

Petrology, Mineral Chemistry and Geochronology of the Eagle,
F.D. no. 5, and Tappy Pegmatites: Cat Lake-Winnipeg River
Pegmatite Field, Southeastern Manitoba, Canada

By

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B.Sc. Earth Sciences, University of Michigan, 2023

A Thesis Submitted in Partial Fulfillment
of the Requirements for the Degree of

Master of Science

in the Graduate Academic Unit of Earth Sciences

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This thesis is accepted by the Dean of Graduate Studies

THE UNIVERSITY OF NEW BRUNSWICK

August, 2025

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Abstract

The Eagle, F.D. no. 5, and Tappy are spodumene-bearing, Li-Cs-Ta (LCT) class, rare-element pegmatites. The Eagle and F.D. no. 5 dykes are spatially related: both located in the Cat Lake-Maskwa Lake pegmatite district in the northern part of the Bird River Domain in southeastern Manitoba. However, petrologically and chemically they do not appear to be part of the same body. The Tappy pegmatite is hosted within the Winnipeg River pegmatite district to the south. All three dykes are emplaced near vertically and have good exposure with accessible locations near roads making them all prospective targets for critical mineral development. U-Pb geochronology on tantalite and monazite gives near contemporaneous ages for the Eagle, F.D. no. 5, and Tappy dykes at ~2650 Ma, placing them all within the D3 deformation event in the Bird River, coeval with widespread granitic magmatism and other pegmatites in the region.

Dedication

This Thesis is dedicated to my grandmother, Talle. Thank you for helping to instill in me a love of the outdoors. It has taken me to so many wonderful places

Acknowledgements

This MSc project would have been impossible without the incredible field support from the Manitoba Geological Survey and the entire group at Axiom Consulting. Without them, I would have been lost both in the field and in my understanding of the Bird River. Everyone I met through my fieldwork was incredible and helped make it the most memorable summer (and two weeks of the following summer) of my life. Thank you, New Age Metals, for providing financial support through a Mitacs granted to C.R.M. McFarlane (University of New Brunswick) and L. Groat (University of British Columbia). Without them, this project and my two years in Fredericton would have again been impossible. I would also like to thank the incredible help at the University of New Brunswick, including both the rock sample preparation lab and the microscopy and imaging department, who both helped me immensely. My deepest thanks to my advisory committee; Drs. Chris McFarlane, Tania Martins, and Dave Lentz. I genuinely could not have asked for a better group to learn from and learn with.

I'd also like to have a dedicated paragraph to thank my family, all of whom encouraged me greatly. First, thank you to Steven and Sonia for letting me spend long weekends and reading week with family in Vermont (and for feeding me). Familiar faces were much needed. Thank you to my grandfather for encouraging me academically and understanding my despair in all good mineral occurrences either being underwater or under a border. And most importantly, thank you to my mom and dad. Your continued encouragement in all of my passions cannot be understated. I'm very lucky to have parents who both understand and take part in my obsession with mineralogy.

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List of Abbreviations

μ-XRF	Micro X-Ray Fluorescence
BRD	Bird River Domain
BRGB	Bird River Greenstone Belt
CGMs	Columbite Group Minerals
CHARAC	Charge-and-Radius Controlled (field)
CL	Cathodoluminescence
CLELFZ	Cat Lake Euclid Lake Fault Zone
EBSD	Electron Backscatter Diffraction
ELSZ	Eaglenest Lake Shear Zone
ERB	English River Basin
HMS	Heavy Mineral Separate
HREE	Heavy Rare Earth Elements
LA ICP-MS	Laser Ablation Inductively Coupled Mass Spectrometry
LCT	Lithium-Cesium-Tantalum (pegmatite)
LREE	Light Rare Earth Elements
MANTIS	Micro-Analysis of Natural Trace-elements and Isotope Systematics
MLB	Maskwa Lake Batholith
MORB	Mid Ocean Ridge Basalt
MREE	Middle Rare Earth Elements
NYF	Niobium-Yttrium-Fluorine (pegmatite)
OCPF	Oxford County Pegmatite Field
PPL	Plane-Polarized Light

PTS	Polished Thin Sections
REE	Rare Earth Elements
SEM-EDS	Scanning Electron Microscope - Energy Dispersive X-ray
SWRSZ	South Winnipeg River Shear Zone
TTG	Tonalite-Trondhjemite-Granitoid
UNB	University of New Brunswick
WRCL	Winnipeg River-Cat Lake (pegmatite field)
WRT	Winnipeg River Terrain
XPL	Cross-Polarized Light

Chapter 1 – Introduction

Although many rock types can exhibit pegmatitic textures, in this context the term pegmatite refers to an intrusive, felsic igneous rock that contains large, interlocking crystals and is composed mainly of quartz, feldspars and micas. Pegmatites are typified by a combination of their large crystal sizes and enrichment of rare elements. However this is not always the case, as pegmatites exhibit a wide range of grain sizes, from sub-millimeter aplite to crystals from highly evolved pegmatites reaching up to tens of meters (Simmons & Webber, 2008). Pegmatites are also defined by their genesis as they are crystallized from highly evolved magmas rich in water, fluxes, and critical elements. These melt components give rise to their varied mineralogy and large grain sizes as high concentrations of rare elements begets rare mineral formation and the high concentrations of fluxes in the melt aid in the growth of large crystals.

Global demand for battery metals, such as lithium (Li), is experiencing a marked increase, in part due to the implementation of new energy production, distribution, and storage modes. In 2024, battery manufacturing accounted for 87% of worldwide Li demand (USGS, 2025). As this field of production and attention to critical materials expands, so does the need to extract them ethically and sustainably. Pegmatites are one of the Earth's prominent carriers of rare and critical elements, acting as a way to concentrate elements like Li, Cesium (Cs), Tantalum (Ta), Tin (Sn), Niobium (Nb), and Beryllium (Be) (Steiner, 2019). These can all be present in economic quantities in pegmatites, making them crucial for producing electronics and other technologies. Expanding this resource is essential, as Li extracted from pegmatites has a lower environmental impact than that mined from other sources, such as Li-rich brines (Chordia et al., 2022). In

addition to environmental reasons, pegmatites may also prove useful geopolitically as their wide distribution makes them more accessible than Li-rich brines that rely on hot dry climates for evaporation and Li-accumulation (Gardiner et al., 2024; Kesler et al., 2012).

As demands for more sustainable sources of critical elements increase, Canada is uniquely positioned, with numerous viable deposits throughout the Canadian Shield. It is estimated that there are roughly 3 million tonnes of Li resources in Canada (USGS, 2024). Although many pegmatites are barren or lacking economic concentrations of critical elements, there are also those enriched in elements like Li, Cs, and Ta (LCT) that are prospective for economic development (Linnen et al., 2012). The Cat Lake-Winnipeg River pegmatite field, located in the Bird River subprovince of Manitoba, hosts various pegmatites, some highly evolved and some barren. Among the most evolved pegmatites of this region is Tanco, which is currently mined for Cs and Li and historically for Ta. The Tanco pegmatite is notable because it serves as one of the archetypes of the LCT family of rare-element pegmatites, with a substantial body of literature associated with its genesis and mineralogy (e.g., Brown et al., 2017; Černý et al., 1981; Stilling et al., 2006). However, many other pegmatites in this region contain notable concentrations of rare and critical elements, including those investigated in this thesis: the Eagle, F.D. no. 5, and the Tappy.

This MSc thesis was initiated in 2023 in collaboration with the Manitoba Geological Survey. Initial fieldwork was conducted in the Bird River Domain of southeastern Manitoba during the summer of 2023, with sample preparation and microanalyses performed at UNB. Over the summer of 2024, a shorter return trip was

made to the field area to collect additional samples and gain a deeper understanding of the regional geology of the Bird River domain. The study area has a long history of pegmatite exploration, with Tanco being mined for decades. This thesis focuses on the petrography, mineral chemistry, and geochronology of the Eagle, F.D. no. 5, and Tappy pegmatites.

1.1 Regional Geology

The Superior Craton is the world's largest intact portion of Archean-aged crust, comprising much of eastern central Canada. It underlies much of Ontario and Quebec, as well as parts of Labrador and Manitoba, where this thesis focuses. In the United States, it comprises a significant portion of Minnesota. This landscape, commonly referred to as the Canadian Shield, is characterized by low-lying hills of rounded rock, mantled by lakes, swamps, and thick coniferous forests. The subprovinces that make up the larger Superior craton have different orientations throughout the craton, but in the western part of the Canadian Shield in Manitoba, they strike roughly east-west. In the Archean, from 2.75 to 2.68 Ga, oceanic crust, island arcs, sedimentary prisms, and fragments of 3.7 Ga basement rock were accreted to form the Superior Craton (Percival et al., 2006). This accretion of exotic terrains onto an older core gives the Superior Craton and other Archean-aged cratons worldwide a distinct and varied lithology. Gold-bearing, ultramafic, and pegmatite systems are found throughout the Canadian Shield, endowing this region with a unique mineralogical heritage. Many rare metal pegmatites in the Superior craton formed between 2.68 and 2.60 Ga during widespread late hydrothermal activity (Percival, 2007).

The Bird River domain (BRD) is located in the far west of the Superior craton, approximately 200 km northeast of Winnipeg. It is a lithologically and tectonically defined subprovince that trends east to west for over 50 km through southeast Manitoba before narrowing and pinching out just east of the Ontario border. The nearby Separation Rapids Greenstone belt, located to the east of the BRD in Ontario, is believed to be related to the BRD due to its similar ages and rock types (Tindle & Breaks, 1998). The BRD is bounded to the north by the meta-sedimentary English River Subprovince and to the south by the largely plutonic Winnipeg River Subprovince (Gilbert, 2008). The Bird River Domain is split into two areas: the Bird River Greenstone Belt (BRGB) in the south and Maskwa Lake Batholith (MLB) and associated rock units to the north, as illustrated in Figure 1 below.

In the southern part of the BRD, the greenstone belt primarily consists of ca. 2.73 Ga arc-type volcanic rocks, divided into north and south panels by the slightly younger, turbiditic Booster Lake Formation, dated to 2712 Ma (Gilbert, 2006). Mid-ocean-ridge basalt (MORB) type volcanic rocks, such as those of the Lamprey Falls Formation (Černý et al., 1981), extend along the belt's northern and southern margins (Gilbert, 2008). The Lac du Bonnet Batholith and the Birse Lake Pluton take up most of the space south of the greenstone belt before the BRD borders the Winnipeg River Subprovince.

North of the Bird River Greenstone Belt, the granitoid MLB marks the divide between the northern and southern halves of the BRD. North of the MLB, adjacent to the border of the English River, is a comparatively smaller sequence of basalts and meta-tonalites making up the northern arm of greenstone belt lithologies within the BRD. These rock units follow the general trend of the Cat-Lake Euclid-Lake Fault Zone

(CLELFZ), which is the boundary between the English River and the Bird River subprovinces. Together with the MLB, these rock units make up the northern portion of the BRD.

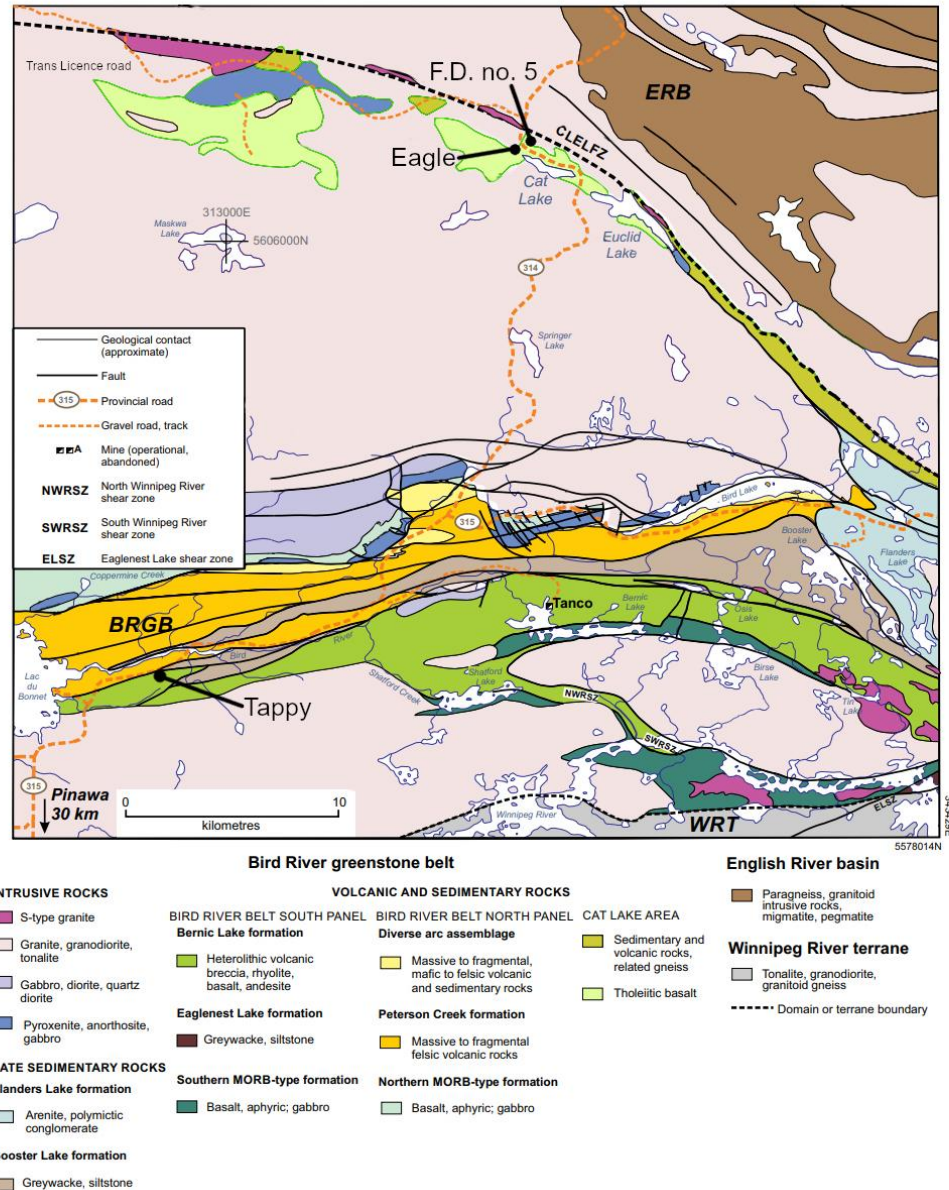


Figure 1: Tectonic assemblages of the Bird River greenstone belt. Locations of the studied pegmatites are shown. Abbreviation: BRGB, Bird River greenstone belt; ERB, English River basin; WRT, Winnipeg River terrane; CLELFZ, Cat Lake-Euclid Lake Fault zone. Figure taken from Roush et al. (2023), and originally adapted from Yang and Houle (2020).

The Winnipeg River-Cat Lake (WRCL) pegmatite field encompasses most of the Bird River Subprovince and the pegmatites found therein. The WRCL pegmatite field can be subdivided between the Cat Lake – Maskwa Lake district in the north and the Winnipeg River district in the south (Černý et al., 1981). These two districts contain multiple distinct pegmatite groups, each composed of individual, geochemically related pegmatite bodies, shown in Table 1 below. The Eagle pegmatite belongs to the Eagle-Irgon group in the Cat Lake – Maskwa Lake Pegmatite district, while the F.D. no. 5 is spatially related but not part of this group. Tappy pegmatite belongs to the Lac du Bonnet pegmatite group in the Winnipeg River Pegmatite district.

Table 1: Subdivision of the pegmatite groups within the Cat Lake - Winnipeg River Pegmatite Field. Figure from Černý (1981).

		Pegmatite Groups	Abbreviations	Elemental Enrichments
Cat Lake - Winnipeg River Pegmatite Field	Winnipeg River District	Shatford Lake	SHL	Be, Sn, Nb-Ta, Zr, REE, U, Th
		Lac du Bonnet	LdB	Li, P
		Greer Lake	GL	Be, Nb-Ta
		Eaglenest Lake	ENL	Be
		Axial	AX	Li
		Birse Lake	BIS	B, Be
		Rush Lake	RL	Li, Rb, Cs, Be, Sn, Ta-Nb, B, P, F
		Bernic Lake	BL	Li, Rb, Cs, Be, Sn, Ta-Nb, B, P, F
	Cat Lake-Maskwa Lake District	Eagle Irgon	EAI	Li
		Beryl-Tourmaline	BET	Be, B
		Cat Lake	CAT	Li, Be
		Central Claim	CC	Li, Be, Ta-Nb
		Maskwa Lake	MWL	Li; Li, Rb, Cs, Ta-Nb, Be

1.2 General Geology of the Eagle Pegmatite

The Eagle pegmatite outcrop is made up of multiple parallel dykes that trend east-west over an exposed area of bedrock just northwest of Cat Lake (Bannatyne, 1985). On the

surface, this manifests as one large dyke near the middle with smaller fingers of pegmatite splaying out along strike on the eastern and western margins of the outcrop. The smaller peripheral sections of pegmatite are shown below in Figure 2. For ease of communication, the larger, central pegmatite is referenced when the Eagle pegmatite is mentioned in this thesis. The vegetative cover on the outcrop makes it, at times, difficult to differentiate between the dykes, although many of the individual dykes have very good exposure.



Figure 2: Parallel unmineralized dykes comprising the western end of the outcrop at the Eagle pegmatite. Picture taken looking southeast with the dykes running nearly east-west. Hammer for scale

The dykes are dominantly hosted by a meta-tonalite composed of variably deformed quartz and pink feldspar with minor biotite and hornblende. Small fibrous

sunbursts of holmquistite are present as purple splotches throughout the host rock near the Eagle outcrop. Moving south from the main exposure at Eagle, the meta-tonalite becomes lighter and is composed of less biotite and more quartz (Roush, 2023). The southern part of the meta-TTG borders a weakly foliated and metamorphosed amphibolite (Bannatyne, 1985). The grains in this unit reach one to three millimeters. The amphibolite unit is weakly foliated, 110° , and borders the meta-granitoid with a sheared boundary also trending $\sim 110^\circ$. The grains within the meta-granitoid unit are 0.5 to 1 cm. The Meta-TTG extends from east to west for most of the Eagle pegmatite exposure.

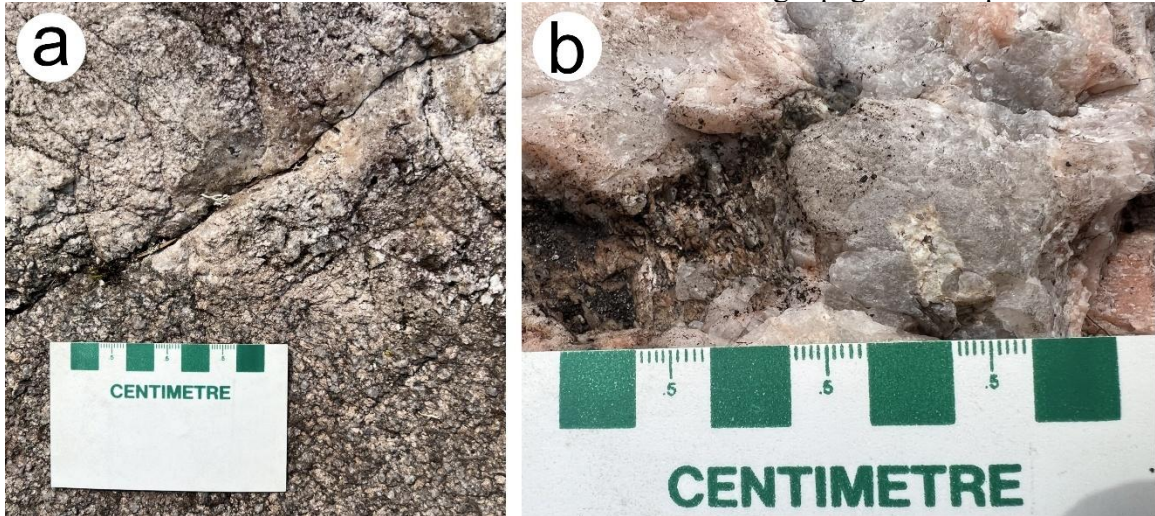


Figure 3: Photographs of outcrops at the Eagle pegmatite. A) border between the darker-colored meta-TTG country rock at the bottom and the lighter-colored aplitic section of pegmatite. B) detail of beryl in the eastern part of the Eagle pegmatite. Figure taken from Roush et al. 2023

The pegmatite dykes of the Eagle range from approximately 10 centimeters up to 9 meters wide (Bannatyne, 1985; Roush, 2023). The composition of the pegmatites is relatively uniform, with variable amounts of feldspar, quartz, spodumene, and white micas, with minor garnet and local beryl. The Eagle pegmatite exhibits crude zonation. In many parts of the Eagle, there is a visible chilled margin along the edge of the pegmatite, but it is never more than one centimeter thick and very fine. Two main zones within the pegmatite were observed: 1) an aplitic textured zone composed of white to pink aplitic

quartz, feldspar, mica, and minor garnet, and 2) a pegmatitic central zone composed of variably sized quartz, feldspar, mica, feldspar, and spodumene with minor tourmaline, beryl, and garnet (Figure 3b). The pegmatitic central zone is often found near the centre of the pegmatite dyke. A third, less distinct zone within the Eagle dyke is a mixture of aplitic and pegmatitic textures, although it is not well-defined enough to be considered a zone.

