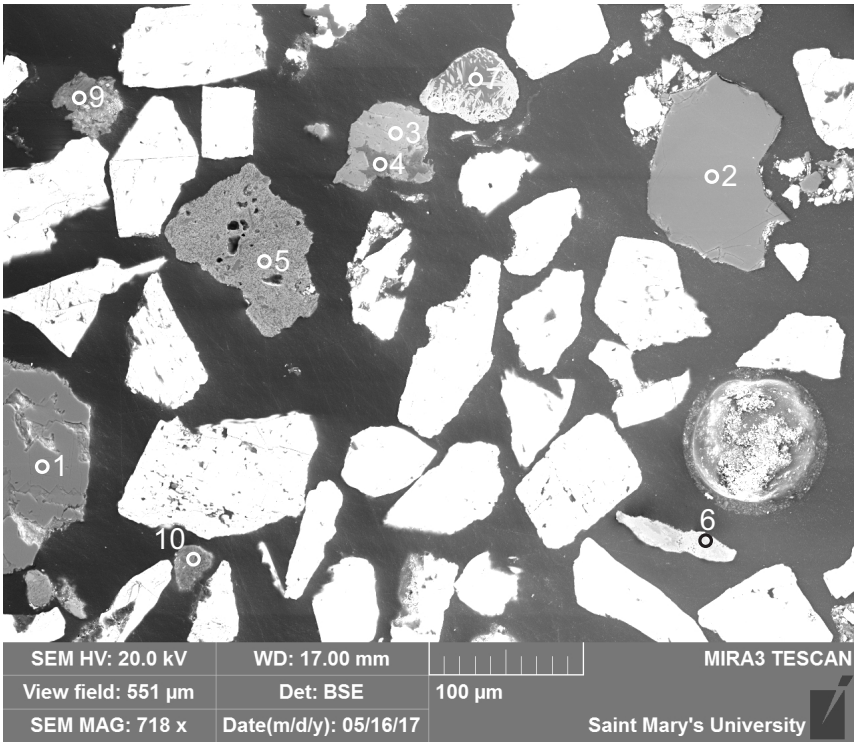
1: Quartz
2: Actinolite
3: Albite
4: Feohy
5: Titanite
6: Barite

Figure 3E.27: Crimson F-81 6470m site 25. A possible lithic clast (A) made up of albite (3) and titanite (5) with late siderite replacing both.



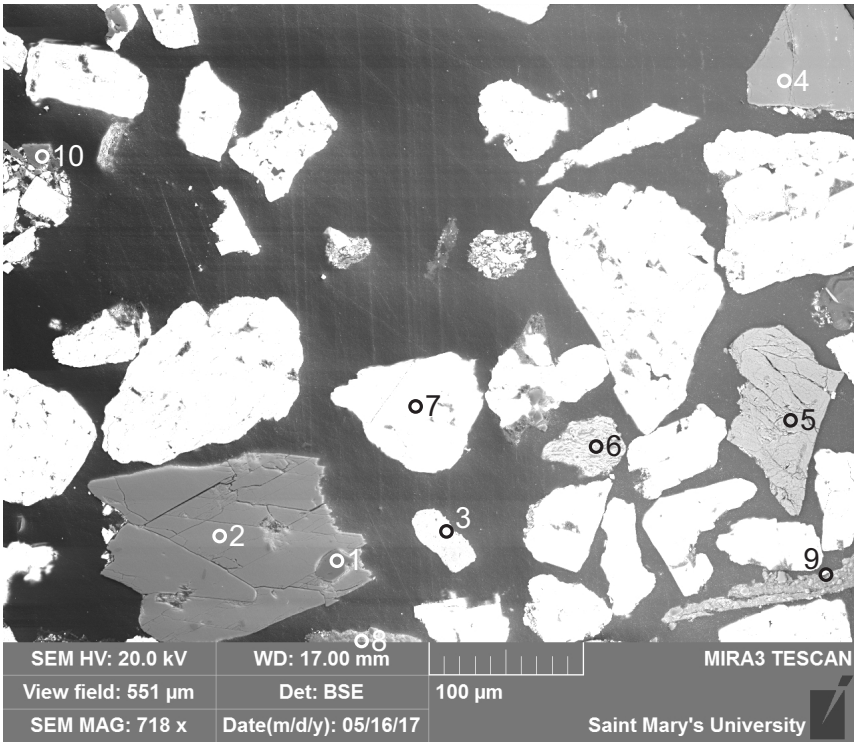
1: Clinopyroxene (Diopside)
2: Mnohy +
3: Mix
4: Dolomite
5: Clinopyroxene (Diopside)
6: Mix
7: Quartz
8: Barite

Figure 3E.28: Crimson F-81 6470m site 26. Diopside (1,4) is likely a contaminant. A piece of dolomite (4) cement?



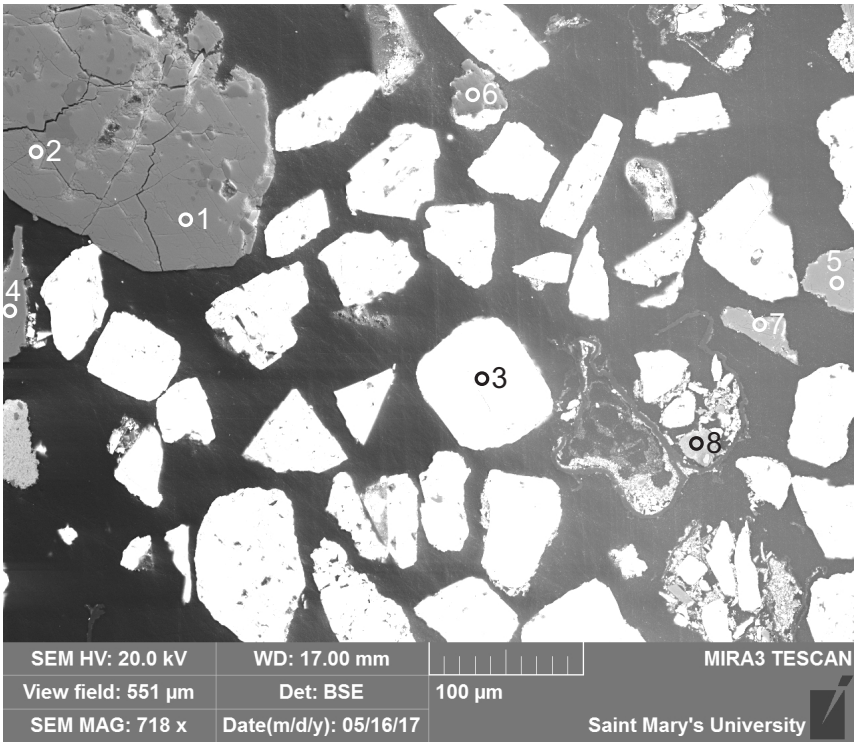
1: Clinopyroxene (Diopside)
2: Quartz
3: Siderite
4: Albite
5: Biotite
6: Hole
7: Quartz
8: Feohy +
9: Kaolinite
10: Mix

Figure 3E.29: Crimson F-81 6470m site 27. Albite (4) is replaced by siderite (3). Free grains of contaminant diopside and biotite (1,5). Kaolinite (9) cementing quartz grains. Siderite (3) replacing albite (4).



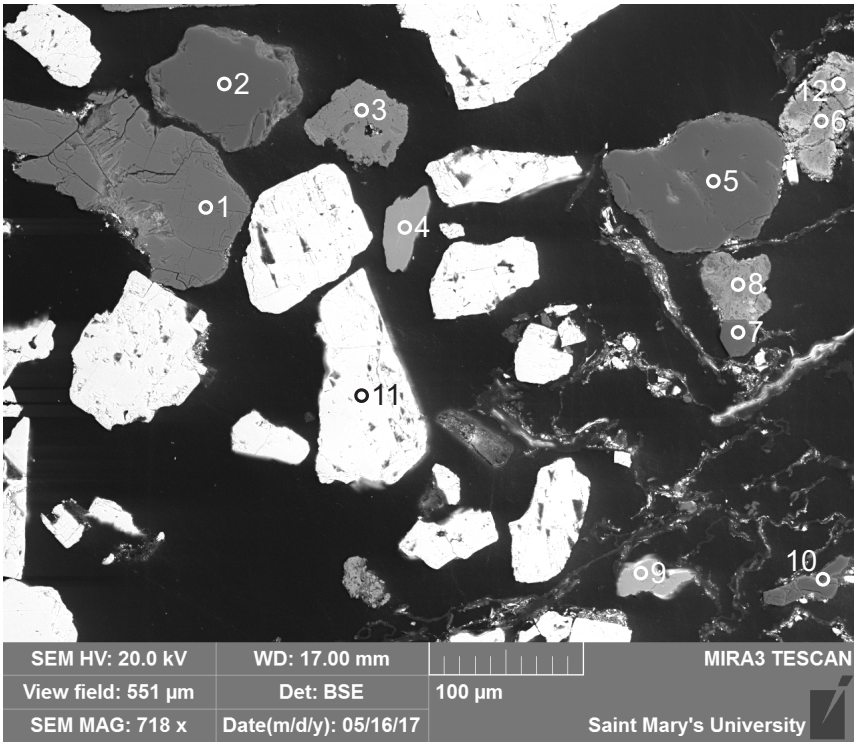
1: Quartz
2: Actinolite
3: Feohy +
4: Quartz
5: Siderite + Chlorite
6: Chlorite + Feohy +
7: Barite
8: Albite
9: Muscovite + Chlorite
10: Mix

Figure 3E.30: Crimson F-81 6470m site 28. Cuttings of siderite (5) and Feohy (6) cemented mudstone containing chlorite (5,6). Detrital muscovite partly altered to chlorite (9).



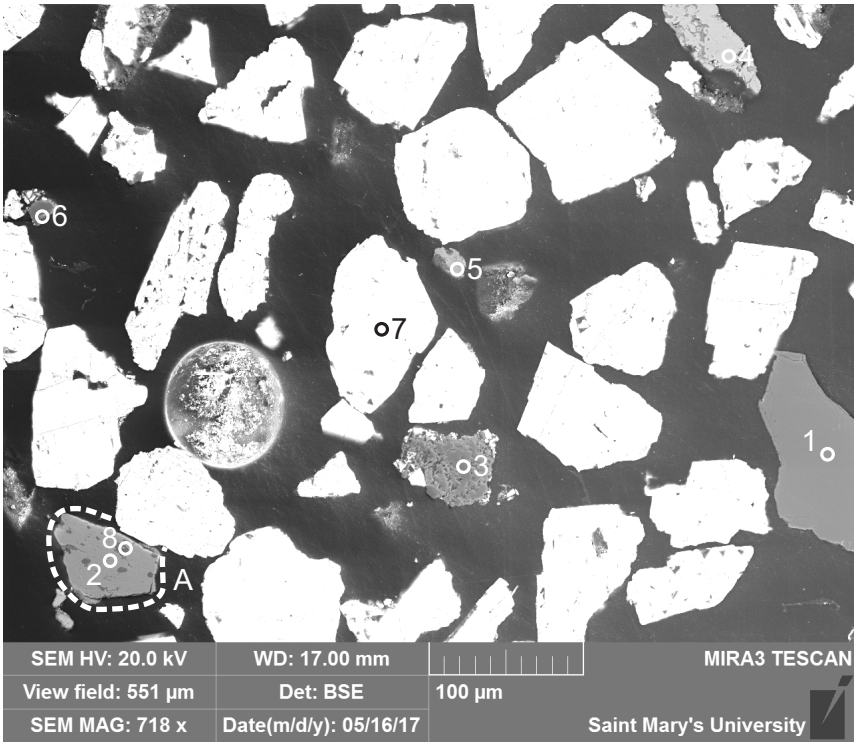
1: Actinolite
2: Fluorite +
3: Barite
4: K-feldspar
5: Quartz
6: Quartz
7: Dolomite
8: Muscovite

Figure 3E.31: Crimson F-81 6470m site 29. A grain of actinolite (1) with fluorite (2) filling dissolution voids. A fragment of dolomite (7) and detrital muscovite (8).



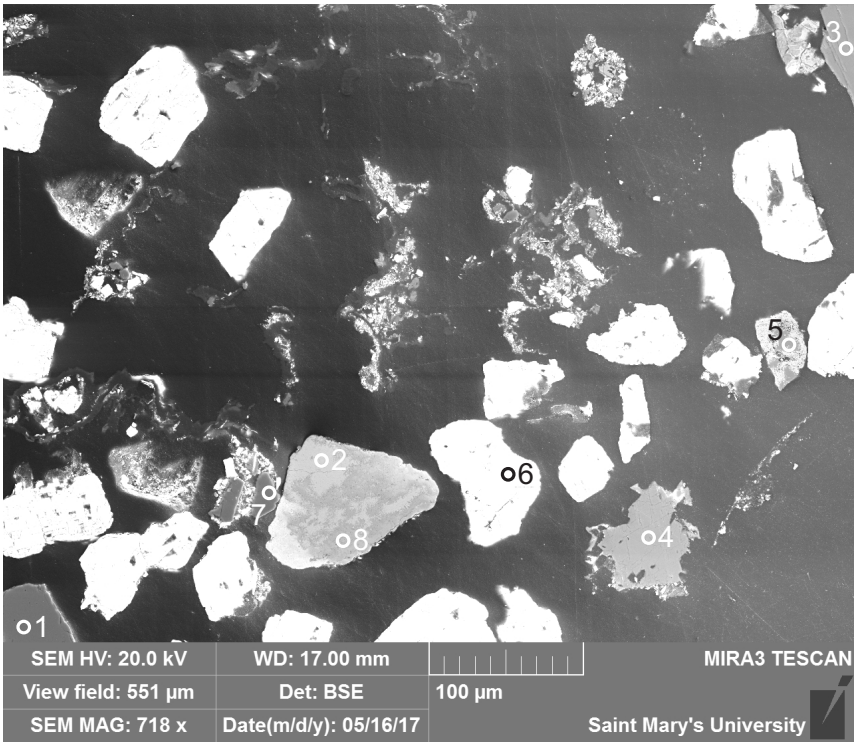
1: Clinopyroxene (Diopside)
2: Quartz
3: Siderite
4: Siderite +
5: Quartz
6: Mnohy + (Mn+Ca)
7: Quartz
8: Biotite?
9: Siderite +
10: Quartz
11: Barite
12: Mnohy + (Mn+Ca+W)

Figure 3E.32: Crimson F-81 6470m site 30. Abundant drilling mud contaminants including barite (11), diopside (1), and Mnohy (6,12).



1: Quartz
2: TiO_2
3: Quartz
4: Siderite + Quartz
5: Siderite + Chlorite
6: Quartz
7: Barite
8: TiO_2 +

Figure 3E.33: Crimson F-81 6470m site 31. A fragment, probably a lithic clast (A), is made up of TiO_2 (2,8) and quartz (low brightness spots). A piece of cement made up of siderite and chlorite (5).



1: Quartz
2: Mix
3: Actinolite
4: Fluorite
5: Quartz
6: Barite
7: Quartz
8: Siderite +

Figure 3E.34: Crimson F-81 6470m site 32. A cutting made up of flourite (4) which appears to be diagenetic.

Table 3E.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6470(2) depth.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	CuO	ZnO	CdO	As_2O_3	SrO	BaO	WO_3	PbO	Total	Actual Total
1	1	Fl						1.85	78.88					19.27												100	56
1	2	Act	61.80			0.22		26.44	11.22	0.32																100	106
1	3	Qz	100.00																							100	103
1	4	Znc																	98.09	1.91						100	38
1	5	Feohy + Qz	2.42			97.58																				100	54
1	6	Brt											39.74				0.01					1.33	58.92			100	94
1	7	Brt											39.75				0.05					2.41	57.79			100	96
2	1	Sd + Qz	1.46			97.05			1.49																	100	60
2	2	Brt											39.55										60.45			100	93
2	3	Qz	99.76			0.24																				100	93
2	4	Mix	15.86		5.30	59.14	1.44	11.08	2.63	4.55																100	52
2	5	Mix	26.53	0.40	21.50	46.54		0.96	0.84		3.22															100	68
2	6	Qz	98.97		0.37	0.66																				100	104
2	7	Mix	27.15	0.41	22.12	6.19	20.68	0.85	1.53		3.84			1.86	0.34						0.89				14.13	100	80
2	8	Sd +	6.88		5.01	82.38			1.30									1.61			2.82					100	55
2	9	Olig	61.84	0.33	23.55	0.55			4.51	8.40	0.82															100	96
2	10	Sd + Qz	7.21		1.51	82.60	5.39	2.03	1.26																	100	52
2	11	Act	61.57		0.48	0.43		26.53	10.99																	100	101
2	12	Sd + Qz	1.12			94.96	0.54		1.89				1.49													100	52
3	1	Sd + Qz	11.07		3.09	81.50	1.30		0.77									0.92			1.35					100	59
3	2	Brt											41.15				0.01						58.84			100	89
3	3	Cpx (Di)	58.51			0.44		20.31	20.74																	100	100
3	4	Bt	40.40	1.60	19.85	13.31	0.28	11.70		0.41	8.44															96	91
3	5	Py				23.69							76.31													100	176
3	6	Qz	100.00																							100	99
3	7	Sd + Qz	14.71		9.26	71.55	0.65		0.65									0.73			2.45					100	60
4	1	Act	61.95		0.42	0.48		26.89	10.26																	100	99
4	2	Sd +	9.35		1.01	82.90	0.73		1.42			1.68									2.91					100	46
4	3	Sd +	3.32		2.49	32.43		10.69	6.14			0.94														56	40
4	4	Ilm +	2.75	46.94	2.11	35.06	0.47	8.90	3.76																	100	47
4	5	Cpx (Di)	58.85			0.19		21.01	19.58	0.36																100	94
4	6	Opx	64.06		0.64	0.30		34.23	0.77																	100	92
4	7	Brt											40.87				0.04						59.09			100	83
4	8	Sd +	6.32		0.92	90.09	1.41		1.26																	100	47
4	9	Qz	97.90		1.44	0.19					0.47															100	97
4	10	Brt											41.62				0.01					2.89	55.48			100	81
4	11	Qz	96.05		2.21						1.74															100	96
4	12	Sd +	1.65		0.88	35.74	0.29	10.56	5.35			1.53														56	36
4	13	Qz	99.75			0.25																				100	95
5	1	Qz	100.00																							100	102
5	2	Sd + Qz	5.01			93.81	0.54		0.64																	100	50
5	3	Feohy + Qz	5.12			94.88																				100	58
5	4	Qz	100.00																							100	101
5	5	Sd	1.00		0.64	39.92	0.39	8.90	5.15																	56	41

Table 3E.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6470(2) depth.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	CuO	ZnO	CdO	As_2O_3	SrO	BaO	WO_3	PbO	Total	Actual Total
5	6	Brt											40.06				0.01					1.35	58.58			100	88
5	7	Qz	99.32			0.68																				100	101
5	8	Qz+ Sd	68.19			31.44			0.37																	100	73
5	9	Qz	99.36			0.64																				100	100
6	1	Feohy +	4.65		0.81	93.15	0.56	0.83																		100	56
6	2	Qz	100.00																							100	103
6	3	Qz	100.00																							100	102
6	4	Chl + Sd	18.62		14.18	63.47		0.89	0.68		2.16															100	68
6	5	Brt											40.64				0.17						59.19			100	90
6	6	Act	61.36		0.60	0.55		26.39	10.76	0.34																100	101
6	7	Act	62.07			0.64		26.57	10.72																	100	100
6	8	Mix	9.58	0.70	23.20	18.68		2.83	44.10	0.46									0.46							100	79
7	1	Qz	96.88		1.15	1.27		0.55			0.15															100	109
7	2	Sd + Chl	5.91	0.60	2.39	90.55			0.55																	100	59
7	3	Qz	100.00																							100	104
7	4	Sd + Qz	2.90			87.54			4.96				1.05			3.55										100	49
7	5	Sd + Chl	4.98		1.14	93.16			0.72																	100	50
7	6	Brt											40.39				0.09						59.52			100	91
7	7	Mnohy + (Mn+Al+Pb)	3.73		24.77		50.31		1.20								0.94	1.38					2.05		15.62	100	61
8	1	Qz	100.00																							100	103
8	2	Sd +	3.36		12.26	76.60			2.20			1.40	2.55			0.64		0.99								100	52
8	3	Sd +	4.47		2.44	90.29			0.64							0.88			1.28							100	54
8	4	Brt											39.69										60.31			100	92
8	5	Sd	0.73			37.31	0.45	9.35	8.16																	56	42
8	6	Fl				0.75		0.96	75.23					23.06												100	55
8	7	Sd +	2.99		2.46	89.55			1.86						0.43						2.71					100	54
8	8	Feohy +	2.48			97.52																				100	60
8	9	Sd +	4.17			86.79	1.51		2.39						0.51				4.63							100	51
9	1	Feohy +	2.48			95.40	2.12																			100	48
9	2	Qz	100.00																							100	102
9	3	Sd +	11.48		4.49	62.52	1.51	16.26	3.74																	100	45
9	4	Ab	67.88		18.36	0.36				12.84			0.56													100	92
9	5	Feohy +	5.95		1.89	92.16																				100	47
9	6	Brt											40.27				-0.07					2.32	57.48			100	90
9	7	Feohy +	1.63			98.37																				100	59
10	1	Sd +	5.10		1.95	92.42			0.53																	100	46
10	2	Act	60.93		1.14	0.78		26.80	9.79	0.56																100	96
10	3	Sd + Qz	10.59			87.52		1.18	0.71																	100	45
10	4	Qz	98.88		0.94						0.18															100	95
10	5	Qz	99.67						0.33																	100	93
10	6	Sd +	1.52		0.73	34.15	0.56	9.62	7.94			1.49														56	36
10	7	Sd +	4.32		2.97	30.85	0.44	12.53	4.65		0.24															56	39
10	8	Ab	66.05		19.65	0.53				13.77																100	107
10	9	Sd +	3.99		3.11	85.23			1.78	1.83			1.25			0.82					1.99					100	38

Table 3E.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6470(2) depth.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	CuO	ZnO	CdO	As_2O_3	SrO	BaO	WO_3	PbO	Total	Actual Total
10	10	Feohy +	5.76			90.95	1.43														1.86					100	43
10	11	Feohy +	4.31			95.69																				100	44
10	12	Sd +	5.85			93.25			0.90																	100	42
10	13	Brt											41.73									3.55	54.72			100	84
10	14	Mix	42.99		8.11	5.41		1.80	14.86		0.27	15.57		11.00												100	90
10	15	Sd				45.25	5.31	3.61	1.84																	56	33
11	1	Feohy +	7.72			91.63	0.65																			100	47
11	2	Sd +	9.84			88.26		1.03	0.87																	100	49
11	3	Feohy +	1.07			93.46									0.39						5.08					100	54
11	4	Sd +	7.99			90.96			0.62						0.43											100	47
11	5	Chl	22.36	0.43	23.46	34.42		0.76	0.62	0.54	2.00					0.42										85	63
11	6	Sd				46.51	3.24	3.78	2.47																	56	36
11	7	Qz +	96.18		2.81	0.24					0.77															100	94
11	8	Brt											40.96				0.01					1.80	57.23			100	86
11	9	Kln +	59.09		21.25	2.69		1.16	0.28	0.32	1.20															86	87
11	10	Qz	100.00																							100	97
11	11	Kfs	67.25		18.63	0.23					13.07												0.82			100	96
11	12	Feohy +	6.65		4.29	89.06																				100	47
11	13	Kfs	68.10		18.14	0.25					13.51															100	94
11.1	1	Feohy				100.00																				100	54
11.1	2	Qz + Sd	78.60		2.64	16.97	0.51	0.51	0.35		0.42															100	84
11.1	3	Feohy				76.07	4.42	19.51																		100	38
11.1	4	Sd				47.44	3.54	3.00	2.03																	56	36
11.1	5	Feohy				100.00																				100	52
11.1	6	Brt				0.87							40.13				-0.05					1.78	57.27			100	89
12	1	Mnohy					91.36			1.83	1.86												4.95			100	53
12	2	Qz	99.60				0.40																			100	98
12	3	Brt											40.99				-0.11					1.72	57.40			100	89
12	4	Mnohy +	13.74		1.36	1.80	76.39	1.39	4.90		0.42															100	67
12	5	Mnohy +	9.84		3.58	2.02	69.60	0.61	4.54		1.76			8.05												100	67
12	6	Qz	100.00																							100	100
12	7	Qz	100.00																							100	96
12	8	Qz+	82.87		8.48	5.77		0.66			2.22															100	92
13	1	Qz	99.26		0.46	0.28																				100	98
13	2	Chl +	16.35		9.34	40.46	0.64	9.54	5.67		1.25	1.75														85	46
13	3	Py	0.22			23.31							76.47													100	163
13	4	Brt											40.93				-0.03					2.02	57.08			100	89
13	5	Sd + Qz	1.93			94.87	0.51	1.05	1.64																	100	49
13	6	Sd + Qz	5.75			91.82		1.54	0.89																	100	47
13	7	Znohy +	3.16																96.84							100	30
13	8	Act	62.02			0.41		27.07	10.50																	100	97
14	1	Qz	98.54		1.15						0.31															100	98
14	2	Sd				47.82	3.57	2.96	1.65																	56	37
14	3	Py				35.32							64.68													100	151

Table 3E.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6470(2) depth.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	CuO	ZnO	CdO	As_2O_3	SrO	BaO	WO_3	PbO	Total	Actual Total
14	4	Py				35.46							64.54													100	151
14	5	Ms	49.76		21.90	2.93	1.00	2.87	3.78	1.38	9.32												2.07			95	96
14	6	Sd +	2.26		1.28	38.68	0.60	9.04	4.15																	56	38
14	7	Mnohy +	6.67		2.71		80.73		7.95														1.94			100	61
14	8	Mnohy +	1.29				63.87		26.07					8.77												100	68
14	9	Brt											41.10				-0.06						58.96			100	86
14	10	Brt											40.98				-0.01						59.03			100	86
15	1	Cal +	14.53		12.21	18.47		5.23	49.56																	100	48
15	2	Qz	99.41			0.59																				100	98
15	3	Brt	2.62		1.09					0.57			37.00				0.05						55.04	3.63		100	80
15	4	Sd + Qz	3.53			85.97			6.27						0.46	3.77										100	50
15	5	Qz	97.86		1.72						0.42															100	96
15	6	Qz + Sd	58.64			41.36																				100	66
16	1	Qz	100.00																							100	100
16	2	Sd +	3.21		2.92	44.60	1.21	0.77	1.36			1.42						0.51								56	50
16	3	Kfs	67.82		18.40						13.78															100	97
16	4	Cal							51.28					4.72												56	43
16	5	Bt	46.36		20.96	21.62		1.46	0.35		4.24												1.02			96	80
16	6	Bt	38.81	0.33	25.77	24.12		1.92			5.06															96	74
16	7	Bt	44.80		24.96	18.51		2.06			5.67															96	72
16	8	Fl	0.94						54.68				1.11	42.60	0.67											100	36
16	9	Py + Kfs	24.70		10.69	15.00		0.81	1.10	2.81	1.10		39.22										0.81	3.77		100	93
16	10	Brt											41.18				0.06					1.67	57.09			100	84
16	11	Ab	65.52	0.25	20.74	1.54		2.14	0.45	8.38	0.98															100	87
16	12	Bt	40.92		23.33	23.39		2.02	0.60		4.51												1.23			96	60
16	13	Ab +	67.56		19.01	0.30				11.22	1.91															100	102
16	14	Qz	98.23		0.64				0.30				0.40										0.43			100	93
16	15	Chl	19.33		20.72	39.59	0.46	0.90	1.40		1.63		0.96													85	59
17	1	Fl							71.29					28.71												100	52
17	2	Act	62.10			0.52		27.07	10.31																	100	94
17	3	Qz	100.00																							100	94
17	4	Act	61.85		0.53	0.35		26.86	9.99	0.42																100	92
17	5	Act	61.10		1.19	0.41		26.97	9.97	0.36																100	95
17	6	Qz	100.00																							100	93
17	7	Feohy +	4.76		0.89	94.35																				100	47
17	8	Sd +	1.34			92.34	0.58		3.20				2.54													100	39
17	9	Brt											42.44				-0.04						57.60			100	82
17	10	Cal	0.61			0.35			49.43	0.77	0.41			2.73	1.71											56	28
18	1	Act	61.97			0.19		27.63	10.21																	100	97
18	2	Cpx (Di)	59.36			0.11		21.49	19.05																	100	94
18	3	Qz	100.00																							100	94
18	4	Kfs	68.31		18.17	0.30					13.22															100	91
18	5	Fl							35.64					64.36												100	142
18	6	Sd +	4.06		2.33	86.36			3.00						0.84	0.67					2.74					100	46

Table 3E.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6470(2) depth.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	CuO	ZnO	CdO	As_2O_3	SrO	BaO	WO_3	PbO	Total	Actual Total
18	7	Brt +	4.25		1.23								35.74				0.01		-0.08				58.85			100	78
18	8	Qz +	82.45		17.55																					100	90
19	1	Qz	99.70			0.30																				100	98
19	2	Act	62.04		0.56			27.39	10.01																	100	98
19	3	Feohy +	6.86		4.50	86.45										0.59			1.60							100	42
19	4	Qz	100.00																							100	92
19	5	Mix	14.37		2.18	70.23			1.64										1.88					5.28	4.42	100	41
19	6	Mix	11.69		2.00	74.45			0.59										4.56						6.71	100	45
19	7	Brt											41.44				-0.11					2.23	56.44			100	83
19	8	Mix	1.40			68.10		21.79	8.71																	100	35
19	9	Sd +	10.82		0.96	84.03			1.50												2.69					100	44
19	10	Sd +	2.14		1.41	91.40			0.52			3.93				0.60										100	42
20	1	Brt											42.01				0.04						57.95			100	82
20	2	Mix	36.26			1.04		18.95	34.39					9.36												100	66
20	3	Act	62.01			0.24		27.84	9.91																	100	95
20	4	Feohy				100.00																				100	47
20	5	Sd +	6.57			91.69	1.19		0.55																	100	40
20	6	Qz	100.00																							100	92
20	7	Qz	98.37		0.86	0.60					0.17															100	92
20	8	Feohy +	7.07		2.51	90.42																				100	40
20	9	Ms + Kln	55.19		31.02	7.37		3.22	0.74		2.46															100	67
21	1	Qz	100.00																							100	94
21	2	Qz	100.00																							100	92
21	3	Sd +	16.59		7.66	67.73	1.62		2.00		0.86	1.91			0.48			1.15								100	42
21	4	Qz	98.11		1.31	0.26					0.32															100	91
21	5	Sd				39.29	0.86	13.51	2.33																	56	32
21	6	Feohy + Qz	1.95			97.48	0.57																			100	38
21	7	Feohy + Qz	4.66			95.34																				100	47
21	8	Brt											41.66				-0.05					1.74	56.65			100	81
22	1	Ap	0.96		0.84				40.22		0.20	43.76		12.09										1.93		100	90
22	2	Sd +	4.07		2.06	86.26			2.45												5.16					100	46
22	3	Cpx (Di)	59.50			0.43		21.44	18.63																	100	92
22	4	Qz	100.00																							100	93
22	5	Act	61.98		0.57	0.25		27.43	9.77																	100	93
22	6	Feohy +	6.00			94.00																				100	41
22	7	Sd +	11.93		1.42	84.63			2.02																	100	40
22	8	Brt											41.79				0.04						58.17			100	81
22	9	Hole	51.49	1.47	11.00	1.96		7.29	3.65	2.78	1.31		3.54	15.51												100	18
23	1	Brt											41.61				0.11					1.51	56.77			100	83
23	2	Sd (Fe+Mn) +	5.55			55.71	29.64		0.59														8.51			100	46
23	3	Mnohy (Mn+Ba)				3.34	73.52		0.55														22.59			100	49
23	4	Bt +	41.48	0.52	29.80	19.43		1.19	0.68		2.90															96	59
23	5	Qz	100.00																							100	89
23	6	Qz +	90.81		7.57						1.62															100	91

Table 3E.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6470(2) depth.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	CuO	ZnO	CdO	As_2O_3	SrO	BaO	WO_3	PbO	Total	Actual Total
23	7	Brt											41.83										58.17			100	79
23	8	Sd + Chl	15.16		10.66	50.10		15.86	7.73		0.49															100	34
23	9	Mix	9.78	1.15	23.73	15.98		5.42	42.76	1.19																100	72
23	10	Kln + Ilm	60.11	2.47	25.73	5.71		1.19	3.86		0.33		0.60													100	70
23	11	Qz	100.00																							100	90
24	1	Mix	15.92		5.48	1.99			61.79	3.75				11.07												100	43
24	2	Ab + Sd	47.29		13.35	20.84	0.47	6.15	1.25	10.66																100	54
24	3	Qz	98.67		0.39	0.31		0.63																		100	77
24	4	Sd +	6.83			90.58	1.38		1.21																	100	30
24	5	Sd + Chl	3.21		2.20	57.05	0.90	15.16	15.43			6.05														100	30
24	6	Sd + Chl	16.06		10.07	51.16	1.04	15.60	5.27		0.81															100	35
24	7	Qz + Brt	93.06										3.40										3.54			100	81
24	8	Sd +	7.91		1.61	84.44			1.36						0.57			1.39			2.72					100	32
24	9	Brt											42.96				-0.01						57.05			100	71
24	10	Ms + Brt	52.28		24.89	2.42		1.88		0.80	5.02		5.99										6.72			100	43
25	1	Qz	99.31		0.69																					100	89
25	2	Act	59.93		2.31	1.02		26.49	8.99	0.89	0.37															100	91
25	3	Ab	66.06		19.58				0.64	13.72																100	97
25	4	Feohy		1.21		98.79																				100	44
25	5	Ttn	40.57	32.17	1.20	0.61			25.44																	100	69
25	6	Brt											42.69										57.31			100	77
26	1	Cpx (Di)	59.69			0.19		21.67	18.45																	100	90
26	2	Mnohy +			2.05		67.33		0.75														19.54		10.33	100	45
26	3	Mix	5.41		3.16	57.79	0.79	24.72	8.13																	100	32
26	4	Dol				3.12	0.25	26.42	24.21																	54	38
26	5	Cpx (Di)	58.69			0.12		22.28	18.92																	100	84
26	6	Mix	4.55			76.26	17.99		1.20																	100	33
26	7	Qz	100.00																							100	85
26	8	Brt											42.74				0.01					3.21	54.04			100	77
27	1	Cpx (Di)	59.69			0.14		21.98	18.19																	100	87
27	2	Qz	99.54		0.46																					100	88
27	3	Sd				37.54	0.96	14.98	2.51																	56	31
27	4	Ab	66.53		19.30	0.38				13.65	0.14															100	97
27	5	Bt	40.82	0.99	26.74	21.07		1.55	0.35		4.49															96	61
27	6	Hole	10.26			79.42	6.40		2.51														1.41			100	36
27	7	Qz	98.83			1.17																				100	85
27	8	Feohy +	2.12			97.88																				100	34
27	9	Kln	46.85		35.38					0.46	0.61			2.70												86	72
27	10	Mix	72.29	0.72	13.36	4.46		1.91	0.66	0.89	1.21		4.50													100	74
28	1	Qz	100.00																							100	84
28	2	Act	62.14			0.24		28.62	9.00																	100	87
28	3	Feohy +	3.33			96.67																				100	30
28	4	Qz	100.00																							100	83
28	5	Sd + Chl	7.60		4.31	50.64		20.95	13.53			2.97														100	28

Table 3E.1: Scanning electron microscope chemical analyses of heavy minerals in Crimson F-81 well at 6470(2) depth.

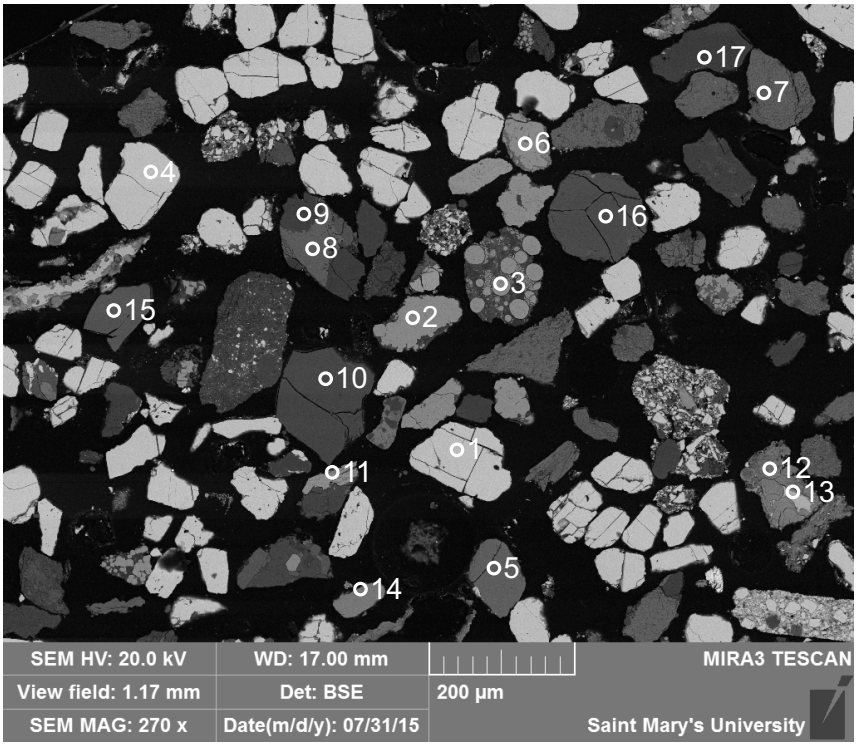
Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	CuO	ZnO	CdO	As_2O_3	SrO	BaO	WO_3	PbO	Total	Actual Total
28	6	Chl + Feohy +	25.26		20.46	53.06					1.22															100	43
28	7	Brt											43.64				-0.08						56.44			100	71
28	8	Ab	62.65		20.99	2.26		0.93	0.22	12.22	0.27				0.46											100	89
28	9	Ms + Chl	53.15	4.62	31.05	3.59		3.71	0.84		3.04															100	55
28	10	Mix	84.40		12.06						2.82												0.72			100	81
29	1	Act	62.08			0.27		28.50	9.15																	100	87
29	2	Fl +	6.51					5.45	62.79					25.25												100	45
29	3	Brt											43.63				0.08					1.76	54.53			100	71
29	4	Kfs	68.60		18.79						12.61															100	83
29	5	Qz	100.00																							100	80
29	6	Qz	100.00																							100	80
29	7	Dol	2.48		1.04	1.25	0.46	25.56	20.34				1.40										1.46			54	35
29	8	Ms	55.25		28.86	1.04		2.68			7.17															95	75
30	1	Cpx (Di)	58.67			0.33		20.71	20.29																	100	98
30	2	Qz	100.00																							100	98
30	3	Sd	0.99		0.77	40.87	0.46	6.39	5.49			1.03														56	39
30	4	Sd +	9.11			86.26			1.05												3.58					100	47
30	5	Qz	100.00																							100	99
30	6	Mnohy + (Mn+Ca)	1.48		2.08	1.99	31.25		53.60				1.10	8.50												100	68
30	7	Qz	99.58		0.42																					100	99
30	8	Bt?	36.40		25.03	30.88	0.40	1.40	0.87		5.02															100	68
30	9	Sd +	8.31			88.72			0.46									1.12	1.39							100	47
30	10	Qz	100.00																							100	100
30	11	Brt											40.31				-0.05						59.74			100	87
30	12	Mnohy + (Mn+Ca+W)		0.41	1.95	1.95	31.89		36.27				3.30	12.19										12.05		100	65
31	1	Qz	99.27		0.73																					100	93
31	2	TiO_2	2.35	93.81	1.82	1.49										0.53										100	58
31	3	Qz	98.92		0.69						0.39															100	86
31	4	Sd + Qz	7.14		3.57	87.02			1.61						0.66											100	39
31	5	Sd + Chl	10.07		6.53	54.44	0.95	16.25	11.76																	100	37
31	6	Qz	98.74		1.07						0.19															100	83
31	7	Brt											42.13				0.08					1.73	56.06			100	79
31	8	TiO_2 +	35.27	54.94	4.64	4.33		0.82																		100	68
32	1	Qz	100.00																							100	86
32	2	Mix				14.95	64.14																20.91			100	42
32	3	Act	61.31		0.68	0.33		28.22	8.91	0.55																100	91
32	4	Fl						2.23	64.10					33.67												100	47
32	5	Qz	99.46			0.54																				100	85
32	6	Brt											43.57				0.04						56.39			100	74
32	7	Qz	100.00																							100	87
32	8	Sd +	7.28		2.50	85.28	4.03		0.91																	100	38

Note: all analyses of cpx (Di) contain no or very small amounts of FeO_t than anticipated. These analyses were checked again, but the maximum value we have got again was 0.44 wt%.

Weymouth A-45 well

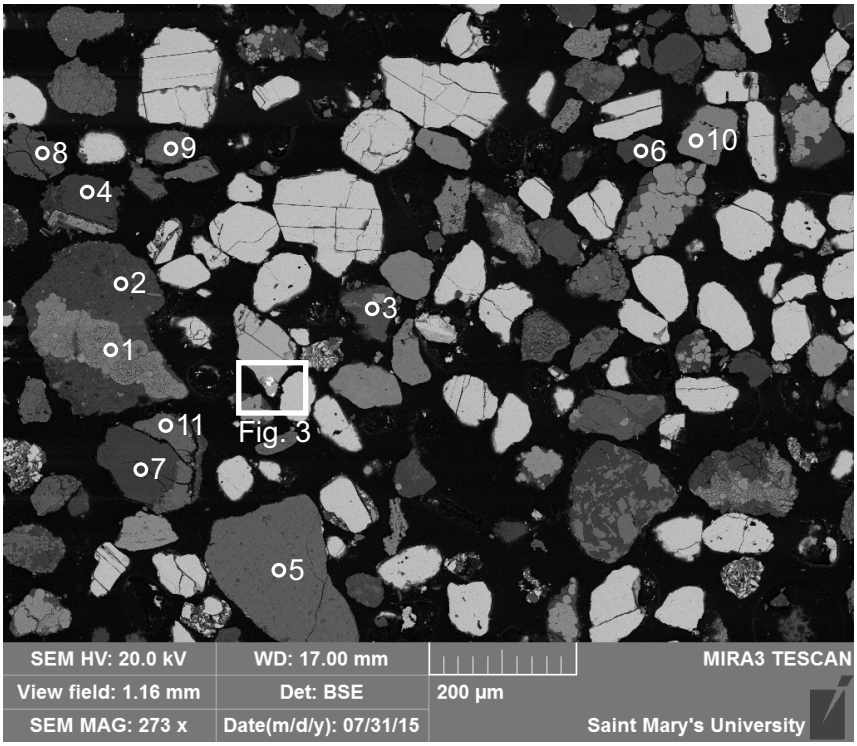
Scanning Electron Microscope (SEM) Backscattered Electron (BSE) images and Energy Dispersive Spectroscopy (EDS) mineral analyses from Weymouth A-45 well

Appendix 4A: SEM-BSE images and EDS mineral analyses for sample A-45 5715



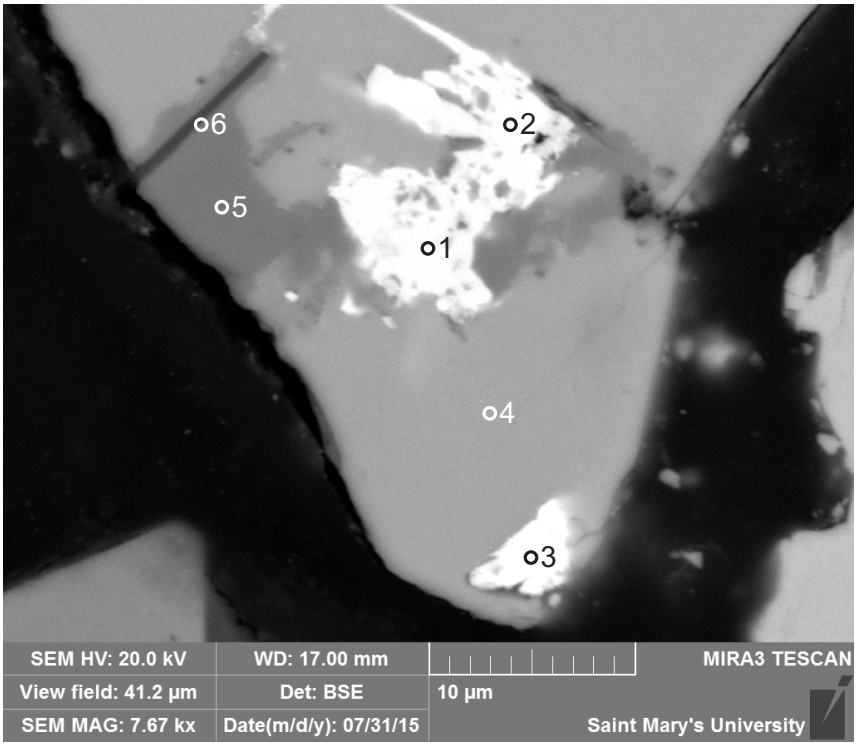
1:Barite
2:Pyrite
3:Pyrite
4:Barite
5:Feohy
6:Pyrite
7:Siderite
8:Siderite
9:Quartz
10:Olivine
11:Pyrite
12:Feohy
13:Magnetite
14:Feohy
15:Hornblende
16:Olivine
17:Quartz

Figure 4A.1: Weymouth A-45 5715m site 1 (SEM). A cutting with pyrite framboids (3). A cutting with quartz (9) and siderite (8). Contaminant made up of magnetite (13) and Feohy (12).



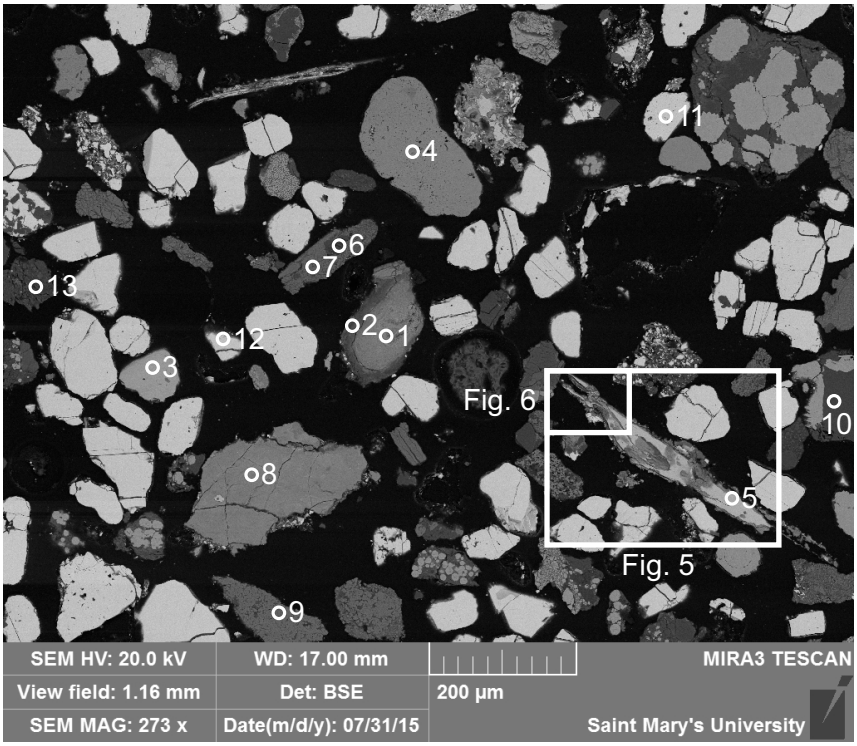
1:Pyrite +
2:Muscovite +
Chlorite
3:Mix
4:Quartz +
5:Siderite + Pyrite
6:Albite
7:Quartz
8:Ankerite
9:Siderite +
10:Feohy
11:Siderite

Figure 4A.2: Weymouth A-45 5715m site 2 (SEM). Cuttings made up of muscovite and chlorite (2) and pyrite (1). Cutting made u pof quartz (7) and siderite (11).



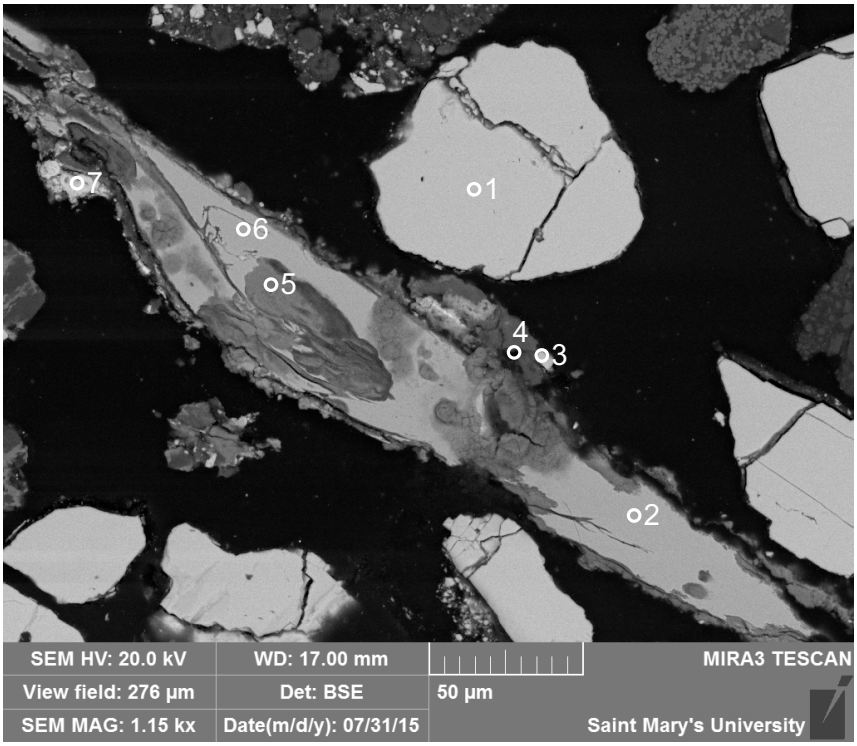
1:Contaminant (Pb)
2:Contaminant (Pb)
3:Contaminant (Pb)
4:Sphalerite
5:Zincite
6:Mix

Figure 4A.3: Weymouth A-45 5715m site 3 (SEM). Either: a cutting made up of sphalerite with later zincite and invading contaminants (Pb) (1-3); or a fragment of drilling mud made up of sphalerite, zincite, and Pb.



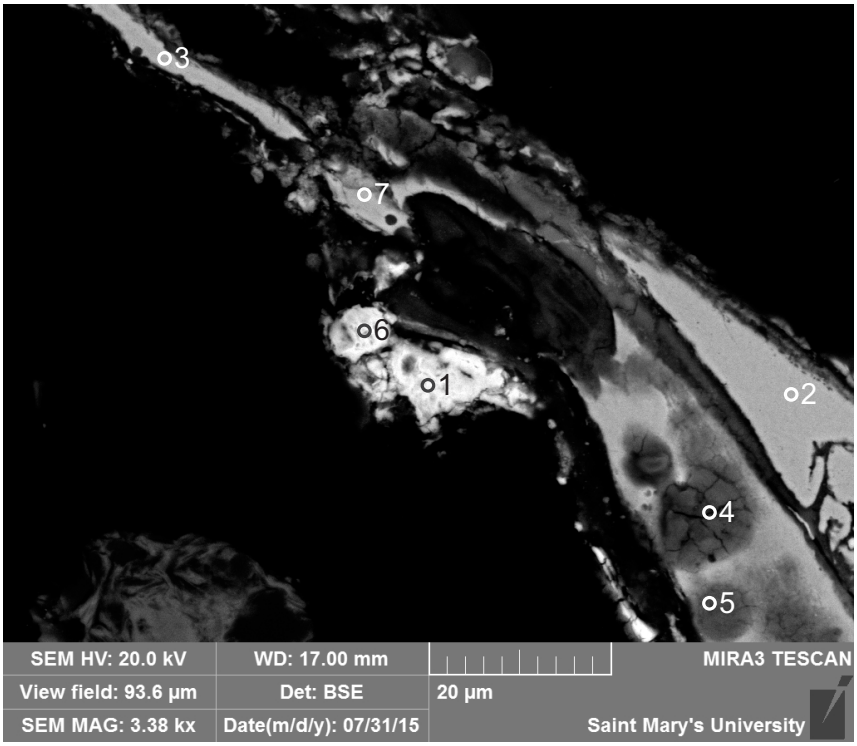
1:Feohy
2:Feohy
3:Zircon
4:Feohy
5:Magnetite
6:Albite
7:Siderite +
8:Feohy
9:Siderite
10:Quartz
11:Barite
12:Barite
13:Muscovite + Chlorite

Figure 4A.4: Weymouth A-45 5715m site 4 (SEM). Cutting made up of albite (6) and siderite (7).



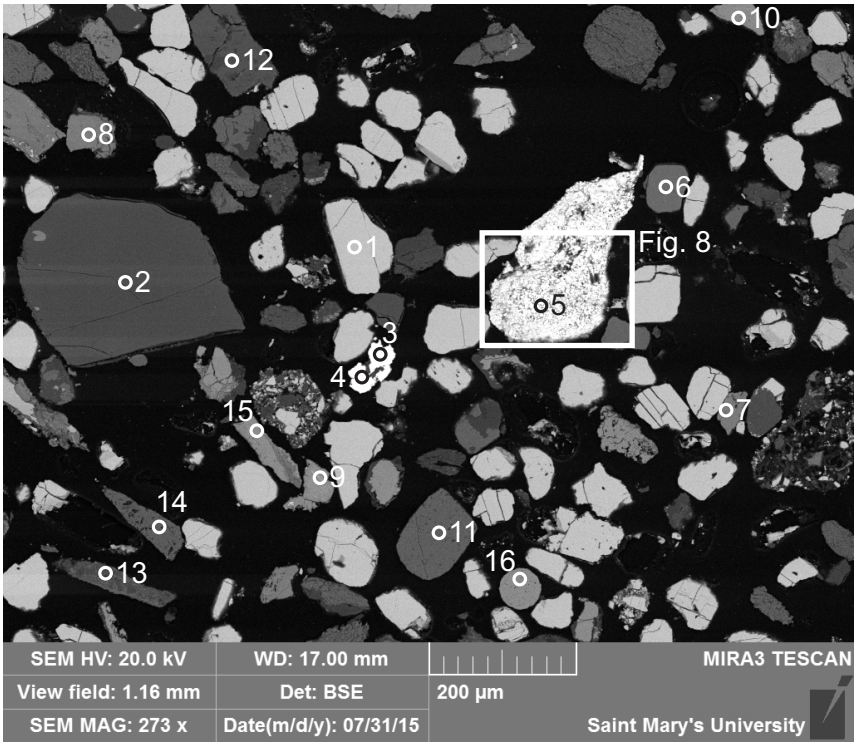
1:Barite
2:Barite
3:Barite
4:Hole
5:Feohy
6:Magnetite
7:Wolframite

Figure 4A.5: Weymouth A-45 5715m site 5 (SEM). Contaminant made up of barite (2), magenetite (6), Feohy (5), and wolframite (7).



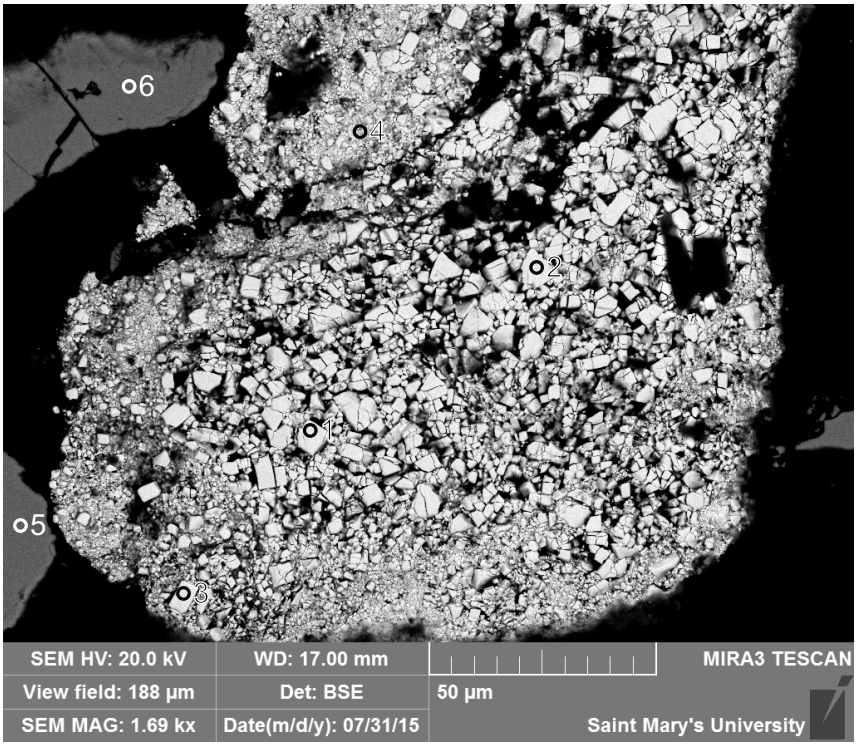
1:Wolframite
2:Magnetite
3:Magnetite
4:Magnetite +
5:Magnetite
6:Wolframite
7:Magnetite

Figure 4A.6: Weymouth A-45 5715m site 6 (SEM). Similar to Fig. 5.



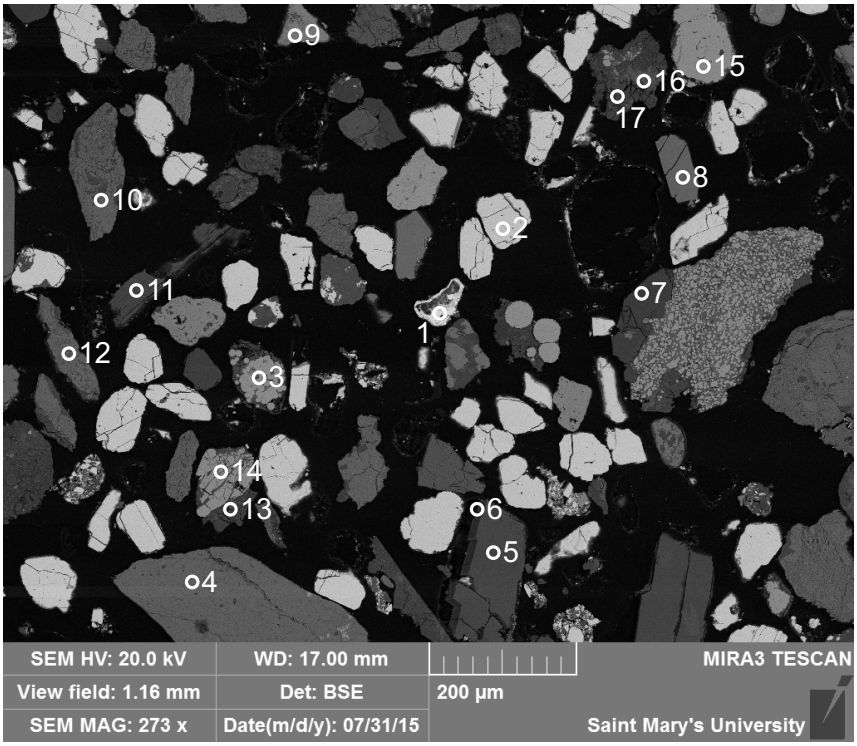
1:Barite
2:Olivine
3:Contaminant (Mo+Pb)
4:Contaminant (Mo+Pb)
5:Wolframite
6:TiO_2 + Quartz
7:Hematite
8:Feohy
9:Pyrolusite
10:Magnetite
11:Siderite
12:Ankerite +
13:Mix
14:Siderite +
15:Magnetite
16:Pyrite

Figure 4A.7: Weymouth A-45 5715m site 7 (SEM). Pyrite framboid (16). Pyrolusite (9) appears to be a contaminant.



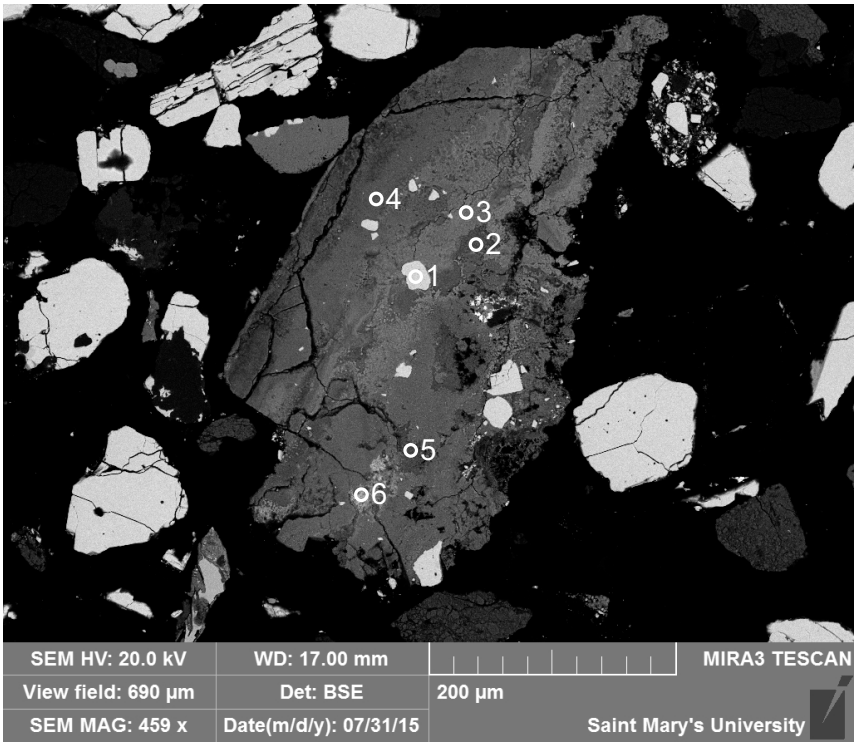
1:Wolframite
2:Wolframite
3:Wolframite
4:Wolframite
5:Barite
6:Barite

Figure 4A.8: Weymouth A-45 5715m site 8 (SEM). A patch of wolframite (1-4) and barite (5,6) which is likely a drilling contaminant.