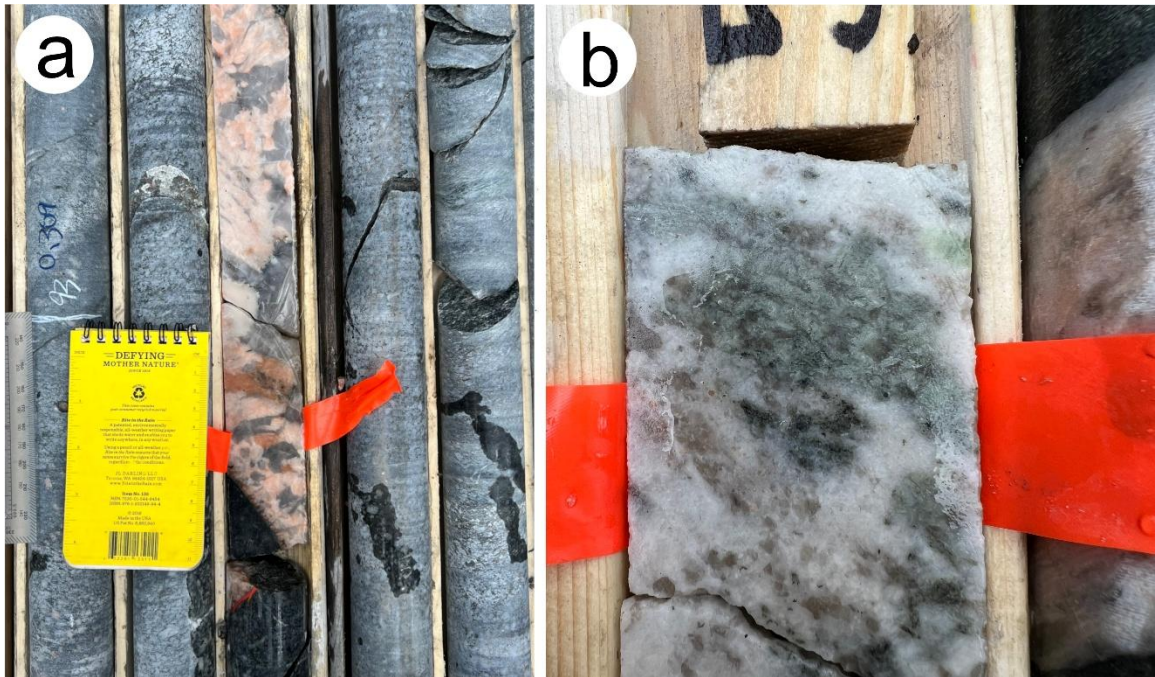


Figure 4: Photograph of samples from drill hole LT-21-11: A) contact of a dyke composed of primarily quartz, feldspar at 45 degrees to the core axis (at 95.8 m); B) green spodumene within a white dyke (at 48.1 m). All core pictured is NQ core with 47.6 mm in diameter. Taken from Roush et al. (2023)

In addition to the field observations of the outcrops at the Eagle pegmatite, two drill cores were examined and logged (LT-21-09 and LT-21-11). The first drill hole (LT-21-09) is 89 m long and consists of granitic dykes cross-cutting a dark, biotite-bearing granitoid like that seen at the Eagle pegmatite outcrop (Roush, 2023). Core from this hole has multiple smaller, barren pegmatites near the top of the hole and one larger spodumene-bearing pegmatite near the bottom. These smaller pegmatites are composed

primarily of white feldspar, quartz, and micas, and exhibit varying degrees of hematization. The larger pegmatite near the end of drill hole LT-21-09 is nine metres in apparent width and is interpreted to be the main mineralized dyke at Eagle that outcrops throughout the area. The dyke consists of white feldspar, quartz that varies from clear to smoky, and spodumene. The foliated spodumene texture is abundant in this dyke. Zones of this pegmatite are hematized to varying degrees (Roush, 2023).

The second drill hole (LT-21-11) is 119 m in length and consists of granitic dykes that cross-cut a similar granodiorite host rock. This hole exhibits a similar pattern to LT-21-09, with smaller pegmatites intersecting the granodiorite near the top and a larger, more mineralized pegmatite located near the bottom. The smaller pegmatites in the drill hole are composed mainly of white feldspar, quartz, and micas, showing varying degrees of hematization (Figure 4A). The large pegmatite intersected in drill hole LT-21-11 is roughly 11 metres in apparent width and consists of similar minerals to the pegmatite logged in drill hole LT-21-09 (Roush, 2023). Various textures, such as a mixture of finer grained groundmass with comparatively large crystal sizes and foliated spodumene, are present in the pegmatites in both drill cores.

1.3 General Geology of the F.D. no. 5 Pegmatite

The F.D. no.5 pegmatite is a coarse- to very coarse-grained pegmatite mainly composed of quartz, feldspar, and spodumene. The pegmatite is hosted by a similar meta-granodiorite to that observed at the Eagle and outcrops just to the northeast of it (Figure 5). The F.D. no. 5 pegmatite is smaller than the Eagle, but is of interest because it was thought that they could be connected underground and represent a larger pegmatite body.

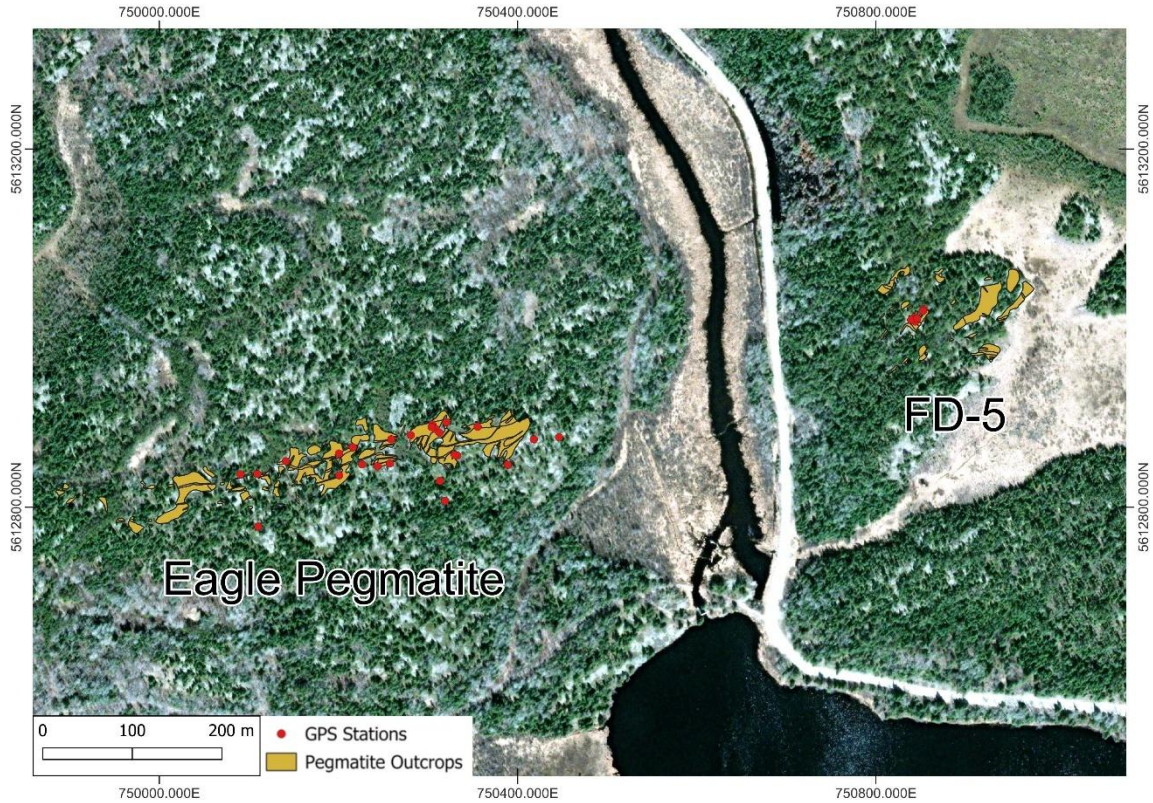


Figure 5: Air photo of the Eagle and F.D. no.5 area with preliminary analysis of the pegmatite outcrops and larger bodies, showing the relationship between the Eagle and F.D. no.5 dykes. Figure taken from Roush et al. (2023)

The exposure at the F.D. no. 5 is very good. It shows the angular contact of the pegmatite with the east and west sides of the dyke contact, both striking close to 170° subvertical. The south side of the exposure is largely obscured as it runs out under cover. The north contact is very undulous, but appears to broadly strike east to west. In addition to the large, mineralized pegmatite making up the peak of the exposed bedrock hill, there are smaller pegmatites without Li mineralization just metres north on the same exposure. One of these dykes is shown below. These other pegmatites are primarily composed of quartz, feldspar, and mica, with minor amounts of beryl.



Figure 6: F.D. no. 5 outcrop; A) Drone image F.D. no. 5 exposure looking east. Majority of exposed rock is pegmatite. Picture taken from New Age Metals press release, October 31, 2023. People for scale. B) Smaller unmineralized dyke just north of the main F.D. no. 5 exposure looking west. Minor beryl is present. Sledgehammer for scale. The two stumps in Figure 6B can also be seen in Figure 6A

Crystal size ranges from small, sub-centimeter scale to large prismatic feldspars that reach over a metre in length, but are sparse throughout the dyke (Figure 7A). The exposure of the F.D. no. 5 pegmatite is primarily composed of quartz, feldspar, and spodumene reaching 4 cm with books of a dark, zinnwaldite mica up to 10 cm wide. Spodumene is present in multiple areas throughout the pegmatite, but does not appear to be evenly distributed throughout the dyke, instead occurring loosely with quartz-rich areas in the outcrop. A prominent spodumene zone is shown in Figure 7B and is full of large, green spodumene crystals. It is locally up to 80 modal% spodumene, while other areas of high spodumene concentration are present throughout the dyke. Small veins of schorl are also observed cross-cutting the dyke and are locally vuggy. Some areas of the F.D. no. 5 dyke are composed of almost 15 modal% beryl.

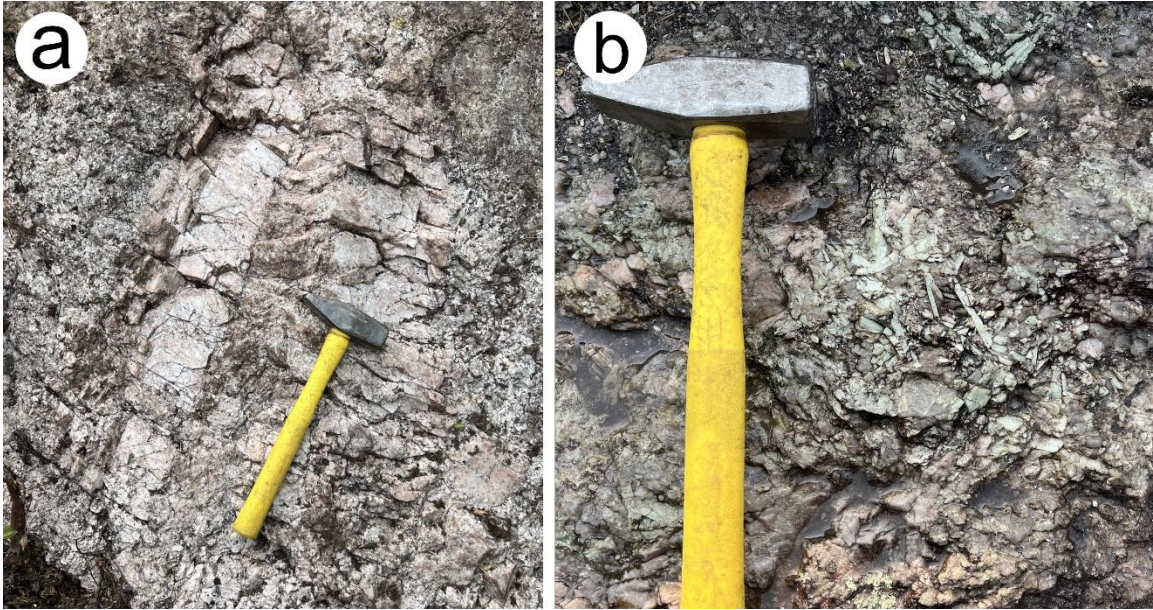


Figure 7: Outcrop photographs of the F.D. no.5 pegmatite. A) metre-scale feldspar crystal at the southeastern corner of the dyke. B) high concentrations of crystals of green spodumene (up to 10cm in length). Hammer for scale. Figure taken from Roush et al. (2023)

1.4 General Geology of the Tappy Pegmatite

The Tappy pegmatite is located south of the BRD in the Winnipeg River pegmatite district. This pegmatite district contains many simple and rare-element pegmatites, including the actively mined Tanco deposit. The Tappy pegmatite is located south of the Bird River, immediately south of Provincial Road 315. The pegmatite is hosted in a meta-pillow basalt (Roush et al., 2023) within the Bird River greenstone belt (BRGB). The Tappy pegmatite is hosted within a weakly foliated metamorphosed pillow basalt unit. The main foliation of the pillows strikes S 243° W, subvertical. A pervasive, unevenly spaced cleavage through the meta-basalt is oriented at N 358° W, sub-vertical, similar to the pegmatite strike. The other structural feature is spaced fractures running N 300° W, dipping 35° (Roush, 2023) (Figure 8).

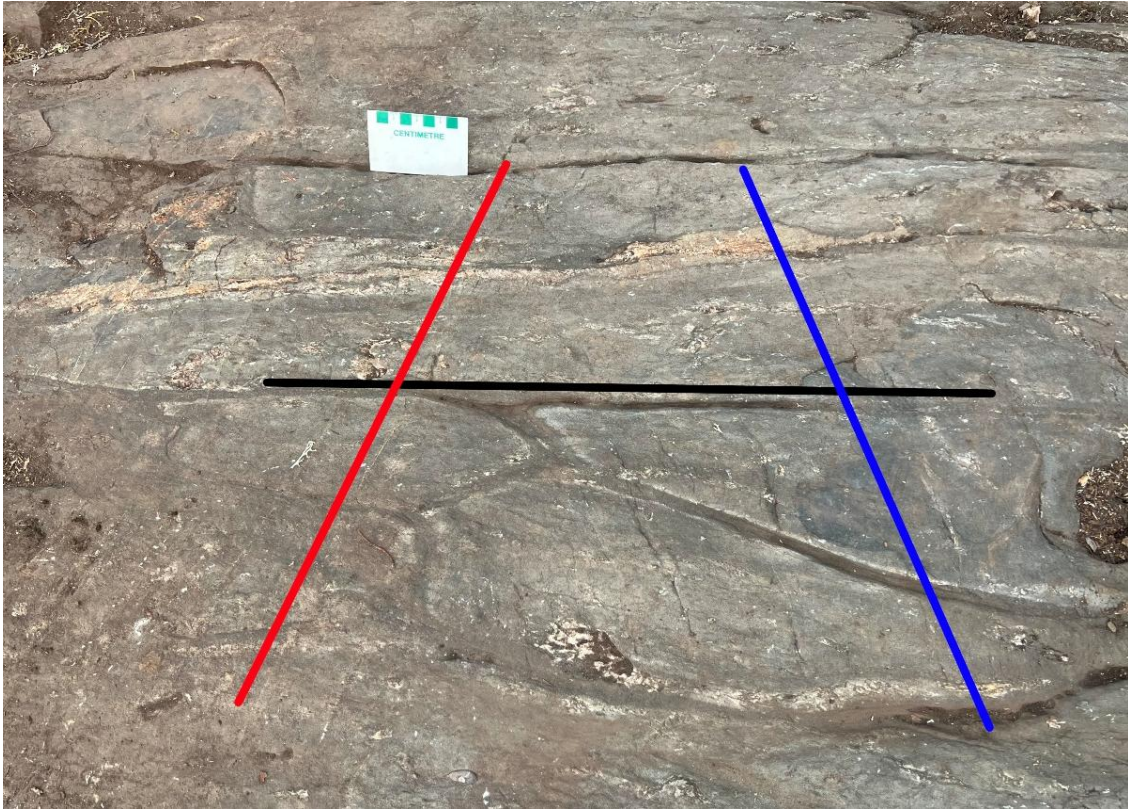


Figure 8: Outcrop photograph of structures present in the pillow basalt around the Tappy pegmatite with northeast being up. The black arrow indicates the strike of the foliation in the pillowed meta-basalts at 063° , sub-vertical. The red arrow indicates the spaced cleavages at 178° , sub-vertical and the blue arrow indicates the other set of spaced cleavages striking $N 300^\circ W$. Figure taken from Roush et al. (2023)

The Tappy pegmatite is a Li-rich spodumene-bearing pegmatite dyke and is well-exposed for over 50 metres (Bannatyne, 1985). It begins at a narrow point at its southern end and broadens northward, eventually terminating at a cliff. Another small outcrop of similar composition to the Tappy pegmatite is visible roughly 100 metres to the south, which is referred to as the Tappy South. The Tappy pegmatite is oriented north to south, with a strike ranging from $N 300^\circ W$ to $N 002^\circ E$, subvertical. At the widest extent of the pegmatite in the northern half of the exposure, the dyke reaches almost 4 m in width. However, most of the pegmatite is under 3 m in width, with the southern half of the exposure having a maximum width of 1.5 m.

Three distinct zones are visible at the southernmost extent of the Tappy pegmatite. A lightly coloured chilled margin less than 1 cm wide is present along much of the dyke in which mineralogy is not easily discernible. Moving inwards, the next zone is the intermediate zone. This zone is present throughout the length of the pegmatite, but at variable thicknesses. It consists of sub-0.5-centimetre quartz, feldspar, and muscovite. This area is partially hematized with small veins of rust-colored material running through it. The most distinct zone within the Tappy ke is the central zone. This zone consists of quartz, feldspar, and muscovite, but its grain size is larger than that of the intermediate zone, reaching a range of 1 to 2 cm. Hematization is also present in the central zone. Pervasive spodumene is readily visible starting in the middle of the pegmatite dyke as it goes northward along the strike. Northward, the size of the spodumene crystals increases, reaching lengths of up to 15 cm. At the Tappy, small, opaque crystals interpreted as columbite group minerals are observed as one- to three-millimetre crystals, abundant in zones of large crystal size within the pegmatite (Roush, 2023).

1.5 Pegmatite Classifications

Traditionally, in the classification system proposed by Černý and Ercit (2005), pegmatites are grouped based on geochemical affinity, geologic setting, emplacement level, and of petrogenesis. Granitic pegmatites are grouped into five classes (abyssal, muscovite, muscovite – rare-element, rare-element, and miarolitic), most of which are subdivided into subclasses with fundamentally different geochemical genetic characteristics. Further subdivision of most subclasses into types and subtypes follows more subtle differences in geochemical signatures or P–T conditions of emplacement, expressed in variable assemblages of accessory minerals (Černý & Ercit, 2005).

Additionally, three broad families of pegmatites are proposed: those of LCT (enriched in Li, Cs, Ta, Rb, Be, Sn, B, P and F), NYF (enriched in Nb, Y, F, Be, Rare Earth Elements (REE), Sc, Ti, Zr, Th and U), and mixed signatures. LCT pegmatites are derived mainly from S-type granites and less commonly from I-type granites (Černý & Ercit, 2005). NYF pegmatites, conversely, are fractionated from subaluminous to metaluminous A- and I-type granites. There is also a mixed NYF + LCT family derived from diverse processes such as contamination of NYF plutons by digestion of undepleted supracrustal, aluminous rocks. These three groups were created to correspond to different formational environments, and their utilization seeks to describe pegmatite formation. However, there are many subgroups of LCT pegmatites outlined in Černý and Ercit (2005) that further refine pegmatite groupings. These different subgroupings are outlined in Table 2 below, which shows the relationships between the different groups and seeks to show how the location-based and petrogenesis-based approaches fit together.

In addition to this classification, Wise et al. (2022) provide another system to group pegmatites. In this classification, pegmatites are grouped in two ways. The first is to divide them into three groups: Group 1, Group 2, and Group 3, based on accessory rock-forming and rare-element mineral assemblages. The second mode of classification is to describe the dykes based on their source rocks, in this case, either residual melts from granitic magmatism or from direct anatexis of metamorphic rocks. Pegmatites in Groups 1 and 2 are generated either as residual melts of S-, A-, and I-type granitic magmatism (RGM) or direct products of anatexis (DPA), whereas Group 3 pegmatites are only derived by anatexis (Wise et al., 2022). The term “Group 1 Pegmatites” are roughly synonymous with LCT dykes and can be further broken down into three broad groups;

beryl and phosphate-bearing dykes, Li-rich dykes with either spodumene or petalite dominant and dykes with either lepidolite or elbaite as the principal Li phase. In Table 4 below, the main divisions in the pegmatite classification system proposed by Wise et al. (2022) are shown.

Table 2: General characteristics of pegmatites in the RMG and DPA groupings of Wise et al. (2022).

GENERAL CHARACTERISTICS OF RMG AND DPA TYPE PEGMATITES			
RMG (Residual melts of granitic magmatism)			
Typical source rock	S-type granite	A-type granite	I-type granite
Granite chemistry	Peraluminous	Peralkaline to mildly peraluminous	Peraluminous to metaluminous
Relation of pegmatites to source	Interior to marginal	Interior to marginal	Interior to marginal
Pegmatite type	Group 1	Group 2	Groups 1 & 2
Typical geochemical signatures	Be, Nb, Ta, P, Sn, Li, Cs, B	REE, Be, Nb, F	B, Be, REE, Nb, Sn, Li, Ca
Examples	Winnipeg River, MB, Canada Canada pegmatite, Spain Kalba field, Kazakhstan Malkhan field, Russia	Pikes peak, CO, USA Mt. Perdosu, Italy Amis complex, Namibia Luumaki, Finland	Tiebiá pluton, Czech Republic Strzegom granite, Poland O'Grady batholith, NWT, Canada Greer Lake, MB, Canada
DPA (Direct products of anatexis)			
Typical source rock	Granulite to amphibolite facies metamorphic rocks	Granulite to amphibolite facies metamorphic rocks	Granulite to amphibolite facies metamorphic rocks
Relation of pegmatites to source	Segregations of anatectic melts	Segregations of anatectic melts	Segregations of anatectic melts
Pegmatite type	Group 1	Group 2	Group 3
Typical geochemical signatures	Be, Nb, Ta, P, Li, B	REE, U, Be	Al, Be, B
Examples	Göry Sowie, Poland Oxford field, ME, USA Cape Cross-Uis, Namibia Leinster pegmatite belt, Ireland	Evje-lveland, Norway Lewisian Gneiss Complex, Scotland Fraser Lake, SK, Canada Ploskaya, Kola Peninsula, Russia	East Antarctica, Antarctica Thomas mine, NC, USA Dolní Bory, Czech Republic Batchellerville, NY, USA

Field observations can aid in assigning a pegmatite to a broad grouping like LCT vs. NYF or Group 1 vs. Group 2, but detailed petrography on polished thin sections, which will be presented in Chapters 2.3 – 2.5, is needed to completely define the classification of a pegmatite. Based on these analyses, the Eagle, F.D. no.5 and Tappy are members of the LCT family of pegmatites and are in the Li-rich rare-element (REL-Li) class of Černý and Ercit (2005). The Eagle and Tappy pegmatites can be further defined as the complex spodumene type as no other Li-bearing phases were identified in either of them during this thesis. While the F.D. no. 5 has an oddly high abundance of the Fe and

Li-bearing mica zinnwaldite it is considered a complex spodumene type pegmatite due to its high abundance of spodumene. According to the Wise et al. (2022) system, the Eagle, F.D. no. 5, and Tappy are all Group 1, type (ii) Li-rich spodumene dominant pegmatites.

Chapter 2 – Mineralogy and Petrology

2.1 Introduction

Many pegmatites have a composition similar to that of granite, with quartz, feldspars, and micas being the most common rock-forming minerals in these systems. Some pegmatites, such as Tanco, become more fractionated as a result of both primary magmatic and secondary hydrothermal processes (Černý et al., 1996); it's mineralogical diversity increases, resulting in extreme enrichments in incompatible elements and the occurrence of over 100 different mineral species (Martins et al., 2013). Concentrations of incompatible elements within these pegmatites become elevated enough to create mineral species found almost exclusively in evolved pegmatites. Spodumene, pollucite, or tantalite are good examples of these types of minerals, as they are not found in simple pegmatites but are found almost exclusively in evolved magmatic systems such as the Eagle, F.D. no.5, or Tappy.

Defining the mineralogy and investigating the petrology of these pegmatites enables a better understanding of their genesis and any secondary processes or tectonic activity that may have occurred in the area (Černý, 1981). Assessing the mineralogy of a pegmatite provides insight into the elements it is enriched with. Minerals like beryl indicate a high enough concentration of Be in the dyke for beryl crystals to saturate from the melt during pegmatite genesis. Furthermore, assessing the mineralogy and rough elemental concentrations of a dyke are integral steps in pegmatite classification. Assessing mineralogy enables researchers to make rapid yet well-informed observations in the field, prior to further refining the pegmatite classification and description through laboratory analysis. In the context of this study, mineralogy helps when differentiating

between the Eagle and F.D. no. 5 dykes as well as when comparing them both to the Tappy. In this sense, mineralogical observations are one of the most important facets of this work, aiding in descriptions of mineralized pegmatites throughout the Bird River.

2.2 Methods

A complete list of samples is provided in Appendix I. A total of 93 samples were collected in the field for geochemical or petrographic study, and 92 polished thin sections (PTS) were made. Some samples were made into multiple thin sections, while others were unused. All polished thin and thick sections of the rocks were prepared at the University of New Brunswick (UNB) Rock Preparation Shop. All petrographic analyses were conducted at UNB.

2.2.1 Petrographic Microscopy

Initial petrographic analyses were done on polished thin and thick sections with a Nikon Eclipse E600 POL petrographic microscope at UNB. Full thin-section scans were done for each thin section on a Zeiss Axio Imager A1.m with digital X-Y stage and Zen imaging software.

2.2.2 Micro X-Ray Fluorescence (μ XRF) Spectrometry

Full scans of polished thin sections (Flude et al., 2017) were performed on a Bruker M4 Tornado micro-XRF machine equipped with dual SDD detectors and a 20-micron polycapillary focus. The beam size ranged from 18 to 40 microns, depending on the scan and the targeted mineralogy. Element spectra maps were done on over 70 polished thin sections (PTS) and one polished face of pegmatite. Offline editing of the maps was done

using M4 Tornado Bruker Microanalysis software. Final scans were used both in mineral identification and for targeting later geochemical analyses.

2.2.3 Scanning Electron Microscope (SEM)

Analyses were performed at the UNB Microscopy and Microanalysis Facility on two microscopes. The first was performed using a JEOL JSM-6400 Scanning Electron Microscope, equipped with an EDAX Genesis 4000 Energy Dispersive X-ray (EDS) analyzer. EDS analysis was performed at an accelerating voltage of 15 kV and a beam current of 1.5 nA, with a working distance of 14 mm. The collection time was 50 seconds per analysis point. The second microscope used was a Thermo Scientific Scios 2 Dualbeam, equipped with an Oxford Ultim Max 170 EDS detector and an Oxford Symmetry EBSD detector, controlled by the Aztec software. Analyses on this machine were performed using an accelerating voltage of 15 kV with a working distance of 7 mm. Samples were carbon-coated using an Edwards 306A carbon coater before observation in the microscope.

2.2.4 Cathodoluminescence

Cathodoluminescence (CL) was conducted on polished thin sections on a Nuclide Corp. optical Cathodoluminescence stage with a trinocular microscope. CL was employed to better characterize zoning within spodumene crystals encountered in PTS. Initial optical work determined that many of the spodumene crystals in the Eagle pegmatite had secondary rims and dissolution features, so CL was used to better show the zoning within the crystals. Images were taken on an iPhone 13 Pro and stitched together using GNU Image Manipulation Program (GIMP).

2.3 Mineralogy and Petrology of the Eagle Pegmatite

The Eagle pegmatite outcrop over multiple exposures in a general east-west strike just north of Cat Lake, Manitoba, Canada. Despite thick vegetation cover over some of the areas, there was ample pegmatite and host rock exposure. The host rock at Eagle is a metamorphosed tonalite-trondhjemite-granite (TTG) with purple sunbursts of holmquistite throughout, which are more common near the contact with the pegmatites. It is moderately foliated, with black biotite crystals creating the main mineralogical foliation between lighter feldspars and greyish quartz. An unoriented polished face of the host rock, along with a photomicrograph of holmquistite, is shown below.

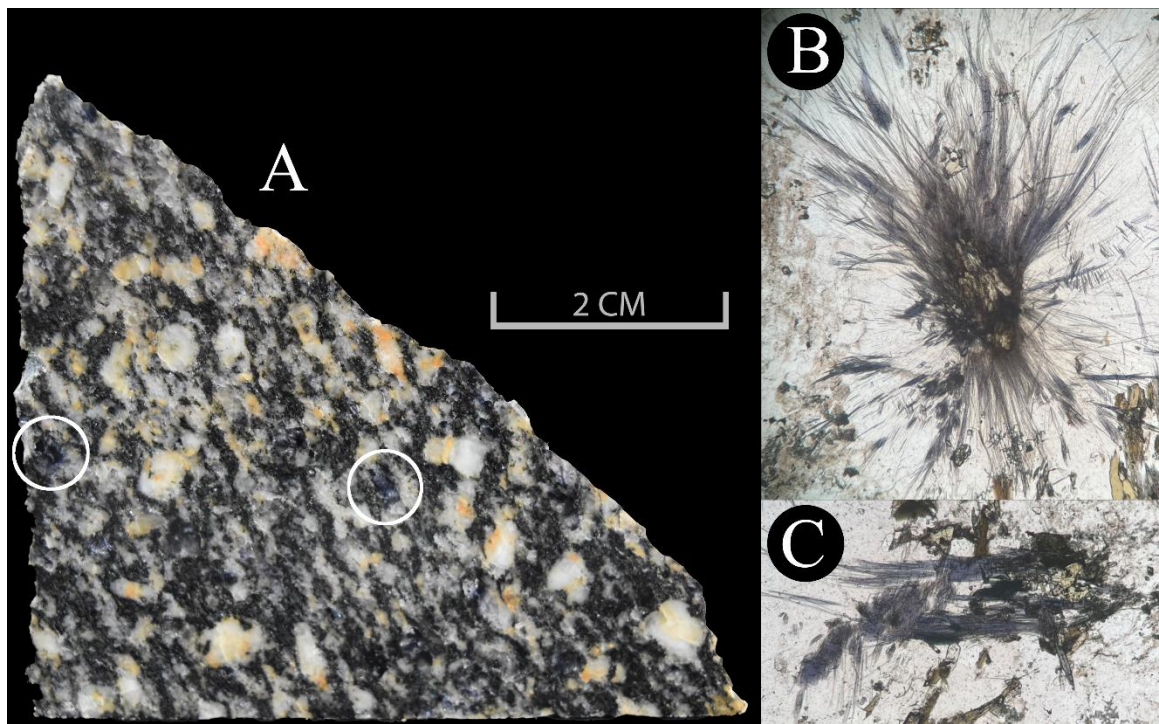


Figure 9: Sample 23-JR-024. A) Polished face of meta-tonalite-trondhjemite-granite host rock of the Eagle dyke. Black biotite crystals define the foliation between grains of quartz and feldspars. Note purple holmquistite blotches throughout the sample two are circled. B) Holmquistite starburst in quartz crystal in a polished thin section from eagle host rock. C) Holmquistite crystals in quartz crystal in a polished thin section from Eagle host rock. Note that B and C do not correspond to the circled holmquistite in Figure 9A.

The Eagle pegmatite dyke appears white to pink at surface and exhibits a range of textures from pegmatitic to aplitic. There is a visible chilled margin along the edge of much of the exposed pegmatite. This margin measures around one centimetre thick and is very fine-grained. The margin is also readily visible in drill cores from the Eagle pegmatite. Three main zones and one minor zone were observed at the Eagle: an intermediate zone, a fine-grained aplitic zone, and a coarse pegmatitic central zone (Roush et al., 2023). The intermediate zone was usually near the margins of the dyke while the central and the aplitic zones are often found near the centre of the dyke. In addition to this, there was a less distinct zone of mixture between the aplitic and other textures within the dyke. The intermediate and central zones are not well delineated from each other, as texturally, there are gradations present between the two. Four representative samples of pegmatite from the Eagle outcrop are shown below (Figure 10A-D).

There are later, structurally controlled veins of quartz and spodumene crosscutting the Eagle that strike N-S, as well as fine-grained epitaxial spodumene within the pegmatite (Roush et al., 2023). The cross-cutting veins were only investigated on the surface as no good samples were taken. No evidence of miarolitic cavities was observed in the outcrop or thin sections.

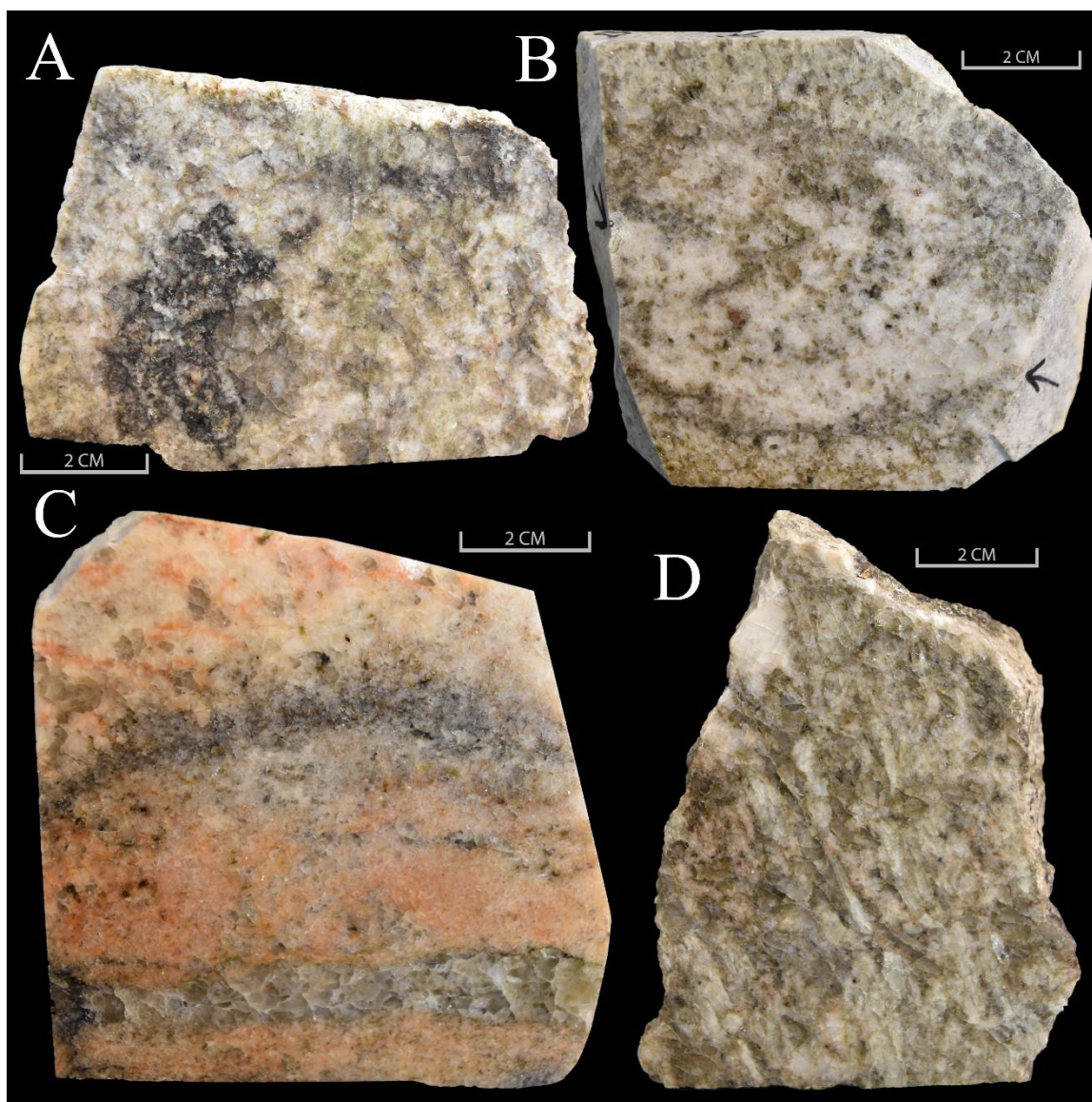


Figure 10: All samples are polished faces from the Eagle pegmatites. A) Sample 23-JR-011- central zone. Shows dark staining not seen in other samples, most likely a result of weathering. B) Sample 23-JR-013 -central zone. Shows variable concentrations of green spodumene with one small red garnet. C) Sample 23-JR-019 – aplitic central zone. Shows the variability in color from the Eagle and has similar mineralogical division to 23-JR-013 with a vein of quartz running through the face. D) Sample 23-JR-025 – central zone. Highlights zone of oriented spodumene crystals, with the majority of spodumene phenocrysts being oriented NW-SE in the image.

Major minerals in the Eagle pegmatites include quartz, plagioclase, alkali feldspar, and spodumene. Minor minerals include garnet and muscovite. Accessory minerals include tantalite, microlite, calcite, pyrite, zircon, and beryl. It should be noted

that pyrite and beryl were only found once each at Eagle, while calcite was found multiple times, but only in drill core samples. The bulk composition of the mineralized sections of Eagle is roughly 25% quartz, 40% feldspars, 25% spodumene, 5% mica, 3% garnet, and 2% for the combined accessory minerals. These numbers are estimates based on hand samples collected both in the field and polished samples in the lab. However, this varied along the strike of the pegmatite as the eastern and western margins are essentially devoid of spodumene.

The Eagle pegmatite has three major morphologies of spodumene. The first and most widespread morphology is of large, euhedral to semi-euhedral spodumene laths. In addition to this, approximately 20% of spodumene observed in the Eagle appears skeletal or almost dissolved, similar to the magmatic intergrowth texture described in Brennan et al. (2024) visually similar to a graphic texture. The last spodumene morphology is of small secondary crystals growing as fine, acicular blades on larger crystals. These preferentially grow on the C-axis of other spodumene crystals, creating small regions (around 1mm thick) of dark, dense crystal growth around other earlier spodumene crystals. These three instances of spodumene morphology are not mutually exclusive, as small secondary crystals grow on both skeletal and euhedral spodumene crystals. In multiple instances, all three types have been found in a single thin section. Examples of each morphology are shown below.

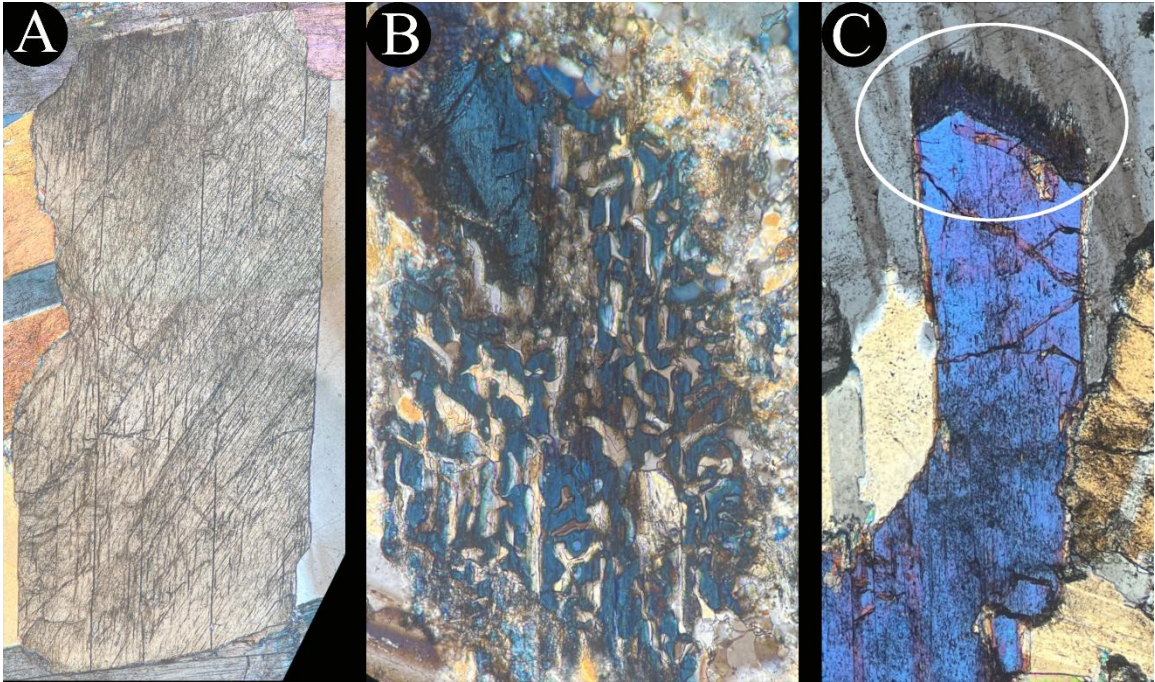


Figure 11: All samples show spodumene in polished thin section from the Eagle. A) Sample 23-JR-008. Larger, 8mm euhedral spodumene crystal shown with gray-yellow interference colour. B) Sample 23-JR-005B. Optically continuous spodumene crystal (blue interference color) intergrown with quartz. This is a spodumene quartz termination on a larger spodumene crystal. Assemblage is roughly 3mm from top to bottom. C) Sample 23-JR-013. Small, epitaxial spodumene crystals growing on the c-axis of a larger, euhedral spodumene crystal. This epitaxial growth is roughly 1mm thick. It

Initially, μ -XRF scans on thin sections indicated that the spodumene from the Eagle dyke was zoned in relation to iron. This, in conjunction with petrographic findings of the small secondary spodumene, elicited cathodoluminescence as a method to better distinguish any zoning of the crystals at the Eagle. In Figure 12 below, CL images reveal zoning within spodumene crystals that is not visible in μ -XRF, as well as large-scale iron zonation in spodumene from the initial μ -XRF scans. Together, these two methods help to show the compositional complexity of the spodumene crystals at the Eagle.

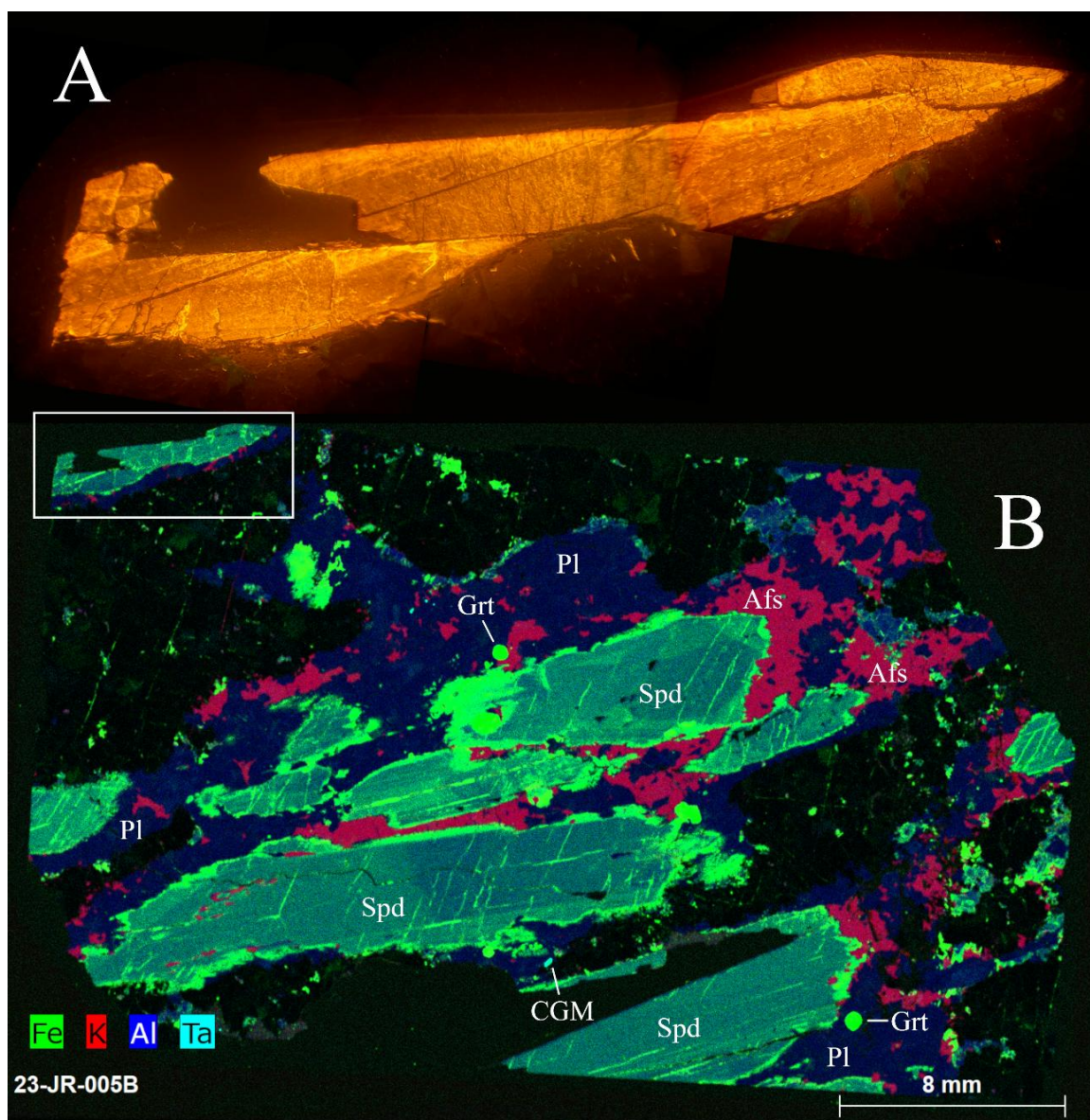


Figure 12: Sample 23-JR-005B. A) Stitched cathodoluminescence image of a spodumene crystal. B) μ -XRF scan of the polished thin section that was analyzed. Sample from the central zone of the dyke. Afs – alkali-feldspar, CGM – Columbite group mineral (informal name), Grt – Garnet group minerals, Pl – plagioclase, Spd – spodumene. Abbreviations after Whitney and Evans (2010)

Plagioclase is more common than alkali feldspar, but concentrations can vary significantly between samples. Some of the plagioclase crystals have bends or shears manifesting as defects in the twinning pattern under transmitted cross-polarized light (XPL). Many of the feldspar crystals also appear to have recrystallized edges. Feldspar

crystals at the Eagle dyke range in size from nearly aplitic (<1mm) up to 8 cm in the central zone of the dykes.

Quartz is very abundant in the Eagle pegmatite, and the majority of it has undergone extensive recrystallization. A scan of a polished thin section from Eagle is shown below. This slide has particularly recrystallized quartz and shows extensive deformation. The borders of most of the quartz grains at the Eagle have either been rounded as the result of grain boundary migration (Passchier & Trouw, 1996) or are replaced with entire recrystallized subdomains where smaller rounded grains form a partition between larger grains of quartz. The most common deformation feature is grain boundary migration through bulging recrystallization; however, deformation lamellae were also found sparingly in PTS (Passchier & Trouw, 1996). The quartz from the Eagle pegmatite has abundant fluid inclusions that sometimes manifest as inclusion tracks across the crystals. Many of these inclusions are large enough for future study. Needle-like inclusions were found in one of the thin sections from the Eagle. These crystals are too small to be identified and could be a multitude of minerals, from fine tourmaline to rutile.