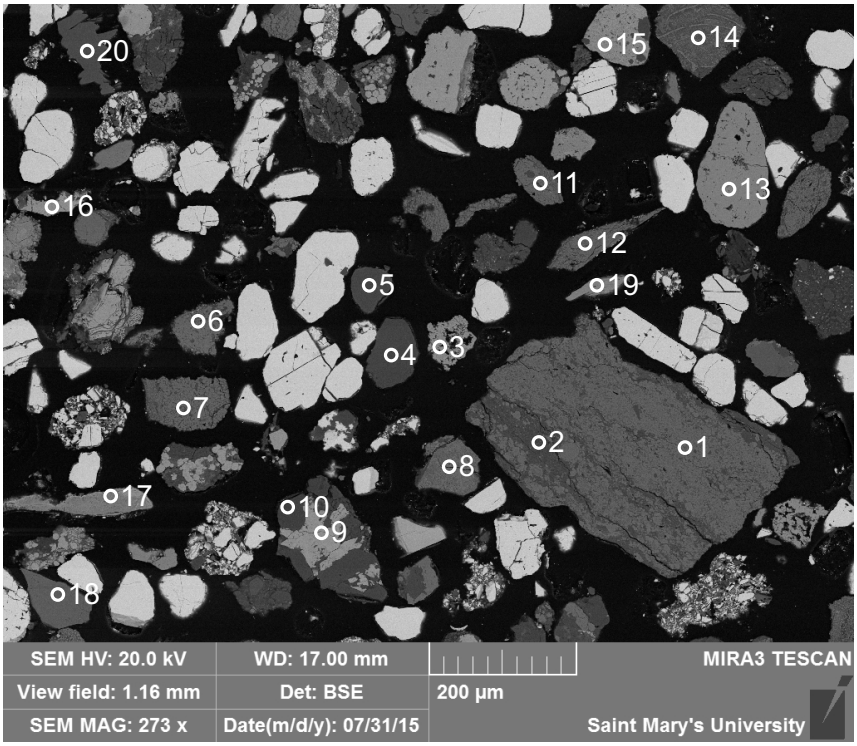
1:Contaminant (Ca+W)
2:Barite
3:Pyrite
4:Feohy
5:Tremolite
6:Quartz +
7:Quartz +
8:Siderite
9:Siderite
10:Siderite +
11:Tremolite
12:Siderite +
13:Quartz +
14:Pyrite +
15:Pyrite
16:Chlorite
17:Mix

Figure 4A.9: Weymouth A-45 5715m site 9 (SEM). Cutting made up of quartz (13) and pyrite (14).



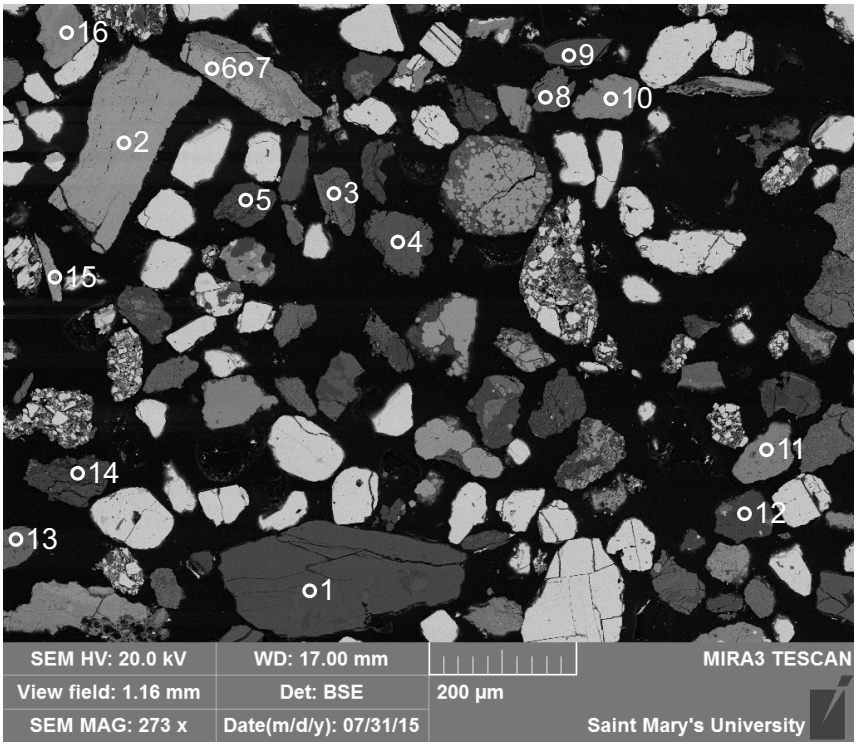
1:Barite
2:Siderite +
3:Siderite +
4:Siderite +
5:Siderite +
6:Wolframite

Figure 4A.10: Weymouth A-45 5715m site 10 (SEM). ? A cutting made up of siderite (2-5) with a diagenetic grain of barite (1). Very small scattered grains of wolframite contaminant.



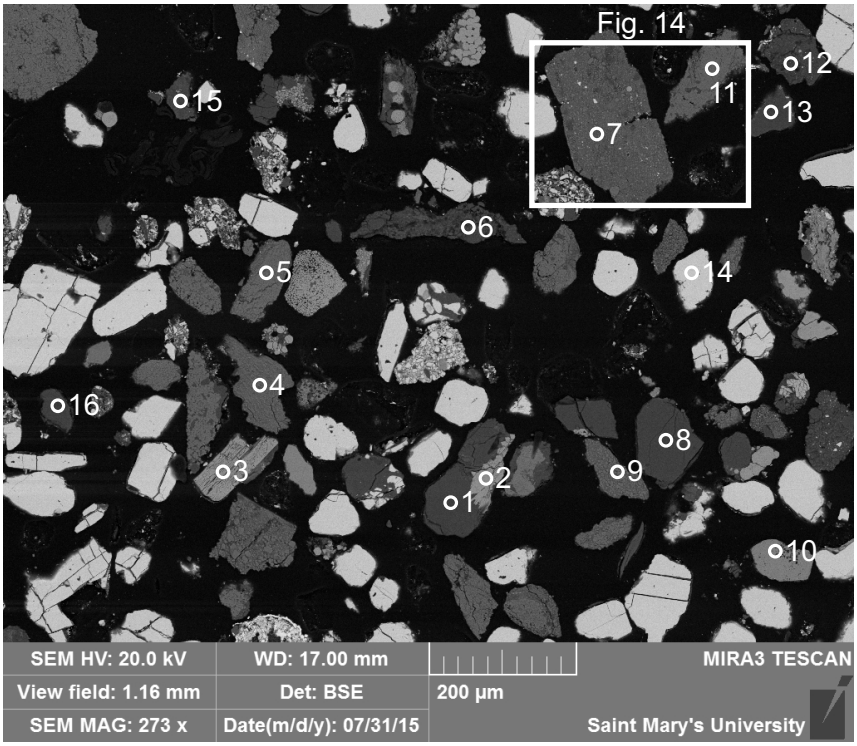
1:Siderite +
2:Muscovite +
Chlorite
3:Feohy
4:Quartz
5:Tourmaline
6:Siderite +
7:Siderite +
8:TiO_2 +
9:Pyrite
10:Quartz
11:Siderite +
12:Siderite +
13:Feohy
14:Mix
15:Magnetite
16:Pyrite
17:Siderite
18:?Orthopyroxene +
19:Feohy +
20:Olivine

Figure 4A.11: Weymouth A-45 5715m site 11 (SEM). Cutting made up mostly of siderite (1) and some altered muscovite (2). Cutting made up of pyrite (9) and quartz (10).



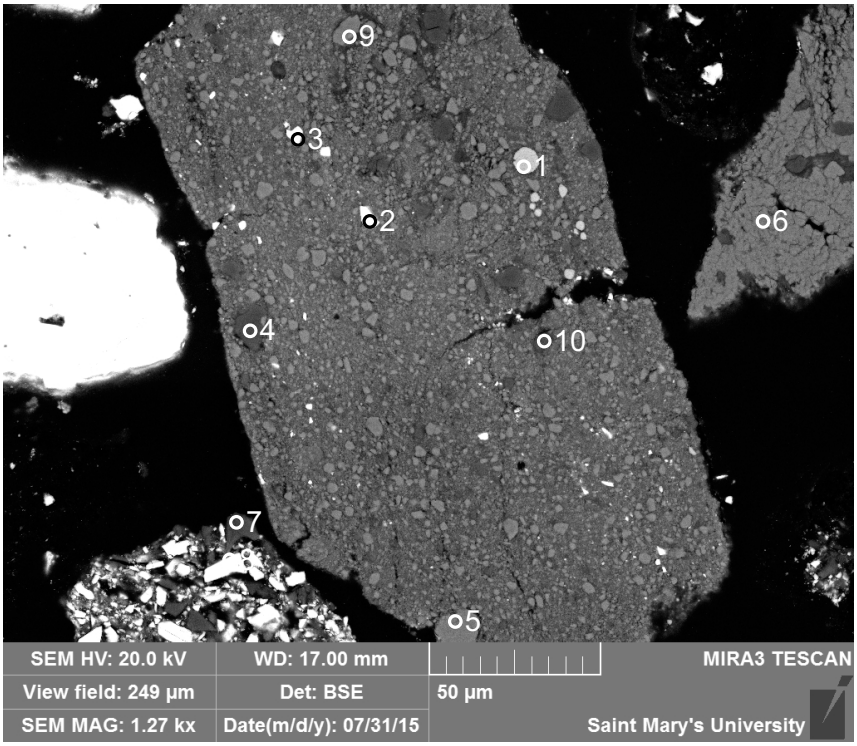
1:Tremolite
2:Magnetite
3:Mix
4:Ankerite +
5:?
6:Magnetite
7:Feohy
8:Chlorite
9:Olivine
10:Feohy
11:Hematite
12:Albite
13:Siderite
14:?
15:Magnetite
16:Feohy

Figure 4A.12: Weymouth A-45 5715m site 12 (SEM). A cutting of Feohy (7) and magnetite (6) which appears to be a contaminant.



1:Quartz
2:Pyrite
3:Pyrite +
4:Chlorite
5:Siderite
6:Mix
7:Mix
8:Quartz
9:Siderite
10:Feohy
11:Siderite +
12:Mix
13:Quartz
14:Barite
15:K-feldspar + Quartz
16:Quartz

Figure 4A.13: Weymouth A-45 5715m site 13 (SEM). A cutting made up of quartz (1) and pyrite (2).



1:Pyrite
2:Barite
3:Barite
4:Quartz
5:Siderite
6:Siderite
7:Mix
8:Barite
9:Siderite
10:Quartz

Figure 4A.14: Weymouth A-45 5715m site 14 (SEM). A cutting made up of siderite (5), pyrite framboid (1), and a very small grain of barite (3) all in a siderite-cemented siltstone nodule. Another cutting made up of siderite (6) and probably quartz (dark areas).

Table 4A.1 SEM-EDS chemical analyses of minerals from sample A-45 5715.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	MoO_3	BaO	WO_3	PbO	B_2O_3	Total	Actual Total
1	1	Brt											36.76				-0.11					2.32			61.06				100	115
1	2	Py				28.39				0.24			71.37																100	223
1	3	Py	0.17			28.56				0.77			70.52																100	222
1	4	Brt											37.01									3.86			59.15				100	111
1	5	Feohy				85.41	3.83	10.76																					100	63
1	6	Py				37.87							62.13																100	167
1	7	Sd	0.60		0.36	44.52	0.87	6.62	3.02																				56	59
1	8	Sd	0.79		0.40	42.10	0.50	7.56	4.65																				56	60
1	9	Qz	99.99																										100	117
1	10	Ol	41.89			7.64		49.70										0.76											100	118
1	11	Py	0.53		0.30	24.71				0.90			68.67					4.87											100	227
1	12	Feohy				97.18	0.52		2.31																				100	75
1	13	Mag	0.62			96.20	0.90									2.28													100	140
1	14	Feohy	3.87			95.57	0.54																						100	79
1	15	Hbl	45.39	1.83	11.77	15.13	0.37	11.19	10.69	1.71	1.65				0.27														100	110
1	16	Ol	41.65			12.49		45.86																					100	114
1	17	Qz	99.99																										100	118
2	1	Py +	5.78		4.01	26.77			0.31	0.63	0.24		62.28																100	179
2	2	Ms + Chl	55.55	0.65	27.21	8.89		2.69	0.97		4.04																		100	96
2	3	Mix	40.35		18.08	18.69	0.44	18.82	3.12	0.49																			100	96
2	4	Qz +	97.76		1.45	0.42					0.35																		100	115
2	5	Sd + Py	1.90		1.23	73.33		7.16	11.00			5.38																	100	64
2	6	Ab	68.73		18.69	0.59				11.38	0.61																		100	114
2	7	Qz	99.99																										100	116
2	8	Ank				15.89	0.54	11.94	27.63																				56	56
2	9	Sd +	2.84		2.29	41.96	0.74	4.51	3.66																				56	62
2	10	Feohy	0.79			99.20																							100	77
2	11	Sd				44.38	1.96	4.89	4.20			0.57																	56	59
3	1	Cont																		7.25						92.77		100	87
3	2	Cont																		4.90				21.30		4.75	69.03		100	130
3	3	Cont				0.63														3.76				29.05			66.57		100	155
3	4	Sp				0.39							51.09							48.53									100	194
3	5	Znc				0.67		1.24	1.93											96.17									100	62
3	6	Mix	30.12		16.34	13.44		1.76			6.49		4.97							26.87									100	81
4	1	Feohy				98.33			1.02						0.66														100	77
4	2	Feohy	2.16			89.11	0.75		2.94				1.00		4.04														100	50
4	3	Zrn	30.95																				69.05						100	122
4	4	Feohy	4.75			94.81			0.43																				100	80
4	5	Mag	0.56			98.29										1.15													100	145
4	6	Ab	68.95		18.54	0.53				12.01																			100	112
4	7	Sd +	5.89		4.01	35.48	0.31	5.70	3.64		0.39	0.58																	56	68
4	8	Feohy	1.30			85.55	0.67		3.48							4.66								4.35					100	81
4	9	Sd	1.38		0.62	43.35	0.30	4.59	5.77																				56	62
4	10	Qz	99.99																										100	126
4	11	Brt											27.44				0.14					0.89			47.35			24.19	100	154
4	12	Brt											26.97				0.03					1.03			47.21			24.80	100	159
4	13	Ms + Chl	52.45	1.12	27.55	8.12		2.39	1.30	0.94	5.03		1.10																100	71
5	1	Brt											36.28				0.20								63.53				100	118
5	2	Brt	0.53			97.34	0.37						0.57			1.18													100	140
5	3	Brt				1.08							23.07				-0.13								43.05			32.95	100	168
5	4	Hole	3.98			72.51		2.77	3.67	4.31			2.50		0.91											9.37			100	15
5	5	Feohy	1.48			89.22			1.41	0.93						0.47								6.50					100	76
5	6	Mag	0.60			98.11										1.30													100	137
5	7	Wo				25.03			4.27	1.81																68.89			100	92
6	1	Wo				24.85			3.92	2.02	0.36															68.85			100	99
6	2	Mag	0.73			98.16										1.11													100	139

Table 4A.1 SEM-EDS chemical analyses of minerals from sample A-45 5715.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	MoO_3	BaO	WO_3	PbO	B_2O_3	Total	Actual Total
6	3	Mag	0.73			98.24										1.04													100	135
6	4	Mag +	2.14			91.04	0.44	0.68		2.36			1.32		0.38	1.62													100	98
6	5	Mag	1.01			94.85				1.95			1.17			1.04													100	113
6	6	Wo				23.27			3.33	2.39																71.01			100	100
6	7	Mag	0.81			94.35	0.45						1.80			1.15									1.45				100	134
7	1	Brt											36.76				-0.14								63.39				100	121
7	2	Ol	41.46			12.05		46.49																					100	122
7	3	Cont (Mo+Pb)																						28.00			72.01		100	156
7	4	Cont (Mo+Pb)																						28.81			71.20		100	159
7	5	Cont (Mo+Pb)				0.62																				99.38			100	136
7	6	TiO_2 +	1.05	96.50	0.91	0.80			0.76																				100	107
7	7	Hem	4.94			92.87	0.96		0.57										0.65										100	86
7	8	Feohy	1.20			89.13	1.45	1.33	1.55							5.35													100	79
7	9	Pyl		1.63	0.93	4.46	81.49		1.40																3.12	6.97			100	103
7	10	Mag				100.00																							100	95
7	11	Sd	1.32		0.62	41.74		4.21	8.12																				56	66
7	12	Ank +	8.25		4.60	12.57	0.65	6.74	22.09		1.09																		56	70
7	13	Mix	47.04		6.20	36.70		4.63	3.90	0.57	0.96																		100	81
7	14	Sd +	2.73		1.61	39.00	0.77	5.82	4.61		0.21	1.24																	56	69
7	15	Mag	1.03			96.81	1.65									0.50													100	105
7	16	Py				28.14							71.87																100	244
8	1	Cont																								100.00			100	155
8	2	Wo																								100.00			100	153
8	3	Wo																								100.00			100	151
8	4	Wo															2.30									97.70			100	120
8	5	Brt											37.16				-0.03					1.56			61.33				100	120
8	6	Brt											37.36				0.39					2.35			59.90				100	121
9	1	Cont							20.40	0.65				3.24												75.71			100	93
9	2	Brt											25.10				0.05					1.67			43.14			30.09	100	169
9	3	Py				28.25				0.23			71.52																100	227
9	4	Feohy	3.59		2.51	75.84		8.13	8.10			1.83																	100	64
9	5	Tr	61.39			1.47		24.28	12.86																				100	122
9	6	Qz +	82.79		1.06	1.03		9.32	4.21	0.46			1.15																100	79
9	7	Qz +	99.99																										100	126
9	8	Sd				47.79	2.79	3.40	2.02																				56	62
9	9	Sd	3.17			52.13	0.69																						56	76
9	10	Sd +	0.97		0.64	38.11	0.32	5.96	6.42	0.43		3.14																	56	63
9	11	Tr	61.01		0.85	0.72		24.79	12.61																				100	121
9	12	Sd +	8.02		6.28	31.69	0.65	6.95	2.41																				56	76
9	13	Qz +	84.65		8.11	6.09		0.55			0.61																		100	112
9	14	Py +	2.27		1.72	25.05			0.20	0.44	0.36		66.62					3.35											100	225
9	15	Py				28.71							71.29																100	221
9	16	Chl	28.58		21.47	30.48		4.47																					85	83
9	17	Mix	63.85		17.25	13.38		1.79	0.36	0.62	0.31															2.41			100	93
10	1	Brt				1.69							38.18												60.14				100	123
10	2	Sd +	2.69			50.44		0.78	1.65	0.44																			56	73
10	3	Sd +	1.78			53.15			1.08																				56	85
10	4	Sd +	2.69			49.75		2.36	0.74	0.46																			56	75
10	5	Sd +	2.82			50.75			2.44																				56	71
10	6	Wo				39.65	0.58		5.12	2.79	0.35			3.28												48.22			100	95
11	1	Sd +	3.54		1.87	33.30	0.37	4.30	12.21		0.40																		56	68
11	2	Ms + Chl	54.34	0.57	29.67	5.08		1.92	1.94	0.74	4.77	0.94																	100	110
11	3	Feohy	1.78			91.33	5.34		0.88										0.68										100	88
11	4	Qz	99.99																										100	125
11	5	Tur	38.74	0.45	29.88	5.82		8.68	1.50	1.93																			87	106
11	6	Sd +	8.04		3.39	35.37	0.35	3.93	3.71		0.63	0.59																	56	64

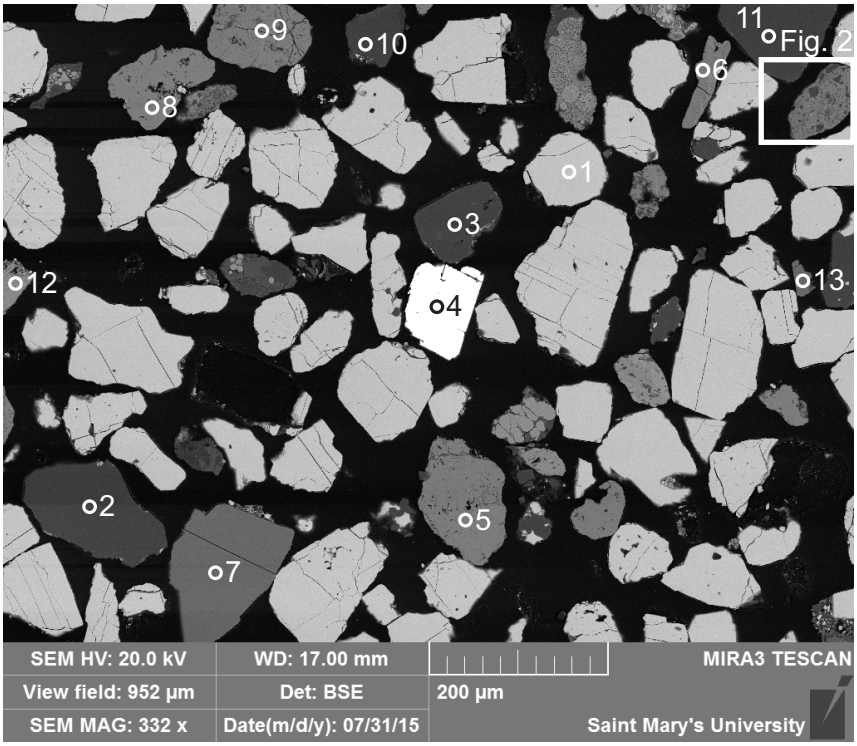
Table 4A.1 SEM-EDS chemical analyses of minerals from sample A-45 5715.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	MoO_3	BaO	WO_3	PbO	B_2O_3	Total	Actual Total
11	7	Sd +	3.30		2.81	36.68	0.38	5.99	4.95		0.19	1.69																	56	70
11	8	TiO_2 +	11.25	88.17		0.57																							100	115
11	9	Py				28.52				0.24			69.04								2.19								100	236
11	10	Qz	99.99																										100	128
11	11	Sd +	18.05		4.16	61.57	0.81	8.82	5.09		0.55	0.94																	100	66
11	12	Sd +	2.43		1.26	41.03	0.36	6.04	4.30			0.58																	56	65
11	13	Feohy	5.78			92.99	0.89		0.34																				100	82
11	14	Mix	64.99	34.65		0.37																							100	117
11	15	Mag	3.40		1.61	94.99																							100	91
11	16	Py				28.37							71.64																100	232
11	17	Sd				50.74	1.62	1.05	2.12	0.47																			56	74
11	18	?Opx +	54.53	0.70	0.98	16.67	0.34	20.89	5.88																				100	120
11	19	Feohy +	5.48			94.53																							100	82
11	20	Ol	41.69			10.07	0.27	47.49	0.49																				100	118
12	1	Tr	61.61			0.58		24.91	12.90																				100	121
12	2	Mag				100.00																							100	97
12	3	Mix	22.42		12.83	45.93		5.90	7.08	0.89	1.65	3.30																	100	71
12	4	Ank +	3.14		0.80	14.35	0.75	8.11	28.11	0.74																			56	62
12	5	?	46.44	0.88	23.35	7.54		1.01	12.19	0.63	2.82		0.85	2.32												1.95			100	53
12	6	Mag				98.80	1.20																						100	93
12	7	Feohy	1.33			95.73	0.84		2.10																				100	77
12	8	Chl	30.07	1.26	17.28	26.40		8.18	0.39		1.44																		85	95
12	9	Ol	41.54			12.80		45.67																					100	119
12	10	Feohy	3.27			93.10	3.06		0.57																				100	81
12	11	Hem	3.55			96.45																							100	86
12	12	Ab	69.35		18.56	0.32				11.18	0.59																		100	126
12	13	Sd				45.23	0.77	4.60	5.39																				56	60
12	14	?	51.40	0.48	23.07	15.26		2.35	0.87	3.71	2.88																		100	99
12	15	Mag	2.40			88.59	1.25									5.35								2.42					100	97
12	16	Feohy	9.46			84.25	2.13		0.76										3.40										100	78
13	1	Qz	99.99																										100	128
13	2	Py	0.17			27.41				0.39			70.89					1.15											100	237
13	3	Py +	5.31		4.29	29.56		0.73		0.47			56.46					3.18											100	161
13	4	Chl	22.55	0.96	15.64	37.28		6.27	1.75		0.55																		85	86
13	5	Sd	2.24		1.39	42.72	0.40	5.91	3.34																				56	64
13	6	Mix	70.79	0.67	15.95	4.39		0.93	0.63	1.19	3.69			1.77															100	117
13	7	Mix	18.72		8.54	50.22		5.57	5.89	0.75	0.88	2.27														7.14			100	62
13	8	Qz	99.99																										100	131
13	9	Sd	2.13		0.95	43.47	0.67	5.12	3.65																				56	66
13	10	Feohy	3.06			96.31	0.65																						100	70
13	11	Sd +	3.67		2.12	39.88	0.32	6.04	3.05		0.33	0.59																	56	67
13	12	Mix	77.70		11.70	2.26		0.95	3.81	0.54	1.41			1.64															100	108
13	13	Qz	99.99																										100	127
13	14	Brt											36.13				0.34								63.55				100	133
13	15	Kfs + Qz	80.16		11.02	1.45		0.41			6.96																		100	118
13	16	Qz	99.99																										100	125
14	1	Py				28.83				0.24			70.92																100	230
14	2	Brt				1.33							24.12				-0.01								43.97			30.60	100	172
14	3	Brt				2.73			0.34				22.60				0.08								40.77			33.50	100	172
14	4	Qz	99.37			0.63																							100	125
14	5	Sd	1.26		0.68	44.97		4.69	3.64			0.77																	56	63
14	6	Sd	1.22		0.90	42.77	0.39	5.16	4.87			0.68																	56	63
14	7	Mix	89.65		6.92	0.59		0.43			2.42																		100	128
14	8	Brt											38.03				-0.09								62.06				100	118
14	9	Sd	0.62			45.09		5.64	3.77			0.88																	56	61
14	10	Qz	99.17			0.82																							100	127

Table 4A.1 SEM-EDS chemical analyses of minerals from sample A-45 5715.

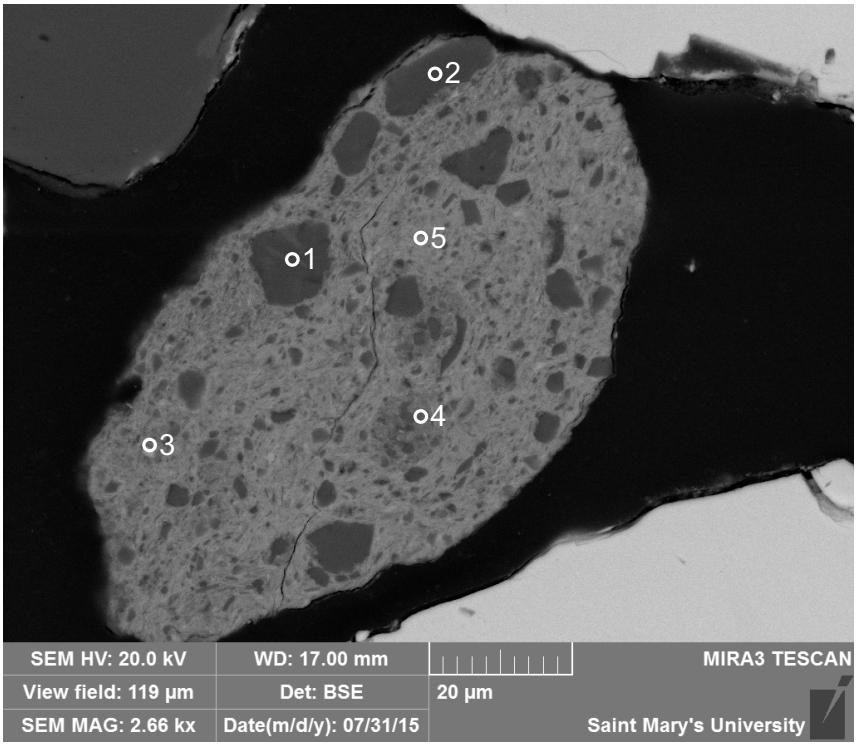
Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	NiO	CuO	ZnO	As_2O_3	SrO	ZrO_2	MoO_3	BaO	WO_3	PbO	B_2O_3	Total	Actual Total
Znc=Zincite, Wo=Wolframite, Pyl=Pyrolusite, Cont=Contaminant																														

Appendix 4B: SEM-BSE images and EDS mineral analyses for sample A-45 5955



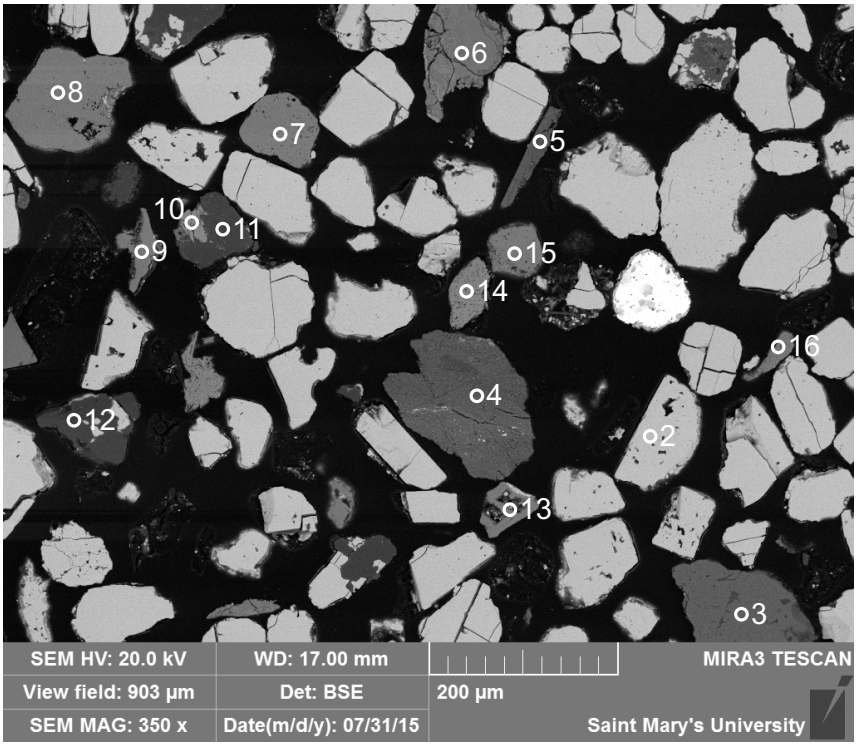
1: Barite
2: Quartz
3: Albite
4: Contaminant (Mo+Pb)
5: Feohy
6: Feohy
7: Apatite
8: Feohy
9: Feohy
10: Quartz
11: Quartz
12: Magnetite
13: Siderite

Figure 4B.1: Weymouth A-45 5955m site 1 (SEM).



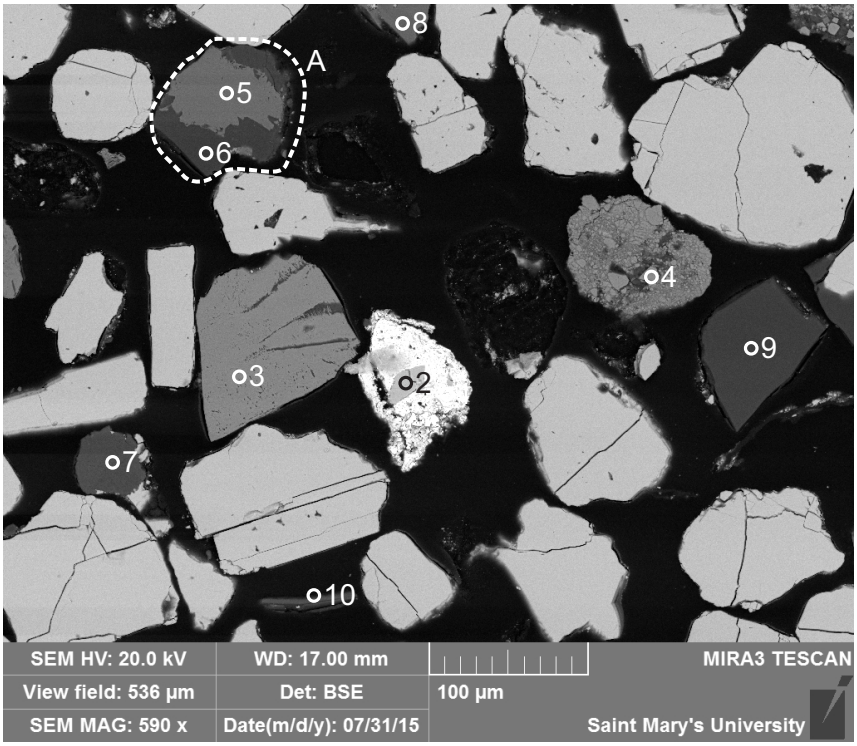
1: Quartz +
2: Quartz
3: Feohy +
4: Chlorite
5: Feohy +

Figure 4B.2: Weymouth A-45 5955m site 2 (SEM). A cutting made up of quartz grains in a matrix of chlorite (4) and Feohy.



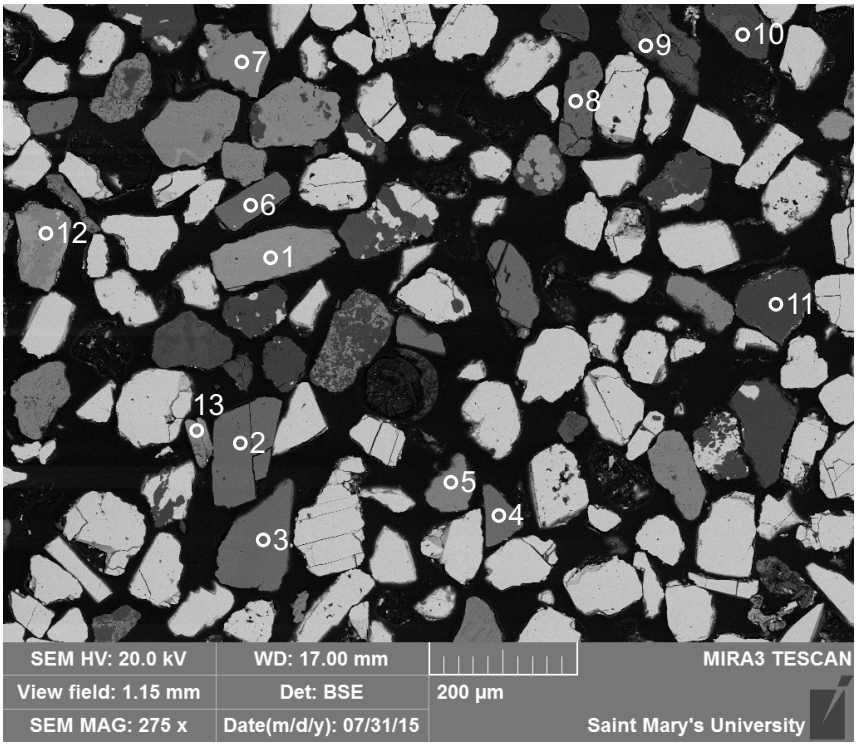
1: Contaminant
2: Barite
3: Siderite +
4: Siderite +
5: Siderite +
6: Feohy
7: Feohy +
8: Feohy +
9: Feohy
10: Feohy +
11: Quartz
12: Quartz
13: Feohy +
14: Feohy +
15: Feohy +
16: Feohy +

Figure 4B.3: Weymouth A-45 5955m site 3 (SEM). Feohy (10) is associated with quartz (11) and appears to be diagenetic.



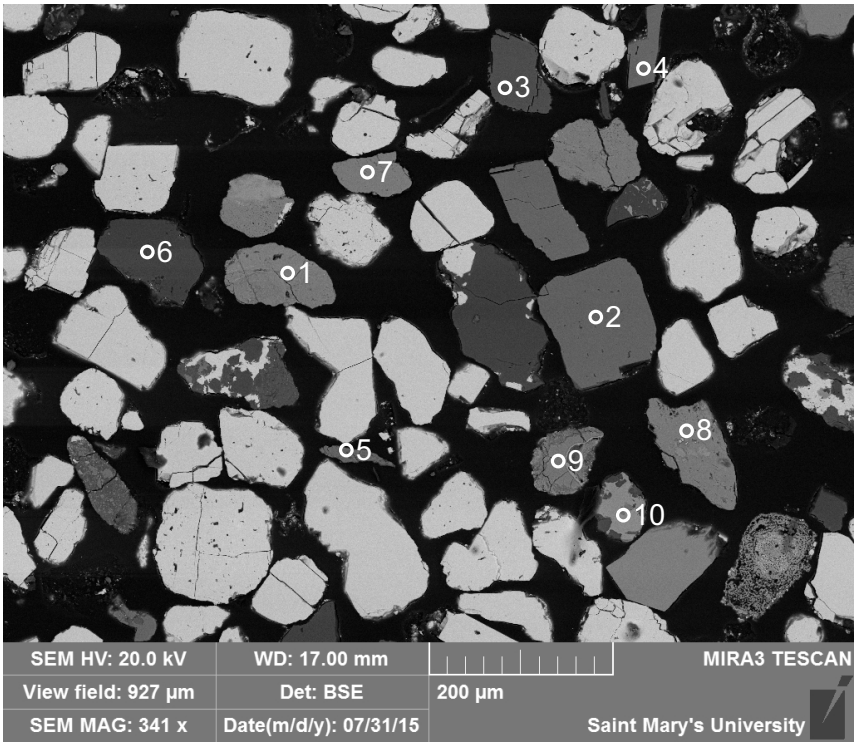
1: Contaminant
2: Barite
3: Magnetite +
4: Pyrite
5: TiO_2
6: Quartz
7: K-feldspar
8: Siderite
9: Quartz
10: Muscovite

Figure 4B.4: Weymouth A-45 5955m site 4 (SEM). Lithic clast (A) made up of quartz (6) and TiO_2 (5).



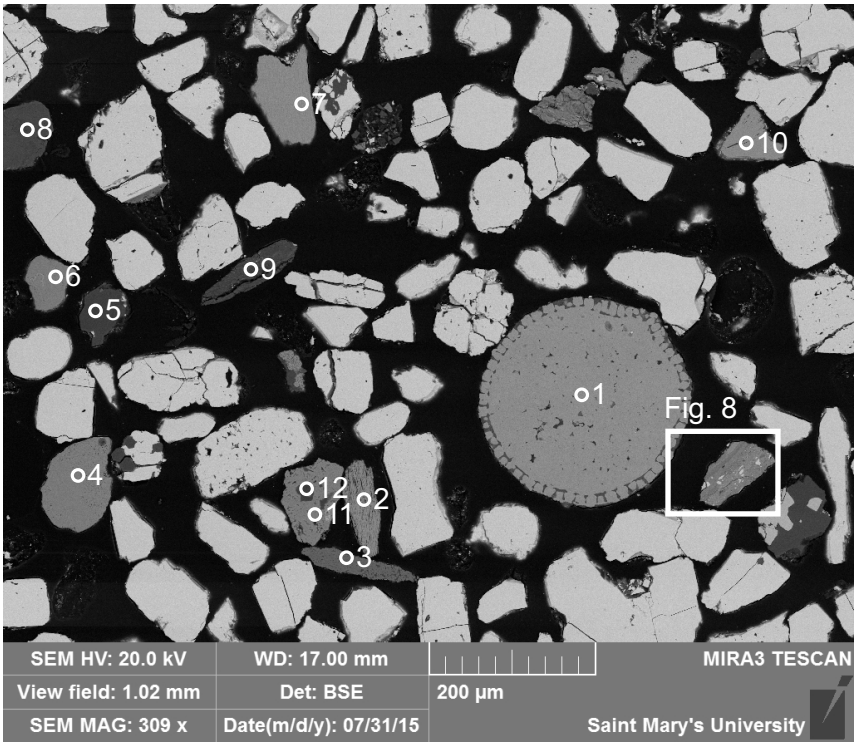
1: Feohy
2: Feohy
3: Feohy
4: Feohy
5: Feohy +
6: Feohy
7: Feohy +
8: Siderite
9: Apatite
10: Muscovite
11: Quartz
12: Feohy +
13: Feohy

Figure 4B.5: Weymouth A-45 5955m site 5 (SEM).



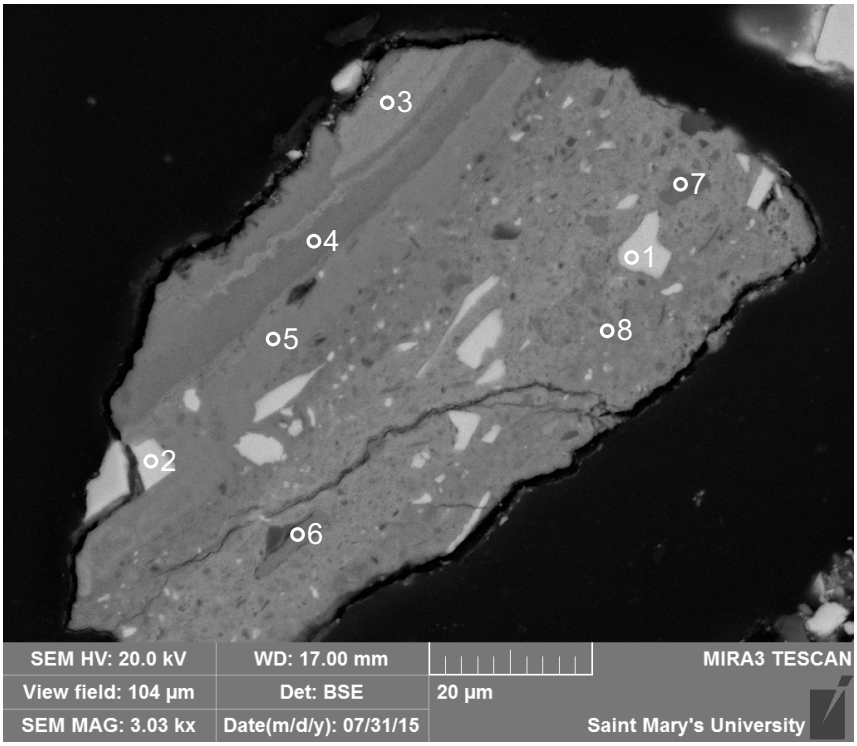
1: Feohy
2: Siderite
3: Calcite
4: Siderite
5: Siderite +Quartz
6: Quartz
7: Feohy +
8: Feohy +
9: Feohy +
10: Magnetite

Figure 4B.6: Weymouth A-45 5955m site 6 (SEM). Magnetite (10) appears to be associated with quartz and is diagenetic.



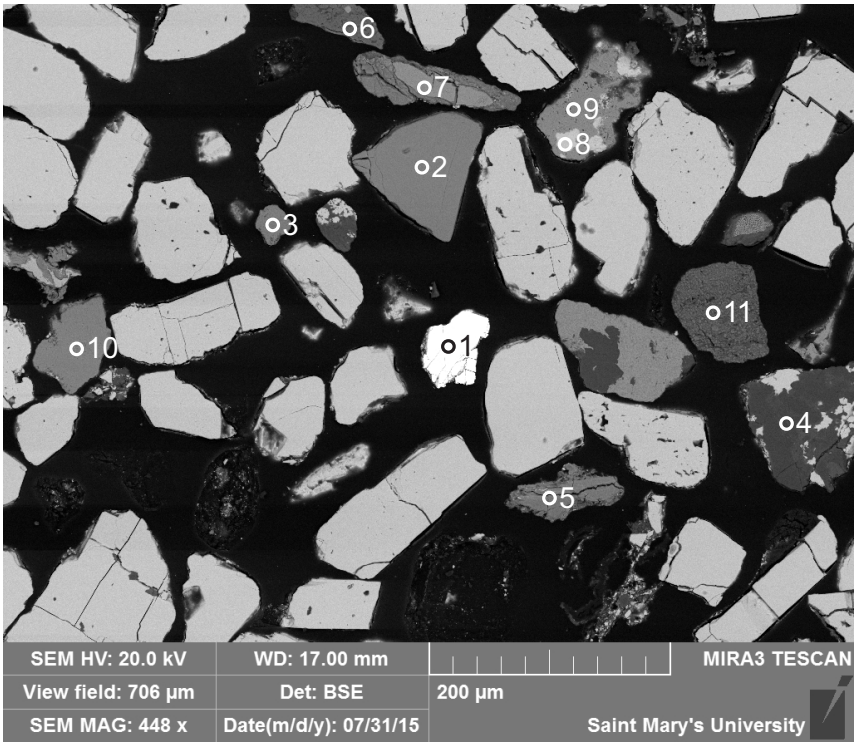
1: Pyrite
2: Feohy +
3: Siderite +
4: Feohy
5: Quartz
6: Feohy
7: Magnetite
8: Quartz
9: Muscovite +
10: Magnetite
11: Hole
12: Quartz

Figure 4B.7: Weymouth A-45 5955m site 7 (SEM). Possible pyritized radiolaria or diotom (1).



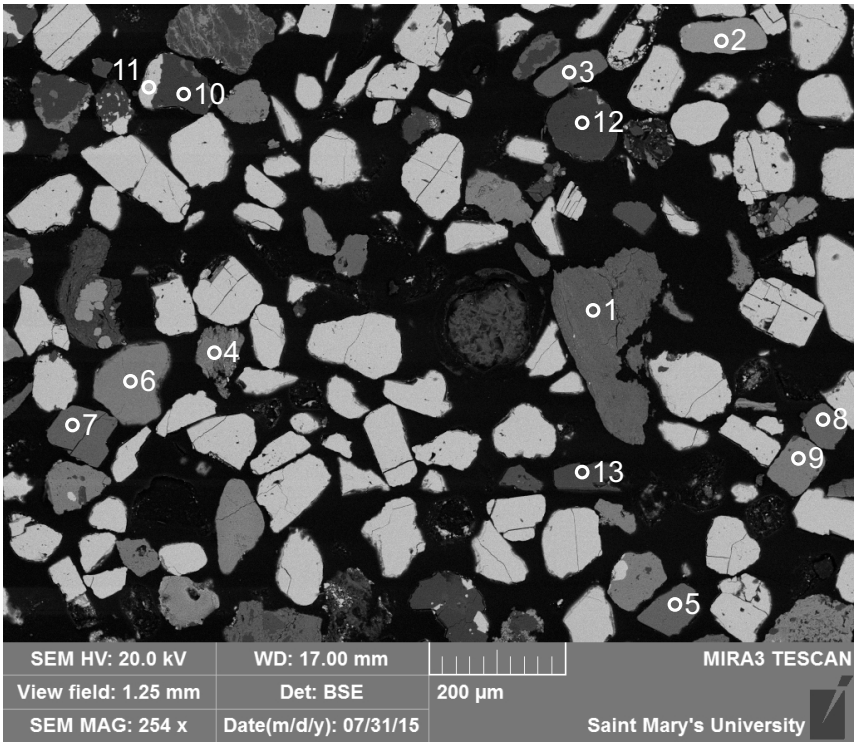
1: Barite
2: Barite
3: Feohy +
4: Siderite +
5: Siderite
6: Titania +
7: Mix
8: Mix

Figure 4B.8: Weymouth A-45 5955m site 8 (SEM). A cutting made up of siderite (5), barite (1,2), TiO_2 (6), and Feohy (3). It may be that this whole cutting is a contaminant.



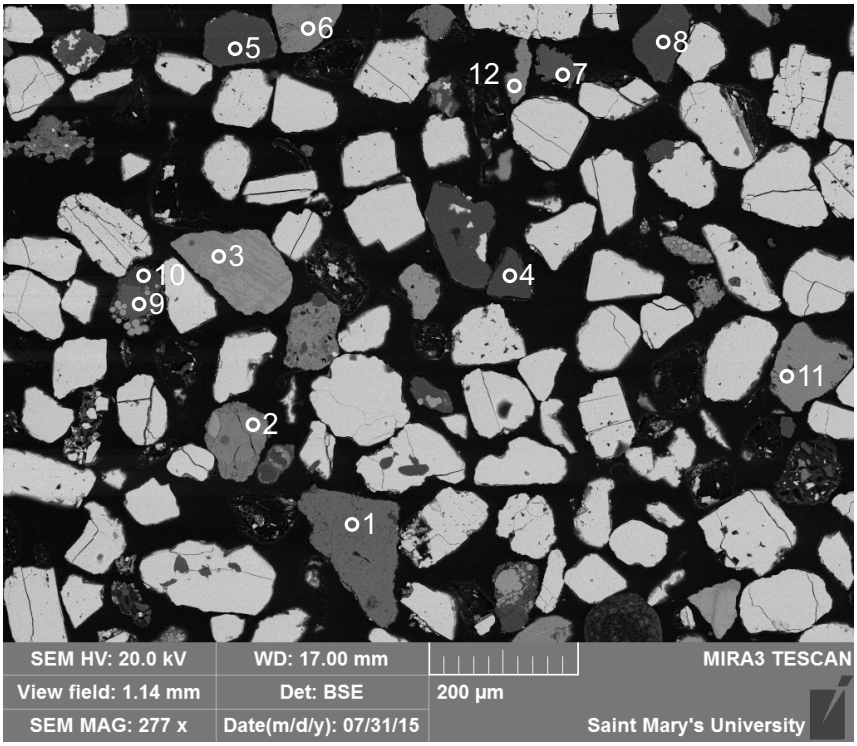
1: Contaminant
2: Feohy
3: Feohy
4: Quartz
5: Feohy
6: Siderite
7: Magnetite
8: Barite
9: Feohy
10: Feohy
11: Siderite +

Figure 4B.9: Weymouth A-45 5955m site 9 (SEM). Magnetite (7) is surrounded by a fine grained matrix, and is likely part of drilling the drilling mud.



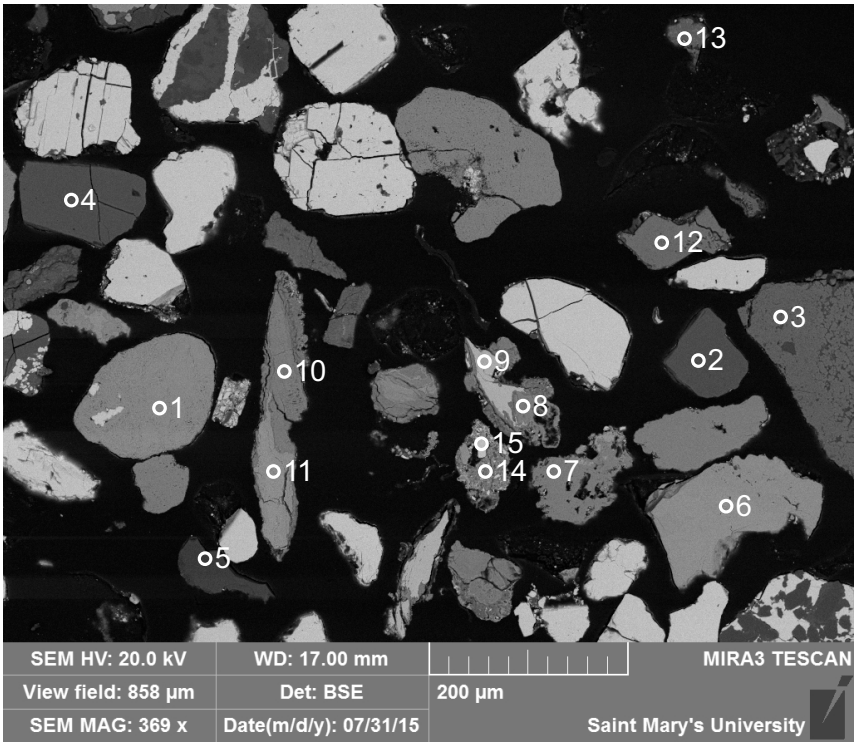
1: Siderite +
2: Psilomelane
3: Siderite
4: Feohy
5: Siderite
6: Feohy
7: Feohy
8: Siderite
9: Feohy
10: Quartz
11: Barite
12: Dolomite
13: Tremolite

Figure 4B.10: Weymouth A-45 5955m site 10 (SEM).



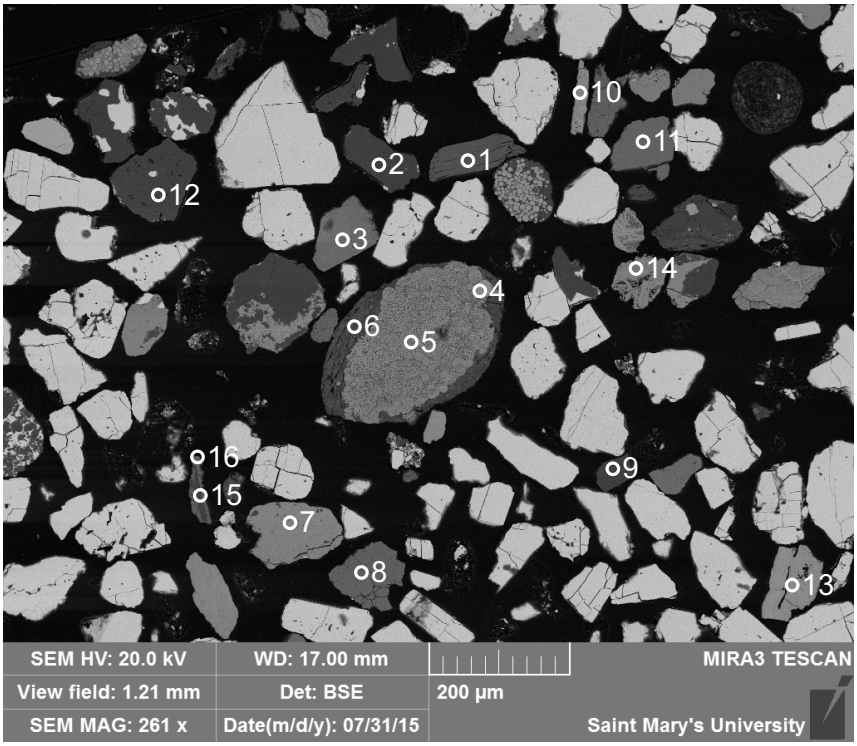
1: Siderite
2: Feohy
3: Magnetite
4: Quartz
5: Quartz
6: Feohy
7: Calcite
8: Quartz
9: Apatite
10: Kaolinite
11: Feohy
12: Feohy

Figure 4B.11: Weymouth A-45 5955m site 11 (SEM). A cutting made up of apatite (9), kaolinite (10), and pyrite framboids. Both kaolinite and pyrite appear to be replacing apatite.



1: Magnetite
2: Calcite
3: Siderite
4: Calcite
5: Quartz
6: Feohy
7: Feohy
8: Feohy
9: Magnetite
10: Feohy
11: Magnetite
12: Ankerite +
13: Mix
14: Mix
15: Barite

Figure 4B.12: Weymouth A-45 5955m site 12 (SEM). A cutting of magnetite (11) and Feohy (10) is likely a contaminant.



1: Chlorite
2: Quartz
3: Apatite
4: Pyrite
5: Pyrite
6: Chlorite +Calcite
7: Feohy
8: Siderite
9: Quartz
10: Feohy
11: Mix
12: Ankerite
13: Ankerite
14: Feohy +
15: Albite
16: Mix

Figure 4B.13: Weymouth A-45 5955m site 13 (SEM). A cutting made up of pyrite (4,5) and chlorite and calcite (6).

Table 4B.1 SEM-EDS chemical analyses of minerals from sample A-45 5955.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	NiO	CuO	As_2O_3	SrO	MoO_3	Sb_2O_3	BaO	WO_3	PbO	B_2O_3	Total	Actual Total
1	1	Brt											36.48				-0.05				1.94			61.64				100	120
1	2	Qz	99.99																									100	128
1	3	Ab	69.20		18.69				0.41	11.70																		100	122
1	4	Cont																				29.02				70.98		100	155
1	5	Feohy	4.43			95.57																						100	84
1	6	Feohy				95.57			0.98						3.45													100	75
1	7	Ap							46.92					53.09														100	176
1	8	Feohy	1.07			98.48			0.45																			100	77
1	9	Feohy	3.25		1.11	94.87			0.77																			100	76
1	10	Qz	99.99																									100	122
1	11	Qz	99.99																									100	123
1	12	Mag				100.00																						100	91
1	13	Sd				46.05	2.89	6.68	0.39																			56	63
2	1	Qz +	94.92		2.99	1.09					1.00																	100	119
2	2	Qz	99.13			0.86																						100	124
2	3	Feohy +	13.48		4.53	78.49					0.93									1.66			0.91					100	95
2	4	Chl	32.93	0.34	9.95	38.82		0.41			2.55																	85	100
2	5	Feohy +	15.17	0.47	5.48	77.59					1.29																	100	93
3	1	Cont												4.02												95.99		100	107
3	2	Brt											37.28				0.04				2.21			60.48				100	119
3	3	Sd +	2.41		1.31	40.97	1.79	4.50	4.20		0.23	0.59																56	66
3	4	Sd +	12.64		5.12	62.56		7.69	5.43		0.70	1.01													4.84			100	67
3	5	Sd +	9.82	2.95	6.18	58.10		15.34	7.11		0.51																	100	64
3	6	Feohy				97.47			1.51							1.02												100	72
3	7	Feohy +	5.35			94.07	0.58																					100	79
3	8	Feohy +	2.82			97.18																						100	78
3	9	Feohy				99.36									0.64													100	75
3	10	Feohy +	1.39	1.03	0.59	96.99																						100	85
3	11	Qz	91.51		2.32	0.78		0.35	2.03	1.46		1.54																100	119
3	12	Qz	99.45		0.55																							100	120
3	13	Feohy +	5.50			93.98			0.52																			100	80
3	14	Feohy +	1.05			98.06																	0.89					100	89
3	15	Feohy +	4.58			95.42																						100	79
3	16	Feohy +	5.75			93.71	0.54																					100	74
4	1	Cont												1.69												98.32		100	108
4	2	Brt											36.83				0.03				1.74			61.40				100	122
4	3	Mag +	1.88	2.22	0.62	95.28																						100	94
4	4	Py				28.30							71.69															100	232
4	5	TiO_2	0.47	99.15		0.40																						100	108
4	6	Qz	99.99																									100	122
4	7	Kfs	65.97		18.01						16.01																	100	117
4	8	Sd				45.88	3.01	6.85	0.26																			56	62
4	9	Qz	99.99																									100	127
4	10	Ms	47.06	0.43	33.55	1.28		0.58		0.55	9.90			1.65														95	109
5	1	Feohy	2.01			94.95																	3.04					100	94
5	2	Feohy				83.85	4.39	11.76																				100	65
5	3	Feohy				84.62	4.67	10.71																				100	65
5	4	Feohy				87.43	5.75	3.81	3.01																			100	65
5	5	Feohy +	2.55			95.61	0.48		0.49			0.87																100	84
5	6	Feohy				86.70	5.25	7.53	0.52																			100	63
5	7	Feohy +	3.68			94.12	0.81		0.53											0.86								100	79
5	8	Sd	1.69		1.26	42.77	0.30	2.39	5.31			2.28																56	65
5	9	Ap							63.17	0.58			1.22	34.19	0.83													100	83
5	10	Ms	58.84	0.41	24.99	1.88		0.98		0.36	7.54																	95	109

Table 4B.1 SEM-EDS chemical analyses of minerals from sample A-45 5955.