Muscovite is present in small quantities throughout the Eagle, but is not a major mineralogical building block of the pegmatite, seldom growing larger than 0.5 cm. It is more common in the central zone of the pegmatite, but is not evenly distributed along the strike of the dyke, with certain areas having more muscovite and others being essentially devoid of it. No biotite was found at the Eagle pegmatite. Fine-grained sericite is also present throughout the dyke. It manifests as fine veinlets, seldom more than 3 mm wide.

There does not seem to be a preference with respect to which minerals or zones the sericite associates.

The garnet crystals from the Eagle are, on average, 1 to 3 mm and are most common in the aplite phase. They are uncommonly found in each zone of the dyke, but are present in the highest amount in aplite. Columbite group minerals (CGM) are found in each zone of Eagle and range in both composition and morphology. Both long, bladed crystals and more tabular crystals are present in the Eagle, with most of the crystals being found using heavy mineral separates (HMS). SEM-EDS mapping showed that many of the crystals are complex, with inner zonation ranging from columbite to tantalite compositions. These SEM-EDS maps are presented in a later chapter to illustrate the variability in the chemistry of the crystals. Comparatively U-rich microlite, present in both the intermediate and central zones, was also found in these separates, but was not encountered in PTS.

Pyrite was only found twice as *in situ* crystals at the Eagle. While some fractions of the HMS done at the Eagle contained pyrite, it was rarely seen outside of these separates. The pyrite-bearing section was found in the drill core from the central most section of the Eagle, adjacent to a large quartz phenocryst. This assemblage of quartz and sulfides could represent a minor ‘quartz core’ to the dyke. The sulfide mineralization, along with a high abundance of CGMs, is primarily located on the margin of the quartz phenocryst in the figure below.

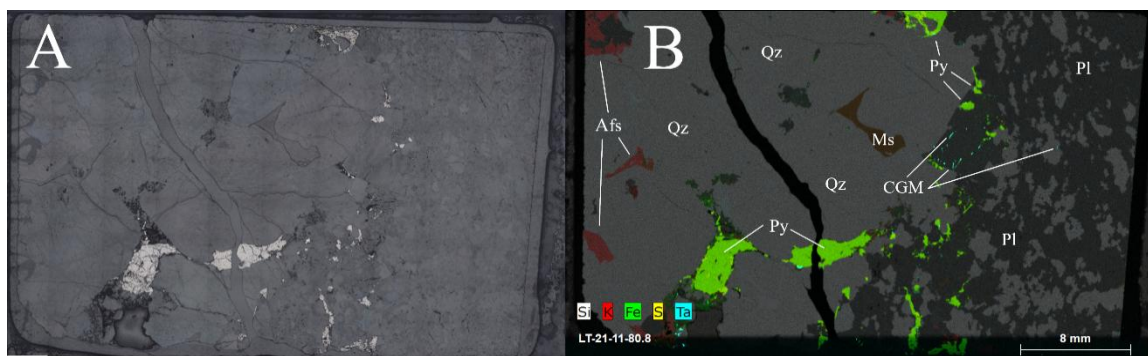


Figure 13: Slide LT-21-11-80.8. A) Full reflected light photomicrograph scan of the sample containing sulphide mineralization. B) μ -XRF scan of the same slide. Sample is from the central zone of the dyke. Afs – alkali-feldspar, CGM – Columbite group mineral, Pl – plagioclase, Spd – spodumene, Qz – quartz, Py - Pyrite. Formal abbreviations after Whitney and Evans (2010)

Two drill cores from Eagle were logged, and samples were collected: LT-21-09 and LT-21-11. Full drill core logs of their mineralogy are available in Appendix II. For drill core LT-21-11, several light pink to light grey dykes are found from 4.77 to 72.73 m with intervening meta-TTG. These small peripheral dykes range from 27 cm to 1.1 m in width, and all host light green to white spodumene. A larger, more mineralized pegmatite is then encountered from 76.4 to 84.2 m. Polished faces from the drill core LT-21-11 are shown below (Figure 14A-D). These drill core specimens were chosen as they are each from one of the smaller peripheral dykes at the Eagle. This choice contrasts the samples collected on the surface, which are inferred to be from the surface exposure of the widest pegmatite intersected from 76.4 to 84.2 m in drill hole LT-21-11. Many of the smaller pegmatites are not as well exposed at the surface and, due to sampling biases, could be underrepresented. It is of note that some of the smaller peripheral dykes at the Eagle site are mineralized, i.e. having spodumene, such as samples LT-21-11-42.8 and LT-21-11-69.5. These samples showcase the mineralogical diversity found in all of the dykes composing the Eagle outcrop.

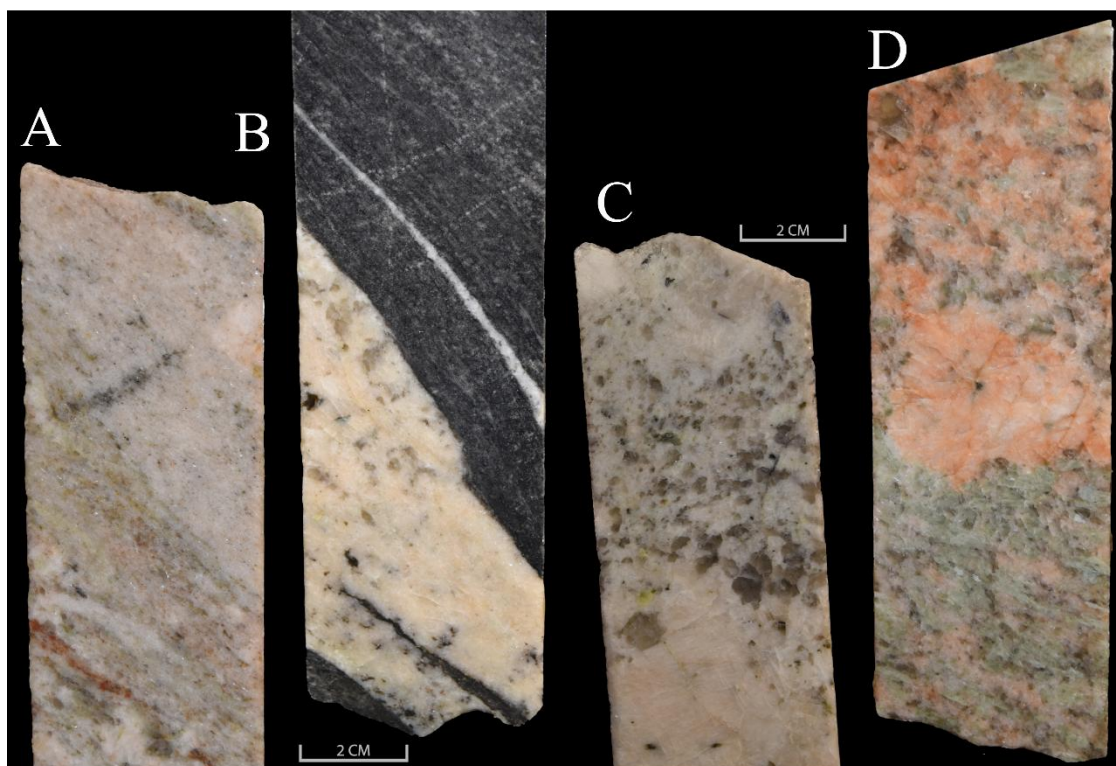


Figure 14: Eagle drillcore samples. A) Sample LT-21-11-42.8 shows the foliated nature of the dyke and the varied mineralogy within it with zones having varying amounts of green spodumene. B) Sample LT-21-11-46.0 shows the contact between a dyke and host rock. C) Sample LT-21-11-59.6 illustrates a zone within the dyke where spodumene is absent. D) Sample LT-21-11-69.5 shows the variability in size of the

2.4 Mineralogy and Petrology of the F.D. no. 5 Pegmatite

The F.D. no. 5 pegmatite appears white to pink in outcrop and is mottled with green spodumene and black zinnwaldite mica, giving it a very distinct appearance. It is majorly pegmatitic at the surface, with only a small section of fine-grained material present on the western flank of the outcrop. There is also a sub-1 cm chilled margin along the majority of the pegmatite. Two samples of the F.D. no. 5 pegmatite are shown below (Figure 15A, B). These examples illustrate the variability in spodumene concentration within the dyke.

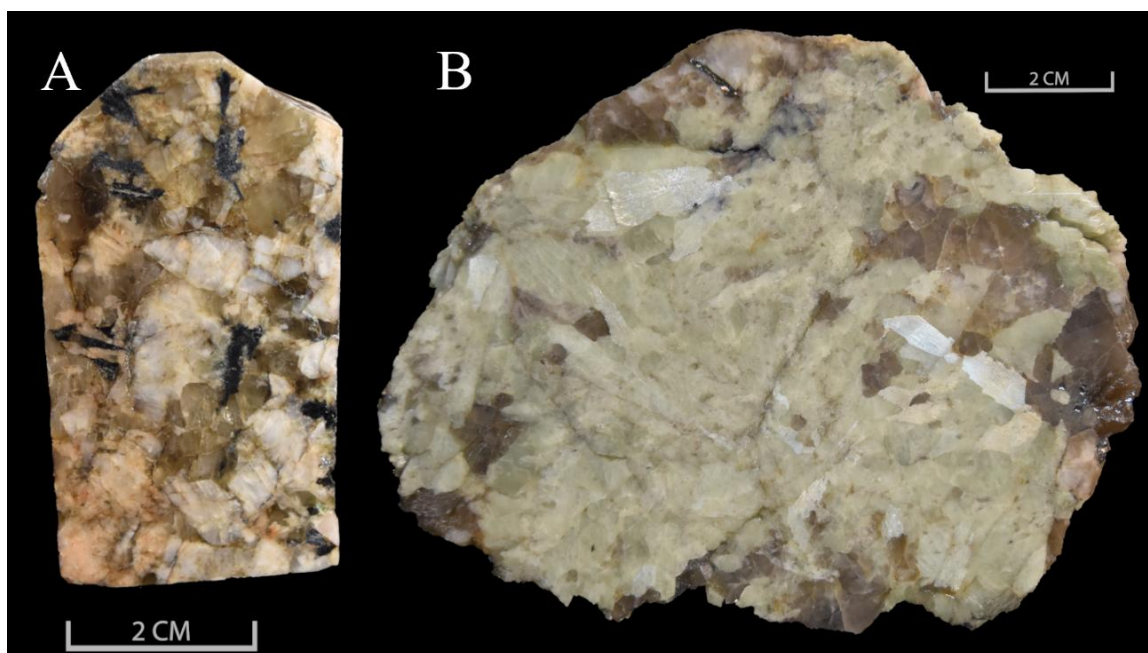


Figure 15: A) Sample 23-JR-030. Polished face of spodumene-free pegmatite zone. Quartz and feldspar are in roughly equal proportions in this sample with lesser zinnwaldite. B) Sample 23-JR-032 Polished face of spodumene rich pegmatite zone. Spodumene is the dominant mineral and appears green with less quartz and even less feldspar. Only minor zinnwaldite is present.

Major minerals found in the F.D. no.5 pegmatite are quartz, plagioclase, alkali-feldspar, spodumene, and zinnwaldite. Minor minerals include biotite, muscovite, schorl, and beryl. Accessory minerals include tantalite, microlite, monazite, and zircon. Many of these accessory minerals were identified from a heavy mineral separate. Although beryl can be of higher abundance in certain zones within the pegmatite, its bulk abundance is not high. Biotite can be found in the F.D. no. 5 as small phenocrysts often associated with the larger and more common zinnwaldite. However, biotite and schorl mainly occur in later veins crosscutting the dyke. No evidence of miarolitic cavities was observed in outcrop or petrographically. The bulk makeup of the F.D. no. 5 pegmatite is roughly 25% quartz, 35% feldspars, 25% spodumene, 10% zinnwaldite, 3% beryl, and 2% for the

combined accessory minerals. These numbers are based on estimation from both hand samples, field observations, and polished faces in the lab.

It is of note that one crystal of pale-green emerald, less than half a centimeter across, was found in a north-south trending biotite vein crosscutting the host rock less than two meters from the northern margin of the F.D. no. 5 dyke. This identification was confirmed by detailed petrography and a μ -XRF analysis of the emerald shown in Figure 16 below. The scan indicated small, consistent concentrations of Cs and Cr throughout the emerald, the latter giving the crystal its pale green color (Groat et al., 2008). Similar, but unmineralized biotite veins, were also rarely found at Eagle, suggesting widespread occurrence of these veins. The mineral assemblage of the analyzed part of the biotite vein is roughly 80% biotite and 10% quartz with a combined 5% apatite, colorless beryl, and 5% fine-grained sericitic mica. The cloudy white beryl is associated with the emerald, but was not observed in the other region of the vein. Small, high-relief minerals with metamict halos, which are most likely either zircon or monazite, are frequently found within biotite crystals.

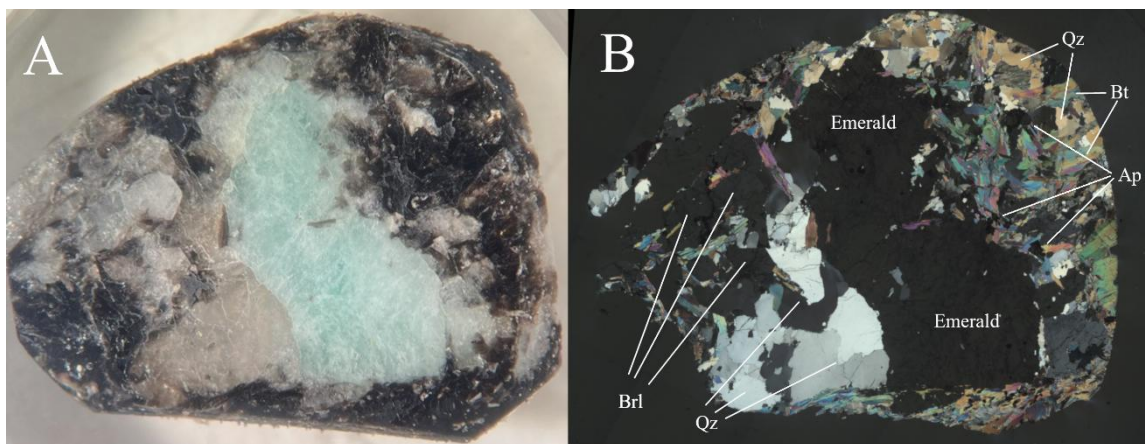


Figure 16: A) Polished emerald puck in reflected light, B) Thin section of the same sample in XPL. Brl – beryl, Bt – biotite, Qz – quartz. Abbreviations after Whitney and Evans (2010)

The outcrop was thoroughly searched, but no other beryl mineralization was found in the biotite veins. However, these veins could be a prospective environment for emeralds, as others have been found in similar environments in the Canadian Shield, such as the Ghost Lake emerald showing near Dryden, Ontario (Brand et al., 2009). Although beryl is common in many of the pegmatites in the region, this is the first positive identification of an emerald found in the Bird River and most likely the province of Manitoba.

The F.D. no. 5 pegmatite has 2 morphologies of spodumene. The majority of the crystals are relatively large, 1 to 10 cm long, and euhedral. Some, around 15%, of the spodumene crystals at the F.D. no. 5 are riddled with 1-3mm inclusions of quartz. They do not represent a classic spodumene-quartz intergrowth texture, but visually resemble graphic intergrowths of quartz and feldspar. This morphology is similar to the magmatic intergrowth texture from the Eagle dyke, although it is, on average, much larger, with some of the crystals with magmatic intergrowths reaching 5 cm (Brennan et al., 2024). There is a loose association between the spodumene and quartz within the pegmatite, with large patches of spodumene often co-occurring with relatively higher concentrations of quartz. The spodumene exhibits a range of green colors throughout the pegmatite, varying in intensity. Figure 17 is a photograph and μ -XRF scan overlay showing a mineralogically diverse section of the F.D. no. 5 pegmatite. Both morphologies of spodumene are present, along with beryl, feldspar, quartz, zinnwaldite, and CGMs.

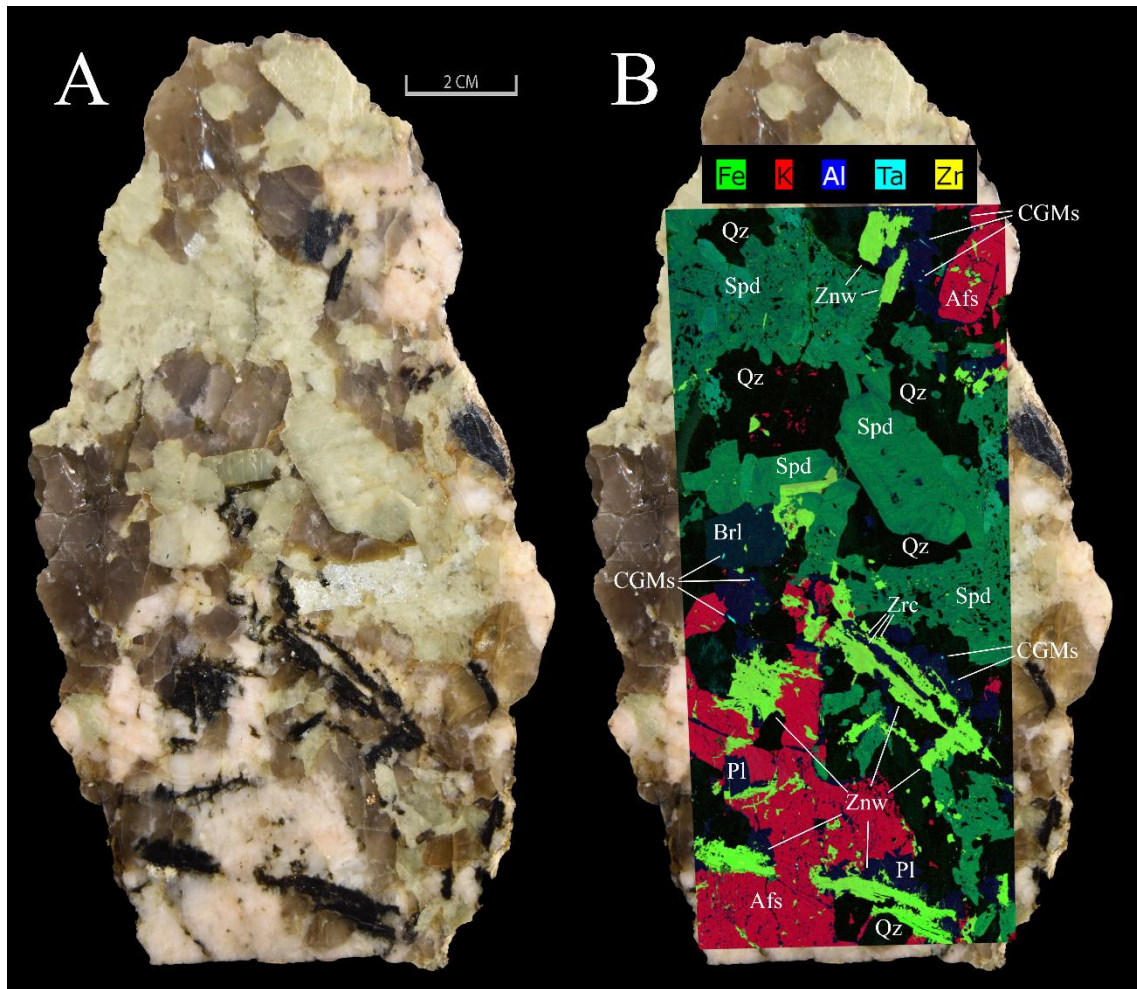


Figure 17: Sample 23-JR-031. A) Polished face collected on surface. It is a representative sample with spodumene, quartz, and feldspar in roughly equal abundance with less zinnwaldite. One crystal of pale blue beryl is present in this sample. B) is the same sample with an overlay of a μ -XRF element map to better show the mineralogy. Afs – alkali-feldspar, CGM – Columbite group mineral (informal name), Pl – plagioclase, Spd – spodumene, Qz – quartz, Zrc – Zircon, Znw – Zinnwaldite. Abbreviations after Whitney and Evans (2010)

Large books of dark, zinnwaldite mica (shown above) are present throughout the F.D. no. 5 pegmatite. It is common throughout the pegmatite and appears evenly distributed over the outcrop exposure. The zinnwaldite crystals appear to preferentially grow on the A and B axes, with limited growth along the C axis, resulting in wide, squat crystals. These often manifest on outcrops and in PTS sections as long, thin crystals,

because they are viewed edge-on. In PTS, many of the dark mica crystals have a secondary growth of lighter micas onto them, manifesting as rims with decreasing iron, as seen in μ -XRF scans of PTS from the dyke.

SEM-EDS and μ -XRF analyses were done on three representative crystals of the zinnwaldite from two PTS from the F.D. no. 5 dyke. Weight-percent-oxide lists returned from the SEM-EDS analyses were used to calculate the formula for these micas, assuming 11 O atoms. Due to the SEM-EDS detector returning less-than-ideal data and not reporting Li, the mica formula recalculation was only approximate. From these analyses, it was inferred that this mica belongs to the siderophyllite–polyolithionite series. It should be noted that the term zinnwaldite does not refer to a species. Instead, it is a series of trioctahedral micas on, or close to, the siderophyllite-polyolithionite compositional join. Colloquially, zinnwaldite can refer to all dark micas containing lithium (Rieder et al., 1998). Considering this, the dark micas from the F.D. no. 5 pegmatite can comfortably be labeled as Zinnwaldite, at least until a more thorough investigation is conducted and lithium is quantifiably measured in their structure.

Both plagioclase and alkali-feldspar are present at the F.D. no. 5 and comprise much of the pegmatite. Similar to the Eagle, plagioclase is more common than alkali-feldspar. Feldspar crystals within the pegmatite can be up to a metre in length, but are much more commonly 1 to 3 cm. The massive feldspar crystals are found in multiple sections of the pegmatite and appear to be growing as comb-structured crystals as they grew from the contact into the centre of the dyke. However, they are not present on every host rock contact and were only noted on the east and west portions of the dyke. Samples were not taken from these large crystals, but they appeared at least minorly perthitic in

the outcrop. In PTS, many of the feldspars show evidence of recrystallization around their edges.

Quartz is abundant in the F.D. no. 5 pegmatite and, like the Eagle, has been recrystallized. The borders of many of the quartz grains have either been rounded as the result of grain boundary creep or are replaced with entire recrystallized subdomains where smaller rounded grains form a partition between larger grains of quartz. However, at the F.D. no. 5, the deformed quartz does not appear as pervasive as it was at the Eagle. The difference in quartz deformation spans a wide range, with some thin sections having little recrystallized quartz, others have minor recrystallized subdomains, and others are almost entirely recrystallized. Some of the more intense grain boundary creep may be attributed to the previously mentioned crosscutting veins, as some of the most pervasive recrystallization seen petrographically is adjacent to one.

Beryl is present throughout the F.D. no. 5 pegmatite as small, hexagonal crystals up to 1.5cm wide. They are usually pale gray with little color but can sometimes have a greenish-blue tint. All the crystals observed were cloudy. Beryl is present throughout the outcrop and does not seem to have an association with any of the other minerals present. However, there are areas on the outcrop where beryl is much more common. There is a small section, around half a square meter, on the westernmost part of the highest pegmatite exposure, where multiple beryl crystals are present, reaching up to 10% beryl in that small area. Other regions of the dyke exhibit similar beryl concentrations as well as some areas are essentially devoid of it. There are no observed mechanisms for this variation.

The garnet crystals from the F.D. no. 5 are, on average, 1 to 3 mm. They are uncommon and found mainly through the mineralogical fractions in the HMS. CGMs are found throughout the dyke and range in both composition and morphology. Similar to Eagle, the majority of these crystals were found using HMS. Also, like Eagle, uranium-rich microlite was found in the separates from the intermediate and central zone of the pegmatite, but was not encountered during petrographic examination.

2.5 Mineralogy and Petrology of the Tappy Pegmatite

The Tappy pegmatite sharply intrudes its meta-basaltic host rock and, when viewed under the microscope, appears to have caused little, if any, alteration in the basalt. The Tappy has four observed zones. The first is the intermediate zone consisting of sub-0.5-centimetre quartz, feldspar, and muscovite, and is partially hematized. The second zone within the Tappy is the central zone, which consists of quartz, feldspar, spodumene, and muscovite, and has a larger grain size than the intermediate zone. On average, the phenocrysts in the central zone are 1 to 2 cm, with some spodumene crystals in the northern part of the dyke up to 15 cm. Hematization is also present in the central zone. The third zone within the Tappy is the aplite phase consisting of mainly fine quartz and feldspar and is relegated to the centre of the dyke and is only found in the northern part of the exposure. The last and least defined zone is a mix between the central zone or intermediate zone and an aplite phase. Six representative samples from the Tappy pegmatite are shown below (Figure 18A-F).

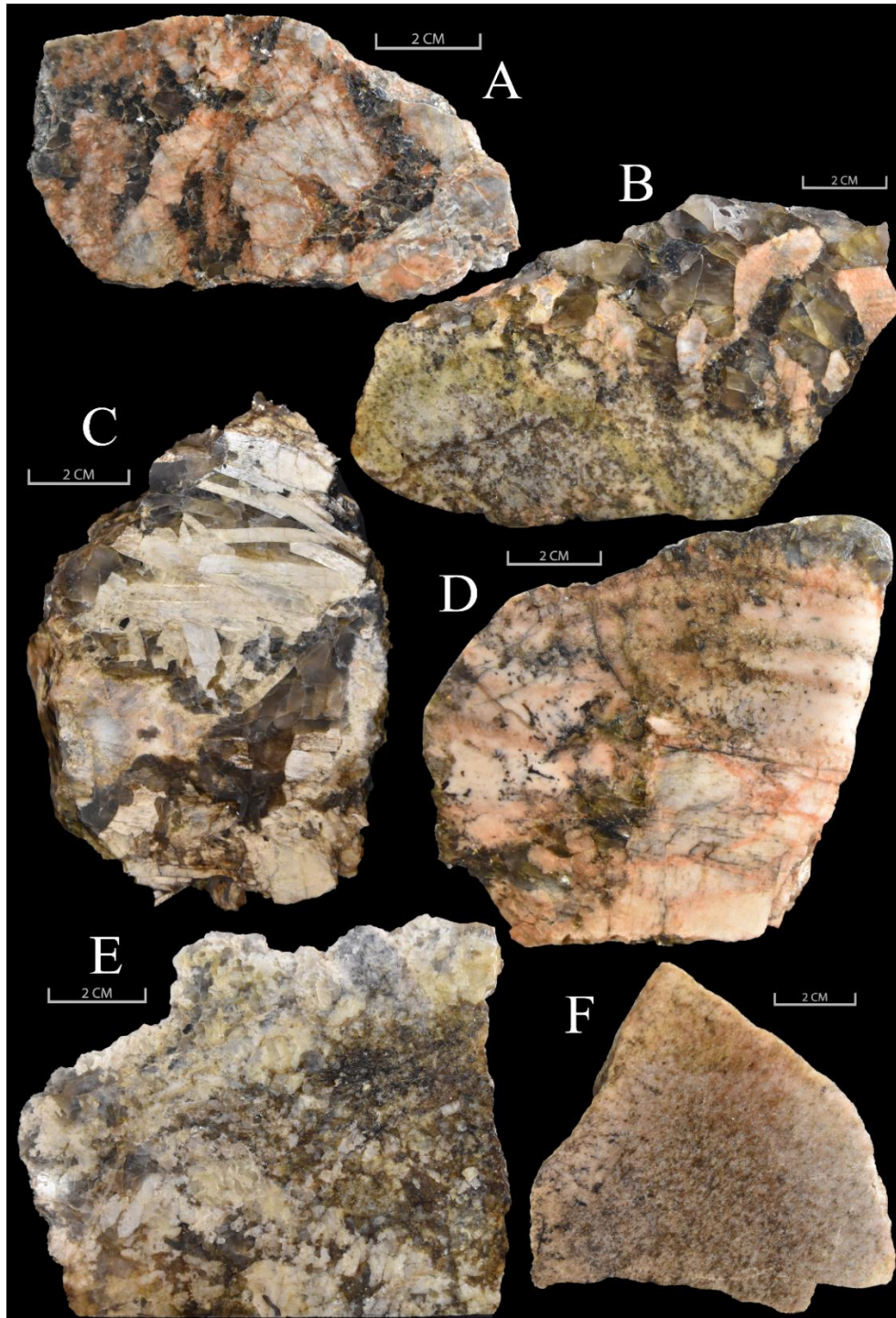


Figure 18: All are polished faces from the Tappy dyke. A) Sample 23-JR-035, spodumene free central zone. B) Sample 23-JR-036, spodumene free border between intermediate and central zones. C) Sample 23-JR-037, spodumene rich area of the dyke with large white spodumene crystals. D) Sample 23-JR-040 is the only sample of linerock from this study. E) Sample 23-JR-041, central zone with white spodumene crystals present. F) Sample 23-JR-042, large section of aplite from near the centre of the dyke

The northern part of the dyke is wider than the southern part and has a more diverse lithology with larger crystals. Textural diversity is also higher here, with aplite being present only in the northern half of the dyke. Unfortunately, the northern part of the dyke was covered by vegetation and was less discernable, as many of the rocks in this section were attached to bedrock. The mixed zone was primarily seen in these *ex-situ* rocks and was less definitive. One sample of *ex-situ* line-rock was also found in this area. Figure 19 shows a PTS of this sample that is from the polished face shown in Figure 18D.

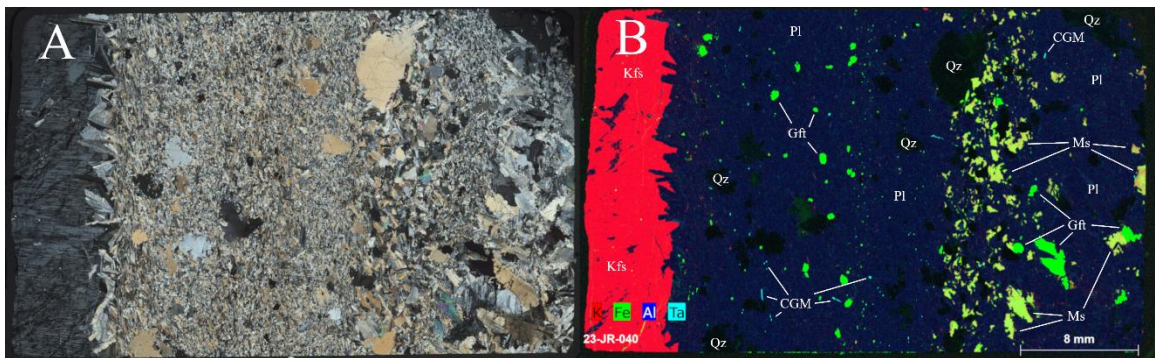


Figure 19: Sample 23-JR-040. A) Image of the polished thin section (PTS) under crossed polars. B) μ -XRF scan of PTS. Afs – alkali-feldspar, CGM – Columbite group mineral (informal name), Gft – graftonite (assumed), Ms – Muscovite, Pl – plagioclase. Abbreviations after Whitney and Evans (2010)

A μ -XRF overlay (Flude et al., 2017) of the polished face from which Figure 19 was taken, is shown below. This μ -XRF overlay illustrates the most texturally and mineralogically diverse sample taken from the Tappy pegmatite. In the μ -XRF overlay, a higher definition for both the linerock texture and the mineral diversity can be seen with graftonite, apatite and zircon present in the polished sample. Specifically, there is a line of very small zircon crystals cutting horizontally through the sample. The zircon line is situated in the saccharoidal aplite zone of the dyke and, despite looking superficially like the classic linerock described in Webber et al. (1997), may instead be a cumulus texture as its orientation was not recorded.

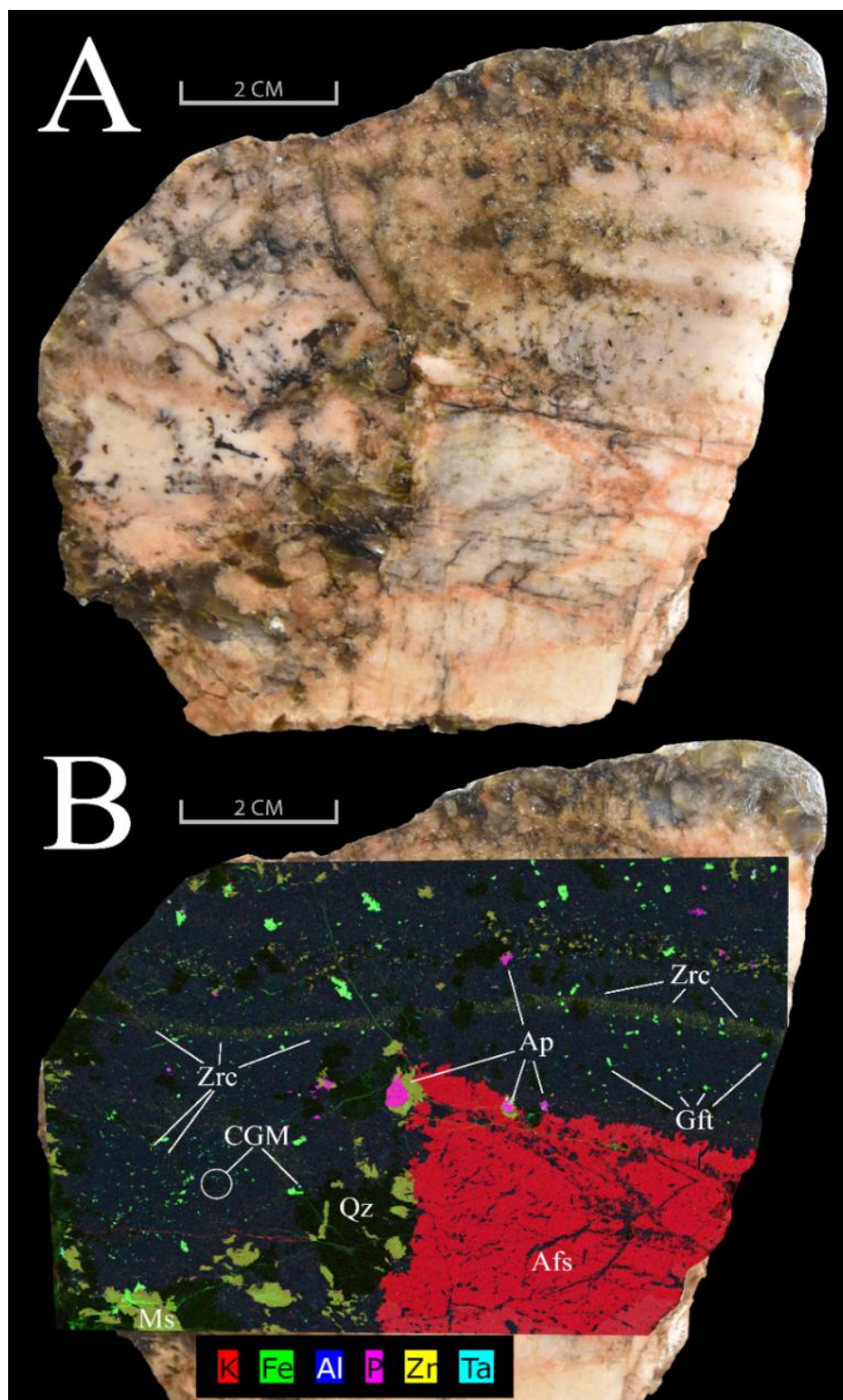


Figure 20: Sample 23-JR-040. A) Polished face B) is the same sample with an overlay of a μ -XRF element map. Afs – alkali-feldspar, CGM – Columbite group mineral (informal name), Pl – plagioclase, Zrc – Zircon. Abbreviations from Whitney and Evans (2010)

There is a lightly colored chilled margin on the pegmatite at the contact with the host rock, where the mineralogy is very fine-grained and not easily discernible. No evidence of miarolitic cavities was observed in outcrop or PTS. The Tappy pegmatite is the least deformed dyke in this study, with only minor recrystallization manifesting in the PTS. Small quartz sub-grains are present throughout much of the Tappy, but to a much lesser extent than at either the Eagle or F.D. no. 5. Some recrystallization of mica and feldspar is also visible, but is minor compared to the others.

Major minerals found in the Tappy pegmatite consist of quartz, plagioclase, alkali-feldspar, and spodumene. Minor minerals include muscovite and those tentatively assigned to the graffonite-beusite series [$\text{Fe}^{2+}\text{Fe}^{2+}_2(\text{PO}_4)_2$ to $\text{Mn}^{2+}\text{Mn}^{2+}_2(\text{PO}_4)_2$]. Graffonite was identified by SEM-EDS and μXRF , but due to Li not being assessed in these analyses and the relatively low accuracy of these methods compared to other analytical tools used in this study; these minerals could also belong to the Lithiophilite-Triphylite series ($\text{LiMn}^{2+}\text{PO}_4$ to $\text{LiFe}^{2+}\text{PO}_4$) or to one of the many other Fe-Mn phosphate phases found in LCT pegmatites. Additionally, Černý et al. (1981) describe the Lac Du Bonnet pegmatite group as having “Mn-sicklerite pseudomorphs after triphylite-lithiophilite” so the phosphate assemblage could be much more complex than initially thought in the Tappy. Until further mineralogical analyses are done on these samples, the small rusty red Fe-Mn phosphates present in the Tappy pegmatite will be referred to as graffonite. Small amounts of tantalite, zircon, and apatite are also present as accessory minerals. The bulk makeup of the mineralized section of Tappy is roughly 35% quartz, 25% feldspars, 25% spodumene, 10% mica, and a combined 10% for other less common minerals like graffonite, CGM, and apatite. These numbers are estimates based on both

hand samples collected in the field and polished faces examined in the lab. However, this varied along the strike of the pegmatite as the southern end was mainly an intermediate zone and devoid of spodumene.

In the Tappy pegmatite, spodumene is abundant, with some areas in the central zone of the dyke being over 50% spodumene. In a press release from New Age Metals, assays indicated up to 5.07% LiO_2 in the Tappy pegmatite (New Age Metals, 2023). Under the microscope, only one morphology of spodumene was found, with the crystals being prismatic and relatively euhedral. In hand samples collected on surface, the spodumene crystals from the Tappy dyke are a pale to bright white and show none of the green colouration that the spodumene from the Eagle and F.D. no. 5 dykes do.

Of the three studied pegmatites, muscovite mica is present in the highest concentrations here. It manifests as 1 to 15 mm crystals throughout the intermediate and central zones of the dyke and appears primarily as magmatic crystals. Very little sericitization was found at the Tappy pegmatite, and little alteration was found here in general. No biotite was found at the Tappy, with muscovite being the only observed phyllosilicate.

Both plagioclase and alkali-feldspar are present at the Tappy. Plagioclase is more common than alkali-feldspar. Large feldspar crystals, reaching up to 5 cm, are common in the coarsest grained sections of the central zone. Saccharoidal albite can be seen consuming the edges of a large alkali-feldspar crystal in Figures 19 and 20.

Quartz is abundant in the Tappy and is present in all three zones. It manifests as relatively clear, clean crystals up to 5 cm in the central zone. There is minor grain boundary recrystallization on the edges of some of the phenocrysts, but it is to a lesser

extent than the other two dykes. There does not appear to be a preferential association between quartz and spodumene, as was seen in F.D. no. 5. Instead, they both happen to manifest together in the central zone.

The Fe-Mn phosphate tentatively described as graftonite is present throughout all the zones of the pegmatite and does not appear to have a preferential mineralogical or zonation association. In the Tappy, it is present as small, rust-colored crystals that are readily identified under the microscope by their amorphous shape and dark color. It is the dominant phosphate phase in the Tappy, although some polished thin sections (PTS) from the Tappy have similar concentrations of both graftonite and apatite

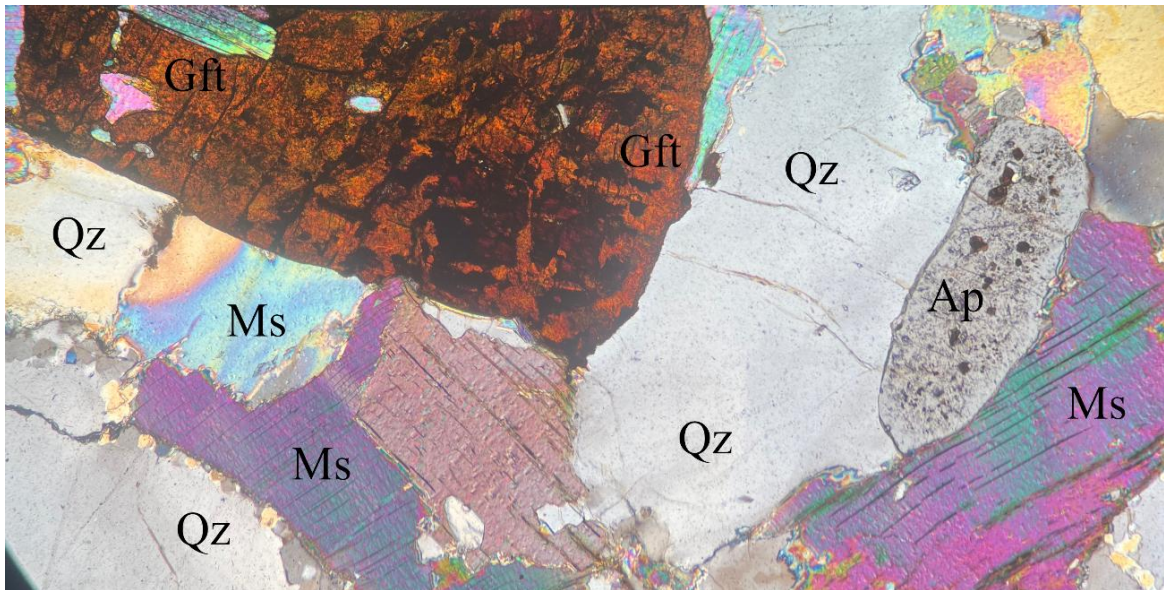


Figure 21: Sample 23-JR-036. Photomicrograph (transmitted CPL) showing both graftonite and apatite in polished thin section from the Tappy pegmatite. Ap – Apatite, Gft – Graftonite, Ms – Muscovite, Qz, Quartz. Abbreviations after Whitney and Evans (2010). Image is in XPL, FOV 5mm

Apatite crystals can reach up to 4mm. Petrographic microscopy and μ -XRF scans identified the apatite crystals found at the Tappy. They are stout and semi-euhedral in

PTS and appear colorless. They are found in both the intermediate and central zones of the dyke, but are larger in the central zone. Graftonite and apatite have been found in close association multiple times in PTS from the Tappy.

Columbite group minerals and zircon are present in small amounts in the Tappy. CGMs are small and usually bladed, seldom growing over 2 mm. They were found multiple times in PTS, most commonly in the central zone. Unlike the Eagle and F.D. no. 5 pegmatites, no HMS were made for the Tappy, so substantially fewer CGMs and zircons were found.

2.6 Conclusions

Mineralogically, the Eagle, F.D. no. 5 and Tappy pegmatites have a lot in common, with each sharing similar major mineral compositions with quartz, feldspar, and spodumene being the most common. Additionally, they all share very similar pegmatite classifications as discussed in the previous section. However, the minor minerals present at each dyke show a distinct variation between the three. Calcite and pyrite were both found at the Eagle, although both in drill core. Having access to fresh, non-weathered samples from the other dykes may have shown similar occurrences of calcite, but further study would be needed.

When comparing the Eagle to the F.D. no. 5 in the field, the most striking differences were the color of the spodumene and the presence of Zinnwaldite and abundant beryl at the F.D. no. 5. After further mineralogical investigation in the lab, these different mineralogies hold firm and the presence of both Zinnwaldite and beryl are hallmarks of the F.D. no. 5.

At the Tappy, the presence of graftonite in PTS supports the notion that it is much more P-rich than the other dykes to the north. Graftonite and apatite present in many of the Tappy samples point toward it being more enriched than the other two both chemically and mineralogically. The presence of abundant phosphates at Tappy is unique compared to the Eagle and F.D. no. 5 as HMS from them showed concentrations of apatite much lower than was initially expected. Comparing the *ex-situ* apatite from the Cat-Lake pegmatites to the Tappy also showed that the Tappy had larger apatites up to 3 times the size of the average crystals in the northern dykes. Mineral chemistry for the three pegmatites will be shown in the following chapter to further refine the evolution and relationships between the pegmatites. Using mineralogy and petrology allowed in this chapter allowed for them to be compared and contrasted to each other in a way that showed meaningful differences between the dykes, showcasing their unique mineralogical endowments.

Chapter 3 – Mineral Chemistry

3.1 Introduction

Trace element analyses of pegmatite minerals provide insight into the unique geochemical signatures of pegmatite dykes. Due to their ubiquity in pegmatite systems and their capacity to host incompatible elements, many studies (e.g., Černý et al., 1985; Garate-Olave et al., 2018; Selway et al., 2005; Wise et al., 2024; Roda-Robles et al., 2012, Van Lichtenvelde et al., 2007, Benn et al., 2022) have utilized feldspars, micas, columbite group minerals (CGMs), and garnets to obtain important information about the fractionation degrees of pegmatites or to infer the relationships between different pegmatites in the same area. The approach presented in this chapter enables the comparison of multiple pegmatites with one another, highlighting similarities and differences in their mineral chemistries. Additionally, the level of chemical similarity between the Eagle and F.D. no. 5 dykes in the Cat Lake Pegmatite District in the north can be shown in relation to the Tappy in the Winnipeg River Pegmatite District in the south, highlighting any geochemical trends between pegmatites in the northern and southern limbs of the Bird River Domain.