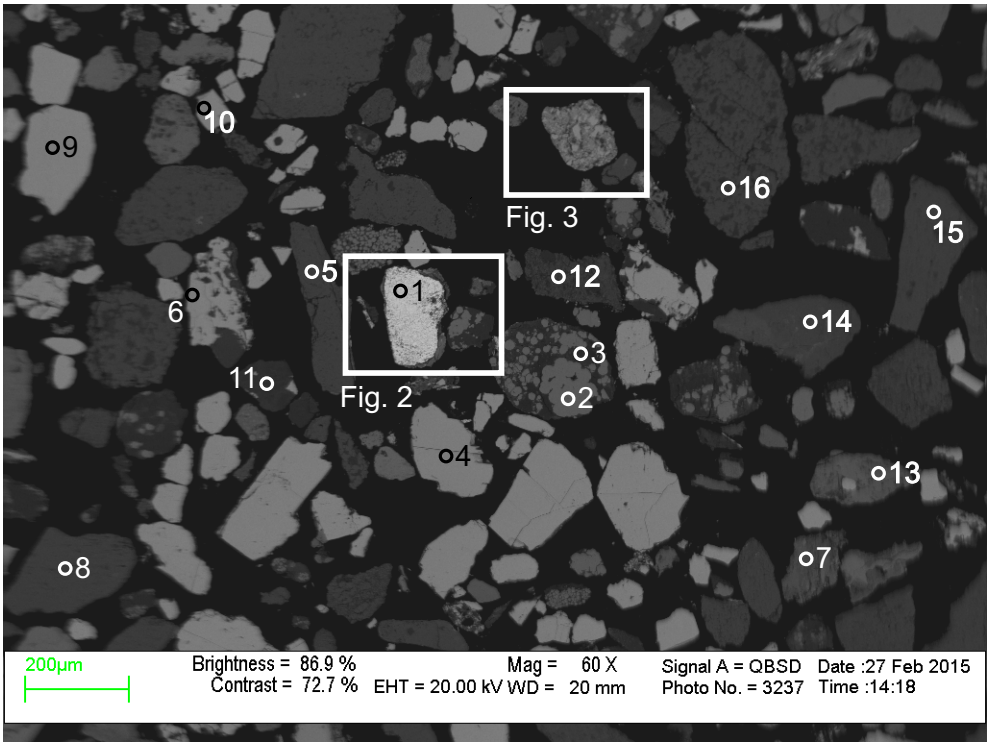
Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	NiO	CuO	As_2O_3	SrO	MoO_3	Sb_2O_3	BaO	WO_3	PbO	B_2O_3	Total	Actual Total
5	11	Qz	99.99																									100	126
5	12	Feohy +	1.82			97.03	1.15																					100	81
5	13	Feohy	2.42	1.22	0.85	94.50		1.01																				100	95
6	1	Feohy	1.78			88.75			7.54						0.76	1.17												100	78
6	2	Sd				47.06	2.85	5.87	0.22																			56	64
6	3	Cal				0.30		0.90	52.03					2.77														56	60
6	4	Sd				48.88	3.46	1.86	1.81																			56	60
6	5	Sd + Qz	58.72			30.09	2.30	2.32	6.58																			100	91
6	6	Qz	99.99																									100	121
6	7	Feohy +	5.22			94.19	0.59																					100	79
6	8	Feohy +	9.37			81.30	4.00		1.80										3.53									100	83
6	9	Feohy +				98.61			1.04						0.35													100	78
6	10	Mag		8.61		91.39																						100	99
7	1	Py				28.78							71.24															100	231
7	2	Feohy +	1.52			98.48																						100	77
7	3	Sd +	2.40		1.27	42.86		4.96	3.63			0.88																56	67
7	4	Feohy	2.12			94.11	3.15		0.62																			100	80
7	5	Qz	99.99																									100	124
7	6	Feohy	3.59			96.41																						100	81
7	7	Mag	2.14			97.85																						100	90
7	8	Qz	95.07		3.19	0.48					1.26																	100	120
7	9	Ms +	52.30	0.55	28.27	5.78		1.77	3.04		3.29																	95	99
7	10	Mag				100.00																						100	92
7	11	Hole	1.75			94.09			1.06															1.41	1.69			100	49
7	12	Qz	98.96			1.04																						100	129
8	1	Brt				2.62							36.68				0.01				4.52			56.18				100	121
8	2	Brt				1.89							36.41				-0.24							61.95				100	126
8	3	Feohy +	3.57			93.88	0.54		0.58				1.44															100	88
8	4	Sd +	19.92		2.00	73.15	1.14	1.84	1.65		0.31																	100	84
8	5	Sd	0.88			52.82	1.17		0.63				0.49															56	76
8	6	TiO_2 +	3.66	88.06	1.49	6.81																						100	105
8	7	Mix	20.49			77.54	0.66		1.32																			100	78
8	8	Mix	5.31		1.53	89.95	0.48	0.65	1.08				1.00															100	82
9	1	Cont																				28.63				71.37		100	156
9	2	Feohy +	3.08			96.00	0.57		0.35																			100	81
9	3	Feohy +	7.44			89.16	1.33		0.85															1.22				100	81
9	4	Qz	90.12		5.91	1.08		0.48			2.37																	100	122
9	5	Feohy				95.98			1.89				1.25			0.88												100	76
9	6	Sd	1.18		0.78	42.51		6.49	4.51				0.53															56	62
9	7	Mag	1.07			94.97	1.06									2.91												100	96
9	8	Brt				1.40							28.12				-0.08				0.79			49.72			20.07	100	153
9	9	Feohy	2.25		0.77	96.48			0.50																			100	92
9	10	Feohy	3.08			96.26	0.66																					100	81
9	11	Sd +	6.58		3.32	36.73	0.31	5.66	2.98		0.42																	56	65
10	1	Sd +	8.62		5.32	32.73	0.25	3.94	3.85	0.39	0.33	0.58																56	72
10	2	Ps					78.56		0.43												2.02			18.98				100	80
10	3	Sd				48.87	2.86	3.80	0.47																			56	58
10	4	Feohy				97.34	0.92		1.74																			100	73
10	5	Sd				48.27	2.57	5.16																				56	64
10	6	Feohy	3.91			97.99												-1.90										100	72
10	7	Feohy				85.11	5.36	9.53																				100	60
10	8	Sd				47.60	3.70	4.25	0.45																			56	62
10	9	Feohy	4.62		1.17	94.21																						100	81
10	10	Qz	99.99																									100	115

Table 4B.1 SEM-EDS chemical analyses of minerals from sample A-45 5955.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	NiO	CuO	As_2O_3	SrO	MoO_3	Sb_2O_3	BaO	WO_3	PbO	B_2O_3	Total	Actual Total
10	11	Brt											37.36				0.62							62.04				100	111
10	12	Dol				0.33		22.63	31.03																			54	54
10	13	Tr	59.49		1.23	0.95		24.03	12.52					1.78														100	121
11	1	Sd	1.10		0.77	44.46	0.30	5.16	4.20																			56	66
11	2	Feohy				98.80			0.88						0.32													100	79
11	3	Mag	2.59		0.81	96.61																						100	92
11	4	Qz	99.99																									100	127
11	5	Qz	99.99																									100	124
11	6	Feohy	1.97			96.76	1.27																					100	80
11	7	Cal						0.40	48.66					6.94														56	68
11	8	Qz	99.99																									100	124
11	9	Ap				2.01		1.19	82.08					14.73														100	69
11	10	Kln	47.88		36.89					0.26				0.97														86	106
11	11	Feohy	5.07			91.58	2.76		0.59																			100	84
11	12	Feohy	3.91			94.91	0.83		0.35																			100	81
12	1	Mag	1.16			98.84																						100	91
12	2	Cal							52.79					3.21														56	61
12	3	Sd	1.62		0.89	39.80	0.30	4.70	8.70																			56	62
12	4	Cal				0.32		0.97	52.42					2.29														56	59
12	5	Qz	99.99																									100	123
12	6	Feohy				99.46	0.54																					100	104
12	7	Feohy	4.83			87.18	6.46		0.80										0.73									100	81
12	8	Feohy	1.63			84.78			0.74						4.89	3.71						4.25						100	83
12	9	Mag	0.60			97.35	0.70									1.36												100	141
12	10	Feohy				93.06	1.61	1.19	1.23						0.71			2.20										100	74
12	11	Mag				98.87	1.14																					100	104
12	12	Ank +	4.23	0.40	7.90	10.12		9.16	24.19																			56	109
12	13	Mix	42.29	1.55	12.32	3.22	2.78	0.91	30.14		6.81																	100	110
12	14	Mix	3.98		0.70	78.14			1.47				5.74			1.74								8.23				100	85
12	15	Brt				0.68							25.74				-0.01							46.20			27.41	100	163
13	1	Chl	26.93		19.68	23.43	0.46	14.50																				85	100
13	2	Qz	99.99																									100	120
13	3	Ap							45.63					54.37														100	174
13	4	Py				29.01							70.99															100	227
13	5	Py	8.19		6.44	24.57			0.32				60.48															100	180
13	6	Chl + Cal	30.55		16.97	13.28		2.64	34.59		1.32		0.67															100	81
13	7	Feohy	7.96		0.70	90.84			0.50																			100	91
13	8	Sd	0.46			44.99	1.70	4.12	3.83			0.90																56	63
13	9	Qz	99.99																									100	126
13	10	Feohy				98.95	1.05																					100	89
13	11	Mix	46.66	1.08	5.90	32.15	0.41	0.80	10.17	1.69	0.95				0.19													100	110
13	12	Ank				2.64	2.04	20.06	31.25																			56	56
13	13	Ank				55.50	0.50																					56	99
13	14	Feohy +	4.00			91.65	1.85		0.50										2.00									100	77
13	15	Ab	69.05		18.91	0.49			0.57	10.68	0.29																	100	111
13	16	Mix	26.21	0.80	10.15	47.06		8.44	5.64	0.57	1.14																	100	90

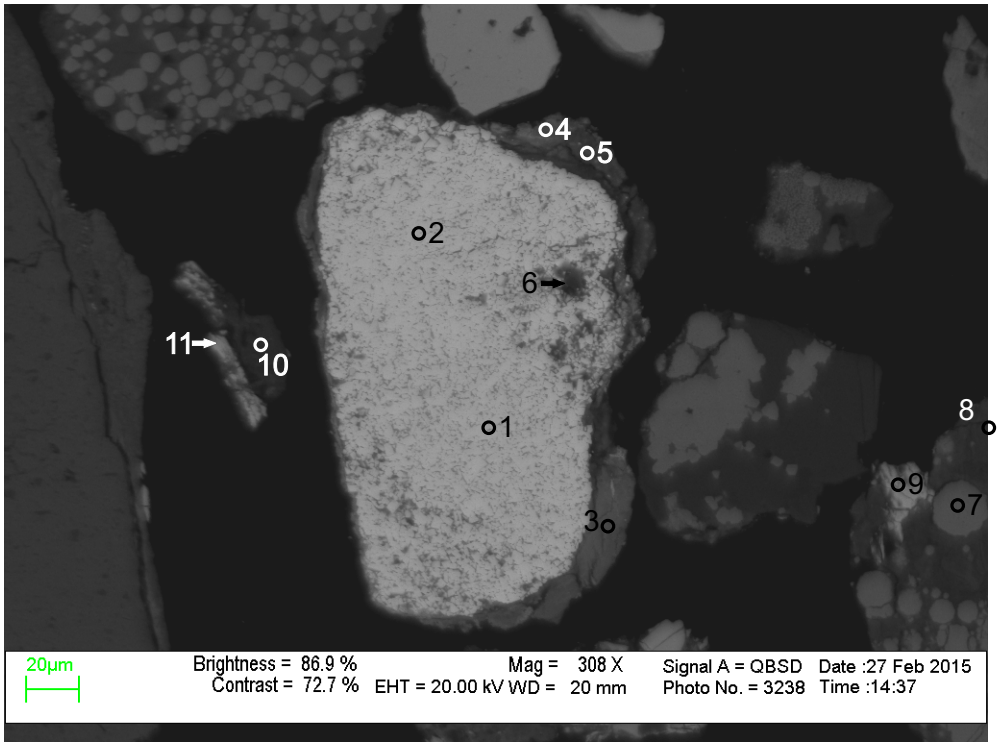
Cont=Contaminant

Appendix 4C: SEM-BSE images and EDS mineral analyses for sample A-45 5960



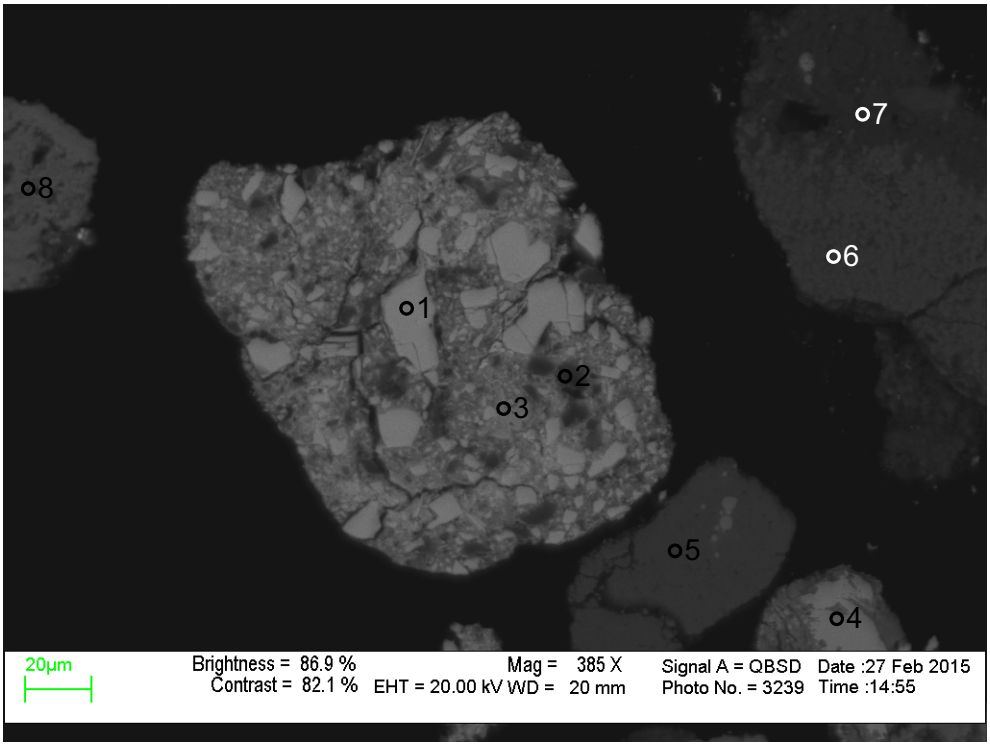
1:Wulframite
2:Pyrite
3:Pyrite + Kaolinite
4:Barite
5:Siderite + Chlorite
6:Barite
7:Mix
8:Siderite + Quartz +
9:Barite
10. Barite
11:K-feldspar
12:Siderite +
13:Feohy +
14:Mix
15:Mix
16:Siderite + Chlorite

Figure 4C.1: Weymouth A-45 5960m site 1. A cutting made up of kaolinite (3) and framboidal pyrite (2). A detrital K-feldspar grain (11).



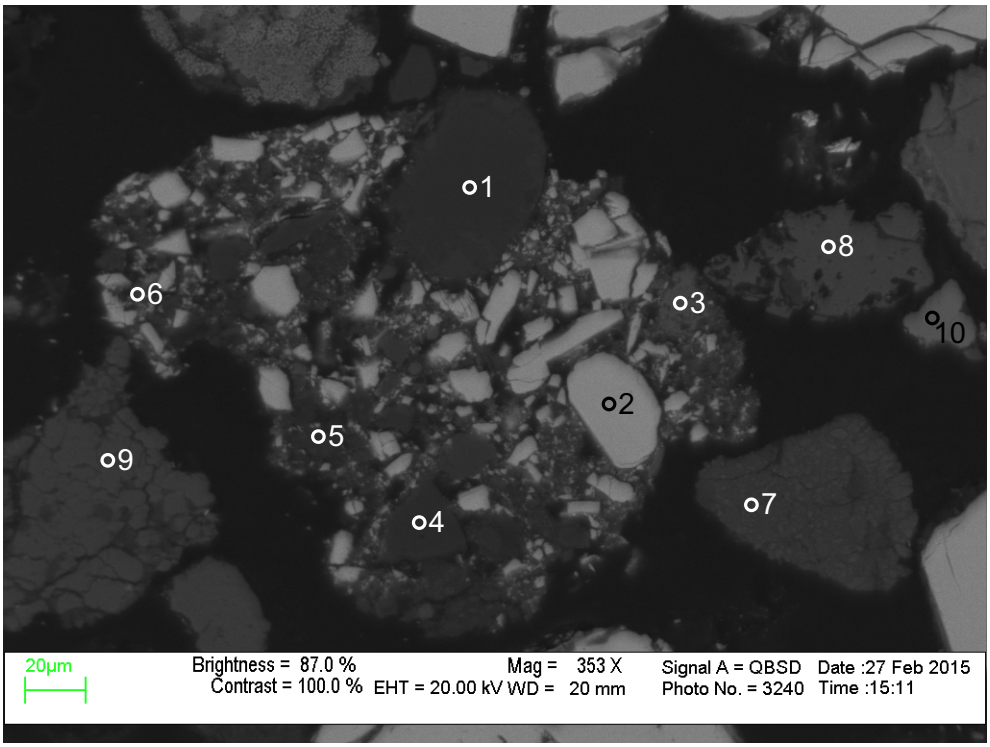
1:Wulframite
2:Wulframite
3:Feohy +
4:Wulframite + Feohy
5:Mix
6:Quartz +
7:Pyrite
8:Mix
9:Wulframite +
10:Muscovite +
11:Wulframite

Figure 4C.2: Weymouth A-45 5960 site 2. A fragment of drilling mud made up of wulframite (1,2,4), Feohy (3,4), and quartz (6). Cuttings of sandstone made up of pyrite (7) or muscovite (10) which have been smeared by wulframite (9,11).



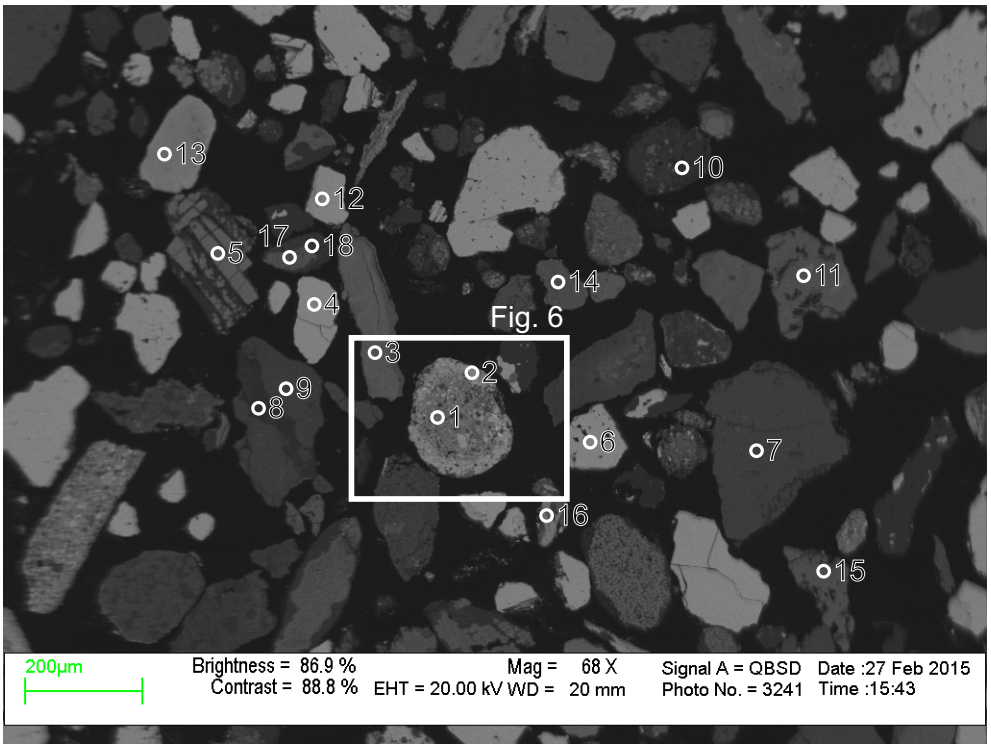
1:Barite
2:Quartz + Barite + Wulframite + K-feldspar
3. Feohy + Barite
4. Feohy +
5. Feohy + Apatite + Dolomite + Kaolinite
6:Feohy + Kaolinite + Dolomite
7. Muscovite + Fluorite
8:Feohy + Quartz

Figure 4C.3: Weymouth A-45 5960m site 3. A fragment of drilling mud with traces of sandstone made up of barite (1), Feohy (3), dolomite, quartz (8), and small amounts of K-feldspar (2) and kaolinite (6).



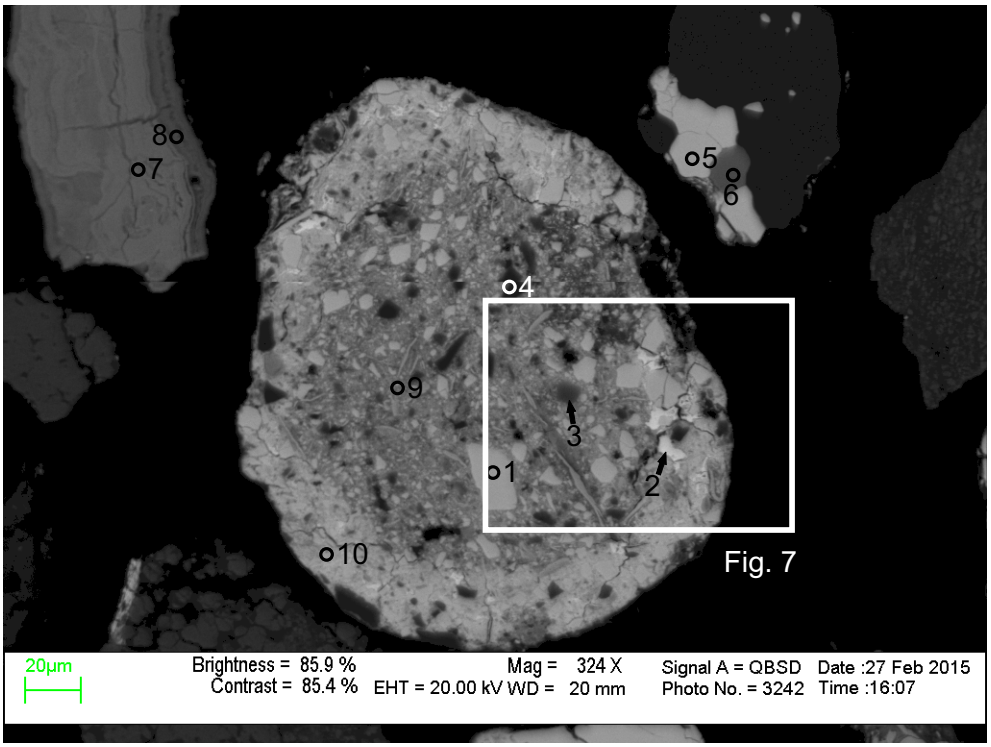
1:Quartz
2:Barite
3. Calcite + Feohy +
4. Quartz
5. Quartz + K-feldspar + Wulframite
6:Barite
7. Feohy + Apatite + Dolomite + Quartz
8:Feohy +
9. Feohy + Apatite +
10. Pyrite

Figure 4C.4: Weymouth A-45 5960m site 4. A fragment of drilling mud and sandstone made up of quartz (1,4), barite (2,6), calcite (3), and wulframite (5).



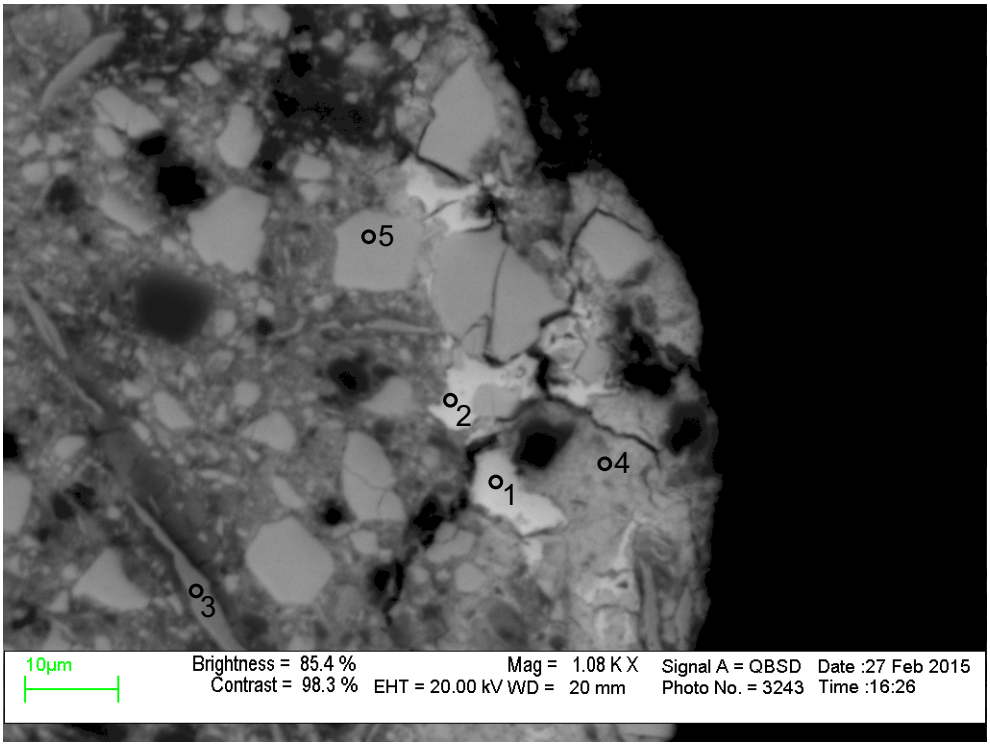
1:Barite + Fluorite + Quartz
2:Barite + Feohy
3. Feohy +
4. Barite
5. Pyrite
6:Barite
7. Feohy + Dolomite + Muscovite
8:Kaolinite + Fluorite + Feohy
9. Feohy + Apatite + Kaolinite
10. Muscovite + Kaolinite + Fluorite
11:Feohy + Quartz
12:Barite
13. Pyrolusite + Psilomelane +
14. Feohy +
15. Feohy + K-feldspar
16:Feohy +
17. Pyrite + Fluorite + Calcite
18:Calcite + Fluorite + Quartz +

Figure 4C.5: Weymouth A-45 5960m site 5. A cutting made up of kaolinite (8,9), fluorite (8), apatite (9), and Feohy (8) in which a vein of kaolinite and fluorite appears to cut Feohy and apatite.



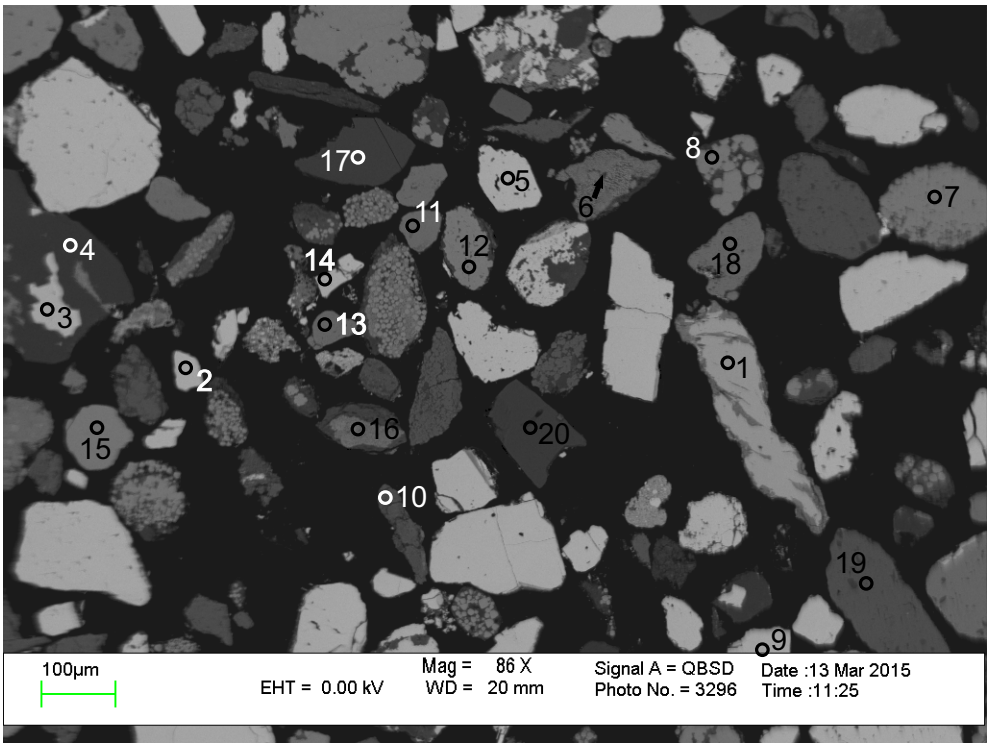
1:Barite
2:Wulframite + Feohy +
3. Fluorite + Barite + Wulframite +
4. Quartz + Fluorite + Barite + Wulframite
5. Barite
6:Zincite
7. Feohy + Dolomite
8:Feohy + Pyrite + Calcite
9. Barite + Wulframite + Fluorite + Feohy
10. Barite + Wulframite + Feohy

Figure 4C.6: Weymouth A-45 5960m site 6. Fragments of drilling mud and contaminants made up of: barite (1,3,4,9,10), wulframite (2,3,9.10), Feohy (2,3,9,10), fluorite (4,9), and quartz (4); Feohy (7,8), pyrite (8), dolomite (7), and calcite (8); and barite (5) and zincite (6).



1:Wulframite + Barite + Feohy + Calcite
2:Wulframite + Barite + Feohy + Calcite
3:Feohy + Barite + Wulframite
4:Wulframite + Barite + Feohy +
5:Barite

Figure 4C.7: Weymouth A-45 5960m site 7. A fragment of drilling mud made up of wulframite (1-4), barite (1-5), Feohy (1-4), and calcite (1,2).



1:Feohy + Pyrite +
2:Barite
3:Barite
4:Quartz
5:Barite
6:Pyrite + Kaolinite
7:Pyrite
8:Pyrite
9:Barite
10:Feohy + Dolomite + K-feldspar + Barite
11:Feohy + Quartz
12:Pyrite
13. Feohy + Quartz
14. Barite
15. Pyrite
16:Pyrite + Kaolinite
17:Quartz + Dolomite
18:Feohy + Quartz
19:Feohy + Apatite +
20:Quartz + Dolomite

Figure 4C.8: Weymouth A-45 5960m site 8. A cutting made up of barite (3) and quartz (4) in which barite appears to be diagenetic. A cutting made up of kaolinite and pyrite (16) in which pyrite appears to be partly replacing kaolinite.

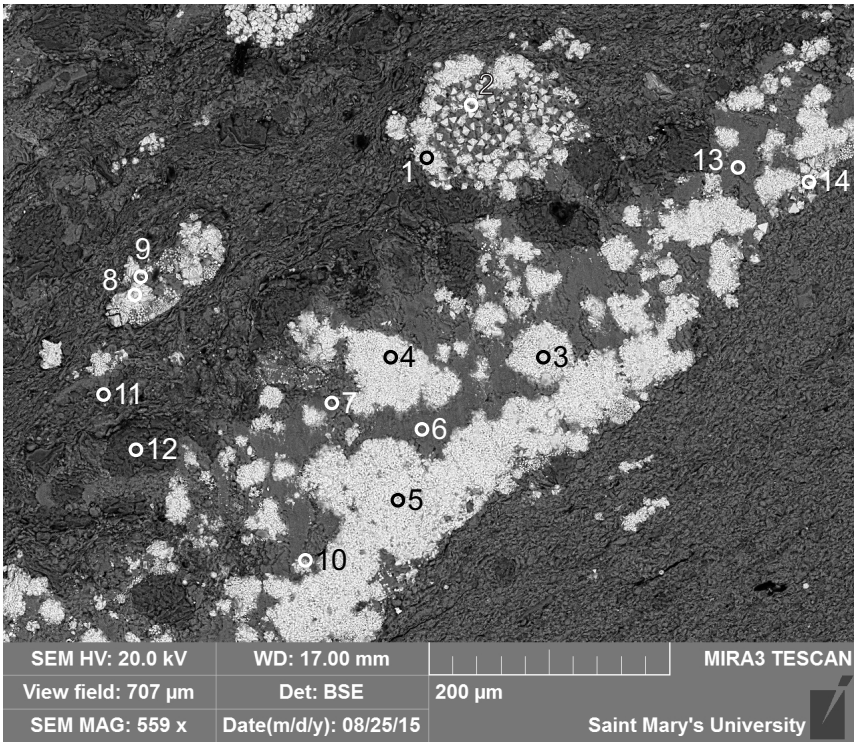
Table 4C.1 SEM-EDS chemical analyses of minerals from sample A-45 5960.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	CuO	ZnO	As_2O_3	SrO	BaO	WO_3	PbO	B_2O_3	Total	Actual Total
1	1	Wfm				1.2											3.01						95.78			100	141
1	2	Py				27.83							72.17													100	204
1	3	Py + Kln	40.67		30.18	12.95		1.16	0.77		0.37		13.88													100	106
1	4	Brt								0.31			38.43				0.17				4.07	57.05				100	100
1	5	Sd + Chl	3.53		2.19	64.05	0.62	7.84	19.53			2.22														100	53
1	6	Brt											28.47				0				0.99	47.46			23.1	100	121
1	7	Mix				75.4	0.9		5.18	1.04			1.27										16.19			100	58
1	8	Sd + Qz +	42.96		2.4	45.89		4.76	3.54		0.46															100	58
1	9	Brt											38.21				-0.04				2.02	59.82				100	85
1	10	Brt											38.53				0.06				3.74	57.69				100	89
1	11	Kfs	68.15		17.95	1.94		0.65			11.31															100	85
1	12	Sd +	19.27		10.54	55.24		8.76	5.04		1.16															100	56
1	13	Feohy +	2.59		1.13	95.7	0.58																			100	68
1	14	Mix	25.46	0.53	6.08	45.13		5.46	9.84	1.02	0.69	4.67	1.12													100	70
1	15	Mix	3.83		2.29	72.17		8.59	8.98			4.15														100	60
1	16	Sd + Chl	5.88		4.35	70.58		10.25	8.94																	100	54
2	1	Wfm				1.26											1.62						97.12			100	116
2	2	Wfm				1.11											3.27						95.62			100	115
2	3	Feohy +	1.41			96.58	0.87		1.15																	100	56
2	4	Wfm + Feohy				68.6	0.88		3.83						0.6								26.09			100	50
2	5	Mix				54.15	1.28		2.38				3.55		0.52							2.75	35.37			100	52
2	6	Qz +	93.5			0.22			0.2	0.4				1.86									3.82			100	143
2	7	Py				27.85							72.14													100	163
2	8	Mix	47.28	0.97	23.41	7.53		1.64	13.26	0.65	2.2			3.08												100	63
2	9	Wfm +				1.7			8.31				1.77	3.62								2.09	82.52			100	76
2	10	Ms +	54.72	1.52	24.13	4.34		1.74	0.73	1.38	2.93			2.96									5.57			100	71
2	11	Wfm				1.11			7.85	0.65				2.67									87.73			100	72
3	1	Brt											37.68				0				1.51	60.81				100	76
3	2	Qz + Brt + Wfm + Kfs	80.05		3.25	2.06		0.48	0.64		0.93		1.67									3.47	7.48			100	71
3	3	Feohy + Brt	0.88			93.81	0.59						1.17			1.37						2.17				100	81
3	4	Feohy +	1.71		0.94	95.42	0.45		0.34							1.15										100	87
3	5	Feohy + Ap + Dol + Kln	2.4		2.36	75.8		8.87	8.87			1.72														100	40
3	6	Feohy + Kln + Dol	17.13		14.23	51.81		7.05	9.78																	100	50
3	7	Ms + Fl	49.57	0.32	34.33	3.62		1.14	0.56	4.57	3.57			2.35												100	76
3	8	Feohy + Qz	2.35			95.93	0.76		0.95																	100	44
4	1	Qz	99.99																							100	76
4	2	Brt											37.51				-0.09					62.59				100	72
4	3	Cal + Feohy +	5.71	1.25	16.42	24.92	0.87	3.55	47.31																	100	61
4	4	Qz	99.99																							100	74
4	5	Qz + Kfs + Wfm	68.54		17.46	3.29		1.39	1.33	0.71	2.72												4.54			100	49
4	6	Brt	5.73		3.8	1.3			0.71				34.81									53.67				100	57
4	7	Feohy + Ap + Dol + Qz	6.33		2.99	69.16		10.61	9.42			1.49														100	35
4	8	Feohy +				82.85	7.49	8.26	1.4																	100	36
4	9	Feohy + Ap +	5.11		3.04	65.95		9.35	10.58		0.4	5.59														100	37
4	10	Py				28.15							71.87													100	132
5	1	Brt + Fl + Qz	5.58		0.91	14.95			6.97				21.52	7.03								32.86	10.18			100	109
5	2	Brt + Feohy			0.74	3.74			2.08				25.17									37.32	30.93			100	111
5	3	Feohy +	1.56			89.44	1.37		3.37							4.27										100	146
5	4	Brt											38.35				-0.04				1.48	60.21				100	233
5	5	Py				27.8							72.19													100	414
5	6	Brt											38.16				-0.06					61.92				100	242
5	7	Feohy + Dol + Ms	9.95		5.93	68.13		8.62	5.41		0.89	1.05														100	147
5	8	Kln + Fl + Feohy	48.8		38.09	3.51			2.15	0.93				5.63									0.9			100	248
5	9	Feohy + Ap + Kln	5.6		3.33	67.66		7.56	10.51	0.78		4.56														100	157
5	10	Ms + Kln + Fl	49.95	0.28	25.23	5.66		2.37	6.53	0.44	2.99		2.25	4.32												100	297
5	11	Feohy + Qz	4.17			93.22	1.06		0.92									0.63								100	223

Table 4C.1 SEM-EDS chemical analyses of minerals from sample A-45 5960.

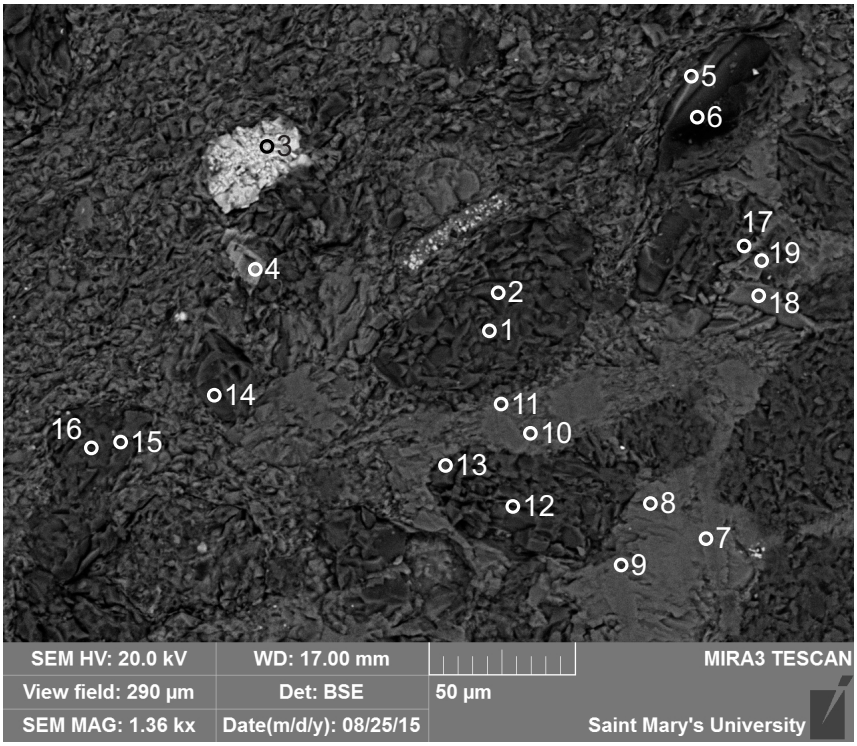
Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CoO	CuO	ZnO	As_2O_3	SrO	BaO	WO_3	PbO	B_2O_3	Total	Actual Total
5	12	Brt											28.49				-0.08				1.36	47.71			22.55	100	388
5	13	Pyro + Psi +			1.87		62.01		0.74									3.22				3.41	3.22	25.52		100	205
5	14	Feohy +	5.8	0.47	1.08	68.25	16.93	2.06	1.93									3.49								100	204
5	15	Feohy + Kfs	5.97		1.85	91.83					0.35															100	217
5	16	Feohy +	0.66			96.41	1.16									1.75										100	345
5	17	Py + Fl + Cal				23.68			11.47				60.7	4.16												100	431
5	18	Cal + Fl + Qz +	24.17		13.53	6.81		1.77	39.47	0.54	0.95		0.67	12.07												100	217
6	1	Brt				0.33							28.24				-0.01				1.21	47.69			22.55	100	389
6	2	Wfm + Feohy +				8.1			5.3	0.82			1.07									2.17	82.51			100	288
6	3	Fl + Brt + Wfm +	0.94		0.3	2.65			33.64				4.82	44.5								8.31	4.87			100	403
6	4	Qz + Fl + Brt + Wfm	76.69		1.44	3.81			1.15		0.31		4.54	1.21								7.38	3.47			100	324
6	5	Brt											37.81				-0.01				1.34	60.87				100	310
6	6	Znc				0.58			2.27										97.17							100	148
6	7	Feohy + Dol				95.48	0.45	2.26	1.11				0.7													100	212
6	8	Feohy + Py + Cal				96.2	0.87		1.89				1.05													100	166
6	9	Brt + Wfm + Fl + Feohy	4		1.25	19.75			5.95	0.65	0.29		20.33	5.37								30.34	12.11			100	284
6	10	Brt + Wfm + Feohy			0.93	8.93	0.44		3.18	0.74			15.23									23.71	46.85			100	285
7	1	Wfm + Brt + Feohy + Cal				8.22	0.43		5.32	0.86			1.72	2.5								2.69	78.26			100	310
7	2	Wfm + Brt + Feohy + Cal				7.68			4.25	1.01			5.04									6.88	75.12			100	330
7	3	Feohy + Brt + Wfm	0.98			90.47	0.44		0.45				1.85			1.04						3.24	1.54			100	330
7	4	Wfm + Brt + Feohy +			1.38	6.64			2.69	0.73			17.88									26.68	44.01			100	299
7	5	Brt	0.81			0.51							37.41				0.03				2.47	58.78				100	318
8	1	Feohy + Py +	0.53			90.23	3.98						3.72			1.53										100	391
8	2	Brt											25.72				-0.01					44.67			29.63	100	420
8	3	Brt											27.49				-0.03				3.54	42.99			26.03	100	396
8	4	Qz	99.99																							100	313
8	5	Brt											24.7				-0.04					43.25			32.11	100	477
8	6	Py + Kln	11.79		11.07	23.27		0.58					53.29													100	488
8	7	Py				27.69							72.32													100	670
8	8	Py				27.79							72.22													100	646
8	9	Brt											38.01				0.04				2.21	59.76				100	325
8	10	Feohy + Dol + Kfs + Brt	14.31		7.07	60.35	0.45	8.52	5.85	0.74	0.67		0.77									1.25				100	177
8	11	Feohy + Qz	2.46			95.21			0.66											1.65						100	204
8	12	Py				27.89							72.12													100	602
8	13	Feohy + Qz	8.94			90.13	0.44		0.49																	100	205
8	14	Brt											37.86				-0.08				1.36	60.87				100	310
8	15	Py	0.34			27.58							72.07													100	547
8	16	Py + Kln	5.16		4.52	28.88		0.99	0.24				60.2													100	473
8	17	Qz + Dol	60.86			2.69		24.36	12.09																	100	322
8	18	Feohy + Qz	5.95			94.07																				100	223
8	19	Feohy + Ap +	1.75		1.25	69.2	0.43	8.32	13.01			6.03														100	182
8	20	Qz + Dol	59.83		0.77	0.58		25.12	11.92					1.76												100	335

Appendix 4D: SEM-BSE images and EDS mineral analyses for sample A-45 6182.5



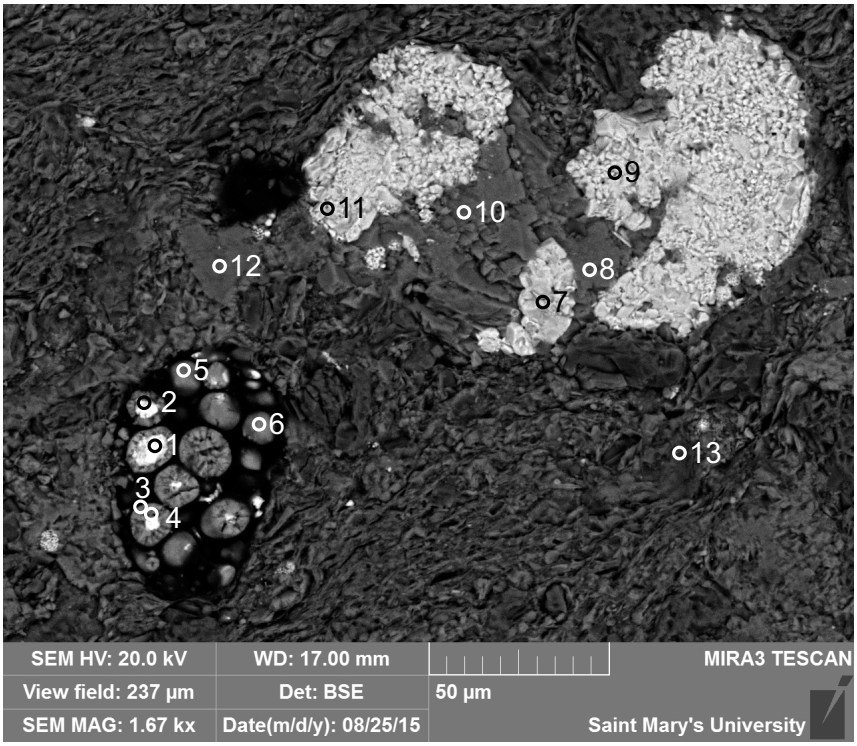
1: Pyrite
2: Pyrite
3: Pyrite
4: Pyrite
5: Pyrite
6: Fe-Calcite
7: Fe-Calcite
8: Pyrite
9: Calcite +
10: Pyrite
11: Albite
12: Quartz
13: Fe-Calcite
14: Pyrite

Figure 4D.1: Sample Weymouth 6182.5m site 1 (SEM). (Table 4D.1). A vein and clots of Fe-calcite (6,7,9,13) and pyrite (1-5,10,14) in a clay rich matrix.



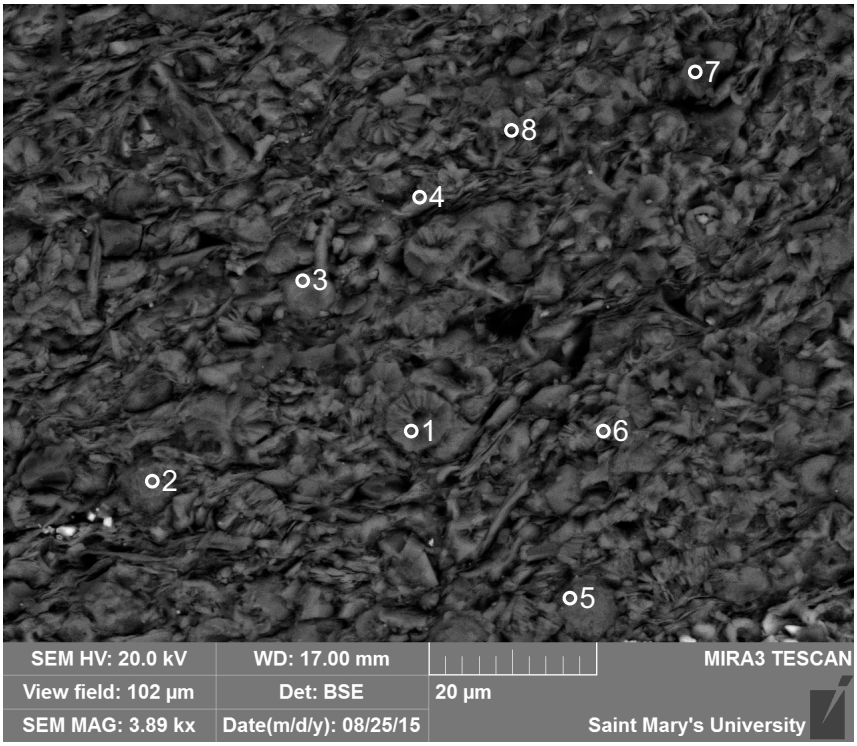
1: Quartz
2: Quartz
3: Pyrite
4: TiO2
5: Quartz +
6: Quartz
7: Fe-Calcite
8: Fe-Calcite
9: Fe-Calcite
10: Fe-Calcite
11: Quartz
12: Quartz
13: Quartz
14: Quartz
15: Quartz
16: Quartz
17: Calcite + Clay
18: Fe-Calcite
19: Ankerite + Clay

Figure 4D.2: Sample Weymouth 6182.5m site 2 (SEM). (Table 4D.1). Grains of quartz (1,2,5,6,11-16) and TiO_2 (4) surrounded bu diagenetic Fe-calcite (7-10,18), calcite (17), clay (17,19), and ankerite (19).



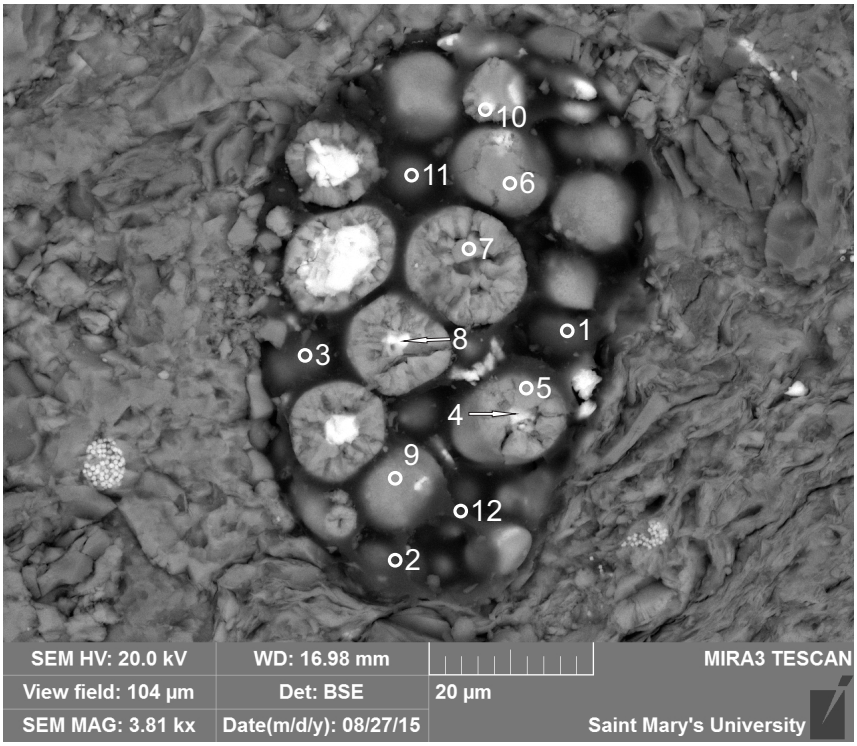
1: Sphalerite + Pyrite
2: Sphalerite + Pyrite
3: Apatite
4: Sphalerite + Pyrite
5: Apatite
6: Apatite + Pyrite
7: Pyrite
8: Fe-Calcite
9: Pyrite
10: Fe-Calcite
11: Pyrite
12: Calcite
13: Quartz

Figure 4D.3: Sample Weymouth 6182.5m site 3 (SEM). (Table 4D.1). A phosphate nodule made up of spahlerite (1,2,4), pyrite (1,2,4,6), and apatite (3,5,6).



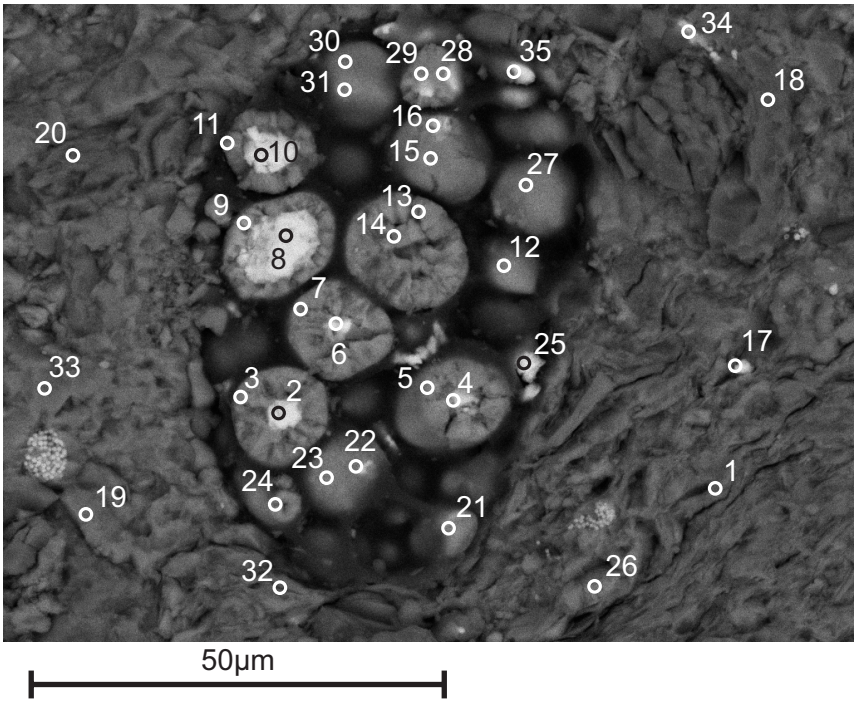
1: Calcite +
2: Calcite +
3: Calcite + Chlorite
4: Calcite + Clay
5: Calcite + Clay
6: Mix
7: Quartz +
8: Albite + Calcite

Figure 4D.4: Sample Weymouth 6182.5m site 4 (SEM). (Table 4D.1). Grains of calcite (1-5,8) cement in a clay matrix made up of chlorite (3) and clays (4,5). Calcite (1) appears to have formed a nodule.



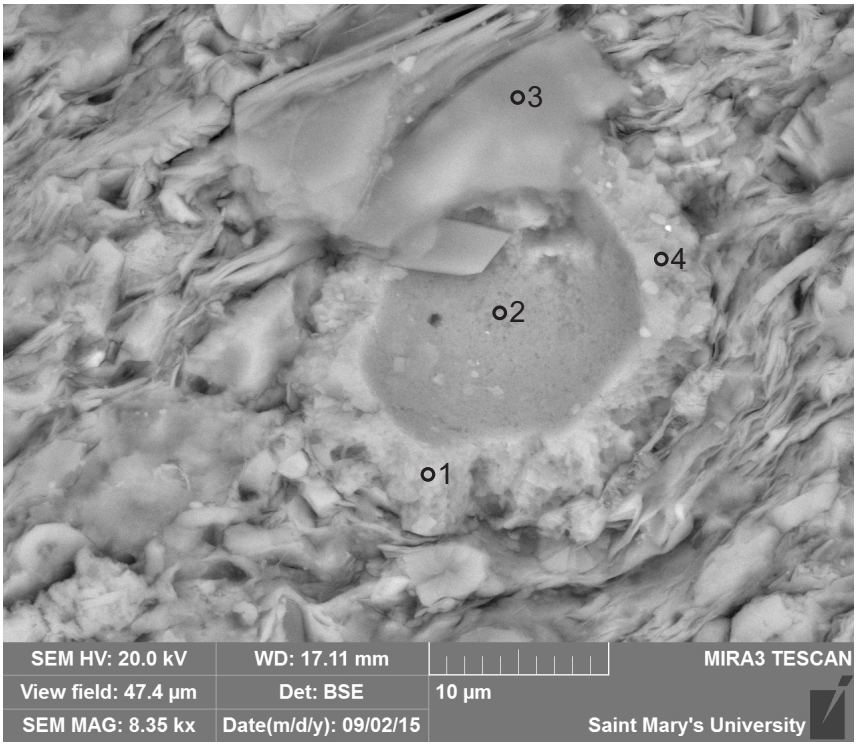
1: Apatite
2: Apatite +
3: Apatite
4: Sphalerite + Apatite
5: Apatite + Sphalerite
6: Apatite
7: Apatite
8: Sphalerite + Apatite
9: Apatite
10: Apatite + Sphalerite
11: Apatite + Pyrite
12: Apatite +

Figure 4D.5: Sample Weymouth 6182.5m site 5 (SEM). (Table 4D.1). Nodules show sphalerite cores (4,8) and apatite rims (1-3,5-7,9-12).



1: Quartz + Kaolinite +
2: Sphalerite +
3: Apatite
4: Sphalerite + Apatite
5: Apatite
6: Sphalerite + Apatite
7: Apatite
8: Sphalerite +
9: Apatite + Sphalerite
10: Sphalerite +
11: Apatite + Sphalerite
12: Apatite + Pyrite
13: Apatite
14: Apatite
15: Apatite
16: Sphalerite + Apatite
17: Zircon +
18: Quartz
19: Calcite + Quartz +
20: Quartz
21: Apatite + Sphalerite
22: Sphalerite + Apatite
23: Apatite
24: Apatite + Pyrite
25: Sphalerite +
26: Calcite + Kaolinite +
27: Apatite + Pyrite
28: Sphalerite + Apatite
29: Apatite + Sphalerite
30: Apatite
31: Apatite
32: Kaolinite + Quartz +
33: Calcite +
34: Pyrite + Quartz
35: Sphalerite +

Figure 4D.6: Sample Weymouth 6182.5m site 1 (SEM). (Table 4D.2). Similar to Fig. 4D.5. Nodules show cores made up of sphalerite (2,4,6,8,10,16,22,25,28,35) and rims made up of apatite (3,5,7,9,11-15,21,23,24,27,29-31).



1: Calcite + Chlorite +
2: Calcite +
3: Kaolinite + Calcite +
4: Calcite + Chlorite +

Figure 4D.7: Sample Weymouth 6182.5m site 2 (SEM). (Table 4D.2). A calcite nodule (1,2,4).

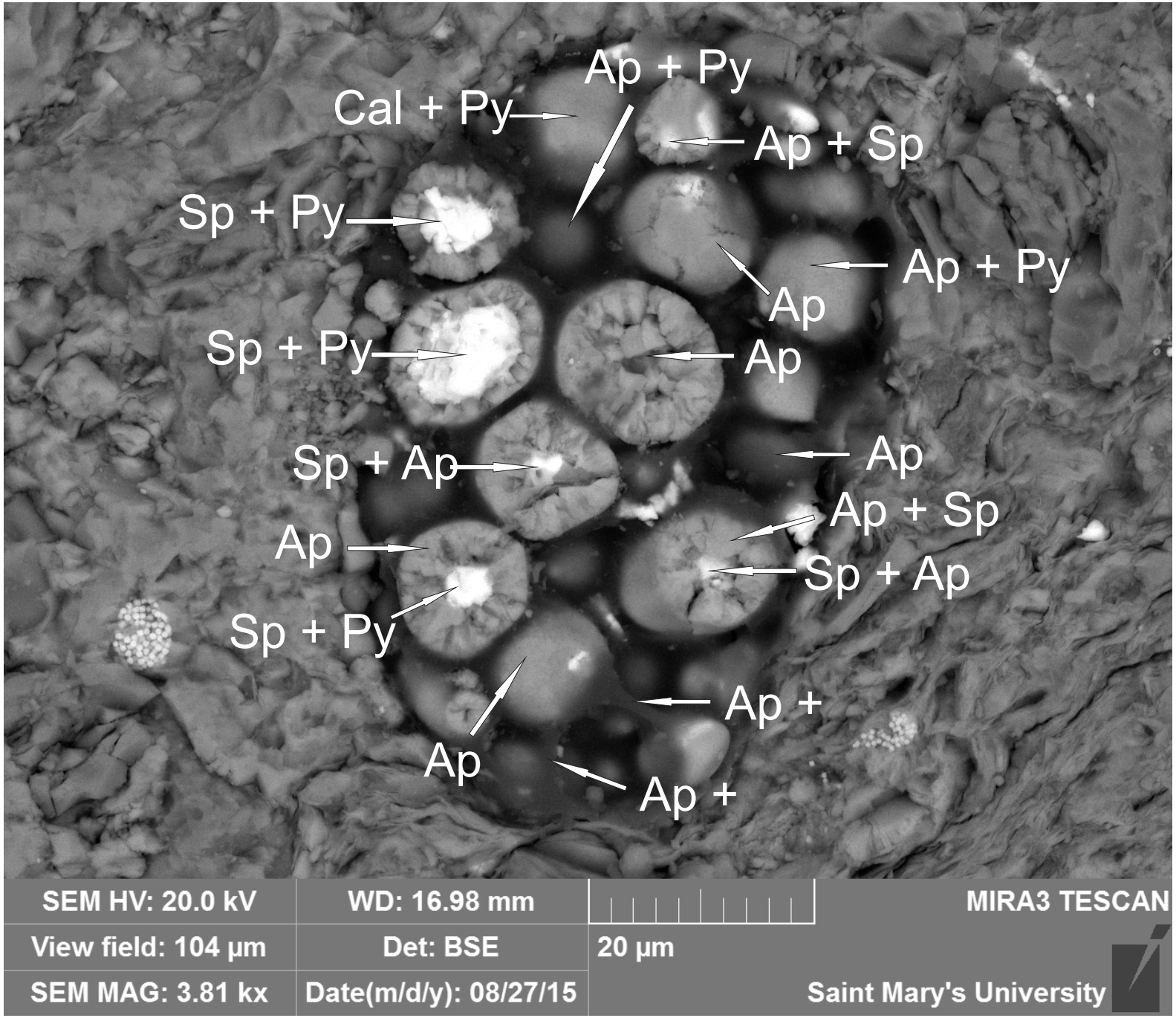


Figure 4D.8: Enlarged BSE image of figure 5.