Trace element geochemical data can also be used to determine the level of fractionation and enrichment of trace and incompatible elements typically present in pegmatites. Incompatible elements, such as Li, Rb, and Cs, measured in feldspars and micas, serve as indicators of pegmatite fractionation, enabling quantitative measurements of pegmatite evolution (e.g., Garate-Olave et al., 2017; Benn et al., 2022). In addition, pegmatite fractionation indices can be obtained from the analysis of micas, feldspars, CGMs, and garnets using the behaviour of certain element pairs, such as Nb and Ta in

CGMs as well as the relationship between Zr/Hf and Y/Ho for garnets (Filiberto et al., 2021). As shown in Chapter 2, feldspars and micas are present in both the intermediate and central zones of the Eagle and Tappy pegmatites and throughout the F.D. no. 5 pegmatite. Columbite group minerals and garnets are common in the HMS from the Eagle and F.D. no. 5, and CGMs were found often in polished thin sections from the Tappy. Due to their abundances and usefulness in trace element analyses, these minerals were used in this study.

Alkali-feldspar and muscovite can both incorporate trace elements, such as Li, Cs, or Rb, whose contents typically increase with the degree of fractionation of these rocks (Wise & Brown, 2010). Lithium does not chemically act as a typical alkali element during magmatic fractionation of a granitic body. Due to its lower charge, Li preferentially stays in a melt phase. This buildup leads to increased contents of Li in early rock-forming pegmatitic minerals, such as alkali feldspar or micas, before its accumulation reaches a level sufficient to trigger the crystallization of Li minerals, such as spodumene ($\text{LiAlSi}_2\text{O}_6$) or petalite ($\text{LiAlSi}_4\text{O}_{10}$) (Černý et al., 1985).

Minerals with structural K, such as alkali feldspar and muscovite, can also incorporate Cs and Rb as they grow. This is due to K being the only major element for which Cs and Rb can readily substitute. The behavior of both Cs and Rb in igneous environments is governed by their large ionic radii (1.67 Å and 1.52 Å) relative to that of K (1.33 Å). Thus, they are only reluctantly admitted into potassic minerals and are strongly partitioned into melt phases. The process of Cs accumulation into residual systems continues not only from the fertile granites into rare-element pegmatites in general, but can also be strongly expressed within zoned groups and fields of pegmatites.

A sharp increase in Cs concentration occurs in the most complex pegmatites on the outskirts of cogenetic pegmatite swarms, furthest away from their plutonic sources (Černý et al., 1985).

Columbite group minerals are present as accessory minerals throughout the three studied pegmatites. *In situ* trace element analyses were performed on multiple CGM crystals from each pegmatite. Although dozens of CGMs were collected from HMS, a sufficient amount were found in thin sections before the separates were made. As CGMs become more fractionated, their chemistry becomes more enriched in Mn and Ta. This results in Mn-rich tantalite being the most evolved CGM species, and Fe-rich columbite being the least evolved. As a result, plotting Mn/(Mn + Fe) and Ta/(Ta + Nb) ratios from CGMs enables the assessment of their fractionation (Wise & Brown, 2010; Selway et al., 2005), and in turn, the fractionation of Eagle, F.D. no. 5, and Tappy to be compared.

Garnet is a semi-common, nesosilicate accessory mineral in the Eagle, F.D. no. 5, and Tappy pegmatites with the general formula $A_3B_2Si_3O_{12}$. The crystal structure of garnet enables it to accommodate a wide range of cations in both the A and B sites within its lattice (Filiberto et al., 2021). Additionally, higher Nb and Ta concentrations correspond to the garnets associated with the most fractionated pegmatites (Filiberto et al., 2021), meaning that for both garnet and CGM, trace element analyses of Nb and Ta can serve as viable fractionation indices. In garnet, the Charge-and-Radius Controlled (CHARAC) field indicates the area where the distribution of trace elements is controlled by the ionic radius and charge parameters of each element. The further the samples are from the CHARAC field, the greater the fractionation degree of the melt (Filiberto et al.,

2021; Bau, 1996). This means that for minerals like garnet, trace element data can be used to infer the enrichment degree of the melt and the subsequent pegmatite.

This trace element analysis aims to better place the Eagle, F.D. no. 5, and Tappy pegmatites within the broader context of pegmatites from the region, and to compare the pegmatites directly with each other. The location of the Eagle and F.D. no. 5, discussed in the first chapter, led researchers and prospectors to wonder if they represented two ends of the same pegmatite body hidden underground. In chapter 2 of this thesis, the petrology of the two dykes was compared and contrasted to investigate this question further. In this chapter, the first quantitative results focusing on mineral chemistry of will shed light on the relationship between the dykes will be presented along with fractionation indices for each dyke showcasing their evolution and rare element concentrations.

3.2 Methods

3.2.1 Scanning Electron Microscope (SEM)

Analyses were performed at the UNB Microscopy and Microanalysis Facility on two Scanning Electron microscopes. The first was performed using a JEOL JSM-6400 Scanning Electron Microscope, equipped with an EDAX Genesis 4000 Energy Dispersive X-ray (EDS) analyzer. EDS analysis was performed at an accelerating voltage of 15 kV and a beam current of 1.5 nA, with a working distance of 14 mm. The collection time was 50 seconds per analysis point. The second microscope used was a Thermo Scientific Scios 2 Dualbeam, equipped with an Oxford Ultim Max 170 EDS detector and an Oxford Symmetry electron backscatter diffraction (EBSD) detector controller, controlled by Aztec software. Analyses on this machine were performed using

an accelerating voltage of 15 kV with a working distance of 7 mm. Samples were carbon-coated using an Edwards 306A carbon coater before observation in the microscope.

3.2.2 Laser Ablation Inductively Coupled Plasma-Mass Spectrometry

In situ trace element analyses of individual mineral grains by Laser Ablation Inductively Coupled Plasma-Mass Spectrometry (LA ICP-MS) were done at the Micro-Analysis of Natural Trace-Element and Isotope Systematics (MANTIS) Lab at the University of New Brunswick using an Agilent 8900 tandem ICP-MS and 193nm laser ablation system. A more detailed analytical technique is described in McFarlane and Luo (2012). Data reduction was done using Iolite4TM software. The gas flow rates for all the analyses were 900 ml Ar/min, 300 ml He/min, and 2 ml N₂/min. Quadrupole dwell times were set to 0.01 seconds for the majority of the elements, with elements of high interest having dwell times up to 0.04 seconds. Ablation lasted for 30 to 40 seconds with background times ranging from 20 to 30 seconds for each analysis. Spot sizes, repetition rate, energy, and standards are listed below for each mineral's methods.

Laser ablation on alkali feldspar and muscovite was done with a beam diameter of 66 μm , a repetition rate of 4 Hz. An energy of 3.5 J/cm² was used for alkali feldspar and 2 J/cm² for muscovite. The primary standards NIST610 and NIST612 were used with the secondary standards ATHO-G and BCR-2G for both minerals. Trace element laser ablation on CGMs was done with a beam diameter of 26 μm , a repetition rate of 3 Hz, and an energy of 2 J/cm². The primary standard NIST 610 was used with the secondary standards BCR-2G, and GSE-1G. Trace element laser ablation on garnet was done with a beam diameter of 36 μm , a repetition rate of 3 Hz, and an energy of 3 J/cm². The primary

standards: NIST 610 and NIST 612, were used with Garnet Mountain Garnet (in-house standard).

3.2.3 Sample Collection and Preparation

Alkali-feldspar and muscovite were analyzed solely on in situ crystal grains on polished thin sections (PTS) from the three dykes. Crystals were first analyzed under a petrographic microscope, and only the least altered, primary crystals were selected for analysis. Crystals were also scanned by a Bruker Tornado μ -XRF to confirm their mineralogy prior to analysis.

CGM analyses were done both on *in situ* grains from PTS as well as *ex situ* grains obtained from HMS done at the Eagle and F.D. no. 5. These HMS samples were obtained from channel cuts done in the host rock, intermediate zone, and central zone of the pegmatites. GCMs from the Eagle pegmatite were analyzed from both the intermediate and central zones of the pegmatite. CGMs from the Tappy were analyzed from the intermediate and central zone of the dyke.

The analyzed garnets only came from HMS at the Eagle and F.D. no. 5. No garnet analyses were done at the Tappy pegmatite as no HMS were collected there. All minerals collected from HMS were hand-picked and set into epoxy for analysis.

3.3 Results

3.3.1 Mineral Chemistry of the Eagle, F.D. no. 5, and Tappy Pegmatites

As stated above, Li, Rb, and Cs, in addition to Si, Al, K, Na, Ca, Ba, Ti, Fe, Mg, Mn, measured in feldspars and micas are good indicators of pegmatite fractionation, although they are not the only trace elements used to assess fractionation, as other elements like Sn

and Ta can also give insight into pegmatite evolution (e.g., Roda-Robles et al., 2012, 2023). Instead, these trace elements were selected because they have been widely used in studies on pegmatite mineralization (e.g., Benn et al., 2022; Černý et al., 1985; Garate-Olave et al., 2018; Roda-Robles et al., 2012; Selway et al., 2005; Wise et al., 2024). A summary of the Li, Rb, Cs, K/Rb, and Ta data from the Eagle, F.D. no. 5, and Tappy pegmatites compared to data from Selway et al. (2005) is shown in Table 3 with Be and Sn also shown for the studied pegmatites.

Table 3: Select trace element data from alkali-feldspar and muscovite from Selway et al. (2005) compared against analogous data from the Eagle, F.D. no. 5, and Tappy

(A) Alkali-Feldspar	Rb (ppm)	Cs (ppm)	K/Rb	Ta (ppm)	Be (ppm)	Sn (ppm)
Barren granite	<400	<10	>150			
Fertile granite	500-3,000	20-100	30-150			
Rare-element pegmatite	>3,000	>100	<30			
Eagle pegmatite	3,700-10,900	15-380	15-42	0.003-0.3	0.1-5.5	0.03-2
F.D. no. 5 pegmatite	2,900-4,300	90-840	34-47	0.005-0.13	0.8-4.3	0.03-0.07
Tappy pegmatite	4,500-16,000	200-1,300	9-14	0.004-0.9	0.7-6	0.13-20

(B) Muscovite	Li (ppm)	Rb (ppm)	Cs (ppm)	K/Rb	Ta (ppm)	Be (ppm)	Sn (ppm)
Fertile granite	200-500	1,000-1,500	10-100	50-100	10-65		
Beryl-type pegmatite	500-2,000	1,500-10,000	100-500	20-50	10-65		
Spodumene-subtype pegmatite	>2,000	>10,000	>500	<20	>65		
Eagle pegmatite	200-12,000	5,500-16,000	100-7,000	4-16	1-450	1-37	10-1360
F.D. no. 5 pegmatite	200-10,000	3,000-10,500	230-7,000	9-27	3-500	10-31	40-470
Tappy pegmatite	1,000-9,000	10,000-18,000	400-4,000	4-9	40-240	15-30	340-880

In the Eagle pegmatite, the majority of the data is within the range for “rare-Li element pegmatite” and “spodumene-subtype pegmatite” (Table 3). Most of the data from the F.D. no. 5 pegmatite lies within in the “rare-element pegmatite” field regarding alkali-feldspar. For muscovite, the F.D. no. 5 plots between the “spodumene-subtype pegmatite” and “beryl-type pegmatite” fields in Table 3. The Tappy pegmatite has the

highest overall enrichments of the three dykes, but the majority of the data is within in the “rare-element pegmatite” field for alkali-feldspar and “spodumene-subtype pegmatite” field for muscovite in the table above. Graphs displaying trace element concentrations will be presented in the next section to illustrate the data spread more effectively.

3.3.1.1 Alkali Feldspar

3.3.1.1.1 Fractionation Indices

Figure 22 shows trace element data for alkali-feldspar from the Eagle, F.D. no. 5, and Tappy pegmatites. The data points in these graphs go from most fractionated in the upper left to least evolved in the bottom right, as a lower K/Rb ratio is associated with more evolved alkali feldspar (Černý et al., 1985). In the Tappy pegmatite, the K/Rb ratio ranges from 9 to 15, with minimal dispersion in the data. The Eagle pegmatite has a K/Rb ratio ranging from 15 to 40, with the majority of the data falling below 30. The F.D. no. 5 K/Rb ratio spans from 35 to 40 with a relatively even distribution of points over this range. The Lac Du Bonnet pegmatite group has a reported K/Rb range of 12 to 16 (Černý et al., 1981) for blocky alkali-feldspar while the Eagle Irgon group and the Beryl-Tourmaline groups have ranges of 9 to 28 and 32 to 37 respectively.

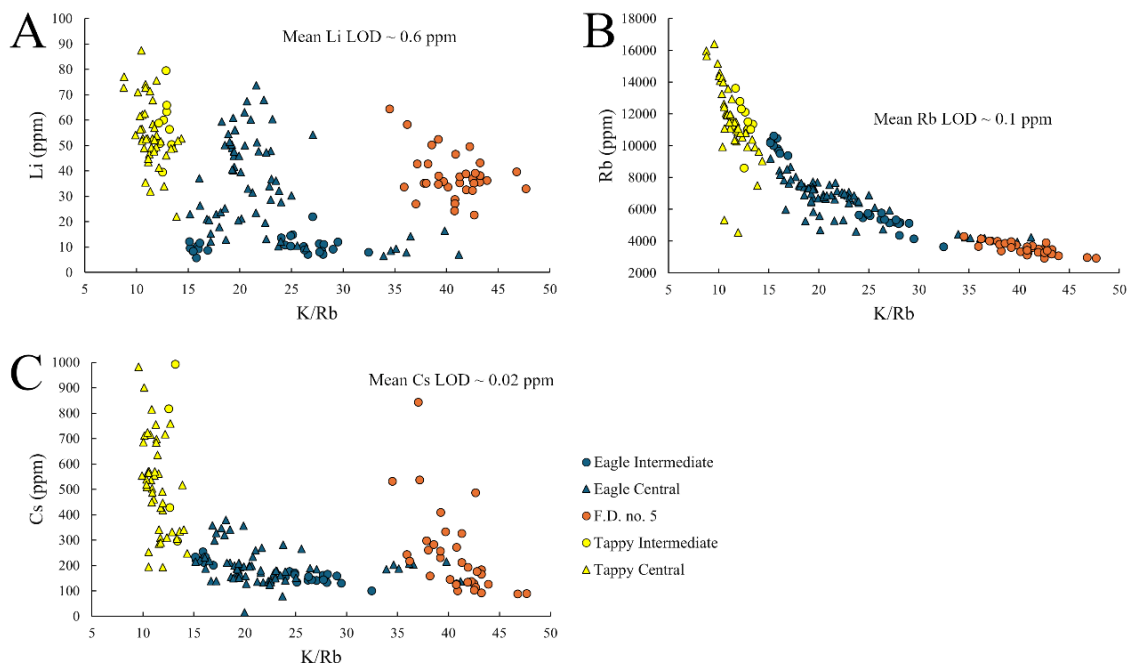


Figure 22: Trace element data for alkali-feldspar from the Eagle, F.D. no. 5, and Tappy pegmatites. A) K/Rb ratio plotted against Li; B) K/Rb ratio plotted against Rb; C) K/Rb ratio plotted against Cs; In order of increasing fractionation, points go from the bottom right to the upper left.

In Figure 22A, it is shown that the Tappy pegmatite has the highest levels of Li present in its alkali-feldspars, with the Li concentrations spanning from 30 ppm to around 90 ppm. In the Eagle, Li concentrations range from 30 to 80 ppm. In the F.D. no. 5, Li concentrations are mostly under 50 ppm reach, but reach up to 70 ppm, increasing with decreasing K/Rb values.

In Figure 22B, the trace element data from Rb concentrations in Tappy alkali-feldspar reach nearly 17000 ppm and drop proportionally with increasing K/Rb. Rubidium concentrations in Eagle alkali-feldspar reach nearly 11000 ppm and drop proportionally with increasing K/Rb. Rubidium concentrations in F.D. no. 5 alkali-feldspar reach near 4500 ppm and drop proportionally with increasing K/Rb.

In Figure 22C, alkali-feldspar from Tappy has 200 to 1000 ppm of Cs and shows no readily apparent trends in this range of values. The majority of the analyzed points from the Eagle fall within the range of 250 to 100 ppm. Select alkali-feldspar crystals from the F.D. no. 5 pegmatite are enriched in Cs relative to the other points, but most analyzed points are within 400 to 100 ppm.

3.3.1.1.2 Additional Trace Element Analysis

Figure 23 is a compilation of 12 graphs showing data for Eagle, F.D. no. 5, and Tappy pegmatites from alkali-feldspar trace element data. Fractionation indices shown in the previous section are a useful tool for comparing pegmatites, as comparing the K/Rb ratio and other rare element concentrations can help to quantify how related nearby pegmatites are to each other (e.g., Garate-Olave et al., 2018; Černý et al., 1981). However, the concentrations for dozens of elements were analyzed on LA-ICP-MS, and their relationships can help to show the level of chemical similarity between the Eagle and F.D. no. 5 dykes, as well as give extra information on the fractionation of the dykes from which the minerals come.

In Figures 23A, C, E, G, and I, trace-element data for the alkali-feldspar from the Tappy pegmatite show high P, Ta, and low Ba relative to the other pegmatites. Tantalum becomes enriched in pegmatites as they chemically fractionate, with more evolved systems tending to have more Ta. Conversely, Barium behaves compatibly and is comparatively rare in evolved systems like pegmatites. Comparing compatible to incompatible elements gives a robust assessment of a pegmatite's degree of fractionation. In Figure 23I, the geochemical enrichment of the Tappy pegmatite is very apparent compared to the other dykes, as it has almost twice the amount of both Rb and Cs relative

to the Eagle and F.D. no. 5. As was discussed previously, Rb and Cs behave incompatibly and, similar to Ta, become enriched in evolved systems.

In Figure 23D, potassium (K) is plotted against Rb and gives one of the most well-defined graphs in the figure, illustrating separate K/Rb trend lines for each pegmatite. Alkali feldspar from the Tappy pegmatite has the highest concentration, followed by the Eagle, while the F.D. no. 5 has very low concentrations of Rb compared to the other dykes, and its fractionation trend appears almost flat. Rubidium can substitute for K in the alkali-feldspar structure, so increases of both indicates a higher percentage of end member microcline within the analyzed feldspar.

In Figure 23H, Ti is plotted against Fe, showing the depleted nature of Ti in alkali-feldspars from the F.D. no. 5 pegmatite, with the maximum concentration reaching only around 10% of the other pegmatites. With the differing mineralogy of the F.D. no. 5 compared to the other dykes, Ti may be preferentially sequestered in the large zinnwaldite mica crystals that make up 10% of the bulk mineralogy of the F.D. no. 5. The Eagle and Tappy pegmatites have similar overlaps when comparing Ti to Fe, while the F.D. no. 5 is a stark outlier. Additionally, in regard to the K/Rb ratio, the ranges expressed by the Eagle and Tappy pegmatites are as similar to each other as the Eagle is to the F.D. no. 5. Based on this, the Eagle and F.D. no. 5 do not seem to be closely related to each other.

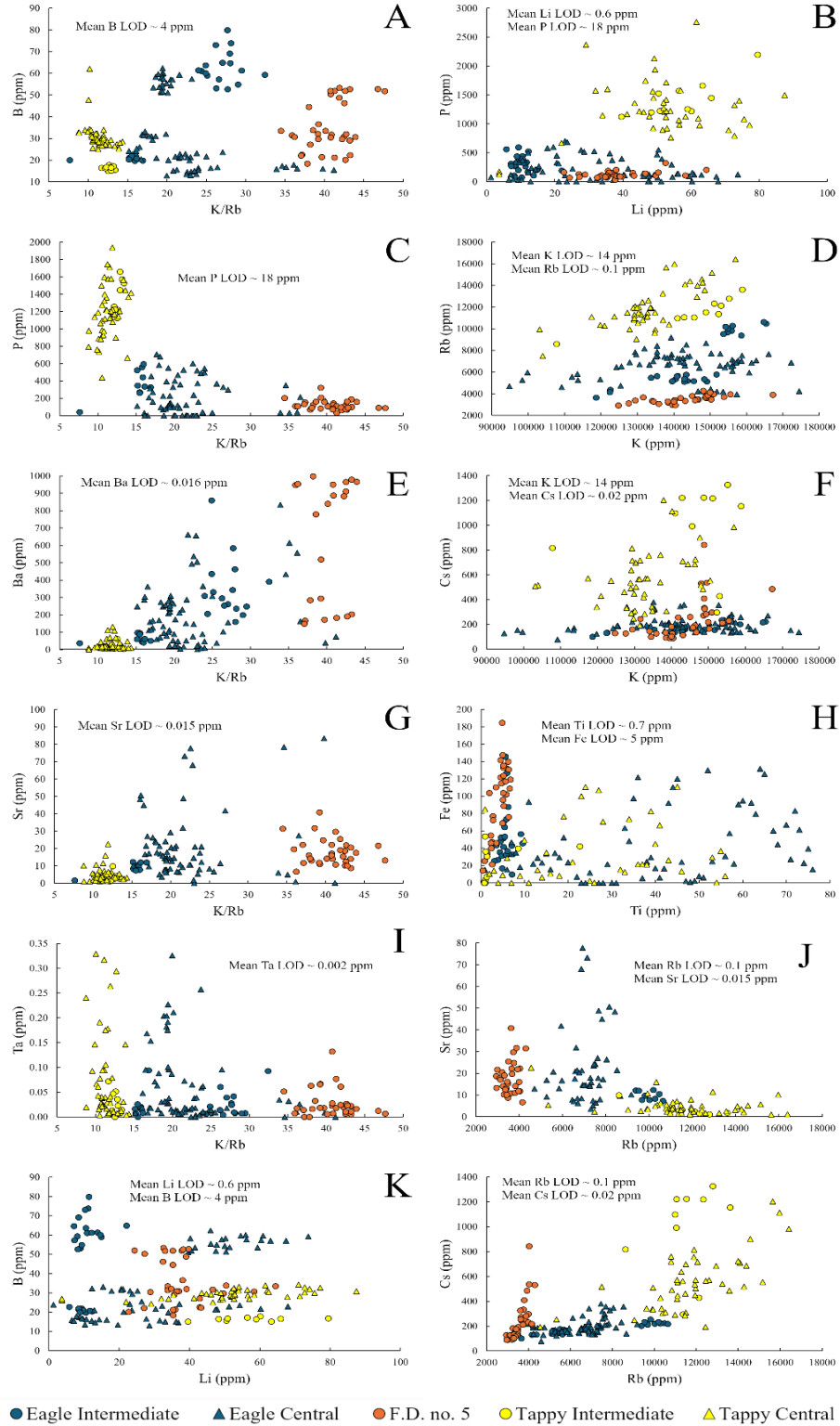


Figure 23: Trace element data for alkali-feldspar from the Eagle, F.D. no. 5, and Tappy pegmatites. A) K/Rb vs. B; B) Li vs. P; C) K/Rb vs. P; D) K vs. Rb; E) K/Rb vs. Ba; F) K vs. Cs; G) K/Rb vs. Sr; H) Ti vs. Fe; I) K/Rb vs. Ta; J) Rb vs. Sr; K) Li vs. B; L) Rb vs. Cs

3.3.1.2 Muscovite

3.3.1.2.1 Fractionation Indices

Figure 24 presents trace element data for muscovite from the three pegmatites studied in this thesis. The data points in these graphs go from most fractionated in the upper left to least evolved in the bottom right. The K/Rb ratio spans roughly 4 to 9 in the muscovite of the Tappy pegmatite, with the data evenly spaced over this range. The muscovite of the Eagle pegmatite has a K/Rb ratio ranging from 5 to 16, with the data evenly spaced over this range. The F.D. no. 5 K/Rb ratio spans from 8 to 28, with the data forming two distinct groups over this range, one below and one above a K/Rb value of 15. The Lac Du Bonnet pegmatite group has a reported K/Rb range of 7 to 7.5 (Černý et al., 1981) for core muscovite while the Eagle Irgon group and the Beryl-Tourmaline are not reported.

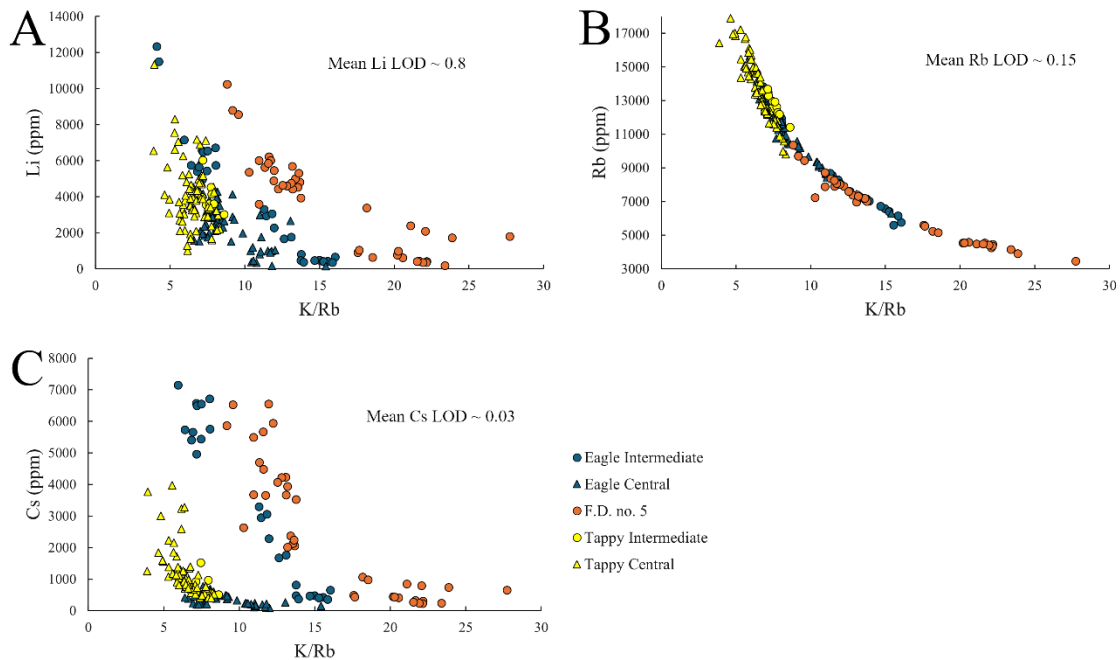


Figure 24: Trace element data for muscovite from the Eagle, F.D. no. 5, and Tappy pegmatites. A) K/Rb ratio plotted against Li; B) K/Rb ratio plotted against Rb; C) K/Rb ratio plotted against Cs. In order of increasing fractionation, points go from the upper left to the bottom right.

Figure 24A shows that muscovite from the Tappy, Eagle, and F.D. no. 5 pegmatites all have similar ranges of Li enrichment. They generally range between 8,000 and 1,000 ppm Li, with some points having up to 12,000 ppm Li; however, the latter may be due to micro-inclusions of spodumene, as they are comparatively much higher than the other points. Lithium concentrations decrease with increasing K/Rb values for the Eagle and F.D. no. 5 pegmatites, but do not show a similar trend for the Tappy pegmatite.

In Figure 24B, the trace element data from Rb concentrations in Tappy mica reach nearly 17,000 ppm and decrease proportionally with increasing K/Rb. Rb concentrations in Eagle mica reach nearly 11,000 ppm and drop proportionally with increasing K/Rb. Rubidium concentrations in F.D. no. 5 mica reach near 4500 ppm and drop proportionally with increasing K/Rb.

In Figure 24C, the K/Rb ratio is plotted against Cs. Mica from Tappy contains 200 to 1000 ppm of Cs and exhibits no readily apparent trends within this range of values. Select mica crystals from the central zone of the Eagle pegmatite are enriched in Cs relative to the other points. Still, the majority of the analyzed points are within 250 to 100 ppm. Select mica crystals from the F.D. no. 5 pegmatite are enriched in Cs relative to the other points, but most analyzed points are within 400 to 100 ppm.

3.3.1.2.2 Additional Trace Element Analysis

Figure 25 illustrates both the fractionation of and how chemically similar the Eagle, F.D. no. 5, and Tappy pegmatites are based on muscovite trace element analyses. Figure 25 shows that muscovite from the Tappy is the most evolved with respect to the K/Rb ratio, with high Sn and Ta and low Sr and Ba relative to the other pegmatites. Tin (Sn) and Ta behave incompatibly and are enriched in more evolved melts. Conversely, Sr and Ba

behave compatibly and are depleted in most pegmatites compared to many other elements. Similar to the data presented for the alkali-feldspar, high concentrations of incompatible elements and low concentrations of compatible elements in the Tappy pegmatite show that it is the most chemically evolved, at least in regard to its muscovite mineral chemistry.

Additionally, Tappy muscovite tends to be low in Fe and Mg compared to the other dykes. In Figure 25B it is possible to see how each pegmatite follows different trends when comparing Fe to Li. Tappy has the lowest Fe concentration, while the Eagle and F.D. no. 5 have higher levels of Fe in their micas. It appears that the Eagle has slightly less Fe than the F.D. no. 5, but the two have a large amount of relative overlap. Lithium enrichment between the three dykes is similar, with Fe creating the visible fractionation trends. However, as they are all LCT pegmatites with common spodumene, Li concentrations are not expected to be wildly variable. In Figure 25L comparing Nb to Ta, the Tappy pegmatite plots in the middle range, with substantial data points from both the Eagle and F.D. no. 5 above and below it. Overall, the data obtained from Tappy muscovite has higher concentrations of incompatible elements, like Sn, Nb, Ta, and Rb than muscovite from the other dykes does. Tappy muscovite also tends to have lower overall concentrations of compatible elements like Sr, Mg, and Fe than the other dykes showcasing a higher chemical evolution relative to the Eagle and F.D. no. 5.

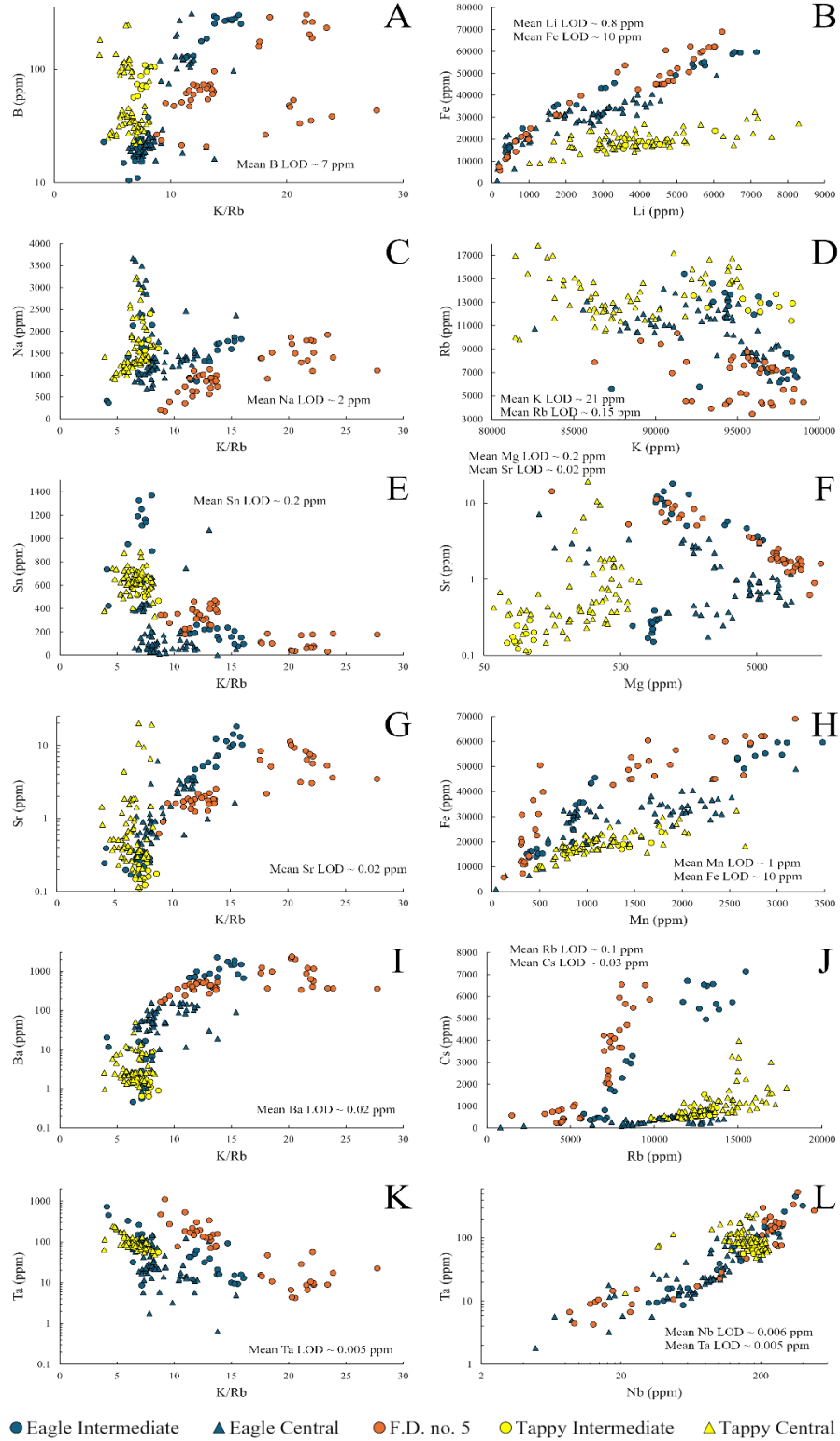


Figure 25: Trace element data for muscovite from the Eagle, F.D. no. 5, and Tappy pegmatites: A) K/Rb vs. B; B) Li vs. Fe; C) K/Rb vs. Na; D) K vs. Rb; E) K/Rb vs. Sn; F) Mg vs. Sr; G) K/Rb vs. Sr; H) Mn vs Fe; I) K/Rb vs. Ba; J) Rb vs. Cs; K) K/Rb vs. Ta; L) Nb vs Ta

3.3.1.3 Columbite Group Minerals

3.3.1.3.1 Fractionation Indices

Figure 26 shows the evolution trend from high Fe columbite in the bottom left-hand corner to high-Mn tantalite in the upper right-hand corner. In the Eagle pegmatite, Mn/(Mn + Fe) values range from approximately 0.25 to 0.95, and Ta/(Ta + Nb) values range from approximately 0.25 to 0.9. CGMs from the central zone appear to have a composition on either end of this range, while the intermediate zone CGMs populate the middle part of this range.

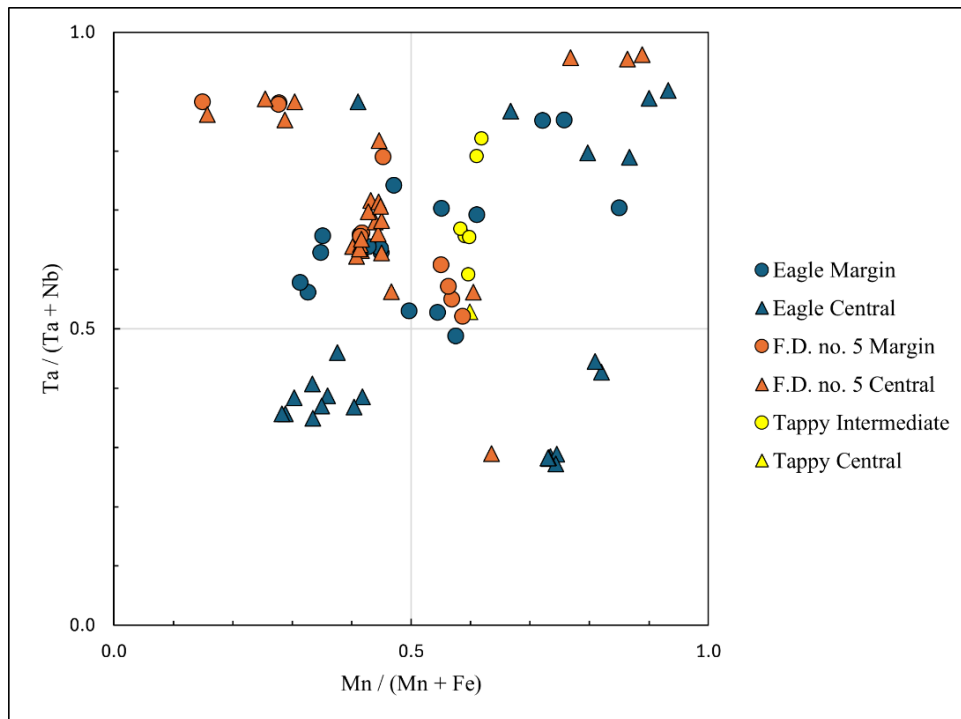


Figure 26: $Ta / (Ta + Nb)$ vs. $Mn / (Mn + Fe)$ for columbite group minerals from the Eagle, F.D. no. 5, and Tappy pegmatites from the different zones of the pegmatites. Fractionation trend goes from least evolved in the lower

Columbite group minerals from the F.D. no. 5 pegmatite were analyzed from two HMS, one from the margin of the pegmatite and the other from the central area of the pegmatite. Mn/(Mn + Fe) values range from approximately 0.15 to 0.90, and Ta/(Ta +

Nb) values from approximately 0.3 to 0.95. CGMs from the Tappy pegmatite were analyzed from 2 polished thin sections, from the intermediate and the central zones of the pegmatite. $Mn/(Mn + Fe)$ values show all the data points centered around 0.6. Note that the one analyzed CGM crystal from the central zone at Tappy has the same $Mn/(Mn + Fe)$ value as all others taken from the intermediate zone. $Ta/(Ta + Nb)$ values range from 0.5 to 0.8.

3.3.1.3.2 Additional Trace Element Analysis

Figure 27 is a compilation of three graphs showing trace element data from CGMs collected from the studied pegmatites. Figures 27A and B further illustrate the variables shown in Figure 27, with Nb, Ta, Mn and Fe compared in bivariate graphs. Figure 27C shows Zr and Hf trace element data from CGMs that represent the chemical relationship between the dykes as Zr and Hf are both incompatible elements.

In Figure 27A, the data points for the Eagle pegmatite show a higher enrichment in Nb compared to the results from the F.D. no. 5 or Tappy, with the lower range of values being similar to the other dykes, but with the maximum Nb concentrations being almost 50% higher. Figure 27B illustrates the very tight grouping of data points in regard to Mn and Fe from the Tappy relative to the other dykes. The fixed Mn/Fe ratio observed in CGMs from Tappy (Figure 26) is unique to that pegmatite and was not observed at Eagle or F.D. no. 5. Figure 27C shows the spread of Zr and Hf concentrations in CGMs. A few points from the Eagle pegmatite and one from the F.D. no. 5 have much higher maximum values for both.

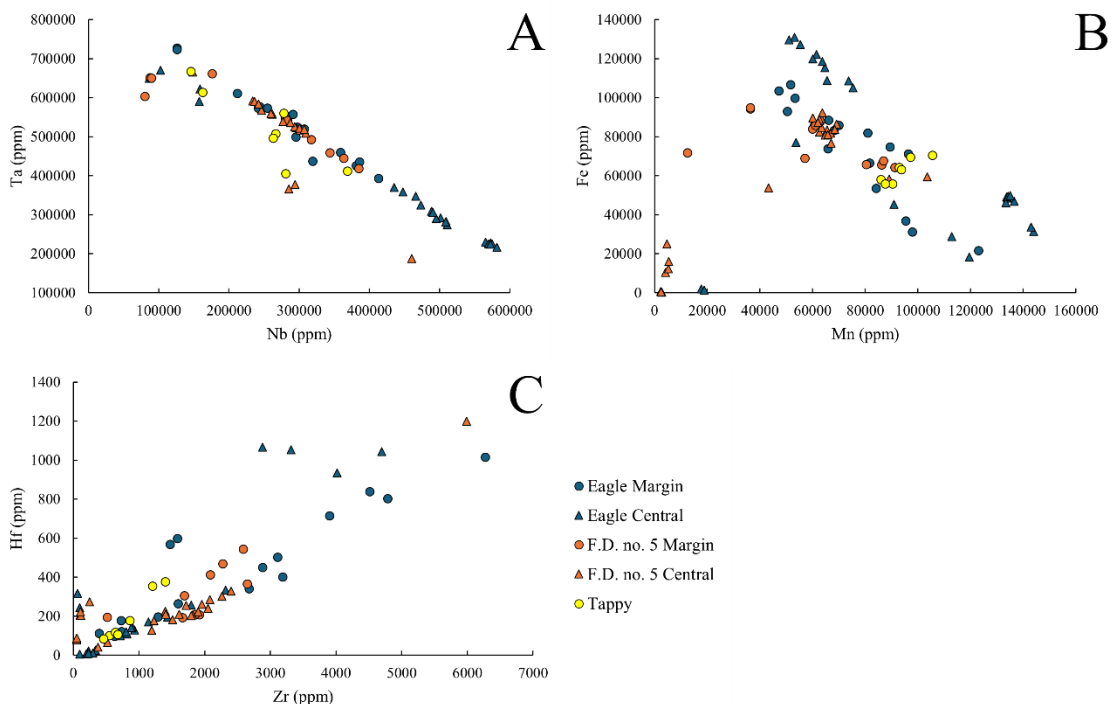


Figure 27 Trace element data obtained from columbite group minerals from the Eagle F.D. no. 5 and Tappy pegmatites. A) Nb vs Ta; B) Mn vs Fe; C) Zr vs Hf

3.3.1.3.3 Rare Earth Element Analyses

Figure 28 shows chondrite-normalized (chondrite values from McDonough & Sun, 1995) rare earth element (REE) profiles for CGM from the Eagle, F.D. no. 5, and Tappy pegmatites. In Figure 18A-D, the REE profiles do not seem to vary considerably between the marginal and central areas of the individual pegmatites. However, the profiles differ when compared between the studied pegmatites. The REE profiles from Eagle, apart from two anomalously LREE-rich (La, Ce, Pr, Nd) profiles in Figure 28B, are most rich in MREEs (Gd, Tb, Dy, Y) with slightly lower concentrations of HREEs (Er, Tm, Yb, Lu), while the profiles from the F.D. no. 5 have positive slopes with MREEs and HREEs. The profiles from Tappy have relatively constant concentrations of MREE and HREEs.

All profiles, except for five in Figure 28, exhibit negative Eu anomalies, with the Eagle having a significantly more negative anomaly than the F.D. no. 5 pegmatite.

In Graupner et al. (2010), sets of CGM REE data from LCT pegmatites and rare-metal granites were analyzed and classified into five major groups of chondrite-normalized REE profiles: Types 1 - 5. These groupings are based on the shape of REE profiles, the HREE/MREE ratios, and the intensity of Eu anomalies. The CGM REE profiles from different pegmatite fields and bodies can exhibit significant differences in their REE patterns, serving as a diagnostic tool for characterizing the source of CGMs (Graupner et al., 2010).

The Eagle exhibits a Type 2a chondrite-normalized REE pattern in CGMs, with $HREE \leq MREE$ and the presence of a significant, negative Eu anomaly. The Type-2 REE patterns are typical of highly evolved granitic pegmatites with highly fractionated CGMs (Graupner et al., 2010). Other examples of pegmatites with this type of REE profiled CGMs are the Wodgina deposit in the Pilbara Craton, Western Australia (Sweetapple & Collins, 2002) and the Bikita deposit in the Victoria Schist Belt, Zimbabwe (Martin, 1964; Cooper, 1964), both large, evolved spodumene-bearing pegmatites.

The profiles with an overall positive slope from the F.D. no. 5 pegmatite exhibit a Type 1a pattern, characterized by $HREE > MREE$. The Type-1 pattern is found in low-degree evolved granitic pegmatites containing columbite (Fe) or subordinate Fe-rich columbite-(Mn) (Graupner et al., 2010). Other examples of pegmatites listed in Graupner et al., 2010, with this type of Type 1 CGMs are the Longotyugan deposit, Taikeu ore field, Polar Urals, Russia (Vasil'ev et al., 2008, 2009) and Högsbo, Göteborg area, Sweden (Brotzen, 1959; Romer & Smeds, 1996). The suite of high-LREE negative slope

profiles present in Figure 28D does not match any of the listed CGM REE types in Graupner et al. (2010).

The majority of the profiles from the Tappy pegmatite show a Type 2a profile with $\text{HREE} \leq \text{MREE}$. As in Eagle, Type-2 REE patterns are typical of highly evolved granitic pegmatites with highly fractionated CGMs (Graupner et al., 2010).