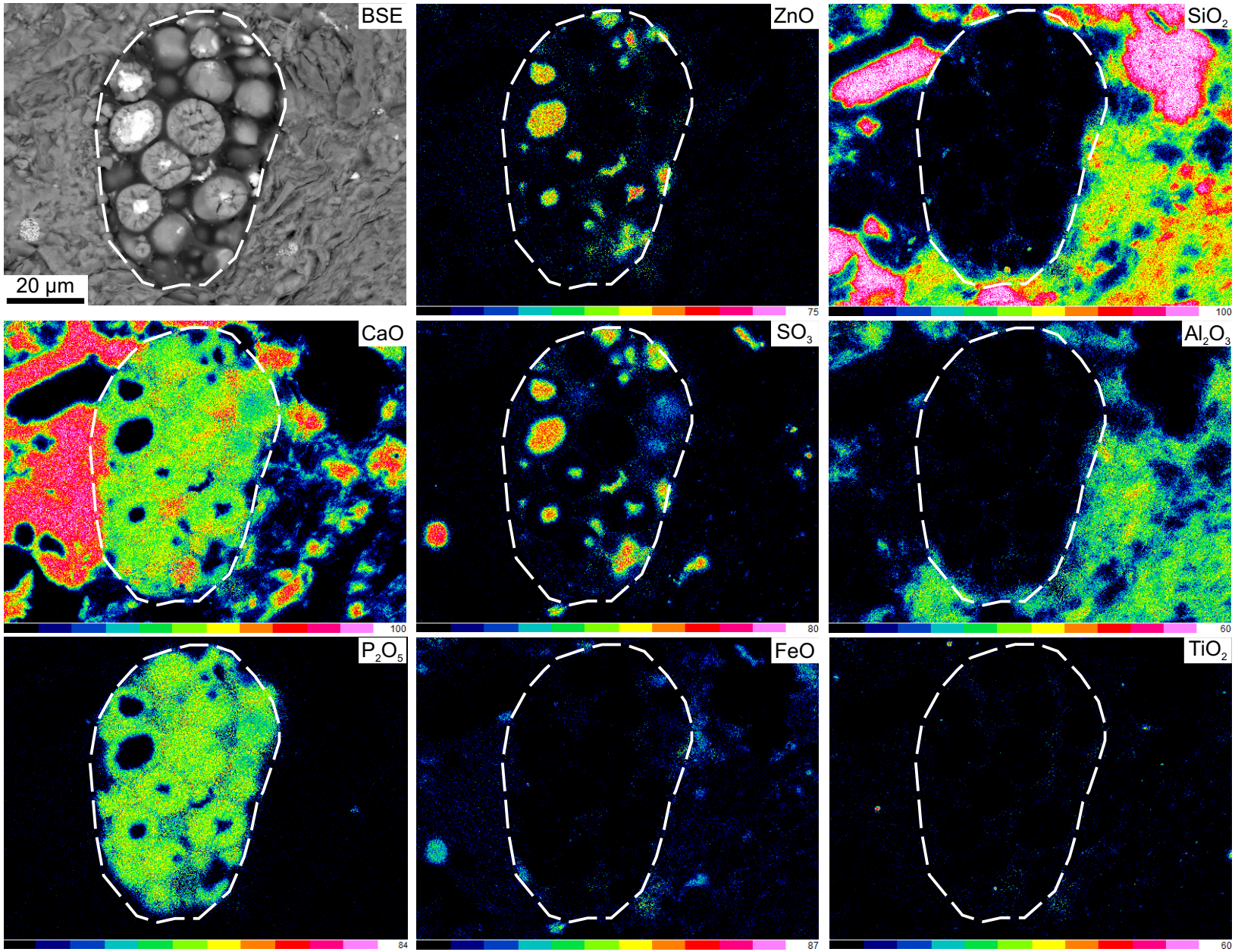


Figure 4D.9: X-ray compositional weight % oxide maps of a nodule found from Weymouth A-45 6182.5m. Maps translate actual chemical analyses acquired by SEM-EDS analyses. Scale for each map has been normalized to the maximum percentage weight obtained.

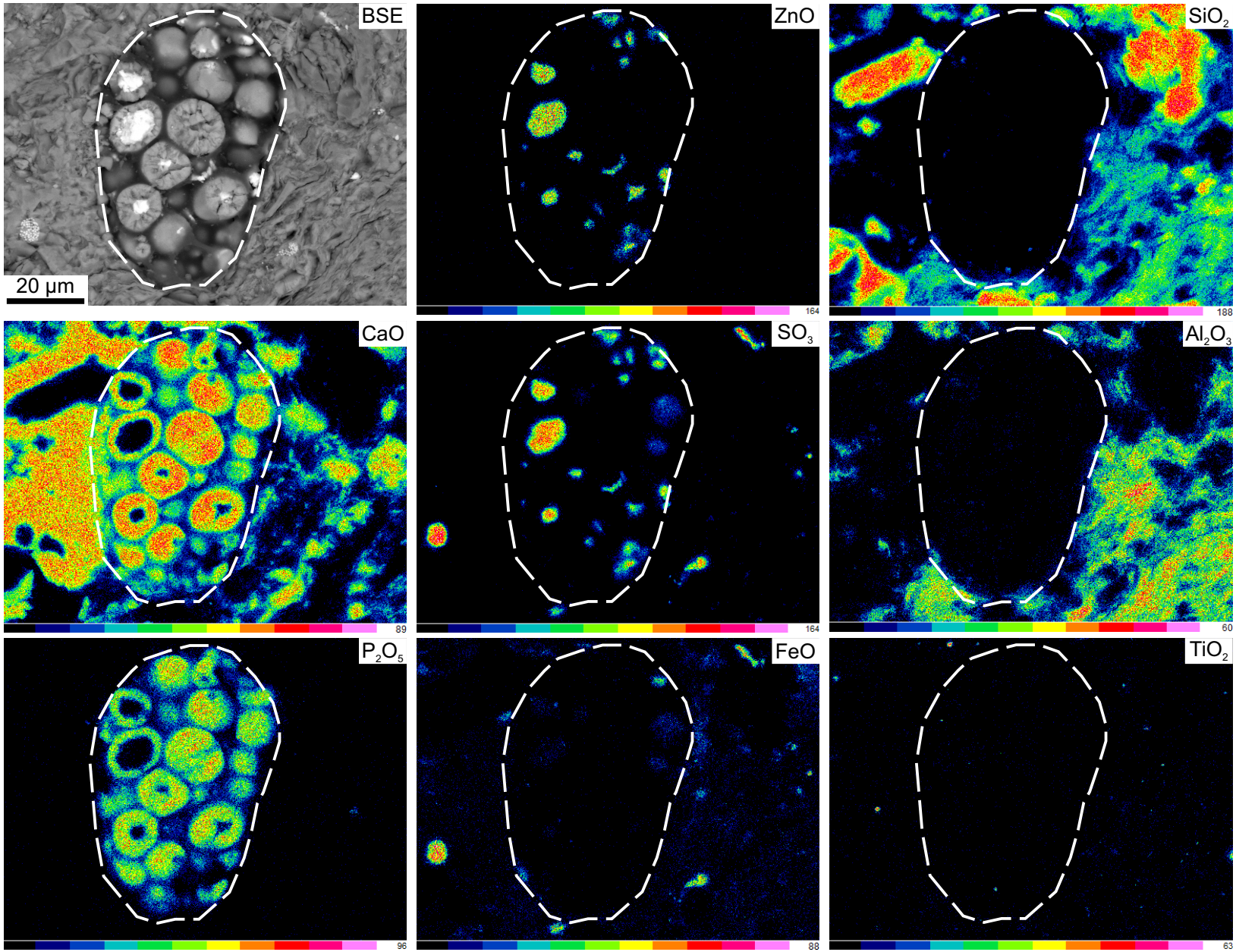


Figure 4D.10: X-ray compositional weight % oxide maps of a nodule found from Weymouth A-45 6182.5m. Maps translate chemical analyses acquired by SEM-EDS analyses recalculated to 100 weight %. Scale for each map has been normalized to the maximum percentage weight obtained.

Table 4D.1 SEM-EDS chemical analyses of minerals from sample A-45 6182.5.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	CuO	ZnO	WO_3	Total	Actual Total
1	1	Py	0.47		0.30	26.69			0.21	0.53			71.82						100	168
1	2	Py	0.26			26.86	0.39		4.42	0.55			67.52						100	159
1	3	Py				29.05				0.85			70.12						100	167
1	4	Py	0.53			29.25				0.47			69.74						100	165
1	5	Py				27.56				0.57			71.89						100	178
1	6	Fe-Cal				3.75		1.54	48.64				2.07						56	45
1	7	Fe-Cal				2.79		0.60	51.40				1.20						56	45
1	8	Py	0.53			25.72	0.59		0.17	0.35			72.64						100	174
1	9	Cal +			5.54	11.48	0.49	1.34	49.69		0.51		22.32						100	67
1	10	Py	0.34			27.25			2.85	1.63			67.92						100	150
1	11	Ab	65.42		19.93	0.37			1.30	12.71	0.25								100	120
1	12	Qz	99.77						0.21										100	99
1	13	Fe-Cal				2.61		0.57	52.82										56	44
1	14	Py	0.24			25.86			0.67				73.24						100	180
2	1	Qz	99.99																100	97
2	2	Qz	99.79						0.20										100	106
2	3	Py	0.36			27.96			0.38	0.75			70.54						100	171
2	4	TiO_2	2.52	95.41	1.10				0.99										100	87
2	5	Qz +	88.39	1.77	1.19	2.30			3.47		1.32		1.57						100	18
2	6	Qz	97.95		0.45				1.39		0.20								100	107
2	7	Fe-Cal	0.62			1.85		0.43	53.10										56	44
2	8	Fe-Cal	0.50			2.32		0.55	52.63										56	45
2	9	Fe-Cal	0.66			2.45		0.75	52.14										56	46
2	10	Fe-Cal	0.90			1.10		1.33	51.61	0.50			0.56						56	46
2	11	Qz	1.30					1.91	94.11	0.90			1.77						100	47
2	12	Qz	99.73						0.25										100	102
2	13	Qz	99.49						0.50										100	99
2	14	Qz	99.77						0.24										100	100
2	15	Qz	98.87		0.60				0.50										100	61
2	16	Qz	99.77						0.22										100	89
2	17	Cal + Clay	9.46		2.46	4.28		1.58	82.22										100	48
2	18	Fe-Cal	0.88			2.17		0.55	52.40										56	45
2	19	Ank + Clay	9.58		2.46	21.39	0.62	21.47	44.45										100	54

Table 4D.1 SEM-EDS chemical analyses of minerals from sample A-45 6182.5.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	CuO	ZnO	WO_3	Total	Actual Total
3	1	Sp + Py	0.30			1.88			0.56				53.99			1.43	41.89		100	155
3	2	Sp + Py	1.05		0.45	2.11			0.81				54.26				41.32		100	150
3	3	Ap	0.81		0.43	0.35			47.35	0.84		41.34	0.95	7.68	0.27				100	94
3	4	Sp + Py	0.51			1.87			1.68			1.26	54.51			0.95	39.21		100	154
3	5	Ap							46.30	0.47		41.45		11.77					100	100
3	6	Ap + Py				4.16			37.32			33.82	14.41	9.10				1.21	100	112
3	7	Py	0.34			26.08	0.54		0.29	0.30			72.44						100	188
3	8	Fe-Cal	0.71			2.31		0.50	50.49	0.52			1.47						56	47
3	9	Py	0.26			26.06	0.22		0.24	1.04			72.19						100	190
3	10	Fe-Cal				2.55		0.60	52.85										56	45
3	11	Py	0.66		0.36	27.20			0.36	0.54			70.87						100	178
3	12	Cal						1.31	54.69										56	45
3	13	Qz	97.35		1.27	0.39		0.28	0.70										100	74
4	1	Cal +	1.88		0.93	0.69	0.38	1.73	49.65				0.74						56	46
4	2	Cal +	1.15		0.62	0.75		2.20	50.15		0.17		0.96						56	46
4	3	Cal + Chl	3.44		1.89	0.99		5.07	86.09		0.28		2.22						100	48
4	4	Cal + Clay	20.71		10.39	1.35		3.50	61.06		1.29		1.70						100	58
4	5	Cal + Clay	2.20			1.66	0.87	4.63	88.30		0.23		2.12						100	47
4	6	Mix	23.27		11.07	4.89		1.72	57.12		1.92								100	54
4	7	Qz +	92.31		2.25	0.66		0.38	3.04		0.41		0.72		0.22				100	85
4	8	Ab + Cal	48.30		13.55	0.60		0.56	28.31	7.58	0.40		0.70						100	66
5	1	Ap							48.03			42.99	3.40	4.63			0.97		100.02	78
5	2	Ap +	2.63		0.85				46.34	0.70		42.05	1.72	5.46	0.26				100.01	61
5	3	Ap	0.88						52.75	0.54		42.99	0.85	2.02					100.03	69
5	4	Sp + Ap	0.47			1.65			5.07			5.18	38.88	0.73		0.70	47.36		100.04	139
5	5	Ap + Sp							45.19	0.67		39.60	3.80	8.84			1.89		99.99	104
5	6	Ap				0.37			49.66			41.06	0.70	7.16				1.05	100	100
5	7	Ap	0.96		0.60				43.77	0.84		41.11	1.02	11.71					100.01	110
5	8	Sp + Ap	0.68			0.45			5.58			5.57	42.70				45.03		100.01	154
5	9	Ap							48.05	0.46		41.50	0.55	9.45					100.01	104
5	10	Ap + Sp	0.53						41.21			34.28	10.29	4.58			9.10		99.99	95
5	11	Ap + Py				4.52			49.91			34.21	11.36						100	61
5	12	Ap +	8.73		2.70				39.81			25.32	18.00				5.44		100	14

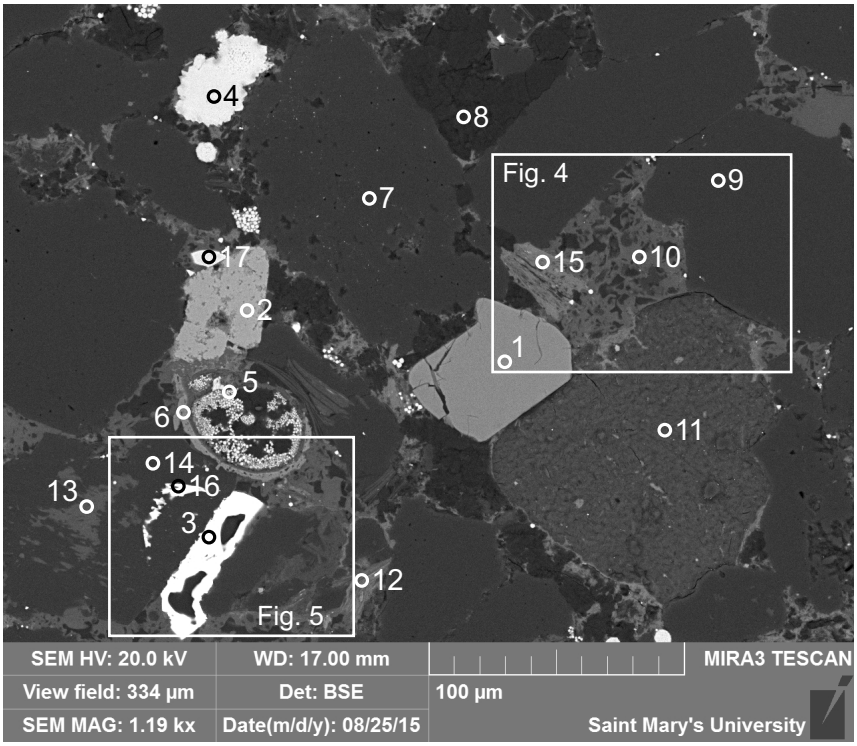
Table 4D.2 SEM-EDS chemical analyses of minerals from sample A-45 6182.5.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	CuO	ZnO	ZrO_2	WO_3	Total	Actual Total
1	1	Qz+Kln+	76.78		14.49	2.21	1.21	1.67	0.57	3.07								100	97
1	2	Sp+	0.47			1.78		1.92			1.1	50.87		0.99	42.91			100	192
1	3	Ap	0.66					47.42	0.93		41.04	0.7	8.12				1.15	100	118
1	4	Sp+Ap	0.51			1.94		4.86			5.04	38.35		1.43	47.88			100	157
1	5	Ap	0.64					46.64	0.49		40.76	2	8.6		0.88			100	119
1	6	Sp+Ap	0.56			0.48		6.93			7.17	42.82	1.59		40.48			100	190
1	7	Ap	0.71			0.3		48.36	0.43		40.44	0.8	8.41		0.56			100	115
1	8	Sp+	1.3			1.57	0.66	0.6				51.59		1.08	43.22			100	189
1	9	Ap+Sp	0.92			0.53		24.98			22.34	26.24	3.16		21.85			100	146
1	10	Sp+	0.62			1.89		0.76				52.29			44.46			100	191
1	11	Ap+Sp	2.14		0.59	0.54		40.53			36.34	6.27	11.24		2.35			100	120
1	12	Ap+Py	0.71			6		34.1	0.44		29.72	18.78	10.27					100	142
1	13	Ap	0.9		0.3			45.75	0.44		40.7	0.57	10.08				1.24	100	123
1	14	Ap	0.88		0.32			44.83	0.61		41.66	0.87	10.82					100	129
1	15	Ap	0.43					48.12	0.36		40.81	0.67	8.49				1.1	100	120
1	16	Sp+Ap	0.88			0.6		10.49			10.29	37.63	1.25		38.87			100	178
1	17	Zrn+	38.42		5.35	0.77	0.68	4.45		0.78						49.56		100	118
1	18	Qz	98.7		0.53	0.32		0.43										100	118
1	19	Cal+Qz+	8.9			3.27	0.99	86.85										100	61
1	20	Qz	98.92			0.26		0.81										100	128
1	21	Ap+Sp	1.24		0.43			32.57			31.23	15.66	10.45		8.44			100	136
1	22	Sp+Ap	1.05		0.3	0.46		11.81			11.55	34.73	1.53		38.58			100	166
1	23	Ap						47.7	0.46		41.5	0.5	8.7				1.16	100	121
1	24	Ap+Py	1.52			2.53		45.4	0.46		36.92	5.77	7.39					100	116
1	25	Sp+	4.04		2.29	1.31		4.09		0.26		40.93			47.11			100	141
1	26	Cal+Kln+	17.24		7.58	1.36	3.55	66.45	0.78	1.17		1.87						100	70
1	27	Ap+Py	0.56		0.26	6.18		34.07	0.39		29.49	19.83	9.21					100	145
1	28	Sp+Ap	1.82		0.43	0.86		1.8			1.4	40.1			53.58			100	141
1	29	Ap+Sp	0.81			0.36		32.85			30.54	17.4	5.69		12.34			100	132
1	30	Ap				0.32		45.82	0.55		40.47	0.75	12.08					100	124
1	31	Ap	1.5		0.51			48.9	0.39		40.93		7.77					100	110

Table 4D.2 SEM-EDS chemical analyses of minerals from sample A-45 6182.5.

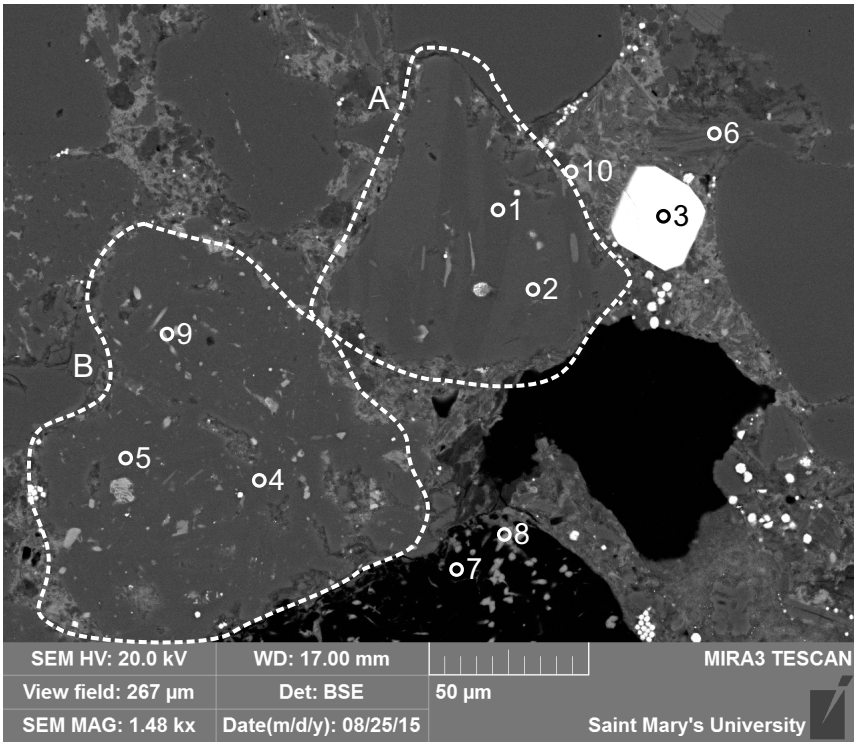
Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	CuO	ZnO	ZrO_2	WO_3	Total	Actual Total
1	32	Kln+Qz+	52.71	0.68	30.82	1.89	1.28	6.67		2.1	1.19	2.65						100	105
1	33	Cal+	2.97			3.92	1.21	91.9										100	58
1	34	Py+Qz	31.66			20.3		0.92				47.12						100	185
1	35	Sp+	4.3		1.1	0.96		2.27			0.53	45.67			45.18			100	163
2	1	Cal+Chl+	7.81		3.02	1.04	3.08	82.87				2.17						100	59
2	2	Cal +	1.41		0.79		1.56	94.91				1.35						100	46
2	3	Kln+Cal+	42.7	1.13	27	3.59	2.17	16.54	1.31	5.56								100	98
2	4	Cal+Chl+	7.19		3.51	1.52	2.74	82.16		0.73		2.15						100	61

Appendix 4E: SEM-BSE images and EDS mineral analyses for sample A-45 6213.5



1: Spinel
2: TiO_2
3: Sphalerite
4: Pyrite
5: Pyrite +
6: Siderite +
7: Quartz
8: Kaolinite
9: Quartz
10: Calcite + Chlorite
11: Muscovite + Chlorite
12: Muscovite + Chlorite
13: Calcite + Albite
14: Albite
15: Chlorite
16: Sphalerite
17: Pyrite

Figure 4E.1: Sample Weymouth 6213.5m site 1 (SEM). A coated grain made up of three layers: a) siderite(6); b) calcite + chlorite (see Fig. 5); and c) pyrite (5).



1: Albite
2: Oligoclase
3: Zircon
4: Albite
5: Albite + Quartz
6: Muscovite
7: Hole
8: Chlorite
9: Apatite + Albite
10: Chlorite

Figure 4E.2: Sample Weymouth 6213.5m site 2 (SEM). Trachytic lithic clasts (A,B) made up of: albite (1) and oligoclase (2); and quartz (5) and albite (4). Albite (9) has either inclusions of apatite (9) or has dissolution voids filled with diagenetic apatite.

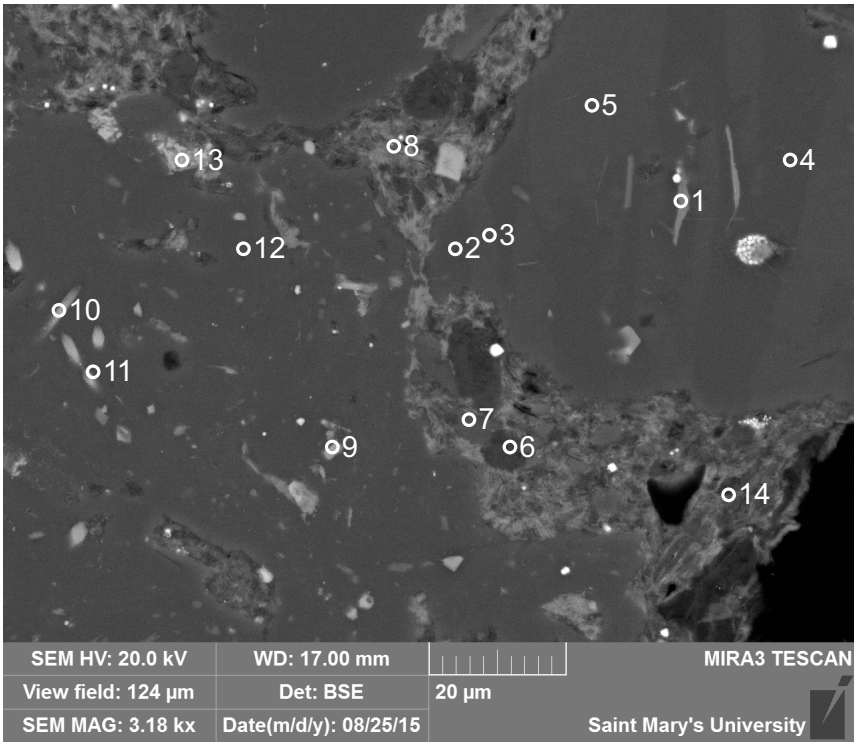


Figure 4E.3: Sample Weymouth 6213.5m site 3 (SEM). Albite (1-5,9-12) shows dissolution voids filled with chlorite (1) and apatite (9-11).

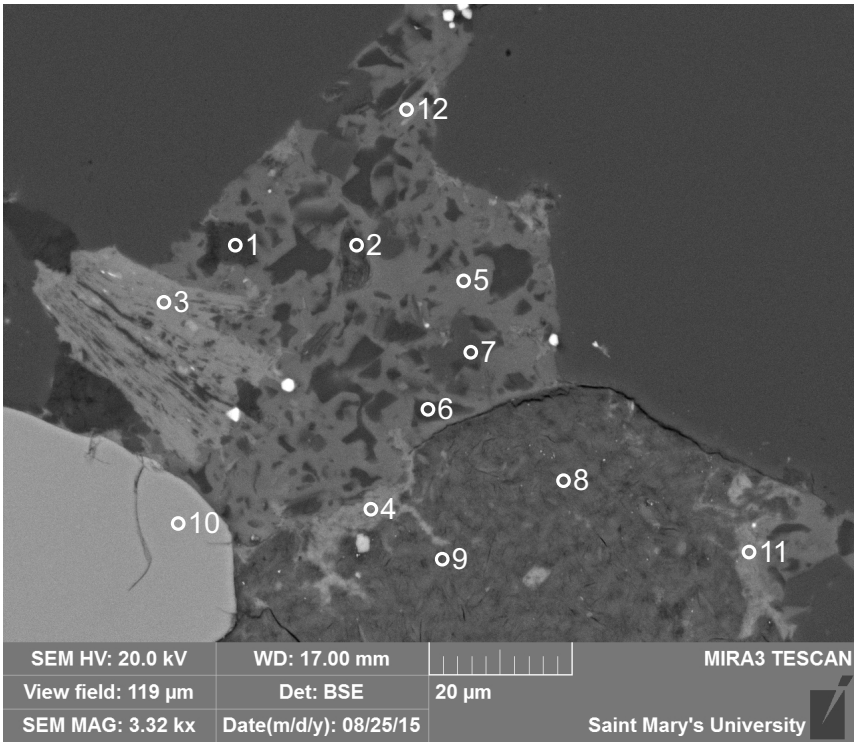
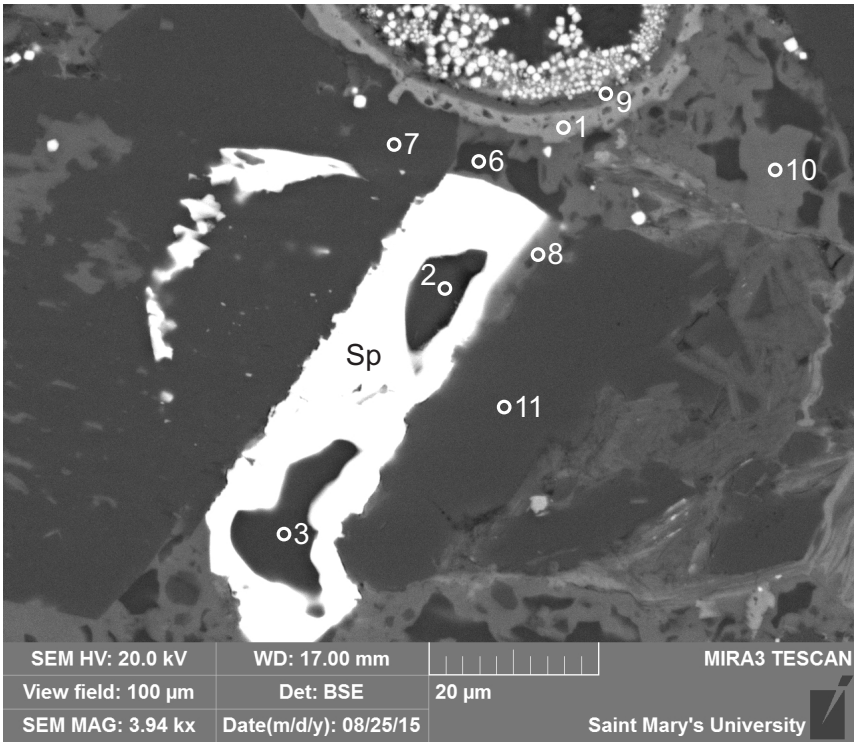
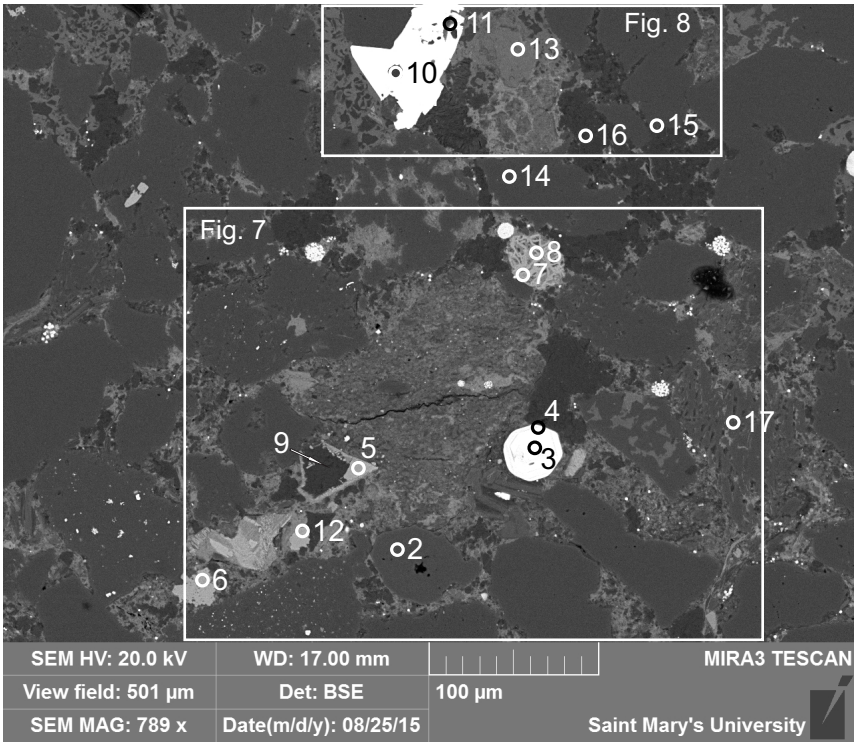


Figure 4E.4: Sample Weymouth 6213.5m site 4 (SEM). A lithic clast made up of chlorite (3,4) grains, and probably albite grain(s) (6) replaced by calcite and chlorite (5) and kaolinite (1). Close to a detrital spinel grain (10) and a large grain of muscovite (analysis 11 from Fig. 1) now replaced by illite (8,9) and chlorite (11) that may be part of the lithic clast.



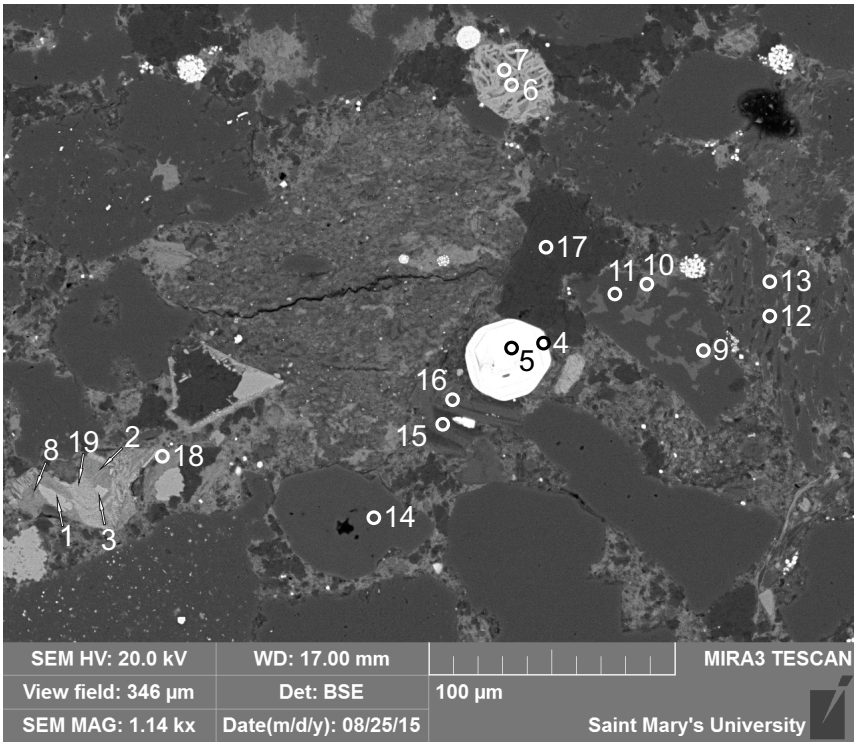
1: Siderite
2: Albite
3: Albite
4: Sphalerite
5: Sphalerite
6: Albite
7: Albite
8: Mix
9: Calcite + Siderite + Chlorite + P
10: Calcite + Chlorite
11: Quartz

Figure 4E.5: Sample Weymouth 6213.5m site 5 (SEM). Sphalerite grain (see Fig. 1) is pseudomorphing albite (2,3).



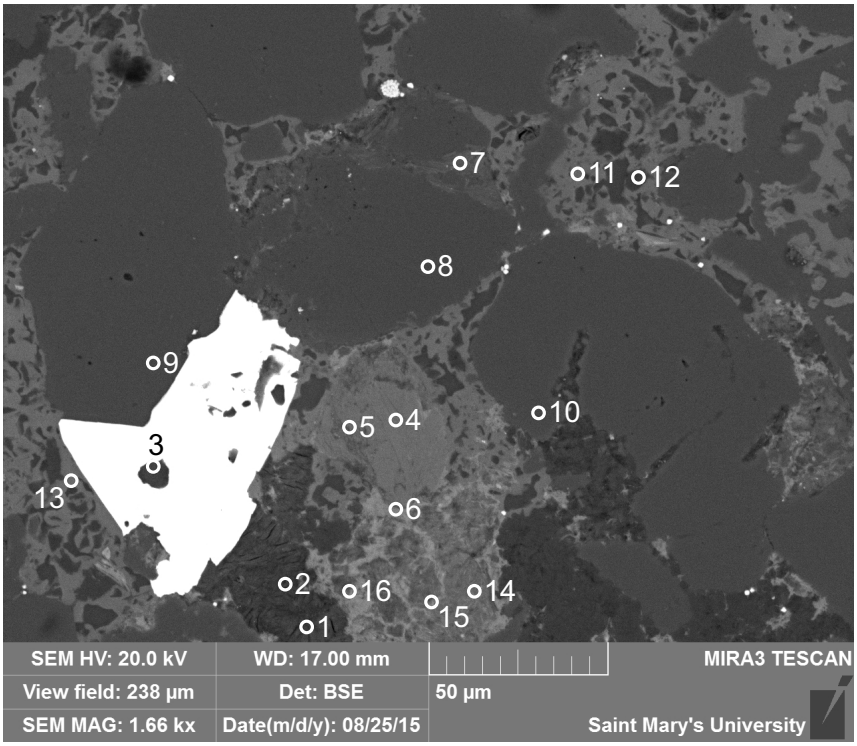
1: Sphalerite
2: Kaolinite +
3: Zircon
4: Zircon
5: TiO_2
6: TiO_2
7: "Ilmenite"
8: "Ilmenite"
9: Kaolinite
10: Kaolinite
11: Chlorite + Sphalerite + Pyrite
12: TiO_2
13: Chlorite
14: Quartz
15: Quartz
16: Kaolinite
17: Albite

Figure 4E.6: Sample Weymouth 6213.5m site 6 (SEM). Sphalerite grain (11) with kaolinite patch (Fig. 8) and straight crystal outlines.



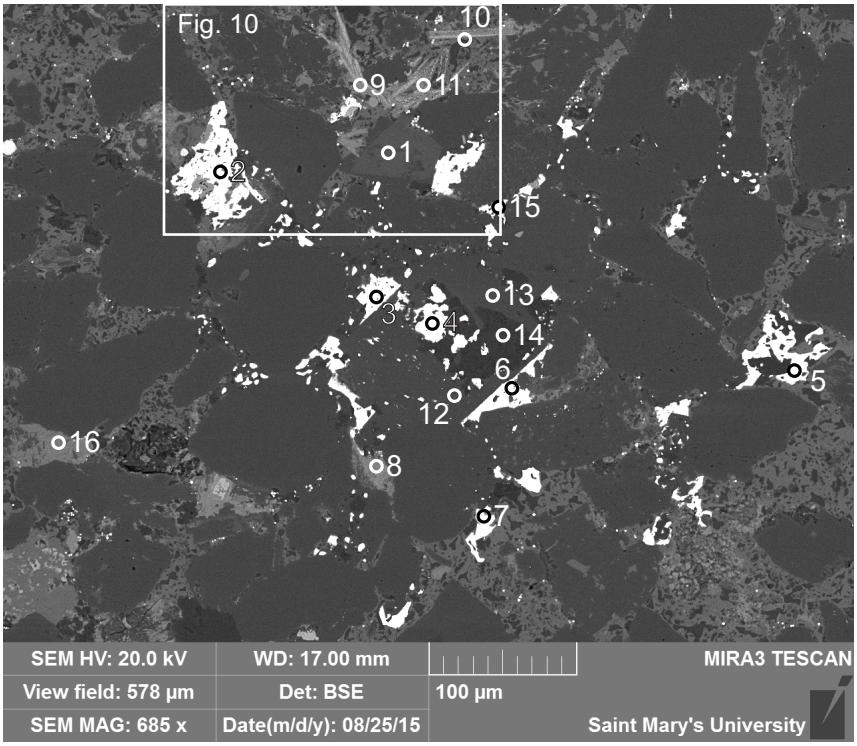
1: TiO_2
2: Mix
3: "Ilmenite"
4: Zircon
5: Zircon
6: TiO_2 ("Ilmenite") +
7: TiO_2 ("Ilmenite") +
8: Chlorite + Ilmenite
9: Calcite +
10: Mix
11: Albite
12: Albite
13: Albite
14: Kaolinite +
15: Muscovite
16: Muscovite
17: Kaolinite
18: Chlorite
19: TiO_2 ("Ilmenite")

Figure 4E.7: Sample Weymouth 6213.5m site 7 (SEM). Detrital grains of zircon (4,5), ilmenite (6,7), albite (11-13), muscovite (15,16). Ilmenite is altering to TiO_2. Kaolinite (14,17) and chlorite (18) patches.



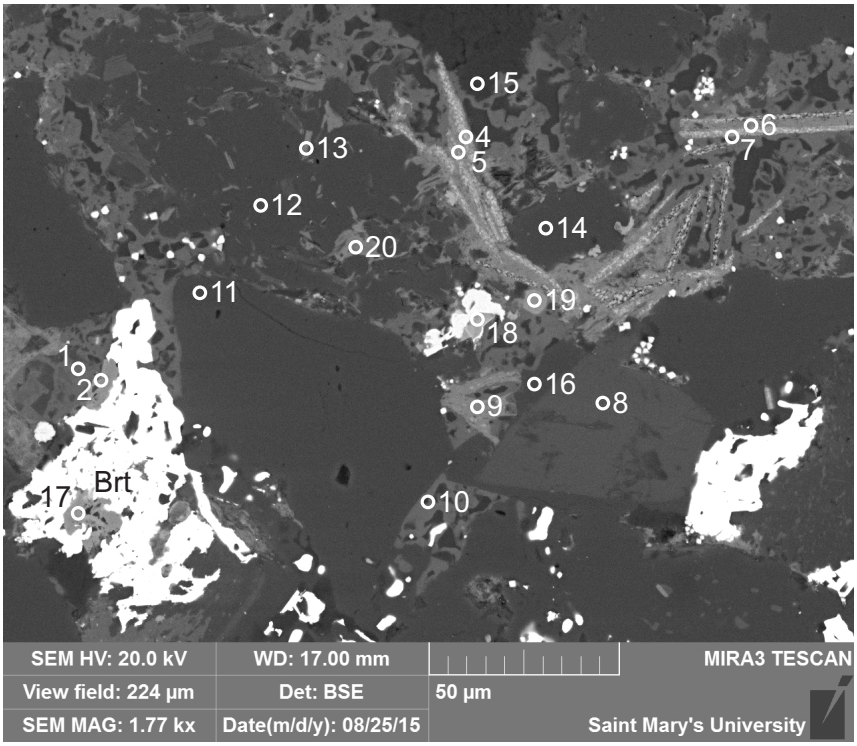
1: Kaolinite
2: Kaolinite
3: Kaolinite
4: Chlorite
5: Chlorite
6: Chlorite
7: Muscovite
8: Quartz
9: Quartz
10: Quartz
11: Albite + Calcite
12: Kaolinite
13: Albite +
14: Chlorite
15: Chlorite
16: Chlorite

Figure 4E.8: Sample Weymouth 6213.5m site 8 (SEM). Albite (11) partly replaced by calcite and kaolinite (12). Several chlorite (4-6,14-16) and kaolinite (1,2) patches.



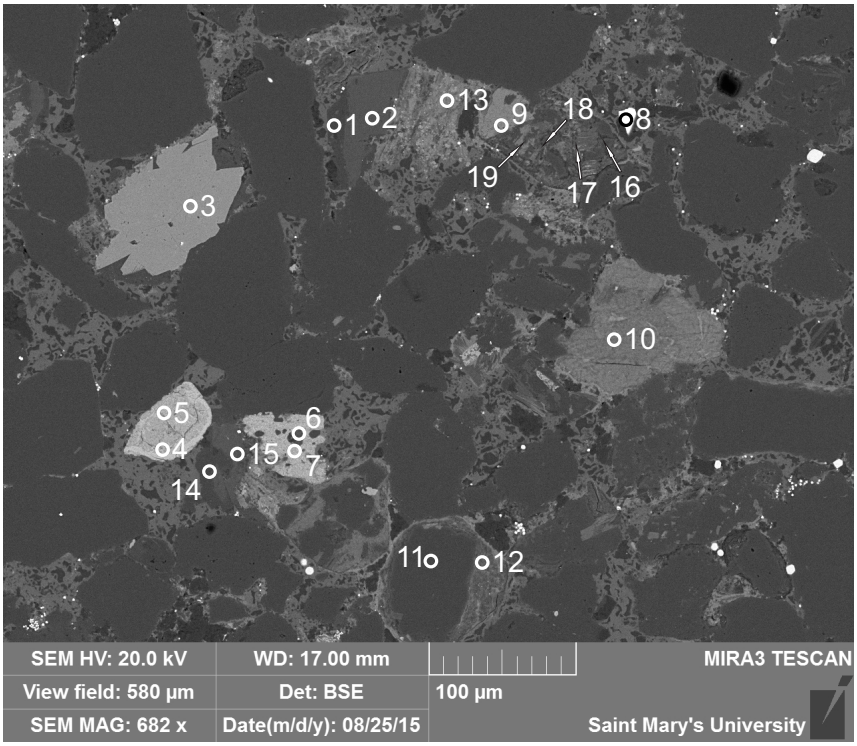
1: Kaolinite + Albite
2: Barite + Kaolinite +
3: Barite + Kaolinite +
4: Barite +
5: Barite +
6: Barite +
7: Barite +
8: Chlorite + TiO_2
9: Chlorite + TiO_2
10: Chlorite + TiO_2 +
11: Chlorite
12: Albite
13: Albite
14: Kaolinite
15: Barite
16: Chlorite

Figure 4E.9: Sample Weymouth 6213.5m site 9 (SEM). Barite appears to be associated with diagenetic kaolinite (2) and often follows grain boundaries (5,7,15), therefore it is considered as diagenetic.



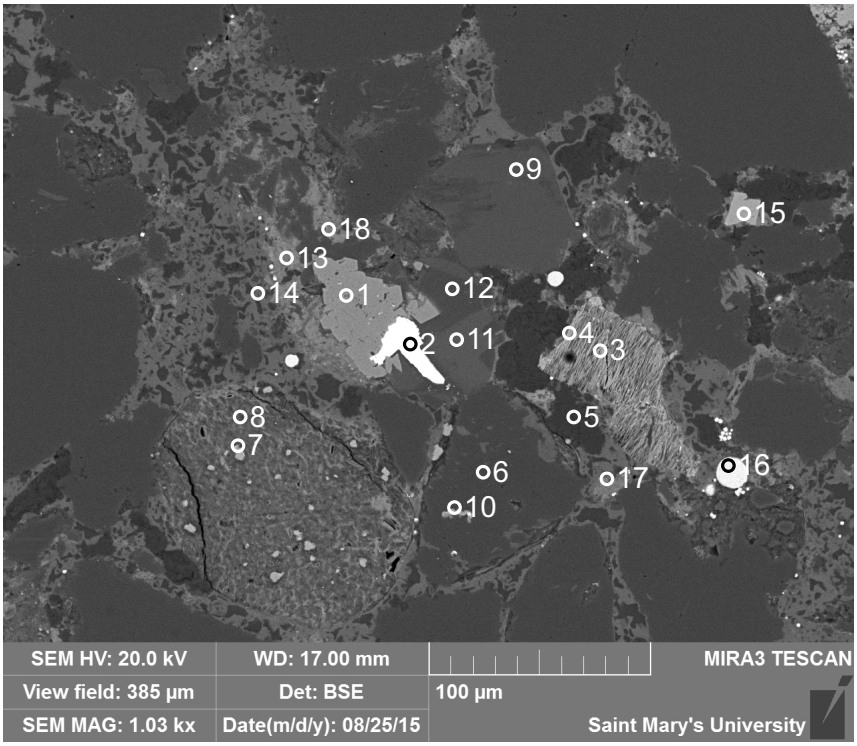
1: Calcite
2: Siderite
3: Barite
4: Mix
5: TiO_2 + Chlorite +
6: TiO_2 + Chlorite
7: Calcite + TiO_2 + Chlorite
8: Albite
9: Chlorite
10: Calcite + Albite
11: Quartz
12: Quartz
13: Quartz + Chlorite
14: Quartz
15: Kaolinite
16: Albite
17: Siderite +
18: TiO_2 + Pyrite +
19: Apatite
20: Chlorite

Figure 4E.10: Sample Weymouth 6213.5m site 10 (SEM). Similar to Fig. 9, diagenetic barite associated with calcite and siderite (12,17).



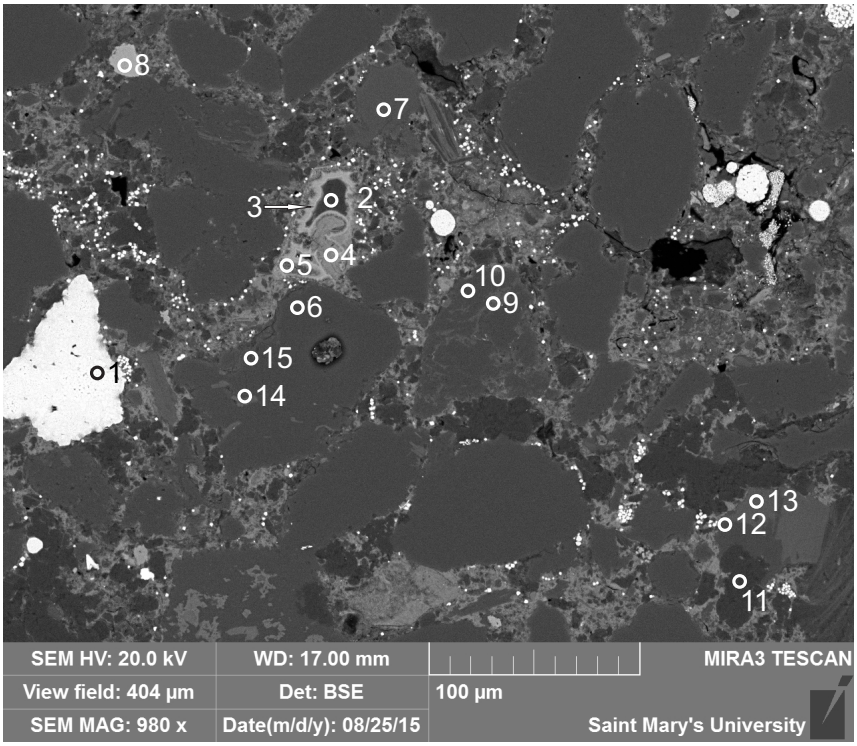
1: Albite
2: Andesine
3: Siderite
4: "Ilmenite" +
5: "Ilmenite" + Chlorite
6: Muscovite
7: "Ilmenite"
8: Sphalerite
9: Chlorite
10: Chlorite
11: Quartz
12: Muscovite +
13: Chlorite
14: Albite
15: Oligoclase
16: Albite
17: Muscovite
18: Albite + Siderite
19: Albite

Figure 4E.11: Sample Weymouth 6213.5m site 11 (SEM). Lithic clast made up of quartz (11) and muscovite (12).



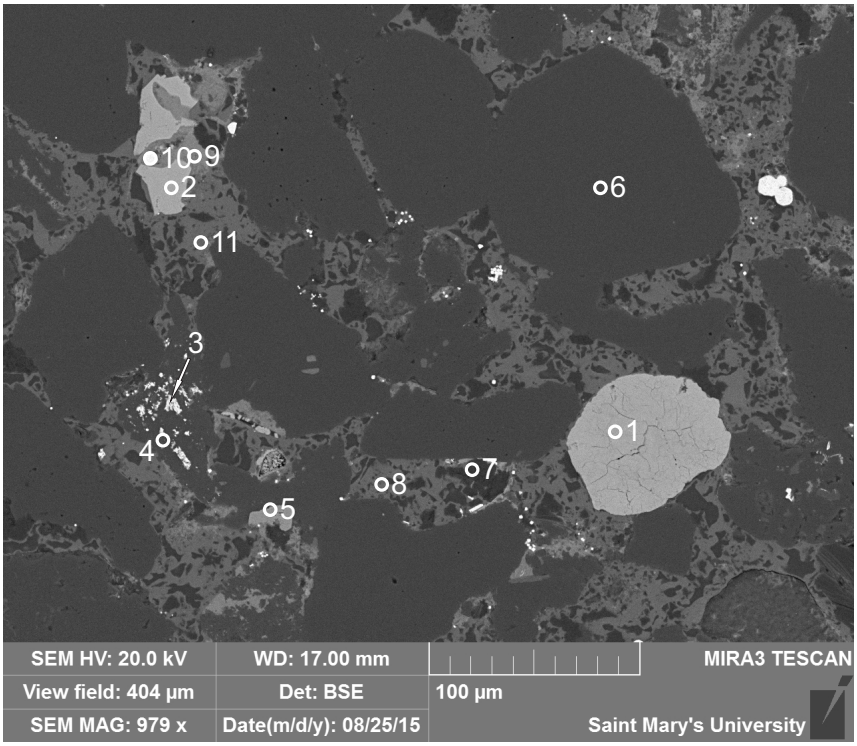
1: Siderite +
2: Sphalerite
3: TiO_2
4: TiO_2 +
5: Kaolinite
6: Quartz
7: TiO_2
8: Muscovite + Chlorite
9: Oligoclase
10: Siderite + Quartz
11: Albite + Kaolinite
12: Albite
13: Chlorite
14: Calcite + Muscovite
15: TiO_2 +
16: Pyrite
17: Chlorite
18: Chlorite

Figure 4E.12: Sample Weymouth 6213.5m site 12 (SEM). ? lithic clast made up of TiO_2 (3,4) and quartz or just detrital TiO_2.



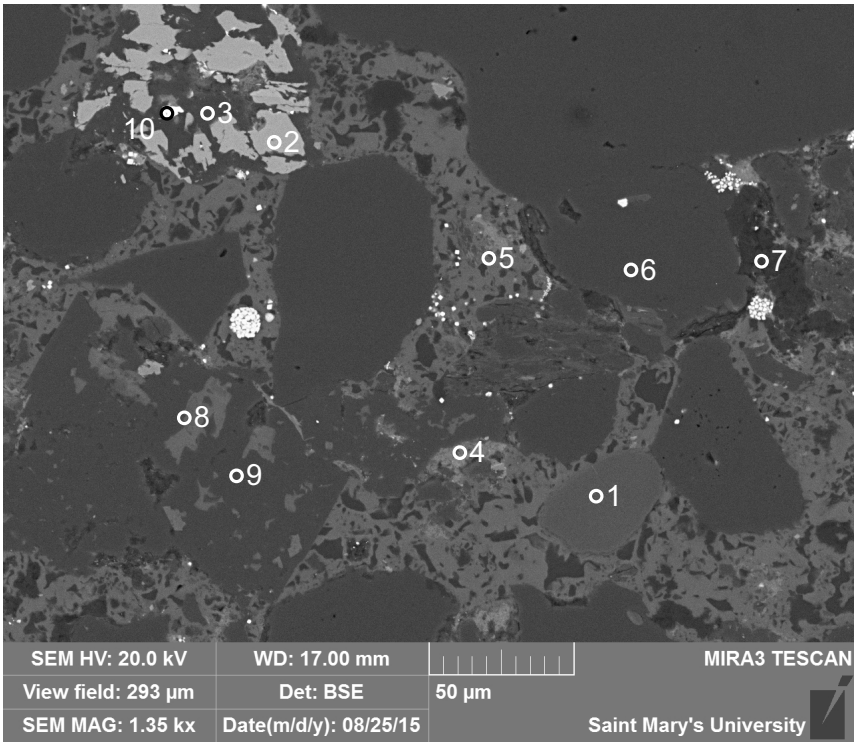
1: Pyrite
2: Kaolinite
3: TiO_2+
4: Chlorite + TiO_2
5: TiO_2 +
6: Quartz
7: Oligoclase
8: TiO_2
9: Muscovite
10: Quartz
11: Kaolinite
12: Albite
13: Andesine
14: Muscovite
15: Quartz

Figure 4E.13: Sample Weymouth 6213.5m site 13 (SEM). Diagenetic TiO2 (3) riming a pore filled with kaolinite (2). Probable lithic clasts made up of quartz and muscovite (9-10,14,15).



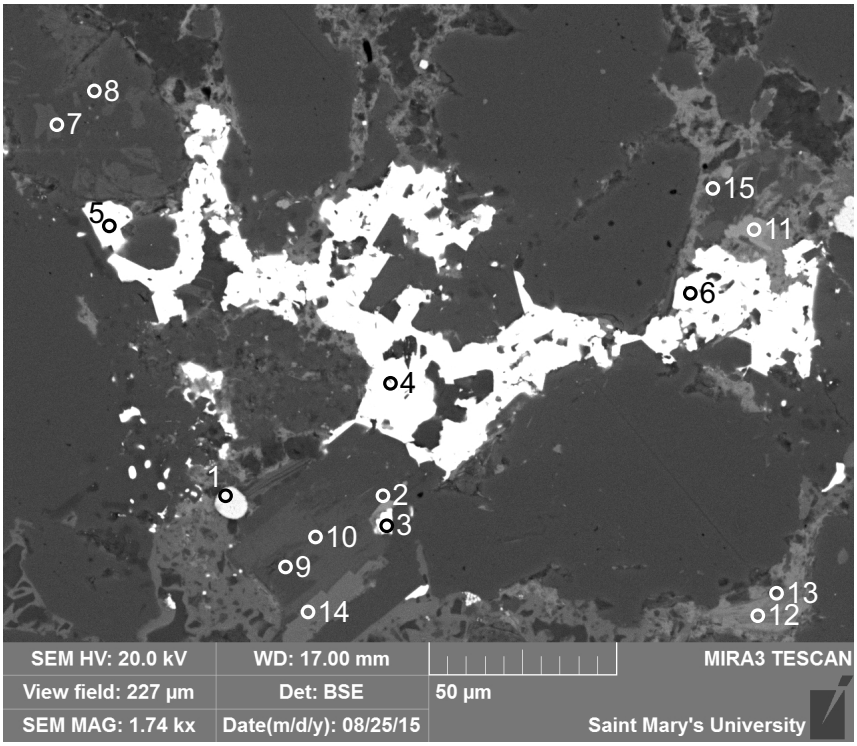
1: TiO_2 +
2: TiO_2
3: Pyrite + Albite
4: Albite
5: Siderite +
6: Quartz
7: Kaolinite
8: Calcite +
9: Chlorite +
10: Pyrite +
11: Calcite +

Figure 4E.14: Sample Weymouth 6213.5m site 14 (SEM). Detrital TiO2 (1,2) associated with chlorite (9) and quartz (low intensity areas in spot 1).



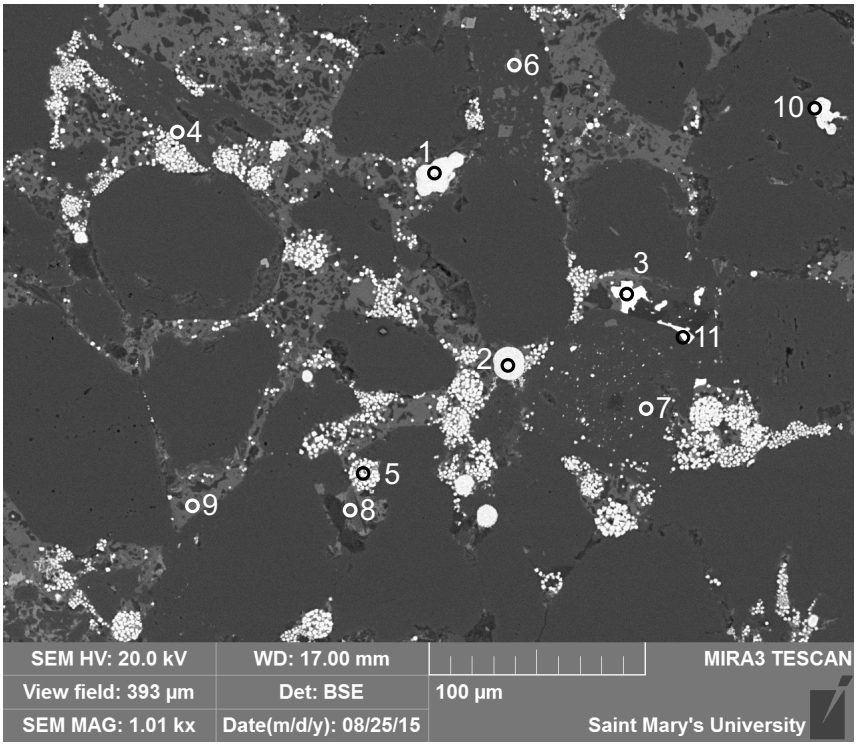
1: Albite + Kaolinite
+
2: TiO_2
3: Quartz
4: Albite + Chlorite
5: Calcite +
6: Quartz
7: Kaolinite
8: K-feldspar +
Calcite
9: Albite
10: Xenotime +

Figure 4E.15: Sample Weymouth 6213.5m site 15 (SEM). Lithic clast made up of TiO_2 (2) and quartz (3) with xenotime (3) either as inclusions or diagenetic filling voids.



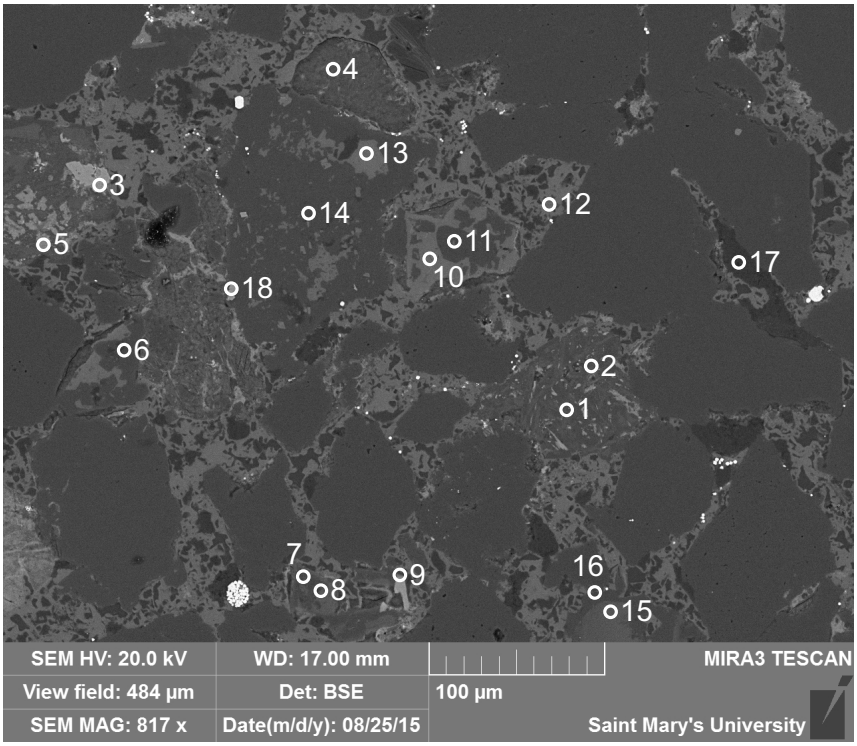
1: Pyrite
2: Apatite + Albite
3: Barite + B
4: Barite + B
5: Barite + B
6: Barite + B
7: Muscovite
8: Albite
9: Albite
10: Andesine
11: Apatite
12: Chlorite +
Apatite
13: Chlorite +
14: Calcite +
15: Oligoclase

Figure 4E.16: Sample Weymouth 6213.5m site 16 (SEM). Barite (3-6) appears to be diagenetic.



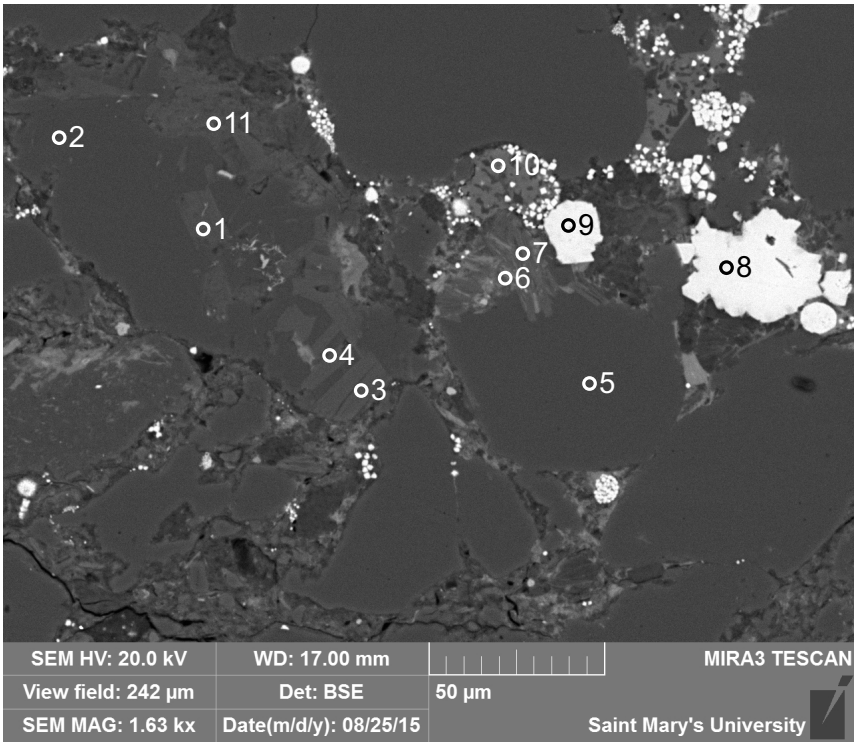
1: Pyrite
2: Pyrite
3: Barite +
4: Albite
5: Pyrite +
6: Muscovite + Chlorite
7: Albite
8: Muscovite
9: Calcite +
10: Pyrite +
11: Barite

Figure 4E.17: Sample Weymouth 6213.5m site 17 (SEM). Abundant pyrite framboids, detrital albite (7) and muscovite (8) and diagenetic barite precipitating along grain boundaries (3,11).



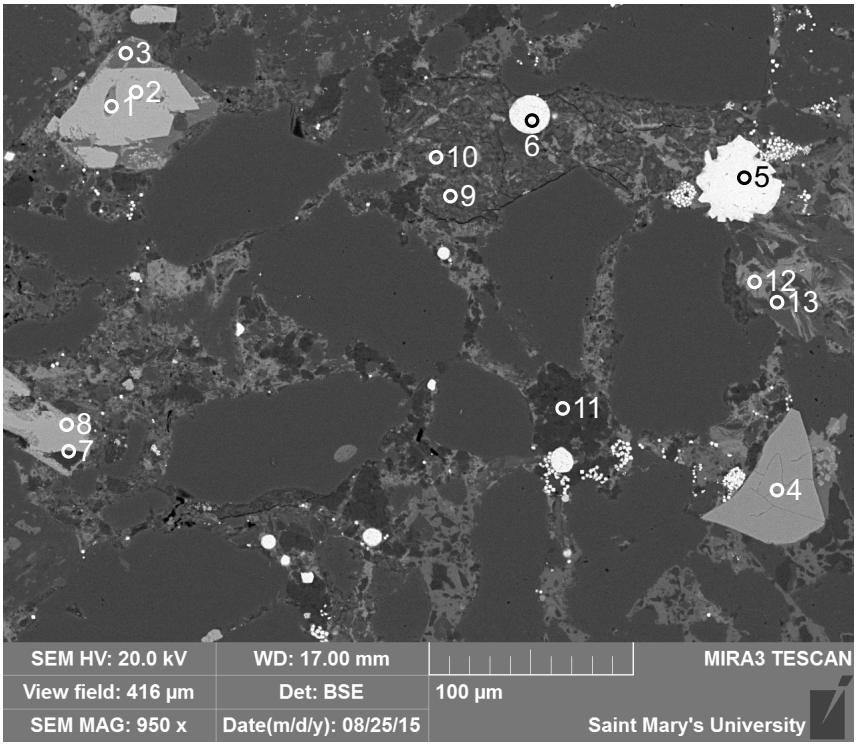
1: Albite
2: Albite
3: Siderite +
4: Muscovite + Chlorite
5: Chlorite
6: Albite
7: Oligoclase
8: Andesine
9: Apatite
10: Calcite +
11: Oligoclase
12: Calcite +
13: Calcite
14: Albite
15: Andesine
16: Albite
17: Kaolinite
18: Siderite +

Figure 4E.18: Sample Weymouth 6213.5m site 18 (SEM). Detrital muscovite (4) and plagioclase grains of albite (14,16), oligoclase (7,11) and andesine (8,15).



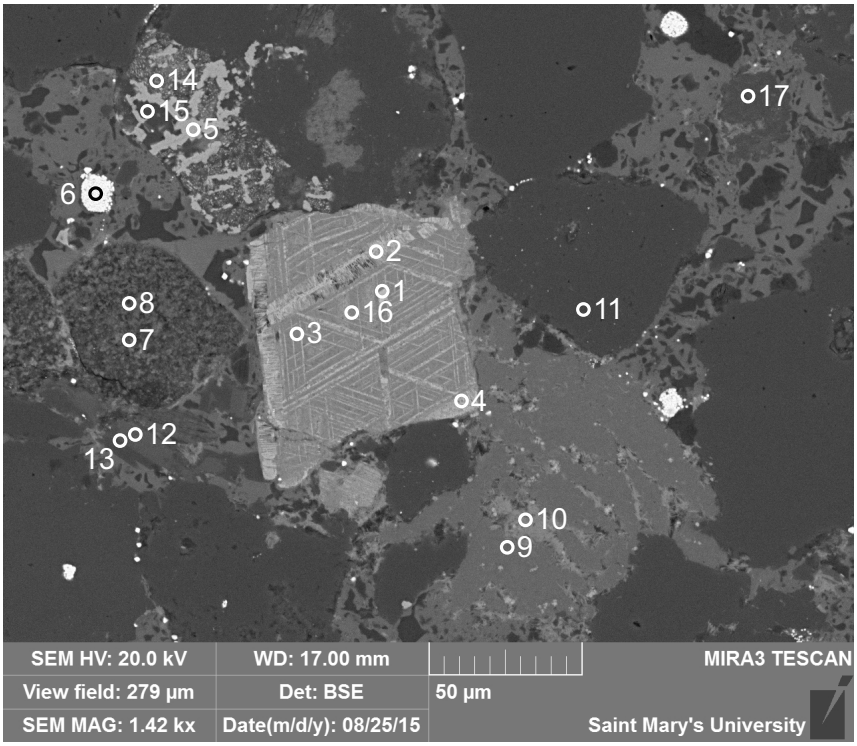
1: Muscovite
2: Quartz
3: K-feldspar + Kaolinite
4: K-feldspar + Kaolinite
5: Quartz
6: Muscovite + Chlorite
7: Muscovite
8: Pyrite
9: Pyrite
10: Mix
11: Muscovite

Figure 4E.19: Sample Weymouth 6213.5m site 19 (SEM). Abundant small pyrite framboids. K-feldspar altering to kaolinite (3,4), and muscovite (7) altering to chlorite (6).



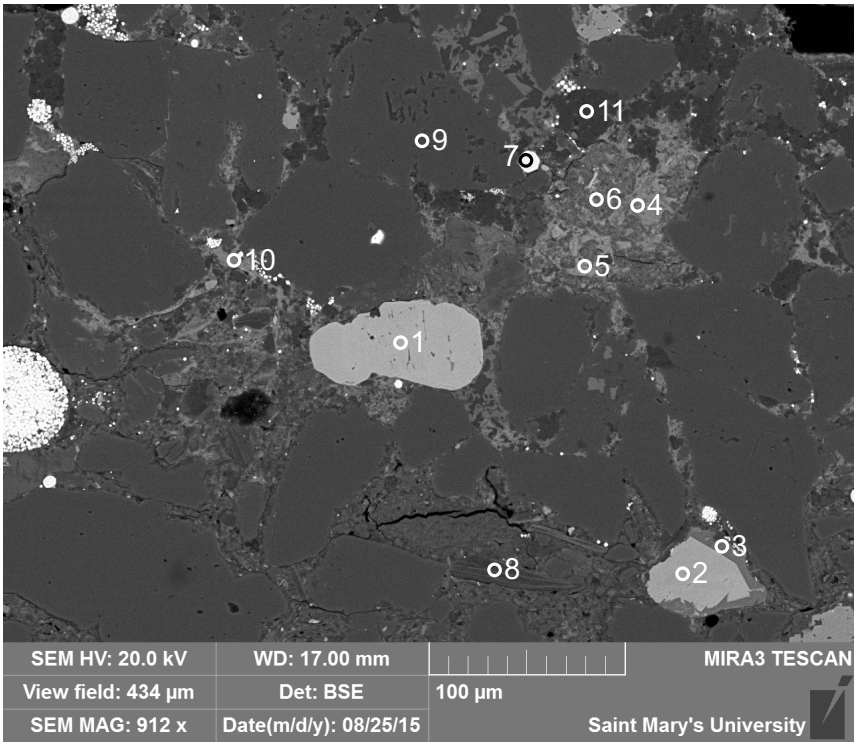
1: Chlorite + TiO_2
2: TiO_2 + Chlorite
3: Calcite
4: Spinel
5: Pyrite
6: Pyrite
7: Kaolinite
8: TiO_2
9: Mix
10: Chlorite +
11: Kaolinite
12: Chlorite
13: Chlorite

Figure 4E.20: Sample Weymouth 6213.5m site 20 (SEM). A TiO_2 detrital grain with chlorite inclusions (1,2) and a detrital spinel (4) grain. Pyrite framboids (6).



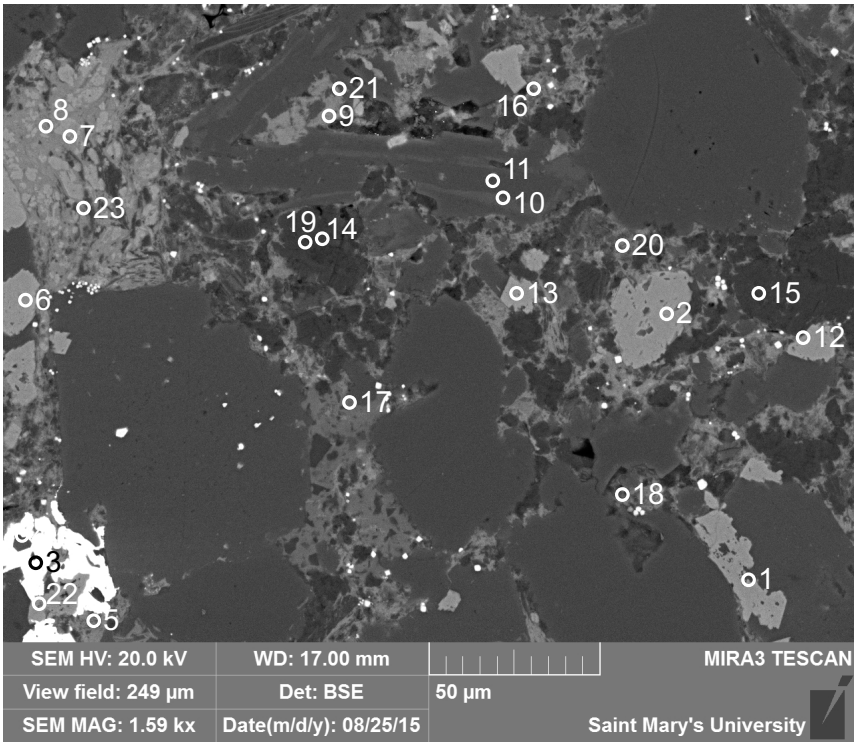
1: TiO_2 ("Ilmenite") +
2: TiO_2 ("Ilmenite") +
3: TiO_2 ("Ilmenite") +
4: TiO_2 ("Ilmenite") +
5: TiO_2 +
6: Pyrite
7: Muscovite + Chlorite
8: Muscovite + Chlorite
9: Calcite +
10: Chlorite
11: Quartz
12: Andesine
13: Albite + Calcite
14: Mix
15: Quartz
16: "Ilmenite" +
17: Albite

Figure 4E.21: Sample Weymouth 6213.5m site 21 (SEM). It appears that chlorite (10) postdates calcite (9). Albite is altering to calcite (13).



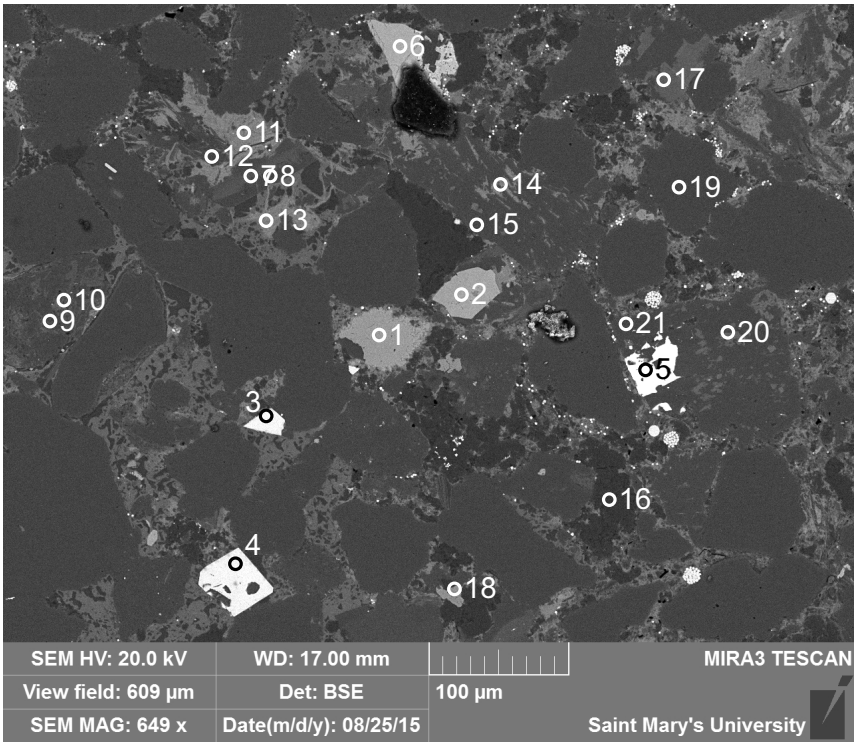
1: TiO_2
2: TiO_2
3: Calcite
4: Chlorite +
5: Chlorite +
6: Mix
7: Pyrite
8: Kaolinite +
9: Quartz
10: Chlorite +
11: Kaolinite

Figure 4E.22: Sample Weymouth 6213.5m site 22 (SEM). The morphology of TiO2 (1) grain suggests that it may be detrital. Pyrite framboid.



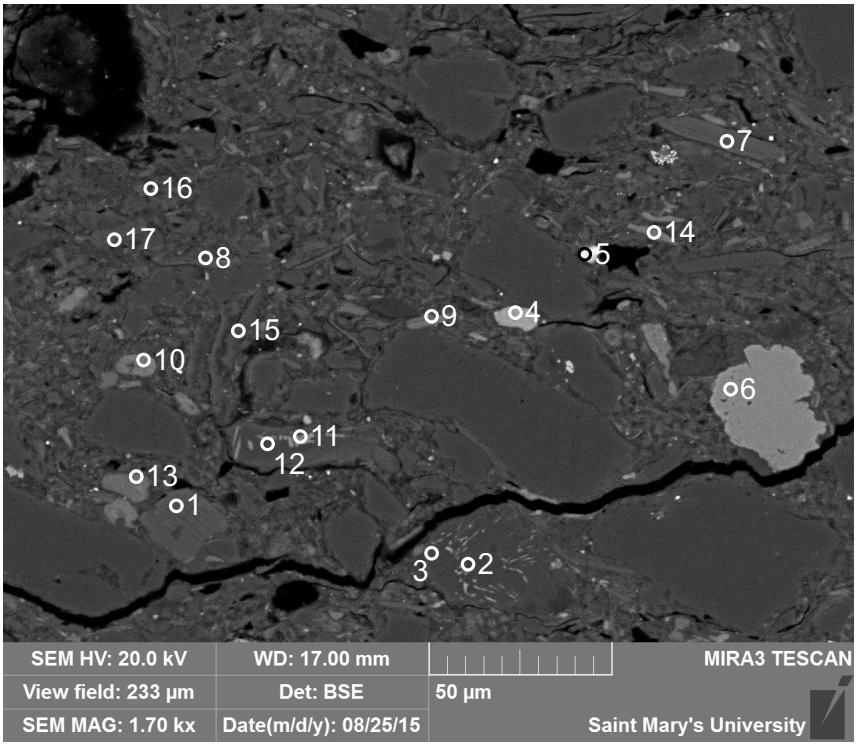
1: Siderite +
2: Siderite
3: Barite
4: Quartz
5: Chlorite
6: Siderite +
7: Chlorite
8: Chlorite
9: Chlorite
10: Albite
11: Albite
12: Siderite + Chlorite
13: Siderite +
14: Kaolinite
15: Kaolinite
16: Chlorite
17: Calcite +
18: Chlorite
19: Kaolinite
20: Chlorite +
21: Albite
22: Siderite +
23: Chlorite +

Figure 4E.23: Sample Weymouth 6213.5m site 23 (SEM). Diagenetic barite (3) associated with chlorite (5) and siderite (22). the only detrital grains present are albite (10,11,21).



1: Siderite
2: TiO_2
3: Pyrite
4: Pyrite
5: Sphalerite
6: Spinel
7: Andesine
8: Albite
9: Quartz +
Muscovite
10: Muscovite +
11: Chlorite +
12: Quartz
13: Chlorite
14: Chlorite
15: Albite
16: Kaolinite
17: K-feldspar
18: Siderite +
19: Quartz
20: Calcite + Albite
21: Albite

Figure 4E.24: Sample Weymouth 6213.5m site 24 (SEM). Albite (8) is associated with andesine (7), it is not clear if albite (8) is diagenetic.



1: Muscovite
2: Albite + TiO_2
3: Albite
4: TiO2
5: Pyrite
6: Siderite
7: Muscovite
8: Muscovite +
9: Chlorite +
10: Calcite +
11: Apatite +
12: Albite
13: Calcite +
14: Chlorite
15: Albite
16: Muscovite +
17: Muscovite

Figure 4E.25: Sample Weymouth 6213.5m site 25 (SEM). Detrital grains of muscovite and albite.

Table 4E.1 SEM-EDS chemical analyses of minerals from sample A-45 6213.5.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	NiO	ZnO	Y_2O_3	ZrO_2	BaO	Ce_2O_3	Gd_2O_3	Dy_2O_3	Yb_2O_3	HfO_2	WO_3	B_2O_3	PtO_2	Au_2O_3	Total	Actual Total
1	1	Spl	0.62	0.55	37.41	17.53		16.22									27.67																100	87
1	2	TiO_2	1.35	95.22	0.72	2.71																											100	81
1	3	Sp	0.49										52.85							46.66													100	147
1	4	Py	0.32			27.56				0.46			71.66																				100	171
1	5	Py +	6.20		5.35	29.83		0.91	0.91				56.80																				100	136
1	6	Sd +	3.94		1.19	36.47	0.76	8.58	4.32	0.74																							56	51
1	7	Qz	100.00																														100	97
1	8	Kln	48.81		37.20																												86	80
1	9	Qz	100.00																														100	97
1	10	Cal + Chl	9.37		6.39	1.70			81.81	0.73																							100	48
1	11	Ms + Chl	58.49	0.43	23.60	7.65		2.59		0.46	6.46				0.32																		100	86
1	12	Ms + Chl	42.24		26.20	22.68		3.52		0.86	3.58		0.92																				100	79
1	13	Cal + Ab	10.57		2.53	1.65			83.34	1.91																							100	48
1	14	Ab	69.39		18.37				0.35	11.89																							100	97
1	15	Chl	29.80		21.09	27.95		5.76	0.39																								85	77
1	16	Sp	1.71		0.42	0.33							52.60							44.94													100	145
1	17	Py				27.40							72.60																				100	180
2	1	Ab	69.47		18.84				0.20	11.50																							100	96
2	2	Pl (Olig)	66.24		20.82				2.28	10.66																							100	97
2	3	Zrn	31.38																			68.62											100	97
2	4	Ab	69.03		18.56				0.57	11.84																							100	96
2	5	Ab + Qz	79.06		13.43					7.51																							100	94
2	6	Ms	49.50	0.33	34.69	0.74		0.53		0.48	8.72																						95	90
2	7	Hole	28.58		14.74	9.16							38.35		9.18																		100	2
2	8	Chl	32.00		22.24	25.60		4.11			1.05																						85	73
2	9	Ap + Ab	38.12		10.52	0.30			19.85	6.61		22.71		1.88																			100	99
2	10	Chl	34.77	0.53	19.99	20.20		5.96	0.77	0.73	1.39		0.65																				85	79
3	1	Ab + Chl	41.32		19.56	19.12		4.18	4.83	4.25	0.84	4.54	1.37																				100	87
3	2	Ab	69.35		18.76				0.32	11.57																							100	97
3	3	Ab	66.58		20.52	0.35			1.53	10.48	0.54																						100	96
3	4	Ab	68.77		19.10				0.39	11.74																							100	97
3	5	Ab	66.24		21.07				2.31	10.38																							100	96
3	6	Kln	49.10		36.00	0.74					0.15																						86	78
3	7	Ab	67.07		20.10	0.68			1.19	10.72	0.24																						100	97
3	8	Ms + Chl	48.88		29.04	15.44		3.25		0.38	2.22		0.80																				100	80
3	9	Ap + Ab	26.69		5.86	0.75		0.38	28.75	2.98		28.15		5.74										0.71									100	98
3	10	Ap + Ab	32.39		9.09				22.60	5.77		24.06		5.30										0.80									100	101
3	11	Ap + Ab	34.38		9.81				21.25	6.22		23.76		3.55										1.03									100	100
3	12	Ab	68.59	0.50	18.86	0.32				11.43	0.30																						100	96
3	13	"Ilm" +	15.51	69.37	7.27	5.26		1.13	0.36	0.69	0.41																						100	80
3	14	Kln + Ms	55.90	0.43	36.03	4.28		1.28		0.49	1.59																						100	86
4	1	Kln	47.08		35.91	0.34			2.67																								86	79
4	2	Chl	43.18	0.31	22.46	4.42		4.17	7.03	0.47	2.74				0.21																		85	80
4	3	Chl	29.82		21.90	27.51		5.44	0.32																								85	77
4	4	Chl	30.64		20.41	27.58		4.02	1.04	0.37	0.65						0.30																85	72
4	5	Cal + Chl	9.60		5.52	2.53			81.92		0.43																						100	47
4	6	Ab + Cal	58.07		18.56	0.58			11.82	10.97																							100	77
4	7	Qz	94.33		2.32	0.46			2.59		0.30																						100	91
4	8	Ilt	52.74	0.39	21.45	6.63		2.30		0.53	5.66				0.31																		90	84
4	9	Ilt	50.08	0.36	21.66	8.60		2.61	0.58	0.46	5.37				0.29																		90	83
4	10	Spl	0.68	0.62	38.26	17.47		15.98									26.98																100	85
4	11	Chl + Cal	31.31		22.09	28.34		4.78	11.08		0.55		1.62		0.23																		100	73
4	12	Chl + Cal	34.06		26.19	28.74		5.29	5.36		0.36																						100	77
5	1	Sd	1.50		0.45	37.94	0.72	7.62	7.77																								56	49
5	2	Ab	65.17		21.28					12.59										0.96													100	84
5	3	Ab	63.97		21.94					12.88										1.21													100	88
5	4	Sp	0.53			0.50							52.82							46.15													100	144
5	5	Sp	1.90		0.38	0.45							52.09							45.18													100	140
5	6	Ab	59.52		21.14				5.07	12.98			0.72							0.57													100	84
5	7	Ab	67.98		17.99				2.11	11.92																							100	96
5	8	Mix	22.68		4.76	1.20			52.18				11.21							7.97													100	62
5	9	Cal + Sd + Chl + P	10.18		7.31	43.29	1.08	5.79	26.84	0.73			4.77																				100	52

Table 4E.1 SEM-EDS chemical analyses of minerals from sample A-45 6213.5.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	NiO	ZnO	Y_2O_3	ZrO_2	BaO	Ce_2O_3	Gd_2O_3	Dy_2O_3	Yb_2O_3	HfO_2	WO_3	B_2O_3	PtO_2	Au_2O_3	Total	Actual Total
5	10	Cal + Chl	8.77		2.53	1.96		0.68	86.06																								100	44
5	11	Qz	99.30																	0.70													100	98
6	1	Sp	0.51			0.45							53.04							46.00													100	143
6	2	Kln +	38.42	0.71	31.71	4.57		7.87	0.55	2.17																							86	82
6	3	Zrn	31.06																			68.94											100	97
6	4	Zrn	31.28																			68.72											100	97
6	5	TiO_2	0.81	97.73	0.64	0.82																											100	80
6	6	TiO_2	1.48	96.76	0.66	0.76			0.34																								100	79
6	7	"Ilm"	7.34	85.33	3.08	2.71		0.58	0.43		0.53																						100	77
6	8	"Ilm"	6.05	85.98	4.06	2.50		0.63	0.52		0.26																						100	77
6	9	Kln	48.86		37.14																												86	82
6	10	Kln	47.80		36.61															1.58													86	77
6	11	Chl + Sp + Py	29.14		19.44	11.91		13.60			0.26		16.26							9.40													100	89
6	12	TiO_2	0.96	98.40		0.64																											100	80
6	13	Chl	29.09		18.47	19.24		17.90	0.30																								85	77
6	14	Qz	100.00																														100	96
6	15	Qz	99.26		0.74																												100	95
6	16	Kln	48.87		37.13																												86	78
6	17	Ab	68.87		18.82	0.44				11.62	0.24																						100	97
7	1	TiO_2	1.56	95.35	0.81	2.28																											100	79
7	2	Mix	27.12	18.65	22.05	27.70		4.48																									100	77
7	3	"Ilm"	4.34	86.18	3.31	5.22		0.68	0.27																								100	80
7	4	Zrn	31.36		0.93	0.42																66.57						0.72					100	97
7	5	Zrn	30.98																			69.02											100	97
7	6	TiO_2 ("Ilm") +	4.83	88.45	4.31	1.85			0.56																								100	75
7	7	TiO_2 ("Ilm") +	7.70	77.81	7.07	5.81		1.09	0.52																								100	75
7	8	Chl + Ilm	31.72	12.24	23.01	27.65		4.44		0.42	0.51																						100	76
7	9	Cal +	10.08		2.55	1.63			85.74																								100	46
7	10	Mix	11.64		3.27	21.19	0.97	13.50	47.14	1.42	0.87																						100	52
7	11	Ab	69.45		18.56					11.99																							100	97
7	12	Ab	66.92		19.24	2.29		0.33		10.72	0.49																						100	95
7	13	Ab	67.76		19.12	1.49				11.39	0.24																						100	94
7	14	Kln +	38.50	0.67	31.86	4.16		8.04	0.45	2.32																							86	81
7	15	Ms	48.99	0.50	35.32	1.05		0.63		0.41	8.10																						95	87
7	16	Ms	49.83	0.49	35.72	0.78		0.76		0.32	7.10																						95	85
7	17	Kln	48.57		37.02	0.41																											86	79
7	18	Chl	28.13	0.61	22.70	28.68		4.88																									85	76
7	19	TiO_2 ("Ilm")	1.93	94.40	1.00	2.42			0.25																								100	78
8	1	Kln	48.76		33.43	1.66		0.95		0.66	0.32				0.21																		86	84
8	2	Kln	48.91		33.15	1.69		0.70		0.76	0.46				0.34																		86	79
8	3	Kln	47.44		35.73	0.46				0.46	0.40									1.51													86	80
8	4	Chl	29.22		18.56	18.96	0.31	17.94																									85	78
8	5	Chl	34.97		24.81	10.72		14.29	0.21																								85	76
8	6	Chl	30.38		22.39	24.91		6.71	0.31		0.31																						85	76
8	7	Ms	51.18		31.23	1.82		1.24		0.66	8.87																						95	87
8	8	Qz	100.00																														100	96
8	9	Qz	100.00																														100	96
8	10	Qz	100.00																														100	96
8	11	Ab + Cal	29.53		9.47	0.93			56.55	3.52																							100	54
8	12	Kln	48.91		33.92				3.17																								86	78
8	13	Ab +	12.96		4.67	1.90			77.81	2.66																							100	49
8	14	Chl	37.37		21.74	16.68		5.58	0.93	0.63	1.23	0.65			0.20																		85	80
8	15	Chl	34.84		21.14	18.73		6.27	1.43	0.39	0.86	1.34																					85	79
8	16	Chl	30.03		22.70	27.35		4.93																									85	80
9	1	Kln + Ab	60.12		24.64	0.54			7.26	6.78	0.66																						100	94
9	2	Brt + Kln +	5.69		5.18	1.63		0.70			0.28		33.23					0.05					49.69						3.56			100	89
9	3	Brt + Kln +	8.13		6.42								18.50					0.03					33.49							33.43		100	125
9	4	Brt +	0.77		1.11								36.98					-0.05					58.45						2.74			100	87
9	5	Brt +	1.09						0.39				37.23					-0.14					61.43									100	90
9	6	Brt +	0.64		0.45								24.56					0.04					42.17							32.14		100	134
9	7	Brt +			0.36								24.70					0.01					41.84						1.69	31.40		100	131
9	8	Chl + TiO_2	32.85	2.54	26.65	32.56		5.39																									100	78

Table 4E.1 SEM-EDS chemical analyses of minerals from sample A-45 6213.5.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	NiO	ZnO	Y_2O_3	ZrO_2	BaO	Ce_2O_3	Gd_2O_3	Dy_2O_3	Yb_2O_3	HfO_2	WO_3	B_2O_3	PtO_2	Au_2O_3	Total	Actual Total
9	9	Chl + TiO_2	26.36	23.35	21.33	24.21		3.95	0.53		0.26																						100	78
9	10	Chl + TiO_2 +	6.37	72.72	4.69	9.22		1.26	5.74																								100	74
9	11	Chl	27.59	5.19	21.28	25.80		4.47	0.35		0.31																						85	76
9	12	Ab	67.95		18.44					11.99																					0.09	1.53	100	97
9	13	Ab	69.00		18.95					12.05																							100	96
9	14	Kln	48.61		37.39																												86	79
9	15	Brt	0.68		0.32								24.20					0.06					42.04							32.69			100	132
9	16	Chl	32.49	3.91	18.69	23.24		5.85	0.31	0.52																							85	77
10	1	Cal	1.16			0.69			54.14																								56	43
10	2	Sd	2.87		1.20	39.82	0.58	8.48	3.06																								56	50
10	3	Brt							0.27				24.86										43.02							31.85			100	132
10	4	Mix	7.17	68.77	3.76	4.97			14.20	1.13																							100	72
10	5	TiO_2 + Chl +	23.27	28.64	18.73	24.07		3.85	1.44																								100	77
10	6	TiO_2 + Chl	28.77	12.28	23.11	30.32		4.59	0.94																								100	77
10	7	Cal + TiO_2 + Chl	7.49	34.65	5.65	10.02	0.50	1.94	39.75																								100	59
10	8	Pl (And)	60.39		24.59	0.59			7.02	6.63	0.78																						100	95
10	9	Chl	28.57		21.51	28.79		5.48	0.65																								85	76
10	10	Cal + Ab	8.11		2.72	2.25			84.66	2.26																							100	47
10	11	Qz	100.00																														100	96
10	12	Qz	100.00																														100	96
10	13	Qz + Chl	81.12	0.58	6.97	8.19		2.75			0.39																						100	79
10	14	Qz	100.00																														100	97
10	15	Kln	48.81		37.20																												86	79
10	16	Ab	69.32		18.63					12.05																							100	97
10	17	Sd +	2.04		0.57	41.37	0.67	8.06	2.56														0.73										56	47
10	18	TiO_2 + Py +	1.99	68.14	1.32	8.62			3.81	1.01			15.11																				100	83
10	19	Ap	0.49			0.48			46.56			44.31		6.65	0.25														1.27				100	96
10	20	Chl	32.34		22.21	23.77		6.68																									85	77
11	1	Ab	69.52		18.35					12.13																							100	96
11	2	Pl (And)	60.63		24.42	0.31			6.30	7.16	1.18																						100	93
11	3	Sd	0.90			43.49	1.02	8.80	1.79																								56	46
11	4	"Ilm" +	1.33	70.02	0.57	24.22	1.12		1.06							1.68																	100	74
11	5	"Ilm" + Chl	13.88	60.76	8.96	13.80			0.84							1.77																	100	74
11	6	Ms	51.17	0.57	32.64	0.93		0.39		0.89	8.41																						95	89
11	7	"Ilm"	2.31	82.24	1.13	13.48			0.84																								100	74
11	8	Sp	0.49			0.40							53.03							46.08													100	144
11	9	Chl	28.38		22.31	29.46		4.58	0.27																								85	76
11	10	Chl	32.70		22.12	23.60		4.35	0.51	0.60	0.64				0.48																		85	76
11	11	Qz	100.00																														100	98
11	12	Ms +	46.58	0.45	24.99	13.87		3.47	0.47	0.62	3.99				0.57																		95	81
11	13	Chl	28.36		16.85	30.42		8.27	1.10																								85	70
11	14	Ab	68.21		18.57				1.48	11.73																							100	95
11	15	Pl (Olig)	62.52		22.69	0.39			5.65	8.28	0.47																						100	95
11	16	Ab	67.33		19.59	0.60			0.56	11.31	0.61																						100	99
11	17	Ms	55.01		23.19	4.64		3.80			8.37																						95	87
11	18	Ab + Sd	63.41		18.63	6.59		2.07	0.31	8.76	0.23																						100	88
11	19	Ab	62.36		19.24	5.56		1.94	0.24	10.08	0.58																						100	93
12	1	Sd +	13.20		3.53	62.71	1.03	12.59	4.76	0.89	1.28																						100	53
12	2	Sp	0.43			1.49			0.27				53.14							44.67													100	144
12	3	TiO_2	0.58	99.42																													100	80
12	4	TiO_2	1.26	96.85	0.49	1.40																											100	75
12	5	Kln	48.72		37.28																												86	79
12	6	Qz	100.00																														100	96
12	7	TiO_2	4.26	91.56	2.49	1.69																											100	79
12	8	Ms + Chl	48.71		27.46	14.58		3.70	0.50	0.90	3.41				0.75																		100	77
12	9	Pl (Olig)	64.57		21.41	0.28			3.19	8.66	1.89																						100	95
12	10	Sd + Qz	47.70		1.83	48.82		0.88	0.35						0.41																		100	79
12	11	Ab + Kln	58.15		26.38	0.54			8.51	6.03	0.39																						100	94
12	12	Ab	68.87		18.56	0.44				11.63	0.51																						100	96
12	13	Chl	28.60		20.99	29.80		4.22	1.39																								85	71
12	14	Cal + Ms	27.38		15.00	2.61		1.04	50.52	0.54	2.91																						100	56
12	15	TiO_2 +	1.28	97.63	0.43	0.66																											100	80

Table 4E.1 SEM-EDS chemical analyses of minerals from sample A-45 6213.5.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	NiO	ZnO	Y_2O_3	ZrO_2	BaO	Ce_2O_3	Gd_2O_3	Dy_2O_3	Yb_2O_3	HfO_2	WO_3	B_2O_3	PtO_2	Au_2O_3	Total	Actual Total
12	16	Py	0.34			27.31			0.17				72.18																				100	173
12	17	Chl	30.95		22.32	25.88		4.56	0.80		0.49																						85	77
12	18	Chl	29.13		21.81	28.77		4.75	0.29		0.25																						85	76
13	1	Py	0.26			27.21				0.28			72.25																				100	176
13	2	Kln	48.54	0.45	36.71	0.30																											86	80
13	3	TiO_2 +	4.26	89.99	3.99	1.02			0.74																								100	75
13	4	Chl + TiO_2	27.37	16.03	22.75	29.24		4.61																									100	77
13	5	TiO_2 +	1.75	94.74	1.15	0.96			0.84						0.56																		100	56
13	6	Qz	99.66						0.34																								100	96
13	7	Pl (Olig)	62.69		23.28				5.22	8.56	0.25																						100	95
13	8	TiO_2	0.71	99.29																													100	80
13	9	Ms	54.19	0.31	26.14	3.89		1.42			9.06																						95	87
13	10	Qz	99.32		0.68																												100	96
13	11	Kln	48.62		37.07	0.31																											86	81
13	12	Ab	69.15		18.65					12.20																							100	98
13	13	Pl (And)	56.91		26.91	0.84			9.54	5.46	0.34																						100	96
13	14	Ms	53.63	0.62	26.50	3.17		2.13			8.95																						95	92
13	15	Qz	100.00																														100	96
14	1	TiO_2 +	1.45	93.06	1.83	2.64			0.38								0.64																100	77
14	2	TiO_2	0.83	98.16					1.01																								100	80
14	3	Py + Ab	14.42		4.69	20.12				1.60	0.93		57.07						1.17														100	135
14	4	Ab	69.29		18.82					11.89																							100	97
14	5	Sd +	1.15	0.42		43.21	0.87	8.49	1.87																								56	46
14	6	Qz	100.00																														100	96
14	7	Kln	48.99		37.01																												86	78
14	8	Cal +	23.55		7.39	1.39			65.63	2.04																							100	51
14	9	Chl +	32.96	0.55	22.68	22.84		3.96	0.59	0.36	1.06																						85	76
14	10	Py +	0.77	0.47	0.36	26.90			0.59	0.35			70.56																				100	169
14	11	Cal +	11.96		5.08	1.57			81.39																								100	46
15	1	Ab + Kln +	43.58	1.22	29.99	9.39		10.73	3.97	1.13																							100	81
15	2	TiO_2	1.54	97.28		0.44			0.74																								100	80
15	3	Qz	99.27	0.73																													100	95
15	4	Ab + Chl +	48.90	2.60	23.75	17.21		3.12	0.38	3.13	0.92																						100	82
15	5	Cal +	14.16		9.05	2.79		0.96	72.49		0.55																						100	49
15	6	Qz	100.00																														100	97
15	7	Kln	48.61		36.93	0.46																											86	78
15	8	Kfs + Cal	53.87		14.83	0.33			19.46	2.82	8.68																						100	81
15	9	Ab	69.30		18.74					11.96																							100	97
15	10	Xtm +	3.55	1.08								39.29						1.14			43.10				3.28	5.34	3.21						100	84
16	1	Py	0.41			27.27			0.25				72.07																				100	171
16	2	Ap + Ab	13.69		4.21	0.59			36.91	2.75		34.62	0.67	6.57																			100	98
16	3	Brt + B	6.80		1.02				0.27	0.66			20.58					-0.01					35.26							35.42		100	143
16	4	Brt + B			0.55								23.42					0.01					40.79						1.37	33.85		100	138
16	5	Brt + B											23.54					-0.01					40.99							35.48		100	137
16	6	Brt + B			0.60								24.77					-0.04					41.78						1.36	31.53		100	133
16	7	Ms	50.47		32.64	0.77		1.08		0.34	9.70																						95	88
16	8	Ab	67.86		20.01				0.70	10.96	0.47																						100	98
16	9	Ab	68.31		19.03	0.59			0.21	11.85																							100	97
16	10	Pl (And)	60.63		24.34	0.45			6.79	7.06	0.73																						100	95
16	11	Ap	0.56						47.03			44.00		8.16	0.26																		100	95
16	12	Chl + Ap	30.92		20.88	23.53		9.35	7.60		0.42	7.31																					100	79
16	13	Chl +	39.38		18.00	19.84		7.40			0.38																						85	84
16	14	Cal +	4.06		1.01	13.31	0.42	8.42	28.24	0.54																							56	48
16	15	Pl (Olig)	62.05		23.66	0.59			5.57	7.67	0.46																						100	95
17	1	Py	0.32			26.94				0.69			72.05																				100	176
17	2	Py	0.41			27.12			0.18	0.61			71.68																				100	173
17	3	Brt											38.37					0.06					61.57										100	88
17	4	Ab	68.35		18.84	0.33			0.64	11.84																							100	95
17	5	Py +	3.89		3.04	27.99		0.70	0.41	0.28			63.69																				100	151
17	6	Mix	21.48		6.46	18.77	0.75	13.10	35.74	3.71																							100	57
17	7	Ab	69.11		19.22					11.68																							100	96
17	8	Ms	48.07	0.45	33.10	3.40		0.84		0.92	8.23																						95	87

Table 4E.1 SEM-EDS chemical analyses of minerals from sample A-45 6213.5.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	NiO	ZnO	Y_2O_3	ZrO_2	BaO	Ce_2O_3	Gd_2O_3	Dy_2O_3	Yb_2O_3	HfO_2	WO_3	B_2O_3	PtO_2	Au_2O_3	Total	Actual Total
17	9	Cal +	2.68		0.40	1.15		0.41	51.36																								56	45
17	10	Py +	2.44		0.85	25.85			0.20	1.02			69.64																				100	169
17	11	Brt	1.60							0.35			37.75					-0.03					60.33										100	88
18	1	Ab	64.18		22.16	0.42			3.55	9.29	0.40																						100	95
18	2	Ab	67.40		19.71	0.36			1.22	10.96	0.35																						100	93
18	3	Sd +	3.89	0.70	2.94	38.30	0.63	7.32	2.22																								56	50
18	4	Ms + Chl	52.33		27.54	10.85		3.37	0.70	0.70	3.83				0.68																		100	79
18	5	Chl	29.00		22.79	28.26		4.31	0.27	0.37																							85	75
18	6	Ab	66.74		21.71				0.48	11.07																							100	95
18	7	Pl (Olig)	58.64		28.78	0.60			6.04	5.61	0.33																						100	91
18	8	Pl (And)	57.17		27.02	0.48			9.08	5.77	0.48																						100	95
18	9	Ap	0.94			0.39			47.21			44.61		6.28	0.58																	100	96
18	10	Cal +	2.19		0.52	1.23		0.57	51.09	0.41																							56	44
18	11	Pl (Olig)	65.93		17.63				4.93	11.51																							100	93
18	12	Cal +	4.48		2.20	0.81			48.13	0.38																							56	46
18	13	Cal	0.65			1.18			54.17																								56	42
18	14	Ab	68.99		19.35					11.66																							100	95
18	15	Pl (And)	56.56		27.15	0.60			9.91	5.49	0.29																						100	95
18	16	Ab	68.55		19.05				0.53	11.86																							100	97
18	17	Kln	49.06		36.94																												86	80
18	18	Sd +	2.26		0.60	41.86	0.87	8.27	2.13																								56	47
19	1	Ms	48.83	0.84	35.72	0.30				1.11	8.21																						95	87
19	2	Qz	100.00																														100	95
19	3	Kfs + Kln	51.63		38.64					1.85	7.88																						100	87
19	4	Kfs + Kln	57.28		33.24	0.53		0.50		1.01	7.44																						100	93
19	5	Qz	100.00																														100	97
19	6	Ms + Chl	44.59	6.59	28.56	11.75		3.10		0.44	4.97																						100	85
19	7	Ms	49.77	0.40	30.89	3.36		1.81		0.33	8.44																						95	86
19	8	Py	0.36			26.15	0.39			0.34			72.76																				100	173
19	9	Py	0.34			26.91			0.63			0.44	71.68																				100	170
19	10	Mix	12.62		7.12	6.37		0.61	60.90		0.58		11.79																				100	58
19	11	Ms	49.84		35.41	0.54		0.38		1.56	7.27																						95	85
20	1	Chl + TiO_2	31.70	4.55	25.57	33.19		4.99																									100	77
20	2	TiO_2 + Chl	2.14	94.56	1.55	1.43			0.32																								100	79
20	3	Cal	0.59	0.74		2.02			52.66																								56	42
20	4	Spl	0.58		39.39	12.81		15.12									32.10																100	87
20	5	Py	0.39			27.18							72.43																				100	177
20	6	Py	0.34			27.50							72.16																				100	171
20	7	Kln	48.81	0.41	36.48	0.30																											86	74
20	8	TiO_2	1.22	96.78	0.76	0.69				0.55																							100	81
20	9	Mix	56.19		26.77	6.86		2.75	0.45	2.24	4.36				0.38																		100	87
20	10	Chl +	46.02		21.65	12.89		2.83			1.61																						85	88
20	11	Kln	48.65		36.89	0.26					0.21																						86	79
20	12	Chl	29.44		21.69	25.20		4.76	1.85		0.45	1.60																					85	79
20	13	Chl	61.55		17.28	0.97		0.28		0.26	4.66																						85	96
21	1	TiO_2 ("Ilm") +	5.33	84.53	4.16	5.17		0.81																									100	78
21	2	TiO_2 ("Ilm") +	3.10	87.76	2.48	4.98			0.32							1.36																	100	80
21	3	TiO_2 ("Ilm") +	25.14	23.55	20.37	26.33		4.24	0.36																								100	80
21	4	TiO_2 ("Ilm") +	3.06	90.53	1.87	3.91			0.63																								100	79
21	5	TiO_2 +	1.37	97.81		0.50			0.32																								100	79
21	6	Py	0.28			26.98			0.38				72.36																				100	171
21	7	Ms + Chl	54.23		28.90	7.85		2.57		0.46	5.36				0.63																		100	81
21	8	Ms + Chl	56.06		29.84	4.86		2.24		0.46	6.09				0.45																		100	90
21	9	Cal +	1.55		1.01	1.53			51.91																								56	44
21	10	Chl	28.66	1.09	23.66	26.39		4.18	1.01																								85	78
21	11	Qz	100.00																														100	97
21	12	Pl (And)	59.15		25.19	0.69			7.54	6.27	1.16																						100	95
21	13	Ab + Cal	61.79		18.20	0.36			8.28	11.12	0.25																						100	93
21	14	Mix	38.40	28.27	24.19	2.07		0.71		1.07	5.28																						100	89
21	15	Qz	98.69	0.48		0.59			0.24																								100	93
21	16	"Ilm" +	29.50	11.39	23.94	30.21		4.96																									100	78
21	17	Ab	66.04	1.53	18.10	0.36		0.33	1.39	10.92	0.41	0.92																					100	96

Table 4E.1 SEM-EDS chemical analyses of minerals from sample A-45 6213.5.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	NiO	ZnO	Y_2O_3	ZrO_2	BaO	Ce_2O_3	Gd_2O_3	Dy_2O_3	Yb_2O_3	HfO_2	WO_3	B_2O_3	PtO_2	Au_2O_3	Total	Actual Total
22	1	TiO_2	0.73	99.27																													100	81
22	2	TiO_2	1.05	98.08		0.55			0.32																								100	80
22	3	Cal	0.67	0.59		3.48		0.92	50.34																								56	45
22	4	Chl +	31.80	0.60	21.43	25.04		4.50		0.99	0.65																						85	79
22	5	Chl +	31.15	0.98	22.15	24.39		4.62	0.38	0.49	0.65				0.18																		85	79
22	6	Mix	42.70	4.62	26.57	17.75		4.06	0.80	0.66	2.20				0.64																		100	79
22	7	Py	0.30			27.14			0.38	0.26			71.92																				100	170
22	8	Kln +	47.42		35.61	0.39				0.34	2.24																						86	82
22	9	Qz	100.00																														100	95
22	10	Chl +	36.74	0.40	19.91	22.40		5.16			0.39																						85	79
22	11	Kln	48.82		36.63	0.55																											86	81
23	1	Sd +	1.48			42.07	0.76	8.76	2.93																								56	47
23	2	Sd	0.80			42.91	0.90	9.33	2.06																								56	47
23	3	Brt	0.58			0.39							25.06					0.11					43.52							30.33			100	128
23	4	Qz	97.02			0.32							1.15										1.51										100	87
23	5	Chl	32.35		23.26	22.91		5.13	0.31	0.39	0.65																						85	79
23	6	Sd +	1.53			41.92	0.76	9.19	2.59																								56	47
23	7	Chl	22.47		17.07	37.66		6.03	1.77																								85	65
23	8	Chl	28.65		21.76	28.27		4.99	0.77			0.56																					85	76
23	9	Chl	29.70		22.67	28.11		4.51																									85	76
23	10	Ab	66.93		20.30	0.36			1.78	10.46	0.17																						100	96
23	11	Ab	69.26		18.56	0.39				11.80																							100	97
23	12	Sd + Chl	5.75		3.72	70.41	1.48	15.21	3.43																								100	51
23	13	Sd +	10.27		2.34	71.40	1.20	12.32	2.10		0.37																						100	49
23	14	Kln	48.56		37.10	0.34																											86	78
23	15	Kln	48.20		37.13	0.67																											86	79
23	16	Chl	35.33	0.31	21.18	23.72		4.07			0.39																						85	77
23	17	Cal +	38.61		3.34	2.37		0.53	55.15																								100	59
23	18	Chl	40.48		23.08	17.25		3.49	0.37		0.34																						85	82
23	19	Kln	48.71		36.90	0.39																											86	78
23	20	Chl +	37.02		25.25	18.17		2.85	0.36	0.39	0.96																						85	76
23	21	Ab	68.31		18.82	1.17				11.70																							100	95
23	22	Sd +	2.75		0.92	40.13	0.68	8.90	2.63																								56	48
23	23	Chl +	30.84	0.49	22.84	22.14		4.61	2.41			1.67																					85	76
24	1	Sd	1.18		0.70	49.39	0.62	0.76	3.35																								56	45
24	2	TiO_2	0.56	98.35	0.51	0.58																											100	80
24	3	Py	0.36			26.93							72.71																				100	178
24	4	Py	0.32			27.39							72.29																				100	178
24	5	Sp	0.47			0.37							53.06							46.10													100	145
24	6	Spl	0.75		25.96	15.99		10.96									46.34																100	81
24	7	Pl (And)	58.74		26.68	0.62			7.04	6.66	0.26																						100	93
24	8	Ab	68.75		19.33				0.31	11.61																							100	95
24	9	Qz + Ms	81.58		12.81	1.78		0.73			3.10																						100	93
24	10	Ms +	51.21		30.17	4.34		1.87		0.97	6.43																						95	80
24	11	Chl +	42.84		16.05	20.01		4.90	0.27	0.37	0.57																						85	80
24	12	Qz	98.38		0.98	0.44					0.20																						100	93
24	13	Chl	28.87		21.97	28.85		4.88	0.42																								85	76
24	14	Chl	33.13		21.86	24.77		4.22		1.03																							85	78
24	15	Ab	69.08		18.99					11.93																							100	95
24	16	Kln	48.57		37.43																												86	81
24	17	Kfs	66.65		17.93					0.69	14.73																						100	93
24	18	Sd +	1.97		0.83	42.76	0.74	8.00	1.70																								56	48
24	19	Qz	100.00																														100	96
24	20	Cal + Ab	14.85		4.25	1.70			76.42	2.78																							100	50
24	21	Ab	69.30		18.52					12.17																							100	97
25	1	Ms	51.42	0.64	28.85	2.35		2.47			9.27																						95	90
25	2	Ab + TiO_2	50.58	23.70	15.02	1.07			0.76	8.87																							100	94
25	3	Ab	67.31		19.99				1.29	11.19	0.22																						100	101
25	4	TiO_2	1.75	96.10	0.94	0.89			0.32																								100	79
25	5	Py	0.53			26.95							72.52																				100	179
25	6	Sd	0.63			43.56	0.76	9.04	2.00																								56	48
25	7	Ms	48.04	0.69	32.67	2.72		0.86		0.45	9.57																						95	90

Table 4E.1 SEM-EDS chemical analyses of minerals from sample A-45 6213.5.

Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	V_2O_5	Cr_2O_3	CoO	NiO	ZnO	Y_2O_3	ZrO_2	BaO	Ce_2O_3	Gd_2O_3	Dy_2O_3	Yb_2O_3	HfO_2	WO_3	B_2O_3	PtO_2	Au_2O_3	Total	Actual Total
25	8	Ms +	52.96	0.35	30.83	2.22		2.15			6.49																						95	88
25	9	Chl +	34.49	0.27	24.05	20.12		4.85		0.46	0.77																						85	86
25	10	Cal +	11.38		8.05	28.70		5.36	45.50				1.02																				100	52
25	11	Ap +	13.58		4.36				37.60	2.75	0.25	34.03		7.43																			100	100
25	12	Ab	67.68		19.48	0.39			0.80	10.88	0.77																						100	99
25	13	Cal +	3.24		2.04	9.00	0.34	2.56	37.39		0.29		1.13																				56	50
25	14	Chl	29.35		22.07	22.14		10.95			0.49																						85	83
25	15	Ab	66.95		20.54	0.82		0.32		10.35	1.01																						100	99
25	16	Ms +	50.08	1.38	23.19	5.71		2.42		0.55	4.35		7.31																				95	90
25	17	Ms	48.56	0.35	34.19	1.05		0.79		0.59	9.46																						95	86

Appendix 5

Select Scanning Electron Microscope (SEM) Energy Dispersive Spectroscopy (EDS) chemical analyses of muscovite, tourmaline, biotite, feldspar, carbonates, and spinel.

Table 5A: Select EDS chemical analyses of muscovite grains

Well	Sample	Appendix	Site	Position	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	SO_3	F	Cl	ZnO	BaO	Total	Actual Total
Annapolis G-24	4401.5A(1)	1A.1	6	8	46.74	1.00	33.05	2.96		0.61		0.64	10.00						95	98
Annapolis G-24	4401.5A(1)	1A.1	10	2	47.27		36.72	0.26				0.40	10.36						95	111
Annapolis G-24	4401.5A(1)	1A.1	19	3	49.69		32.83	2.32		0.99			9.18						95	90
Annapolis G-24	4401.5A(2)	1B.1	2	8	47.48	0.62	35.12	0.77		0.41		1.47	8.34				0.80		95	107
Annapolis G-24	4401.5A(2)	1B.2	2.redo	8	47.33	0.67	35.07	0.67		0.55		1.52	8.32				0.86		95	108
Annapolis G-24	4401.5B	1C.1	5.2	4	48.95	0.61	33.64	1.16		0.76		0.50	9.38						95	107
Annapolis G-24	5505	1D.1	1	9	47.70		34.05	0.72		0.72		0.64	9.35		1.81				95	160
Annapolis G-24	5505	1D.1	10	9	47.60	0.29	33.44	1.79		0.58		1.62	8.47		1.22				95	102
Annapolis G-24	6045	1J.1	6	3	51.67	0.36	27.70	2.40		2.70		0.82	9.35						95	103
Annapolis G-24	6045	1K.1	14	17	55.25		26.33	1.87		1.01		1.90	8.65						95	116
Crimson F-81	6415	3A.1	3.1	4	47.36		34.05	2.90		0.36		0.77	9.56						95	106
Crimson F-81	6415	3A.1	4	11	49.78	0.34	34.78	1.77		0.62	0.42	0.69	6.60						95	102
Crimson F-81	6425	3B.1	4	11	50.45		33.86		0.55	0.79	0.34		7.52		1.49				95	99
Crimson F-81	6450	3C.1	6	16	50.78		29.11	1.02		1.82	0.49	0.25	8.10		3.43				95	100
Crimson F-81	6470(1)	3D.1	10	13	52.66	0.61	28.24	1.81		2.19			9.49						95	113
Crimson F-81	6470(1)	3D.1	14	6	51.88		32.20	0.96		1.29			8.67						95	113
Crimson F-81	6470(2)	3E.1	29	8	55.25		28.86	1.04		2.68			7.17						95	75
Weymouth A-45	5955	4B.1	4	10	47.06	0.43	33.55	1.28		0.58		0.55	9.90		1.65				95	109
Weymouth A-45	5955	4B.1	5	10	58.84	0.41	24.99	1.88		0.98		0.36	7.54						95	109
Weymouth A-45	6213.5	4E.1	2	6	49.50	0.33	34.69	0.74		0.53		0.48	8.72						95	90
Weymouth A-45	6213.5	4E.1	7	15	48.99	0.50	35.32	1.05		0.63		0.41	8.10						95	87
Weymouth A-45	6213.5	4E.1	7	16	49.83	0.49	35.72	0.78		0.76		0.32	7.10						95	85
Weymouth A-45	6213.5	4E.1	8	7	51.18		31.23	1.82		1.24		0.66	8.87						95	87
Weymouth A-45	6213.5	4E.1	11	6	51.17	0.57	32.64	0.93		0.39		0.89	8.41						95	89
Weymouth A-45	6213.5	4E.1	16	7	50.47		32.64	0.77		1.08		0.34	9.70						95	88
Weymouth A-45	6213.5	4E.1	19	1	48.83	0.84	35.72	0.30				1.11	8.21						95	87
Weymouth A-45	6213.5	4E.1	19	11	49.84		35.41	0.54		0.38		1.56	7.27						95	85
Weymouth A-45	6213.5	4E.1	25	1	51.42	0.64	28.85	2.35		2.47			9.27						95	90
Weymouth A-45	6213.5	4E.1	25	7	48.04	0.69	32.67	2.72		0.86		0.45	9.57						95	90
Weymouth A-45	6213.5	4E.1	25	17	48.56	0.35	34.19	1.05		0.79		0.59	9.46						95	86

Table 5B: Select EDS chemical analyses of tourmaline grains

Well	Sample	Appendix	Site	Position	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	F	Total	Actual Total
Annapolis G-24	5510	1E.1	4	1	38.44	0.93	29.37	8.68		6.11	1.10	2.36			87	72
Annapolis G-24	5520	1F.1	12	10	39.34	0.44	34.21	5.39		5.32	0.18	2.12			87	61
Annapolis G-24	5535(1)	1H.1	7	1	38.11		30.49	6.83		8.70	1.04	1.83			87	32
Annapolis G-24	5535(1)	1H.1	7	4	39.23	0.72	31.32	5.32		7.54	1.04	1.81			87	32
Annapolis G-24	5535(1)	1H.1	7	5	38.58	0.87	33.65	7.15		4.73		2.02			87	33
Annapolis G-24	5535(1)	1H.1	8	2	38.54	0.98	30.71	5.64		7.60	0.39	3.13			87	28
Annapolis G-24	5535(2)	1I.1	2	8	38.48	0.70	31.99	5.53		7.39	0.98	1.93			87	107
Annapolis G-24	5535(2)	1I.1	2	9	38.51	0.39	30.88	6.11		8.38	0.89	1.85			87	105
Annapolis G-24	5535(2)	1I.1	12	8	39.18	0.50	30.66	4.06		9.54	0.49	2.58			87	101
Annapolis G-24	6045	1J.1	3	1	38.45	0.67	33.99	5.05		6.09	0.89	1.86			87	104
Annapolis G-24	6045	1J.1	3	5	37.95	0.76	33.69	9.95		2.26	0.31	2.08			87	104
Annapolis G-24	6045	1J.1	5	1	38.25	1.09	33.86	6.46		5.11	0.36	1.88			87	107
Crimson F-81	6425	3B.1	19	8	38.55	0.90	32.70	7.46		5.25	0.20	1.95			87	96
Crimson F-81	6450	3C.1	5	18	41.41		24.10	15.70	0.31	2.11	0.91	2.28	0.17		87	83
Crimson F-81	6450	3C.1	9	12	37.68	0.52	33.29	11.10		2.36		2.05			87	97
Crimson F-81	6450	3C.2	9.1	3	37.78	0.57	33.13	11.01		2.43		2.09			87	100
Crimson F-81	6470(1)	3D.1	1	8	38.38	0.48	27.96	0.17		13.92	3.05	1.35		1.70	87	104
Weymouth A-45	5715	4A.1	11	5	38.74	0.45	29.88	5.82		8.68	1.50	1.93			87	106

Table 5C: Select EDS chemical analyses of biotite grains

Well	Sample	Appendix	Site	Position	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	ZnO	BaO	Total	Actual Total
Annapolis G-24	4401.5A(1)	1A.1	1	3	36.67	4.19	14.09	19.04	1.08	14.05		0.65	6.21							96	102
Annapolis G-24	4401.5A(2)	1B.1	13	4	37.68	2.64	19.54	17.83		9.44	2.26	0.44	5.92				0.25			96	82
Annapolis G-24	4401.5B	1C.1	6.2	1	39.56	2.95	20.16	15.70		11.18	0.46		5.99							96	100
Annapolis G-24	4401.5B	1C.1	11.1	5	40.46	3.22	19.37	16.11	0.37	9.68	0.42		6.37							96	101
Annapolis G-24	5505	1D.1	14	1	38.94	0.79	18.12	9.08		16.81		0.55	8.32			3.39				96	121
Annapolis G-24	6045	1K.1	3	10	39.06	2.41	21.84	19.64		4.05	2.10		6.05	0.84						96	81
Crimson F-81	6415	3A.1	16	2	36.06	4.60	12.91	27.28	0.36	5.63		0.77	8.09				0.30			96	101
Crimson F-81	6425	3B.1	9	12	37.51		24.31	26.07		0.87	0.83		5.49	0.92						96	93
Crimson F-81	6450	3C.1	7	16	40.98	3.27	19.58	19.58		2.20	0.69		9.17	0.53						96	83
Crimson F-81	6470(2)	3E.1	3	4	40.40	1.60	19.85	13.31	0.28	11.70		0.41	8.44							96	91
Crimson F-81	6470(2)	3E.1	16	6	38.81	0.33	25.77	24.12		1.92			5.06							96	74
Crimson F-81	6470(2)	3E.1	16	12	40.92		23.33	23.39		2.02	0.60		4.51						1.23	96	60
Crimson F-81	6470(2)	3E.1	27	5	40.82	0.99	26.74	21.07		1.55	0.35		4.49							96	61
Newburn H-23	4300	Sangster, 2016	8	6	37.64	4.87	11.09	5.9		18.23		1	6.84				10.43			96	120
Newburn H-23	5950	Sangster, 2016	6	1	39.86	2.35	17.76	12.9		13.88			9.24							96	120

Table 5D: Select EDS chemical analyses of feldspar grains

Well	Sample	Appendix	Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	CoO	ZnO	BaO	PtO_2	Au_2O	Total	Actual Total
Annapolis G-24	4401.5A(1)	1A.1	1	1	Ab	66.99		20.14	0.88			1.39	9.10	1.32				0.17						100	108
Annapolis G-24	4401.5A(1)	1A.1	1	8	Ab	68.74		19.16				0.70	11.41											100	115
Annapolis G-24	4401.5A(1)	1A.1	1	9	Ab	68.55		19.26				0.76	11.33	0.10										100	115
Annapolis G-24	4401.5A(1)	1A.1	2	1	Ab	69.72		18.61					11.68											100	116
Annapolis G-24	4401.5A(1)	1A.1	3	1	Ab	65.76		21.34				2.98	9.81	0.11										100	112
Annapolis G-24	4401.5A(1)	1A.1	5	1	Ab	66.45		20.82	0.50			0.43	10.48	1.31										100	113
Annapolis G-24	4401.5A(1)	1A.1	6	4	Ab	69.92		18.60					11.48											100	113
Annapolis G-24	4401.5A(1)	1A.1	6	7	Ab	69.55		18.79	0.26				11.40											100	114
Annapolis G-24	4401.5A(1)	1A.1	7	10	Ab	69.31		18.77				0.27	11.65											100	117
Annapolis G-24	4401.5A(1)	1A.1	7	15	Ab	67.91		19.85				1.36	10.88											100	117
Annapolis G-24	4401.5A(1)	1A.1	8	5	Ab	69.41		18.73					11.86											100	118
Annapolis G-24	4401.5A(1)	1A.1	8	6	Ab	69.34		18.67					11.99											100	120
Annapolis G-24	4401.5A(1)	1A.1	12	8	Ab	69.26		18.90				0.26	11.58											100	119
Annapolis G-24	4401.5A(1)	1A.1	21	10	Ab	66.21		20.01	1.00			0.79	11.30	0.55				0.15						100	114
Annapolis G-24	4401.5A(1)	1A.1	21	12	Ab	68.48		18.99	0.77			0.16	11.60											100	115
Annapolis G-24	4401.5A(2)	1B.1	2	1	Ab	68.66		18.70				0.21	11.83							0.60				100	120
Annapolis G-24	4401.5A(2)	1B.1	4	10	Ab	68.57		18.59				0.29	11.85							0.71				100	121
Annapolis G-24	4401.5A(2)	1B.1	5.1	4	Ab	68.85		18.58				0.61	11.43							0.52				100	119
Annapolis G-24	4401.5A(2)	1B.1	6.1	1	Ab	68.50		18.60					12.50							0.39				100	120
Annapolis G-24	4401.5A(2)	1B.1	7	4	Ab	69.34		18.90				0.41	11.35											100	118
Annapolis G-24	4401.5A(2)	1B.1	10	9	Ab	69.33		18.48				0.21	11.99											100	121
Annapolis G-24	4401.5A(2)	1B.1	11	7	Ab	69.61		18.70					11.69											100	116
Annapolis G-24	4401.5A(2)	1B.1	11	12	Ab	67.68		19.51	0.84			0.80	10.95	0.21										100	117
Annapolis G-24	4401.5A(2)	1B.1	12	6	Ab	73.45		16.68					9.86											100	120
Annapolis G-24	4401.5A(2)	1B.1	14	8	Ab	68.88		18.42				0.90	11.79											100	116
Annapolis G-24	4401.5A(2)	1B.1	22	8	Ab	69.82		18.62					11.56											100	114
Annapolis G-24	4401.5A(2)	1B.1	23	6	Ab	50.47		37.57	0.43			11.53												100	72
Annapolis G-24	4401.5A(2)	1B.1	24	1	Ab	69.74		18.72					11.54											100	115
Annapolis G-24	4401.5A(2)	1B.1	24.1	3	Ab	68.62		18.07	1.55				11.60					0.16						100	112
Annapolis G-24	4401.5A(2)	1B.1	26	4	Ab	69.52		18.77					11.71											100	118
Annapolis G-24	4401.5A(2)	1B.1	33	8	Ab	70.07		18.39	0.22				11.33											100	111
Annapolis G-24	4401.5A(2)	1B.2	1.redo*	1	Ab	71.29		17.26	0.23				10.54							0.68				100	120
Annapolis G-24	4401.5A(2)	1B.2	2.redo	1	Ab	68.47		18.88				0.30	11.68							0.67				100	120
Annapolis G-24	4401.5B	1C.1	2	4	Ab	69.32		18.80				0.21	11.67											100	121
Annapolis G-24	4401.5B	1C.1	3	7	Ab	69.26		18.95				0.20	11.59											100	117
Annapolis G-24	4401.5B	1C.1	3	9	Ab	69.70		18.51					11.80											100	116
Annapolis G-24	4401.5B	1C.1	3.1	1	Ab	69.41		18.72					11.87											100	117
Annapolis G-24	4401.5B	1C.1	7	1	Ab	69.65		18.61					11.73											100	118
Annapolis G-24	4401.5B	1C.1	11.1	8	Ab	70.42		18.78					10.80											100	116
Annapolis G-24	4401.5B	1C.1	12	2	Ab	67.73		20.25					10.96	1.07										100	114
Annapolis G-24	4401.5B	1C.1	13	3	Ab	68.48		19.90					11.02	0.61										100	116
Annapolis G-24	4401.5B	1C.1	14.1	2	Ab	66.95		17.50				4.79	10.59	0.16										100	113
Annapolis G-24	4401.5B	1C.1	15.1	5	Ab	69.52		18.54	0.30				11.63											100	118
Annapolis G-24	5520	1F.1	3	5	Ab	67.53		19.24	0.91			0.36	11.77	0.18										100	125
Annapolis G-24	5520	1F.1	4	15	Ab	67.11		19.93	0.24			0.60	11.37	0.73										100	131
Annapolis G-24	5520	1F.1	6	13	Ab	68.88		18.78	0.24				12.12											100	137
Annapolis G-24	5520	1F.1	8	5	Ab	67.71		18.88	0.49				12.34	0.17		0.42								100	74
Annapolis G-24	5530	1G.1	3	11	Ab	69.83		18.63					11.54											100	118
Annapolis G-24	5530	1G.1	4	11	Ab	69.16		18.38	0.31			0.53	11.62											100	116
Annapolis G-24	5530	1G.1	7	8	Ab	69.38		18.62	0.22				11.77											100	119
Annapolis G-24	5530	1G.1	8	2	Ab	69.67		18.67					11.65											100	117
Annapolis G-24	5530	1G.1	11	8	Ab	69.44		18.80					11.76											100	116
Annapolis G-24	5530	1G.1	14	3	Ab	69.16		18.61	0.35			0.30	11.58											100	118

Table 5D: Select EDS chemical analyses of feldspar grains

Well	Sample	Appendix	Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	CoO	ZnO	BaO	PtO_2	Au_2O	Total	Actual Total
Annapolis G-24	5530	1G.1	14	5	Ab	69.88		18.51					11.61											100	117
Annapolis G-24	5530	1G.1	17	4	Ab	69.02		18.55	0.33			0.19	11.91											100	117
Annapolis G-24	5530	1G.1	18	1	Ab	69.08		19.03				0.42	11.35	0.11										100	117
Annapolis G-24	5530	1G.1	19	4	Ab	69.12		18.83	0.23				11.81											100	115
Annapolis G-24	5530	1G.1	19	5	Ab	69.41		18.67					11.18	0.74										100	114
Annapolis G-24	5530	1G.1	19	8	Ab	69.01		18.97	0.24			0.21	11.56											100	117
Annapolis G-24	5530	1G.1	20	6	Ab	69.33		18.61	0.23				11.84											100	118
Annapolis G-24	5530	1G.1	20	12	Ab	69.57		18.66	0.23				11.54											100	119
Annapolis G-24	5530	1G.1	21	4	Ab	69.79		18.54					11.67											100	119
Annapolis G-24	5530	1G.1	22	8	Ab	69.22		18.63	0.34			0.23	11.57											100	116
Annapolis G-24	5530	1G.1	25	3	Ab	69.39		18.56	0.22				11.83											100	119
Annapolis G-24	5530	1G.1	25	8	Ab	69.48		18.55	0.22				11.74											100	116
Annapolis G-24	5530	1G.1	27	7	Ab	69.37		18.58	0.42				11.63											100	117
Annapolis G-24	5530	1G.1	32	4	Ab	69.74		18.70					11.56											100	115
Annapolis G-24	5530	1G.1	33	5	Ab	69.51		18.60					11.89											100	118
Annapolis G-24	6045	1J.1	14	16	Ab	68.69		19.10					12.21											100	133
Annapolis G-24	6045	1K.1	2	3	Ab	67.92		19.98				0.45	10.81	0.84										100	118
Annapolis G-24	6045	1K.1	4	1	Ab	67.56		20.27				0.81	10.78	0.57										100	117
Annapolis G-24	6045	1K.1	6	4	Ab	68.75		18.68	0.26			0.39	11.91											100	118
Annapolis G-24	6045	1K.1	12	2	Ab	66.81		21.37	1.29				10.53											100	114
Annapolis G-24	6045	1K.1	12	6	Ab	69.06		18.50	0.37				12.07											100	118
Annapolis G-24	6045	1K.1	13	3	Ab	68.81		18.32	0.36				11.34	1.17										100	121
Annapolis G-24	6045	1K.1	22	3	Ab	67.71		19.73	0.25			1.24	11.08											100	120
Annapolis G-24	6045	1K.1	24	4	Ab	69.18	0.53	18.57				0.48	11.24											100	116
Annapolis G-24	6045	1K.1	34	11	Ab	68.98		19.10				0.65	11.27											100	119
Annapolis G-24	6045	1K.1	38	6	Ab	69.51		18.71					11.78											100	120
Annapolis G-24	6045	1K.1	40	8	Ab	68.98		19.15	0.23				11.65											100	114
Annapolis G-24	6045	1K.1	41	9	Ab	68.92		18.77	0.27			0.63	11.41											100	123
Balvenie B-79	3610	2A.1	7	2	Ab	67.39		19.17	0.21			0.51	12.36	0.36										100	107
Crimson F-81	6415	3A.1	1	13	Ab	60.87		16.71	0.51			11.39	10.51											100	111
Crimson F-81	6415	3A.1	3.1	1	Ab	68.39		18.95	0.90			0.46	11.31											100	122
Crimson F-81	6415	3A.1	3.1	5	Ab	69.29		18.65	1.17				10.89											100	116
Crimson F-81	6415	3A.1	5	18	Ab	68.20		19.70	0.43				11.29	0.38										100	117
Crimson F-81	6415	3A.1	6.1	5	Ab	67.84		19.49	0.32			0.73	11.47	0.16										100	124
Crimson F-81	6415	3A.1	10	6	Ab	66.05		21.17				2.82	9.96											100	118
Crimson F-81	6415	3A.1	10.2	1	Ab	69.30		18.82	0.45			0.29	11.13											100	121
Crimson F-81	6415	3A.2	23.2	1	Ab	69.01		18.63	1.03				11.33											100	119
Crimson F-81	6425	3B.1	9	13	Ab	69.40		18.68					11.92											100	113
Crimson F-81	6425	3B.1	15	9	Ab	67.21		19.47	1.08			0.70	11.12	0.42										100	121
Crimson F-81	6425	3B.1	15	13	Ab	74.33		15.55					10.12											100	118
Crimson F-81	6450	3C.1	4	15	Ab	68.58		18.41				0.20	11.53				1.28							100	117
Crimson F-81	6450	3C.1	7	1	Ab	69.30		18.73	0.22				11.75											100	117
Crimson F-81	6450	3C.1	7	5	Ab	68.87		19.07	0.30			0.47	11.29											100	118
Crimson F-81	6450	3C.1	7	10	Ab	69.09		18.67	0.61				11.63											100	117
Crimson F-81	6450	3C.1	7	13	Ab	63.91		21.38	4.42		0.70	0.57	7.18	1.84										100	111
Crimson F-81	6450	3C.1	8	13	Ab	69.10		18.68	0.80				11.42											100	114
Crimson F-81	6450	3C.1	12	5	Ab	67.58		19.03	1.48			0.40	10.86	0.65										100	121
Crimson F-81	6450	3C.1	12	6	Ab	69.97		18.35					11.68											100	118
Crimson F-81	6450	3C.1	13	7	Ab	70.13		17.59	0.63				11.21			0.44								100	118
Crimson F-81	6450	3C.1	21	5	Ab	69.29		18.70	0.32				11.69											100	117
Crimson F-81	6470(1)	3D.1	7	2	Ab	69.22		18.64	0.43			0.21	11.50											100	118
Crimson F-81	6470(1)	3D.1	11	4	Ab	69.23	0.24	19.03				0.48	11.02											100	116
Crimson F-81	6470(1)	3D.1	11	8	Ab	67.34	0.49	19.59	1.08			0.60	10.14	0.76										100	118

Table 5D: Select EDS chemical analyses of feldspar grains

Well	Sample	Appendix	Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	CoO	ZnO	BaO	PtO_2	Au_2O	Total	Actual Total
Crimson F-81	6470(1)	3D.1	12	1	Ab	68.54		19.37	0.33			0.47	10.98	0.31										100	118
Crimson F-81	6470(2)	3E.1	9	4	Ab	67.88		18.36	0.36				12.84			0.56								100	92
Crimson F-81	6470(2)	3E.1	10	8	Ab	66.05		19.65	0.53				13.77											100	107
Crimson F-81	6470(2)	3E.1	25	3	Ab	66.06		19.58				0.64	13.72											100	97
Crimson F-81	6470(2)	3E.1	27	4	Ab	66.53		19.30	0.38				13.65	0.14										100	97
Weymouth A-45	5715	4A.1	2	6	Ab	68.73		18.69	0.59				11.38	0.61										100	114
Weymouth A-45	5715	4A.1	4	6	Ab	68.95		18.54	0.53				12.01											100	112
Weymouth A-45	5715	4A.1	12	12	Ab	69.35		18.56	0.32				11.18	0.59										100	126
Weymouth A-45	5955	4B.1	1	3	Ab	69.20		18.69				0.41	11.70											100	122
Weymouth A-45	5955	4B.1	13	15	Ab	69.05		18.91	0.49			0.57	10.68	0.29										100	111
Weymouth A-45	6182.5	4D.1	1	11	Ab	65.42		19.93	0.37			1.30	12.71	0.25										100	120
Weymouth A-45	6213.5	4E.1	1	14	Ab	69.39		18.37				0.35	11.89											100	97
Weymouth A-45	6213.5	4E.1	2	1	Ab	69.47		18.84				0.20	11.50											100	96
Weymouth A-45	6213.5	4E.1	2	4	Ab	69.03		18.56				0.57	11.84											100	96
Weymouth A-45	6213.5	4E.1	3	2	Ab	69.35		18.76				0.32	11.57											100	97
Weymouth A-45	6213.5	4E.1	3	3	Ab	66.58		20.52	0.35			1.53	10.48	0.54										100	96
Weymouth A-45	6213.5	4E.1	3	4	Ab	68.77		19.10				0.39	11.74											100	97
Weymouth A-45	6213.5	4E.1	3	5	Ab	66.24		21.07				2.31	10.38											100	96
Weymouth A-45	6213.5	4E.1	3	7	Ab	67.07		20.10	0.68			1.19	10.72	0.24										100	97
Weymouth A-45	6213.5	4E.1	3	12	Ab	68.59	0.50	18.86	0.32				11.43	0.30										100	96
Weymouth A-45	6213.5	4E.1	5	2	Ab	65.17		21.28					12.59							0.96				100	84
Weymouth A-45	6213.5	4E.1	5	3	Ab	63.97		21.94					12.88							1.21				100	88
Weymouth A-45	6213.5	4E.1	5	6	Ab	59.52		21.14				5.07	12.98			0.72				0.57				100	84
Weymouth A-45	6213.5	4E.1	5	7	Ab	67.98		17.99				2.11	11.92											100	96
Weymouth A-45	6213.5	4E.1	6	17	Ab	68.87		18.82	0.44				11.62	0.24										100	97
Weymouth A-45	6213.5	4E.1	7	11	Ab	69.45		18.56					11.99											100	97
Weymouth A-45	6213.5	4E.1	7	13	Ab	67.76		19.12	1.49				11.39	0.24										100	94
Weymouth A-45	6213.5	4E.1	9	12	Ab	67.95		18.44					11.99									0.09	1.53	100	97
Weymouth A-45	6213.5	4E.1	9	13	Ab	69.00		18.95					12.05											100	96
Weymouth A-45	6213.5	4E.1	10	16	Ab	69.32		18.63					12.05											100	97
Weymouth A-45	6213.5	4E.1	11	1	Ab	69.52		18.35					12.13											100	96
Weymouth A-45	6213.5	4E.1	11	14	Ab	68.21		18.57				1.48	11.73											100	95
Weymouth A-45	6213.5	4E.1	11	16	Ab	67.33		19.59	0.60			0.56	11.31	0.61										100	99
Weymouth A-45	6213.5	4E.1	12	12	Ab	68.87		18.56	0.44				11.63	0.51										100	96
Weymouth A-45	6213.5	4E.1	13	12	Ab	69.15		18.65					12.20											100	98
Weymouth A-45	6213.5	4E.1	14	4	Ab	69.29		18.82					11.89											100	97
Weymouth A-45	6213.5	4E.1	15	9	Ab	69.30		18.74					11.96											100	97
Weymouth A-45	6213.5	4E.1	16	8	Ab	67.86		20.01				0.70	10.96	0.47										100	98
Weymouth A-45	6213.5	4E.1	16	9	Ab	68.31		19.03	0.59			0.21	11.85											100	97
Weymouth A-45	6213.5	4E.1	17	4	Ab	68.35		18.84	0.33			0.64	11.84											100	95
Weymouth A-45	6213.5	4E.1	17	7	Ab	69.11		19.22					11.68											100	96
Weymouth A-45	6213.5	4E.1	18	1	Ab	64.18		22.16	0.42			3.55	9.29	0.40										100	95
Weymouth A-45	6213.5	4E.1	18	2	Ab	67.40		19.71	0.36			1.22	10.96	0.35										100	93
Weymouth A-45	6213.5	4E.1	18	6	Ab	66.74		21.71				0.48	11.07											100	95
Weymouth A-45	6213.5	4E.1	18	14	Ab	68.99		19.35					11.66											100	95
Weymouth A-45	6213.5	4E.1	18	16	Ab	68.55		19.05				0.53	11.86											100	97
Weymouth A-45	6213.5	4E.1	21	17	Ab	66.04	1.53	18.10	0.36		0.33	1.39	10.92	0.41	0.92									100	96
Weymouth A-45	6213.5	4E.1	23	10	Ab	66.93		20.30	0.36			1.78	10.46	0.17										100	96
Weymouth A-45	6213.5	4E.1	23	11	Ab	69.26		18.56	0.39				11.80											100	97
Weymouth A-45	6213.5	4E.1	23	21	Ab	68.31		18.82	1.17				11.70											100	95
Weymouth A-45	6213.5	4E.1	24	8	Ab	68.75		19.33				0.31	11.61											100	95
Weymouth A-45	6213.5	4E.1	24	15	Ab	69.08		18.99					11.93											100	95
Weymouth A-45	6213.5	4E.1	24	21	Ab	69.30		18.52					12.17											100	97

Table 5D: Select EDS chemical analyses of feldspar grains

Well	Sample	Appendix	Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	CoO	ZnO	BaO	PtO_2	Au_2O	Total	Actual Total
Weymouth A-45	6213.5	4E.1	25	3	Ab	67.31		19.99				1.29	11.19	0.22										100	101
Weymouth A-45	6213.5	4E.1	25	15	Ab	66.95		20.54	0.82		0.32		10.35	1.01										100	99
Newburn H-23	4318.5	Sangster, 2016	1	1	Ab	65.20		21.54				2.85	10.25	0.16										100	97
Newburn H-23	5407	Sangster, 2016	1	1	Ab	75.68		14.64					9.41	0.26										100	104
Newburn H-23	5407	Sangster, 2016	1	1	Ab	68.97		18.56					12.48											100	125
Newburn H-23	4318.5	Sangster, 2016	1	3	Ab	66.61		20.50				1.13	11.19	0.58										100	97
Newburn H-23	4353.5	Sangster, 2016	1	4	Ab	68.71		18.65				0.25	12.40											100	119
Newburn H-23	4313.5	Sangster, 2016	1	6	Ab	69.27		18.65					12.08											100	142
Newburn H-23	4318.5	Sangster, 2016	1	6	Ab	64.60		21.75				2.99	10.52	0.12										100	91
Newburn H-23	4353.5	Sangster, 2016	1	6	Ab	67.77		20.05	0.21			0.25	11.73											100	117
Newburn H-23	5957	Sangster, 2016	1	6	Ab	68.92		18.82					12.26											100	131
Newburn H-23	4313.5	Sangster, 2016	1	7	Ab	69.07		18.86					12.05											100	147
Newburn H-23	5407	Sangster, 2016	1	9	Ab	69.01		18.57					12.42											100	121
Newburn H-23	5408.5	Sangster, 2016	1	9	Ab	67.71		18.95				0.25	13.09											100	144
Newburn H-23	5407	Sangster, 2016	1	10	Ab	65.57		21.92	1.14				11.37											100	77
Newburn H-23	4313.5	Sangster, 2016	1	11	Ab	68.52		19.44				0.45	11.58											100	146
Newburn H-23	4313.5	Sangster, 2016	1	12	Ab	79.81		12.43					7.77											100	135
Newburn H-23	4318.5	Sangster, 2016	1	12	Ab	69.61		17.84	0.21				11.89					0.47						100	63
Newburn H-23	4353.5	Sangster, 2016	1	12	Ab	67.86		20.58				1.08	10.22	0.28										100	107
Newburn H-23	4318.5	Sangster, 2016	1	15	Ab	68.07		19.18					12.35	0.40										100	111
Newburn H-23	5408.5	Sangster, 2016	1	19	Ab	68.37		18.82					12.81											100	162
Newburn H-23	5407	Sangster, 2016	1	22	Ab	67.45		19.25				0.31	13.00											100	85
Newburn H-23	4353.5	Sangster, 2016	1	23	Ab	68.73		20.03	0.54				10.70											100	120
Newburn H-23	4353.5	Sangster, 2016	1	26	Ab	68.60		20.60	0.23				10.39	0.19										100	116
Newburn H-23	4315	Sangster, 2016	2	4	Ab	67.96		18.46	0.31			1.30	11.95											100	119
Newburn H-23	4315	Sangster, 2016	2	5	Ab	69.29		18.67					12.04											100	124
Newburn H-23	5407	Sangster, 2016	2	5	Ab	67.41		19.18	0.58				12.82											100	72
Newburn H-23	4353.5	Sangster, 2016	2	6	Ab	68.92		18.67					12.40											100	120
Newburn H-23	5408.5	Sangster, 2016	2	6	Ab	70.85		17.21					11.95											100	125
Newburn H-23	4353.5	Sangster, 2016	2	7	Ab	78.72		12.36					8.93											100	121
Newburn H-23	5407	Sangster, 2016	2	7	Ab	77.52		12.58	0.36				9.37	0.17										100	123
Newburn H-23	4353.5	Sangster, 2016	2	8	Ab	68.63		18.16				0.98	12.24											100	121
Newburn H-23	5213.5	Sangster, 2016	2	8	Ab	68.30		19.20				0.41	12.09											100	136
Newburn H-23	4353.5	Sangster, 2016	2	9	Ab	70.02		19.48					10.50											100	110
Newburn H-23	5407	Sangster, 2016	2	9	Ab	67.51		19.20				0.32	12.97											100	68
Newburn H-23	5407	Sangster, 2016	2	10	Ab	68.09		18.73					13.20											100	68
Newburn H-23	4318.5	Sangster, 2016	2	11	Ab	66.06		20.71				1.79	11.32	0.13										100	92
Newburn H-23	4353.5	Sangster, 2016	2	11	Ab	65.63		20.60	0.95			0.62	10.06	0.29		1.87								100	102
Newburn H-23	4353.5	Sangster, 2016	2	11	Ab	67.86		19.37				0.78	12.00											100	117
Newburn H-23	4318.5	Sangster, 2016	2	13	Ab	74.40		15.42					10.17											100	102
Newburn H-23	4318.5	Sangster, 2016	2	15	Ab	69.22		20.52					9.01	1.05				0.20						100	46
Newburn H-23	4318.5	Sangster, 2016	2	16	Ab	68.54		18.93					12.21	0.31										100	99
Newburn H-23	4913.8	Sangster, 2016	3	1	Ab	71.00		16.95	0.28				11.74											100	121
Newburn H-23	5408.5	Sangster, 2016	3	3	Ab	68.86		18.52					12.63											100	116
Newburn H-23	4315	Sangster, 2016	3	4	Ab	66.29		21.22	0.32			0.90	10.95	0.34										100	122
Newburn H-23	5213.5	Sangster, 2016	3	4	Ab	68.43		18.50	0.23			0.35	12.47											100	147
Newburn H-23	5407	Sangster, 2016	3	5	Ab	67.96		18.84					13.20											100	64
Newburn H-23	5408.5	Sangster, 2016	3	6	Ab	68.56		18.63				0.22	12.59											100	110
Newburn H-23	5961.7	Sangster, 2016	3	7	Ab	68.88		18.82					12.30											100	98
Newburn H-23	5962	Sangster, 2016	3	7	Ab	67.36		19.69	0.66			0.28	11.70	0.31										100	88
Newburn H-23	4313.5	Sangster, 2016	3	9	Ab	68.26		18.84	0.63				12.03	0.25										100	140
Newburn H-23	4318.5	Sangster, 2016	3	9	Ab	68.26		19.07					12.67											100	94
Newburn H-23	5407	Sangster, 2016	3	10	Ab	65.61		20.10	1.43				12.66	0.19										100	64

Table 5D: Select EDS chemical analyses of feldspar grains

Well	Sample	Appendix	Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	CoO	ZnO	BaO	PtO_2	Au_2O	Total	Actual Total
Newburn H-23	4353.5	Sangster, 2016	3	11	Ab	68.90		19.92				0.39	10.79											100	92
Newburn H-23	4315	Sangster, 2016	3	13	Ab	67.21		19.07	1.62				11.84	0.25										100	140
Newburn H-23	4318.5	Sangster, 2016	3	14	Ab	67.60		20.29				0.20	11.92											100	95
Newburn H-23	4353.5	Sangster, 2016	3	14	Ab	67.79		20.05				1.50	10.66											100	98
Newburn H-23	5961.7	Sangster, 2016	3	14	Ab	68.73		18.99				0.20	12.09											100	98
Newburn H-23	4318.5	Sangster, 2016	3	15	Ab	68.50		18.93					12.57											100	89
Newburn H-23	4318.5	Sangster, 2016	3	17	Ab	68.07		19.22					12.23	0.48										100	93
Newburn H-23	5408.5	Sangster, 2016	3	18	Ab	69.12		18.63					12.26											100	110
Newburn H-23	4353.5	Sangster, 2016	3	19	Ab	68.86		20.33					10.66	0.14										100	108
Newburn H-23	5407	Sangster, 2016	3	21	Ab	68.09		18.74					13.16											100	61
Newburn H-23	4353.5	Sangster, 2016	3	22	Ab	67.81		21.05	0.55			0.34	10.25											100	123
Newburn H-23	5213.5	Sangster, 2016	4	1	Ab	68.60		18.61				0.18	12.61											100	147
Newburn H-23	4353.5	Sangster, 2016	4	3	Ab	65.59		19.58	0.44			2.18	10.44		1.79									100	118
Newburn H-23	4318.5	Sangster, 2016	4	4	Ab	68.09		19.41				0.21	12.30											100	73
Newburn H-23	4353.5	Sangster, 2016	4	4	Ab	69.10		20.10					10.79											100	116
Newburn H-23	4913.8	Sangster, 2016	4	4	Ab	69.48		18.76					11.74											100	123
Newburn H-23	5213.5	Sangster, 2016	4	5	Ab	68.48		18.82	0.26			0.29	11.84	0.30										100	136
Newburn H-23	5403.6	Sangster, 2016	4	6	Ab	68.86		18.90					12.24											100	116
Newburn H-23	4353.5	Sangster, 2016	4	9	Ab	68.63		20.07				0.78	10.52											100	110
Newburn H-23	4353.5	Sangster, 2016	4	13	Ab	69.20		20.20					10.58											100	111
Newburn H-23	5408.5	Sangster, 2016	4	14	Ab	66.61		18.33	0.22			1.36	11.95		1.51									100	128
Newburn H-23	5408.5	Sangster, 2016	4	15	Ab	67.43		20.35	0.31				11.07	0.83										100	120
Newburn H-23	5961.7	Sangster, 2016	4	17	Ab	72.73	0.25	16.29	0.53			0.32	8.93	0.94										100	91
Newburn H-23	5408.5	Sangster, 2016	4	19	Ab	68.05		19.12	1.52				11.28											100	117
Newburn H-23	5213.5	Sangster, 2016	4	22	Ab	74.19		15.38					10.42											100	145
Newburn H-23	5407	Sangster, 2016	4	24	Ab	68.30		18.80					12.89											100	58
Newburn H-23	4353.5	Sangster, 2016	4	27	Ab	66.98		21.37	0.22			0.24	9.94	1.25										100	107
Newburn H-23	5407	Sangster, 2016	4	28	Ab	67.06		18.97	0.66				13.32											100	59
Newburn H-23	5403.6	Sangster, 2016	5	6	Ab	68.75		18.82					12.42											100	117
Newburn H-23	4353.5	Sangster, 2016	5	13	Ab	71.32		18.76					9.94											100	127
Newburn H-23	4313.5	Sangster, 2016	5	14	Ab	68.28	0.47	18.95					12.31											100	148
Newburn H-23	5407	Sangster, 2016	5	16	Ab	64.92	0.65	19.39	1.69		0.53		12.43	0.39										100	51
Newburn H-23	5961.7	Sangster, 2016	5	17	Ab	68.52		19.14	0.35				12.00											100	100
Newburn H-23	5407	Sangster, 2016	5	18	Ab	68.13		18.67					13.20											100	53
Newburn H-23	5407	Sangster, 2016	5	23	Ab	65.93	1.22	18.91	1.87				12.07											100	49
Newburn H-23	5408.5	Sangster, 2016	5	23	Ab	66.85		19.35	1.70			0.31	11.68	0.11										100	164
Newburn H-23	5965	Sangster, 2016	6	1	Ab	68.41		18.99	0.32				12.27											100	130
Newburn H-23	4315	Sangster, 2016	6	3	Ab	69.01		18.50	0.24				11.81	0.43										100	126
Newburn H-23	5957	Sangster, 2016	6	3	Ab	65.35		21.54				1.18	10.75	1.17										100	131
Newburn H-23	4315	Sangster, 2016	6	4	Ab	68.71		18.84	0.58				11.88											100	134
Newburn H-23	5957	Sangster, 2016	6	4	Ab	65.84		21.52	0.23			1.19	10.37	0.84										100	127
Newburn H-23	4318.5	Sangster, 2016	6	5	Ab	69.07		18.59					12.34											100	72
Newburn H-23	4318.5	Sangster, 2016	6	9	Ab	68.52		19.08					12.39											100	69
Newburn H-23	5403.6	Sangster, 2016	6	9	Ab	68.99		18.71					12.30											100	113
Newburn H-23	5407	Sangster, 2016	6	9	Ab	66.61		19.97	0.55				12.27	0.59										100	52
Newburn H-23	5408.5	Sangster, 2016	6	13	Ab	68.35		18.88	0.39				12.38											100	138
Newburn H-23	5407	Sangster, 2016	6	22	Ab	67.90		18.82					13.28											100	51
Newburn H-23	5407	Sangster, 2016	6	27	Ab	65.84	0.47	20.86	0.66				11.16	1.00										100	43
Newburn H-23	5403.6	Sangster, 2016	7	5	Ab	68.63		18.71				0.43	12.23											100	113
Newburn H-23	4313.5	Sangster, 2016	7	7	Ab	69.93		18.88					10.73	0.46										100	110
Newburn H-23	4313.5	Sangster, 2016	7	8	Ab	68.90		19.42					10.99	0.69										100	121
Newburn H-23	4353.5	Sangster, 2016	7	8	Ab	69.01		20.29					10.54					0.15						100	101
Newburn H-23	5407	Sangster, 2016	7	8	Ab	66.76		19.08	1.83				12.32											100	45

Table 5D: Select EDS chemical analyses of feldspar grains

Well	Sample	Appendix	Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	CoO	ZnO	BaO	PtO_2	Au_2O	Total	Actual Total
Newburn H-23	5213.5	Sangster, 2016	7	10	Ab	68.73		18.97					12.30											100	140
Newburn H-23	4313.5	Sangster, 2016	7	12	Ab	69.10		18.50					12.40											100	156
Newburn H-23	4318.5	Sangster, 2016	7	12	Ab	99.99																		100	63
Newburn H-23	4318.5	Sangster, 2016	7	13	Ab	72.69		16.34					10.95											100	69
Newburn H-23	5407	Sangster, 2016	7	13	Ab	67.30		19.03	0.99				12.69											100	53
Newburn H-23	5408.5	Sangster, 2016	7	14	Ab	68.75		19.25	0.30				11.69											100	141
Newburn H-23	5408.5	Sangster, 2016	7	15	Ab	69.07		18.82					12.09											100	140
Newburn H-23	4353.5	Sangster, 2016	7	16	Ab	68.99		20.43					10.60											100	91
Newburn H-23	4313.5	Sangster, 2016	7	19	Ab	68.78		17.69					11.76			1.27		0.52						100	58
Newburn H-23	4313.5	Sangster, 2016	7	20	Ab	67.66		18.46					12.90			0.97								100	120
Newburn H-23	5407	Sangster, 2016	7	23	Ab	64.77		21.13	0.85				11.63	1.63										100	49
Newburn H-23	5408.5	Sangster, 2016	7	28	Ab	68.54		19.10	0.30				12.07											100	143
Newburn H-23	5408.5	Sangster, 2016	8	2	Ab	67.75		19.07	0.24				12.82	0.12										100	141
Newburn H-23	4313.5	Sangster, 2016	8	3	Ab	66.19		20.97				2.27	10.57											100	142
Newburn H-23	4300	Sangster, 2016	8	5	Ab	68.41		18.52					13.08											100	108
Newburn H-23	4353.5	Sangster, 2016	8	5	Ab	67.86		20.52	0.76			0.27	10.34	0.25										100	111
Newburn H-23	4913.8	Sangster, 2016	8	5	Ab	69.03		18.65	0.33				11.99											100	120
Newburn H-23	4313.5	Sangster, 2016	8	12	Ab	69.48		18.50					12.01											100	135
Newburn H-23	4318.5	Sangster, 2016	8	13	Ab	67.56		18.91					11.54	1.99										100	53
Newburn H-23	4353.5	Sangster, 2016	8	15	Ab	69.31		20.05					10.64											100	114
Newburn H-23	4353.5	Sangster, 2016	8	18	Ab	69.31		20.05					10.65											100	116
Newburn H-23	4313.5	Sangster, 2016	8	21	Ab	68.84		18.61					12.54											100	149
Newburn H-23	5408.5	Sangster, 2016	8	22	Ab	70.44		15.44	0.35			2.07	11.69											100	131
Newburn H-23	4313.5	Sangster, 2016	8	23	Ab	68.95		18.76					12.27											100	149
Newburn H-23	5213.5	Sangster, 2016	9	1	Ab	64.39		22.05				3.62	9.76	0.17										100	136
Newburn H-23	4313.5	Sangster, 2016	9	10	Ab	68.43		19.42				0.48	11.65											100	142
Newburn H-23	4313.5	Sangster, 2016	9	12	Ab	66.94		20.20	1.78		0.56	0.56	8.68	1.29										100	120
Newburn H-23	4353.5	Sangster, 2016	9	13	Ab	65.18		21.84	0.46			1.19	9.56	0.99		0.77								100	89
Newburn H-23	4318.5	Sangster, 2016	9	14	Ab	64.82		21.96				2.87	10.06	0.29										100	67
Newburn H-23	4318.5	Sangster, 2016	9	16	Ab	68.75		18.65					12.61											100	68
Newburn H-23	4353.5	Sangster, 2016	9	16	Ab	68.09		21.28	0.33				10.31											100	113
Newburn H-23	5407	Sangster, 2016	9	16	Ab	68.28		18.86					12.85											100	51
Newburn H-23	5213.5	Sangster, 2016	9	18	Ab	68.80		18.88					12.34											100	139
Newburn H-23	5407	Sangster, 2016	9	20	Ab	77.18		13.32	0.36				9.14											100	48
Newburn H-23	5407	Sangster, 2016	9	21	Ab	68.33		18.63					13.05											100	50
Newburn H-23	4913.8	Sangster, 2016	10	5	Ab	72.16		16.87					10.97											100	109
Newburn H-23	5408.5	Sangster, 2016	10	9	Ab	68.71		18.76					12.52											100	146
Newburn H-23	5408.5	Sangster, 2016	10	11	Ab	67.11		19.84	0.66		0.41	0.94	10.77	0.28										100	152
Newburn H-23	5408.5	Sangster, 2016	10	25	Ab	66.61		18.71	0.73			1.18	11.99		0.76									100	148
Newburn H-23	4313.5	Sangster, 2016	11	4	Ab	69.44		18.40					12.16											100	147
Newburn H-23	5962	Sangster, 2016	11	4	Ab	68.07		18.82	0.49			0.35	12.27											100	161
Newburn H-23	4318.5	Sangster, 2016	11	5	Ab	67.83		19.03	1.33				11.81											100	48
Newburn H-23	5962	Sangster, 2016	11	8	Ab	68.50		18.74	0.32				12.44											100	163
Newburn H-23	5961.7	Sangster, 2016	11	10	Ab	67.66		19.65	0.67				11.50	0.49										100	92
Newburn H-23	5962	Sangster, 2016	11	10	Ab	68.86		18.97					12.17											100	160
Newburn H-23	5962	Sangster, 2016	11	11	Ab	67.79		20.29	0.30				11.59											100	159
Newburn H-23	5407	Sangster, 2016	11	13	Ab	67.68		18.76	0.36				13.20											100	51
Newburn H-23	4353.5	Sangster, 2016	11	21	Ab	69.12		20.14					10.75											100	108
Newburn H-23	5213.5	Sangster, 2016	11	22	Ab	66.94		18.82	0.41			0.99	12.43		0.41									100	119
Newburn H-23	4300	Sangster, 2016	12	3	Ab	65.74		21.20	0.46			0.85	10.76	0.96										100	129
Newburn H-23	5407	Sangster, 2016	12	3	Ab	66.83		18.76	1.03				12.78			0.60								100	47
Newburn H-23	4300	Sangster, 2016	12	7	Ab	68.52		18.56					12.93											100	145
Newburn H-23	5213.5	Sangster, 2016	12	7	Ab	69.87		16.93	1.81			0.18	11.22											100	130

Table 5D: Select EDS chemical analyses of feldspar grains

Well	Sample	Appendix	Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	CoO	ZnO	BaO	PtO_2	Au_2O	Total	Actual Total
Newburn H-23	5213.5	Sangster, 2016	12	14	Ab	67.88		19.22	0.19			0.34	12.26	0.12										100	130
Newburn H-23	5213.5	Sangster, 2016	12	20	Ab	67.58		19.27	0.71			0.28	12.16											100	137
Newburn H-23	5407	Sangster, 2016	12	20	Ab	68.56		18.25					13.19											100	46
Newburn H-23	5213.5	Sangster, 2016	12	21	Ab	66.74		18.91	0.54			0.90	12.07		0.85									100	139
Newburn H-23	4300	Sangster, 2016	13	2	Ab	68.60		18.56					12.85											100	144
Newburn H-23	5957	Sangster, 2016	13	4	Ab	67.66		19.52	0.45			0.41	11.62	0.34										100	133
Newburn H-23	5957	Sangster, 2016	13	9	Ab	68.52		18.95	0.28				12.24											100	131
Newburn H-23	4353.5	Sangster, 2016	13	11	Ab	71.41		18.61	0.49		0.40	0.17	8.53	0.41										100	104
Newburn H-23	5408.5	Sangster, 2016	13	11	Ab	67.11		19.54	0.28			0.64	12.27	0.16										100	132
Newburn H-23	5408.5	Sangster, 2016	13	12	Ab	66.46		20.22	0.58			1.05	11.68											100	129
Newburn H-23	5407	Sangster, 2016	13	13	Ab	68.20		18.90					12.90											100	50
Newburn H-23	4353.5	Sangster, 2016	13	15	Ab	68.90		20.37					10.73											100	104
Newburn H-23	5408.5	Sangster, 2016	13	15	Ab	65.84		20.75	0.33			0.98	11.39	0.71										100	131
Newburn H-23	5406.5	Sangster, 2016	14	1	Ab	69.05		19.33					11.62											100	48
Newburn H-23	5403.6	Sangster, 2016	14	7	Ab	68.37		19.25					12.36											100	93
Newburn H-23	5957	Sangster, 2016	14	10	Ab	67.47		19.37	0.63			0.28	11.50	0.73										100	133
Newburn H-23	5957	Sangster, 2016	14	11	Ab	67.38		19.05	1.47				11.95	0.14										100	130
Newburn H-23	5961.7	Sangster, 2016	14	14	Ab	69.03		18.82					12.16											100	89
Newburn H-23	4313.5	Sangster, 2016	15	4	Ab	69.33		18.78					11.89											100	132
Newburn H-23	4913.8	Sangster, 2016	15	5	Ab	67.60		19.27	0.94				11.97	0.22										100	105
Newburn H-23	5957	Sangster, 2016	15	5	Ab	65.72		21.22	0.93		0.41	0.29	10.42	1.00										100	130
Newburn H-23	5965	Sangster, 2016	15	6	Ab	68.56		18.82				0.25	12.38											100	149
Newburn H-23	5961.7	Sangster, 2016	15	6	Ab	69.14		18.80	0.28				11.77											100	89
Newburn H-23	5962	Sangster, 2016	15	6	Ab	68.05		18.76	0.87				12.31											100	156
Newburn H-23	4318.5	Sangster, 2016	15	9	Ab	68.39		19.14					12.13	0.34										100	45
Newburn H-23	4913.8	Sangster, 2016	16	2	Ab	67.66		20.20				0.35	11.32	0.47										100	106
Newburn H-23	4313.5	Sangster, 2016	16	7	Ab	69.29		18.76					11.96											100	123
Newburn H-23	4913.8	Sangster, 2016	16	10	Ab	66.96		20.22				1.60	11.23											100	107
Newburn H-23	4300	Sangster, 2016	17	6	Ab	68.43		18.57					13.00											100	183
Newburn H-23	5961.7	Sangster, 2016	17	7	Ab	68.56		18.99	0.21				12.26											100	88
Newburn H-23	5957	Sangster, 2016	18	7	Ab	66.94		19.59	1.13			0.31	11.45	0.58										100	131
Newburn H-23	4313.5	Sangster, 2016	19	12	Ab	68.86		19.05					12.09											100	130
Newburn H-23	4313.5	Sangster, 2016	19	13	Ab	68.95	0.60	18.10				0.32	11.68	0.37										100	127
Newburn H-23	4313.5	Sangster, 2016	20	5	Ab	68.82		19.10					12.08											100	124
Newburn H-23	5961.7	Sangster, 2016	20	7	Ab	68.84		18.86					12.31											100	81
Newburn H-23	4313.5	Sangster, 2016	21	6	Ab	68.45		19.31			0.46		11.23	0.55										100	131
Weymouth A-45	6213.5	4E.1	25	12	Ab	67.68		19.48	0.39			0.80	10.88	0.77										100	99
Crimson F-81	6415	3A.2	23.2	2	And	54.64		28.24	3.33			8.30	5.34	0.15										100	114
Weymouth A-45	6213.5	4E.1	10	8	And	60.39		24.59	0.59			7.02	6.63	0.78										100	95
Weymouth A-45	6213.5	4E.1	11	2	And	60.63		24.42	0.31			6.30	7.16	1.18										100	93
Weymouth A-45	6213.5	4E.1	13	13	And	56.91		26.91	0.84			9.54	5.46	0.34										100	96
Weymouth A-45	6213.5	4E.1	16	10	And	60.63		24.34	0.45			6.79	7.06	0.73										100	95
Weymouth A-45	6213.5	4E.1	18	8	And	57.17		27.02	0.48			9.08	5.77	0.48										100	95
Weymouth A-45	6213.5	4E.1	18	15	And	56.56		27.15	0.60			9.91	5.49	0.29										100	95
Weymouth A-45	6213.5	4E.1	21	12	And	59.15		25.19	0.69			7.54	6.27	1.16										100	95
Weymouth A-45	6213.5	4E.1	24	7	And	58.74		26.68	0.62			7.04	6.66	0.26										100	93
Annapolis G-24	4401.5A(1)	1A.1	14	3	Kfs	66.22		17.76					0.64	15.38										100	114
Annapolis G-24	4401.5A(2)	1B.1	19	9	Kfs	66.36		17.63					0.66	15.35										100	119
Annapolis G-24	4401.5B	1C.1	12.1	6	Kfs	65.67		17.81					0.73	14.85							0.95			100	115
Annapolis G-24	5505	1D.1	9	14	Kfs	67.06		17.63	0.33				0.27	14.71										100	96
Annapolis G-24	5505	1D.1	11	1	Kfs	66.94		17.67						15.39										100	125
Annapolis G-24	5530	1G.1	24.1	2	Kfs	65.94		17.62					0.32	16.12										100	112
Annapolis G-24	6045	1J.1	2	1	Kfs	66.25		18.16	0.17					15.42										100	118

Table 5D: Select EDS chemical analyses of feldspar grains

Well	Sample	Appendix	Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	CoO	ZnO	BaO	PtO_2	Au_2O	Total	Actual Total
Annapolis G-24	6045	1J.1	2	5	Kfs	65.63	1.42	17.57	0.21					15.19										100	118
Annapolis G-24	6045	1J.1	2	6	Kfs	64.26		18.76	1.54	0.36				15.09										100	116
Annapolis G-24	6045	1J.1	2	10	Kfs	64.09		18.06	0.96	1.56				14.68							0.64			100	118
Annapolis G-24	6045	1J.1	10	4	Kfs	62.06	0.67	21.75	1.05		0.95			13.54										100	103
Annapolis G-24	6045	1K.1	2	2	Kfs	65.45		18.04						15.37							1.13			100	116
Annapolis G-24	6045	1K.1	2	12	Kfs	66.47		17.77						15.76										100	117
Annapolis G-24	6045	1K.1	6	2	Kfs	66.60		17.23	0.44					15.74										100	114
Annapolis G-24	6045	1K.1	10	5	Kfs	66.75		17.72					1.79	13.74										100	117
Annapolis G-24	6045	1K.1	29	4	Kfs	65.16	0.42	18.24	0.34				0.90	14.95										100	115
Annapolis G-24	6045	1K.1	31	3	Kfs	66.15		17.25	0.71				1.10	14.80										100	119
Annapolis G-24	6045	1K.1	38	3	Kfs	65.76		18.60	0.33					15.31										100	113
Balvenie B-79	3610	2A.1	10	2	Kfs	66.90		18.24	0.70				0.46	13.70										100	91
Balvenie B-79	3645	2B.1	5	10	Kfs	65.65		17.56	0.63				0.60	15.56										100	110
Balvenie B-79	3645	2B.1	17	1	Kfs	66.19		17.65					0.44	15.72										100	113
Crimson F-81	6415	3A.1	9	9	Kfs	63.94		19.82	0.72		0.57			14.95										100	116
Crimson F-81	6415	3A.1	10	4	Kfs	66.93		17.55						15.52										100	120
Crimson F-81	6415	3A.1	18	2	Kfs	63.66		19.87	0.88		0.58			15.02										100	118
Crimson F-81	6415	3A.1	19	26	Kfs	66.07		17.55					0.29	15.40							0.70			100	112
Crimson F-81	6415	3A.3	6.2	Fig. 52, 9	Kfs	66.68		17.52	1.21			0.55	4.87	9.17										100	141
Crimson F-81	6425	3B.1	2	6	Kfs	65.50	0.35	13.45	1.62		1.58	0.66	2.44	14.40										100	121
Crimson F-81	6425	3B.1	4	17	Kfs	66.41		17.58						16.01										100	113
Crimson F-81	6425	3B.1	11	13	Kfs	69.94		15.75	0.39					13.92										100	112
Crimson F-81	6450	3C.1	6	3	Kfs	66.72		17.41						15.87										100	115
Crimson F-81	6450	3C.1	6	15	Kfs	66.12		17.77						15.47							0.64			100	118
Crimson F-81	6450	3C.1	9	10	Kfs	65.13		18.81	0.27					15.79										100	112
Crimson F-81	6450	3C.2	22	3	Kfs	69.47		18.77	0.53				11.23											100	120
Crimson F-81	6470(1)	3D.1	7	10	Kfs	65.92		17.93						16.15										100	117
Crimson F-81	6470(1)	3D.1	10	8	Kfs	65.96		18.30						15.74										100	122
Crimson F-81	6470(1)	3D.1	13	8	Kfs	65.63		18.23	0.22				0.47	15.45										100	123
Crimson F-81	6470(1)	3D.1	16	8	Kfs	66.27		17.81						15.92										100	121
Crimson F-81	6470(2)	3E.1	11	11	Kfs	67.25		18.63	0.23					13.07							0.82			100	96
Crimson F-81	6470(2)	3E.1	11	13	Kfs	68.10		18.14	0.25					13.51										100	94
Crimson F-81	6470(2)	3E.1	16	3	Kfs	67.82		18.40						13.78										100	97
Crimson F-81	6470(2)	3E.1	18	4	Kfs	68.31		18.17	0.30					13.22										100	91
Crimson F-81	6470(2)	3E.1	29	4	Kfs	68.60		18.79						12.61										100	83
Weymouth A-45	5955	4B.1	4	7	Kfs	65.97		18.01						16.01										100	117
Weymouth A-45	5960	4C.1	1	11	Kfs	68.15		17.95	1.94		0.65			11.31										100	85
Weymouth A-45	6213.5	4E.1	24	17	Kfs	66.65		17.93					0.69	14.73										100	93
Newburn H-23	4318.5	Sangster, 2016	1	5	Kfs	66.51		18.29					0.62	14.60										100	92
Newburn H-23	4318.5	Sangster, 2016	1	13	Kfs	65.84		17.19					2.80	11.00			2.63	0.54						100	33
Newburn H-23	4318.5	Sangster, 2016	2	2	Kfs	66.72		17.99						15.29										100	89
Newburn H-23	4318.5	Sangster, 2016	2	3	Kfs	66.79		18.03					0.61	14.57										100	98
Newburn H-23	4318.5	Sangster, 2016	3	1	Kfs	66.57		18.06					0.55	14.83										100	92
Newburn H-23	4353.5	Sangster, 2016	3	1	Kfs	66.70		17.91					0.67	14.72										100	117
Newburn H-23	4318.5	Sangster, 2016	3	2	Kfs	66.72		18.14					0.86	14.29										100	85
Newburn H-23	4318.5	Sangster, 2016	3	3	Kfs	66.61		18.08	0.18				0.73	14.39										100	81
Newburn H-23	4318.5	Sangster, 2016	3	6	Kfs	66.72		18.14					0.59	14.53										100	83
Newburn H-23	4318.5	Sangster, 2016	3	23	Kfs	67.04		17.95					0.49	14.53										100	88
Newburn H-23	4318.5	Sangster, 2016	4	5	Kfs	66.68		17.99					0.81	14.51										100	71
Newburn H-23	4318.5	Sangster, 2016	4	13	Kfs	66.64		17.97						14.94							0.45			100	76
Newburn H-23	4318.5	Sangster, 2016	7	4	Kfs	66.57		17.88					0.67	14.88										100	69
Newburn H-23	4318.5	Sangster, 2016	7	7	Kfs	66.66		18.06					0.39	14.88										100	67
Newburn H-23	4318.5	Sangster, 2016	7	8	Kfs	66.74		17.95					0.40	14.90										100	67

Table 5D: Select EDS chemical analyses of feldspar grains

Well	Sample	Appendix	Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	CoO	ZnO	BaO	PtO_2	Au_2O	Total	Actual Total
Newburn H-23	4318.5	Sangster, 2016	7	9	Kfs	66.51		18.18					0.75	14.56										100	66
Newburn H-23	4318.5	Sangster, 2016	8	4	Kfs	66.85		17.99					0.74	14.42										100	62
Newburn H-23	4318.5	Sangster, 2016	8	6	Kfs	66.44		18.18					1.12	14.26										100	55
Newburn H-23	4318.5	Sangster, 2016	8	10	Kfs	66.66		17.78					0.38	15.17										100	64
Newburn H-23	4318.5	Sangster, 2016	8	14	Kfs	66.83		17.95					0.63	14.57										100	52
Newburn H-23	4318.5	Sangster, 2016	9	13	Kfs	67.02		18.23					1.71	13.01										100	66
Newburn H-23	4318.5	Sangster, 2016	10	1	Kfs	66.34		18.22					0.74	14.72										100	49
Newburn H-23	4318.5	Sangster, 2016	10	4	Kfs	66.21		18.31					0.65	14.84										100	50
Newburn H-23	4300	Sangster, 2016	11	4	Kfs	67.26		17.74	0.55					14.44										100	121
Newburn H-23	5965	Sangster, 2016	11	5	Kfs	66.55		18.03						15.43										100	119
Newburn H-23	4318.5	Sangster, 2016	11	8	Kfs	66.59		17.95					0.90	14.56										100	52
Newburn H-23	4318.5	Sangster, 2016	12	3	Kfs	66.61		17.99					0.70	14.70										100	48
Newburn H-23	5950	Sangster, 2016	13	5	Kfs	66.81		17.72						15.47										100	139
Newburn H-23	4318.5	Sangster, 2016	13	21	Kfs	66.27		18.23					0.58	14.90										100	44
Newburn H-23	5950	Sangster, 2016	14	3	Kfs	66.74		17.84						15.41										100	137
Newburn H-23	5950	Sangster, 2016	14	5	Kfs	67.13		17.78						15.10										100	141
Newburn H-23	4318.5	Sangster, 2016	14	5	Kfs	66.61		17.97					0.62	14.79										100	41
Newburn H-23	4318.5	Sangster, 2016	14	7	Kfs	67.06		17.71						15.23										100	37
Newburn H-23	4318.5	Sangster, 2016	14	14	Kfs	67.04		17.91					0.57	14.48										100	45
Newburn H-23	4313.5	Sangster, 2016	17	10	Kfs	66.79		18.01					0.75	14.44										100	124
Newburn H-23	5950	Sangster, 2016	5	2	Lbd	59.49		25.36	0.51			6.90	7.74											100	128
Annapolis G-24	4401.5A(2)	1B.1	2.1	3	Olig	66.41		18.00				3.89	11.10							0.60				100	118
Annapolis G-24	4401.5A(2)	1B.1	2.1	4	Olig	65.58		18.37				4.54	10.94							0.57				100	116
Annapolis G-24	4401.5B	1C.1	1	10	Olig	65.56		21.35				3.29	9.80											100	118
Annapolis G-24	4401.5B	1C.1	5.1	4	Olig	66.69		20.64	0.28			2.44	9.70	0.25										100	115
Annapolis G-24	5530	1G.1	7	5	Olig	67.09		20.59				2.14	10.18											100	113
Crimson F-81	6450	3C.1	11	4	Olig	64.12		22.87	0.63			3.07	8.47	0.84										100	113
Crimson F-81	6470(2)	3E.1	2	9	Olig	61.84	0.33	23.55	0.55			4.51	8.40	0.82										100	96
Weymouth A-45	6213.5	4E.1	2	2	Olig	66.24		20.82				2.28	10.66											100	97
Weymouth A-45	6213.5	4E.1	11	15	Olig	62.52		22.69	0.39			5.65	8.28	0.47										100	95
Weymouth A-45	6213.5	4E.1	12	9	Olig	64.57		21.41	0.28			3.19	8.66	1.89										100	95
Weymouth A-45	6213.5	4E.1	13	7	Olig	62.69		23.28				5.22	8.56	0.25										100	95
Weymouth A-45	6213.5	4E.1	16	15	Olig	62.05		23.66	0.59			5.57	7.67	0.46										100	95
Weymouth A-45	6213.5	4E.1	18	7	Olig	58.64		28.78	0.60			6.04	5.61	0.33										100	91
Weymouth A-45	6213.5	4E.1	18	11	Olig	65.93		17.63				4.93	11.51											100	93
Newburn H-23	4353.5	Sangster, 2016	2	6	Olig	62.79		23.92	0.14			4.60	8.28	0.28										100	102
Newburn H-23	4353.5	Sangster, 2016	2	10	Olig	64.60		22.90				3.27	8.98	0.25										100	98
Newburn H-23	5408.5	Sangster, 2016	2	15	Olig	66.34		20.50	0.14			1.78	11.04	0.19										100	136
Newburn H-23	4353.5	Sangster, 2016	2	19	Olig	63.85		23.28				3.93	8.61	0.33										100	93
Newburn H-23	5408.5	Sangster, 2016	3	12	Olig	65.57		21.33				2.49	10.49	0.13										100	139
Newburn H-23	5408.5	Sangster, 2016	3	17	Olig	65.97		20.96				2.08	10.99											100	105
Newburn H-23	5407	Sangster, 2016	4	2	Olig	65.12		21.39				2.80	10.50	0.18										100	125
Newburn H-23	4913.8	Sangster, 2016	5	3	Olig	64.30		22.15				3.58	9.34	0.61										100	113
Newburn H-23	4913.8	Sangster, 2016	10	6	Olig	63.15		22.90	0.39			3.47	9.59	0.51										100	106
Newburn H-23	4313.5	Sangster, 2016	20	9	Olig	65.91		21.18				2.73	10.17											100	126

Table 5E: Select EDS chemical analyses of carbonate grains

Well	Sample	Appendix	Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CuO	ZnO	As_2O_3	SrO	Y_2O_3	Sb_2O_3	BaO	WO_3	Total	Actual Total
Annapolis G-24	5505	1D.1	1	15	Ank				8.45	0.74	18.38	28.42																56	97
Annapolis G-24	5505	1D.1	4	2	Ank				9.93	2.03	15.59	28.44																56	65
Annapolis G-24	5505	1D.1	9	4	Ank				9.88	1.36	16.80	27.96																56	51
Annapolis G-24	5505	1D.1	10	1	Ank				6.20	0.65	20.22	28.93																56	50
Annapolis G-24	5510	1E.1	4	11	Ank				6.48	0.67	20.31	28.53																56	37
Annapolis G-24	5510	1E.1	6	10	Ank				15.24	0.52	11.23	29.01																56	60
Annapolis G-24	5510	1E.1	6	12	Ank	0.79			33.41	0.18	1.14	18.86				0.50		1.12										56	62
Annapolis G-24	5510	1E.1	10	12	Ank	1.11		0.62	14.28	0.57	11.29	28.13																56	57
Annapolis G-24	5520	1F.1	12	13	Ank		0.50		15.15	0.74	11.04	28.56																56	36
Annapolis G-24	5530	1G.1	1	8	Ank	0.60		0.49	16.58	0.60	10.38	27.35																56	61
Annapolis G-24	5530	1G.1	1	13	Ank				15.64	0.62	10.76	28.99																56	61
Annapolis G-24	5530	1G.1	2	1	Ank				16.19	0.49	11.65	27.67																56	60
Annapolis G-24	5530	1G.1	2	8	Ank	0.49			15.26	0.69	9.61	29.95																56	60
Annapolis G-24	5530	1G.1	2	11	Ank				16.83	0.62	10.26	28.30																56	60
Annapolis G-24	5530	1G.1	3	4	Ank				16.45	0.63	10.30	28.62																56	60
Annapolis G-24	5530	1G.1	3	6	Ank				14.46	0.65	9.37	31.52																56	59
Annapolis G-24	5530	1G.1	3	8	Ank				15.09	0.71	9.87	30.33																56	61
Annapolis G-24	5530	1G.1	3	12	Ank	0.80			16.56	0.50	11.32	26.81																56	43
Annapolis G-24	5530	1G.1	4	2	Ank				14.98	0.69	9.63	30.70																56	59
Annapolis G-24	5530	1G.1	4	3	Ank				15.73	0.62	9.96	29.69																56	59
Annapolis G-24	5530	1G.1	4	6	Ank				15.01	0.57	9.31	31.11																56	60
Annapolis G-24	5530	1G.1	4	9	Ank				16.39	0.64	10.40	28.57																56	60
Annapolis G-24	5530	1G.1	6	2	Ank	0.60			16.02	0.69	9.72	28.96																56	60
Annapolis G-24	5530	1G.1	6	3	Ank				6.01	1.24	18.83	29.92																56	58
Annapolis G-24	5530	1G.1	6	5	Ank	0.45			15.56	0.59	9.98	29.43																56	58
Annapolis G-24	5530	1G.1	6	7	Ank				16.67	0.73	10.08	28.52																56	61
Annapolis G-24	5530	1G.1	7	7	Ank				15.96	0.71	9.98	29.35																56	61
Annapolis G-24	5530	1G.1	8	7	Ank		0.67		15.97	0.67	9.82	28.05			0.81													56	60
Annapolis G-24	5530	1G.1	9	3	Ank				16.34	0.55	11.46	27.65																56	58
Annapolis G-24	5530	1G.1	9	6	Ank				14.56	0.60	10.40	30.44																56	57
Annapolis G-24	5530	1G.1	9	10	Ank				16.43	0.59	10.03	27.85															1.09	56	58
Annapolis G-24	5530	1G.1	9	13	Ank	0.56			15.70	0.63	8.44	30.44						0.23										56	58
Annapolis G-24	5530	1G.1	10	3	Ank				16.84	0.76	10.16	28.24																56	59
Annapolis G-24	5530	1G.1	10	6	Ank				15.97	0.66	9.60	29.78																56	60
Annapolis G-24	5530	1G.1	11	1	Ank				15.39	0.73	9.66	30.22																56	58
Annapolis G-24	5530	1G.1	11	5	Ank				16.31	0.85	9.64	29.19																56	60
Annapolis G-24	5530	1G.1	11	7	Ank				14.65	0.59	9.59	31.17																56	59
Annapolis G-24	5530	1G.1	12	2	Ank	0.48			15.26	0.77	9.52	29.97																56	60
Annapolis G-24	5530	1G.1	12	4	Ank				14.89	0.54	9.59	30.98																56	61
Annapolis G-24	5530	1G.1	13	9	Ank				15.49	0.70	9.66	30.15																56	58
Annapolis G-24	5530	1G.1	14	1	Ank				12.23	2.16	13.33	28.07						0.21										56	60
Annapolis G-24	5530	1G.1	14	2	Ank				17.55	0.55	10.57	27.33																56	60
Annapolis G-24	5530	1G.1	15	5	Ank				5.69	1.09	18.88	30.33																56	58
Annapolis G-24	5530	1G.1	15	6	Ank				16.57	0.58	9.88	28.98																56	61
Annapolis G-24	5530	1G.1	15	8	Ank				15.06	0.55	9.73	30.66																56	59
Annapolis G-24	5530	1G.1	15	9	Ank				7.60	1.28	17.46	29.66																56	57
Annapolis G-24	5530	1G.1	15	11	Ank				16.00	0.55	10.26	29.19																56	59
Annapolis G-24	5530	1G.1	16	12	Ank				16.55	0.67	10.74	28.04																56	59
Annapolis G-24	5530	1G.1	16	13	Ank				16.32	0.72	9.89	29.07																56	60
Annapolis G-24	5530	1G.1	17	1	Ank				15.74	0.61	9.84	29.81																56	58
Annapolis G-24	5530	1G.1	17	12	Ank				16.54	0.66	10.74	28.07																56	59
Annapolis G-24	5530	1G.1	18	7	Ank				13.83	0.69	9.33	32.15																56	61
Annapolis G-24	5530	1G.1	18	11	Ank				15.93	0.52	10.05	29.50																56	60
Annapolis G-24	5530	1G.1	18	13	Ank				16.22	0.74	9.91	29.13																56	62
Annapolis G-24	5530	1G.1	18	17	Ank				15.39	0.72	9.67	30.23																56	59
Annapolis G-24	5530	1G.1	19	3	Ank				16.15	0.56	10.53	28.76																56	58
Annapolis G-24	5530	1G.1	19	7	Ank				15.48	0.56	9.92	30.04																56	59
Annapolis G-24	5530	1G.1	19	9	Ank	0.49			15.89	0.58	9.98	29.06																56	60
Annapolis G-24	5530	1G.1	19	12	Ank				15.47	0.66	9.91	29.96																56	59

Table 5E: Select EDS chemical analyses of carbonate grains

Well	Sample	Appendix	Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CuO	ZnO	As_2O_3	SrO	Y_2O_3	Sb_2O_3	BaO	WO_3	Total	Actual Total
Annapolis G-24	5530	1G.1	19	13	Ank	0.75		0.47	15.49	0.69	9.88	28.73																56	60
Annapolis G-24	5530	1G.1	19	15	Ank				15.82	0.65	9.45	30.09																56	60
Annapolis G-24	5530	1G.1	20	5	Ank				18.52	0.85	8.47	28.16																56	59
Annapolis G-24	5530	1G.1	20	11	Ank				16.89	0.64	10.35	28.12																56	60
Annapolis G-24	5530	1G.1	20	14	Ank				16.40	0.58	10.27	28.74																56	59
Annapolis G-24	5530	1G.1	21	2	Ank				16.72	0.68	10.01	28.59																56	59
Annapolis G-24	5530	1G.1	21	3	Ank				15.03	0.53	9.70	30.74																56	60
Annapolis G-24	5530	1G.1	21	8	Ank				16.31	0.69	10.13	28.87																56	59
Annapolis G-24	5530	1G.1	22	2	Ank				17.15	0.61	10.39	27.85																56	58
Annapolis G-24	5530	1G.1	22	4	Ank				15.20	0.68	9.16	30.96																56	59
Annapolis G-24	5530	1G.1	22	5	Ank				16.62	0.66	9.72	28.99																56	60
Annapolis G-24	5530	1G.1	22	9	Ank				17.20	0.58	9.98	28.23																56	60
Annapolis G-24	5530	1G.1	22	11	Ank	0.40			15.06	0.59	9.66	30.29																56	60
Annapolis G-24	5530	1G.1	23	4	Ank				16.29	0.69	9.65	29.37																56	60
Annapolis G-24	5530	1G.1	23	8	Ank	0.54			16.03	0.62	10.43	28.39																56	60
Annapolis G-24	5530	1G.1	23	13	Ank	0.53			15.30	0.64	9.49	30.05																56	60
Annapolis G-24	5530	1G.1	24	1	Ank				15.53	0.69	9.96	29.81																56	59
Annapolis G-24	5530	1G.1	24	9	Ank				15.97	0.68	10.58	28.76																56	58
Annapolis G-24	5530	1G.1	24	10	Ank				15.12	0.62	9.68	30.58																56	58
Annapolis G-24	5530	1G.1	25	1	Ank	0.69		0.37	17.35	0.65	9.29	27.65																56	61
Annapolis G-24	5530	1G.1	25	4	Ank				16.98	0.62	10.21	28.18																56	60
Annapolis G-24	5530	1G.1	25	7	Ank				16.69	0.58	9.93	28.80																56	60
Annapolis G-24	5530	1G.1	26	7	Ank				15.35	0.73	9.63	30.29																56	59
Annapolis G-24	5530	1G.1	26	8	Ank				14.64	0.68	9.36	31.32																56	59
Annapolis G-24	5530	1G.1	27	2	Ank				15.79	0.52	10.25	29.44																56	60
Annapolis G-24	5530	1G.1	27	6	Ank				14.90	0.59	9.78	30.73																56	58
Annapolis G-24	5530	1G.1	27	8	Ank				15.61	0.77	9.08	30.54																56	60
Annapolis G-24	5530	1G.1	28	7	Ank	0.81		0.52	14.90	0.73	8.68	30.36																56	61
Annapolis G-24	5530	1G.1	28	9	Ank				17.63	0.79	8.92	28.67																56	60
Annapolis G-24	5530	1G.1	28	11	Ank				16.06	0.69	9.56	29.69																56	60
Annapolis G-24	5530	1G.1	29	3	Ank				16.74	0.73	9.11	29.42																56	61
Annapolis G-24	5530	1G.1	30	3	Ank	0.68		0.42	15.26	0.70	9.05	29.89																56	60
Annapolis G-24	5530	1G.1	30	5	Ank				14.12	0.65	9.48	31.75																56	58
Annapolis G-24	5530	1G.1	30	6	Ank				17.76	0.75	9.03	28.46																56	60
Annapolis G-24	5530	1G.1	30	7	Ank				44.25	0.78	7.38	3.60																56	59
Annapolis G-24	5530	1G.1	31	2	Ank	0.42			16.27	0.63	10.31	28.37																56	60
Annapolis G-24	5530	1G.1	31	6	Ank				18.12	0.66	9.56	27.65																56	60
Annapolis G-24	5530	1G.1	32	5	Ank				15.88	0.63	9.92	29.57																56	60
Annapolis G-24	5530	1G.1	33	2	Ank				14.71	0.63	9.70	30.96																56	58
Annapolis G-24	5530	1G.1	33	4	Ank				15.46	0.57	9.93	30.04																56	59
Annapolis G-24	5530	1G.1	33	8	Ank				16.34	0.67	10.01	28.98																56	59
Annapolis G-24	5530	1G.1	33	11	Ank	0.46			15.71	0.65	9.67	29.51																56	58
Annapolis G-24	5530	1G.1	34	2	Ank				15.33	0.64	9.78	30.24																56	58
Annapolis G-24	5530	1G.1	34	10	Ank				15.35	0.61	10.01	30.04																56	60
Annapolis G-24	5530	1G.1	34	12	Ank				15.50	0.59	9.81	30.10																56	59
Annapolis G-24	5530	1G.1	34	13	Ank	0.54		0.48	16.56	0.83	9.86	27.72																56	62
Annapolis G-24	5530	1G.1	35	3	Ank				15.63	0.71	9.34	30.32																56	59
Annapolis G-24	5530	1G.1	35	6	Ank				15.68	0.63	9.97	29.72																56	61
Annapolis G-24	5530	1G.1	35	7	Ank				16.68	0.71	10.04	28.57																56	59
Annapolis G-24	5530	1G.1	35	10	Ank				16.81	0.63	9.80	28.76																56	60
Annapolis G-24	5530	1G.1	36	4	Ank				15.67	0.68	10.07	29.57																56	59
Annapolis G-24	5530	1G.1	36	7	Ank				15.14	0.60	10.05	30.20																56	60
Annapolis G-24	5530	1G.1	36	12	Ank				15.06	0.60	9.65	30.68																56	58
Annapolis G-24	5535(1)	1H.1	1	25	Ank				15.59	0.67	9.06	30.68																56	34
Annapolis G-24	5535(1)	1H.1	6	13	Ank				15.64	0.90	8.14	31.33																56	24
Annapolis G-24	5535(1)	1H.1	7	22	Ank				17.98	0.67	9.12	28.23																56	17
Annapolis G-24	5535(1)	1H.1	8	8	Ank				16.48	0.82	9.48	29.21																56	12
Annapolis G-24	5535(2)	1I.1	3	11	Ank	0.54			14.79	0.77	8.40	31.50																56	61
Annapolis G-24	5535(2)	1I.1	3	12	Ank	0.69	3.89	0.59	14.65	0.55	8.11	27.51																56	61

Table 5E: Select EDS chemical analyses of carbonate grains

Well	Sample	Appendix	Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CuO	ZnO	As_2O_3	SrO	Y_2O_3	Sb_2O_3	BaO	WO_3	Total	Actual Total
Annapolis G-24	5535(2)	1I.1	4	12	Ank				13.81	1.56	9.05	31.57																56	60
Annapolis G-24	5535(2)	1I.1	6	6	Ank	0.41			17.53	0.85	8.83	28.38																56	63
Annapolis G-24	5535(2)	1I.1	7	4	Ank				15.18	0.60	9.22	31.00																56	62
Annapolis G-24	5535(2)	1I.1	7	12	Ank	0.65		0.63	17.18	0.64	9.41	27.49																56	60
Annapolis G-24	5535(2)	1I.1	9	5	Ank				15.24	0.67	8.31	31.79																56	59
Annapolis G-24	5535(2)	1I.1	9	10	Ank				14.32	1.49	8.31	31.88																56	58
Annapolis G-24	5535(2)	1I.1	10	4	Ank				17.90	0.81	8.65	28.64																56	60
Annapolis G-24	5535(2)	1I.1	12	9	Ank				16.08	0.76	8.84	30.32																56	59
Annapolis G-24	6045	1J.1	10	10	Ank				10.05	2.61	15.19	28.14																56	66
Annapolis G-24	6045	1J.1	12	8	Ank				12.78	1.02	14.36	27.84																56	63
Annapolis G-24	6045	1J.1	14	14	Ank				15.65	0.74	9.76	29.85																56	63
Annapolis G-24	6045	1K.1	1	3	Ank				6.27	0.69	19.41	29.64																56	57
Annapolis G-24	6045	1K.1	1	8	Ank	0.57			4.68	0.47	20.62	29.67																56	59
Annapolis G-24	6045	1K.1	4	10	Ank				5.94	1.85	17.90	30.30																56	59
Annapolis G-24	6045	1K.1	5	1	Ank				5.71	2.01	18.37	29.91																56	59
Annapolis G-24	6045	1K.1	5	3	Ank	0.48		0.39	17.17	0.65	9.54	27.78																56	62
Annapolis G-24	6045	1K.1	5	6	Ank				7.31	1.71	17.43	29.54																56	60
Annapolis G-24	6045	1K.1	6	5	Ank				15.09	0.97	8.46	31.48																56	59
Annapolis G-24	6045	1K.1	6	8	Ank				8.70	2.18	15.99	28.97						0.16										56	59
Annapolis G-24	6045	1K.1	6	9	Ank				6.89	1.95	17.43	29.72																56	58
Annapolis G-24	6045	1K.1	6	14	Ank				5.12	1.45	19.18	30.25																56	56
Annapolis G-24	6045	1K.1	7	5	Ank				16.19	0.76	9.12	29.14			0.79													56	61
Annapolis G-24	6045	1K.1	7	8	Ank				6.71	1.83	17.96	29.50																56	60
Annapolis G-24	6045	1K.1	7	9	Ank				8.55	2.78	16.00	28.67																56	60
Annapolis G-24	6045	1K.1	7	10	Ank				5.70	0.57	19.62	30.12																56	58
Annapolis G-24	6045	1K.1	8	5	Ank				14.78	0.61	9.54	31.06																56	60
Annapolis G-24	6045	1K.1	10	6	Ank				10.11	0.91	16.37	28.61																56	60
Annapolis G-24	6045	1K.1	11	3	Ank				13.64	1.44	9.07	31.85																56	60
Annapolis G-24	6045	1K.1	12	1	Ank	0.74			16.34	0.74	9.55	28.64																56	60
Annapolis G-24	6045	1K.1	14	4	Ank				8.94	0.92	16.91	29.23																56	57
Annapolis G-24	6045	1K.1	14	9	Ank	0.49			16.73	0.71	9.17	28.90																56	61
Annapolis G-24	6045	1K.1	15	1	Ank				5.75	1.15	19.58	29.52																56	58
Annapolis G-24	6045	1K.1	16	2	Ank				8.70	0.85	17.25	29.20																56	59
Annapolis G-24	6045	1K.1	17	5	Ank				7.62	2.01	16.69	29.68																56	59
Annapolis G-24	6045	1K.1	19	3	Ank				6.09	0.73	19.44	29.74																56	58
Annapolis G-24	6045	1K.1	19	11	Ank				17.20	0.77	9.34	28.70																56	59
Annapolis G-24	6045	1K.1	20	7	Ank				5.65	1.65	17.85	30.68						0.18										56	59
Annapolis G-24	6045	1K.1	20	8	Ank				5.77	0.91	19.23	30.09																56	60
Annapolis G-24	6045	1K.1	21	2	Ank				0.27		22.80	32.64						0.29										56	56
Annapolis G-24	6045	1K.1	21	9	Ank				5.22	1.45	19.25	30.09																56	58
Annapolis G-24	6045	1K.1	22	6	Ank	0.45			7.34	1.37	17.83	29.01																56	58
Annapolis G-24	6045	1K.1	23	8	Ank				16.67	0.71	9.23	29.40																56	60
Annapolis G-24	6045	1K.1	24	1	Ank				5.10	0.88	19.85	30.18																56	57
Annapolis G-24	6045	1K.1	24	5	Ank				9.77	1.64	14.87	29.72																56	56
Annapolis G-24	6045	1K.1	25	7	Ank				6.08	1.06	18.80	30.06																56	59
Annapolis G-24	6045	1K.1	26	2	Ank	0.55			17.39	0.83	9.09	28.13																56	60
Annapolis G-24	6045	1K.1	26	4	Ank				9.66	1.15	16.07	29.12																56	58
Annapolis G-24	6045	1K.1	29	8	Ank				6.18	0.82	19.22	29.77																56	59
Annapolis G-24	6045	1K.1	30	5	Ank				6.73	1.14	18.59	29.54																56	50
Annapolis G-24	6045	1K.1	31	4	Ank				9.80	2.81	14.76	28.63																56	59
Annapolis G-24	6045	1K.1	31	5	Ank				4.21	0.32	20.76	30.70																56	55
Annapolis G-24	6045	1K.1	32	1	Ank				6.60	0.68	19.18	29.53																56	59
Annapolis G-24	6045	1K.1	34	1	Ank				5.81	1.99	18.07	30.13																56	58
Annapolis G-24	6045	1K.1	34	4	Ank				18.00	0.99	8.79	28.22																56	60
Annapolis G-24	6045	1K.1	35	8	Ank				16.55	0.64	10.63	28.17																56	60
Annapolis G-24	6045	1K.1	39	5	Ank				15.72	0.64	8.97	30.67																56	59
Annapolis G-24	6045	1K.1	40	4	Ank				3.74	0.84	19.54	31.88																56	59
Annapolis G-24	6045	1K.1	40	7	Ank				15.77	0.76	9.19	30.28																56	60
Annapolis G-24	6045	1K.1	41	2	Ank				5.43	0.66	19.87	30.04																56	58

Table 5E: Select EDS chemical analyses of carbonate grains

Well	Sample	Appendix	Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CuO	ZnO	As_2O_3	SrO	Y_2O_3	Sb_2O_3	BaO	WO_3	Total	Actual Total
Annapolis G-24	6045	1K.1	41	3	Ank				12.08	1.70	13.97	28.25																56	60
Balvenie B-79	3645	2B.1	12	3	Ank				10.30	1.53	15.51	28.66																56	58
Weymouth A-45	5715	4A.1	2	8	Ank				15.89	0.54	11.94	27.63																56	56
Weymouth A-45	5955	4B.1	13	12	Ank				2.64	2.04	20.06	31.25																56	56
Weymouth A-45	5955	4B.1	13	13	Ank				55.50	0.50																		56	99
Newburn H-23	5957	Sangster, 2016	1	4	Ank				16.15	1.07	9.35	29.43																56	63
Newburn H-23	5961.7	Sangster, 2016	1	4	Ank		0.32		15.62	1.22	10.42	28.43																56	54
Newburn H-23	5408.5	Sangster, 2016	1	5	Ank			0.64	14.04	0.85	11.89	28.57																56	67
Newburn H-23	5213.5	Sangster, 2016	1	6	Ank	0.72		0.57	15.65	0.72	9.82	28.53																56	77
Newburn H-23	5213.5	Sangster, 2016	1	8	Ank	0.71			2.41	0.34	0.86	51.68																56	61
Newburn H-23	5406.5	Sangster, 2016	1	14	Ank				11.80	1.04	11.27	31.89																56	48
Newburn H-23	5961.7	Sangster, 2016	2	2	Ank	0.77			14.47	1.48	9.72	29.55																56	49
Newburn H-23	5965	Sangster, 2016	2	4	Ank				15.64	1.00	9.09	30.27																56	60
Newburn H-23	5408.5	Sangster, 2016	2	9	Ank				14.65	1.10	9.67	30.59																56	76
Newburn H-23	5408.5	Sangster, 2016	2	10	Ank	0.43			14.94	1.02	10.12	29.49																56	66
Newburn H-23	5408.5	Sangster, 2016	2	11	Ank				12.92	0.87	10.53	31.68																56	62
Newburn H-23	5962	Sangster, 2016	2	15	Ank				15.30	0.95	10.53	29.22																56	39
Newburn H-23	5961.7	Sangster, 2016	3	2	Ank				14.61	1.47	10.27	29.65																56	49
Newburn H-23	5213.5	Sangster, 2016	3	3	Ank				12.74	0.68	11.51	31.07																56	69
Newburn H-23	5961.7	Sangster, 2016	3	4	Ank				15.36	1.16	9.86	29.62																56	49
Newburn H-23	5408.5	Sangster, 2016	4	1	Ank			0.44	15.52	1.05	9.98	29.01																56	64
Newburn H-23	5961.7	Sangster, 2016	4	4	Ank	1.05			14.47	1.18	10.17	29.13																56	46
Newburn H-23	5961.7	Sangster, 2016	4	5	Ank			0.71	15.72	1.14	9.55	28.88																56	50
Newburn H-23	5965	Sangster, 2016	4	8	Ank				15.42	1.08	9.72	29.78																56	61
Newburn H-23	5408.5	Sangster, 2016	4	8	Ank	1.55		0.60	14.90	0.87	10.02	28.06																56	67
Newburn H-23	5962	Sangster, 2016	4	9	Ank				15.79	1.11	9.56	29.54																56	39
Newburn H-23	5962	Sangster, 2016	5	1	Ank				15.53	1.34	9.75	29.38																56	42
Newburn H-23	5975	Sangster, 2016	5	4	Ank				15.69		11.30	29.01																56	66
Newburn H-23	5213.5	Sangster, 2016	5	4	Ank	0.58			14.61	0.70	10.97	29.15																56	65
Newburn H-23	5961.7	Sangster, 2016	6	8	Ank	1.53			14.23	1.26	10.34	28.64																56	45
Newburn H-23	4300	Sangster, 2016	7	2	Ank				10.38	1.16	17.54	26.91																56	52
Newburn H-23	5975	Sangster, 2016	7	3	Ank				16.43		10.47	29.10																56	67
Newburn H-23	5961.7	Sangster, 2016	7	3	Ank	1.52		0.63	13.91	1.28	11.21	27.44																56	52
Newburn H-23	5403.6	Sangster, 2016	7	4	Ank				14.23	0.90	10.82	30.05																56	54
Newburn H-23	5975	Sangster, 2016	7	5	Ank				14.87	1.02	9.96	30.15																56	65
Newburn H-23	5408.5	Sangster, 2016	7	8	Ank	0.59			15.48	1.05	10.13	28.75																56	77
Newburn H-23	5965	Sangster, 2016	8	3	Ank				15.27	1.11	9.09	30.53																56	64
Newburn H-23	5962	Sangster, 2016	8	3	Ank				14.83	1.22	10.25	29.70																56	72
Newburn H-23	5975	Sangster, 2016	8	4	Ank				15.82	0.97	9.17	30.04																56	67
Newburn H-23	5213.5	Sangster, 2016	9	2	Ank	0.88			15.09	0.59	10.61	28.82																56	67
Newburn H-23	5408.5	Sangster, 2016	9	3	Ank				13.81	0.96	11.09	30.14																56	68
Newburn H-23	5408.5	Sangster, 2016	9	15	Ank				14.44	1.00	10.02	30.54																56	65
Newburn H-23	5407	Sangster, 2016	10	1	Ank				12.86	0.64	11.95	30.55																56	21
Newburn H-23	5965	Sangster, 2016	10	9	Ank				15.66	1.00	9.55	29.79																56	70
Newburn H-23	5407	Sangster, 2016	10	15	Ank				12.92	0.81	11.99	30.28																56	21
Newburn H-23	5975	Sangster, 2016	11	1	Ank				16.34	0.89	9.38	29.39																56	61
Newburn H-23	5407	Sangster, 2016	11	1	Ank	0.90			12.35	0.90	12.05	29.81																56	22
Newburn H-23	5975	Sangster, 2016	11	2	Ank				15.28	0.90	9.71	30.11																56	61
Newburn H-23	5407	Sangster, 2016	11	2	Ank				13.40	0.80	12.63	29.17																56	21
Newburn H-23	5408.5	Sangster, 2016	11	11	Ank	1.28			14.51	0.92	10.35	28.93																56	62
Newburn H-23	4300	Sangster, 2016	12	4	Ank				6.84	0.73	20.44	27.99																56	64
Newburn H-23	5408.5	Sangster, 2016	12	4	Ank				14.14	0.94	10.71	30.22																56	71
Newburn H-23	5406.5	Sangster, 2016	12	5	Ank				12.93	0.79	10.45	31.83																56	25
Newburn H-23	5406.5	Sangster, 2016	12	8	Ank		3.42		12.03	0.77	10.31	29.47																56	25
Newburn H-23	5408.5	Sangster, 2016	12	10	Ank	0.63		0.44	13.02	0.94	10.46	30.51																56	79
Newburn H-23	5408.5	Sangster, 2016	12	24	Ank				14.44	1.00	9.78	30.78																56	72
Newburn H-23	5213.5	Sangster, 2016	12	25	Ank				15.07	0.65	11.50	28.78																56	57
Newburn H-23	5407	Sangster, 2016	13	1	Ank				12.77	0.60	12.28	30.34																56	22
Newburn H-23	5407	Sangster, 2016	13	2	Ank				14.38	0.87	11.86	28.89																56	22

Table 5E: Select EDS chemical analyses of carbonate grains

Well	Sample	Appendix	Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CuO	ZnO	As_2O_3	SrO	Y_2O_3	Sb_2O_3	BaO	WO_3	Total	Actual Total
Newburn H-23	5408.5	Sangster, 2016	13	7	Ank	0.49		0.44	14.99	1.01	10.71	28.35																56	71
Newburn H-23	5961.7	Sangster, 2016	15	1	Ank				12.12	1.22	8.92	33.75																56	42
Newburn H-23	5962	Sangster, 2016	15	2	Ank				15.10	1.13	10.74	29.03																56	79
Newburn H-23	5962	Sangster, 2016	15	3	Ank				13.91	1.35	10.32	30.42																56	76
Newburn H-23	5957	Sangster, 2016	16	1	Ank	0.41			14.87	1.33	9.52	29.87																56	63
Newburn H-23	5962	Sangster, 2016	16	1	Ank				15.32	1.13	10.37	29.18																56	75
Newburn H-23	5406.5	Sangster, 2016	16	5	Ank				12.45	0.74	10.99	31.81																56	22
Newburn H-23	5962	Sangster, 2016	17	1	Ank				15.30	1.16	10.20	29.34																56	78
Newburn H-23	5961.7	Sangster, 2016	19	2	Ank	1.81			14.09	1.38	9.41	29.30																56	42
Newburn H-23	5962	Sangster, 2016	19	2	Ank				15.06	1.11	10.51	29.32																56	75
Newburn H-23	5961.7	Sangster, 2016	19	9	Ank				14.03	1.22	10.12	30.63																56	40
Annapolis G-24	4401.5A(1)	1A.1	1	6	Cal	0.60			1.70	0.66		52.93		0.11														56	56
Annapolis G-24	4401.5A(1)	1A.1	1	7	Cal				1.13			54.87																56	54
Annapolis G-24	4401.5A(1)	1A.1	1	12	Cal	0.48			1.40	0.38		53.75																56	55
Annapolis G-24	4401.5A(1)	1A.1	1	16	Cal				0.67		0.46	53.82					1.05											56	56
Annapolis G-24	4401.5A(1)	1A.1	2	4	Cal	0.79		0.50	1.47	0.68		52.56																56	55
Annapolis G-24	4401.5A(1)	1A.1	2	6	Cal	1.23		0.74	1.28	0.39		52.36																56	56
Annapolis G-24	4401.5A(1)	1A.1	2	13	Cal	0.50			1.33	0.50		53.66																56	55
Annapolis G-24	4401.5A(1)	1A.1	3	3	Cal				1.29	0.38		54.33																56	53
Annapolis G-24	4401.5A(1)	1A.1	3	8	Cal				1.76	0.32	0.29	53.64																56	53
Annapolis G-24	4401.5A(1)	1A.1	4	10	Cal				1.54	0.27		54.19																56	54
Annapolis G-24	4401.5A(1)	1A.1	5	3	Cal	0.73		0.32	1.37	0.28	0.36	52.94																56	56
Annapolis G-24	4401.5A(1)	1A.1	5	5	Cal				1.56	0.41	0.30	53.73																56	55
Annapolis G-24	4401.5A(1)	1A.1	5	11	Cal				1.20	0.26		54.54																56	54
Annapolis G-24	4401.5A(1)	1A.1	6	3	Cal				2.06	0.37	0.39	53.19																56	55
Annapolis G-24	4401.5A(1)	1A.1	6	13	Cal	0.56			1.48	0.69		53.26																56	56
Annapolis G-24	4401.5A(1)	1A.1	7	4	Cal				1.32	0.35	0.32	50.14					3.62	0.24										56	57
Annapolis G-24	4401.5A(1)	1A.1	7	9	Cal				1.13	0.34		54.53																56	56
Annapolis G-24	4401.5A(1)	1A.1	7	13	Cal	0.86		0.59	1.71	0.35		52.49																56	57
Annapolis G-24	4401.5A(1)	1A.1	8	1	Cal				1.08			54.92																56	56
Annapolis G-24	4401.5A(1)	1A.1	9	1	Cal	0.52			1.72	0.39		53.37																56	57
Annapolis G-24	4401.5A(1)	1A.1	10	4	Cal	0.57			1.47	0.31		52.04					1.60											56	61
Annapolis G-24	4401.5A(1)	1A.1	11	1	Cal	0.51		0.31	1.72	0.51		52.95																56	58
Annapolis G-24	4401.5A(1)	1A.1	12	1	Cal				0.94	0.39		54.68																56	56
Annapolis G-24	4401.5A(1)	1A.1	12	10	Cal				1.51	0.27		53.89		0.32														56	57
Annapolis G-24	4401.5A(1)	1A.1	13	4	Cal	1.19		0.38	1.64	0.58		52.21																56	56
Annapolis G-24	4401.5A(1)	1A.1	14	2	Cal				1.70	0.27	0.46	53.57																56	55
Annapolis G-24	4401.5A(1)	1A.1	14	4	Cal				1.36			54.64																56	55
Annapolis G-24	4401.5A(1)	1A.1	14	5	Cal	0.72			1.42	0.42	0.31	53.00		0.13														56	55
Annapolis G-24	4401.5A(1)	1A.1	14	10	Cal	0.99			1.16	0.40		53.45																56	56
Annapolis G-24	4401.5A(1)	1A.1	15	2	Cal				1.78	0.28	0.43	53.51																56	54
Annapolis G-24	4401.5A(1)	1A.1	15	5	Cal				1.48		0.35	54.17																56	56
Annapolis G-24	4401.5A(1)	1A.1	16	4	Cal				1.22	0.45		54.33																56	117
Annapolis G-24	4401.5A(1)	1A.1	17	1	Cal				1.75	0.30	0.40	53.54																56	96
Annapolis G-24	4401.5A(1)	1A.1	18	1	Cal				0.69			55.31																56	55
Annapolis G-24	4401.5A(1)	1A.1	18	11	Cal				1.28	0.25	0.27	54.20																56	56
Annapolis G-24	4401.5A(1)	1A.1	19	5	Cal				1.09	0.26		54.66																56	54
Annapolis G-24	4401.5A(1)	1A.1	20	1	Cal	0.76		0.31	1.67	0.59	0.31	52.35																56	54
Annapolis G-24	4401.5A(1)	1A.1	20	7	Cal				1.60	0.39	0.35	53.66																56	53
Annapolis G-24	4401.5A(1)	1A.1	21	1	Cal				1.37	0.30		54.34																56	53
Annapolis G-24	4401.5A(1)	1A.1	21	3	Cal				1.06	0.55		54.39																56	54
Annapolis G-24	4401.5A(1)	1A.1	21	5	Cal				0.62			55.38																56	54
Annapolis G-24	4401.5A(1)	1A.1	21	13	Cal	0.81			1.43	0.39		53.36																56	53
Annapolis G-24	4401.5A(2)	1B.1	1	2	Cal				1.28	0.27		53.80									0.65							56	57
Annapolis G-24	4401.5A(2)	1B.1	1	3	Cal	0.39			1.49	0.30	0.43	52.46									0.94							56	57
Annapolis G-24	4401.5A(2)	1B.1	2	5	Cal				1.33	0.32		53.52									0.83							56	56
Annapolis G-24	4401.5A(2)	1B.1	2	10	Cal	0.92		0.35	1.38	0.43	0.41	51.69									0.82							56	58
Annapolis G-24	4401.5A(2)	1B.1	2.1	2	Cal	0.99			2.12	0.35	0.35	51.08				0.43					0.69							56	58
Annapolis G-24	4401.5A(2)	1B.1	2.1	5	Cal				1.58	0.45		53.32									0.64							56	57

Table 5E: Select EDS chemical analyses of carbonate grains

Well	Sample	Appendix	Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CuO	ZnO	As_2O_3	SrO	Y_2O_3	Sb_2O_3	BaO	WO_3	Total	Actual Total
Annapolis G-24	4401.5A(2)	1B.1	3	9	Cal	0.77		0.37	0.91	0.39		52.88									0.69							56	58
Annapolis G-24	4401.5A(2)	1B.1	4	8	Cal				1.41			53.79									0.80							56	57
Annapolis G-24	4401.5A(2)	1B.1	4	9	Cal				1.46	0.43		53.51									0.60							56	57
Annapolis G-24	4401.5A(2)	1B.1	5	7	Cal	0.59			1.33	0.59		52.41									1.09							56	55
Annapolis G-24	4401.5A(2)	1B.1	5	11	Cal	0.85		0.48	1.64	0.62		51.57									0.85							56	57
Annapolis G-24	4401.5A(2)	1B.1	5.1	5	Cal				1.54	0.39		53.49									0.58							56	57
Annapolis G-24	4401.5A(2)	1B.1	6	6	Cal				1.31	0.30	0.44	53.11									0.83							56	50
Annapolis G-24	4401.5A(2)	1B.1	6	7	Cal	0.40			1.11			51.45					2.44				0.61							56	51
Annapolis G-24	4401.5A(2)	1B.1	6.1	3	Cal				1.85	0.30	0.44	52.73									0.67							56	52
Annapolis G-24	4401.5A(2)	1B.1	7	3	Cal				1.72	0.35		53.92																56	56
Annapolis G-24	4401.5A(2)	1B.1	8	1	Cal				1.14	0.43		54.43																56	57
Annapolis G-24	4401.5A(2)	1B.1	8.1	2	Cal	0.71			1.48	0.38		51.02					2.40											56	59
Annapolis G-24	4401.5A(2)	1B.1	8.1	4	Cal	0.60			5.47	0.63	0.37	48.76						0.17										56	57
Annapolis G-24	4401.5A(2)	1B.1	9	2	Cal				1.78	0.34	0.37	53.51																56	58
Annapolis G-24	4401.5A(2)	1B.1	9	3	Cal	1.04		0.52	2.04	0.63	0.36	51.42																56	59
Annapolis G-24	4401.5A(2)	1B.1	9	7	Cal	0.64		0.44	1.09	0.45		53.39																56	58
Annapolis G-24	4401.5A(2)	1B.1	10	2	Cal	0.85	1.79	0.41	1.83	0.56	0.29	50.28																56	59
Annapolis G-24	4401.5A(2)	1B.1	10	7	Cal	0.60		0.27	1.63	0.60	0.34	52.57																56	58
Annapolis G-24	4401.5A(2)	1B.1	10	10	Cal	0.66			1.34	0.39		53.60																56	58
Annapolis G-24	4401.5A(2)	1B.1	10.1	2	Cal				1.32	0.39	0.32	53.97																56	57
Annapolis G-24	4401.5A(2)	1B.1	11	6	Cal				1.31	0.36		54.33																56	56
Annapolis G-24	4401.5A(2)	1B.1	11	8	Cal				2.02	0.38	0.39	53.21																56	57
Annapolis G-24	4401.5A(2)	1B.1	11	11	Cal	0.49			1.37	0.30		50.68					3.17											56	58
Annapolis G-24	4401.5A(2)	1B.1	12	1	Cal				1.37	0.32		54.03									0.27							56	53
Annapolis G-24	4401.5A(2)	1B.1	12	7	Cal	1.05		0.35	1.53	0.59	0.34	52.15																56	55
Annapolis G-24	4401.5A(2)	1B.1	13	5	Cal				1.44	0.58		53.97																56	55
Annapolis G-24	4401.5A(2)	1B.1	14	3	Cal	0.48		0.30	2.28	0.35	0.50	52.09																56	57
Annapolis G-24	4401.5A(2)	1B.1	14	9	Cal				1.67	0.36	0.38	53.59																56	56
Annapolis G-24	4401.5A(2)	1B.1	14.1	1	Cal	0.66		0.26	1.20	0.52		53.35																56	56
Annapolis G-24	4401.5A(2)	1B.1	14.3	1	Cal	0.62		0.34	1.50	0.45		53.10																56	56
Annapolis G-24	4401.5A(2)	1B.1	15	2	Cal	0.47			1.01	0.55		52.66					1.31											56	58
Annapolis G-24	4401.5A(2)	1B.1	15	8	Cal	0.68			1.67	0.40		53.25																56	56
Annapolis G-24	4401.5A(2)	1B.1	15	11	Cal				0.85	0.40		54.75																56	56
Annapolis G-24	4401.5A(2)	1B.1	16	4	Cal	1.51		0.87	1.85	0.35		51.41																56	56
Annapolis G-24	4401.5A(2)	1B.1	17	3	Cal	0.63			1.50	0.40		53.47																56	56
Annapolis G-24	4401.5A(2)	1B.1	17.1	2	Cal	1.23		0.86	1.94	0.36	0.31	51.31																56	58
Annapolis G-24	4401.5A(2)	1B.1	18	5	Cal	0.59			0.94	0.25		49.77					4.45											56	58
Annapolis G-24	4401.5A(2)	1B.1	18	6	Cal	0.77		0.31	1.52	0.59	0.31	52.49																56	58
Annapolis G-24	4401.5A(2)	1B.1	18.1	3	Cal	0.50			1.23	0.58		51.06					2.62											56	59
Annapolis G-24	4401.5A(2)	1B.1	19	2	Cal	0.66			1.19	0.39		53.77																56	56
Annapolis G-24	4401.5A(2)	1B.1	20	1	Cal				0.89	0.26		54.85																56	56
Annapolis G-24	4401.5A(2)	1B.1	21	2	Cal	0.85		0.32	1.26	0.59		50.94					2.04											56	59
Annapolis G-24	4401.5A(2)	1B.1	21	4	Cal	0.50			1.35	0.35		53.80																56	56
Annapolis G-24	4401.5A(2)	1B.1	21	6	Cal	0.30			1.19	0.32		52.11					2.08											56	60
Annapolis G-24	4401.5A(2)	1B.1	22	6	Cal	0.99			2.18	0.38	0.55	51.89																56	55
Annapolis G-24	4401.5A(2)	1B.1	23	4	Cal	0.57	0.92		1.64	0.29	0.34	52.25																56	55
Annapolis G-24	4401.5A(2)	1B.1	23	7	Cal				1.56	0.36		54.08																56	56
Annapolis G-24	4401.5A(2)	1B.1	23	10	Cal				1.30	0.34		53.01					1.34											56	57
Annapolis G-24	4401.5A(2)	1B.1	23	11	Cal	1.14		0.61	2.30	0.58		51.38																56	57
Annapolis G-24	4401.5A(2)	1B.1	23	14	Cal	0.44			1.60	0.25	0.32	53.38																56	57
Annapolis G-24	4401.5A(2)	1B.1	24	5	Cal	1.48		0.39	1.54	0.43	0.43	51.73																56	58
Annapolis G-24	4401.5A(2)	1B.1	24	7	Cal	1.19		0.57	1.60	0.55		52.09																56	57
Annapolis G-24	4401.5A(2)	1B.1	25	2	Cal	0.69			1.18	0.49		53.65																56	55
Annapolis G-24	4401.5A(2)	1B.1	25	4	Cal	0.54			1.23	0.38		53.86																56	55
Annapolis G-24	4401.5A(2)	1B.1	27	1	Cal				0.72			55.28																56	55
Annapolis G-24	4401.5A(2)	1B.1	27	5	Cal				1.93	0.45		53.63																56	55
Annapolis G-24	4401.5A(2)	1B.1	28	2	Cal				1.25	0.32		54.43																56	56
Annapolis G-24	4401.5A(2)	1B.1	28.1	2	Cal	0.53			1.60	0.37		53.51																56	56
Annapolis G-24	4401.5A(2)	1B.1	29	2	Cal	0.69			0.98	0.26		51.02					3.05											56	59

Table 5E: Select EDS chemical analyses of carbonate grains

Well	Sample	Appendix	Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CuO	ZnO	As_2O_3	SrO	Y_2O_3	Sb_2O_3	BaO	WO_3	Total	Actual Total
Annapolis G-24	4401.5A(2)	1B.1	29	4	Cal	0.41			1.39	0.32		49.43					3.91	0.54										56	62
Annapolis G-24	4401.5A(2)	1B.1	29	7	Cal				1.13	0.31	0.35	54.21																56	56
Annapolis G-24	4401.5A(2)	1B.1	29	10	Cal	0.90		0.53	2.08	0.30		48.63					3.57											56	63
Annapolis G-24	4401.5A(2)	1B.1	30	4	Cal	1.65		0.92	1.49	0.31		51.63																56	59
Annapolis G-24	4401.5A(2)	1B.1	31	4	Cal				1.50	0.28		54.22																56	55
Annapolis G-24	4401.5A(2)	1B.1	32	1	Cal				1.19	0.27		54.54																56	57
Annapolis G-24	4401.5A(2)	1B.1	32	5	Cal	0.76		0.39	1.27	0.72		52.86																56	57
Annapolis G-24	4401.5A(2)	1B.1	33	4	Cal				1.62	0.26		54.11																56	55
Annapolis G-24	4401.5A(2)	1B.1	33	6	Cal	1.04		0.52	1.79	0.57	0.31	51.78																56	58
Annapolis G-24	4401.5A(2)	1B.2	1.redo	2	Cal				1.15			54.07									0.78							56	56
Annapolis G-24	4401.5A(2)	1B.2	1.redo	3	Cal				1.45	0.31		53.27									0.97							56	56
Annapolis G-24	4401.5A(2)	1B.2	2.redo	3	Cal	0.75		0.38	1.71	0.58	0.33	51.46									0.79							56	59
Annapolis G-24	4401.5A(2)	1B.2	2.redo	5	Cal				1.51			53.48									1.01							56	57
Annapolis G-24	4401.5A(2)	1B.2	2.redo	10	Cal	1.07		0.46	1.27	0.38		51.99									0.83							56	59
Annapolis G-24	4401.5B	1C.1	1	9	Cal	0.67			1.14	0.35	0.32	53.52																56	56
Annapolis G-24	4401.5B	1C.1	1	11	Cal	1.29		0.74	2.45	0.59	0.40	50.53																56	58
Annapolis G-24	4401.5B	1C.1	2	9	Cal				1.22	0.25		54.53																56	55
Annapolis G-24	4401.5B	1C.1	3.1	6	Cal	1.05		0.61	2.15	0.69	0.31	51.18																56	57
Annapolis G-24	4401.5B	1C.1	3.1	7	Cal	0.67			1.66	0.35		53.32																56	55
Annapolis G-24	4401.5B	1C.1	4	4	Cal	0.52			1.10	0.51		53.87																56	55
Annapolis G-24	4401.5B	1C.1	5	2	Cal				1.33		0.31	54.36																56	55
Annapolis G-24	4401.5B	1C.1	6	6	Cal				1.65	0.27	0.30	53.78																56	55
Annapolis G-24	4401.5B	1C.1	6.1	2	Cal	0.67			1.73	0.40		53.21																56	55
Annapolis G-24	4401.5B	1C.1	7	2	Cal	0.78		0.34	1.80	0.69	0.32	52.07																56	55
Annapolis G-24	4401.5B	1C.1	7	6	Cal	1.24		0.73	1.86	0.31		51.84																56	57
Annapolis G-24	4401.5B	1C.1	8	1	Cal				2.18	0.37	0.46	52.99																56	54
Annapolis G-24	4401.5B	1C.1	9	2	Cal				1.30			54.70																56	56
Annapolis G-24	4401.5B	1C.1	9	4	Cal				1.37	0.27		54.36																56	55
Annapolis G-24	4401.5B	1C.1	9	5	Cal				1.22	0.29		54.49																56	55
Annapolis G-24	4401.5B	1C.1	9.1	4	Cal				2.17	0.38	0.35	53.10																56	60
Annapolis G-24	4401.5B	1C.1	10.1	2	Cal	0.47			1.38	0.39		53.75																56	56
Annapolis G-24	4401.5B	1C.1	11	3	Cal				1.20	0.28		54.52																56	56
Annapolis G-24	4401.5B	1C.1	11	9	Cal				1.53		0.35	54.11																56	55
Annapolis G-24	4401.5B	1C.1	12	4	Cal				0.62			55.38																56	56
Annapolis G-24	4401.5B	1C.1	12	6	Cal				1.22	0.43		54.35																56	56
Annapolis G-24	4401.5B	1C.1	12.1	3	Cal				0.77			55.23																56	56
Annapolis G-24	4401.5B	1C.1	12.1	5	Cal	1.29		0.83	1.43	0.31		52.14																56	56
Annapolis G-24	4401.5B	1C.1	12.1	7	Cal	0.57			0.77	0.24		54.43																56	55
Annapolis G-24	4401.5B	1C.1	13	6	Cal	0.43			1.10	0.37		54.10																56	56
Annapolis G-24	4401.5B	1C.1	13.1	6	Cal				1.35	0.60		54.05																56	55
Annapolis G-24	4401.5B	1C.1	13.1	7	Cal	0.88		0.38	1.47	0.57	0.32	52.39																56	56
Annapolis G-24	4401.5B	1C.1	14	5	Cal	1.47		0.68	2.26	0.35		51.24																56	58
Annapolis G-24	4401.5B	1C.1	14	6	Cal	0.48		0.34	1.13	0.34		53.71																56	55
Annapolis G-24	4401.5B	1C.1	14	7	Cal				1.48	0.27	0.31	53.93																56	58
Annapolis G-24	4401.5B	1C.1	14.2	1	Cal	0.89		0.44	1.38	0.52	0.32	52.44																56	57
Annapolis G-24	4401.5B	1C.1	15	2	Cal	1.34		0.51	2.07	0.36	0.40	51.32																56	58
Annapolis G-24	4401.5B	1C.1	15	5	Cal				1.30	0.28		54.42																56	56
Annapolis G-24	4401.5B	1C.1	15	9	Cal	0.61			1.45	0.25		53.69																56	57
Annapolis G-24	4401.5B	1C.1	15	10	Cal				1.29	0.32		54.39																56	55
Annapolis G-24	4401.5B	1C.1	15.1	6	Cal				1.86	0.38	0.32	53.44																56	57
Annapolis G-24	5505	1D.1	13	14	Cal					1.62	0.48	45.34					8.56											56	68
Annapolis G-24	5520	1F.1	9	4	Cal						1.78	52.58	0.76			0.88												56	32
Annapolis G-24	5535(1)	1H.1	8	13	Cal				2.11			53.89																56	13
Annapolis G-24	5535(2)	1I.1	12	7	Cal				0.40	1.65		47.36					6.59											56	64
Annapolis G-24	6045	1J.1	1	10	Cal						0.99	55.01																56	55
Annapolis G-24	6045	1J.1	1	14	Cal						0.80	55.20																56	50
Annapolis G-24	6045	1J.1	3	13	Cal				0.20		0.81	55.00																56	58
Annapolis G-24	6045	1J.1	11	6	Cal							56.00																56	50
Annapolis G-24	6045	1J.1	14	9	Cal				0.21		0.68	55.12																56	50

Table 5E: Select EDS chemical analyses of carbonate grains

Well	Sample	Appendix	Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CuO	ZnO	As_2O_3	SrO	Y_2O_3	Sb_2O_3	BaO	WO_3	Total	Actual Total
Balvenie B-79	3610	2A.1	2	19	Cal	0.54			1.53			44.92					9.01											56	57
Balvenie B-79	3610	2A.1	3	8	Cal				0.37			43.61				0.35	11.66											56	63
Balvenie B-79	3610	2A.1	3	9	Cal	0.50			1.28			43.07					11.16											56	63
Balvenie B-79	3610	2A.1	4	20	Cal				0.53			48.31				0.63	6.54											56	54
Balvenie B-79	3610	2A.1	4	23	Cal	1.06			1.12		0.41	39.04				0.80	13.56											56	61
Balvenie B-79	3610	2A.1	5	6	Cal				0.96			46.97					8.08											56	54
Balvenie B-79	3610	2A.1	6	1	Cal				0.83	0.26		47.01					7.90											56	53
Balvenie B-79	3610	2A.1	6	8	Cal	0.43			1.50		0.41	42.21					11.45											56	58
Balvenie B-79	3610	2A.1	6	9	Cal				1.28			43.05					11.66											56	57
Balvenie B-79	3610	2A.1	7	5	Cal				0.80			43.74					11.46											56	53
Balvenie B-79	3610	2A.1	7	6	Cal				0.88			43.32					11.79											56	51
Balvenie B-79	3610	2A.1	8	8	Cal				1.30	0.63		43.19					10.88											56	50
Balvenie B-79	3610	2A.1	9	2	Cal				0.61			46.04					9.35											56	46
Balvenie B-79	3610	2A.1	10	3	Cal				1.08			46.71					8.21											56	43
Balvenie B-79	3610	2A.1	10	6	Cal				0.83			43.78					11.38											56	46
Balvenie B-79	3610	2A.1	10	10	Cal	0.81			1.13			40.31					13.76											56	49
Balvenie B-79	3610	2A.1	11	1	Cal				0.92			44.03					11.04											56	43
Balvenie B-79	3610	2A.1	11	2	Cal				1.35			42.61					12.04											56	43
Balvenie B-79	3610	2A.1	11	5	Cal				1.11			41.34					13.55											56	45
Balvenie B-79	3610	2A.1	11	14	Cal				0.32			39.79					15.89											56	46
Balvenie B-79	3610	2A.1	13	11	Cal				0.94	0.50		39.00					15.56											56	40
Balvenie B-79	3610	2A.1	14	9	Cal				0.48			46.68					8.84											56	39
Balvenie B-79	3645	2B.1	1	2	Cal				1.14			48.27					6.60											56	65
Balvenie B-79	3645	2B.1	2	1	Cal				0.68			49.88					5.44											56	60
Balvenie B-79	3645	2B.1	2	2	Cal				1.00		0.31	45.81					8.89											56	65
Balvenie B-79	3645	2B.1	4	1	Cal				1.42		0.29	47.66					6.64											56	63
Balvenie B-79	3645	2B.1	4	2	Cal				1.24		0.36	48.05					6.34											56	63
Balvenie B-79	3645	2B.1	4	4	Cal				0.31			50.06					5.63											56	65
Balvenie B-79	3645	2B.1	5	2	Cal				1.58		0.29	47.37					6.76											56	63
Balvenie B-79	3645	2B.1	5	7	Cal				1.28		0.30	48.57					5.85											56	62
Balvenie B-79	3645	2B.1	6	2	Cal				1.33			44.20					10.47											56	68
Balvenie B-79	3645	2B.1	7	3	Cal				1.53			46.86					7.61											56	66
Balvenie B-79	3645	2B.1	7	6	Cal				1.08			45.60					9.32											56	67
Balvenie B-79	3645	2B.1	8	2	Cal				1.13			42.46					12.40											56	71
Balvenie B-79	3645	2B.1	8	14	Cal							45.73					10.27											56	68
Balvenie B-79	3645	2B.1	9	3	Cal				1.49	0.21		44.65					9.66											56	69
Balvenie B-79	3645	2B.1	9	6	Cal				1.10			41.56				0.43	12.91											56	71
Balvenie B-79	3645	2B.1	10	9	Cal				1.02	0.20		44.37					10.40											56	69
Balvenie B-79	3645	2B.1	10	13	Cal	0.38			1.23	0.31		45.26					8.81											56	66
Balvenie B-79	3645	2B.1	11	2	Cal				1.18		0.41	45.23					9.18											56	69
Balvenie B-79	3645	2B.1	11	3	Cal				1.56			44.53					9.91											56	69
Balvenie B-79	3645	2B.1	11	5	Cal				1.10			47.80					7.10											56	64
Balvenie B-79	3645	2B.1	13	1	Cal				0.61			49.03					6.36											56	65
Balvenie B-79	3645	2B.1	14	1	Cal	0.68		0.28	1.04			43.41	0.28				10.32											56	72
Balvenie B-79	3645	2B.1	15	3	Cal				1.65			47.20					7.15											56	65
Balvenie B-79	3645	2B.1	15	11	Cal				0.35			48.21					7.44											56	65
Balvenie B-79	3645	2B.1	16	1	Cal				1.30			48.73					5.98											56	62
Balvenie B-79	3645	2B.1	16	5	Cal				0.53			51.02					4.46											56	63
Balvenie B-79	3645	2B.1	16	8	Cal				0.84	0.24		47.65					7.27											56	64
Balvenie B-79	3645	2B.1	17	3	Cal				0.98			49.95					5.07											56	62
Balvenie B-79	3645	2B.1	17	6	Cal				1.31			47.33				0.36	7.01											56	63
Crimson F-81	6415	3A.1	4	12	Cal						0.45	50.32					4.06						1.17					56	62
Crimson F-81	6415	3A.1	5	10	Cal						0.50	53.07					2.44											56	60
Crimson F-81	6415	3A.1	6	3	Cal						0.41	49.61					5.98											56	66
Crimson F-81	6415	3A.1	6	4	Cal						0.78	50.43					4.79											56	63
Crimson F-81	6415	3A.1	6	19	Cal				0.24		0.94	50.24					4.59											56	65
Crimson F-81	6415	3A.1	6.1	2	Cal						0.59	49.51					5.90											56	65
Crimson F-81	6415	3A.1	6.1	7	Cal	0.62		0.55	2.66	0.28	0.49	43.57				0.75	7.08											56	68
Crimson F-81	6415	3A.1	7	2	Cal							51.89					4.11											56	63

Table 5E: Select EDS chemical analyses of carbonate grains

Well	Sample	Appendix	Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CuO	ZnO	As_2O_3	SrO	Y_2O_3	Sb_2O_3	BaO	WO_3	Total	Actual Total
Crimson F-81	6415	3A.1	9	13	Cal						0.81	51.61					3.58											56	63
Crimson F-81	6415	3A.1	9	16	Cal	0.56		0.46	3.21	0.24	0.99	45.45					5.09											56	62
Crimson F-81	6415	3A.1	11	7	Cal						0.66	45.42					9.92											56	69
Crimson F-81	6415	3A.1	12	1	Cal						0.92	50.62					4.45											56	64
Crimson F-81	6415	3A.1	12	9	Cal							47.55					8.45											56	72
Crimson F-81	6415	3A.1	12	10	Cal						0.53	49.25					6.22											56	69
Crimson F-81	6415	3A.1	14	9	Cal						0.94	49.56					5.50											56	65
Crimson F-81	6415	3A.1	18	5	Cal						0.65	48.98					6.37											56	65
Crimson F-81	6415	3A.1	18	13	Cal							49.38					6.62											56	66
Crimson F-81	6415	3A.1	18.1	11	Cal							49.67					6.33											56	67
Crimson F-81	6415	3A.1	19	2	Cal						0.67	44.34					10.99											56	75
Crimson F-81	6415	3A.1	19	18	Cal						0.34	43.23					12.43											56	74
Crimson F-81	6415	3A.1	21	11	Cal						0.39	47.87					7.74											56	67
Crimson F-81	6415	3A.1	21	18	Cal						0.67	44.57					10.75											56	73
Crimson F-81	6415	3A.1	22	17	Cal							48.41					7.59											56	67
Crimson F-81	6415	3A.1	24	10	Cal						0.70	42.67					12.63											56	77
Crimson F-81	6415	3A.1	25	1	Cal				0.63	0.22	0.57	45.34					8.82	0.41										56	68
Crimson F-81	6415	3A.1	26	4	Cal					0.81	0.35	45.92					8.62				0.30							56	68
Crimson F-81	6425	3B.1	6	13	Cal	0.97					2.68	43.60				0.59	8.16											56	59
Crimson F-81	6425	3B.1	11	19	Cal						0.60	49.37					6.03											56	63
Crimson F-81	6425	3B.1	21	1	Cal						0.68	51.86					3.46											56	62
Crimson F-81	6425	3B.1	21	8	Cal	1.15		0.66			0.32	48.90		0.15			4.82											56	65
Crimson F-81	6470(1)	3D.1	1	3	Cal				0.50	0.82		54.68																56	56
Crimson F-81	6470(2)	3E.1	16	4	Cal							51.28					4.72											56	43
Crimson F-81	6470(2)	3E.1	17	10	Cal	0.61			0.35			49.42	0.77	0.41			2.73	1.71										56	28
Weymouth A-45	5955	4B.1	6	3	Cal				0.30		0.90	52.03					2.77											56	60
Weymouth A-45	5955	4B.1	11	7	Cal						0.40	48.66					6.94											56	68
Weymouth A-45	5955	4B.1	12	2	Cal							52.79					3.21											56	61
Weymouth A-45	5955	4B.1	12	4	Cal				0.32		0.97	52.42					2.29											56	59
Weymouth A-45	6182.5	4D.1	3	12	Cal						1.31	54.69																56	45
Weymouth A-45	6213.5	4E.1	10	1	Cal	1.16			0.69			54.14																56	43
Weymouth A-45	6213.5	4E.1	18	13	Cal	0.65			1.18			54.17																56	42
Weymouth A-45	6213.5	4E.1	20	3	Cal	0.59	0.74		2.02			52.66																56	42
Weymouth A-45	6213.5	4E.1	22	3	Cal	0.67	0.59		3.48		0.92	50.34																56	45
Newburn H-23	5975	Sangster, 2016	2	3	Cal							53.72					2.28											56	63
Newburn H-23	5975	Sangster, 2016	3	5	Cal				0.50		1.90	53.60																56	65
Newburn H-23	4353.5	Sangster, 2016	5	2	Cal				1.04	0.21		54.76																56	59
Newburn H-23	4353.5	Sangster, 2016	5	3	Cal	1.65		0.46	0.94	0.20		52.51		0.24														56	66
Newburn H-23	4353.5	Sangster, 2016	6	9	Cal				0.48			55.52																56	67
Newburn H-23	4353.5	Sangster, 2016	6	14	Cal				0.98			55.02																56	59
Newburn H-23	5213.5	Sangster, 2016	6	14	Cal				2.28	0.28	0.44	53.00																56	64
Newburn H-23	4353.5	Sangster, 2016	7	12	Cal	0.42		0.41	1.13			54.04																56	52
Newburn H-23	5950	Sangster, 2016	8	1	Cal				1.47			54.53																56	53
Newburn H-23	5975	Sangster, 2016	8	1	Cal				0.62	0.79		52.69					1.90											56	62
Newburn H-23	4353.5	Sangster, 2016	8	3	Cal	1.26			0.78			53.96																56	62
Newburn H-23	5408.5	Sangster, 2016	8	27	Cal				0.99	0.32		54.70																56	60
Newburn H-23	4353.5	Sangster, 2016	10	1	Cal	1.27		0.44	0.44			53.85																56	56
Newburn H-23	4353.5	Sangster, 2016	10	3	Cal				0.45			55.55																56	43
Newburn H-23	4353.5	Sangster, 2016	10	7	Cal				0.70			55.30																56	48
Newburn H-23	5408.5	Sangster, 2016	10	21	Cal				1.11	0.38	0.41	54.10																56	60
Newburn H-23	4353.5	Sangster, 2016	11	8	Cal	1.78			0.96	0.17		53.09																56	69
Newburn H-23	4353.5	Sangster, 2016	11	9	Cal				1.18	0.18		54.64																56	63
Newburn H-23	5975	Sangster, 2016	12	1	Cal						0.65	55.35																56	59
Newburn H-23	5950	Sangster, 2016	12	9	Cal							56.00																56	58
Newburn H-23	5975	Sangster, 2016	13	3	Cal	0.83			1.00			44.43				0.92	8.82											56	37
Newburn H-23	4353.5	Sangster, 2016	13	6	Cal	1.26			0.56			54.18																56	53
Newburn H-23	4353.5	Sangster, 2016	13	14	Cal	0.88		0.39	0.63			53.95		0.14														56	57
Newburn H-23	5950	Sangster, 2016	14	1	Cal						0.92	55.08																56	62
Newburn H-23	5408.5	Sangster, 2016	16	2	Cal				0.56	0.23		55.21																56	60

Table 5E: Select EDS chemical analyses of carbonate grains

Well	Sample	Appendix	Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CuO	ZnO	As_2O_3	SrO	Y_2O_3	Sb_2O_3	BaO	WO_3	Total	Actual Total
Annapolis G-24	5505	1D.1	8	21	Dol						13.44	38.58					1.98											54	49
Annapolis G-24	5505	1D.1	9	1	Dol				0.34		23.16	29.44					1.06											54	51
Annapolis G-24	5505	1D.1	9	15	Dol				0.33	0.24	23.19	28.87					1.19	0.17										54	46
Annapolis G-24	5505	1D.1	10	10	Dol				4.34	0.51	20.96	28.20																54	48
Annapolis G-24	5530	1G.1	14	7	Dol				0.33		21.94	31.54						0.18										54	57
Annapolis G-24	5530	1G.1	23	7	Dol				9.16	1.02	15.65	28.17																54	59
Annapolis G-24	5530	1G.1	29	1	Dol				6.02	1.99	17.03	28.96																54	58
Annapolis G-24	6045	1J.1	5	14	Dol				0.56	0.39	22.47	30.44						0.15										54	58
Annapolis G-24	6045	1J.1	12	6	Dol				1.84	0.85	21.88	29.44																54	58
Annapolis G-24	6045	1J.1	13	8	Dol				0.44	0.43	21.94	31.19																54	55
Balvenie B-79	3610	2A.1	6.1	7	Dol				0.64	0.52	23.57	29.27																54	48
Balvenie B-79	3610	2A.1	13	7	Dol				6.74	1.23	20.49	25.53																54	35
Crimson F-81	6415	3A.1	19	3	Dol				0.33		21.86	30.96					0.84											54	59
Crimson F-81	6415	3A.1	19	7	Dol				0.26		22.55	30.55					0.64											54	58
Crimson F-81	6425	3B.1	17	2	Dol				0.39	0.38	22.17	31.06																54	57
Crimson F-81	6425	3B.1	20.1	5	Dol	0.79			6.90	0.77	18.15	26.99				0.40												54	61
Crimson F-81	6450	3C.1	10	3	Dol				0.35		22.18	31.47																54	55
Crimson F-81	6470(2)	3E.1	26	4	Dol				3.12	0.25	26.42	24.21																54	38
Weymouth A-45	5955	4B.1	10	12	Dol				0.33		22.63	31.03																54	54
Newburn H-23	5965	Sangster, 2016	2	6	Dol				5.58	1.11	19.38	27.93																54	59
Newburn H-23	5965	Sangster, 2016	4	9	Dol				0.43		22.62	30.73						0.22										54	59
Newburn H-23	5975	Sangster, 2016	7	7	Dol				0.59	0.32	23.21	29.88																54	58
Newburn H-23	5975	Sangster, 2016	9	1	Dol				5.70	1.88	18.23	28.19																54	64
Newburn H-23	5975	Sangster, 2016	9	2	Dol				5.28	0.86	19.78	28.08																54	69
Newburn H-23	5950	Sangster, 2016	13	10	Dol						23.57	30.43																54	62
Crimson F-81	6450	3C.1	2	15	F-Cal				2.74	0.44	0.48	40.04					12.31											56	72
Crimson F-81	6450	3C.1	11	1	F-Cal							35.12					20.88											56	92
Crimson F-81	6450	3C.1	12	14	F-Cal				0.18		1.40	37.24					17.18											56	82
Crimson F-81	6450	3C.1	17	4	F-Cal	0.31			0.24		0.31	35.21					19.94											56	92
Crimson F-81	6450	3C.1	18	1	F-Cal						0.62	34.72					20.67											56	95
Crimson F-81	6450	3C.1	18	2	F-Cal	0.97					0.32	35.07					19.64											56	94
Crimson F-81	6450	3C.2	3.1	1	F-Cal							35.12					20.88											56	95
Newburn H-23	5403.6	Sangster, 2016	1	1	F-Cal	0.18			0.80	0.29	0.20	40.76			13.50									0.27				56	
Newburn H-23	5403.6	Sangster, 2016	1	2	F-Cal	0.13			1.48	0.49	0.49	38.29			15.04									0.08				56	
Newburn H-23	5407	Sangster, 2016	1	3	F-Cal	0.37			0.91	0.31	0.38	41.54					12.48											56	71
Newburn H-23	5403.6	Sangster, 2016	1	3	F-Cal	0.13			1.57	0.53	0.39	41.06			12.08									0.24				56	
Newburn H-23	4353.5	Sangster, 2016	1	3	F-Cal				0.74			46.33					8.93											56	61
Newburn H-23	5403.6	Sangster, 2016	1	4	F-Cal	0.41			1.24	0.44	0.26	39.05			14.35									0.25				56	
Newburn H-23	5213.5	Sangster, 2016	1	5	F-Cal				0.31		0.48	50.50					4.71											56	57
Newburn H-23	4353.5	Sangster, 2016	2	1	F-Cal				0.87	0.25		49.31					5.56											56	59
Newburn H-23	5403.6	Sangster, 2016	2	1	F-Cal				1.22	0.46	0.37	36.28			17.67													56	
Newburn H-23	4353.5	Sangster, 2016	2	2	F-Cal				0.93			51.11					3.96											56	54
Newburn H-23	5213.5	Sangster, 2016	2	2	F-Cal						0.99	48.33					6.68											56	71
Newburn H-23	5407	Sangster, 2016	2	5	F-Cal	0.67		0.44	0.81		0.51	40.78				1.10	11.68											56	73
Newburn H-23	5213.5	Sangster, 2016	2	5	F-Cal			0.30	0.59		0.83	47.44				0.60	6.24											56	71
Newburn H-23	4353.5	Sangster, 2016	2	5	F-Cal				0.93			52.46					2.61											56	60
Newburn H-23	5213.5	Sangster, 2016	2	5	F-Cal					0.31	1.32	51.44					2.93											56	63
Newburn H-23	5213.5	Sangster, 2016	2	7	F-Cal				0.55		0.94	48.01				0.87	5.63											56	69
Newburn H-23	5213.5	Sangster, 2016	2	10	F-Cal	0.63		0.52	1.26		0.69	46.90				0.45	5.54											56	70
Newburn H-23	5213.5	Sangster, 2016	2	17	F-Cal	0.54		0.34	0.53		3.15	43.86				1.19	6.41											56	75
Newburn H-23	5403.6	Sangster, 2016	3	1	F-Cal	0.11			1.43	0.45	0.41	39.78			13.69									0.13				56	
Newburn H-23	5213.5	Sangster, 2016	3	1	F-Cal						1.13	49.62					5.26											56	70
Newburn H-23	5403.6	Sangster, 2016	3	2	F-Cal	0.13			0.48	0.22		40.17			14.81									0.19				56	
Newburn H-23	5213.5	Sangster, 2016	3	3	F-Cal						0.41	47.76				0.42	7.41											56	69
Newburn H-23	5407	Sangster, 2016	3	4	F-Cal				0.97	0.30	0.31	41.95					12.48											56	70
Newburn H-23	5213.5	Sangster, 2016	3	23	F-Cal						2.24	45.01				1.38	7.36											56	75
Newburn H-23	5213.5	Sangster, 2016	4	1	F-Cal				0.24		0.60	49.05				0.62	5.50											56	68
Newburn H-23	5213.5	Sangster, 2016	4	3	F-Cal						1.33	46.27	0.38			0.64	7.38											56	75
Newburn H-23	5213.5	Sangster, 2016	4	5	F-Cal				0.32		3.06	45.08				1.18	6.37											56	76

Table 5E: Select EDS chemical analyses of carbonate grains

Well	Sample	Appendix	Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CuO	ZnO	As_2O_3	SrO	Y_2O_3	Sb_2O_3	BaO	WO_3	Total	Actual Total
Newburn H-23	5213.5	Sangster, 2016	4	6	F-Cal			0.34	0.78		0.72	46.47				0.50	7.20											56	73
Newburn H-23	5213.5	Sangster, 2016	4	18	F-Cal				0.22		0.83	48.44				0.50	6.00											56	69
Newburn H-23	5213.5	Sangster, 2016	4	19	F-Cal						0.68	46.72				0.53	8.08											56	72
Newburn H-23	5213.5	Sangster, 2016	5	1	F-Cal						0.48	48.67				0.35	6.50											56	73
Newburn H-23	5407	Sangster, 2016	5	2	F-Cal						1.24	43.62				0.42	10.72											56	69
Newburn H-23	5213.5	Sangster, 2016	5	6	F-Cal				0.43		0.82	47.39				0.78	6.58											56	73
Newburn H-23	5213.5	Sangster, 2016	5	7	F-Cal						0.67	46.59	0.39			0.67	7.68											56	74
Newburn H-23	5213.5	Sangster, 2016	5	9	F-Cal						0.48	47.95	0.41			0.45	6.72											56	74
Newburn H-23	5213.5	Sangster, 2016	5	13	F-Cal	0.50		0.35	0.54		0.55	47.61					6.45											56	78
Newburn H-23	5407	Sangster, 2016	5	17	F-Cal				0.94			39.17					15.89											56	27
Newburn H-23	5213.5	Sangster, 2016	6	5	F-Cal						0.80	47.40	0.37			1.79	5.64											56	76
Newburn H-23	5213.5	Sangster, 2016	6	8	F-Cal	0.48					0.75	51.48					3.29											56	66
Newburn H-23	5213.5	Sangster, 2016	6	9	F-Cal				0.38	0.17	0.88	49.63				0.36	4.58											56	70
Newburn H-23	5213.5	Sangster, 2016	6	13	F-Cal						1.72	51.40					2.88											56	70
Newburn H-23	5407	Sangster, 2016	6	25	F-Cal				0.76			39.29					15.95											56	28
Newburn H-23	5213.5	Sangster, 2016	7	8	F-Cal	0.79		0.35	0.73	0.18		51.51		0.08			2.36											56	63
Newburn H-23	5213.5	Sangster, 2016	7	9	F-Cal						0.59	48.96				0.53	5.91											56	68
Newburn H-23	5213.5	Sangster, 2016	8	13	F-Cal						2.65	49.07				0.95	3.33											56	67
Newburn H-23	5403.6	Sangster, 2016	10	3	F-Cal				0.92			39.61					15.47											56	53
Newburn H-23	5213.5	Sangster, 2016	10	4	F-Cal						0.34	48.28					7.38											56	80
Newburn H-23	5213.5	Sangster, 2016	10	7	F-Cal				0.20		1.74	43.93				1.50	8.64											56	81
Newburn H-23	5213.5	Sangster, 2016	10	17	F-Cal						1.20	44.03	0.40			0.74	9.64											56	84
Newburn H-23	5213.5	Sangster, 2016	11	1	F-Cal						0.58	48.21					7.21											56	63
Newburn H-23	5213.5	Sangster, 2016	11	6	F-Cal				0.29		0.68	45.37					9.67											56	68
Newburn H-23	5213.5	Sangster, 2016	11	10	F-Cal				1.43		0.40	46.35					7.82											56	58
Newburn H-23	5213.5	Sangster, 2016	13	1	F-Cal						0.49	51.97				0.53	3.00											56	58
Newburn H-23	5403.6	Sangster, 2016	14	4	F-Cal				0.81			38.93					16.26											56	56
Crimson F-81	6415	3A.1	4.1	6	Fe-Cal				9.76		2.31	43.46				0.47												56	59
Weymouth A-45	6182.5	4D.1	1	6	Fe-Cal				3.75		1.54	48.64				2.07												56	45
Weymouth A-45	6182.5	4D.1	1	7	Fe-Cal				2.79		0.60	51.40				1.20												56	45
Weymouth A-45	6182.5	4D.1	1	13	Fe-Cal				2.61		0.57	52.82																56	44
Weymouth A-45	6182.5	4D.1	2	7	Fe-Cal	0.62			1.85		0.43	53.10																56	44
Weymouth A-45	6182.5	4D.1	2	8	Fe-Cal	0.50			2.32		0.55	52.63																56	45
Weymouth A-45	6182.5	4D.1	2	9	Fe-Cal	0.66			2.45		0.75	52.14																56	46
Weymouth A-45	6182.5	4D.1	2	10	Fe-Cal	0.90			1.10		1.33	51.61	0.50			0.56												56	46
Weymouth A-45	6182.5	4D.1	2	18	Fe-Cal	0.88			2.17		0.55	52.40																56	45
Weymouth A-45	6182.5	4D.1	3	8	Fe-Cal	0.71			2.31		0.50	50.49	0.52			1.47												56	47
Weymouth A-45	6182.5	4D.1	3	10	Fe-Cal				2.55		0.60	52.85																56	45
Newburn H-23	5213.5	Sangster, 2016	1	2	Fe-Cal				1.89	0.30	0.53	53.28																56	59
Newburn H-23	5961.7	Sangster, 2016	1	7	Fe-Cal	1.05		0.81	2.11	0.57	0.76	50.70																56	49
Newburn H-23	5961.7	Sangster, 2016	1	8	Fe-Cal	0.53			1.57	0.52	0.66	52.72																56	47
Newburn H-23	5213.5	Sangster, 2016	1	12	Fe-Cal				2.21	0.26	0.55	52.98																56	72
Newburn H-23	4353.5	Sangster, 2016	1	14	Fe-Cal	0.88			1.25	0.27		53.45		0.15														56	62
Newburn H-23	5408.5	Sangster, 2016	2	3	Fe-Cal				1.37	0.40	0.38	53.85																56	53
Newburn H-23	5408.5	Sangster, 2016	3	5	Fe-Cal				1.28	0.41		54.30																56	61
Newburn H-23	5408.5	Sangster, 2016	3	6	Fe-Cal	1.48		0.48	1.43	0.53	0.42	51.37		0.29														56	68
Newburn H-23	4353.5	Sangster, 2016	3	8	Fe-Cal	0.48			1.15			54.37																56	63
Newburn H-23	4353.5	Sangster, 2016	3	10	Fe-Cal	1.55			3.62	0.21	0.54	49.44		0.65														56	52
Newburn H-23	4353.5	Sangster, 2016	3	20	Fe-Cal				1.13			54.87																56	64
Newburn H-23	5213.5	Sangster, 2016	3	20	Fe-Cal				7.35	0.52	5.40	42.73																56	73
Newburn H-23	5213.5	Sangster, 2016	3	24	Fe-Cal				1.99	0.25	0.55	53.21																56	61
Newburn H-23	4353.5	Sangster, 2016	4	18	Fe-Cal				1.14			54.86																56	57
Newburn H-23	4353.5	Sangster, 2016	4	19	Fe-Cal				1.08			54.92																56	63
Newburn H-23	5408.5	Sangster, 2016	5	4	Fe-Cal				1.10	0.44		54.45																56	41
Newburn H-23	5962	Sangster, 2016	6	1	Fe-Cal				1.39	0.50		54.11																56	38
Newburn H-23	5962	Sangster, 2016	6	4	Fe-Cal				1.66	0.67	0.43	53.24																56	39
Newburn H-23	4353.5	Sangster, 2016	6	5	Fe-Cal				1.25			54.75																56	54
Newburn H-23	5213.5	Sangster, 2016	6	6	Fe-Cal				1.92	0.23	0.54	53.31																56	65
Newburn H-23	5408.5	Sangster, 2016	6	6	Fe-Cal				1.23	0.43		54.35																56	49

Table 5E: Select EDS chemical analyses of carbonate grains

Well	Sample	Appendix	Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CuO	ZnO	As_2O_3	SrO	Y_2O_3	Sb_2O_3	BaO	WO_3	Total	Actual Total
Newburn H-23	5408.5	Sangster, 2016	6	7	Fe-Cal	1.13		0.43	1.20	0.33		52.91																56	61
Newburn H-23	4353.5	Sangster, 2016	6	10	Fe-Cal				1.34			54.66																56	65
Newburn H-23	5213.5	Sangster, 2016	6	10	Fe-Cal				2.09	0.31	0.45	53.14																56	62
Newburn H-23	5213.5	Sangster, 2016	6	12	Fe-Cal				2.49	0.58	0.72	52.21																56	58
Newburn H-23	4353.5	Sangster, 2016	6	13	Fe-Cal				1.20			54.80																56	63
Newburn H-23	4353.5	Sangster, 2016	6	19	Fe-Cal				1.22	0.22		54.56																56	53
Newburn H-23	4353.5	Sangster, 2016	7	2	Fe-Cal				1.31			54.69																56	54
Newburn H-23	5957	Sangster, 2016	7	3	Fe-Cal				1.64	0.45	0.52	53.39																56	59
Newburn H-23	5962	Sangster, 2016	8	4	Fe-Cal				1.00	0.50	0.38	54.12																56	70
Newburn H-23	5408.5	Sangster, 2016	8	9	Fe-Cal				1.23	0.34		54.43																56	66
Newburn H-23	4353.5	Sangster, 2016	8	17	Fe-Cal				1.30	0.19		54.51																56	56
Newburn H-23	5213.5	Sangster, 2016	9	3	Fe-Cal				2.33	0.32	0.69	52.65																56	58
Newburn H-23	5408.5	Sangster, 2016	9	4	Fe-Cal				1.32	0.32	0.44	53.92																56	62
Newburn H-23	5408.5	Sangster, 2016	9	8	Fe-Cal				1.36	0.26		54.39																56	53
Newburn H-23	5961.7	Sangster, 2016	9	10	Fe-Cal				2.11	0.57		53.32																56	39
Newburn H-23	4353.5	Sangster, 2016	9	14	Fe-Cal				1.22			54.78																56	47
Newburn H-23	5213.5	Sangster, 2016	9	15	Fe-Cal	0.66			2.27	0.34	0.55	52.18																56	60
Newburn H-23	4353.5	Sangster, 2016	9	15	Fe-Cal				1.19		0.32	54.49																56	57
Newburn H-23	5965	Sangster, 2016	10	3	Fe-Cal				4.32	0.45	0.87	50.36																56	59
Newburn H-23	4353.5	Sangster, 2016	10	4	Fe-Cal	0.96		0.68	1.06			53.31																56	48
Newburn H-23	5408.5	Sangster, 2016	10	5	Fe-Cal				1.10	0.29		54.61																56	57
Newburn H-23	4353.5	Sangster, 2016	10	6	Fe-Cal				1.23			54.77																56	57
Newburn H-23	5213.5	Sangster, 2016	11	2	Fe-Cal				2.03	0.29	0.66	53.02																56	52
Newburn H-23	5408.5	Sangster, 2016	11	2	Fe-Cal				1.31	0.42		54.27																56	55
Newburn H-23	5408.5	Sangster, 2016	11	6	Fe-Cal	0.68		0.35	1.47	0.43	0.39	52.69																56	65
Newburn H-23	4353.5	Sangster, 2016	11	15	Fe-Cal				1.34	0.20		54.47																56	48
Newburn H-23	4353.5	Sangster, 2016	11	18	Fe-Cal	0.97		0.38	1.44	0.20		53.01																56	48
Newburn H-23	5408.5	Sangster, 2016	11	19	Fe-Cal				1.11	0.33		54.55																56	64
Newburn H-23	5213.5	Sangster, 2016	12	11	Fe-Cal				1.99	0.30	0.69	53.02																56	50
Newburn H-23	5408.5	Sangster, 2016	13	3	Fe-Cal				1.00	0.25		54.75																56	50
Newburn H-23	5961.7	Sangster, 2016	15	2	Fe-Cal				1.74	0.48	0.69	53.09																56	39
Newburn H-23	5962	Sangster, 2016	15	5	Fe-Cal				2.09	0.43	0.73	52.75																56	72
Newburn H-23	5408.5	Sangster, 2016	16	9	Fe-Cal				1.08	0.30	0.40	54.22																56	59
Newburn H-23	5408.5	Sangster, 2016	16	10	Fe-Cal	0.54			1.33	0.35		53.78																56	53
Newburn H-23	5962	Sangster, 2016	18	2	Fe-Cal				1.93	0.80	0.80	52.47																56	67
Newburn H-23	5962	Sangster, 2016	18	4	Fe-Cal				1.92	0.59	0.72	52.77																56	68
Newburn H-23	5957	Sangster, 2016	19	1	Fe-Cal				2.27	0.57	0.68	52.48																56	57
Newburn H-23	4300	Sangster, 2016	14	4	Fe-Dol				6.04	1.06	21.22	27.68																56	62
Newburn H-23	4353.5	Sangster, 2016	1	1	Fe-F-Cal				1.16			49.04					5.79											56	57
Newburn H-23	5213.5	Sangster, 2016	1	4	Fe-F-Cal				1.49	0.33	0.54	49.31					4.33											56	56
Newburn H-23	5213.5	Sangster, 2016	1	7	Fe-F-Cal				0.60		0.66	48.89				0.57	5.28											56	60
Newburn H-23	5213.5	Sangster, 2016	1	8	Fe-F-Cal				1.45		0.41	50.66					3.48											56	55
Newburn H-23	5407	Sangster, 2016	2	2	Fe-F-Cal				1.87		0.99	43.03					10.10											56	35
Newburn H-23	4353.5	Sangster, 2016	2	3	Fe-F-Cal				1.30			51.74					2.95											56	52
Newburn H-23	5213.5	Sangster, 2016	2	3	Fe-F-Cal				1.56	0.27	0.45	49.64					4.08											56	67
Newburn H-23	5407	Sangster, 2016	2	3	Fe-F-Cal				1.38	0.59	0.52	40.95					12.55											56	71
Newburn H-23	5213.5	Sangster, 2016	2	4	Fe-F-Cal	0.58		0.34	1.86	0.26	0.53	48.50					3.93											56	67
Newburn H-23	5407	Sangster, 2016	2	4	Fe-F-Cal				1.48	0.50	0.53	40.92					12.57											56	70
Newburn H-23	5213.5	Sangster, 2016	2	6	Fe-F-Cal				1.52	0.22	0.62	47.47					6.17											56	68
Newburn H-23	4353.5	Sangster, 2016	2	9	Fe-F-Cal				1.11			51.54					3.34											56	55
Newburn H-23	5213.5	Sangster, 2016	2	9	Fe-F-Cal				1.25		1.13	46.19	0.39			0.57	6.48											56	69
Newburn H-23	4353.5	Sangster, 2016	2	10	Fe-F-Cal	0.59			1.18			50.75					3.49											56	54
Newburn H-23	5213.5	Sangster, 2016	2	19	Fe-F-Cal	0.86	2.17	0.59	2.33	0.52	1.00	42.66					5.86											56	75
Newburn H-23	5408.5	Sangster, 2016	3	1	Fe-F-Cal				1.39	0.46	0.52	49.66					3.97											56	54
Newburn H-23	4353.5	Sangster, 2016	3	2	Fe-F-Cal				1.25			52.65					2.11											56	53
Newburn H-23	5213.5	Sangster, 2016	3	2	Fe-F-Cal				1.83	0.33	0.55	49.73					3.56											56	67
Newburn H-23	5408.5	Sangster, 2016	3	2	Fe-F-Cal				1.14			50.79					4.07											56	51
Newburn H-23	5407	Sangster, 2016	3	3	Fe-F-Cal				1.74	0.49	0.58	41.05					12.14											56	68
Newburn H-23	5408.5	Sangster, 2016	3	4	Fe-F-Cal	0.81			1.36	0.62	0.50	49.68					3.02											56	51

Table 5E: Select EDS chemical analyses of carbonate grains

Well	Sample	Appendix	Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CuO	ZnO	As_2O_3	SrO	Y_2O_3	Sb_2O_3	BaO	WO_3	Total	Actual Total
Newburn H-23	5213.5	Sangster, 2016	3	5	Fe-F-Cal				2.08	0.42	0.62	50.01					2.86											56	67
Newburn H-23	5213.5	Sangster, 2016	3	6	Fe-F-Cal				1.81	0.38	0.65	47.10					6.06											56	73
Newburn H-23	5213.5	Sangster, 2016	3	13	Fe-F-Cal	0.66		0.35	2.09		0.51	50.06					2.33											56	59
Newburn H-23	5213.5	Sangster, 2016	3	25	Fe-F-Cal				1.66	0.27	0.48	44.16					9.44											56	84
Newburn H-23	5213.5	Sangster, 2016	3	26	Fe-F-Cal				2.17	0.25	0.77	50.75					2.06											56	71
Newburn H-23	5213.5	Sangster, 2016	4	2	Fe-F-Cal				1.62		0.48	45.75					8.16											56	69
Newburn H-23	5213.5	Sangster, 2016	4	4	Fe-F-Cal	0.52		0.40	1.61	0.21	0.82	42.76					9.69											56	79
Newburn H-23	5213.5	Sangster, 2016	4	7	Fe-F-Cal	0.96		0.52	2.04	0.25	0.60	43.90					7.74											56	77
Newburn H-23	5213.5	Sangster, 2016	4	7	Fe-F-Cal	0.62		0.29	1.69	0.25	0.46	46.05					6.65											56	72
Newburn H-23	5213.5	Sangster, 2016	4	10	Fe-F-Cal				1.77	0.34	0.61	47.07					6.21											56	71
Newburn H-23	5213.5	Sangster, 2016	4	20	Fe-F-Cal	0.54		0.45	1.58	0.18	1.51	45.09					6.64											56	75
Newburn H-23	5407	Sangster, 2016	5	1	Fe-F-Cal				1.25	0.35	0.34	41.99					12.07											56	69
Newburn H-23	5213.5	Sangster, 2016	5	4	Fe-F-Cal				2.03	0.30	0.68	48.80					4.19											56	69
Newburn H-23	5213.5	Sangster, 2016	5	5	Fe-F-Cal	0.50		0.32	1.84	0.25	0.66	46.49					5.95											56	70
Newburn H-23	5213.5	Sangster, 2016	5	5	Fe-F-Cal				1.71	0.23	0.52	46.50					7.04											56	74
Newburn H-23	5407	Sangster, 2016	5	6	Fe-F-Cal				1.36	0.44		42.63					11.57											56	69
Newburn H-23	5213.5	Sangster, 2016	5	8	Fe-F-Cal	0.53		0.38	2.26	0.32	0.55	48.28					3.68											56	68
Newburn H-23	5213.5	Sangster, 2016	5	8	Fe-F-Cal				1.82	0.23	0.60	46.51					6.83											56	71
Newburn H-23	5213.5	Sangster, 2016	5	14	Fe-F-Cal	0.49			1.50	0.20	0.99	43.86				0.62	8.34											56	81
Newburn H-23	5213.5	Sangster, 2016	6	7	Fe-F-Cal				1.93	0.27	0.73	48.12					4.94											56	67
Newburn H-23	5403.6	Sangster, 2016	9	2	Fe-F-Cal				1.40	0.50		39.04					15.06											56	53
Newburn H-23	5403.6	Sangster, 2016	9	7	Fe-F-Cal				1.38	0.45	0.48	38.85					14.85											56	57
Newburn H-23	5403.6	Sangster, 2016	9	8	Fe-F-Cal				1.30	0.55	0.52	39.33					14.30											56	54
Newburn H-23	5213.5	Sangster, 2016	10	5	Fe-F-Cal				1.70	0.22	0.58	45.03					8.46											56	79
Newburn H-23	5213.5	Sangster, 2016	10	18	Fe-F-Cal				1.77	0.26	0.55	45.76					7.66											56	76
Newburn H-23	5213.5	Sangster, 2016	12	4	Fe-F-Cal				2.23	0.27	0.80	49.61					3.09											56	57
Newburn H-23	5403.6	Sangster, 2016	14	1	Fe-F-Cal				1.33	0.54	0.55	39.86					13.71											56	53
Newburn H-23	5403.6	Sangster, 2016	14	2	Fe-F-Cal				1.53	0.54		39.80					14.13											56	51
Newburn H-23	5403.6	Sangster, 2016	14	6	Fe-F-Cal	1.66			1.47	0.47		39.02		0.30			13.09											56	54
Newburn H-23	5403.6	Sangster, 2016	15	2	Fe-F-Cal				1.23			38.37					16.40											56	56
Newburn H-23	5213.5	Sangster, 2016	4	8	F-Fe-Cal				1.94	0.30	0.65	47.14					5.97											56	72
Newburn H-23	4313.5	Sangster, 2016	12	13	Mg-Sd	0.98			37.49		13.05	4.47																56	65
Annapolis G-24	4401.5A(1)	1A.1	2	14	Sd				47.45	1.13	5.56	1.86																56	58
Annapolis G-24	4401.5A(1)	1A.1	3	4	Sd				43.11	0.49	7.19	5.21																56	55
Annapolis G-24	4401.5A(1)	1A.1	5	12	Sd	0.42			47.26	1.32	5.30	1.69																56	58
Annapolis G-24	4401.5A(2)	1B.1	1	5	Sd				45.50	1.41	5.38	2.83									0.88							56	62
Annapolis G-24	4401.5A(2)	1B.2	1.redo	5	Sd				45.12	1.53	5.01	3.32									1.02							56	61
Annapolis G-24	4401.5B	1C.1	6.2	3	Sd				45.83	0.41	6.46	3.29																56	60
Annapolis G-24	4401.5B	1C.1	15.1	7	Sd	0.60			46.90	1.37	6.26	0.87																56	63
Annapolis G-24	5505	1D.1	2	1	Sd				38.63	0.31	11.37	5.69																56	90
Annapolis G-24	5505	1D.1	10	13	Sd				47.11	4.12	4.19	0.59																56	51
Annapolis G-24	5510	1E.1	5	4	Sd	0.62			52.67	0.91	0.72	1.08																56	46
Annapolis G-24	5520	1F.1	1	12	Sd				44.46	0.82	9.06	1.65																56	61
Annapolis G-24	5520	1F.1	1	13	Sd	1.19		0.94	43.75	0.85	8.06	1.22																56	53
Annapolis G-24	5520	1F.1	5	14	Sd				53.81	0.25		0.26	0.89					0.40	0.39									56	47
Annapolis G-24	5520	1F.1	7	5	Sd				55.09	0.45								0.46										56	59
Annapolis G-24	5520	1F.1	10	3	Sd	0.42			55.58																			56	45
Annapolis G-24	5520	1F.1	10	7	Sd				55.18	0.82																		56	40
Annapolis G-24	5520	1F.1	12	7	Sd				55.19	0.81																		56	47
Annapolis G-24	5530	1G.1	1	5	Sd	0.99		0.70	42.98	1.42	6.72	3.19																56	59
Annapolis G-24	5530	1G.1	4	10	Sd	0.96			53.89	0.36	0.32	0.46																56	76
Annapolis G-24	5530	1G.1	5	13	Sd	1.05			43.32	0.88	8.23	2.52																56	59
Annapolis G-24	5530	1G.1	10	8	Sd				44.40	0.74	9.67	1.18																56	56
Annapolis G-24	5530	1G.1	12	6	Sd	0.54			44.88	0.73	8.57	1.28																56	55
Annapolis G-24	5530	1G.1	17	13	Sd	0.53			43.83	0.74	8.58	2.32																56	62
Annapolis G-24	5530	1G.1	21	6	Sd				45.93	0.89	8.53	0.64																56	61
Annapolis G-24	5530	1G.1	28	1	Sd	0.63			44.61	1.32	7.85	1.60																56	60
Annapolis G-24	5530	1G.1	32	2	Sd				49.73	3.66	1.81	0.80																56	59
Annapolis G-24	5535(1)	1H.1	1	18	Sd				51.83	0.26	1.55	2.16						0.20										56	41

Table 5E: Select EDS chemical analyses of carbonate grains

Well	Sample	Appendix	Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CuO	ZnO	As_2O_3	SrO	Y_2O_3	Sb_2O_3	BaO	WO_3	Total	Actual Total
Annapolis G-24	5535(1)	1H.1	3	4	Sd	0.91			43.12	0.81	9.28	1.88																56	23
Annapolis G-24	5535(1)	1H.1	3	23	Sd	1.18		0.94	43.26	0.71	3.11	6.80																56	18
Annapolis G-24	5535(1)	1H.1	8	16	Sd				7.83	2.04	16.16	29.98																56	13
Annapolis G-24	5535(2)	1I.1	1	3	Sd	0.83		0.38	42.24	0.45	4.47	7.04			0.58													56	68
Annapolis G-24	5535(2)	1I.1	1	4	Sd	1.36		0.75	41.97	1.14	7.21	3.58																56	65
Annapolis G-24	5535(2)	1I.1	2	7	Sd	0.66			45.85	0.63	5.28	3.59																56	65
Annapolis G-24	5535(2)	1I.1	3	6	Sd				48.73	3.15	2.83	0.60														0.68		56	59
Annapolis G-24	5535(2)	1I.1	3	9	Sd	0.69			50.93	1.69	0.72	1.79						0.19										56	73
Annapolis G-24	5535(2)	1I.1	4	3	Sd	0.79			43.02	1.56	8.11	2.51																56	65
Annapolis G-24	5535(2)	1I.1	4	14	Sd	1.29		0.73	41.58	0.35	6.45	4.85			0.74													56	60
Annapolis G-24	5535(2)	1I.1	7	11	Sd	0.91		0.66	38.57		9.48	6.38																56	62
Annapolis G-24	5535(2)	1I.1	8	4	Sd	0.79		0.54	41.95	0.45	6.45	5.02			0.80													56	60
Annapolis G-24	5535(2)	1I.1	10	5	Sd	1.34		0.64	43.20	0.92	7.02	2.17														0.69		56	55
Annapolis G-24	5535(2)	1I.1	10	6	Sd				44.53		6.28	4.24			0.95													56	61
Annapolis G-24	5535(2)	1I.1	10	10	Sd				46.02	0.97	7.95	1.06																56	62
Annapolis G-24	6045	1J.1	3	7	Sd				47.52	3.88	3.64	0.96																56	56
Annapolis G-24	6045	1J.1	9	1	Sd				46.98	3.70	4.35	0.97																56	57
Annapolis G-24	6045	1K.1	12	10	Sd				46.25	1.08	7.50	1.17																56	62
Annapolis G-24	6045	1K.1	13	4	Sd				44.83	0.76	7.18	2.34			0.89													56	62
Annapolis G-24	6045	1K.1	16	3	Sd				46.35	1.08	7.03	1.55																56	60
Annapolis G-24	6045	1K.1	17	9	Sd	0.91			34.34	0.65	7.36	12.73																56	70
Annapolis G-24	6045	1K.1	19	7	Sd				46.67	0.96	7.36	1.02																56	62
Annapolis G-24	6045	1K.1	23	4	Sd				44.97	1.08	7.79	2.16																56	61
Annapolis G-24	6045	1K.1	39	2	Sd				48.22	3.03	2.23	2.53																56	60
Annapolis G-24	6045	1K.1	40	3	Sd				48.72	3.19	1.81	2.28																56	61
Balvenie B-79	3610	2A.1	1	14	Sd				44.32	1.27	6.24	4.16																56	54
Balvenie B-79	3610	2A.1	1	19	Sd	0.52			43.22	2.67	5.36	4.23																56	56
Balvenie B-79	3610	2A.1	1	22	Sd	0.77			44.13	0.76	6.30	4.03																56	55
Balvenie B-79	3610	2A.1	2	5	Sd				43.63	1.59	5.84	4.94																56	53
Balvenie B-79	3610	2A.1	2	7	Sd	0.64			43.16	1.39	5.59	5.21																56	54
Balvenie B-79	3610	2A.1	2	14	Sd				42.97	1.84	6.02	5.17																56	51
Balvenie B-79	3610	2A.1	2	20	Sd				44.03	1.22	5.97	4.79																56	51
Balvenie B-79	3610	2A.1	2	21	Sd				44.47	0.94	5.96	4.63																56	53
Balvenie B-79	3610	2A.1	3	3	Sd				38.14	1.90	4.05	11.91																56	51
Balvenie B-79	3610	2A.1	3	4	Sd				43.63	1.47	6.40	4.50																56	53
Balvenie B-79	3610	2A.1	3	5	Sd				43.00	1.75	5.85	5.40																56	52
Balvenie B-79	3610	2A.1	3	6	Sd				43.48	1.62	5.86	5.04																56	54
Balvenie B-79	3610	2A.1	3	7	Sd				44.06	1.28	5.98	4.68																56	54
Balvenie B-79	3610	2A.1	3	18	Sd				44.60	0.69	6.76	3.94																56	51
Balvenie B-79	3610	2A.1	4	8	Sd	1.12			42.30	1.65	5.89	5.05																56	52
Balvenie B-79	3610	2A.1	4	15	Sd				44.44	0.86	5.76	4.94																56	50
Balvenie B-79	3610	2A.1	4	17	Sd				43.70	1.32	5.91	5.07																56	50
Balvenie B-79	3610	2A.1	4	24	Sd				43.21	1.32	6.27	5.20																56	50
Balvenie B-79	3610	2A.1	5	4	Sd				43.70	1.62	5.48	5.20																56	49
Balvenie B-79	3610	2A.1	5	7	Sd				43.28	1.97	6.36	4.39																56	50
Balvenie B-79	3610	2A.1	5	15	Sd	1.11			41.93	2.05	5.55	5.35																56	49
Balvenie B-79	3610	2A.1	5	16	Sd				43.85	0.74	7.44	3.97																56	49
Balvenie B-79	3610	2A.1	6	10	Sd	1.00			42.36	1.25	5.63	5.02			0.73													56	49
Balvenie B-79	3610	2A.1	6	17	Sd				44.45	0.62	6.98	3.95																56	47
Balvenie B-79	3610	2A.1	6	18	Sd	0.66		0.51	44.09	1.86	6.47	2.40																56	49
Balvenie B-79	3610	2A.1	6.1	1	Sd				42.57	2.11	5.78	5.54																56	49
Balvenie B-79	3610	2A.1	7	12	Sd				42.74	1.38	6.78	5.10																56	43
Balvenie B-79	3610	2A.1	7	17	Sd	0.91		0.64	40.55	1.60	6.98	5.32																56	45
Balvenie B-79	3610	2A.1	7	18	Sd				43.98	1.40	6.59	4.04																56	42
Balvenie B-79	3610	2A.1	7	19	Sd	0.88			42.31	1.57	6.62	4.61																56	43
Balvenie B-79	3610	2A.1	7	25	Sd	0.86	0.45		43.06	0.89	6.56	4.17																56	42
Balvenie B-79	3610	2A.1	8	9	Sd				42.19	1.31	7.17	5.33																56	44
Balvenie B-79	3610	2A.1	8	10	Sd				42.58	1.06	7.53	4.83																56	43
Balvenie B-79	3610	2A.1	8	12	Sd	0.82			43.17	1.39	6.60	4.02																56	43

Table 5E: Select EDS chemical analyses of carbonate grains

Well	Sample	Appendix	Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CuO	ZnO	As_2O_3	SrO	Y_2O_3	Sb_2O_3	BaO	WO_3	Total	Actual Total
Balvenie B-79	3610	2A.1	8	14	Sd				42.33	1.58	6.69	5.40																56	43
Balvenie B-79	3610	2A.1	9	1	Sd				42.02	1.60	7.11	5.26																56	41
Balvenie B-79	3610	2A.1	9	3	Sd				43.25	0.96	6.79	5.00																56	40
Balvenie B-79	3610	2A.1	9	7	Sd	0.99		0.74	41.74	1.98	6.37	4.18																56	41
Balvenie B-79	3610	2A.1	9	9	Sd				43.00	0.91	8.01	4.08																56	40
Balvenie B-79	3610	2A.1	10	4	Sd	0.67			43.09	1.69	6.60	3.95																56	39
Balvenie B-79	3610	2A.1	10	5	Sd				41.74	1.39	7.57	5.30																56	39
Balvenie B-79	3610	2A.1	10	7	Sd	1.01		0.82	41.37	2.04	6.65	4.09																56	40
Balvenie B-79	3610	2A.1	10	8	Sd	0.95	0.38		41.22	1.98	6.23	5.24																56	40
Balvenie B-79	3610	2A.1	10	13	Sd				41.69	1.05	8.54	4.72																56	36
Balvenie B-79	3610	2A.1	11	8	Sd				41.80	0.70	8.95	4.55																56	36
Balvenie B-79	3610	2A.1	11	11	Sd				41.43	1.51	7.60	5.46																56	33
Balvenie B-79	3610	2A.1	11	13	Sd				40.94	1.30	8.27	5.48																56	34
Balvenie B-79	3610	2A.1	11	15	Sd				39.14	2.04	7.96	6.87																56	34
Balvenie B-79	3610	2A.1	11	16	Sd				41.97	0.83	8.54	4.67																56	34
Balvenie B-79	3610	2A.1	12	1	Sd				40.48	1.91	7.73	5.89																56	34
Balvenie B-79	3610	2A.1	12	3	Sd				40.41	1.55	8.55	5.49																56	32
Balvenie B-79	3610	2A.1	12	5	Sd				16.05	1.46	11.37	26.90						0.22										56	35
Balvenie B-79	3610	2A.1	12	6	Sd				40.15	2.00	7.47	6.38																56	33
Balvenie B-79	3610	2A.1	12	7	Sd	0.76			40.81	0.87	9.03	4.54																56	33
Balvenie B-79	3610	2A.1	12	8	Sd	0.76			41.15	1.79	6.78	5.52																56	37
Balvenie B-79	3610	2A.1	13	4	Sd				39.29	1.72	8.57	6.42																56	29
Balvenie B-79	3610	2A.1	13	6	Sd				40.29	1.48	8.22	6.01																56	32
Balvenie B-79	3610	2A.1	13	9	Sd				41.04	0.82	8.68	5.47																56	30
Balvenie B-79	3610	2A.1	13	13	Sd				43.41	2.07	6.81	3.71																56	30
Balvenie B-79	3610	2A.1	14	2	Sd				36.17	1.47	8.94	9.42																56	25
Balvenie B-79	3610	2A.1	14	3	Sd				39.78	1.95	9.19	5.08																56	27
Balvenie B-79	3610	2A.1	14	7	Sd				39.09	0.62	11.54	4.75																56	24
Balvenie B-79	3645	2B.1	4	3	Sd				45.42	0.88	4.99	4.71																56	61
Balvenie B-79	3645	2B.1	7	7	Sd	0.60		0.39	43.62	0.91	5.72	4.76																56	62
Balvenie B-79	3645	2B.1	10	7	Sd				43.84	1.91	5.11	5.14																56	61
Balvenie B-79	3645	2B.1	15	18	Sd	0.84			43.56	1.93	6.64	3.03																56	60
Crimson F-81	6415	3A.1	1	17	Sd	0.90			44.46		5.23	4.86			0.56													56	60
Crimson F-81	6415	3A.1	2.1	1	Sd				38.61	0.24	9.26	7.90																56	61
Crimson F-81	6415	3A.1	3.1	2	Sd	0.73			43.53	0.38	6.19	4.61			0.55													56	63
Crimson F-81	6415	3A.1	4	3	Sd	0.78		0.45	42.70	0.39	4.38	6.61			0.69													56	63
Crimson F-81	6415	3A.1	4	10	Sd	0.91		0.62	39.32	0.41	6.19	7.86			0.69													56	62
Crimson F-81	6415	3A.1	6	22	Sd	0.78			43.27	0.40	6.09	4.82			0.63													56	64
Crimson F-81	6415	3A.1	8	11	Sd	0.85			43.58	0.45	5.43	5.06			0.63													56	61
Crimson F-81	6415	3A.1	11	2	Sd	1.06			41.90	0.35	4.59	6.66	0.35		1.10													56	65
Crimson F-81	6415	3A.1	12	15	Sd	1.12		0.76	39.52	0.44	6.57	7.58																56	63
Crimson F-81	6415	3A.1	21	7	Sd	1.13		0.70	41.64	0.46	6.54	4.87			0.61						0.04							56	63
Crimson F-81	6415	3A.1	21	10	Sd				47.20	4.80	3.13	0.88																56	60
Crimson F-81	6415	3A.1	25	19	Sd	0.80		0.39	40.85	0.44	8.63	4.64									0.25							56	62
Crimson F-81	6415	3A.2	1.1	10	Sd	0.74			42.63	0.60	7.42	3.86				0.75												56	61
Crimson F-81	6425	3B.1	5	8	Sd	0.96		0.62	41.50	0.40	5.64	6.10			0.78													56	61
Crimson F-81	6425	3B.1	5	9	Sd				46.69	2.03	4.47	2.81																56	61
Crimson F-81	6425	3B.1	10	3	Sd	1.80		0.87	40.78	0.49	7.40	3.64	0.49		0.53													56	66
Crimson F-81	6425	3B.1	11	8	Sd	0.77		0.47	45.12	0.56	4.87	3.53			0.68													56	63
Crimson F-81	6425	3B.1	12	3	Sd	0.98		0.59	45.11	0.40	4.26	3.98			0.68													56	62
Crimson F-81	6425	3B.1	12	5	Sd				50.25	3.16	1.72	0.87																56	59
Crimson F-81	6425	3B.1	16.1	1	Sd	0.62			43.58	0.28	5.92	5.02			0.58													56	60
Crimson F-81	6425	3B.1	16.1	2	Sd	0.49			44.06	0.23	6.47	4.75																56	60
Crimson F-81	6425	3B.1	16.1	3	Sd	0.55			44.16	0.27	6.26	4.13			0.63													56	61
Crimson F-81	6425	3B.1	16.1	6	Sd	1.08			42.87	0.29	6.20	5.56																56	62
Crimson F-81	6425	3B.1	16.1	7	Sd	0.88			43.37	0.37	5.87	4.88			0.63													56	61
Crimson F-81	6425	3B.1	18	5	Sd				48.51	2.93	4.34	0.22																56	61
Crimson F-81	6450	3C.1	4	17	Sd	0.35			54.48	0.34		0.82																56	71
Crimson F-81	6450	3C.1	6	5	Sd	0.47			43.88	0.30	7.03	3.75			0.57													56	61

Table 5E: Select EDS chemical analyses of carbonate grains

Well	Sample	Appendix	Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CuO	ZnO	As_2O_3	SrO	Y_2O_3	Sb_2O_3	BaO	WO_3	Total	Actual Total
Crimson F-81	6450	3C.1	7	12	Sd	0.41			46.27	0.99	5.95	2.37																56	60
Crimson F-81	6450	3C.1	7	15	Sd				45.98	3.00	6.73	0.29																56	62
Crimson F-81	6450	3C.1	12	9	Sd				47.04	2.06	4.56	2.35																56	63
Crimson F-81	6450	3C.1	13	12	Sd				48.79	3.18	1.71	2.32																56	61
Crimson F-81	6450	3C.2	22	4	Sd	0.40			43.99	1.05	7.51	3.05																56	63
Crimson F-81	6470(1)	3D.1	3	2	Sd	0.98		0.58	42.61	0.24	6.76	4.19			0.64													56	62
Crimson F-81	6470(1)	3D.1	3.1	2	Sd	0.74		0.37	42.67	0.32	6.10	5.16			0.64													56	61
Crimson F-81	6470(1)	3D.1	3.1	3	Sd	0.91			43.56	0.30	6.55	4.17			0.51													56	60
Crimson F-81	6470(1)	3D.1	4	5	Sd	1.01		0.45	42.07	0.39	6.58	5.50																56	63
Crimson F-81	6470(1)	3D.1	7	12	Sd				45.21	0.88	8.51	1.40																56	62
Crimson F-81	6470(1)	3D.1	10	15	Sd	0.83			40.66	0.28	7.40	6.83																56	61
Crimson F-81	6470(1)	3D.1	14	1	Sd				48.86	3.06	2.28	1.80																56	64
Crimson F-81	6470(1)	3D.1	16	1	Sd				49.26	2.92	2.40	1.42																56	64
Crimson F-81	6470(2)	3E.1	5	5	Sd	1.00		0.64	39.92	0.39	8.90	5.15																56	41
Crimson F-81	6470(2)	3E.1	8	5	Sd	0.73			37.31	0.45	9.35	8.16																56	42
Crimson F-81	6470(2)	3E.1	10	15	Sd				45.24	5.31	3.61	1.84																56	33
Crimson F-81	6470(2)	3E.1	11	6	Sd				46.51	3.24	3.78	2.47																56	36
Crimson F-81	6470(2)	3E.1	11.1	4	Sd				47.43	3.54	3.00	2.03																56	36
Crimson F-81	6470(2)	3E.1	14	2	Sd				47.82	3.57	2.96	1.65																56	37
Crimson F-81	6470(2)	3E.1	21	5	Sd				39.30	0.86	13.51	2.33																56	32
Crimson F-81	6470(2)	3E.1	27	3	Sd				37.55	0.96	14.98	2.51																56	31
Crimson F-81	6470(2)	3E.1	30	3	Sd	0.99		0.77	40.87	0.46	6.39	5.49			1.03													56	39
Weymouth A-45	5715	4A.1	1	7	Sd	0.60		0.36	44.52	0.87	6.62	3.02																56	59
Weymouth A-45	5715	4A.1	1	8	Sd	0.79		0.40	42.10	0.50	7.56	4.65																56	60
Weymouth A-45	5715	4A.1	2	11	Sd				44.38	1.96	4.89	4.20			0.57													56	59
Weymouth A-45	5715	4A.1	4	9	Sd	1.38		0.62	43.35	0.30	4.59	5.77																56	62
Weymouth A-45	5715	4A.1	7	11	Sd	1.32		0.62	41.74		4.21	8.12																56	66
Weymouth A-45	5715	4A.1	9	8	Sd				47.79	2.79	3.40	2.02																56	62
Weymouth A-45	5715	4A.1	11	17	Sd				50.74	1.62	1.05	2.12	0.47															56	74
Weymouth A-45	5715	4A.1	12	13	Sd				45.23	0.77	4.60	5.39																56	60
Weymouth A-45	5715	4A.1	14	5	Sd	1.26		0.68	44.97		4.69	3.64			0.77													56	63
Weymouth A-45	5715	4A.1	14	6	Sd	1.22		0.90	42.77	0.39	5.16	4.87			0.68													56	63
Weymouth A-45	5715	4A.1	14	9	Sd	0.62			45.09		5.64	3.77			0.88													56	61
Weymouth A-45	5955	4B.1	1	13	Sd				46.05	2.89	6.68	0.39																56	63
Weymouth A-45	5955	4B.1	4	8	Sd				45.88	3.01	6.85	0.26																56	62
Weymouth A-45	5955	4B.1	6	2	Sd				47.06	2.85	5.87	0.22																56	64
Weymouth A-45	5955	4B.1	6	4	Sd				48.88	3.46	1.86	1.81																56	60
Weymouth A-45	5955	4B.1	8	5	Sd	0.88			52.82	1.17		0.63				0.49												56	76
Weymouth A-45	5955	4B.1	9	6	Sd	1.18		0.78	42.51		6.49	4.51				0.53												56	62
Weymouth A-45	5955	4B.1	10	3	Sd				48.87	2.86	3.80	0.47																56	58
Weymouth A-45	5955	4B.1	10	5	Sd				48.27	2.57	5.16																	56	64
Weymouth A-45	5955	4B.1	10	8	Sd				47.60	3.70	4.25	0.45																56	62
Weymouth A-45	5955	4B.1	11	1	Sd	1.10		0.77	44.46	0.30	5.16	4.20																56	66
Weymouth A-45	5955	4B.1	12	3	Sd	1.62		0.89	39.80	0.30	4.70	8.70																56	62
Weymouth A-45	5955	4B.1	13	8	Sd	0.46			44.99	1.70	4.12	3.83			0.90													56	63
Weymouth A-45	6213.5	4E.1	5	1	Sd	1.50		0.45	37.94	0.72	7.62	7.77																56	49
Weymouth A-45	6213.5	4E.1	11	3	Sd	0.90			43.49	1.02	8.80	1.79																56	46
Weymouth A-45	6213.5	4E.1	23	2	Sd	0.80			42.91	0.90	9.33	2.06																56	47
Weymouth A-45	6213.5	4E.1	24	1	Sd	1.18		0.70	49.39	0.62	0.76	3.35																56	45
Weymouth A-45	6213.5	4E.1	25	6	Sd	0.63			43.56	0.76	9.04	2.00																56	48
Newburn H-23	5406.5	Sangster, 2016	2	3	Sd				43.53	1.84	5.92	4.70																56	36
Newburn H-23	5406.5	Sangster, 2016	2	4	Sd				45.58	1.44	3.86	5.11																56	37
Newburn H-23	4315	Sangster, 2016	2	7	Sd		0.30		39.61	0.87	8.99	6.23																56	62
Newburn H-23	5406.5	Sangster, 2016	2	10	Sd				50.85	1.70		3.45																56	36
Newburn H-23	4315	Sangster, 2016	3	9	Sd	0.52			39.98	0.34	8.59	6.57																56	68
Newburn H-23	4300	Sangster, 2016	3	9	Sd				42.00	0.68	10.75	2.57																56	45
Newburn H-23	4315	Sangster, 2016	3	12	Sd				45.25	0.83	8.02	1.90																56	70
Newburn H-23	5965	Sangster, 2016	4	6	Sd				44.68	1.57	8.57	1.18																56	64
Newburn H-23	5965	Sangster, 2016	5	8	Sd				44.41	1.67	8.64	1.28																56	65

Table 5E: Select EDS chemical analyses of carbonate grains

Well	Sample	Appendix	Site	Position	Mineral	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	SO_3	F	Cl	Cr_2O_3	CuO	ZnO	As_2O_3	SrO	Y_2O_3	Sb_2O_3	BaO	WO_3	Total	Actual Total
Newburn H-23	4300	Sangster, 2016	6	2	Sd	1.23		0.76	41.07	0.45	7.06	4.08			1.35													56	55
Newburn H-23	4315	Sangster, 2016	6	2	Sd				45.30	0.85	7.12	2.73																56	68
Newburn H-23	5965	Sangster, 2016	6	3	Sd				43.05	1.73	9.41	1.81																56	61
Newburn H-23	4315	Sangster, 2016	6	6	Sd			0.44	45.58	0.85	6.87	2.26																56	66
Newburn H-23	4315	Sangster, 2016	7	3	Sd				45.30	0.90	6.84	2.96																56	69
Newburn H-23	5965	Sangster, 2016	8	6	Sd				50.28	3.41	1.94	0.37																56	65
Newburn H-23	4353.5	Sangster, 2016	8	20	Sd				54.17	0.32		0.39			1.11													56	55
Newburn H-23	5965	Sangster, 2016	9	3	Sd				44.81	1.74	7.64	1.81																56	72
Newburn H-23	5406.5	Sangster, 2016	10	1	Sd	1.13			48.71	0.74	1.72	3.70																56	23
Newburn H-23	4300	Sangster, 2016	10	3	Sd				52.42	1.71		1.87																56	56
Newburn H-23	5407	Sangster, 2016	10	5	Sd				51.96	2.45		1.59																56	19
Newburn H-23	4300	Sangster, 2016	11	3	Sd				49.34	3.99	1.76	0.91																56	52
Newburn H-23	5965	Sangster, 2016	11	8	Sd				48.14	3.61	3.50	0.75																56	66
Newburn H-23	5965	Sangster, 2016	12	5	Sd				44.03	1.48	8.79	1.70																56	63
Newburn H-23	4300	Sangster, 2016	12	8	Sd	1.69			39.82	0.96	10.53	3.00																56	61
Newburn H-23	5965	Sangster, 2016	13	3	Sd				46.70	1.53	7.16	0.61																56	71
Newburn H-23	5965	Sangster, 2016	13	10	Sd				42.69	1.74	9.93	1.64																56	68
Newburn H-23	5950	Sangster, 2016	14	2	Sd				15.86	0.41	10.85	28.88																56	69
Newburn H-23	4318.5	Sangster, 2016	14	2	Sd				46.50	1.02	4.55	3.93																56	19
Newburn H-23	4300	Sangster, 2016	15	6	Sd	0.76			37.47	0.52	11.64	5.62																56	58
Newburn H-23	4313.5	Sangster, 2016	16	4	Sd				48.34	2.78		4.87																56	60
Newburn H-23	5962	Sangster, 2016	17	2	Sd				53.11	0.84		1.15			0.90													56	72
Newburn H-23	5975	Sangster, 2016	17	3	Sd				43.10	1.69	9.89	1.32																56	64
Newburn H-23	4313.5	Sangster, 2016	17	3	Sd				42.26	0.66	9.56	3.53																56	61
Newburn H-23	4313.5	Sangster, 2016	18	12	Sd				43.06	1.23	8.54	3.18																56	62

Table 5F: Select EDS chemical analyses of spinel grains

Well	Sample	Appendix	Site	Position	SiO_2	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	V_2O_5	Total	Actual Total
Annapolis G-24	4401.5B	1C.1	12	7		0.72	11.10	50.72	27.04		10.09	0.32		100	105
Annapolis G-24	4401.5B	1C.1	12.1	4	0.95	0.78	11.06	49.27	27.63		9.91	0.40		100	106
Annapolis G-24	5530	1G.1	17	10		1.17	25.32	38.83	25.94		7.92		0.83	100	107
Weymouth A-45	6213.5	4E.1	1	1	0.62	0.55	37.41	27.67	17.53		16.22			100	87
Weymouth A-45	6213.5	4E.1	4	10	0.68	0.62	38.26	26.98	17.47		15.98			100	85
Weymouth A-45	6213.5	4E.1	20	4	0.58		39.39	32.10	12.81		15.12			100	87
Weymouth A-45	6213.5	4E.1	24	6	0.75		25.96	46.34	15.99		10.96			100	81
Newburn H-23	4300	Sangster, 2016	8	3			20.24	48.35	18.87		12.55			100	90
Newburn H-23	4300	Sangster, 2016	8	4			22.6	40.88	23.13		13.4			100	99
Newburn H-23	4300	Sangster, 2016	9	2			21.11	46.91	18.83		13.17			100	96
Newburn H-23	4300	Sangster, 2016	11	5			17.74	47.42	28.39		6.45			100	97
Newburn H-23	4318.5	Sangster, 2016	4	1		0.28	20.29	44.42	24.82		10.2			100	65
Newburn H-23	4318.5	Sangster, 2016	4	2			21.56	46.79	22.94		8.39			100	64
Newburn H-23	4353.5	Sangster, 2016	3	3			30.57	40.77	14.87		13.35			100	110
Newburn H-23	5406.5	Sangster, 2016	1	4			24.85	45.85	18.77		10.53			100	81
Newburn H-23	5406.5	Sangster, 2016	1	12			37.6	34.99	13.32		14.09			100	80
Newburn H-23	5406.5	Sangster, 2016	3	1		0.38	17.86	46.86	24.39		10.51			100	67
Newburn H-23	5406.5	Sangster, 2016	4	2			21.94	51.89	15.28		10.91			100	65
Newburn H-23	5406.5	Sangster, 2016	10	2			18.99	44.17	26.53		10.31			100	45
Newburn H-23	5406.5	Sangster, 2016	10	7			14.72	59.14	14.42	1.3	10.43			100	51
Newburn H-23	5406.5	Sangster, 2016	10	11			28.14	36.12	21.79		13.95			100	36
Newburn H-23	5406.5	Sangster, 2016	11	6		1.97	20.75	37.51	33.33		6.45			100	40
Newburn H-23	5406.5	Sangster, 2016	15	4			30.18	43.56	14.82		11.44			100	40
Newburn H-23	5406.5	Sangster, 2016	19	1			25.26	44.38	15.44		14.92			100	39
Newburn H-23	5406.5	Sangster, 2016	19	4		0.77	27.68	35.8	27.76		8.01			100	40
Newburn H-23	5406.5	Sangster, 2016	20	1			11.22	59.39	15.45		13.95			100	39
Newburn H-23	5406.5	Sangster, 2016	20	2			18.93	46.38	23.7		10.99			100	37
Newburn H-23	5406.5	Sangster, 2016	20	11			22.81	48.35	16.75		12.09			100	46
Newburn H-23	5406.5	Sangster, 2016	20	13			10.09	62.59	21.43		5.9			100	40
Newburn H-23	5408.5	Sangster, 2016	13	13		0.43	41.31	29.37	14.31		14.59			100	134
Newburn H-23	5408.5	Sangster, 2016	14	11		0.7	40.64	30.7	14.4		13.58			100	116
Newburn H-23	5957.8	Sangster, 2016	5	1			17.36	52.89	19.97		9.8			100	112
Newburn H-23	5962	Sangster, 2016	7	5		0.45	23.3	41.64	28.88		5.75			100	75