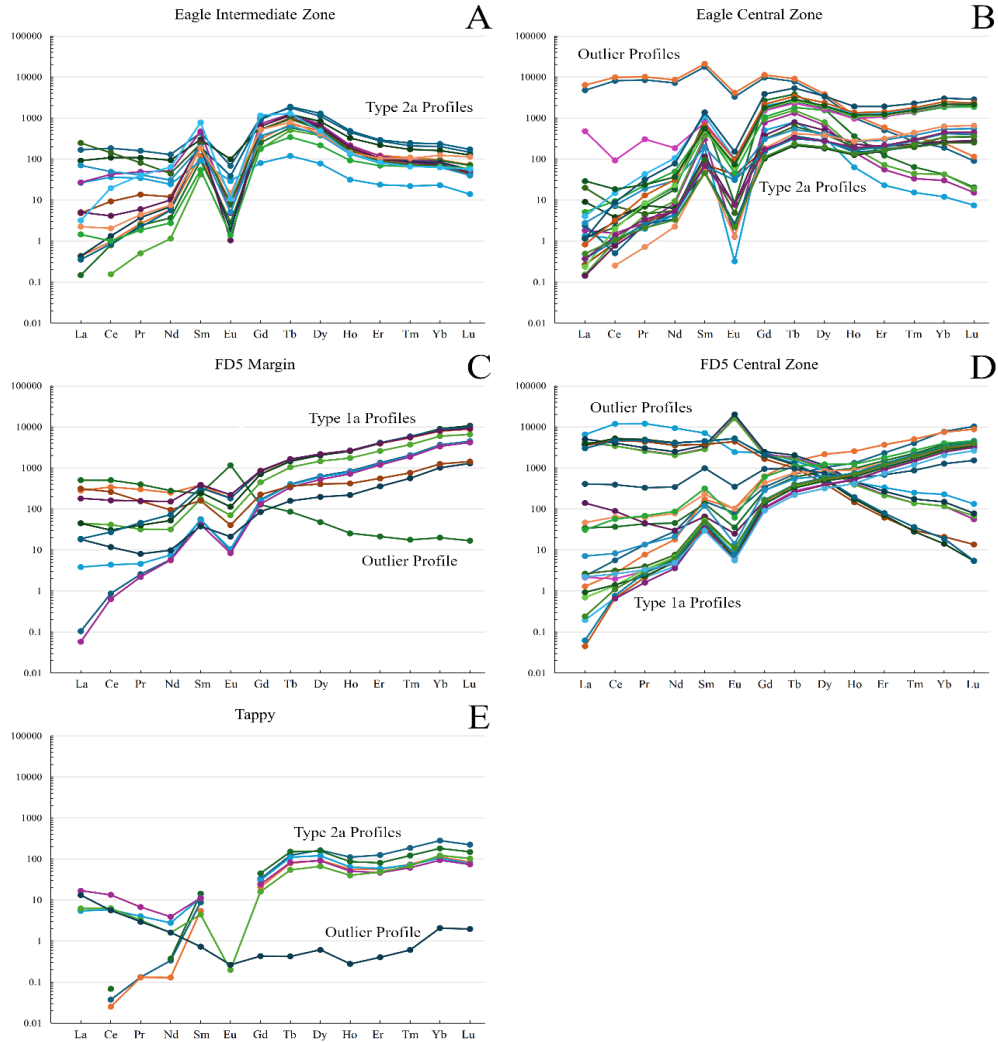


Figure 28: Chondrite-normalized rare earth element profiles for columbite group minerals. A) CGM REE profile from the Eagle pegmatite intermediate zone; B) CGM REE profile from the Eagle pegmatite central zone; C) CGM REE profile from the margin of the F.D. no. 5 pegmatite; D) CGM REE profile from the Eagle pegmatite central zone; E) CGM REE profile from the Tappy pegmatite. The elevated profiles in Figure 28E are from the intermediate zone, while the lower concentration profile is from the central zone. Data is normalized to values from McDonough and Sun (1995).

3.3.1.4 Garnet

3.3.1.4.1 Fractionation Indices

In Figure 29, trace element data for garnet from the Eagle pegmatite and the F.D. no. 5 pegmatite are shown. The trace element data show the definition between LA ICP-MS ablation craters done in the central area of the garnet crystal and craters done on the rims. However, this resolution shows no visible trends between the rims and cores of the analysed garnets.

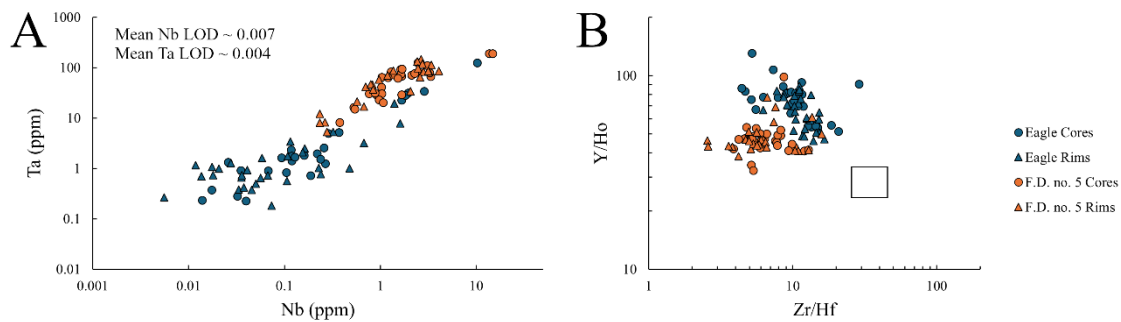


Figure 29: Trace element data for garnet from the Eagle and F.D. no. 5 pegmatites. Figures adapted from Filiberto et al., 2021. A) Nb plotted against Ta in ppm. B) the Zr/Hf ratio plotted against the Y/Ho ratio. The CHARAC field proposed by Bau (1996) is denoted by the rectangle in graph B

Figure 29A shows the relationship between Nb and Ta as a method to track fractionation in garnet. Higher values of both Nb and Ta indicate a more evolved pegmatite (Filiberto et al., 2021). The Eagle and F.D. no. 5 pegmatites show the same fractionation trend, with Nb and Ta increasing. However, the Nb and Ta content in the Eagle pegmatite is generally lower. On average, the F.D. no. 5 pegmatite is much more enriched in Nb and Ta than the Eagle, with only a few Eagle garnets having the same level of Nb and Ta as F.D. no. 5 garnets.

Figure 29B shows the CHARAC field, which is a region of the diagram where trace elements are controlled exclusively by their ionic radius and charge parameters, rather than fluid activity in the melt. According to Bau (1996), the further away the

samples in an evolved magmatic system are from the CHARAC field, the greater the degree of melt fractionation. In Figure 29B, none of the samples from the Eagle pegmatite or the F.D. no. 5 pegmatite fall within the CHARAC field. This is attributed to higher fluid activity in the pegmatite melt, as suggested by Bau (1996). However, the Eagle pegmatite is more enriched relative to the Y/Ho ratio than the F.D. no. 5 pegmatite, causing its data points to be shifted vertically.

Regarding fractionation and the relationship between the Eagle and F.D. no. 5 pegmatites, the data presented above show apparent enrichment of Ta, similar to what was seen in section 3.3.1.3 with CGMs. However, the garnets from F.D. no. 5 show a higher average enrichment in both Ta and Nb compared to garnets from the Eagle, something that is not in line with the overall fractionation trend of the two pegmatites as derived from alkali-feldspar and muscovite.

3.3.1.4.2 Additional Trace Element Analysis

Figure 30 shows trace element data from garnets collected from the Eagle and F.D. no. 5 pegmatites. Due to the trace element data from Eagle and F.D. no. 5, plotting in separate areas on the graphs, this section serves mainly to differentiate between the two adjacent dykes.

Garnets from the Eagle pegmatite tend to be higher in Fe and Zn, with a very large difference in these concentrations between the two pegmatites. The garnet from F.D. no. 5 is notably higher in Li, Mn, Ti, Co, Zr, Hf, Ta, and Y. A complete list of trace element chemistry from both dykes can be found in Appendix III, but the chemical comparisons shown below are some of the most striking. Figures 30 B-H all show a very strongly illustrated separation between the garnets found at the Eagle and the F.D. no. 5

pegmatites. Despite these stark differences in certain trace elements, Figure 30J shows a remarkably similar rare earth element fractionation trend between the two, with the Eagle pegmatite being only slightly more enriched in Y. In Figure 30B, D, and E, the notable Fe enrichment in the garnets from the Eagle compared to those from the F.D. no. 5 is illustrated.

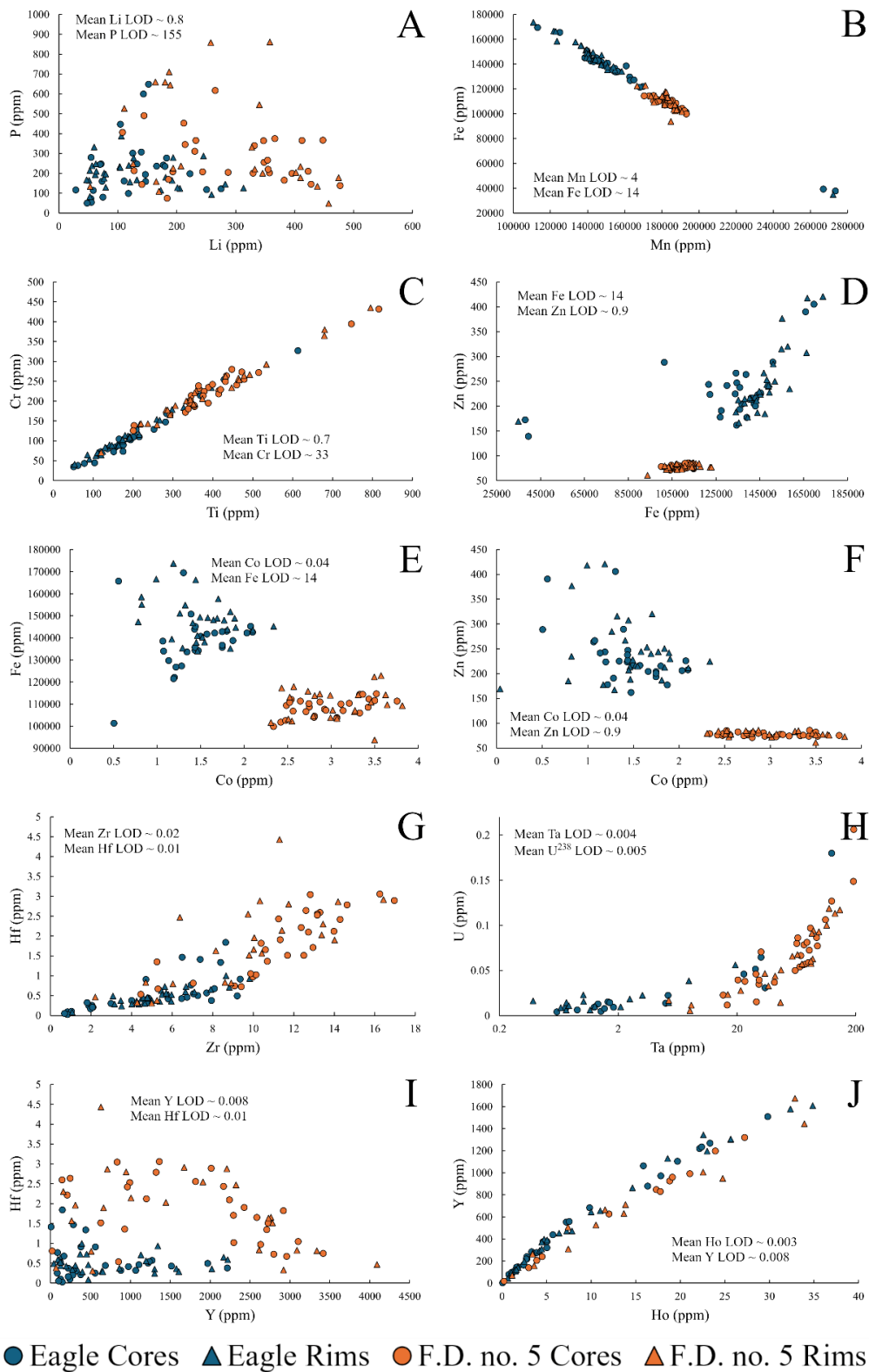


Figure 30: Trace element data for garnets from the Eagle and F.D. no. 5 pegmatites A) Li vs. P; B) Mn vs. Fe; C) Ti vs. Cr; D) Fe vs. Zn; E) Co vs. Fe; F) Co vs. Zn; G) Zr vs. Hf; H) Ta vs. U; I) Y vs. Hf; J) Ho vs. Y

3.3.1.4.3 Rare Earth Element Analyses

Figure 31 below, shows chondrite-normalized REE profiles for garnets from the margins and central zones of the Eagle and F.D. no. 5 pegmatites. There is little difference in the LREEs between the marginal and central zones. Additionally, Eu plots at an almost identical value for the margin and core from each dyke, but Eu is more depleted in the Eagle than in the F.D. no. 5, acting as a way to differentiate the two.

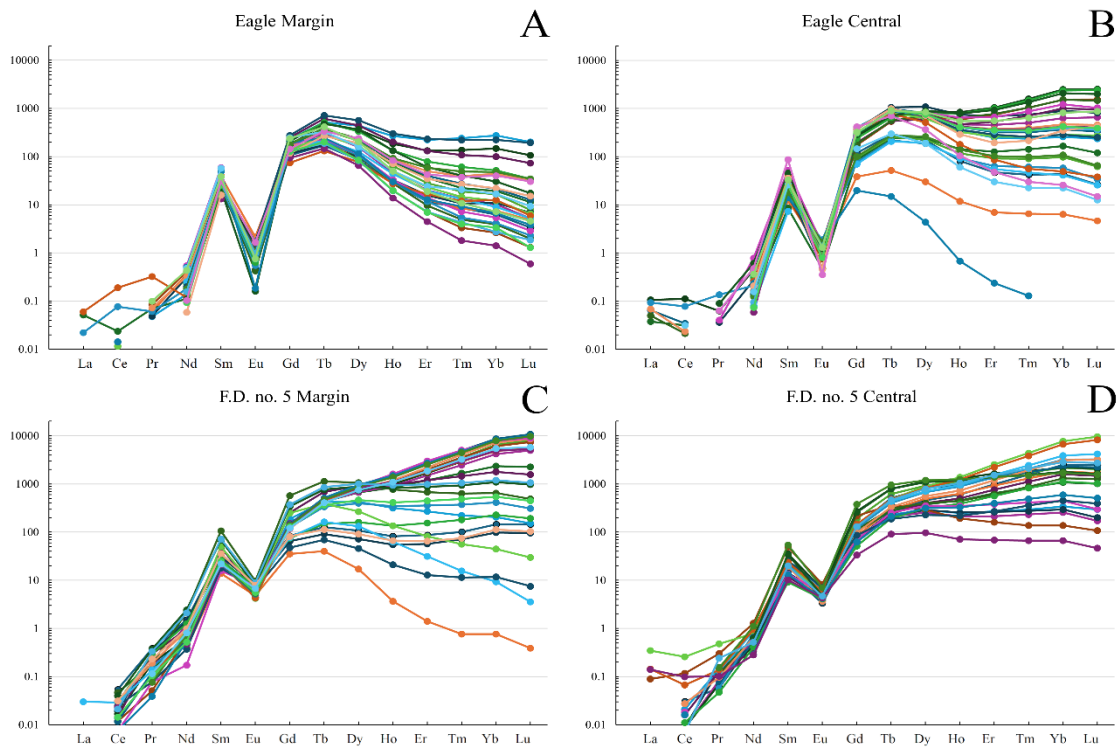


Figure 31: Chondrite-normalized rare earth element profiles for garnets. A) Garnet REE profiles from the rims of Eagle garnets; B) Garnet REE profiles from the cores of Eagle garnets; C) Garnet REE profiles from the rims of F.D. no. 5 garnets; D) Garnet REE profiles from the cores of F.D. no. 5 garnets. Data is normalized to values from McDonough and Sun (1995).

The Eagle and F.D. no. 5 pegmatites exhibit distinct profiles most notably in the HREEs (Tb-Lu). The Eagle pegmatite has a much more negative HREE slope than the F.D. no. 5, despite having similar ranges of Gd and Tb.

Filiberto et al. (2021) stated that differences observed in the Oxford County pegmatite field HREE profiles relate to the fractionation degree of the pegmatite with garnets from the most fractionated pegmatites in their study having a flat or negative HREE slope. Garnets from intermediate pegmatites show both negative and positive slopes, and garnets from barren pegmatites always present positive slopes for HREE (Filiberto et al., 2021). Based on this author's work, a more negative HREE slope equates to a more evolved pegmatite, thus the garnets from the Eagle are more evolved than the F.D. no. 5. However, the margin of the Eagle appears to have more evolved garnets than the central zone based on the steepness of the HREE profile. The F.D. no. 5 pegmatite is largely unzoned, while the Eagle does have distinct intermediate and central zones. The garnets from the marginal intermediate zone at the Eagle show a distinct difference in regard to slope from those of the central zone, reinforcing the distinction between the two zones.

Figure 32 aids in further illustrating the range of HREE values first displayed in Figure 31. Given that Lu has the greatest range of the REEs, comparing the Tb/Lu ratio (HREEs) to trace elements present in the garnets can illustrate the relative conditions in which they formed. The graphs below show that garnets with the most negative HREE slopes (Eagle intermediate zone) have the comparatively lowest concentrations of trace elements like Li and Ta and the highest Tb/Lu ratio which equates to a steeper sloped HREE profile.

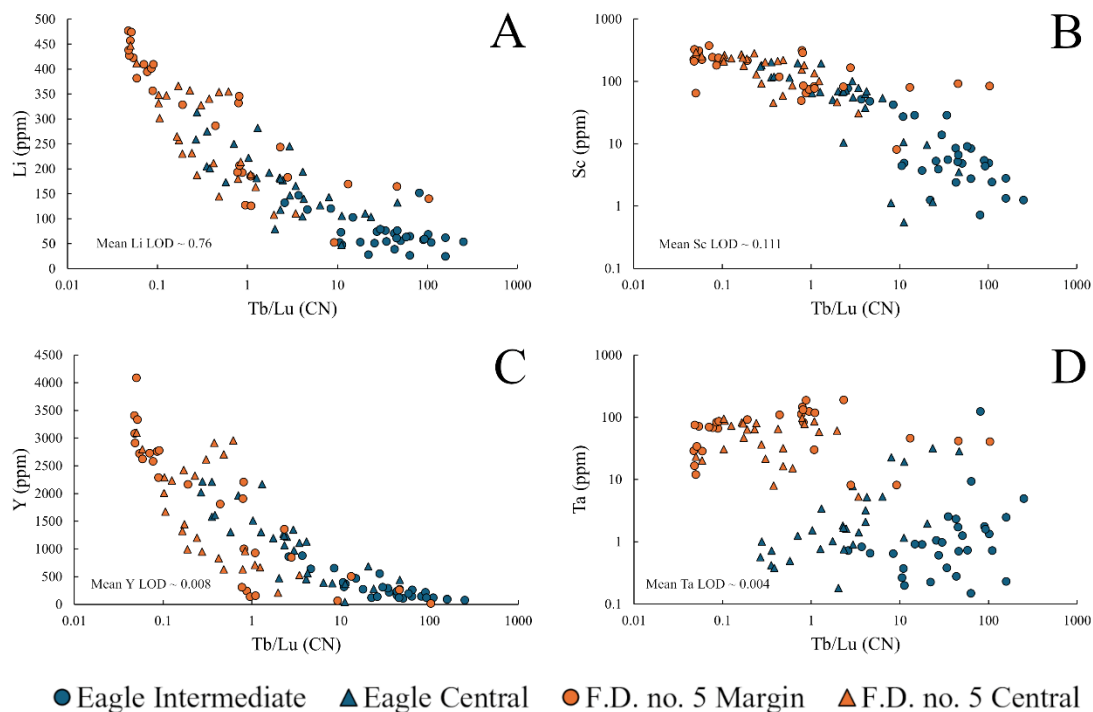


Figure 32: Chondrite-normalized Tb/Lu ratios compared against trace element concentrations for garnet crystals from the intermediate and central zones of the Eagle and F.D. no. 5 pegmatites.

Muller et al. (2012) suggested that average Y and HREE contents in garnet from pegmatite associations decrease with increasing magma fractionation. However, in the Eagle, it appears as if the opposite trend is happening with higher HREE concentrations and a flatter HREE profile in the central zone compared to the intermediate. However, due to the relatively uniform MREE and LREE concentration, this phenomenon may be the result of HREEs being preferentially taken into another mineral phase in the intermediate zone, whose effect does not extend into the central zone, giving an artificially negative slope to the profiles in Figure 31. The samples for this analysis were taken directly adjacent to the host rock, which may have effected the Eagle differently than the F.D. no. 5 in regard to the intermediate zone garnet.

3.4 Discussion - Comparative Mineral Chemistry

3.4.1 Alkali Feldspar Fractionation Indices

Figure 33 shows trace element data for alkali-feldspar from the Eagle, F.D. no. 5, and Tappy pegmatites plotted against Tanco alkali-feldspar data from Brown et al. (2017) and Brown (2001). Based on alkali feldspar data, the Tappy pegmatite is the most evolved of the studied dykes, followed by the Eagle and the F.D. no. 5 pegmatites.

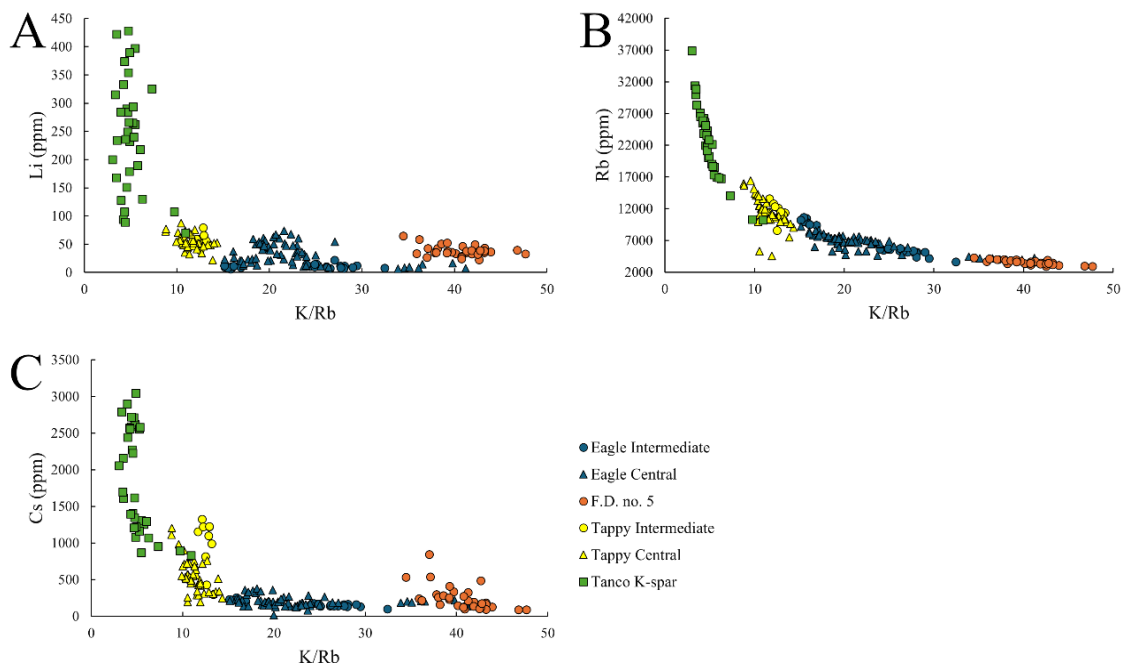


Figure 33: Trace element data for alkali-feldspar from the Eagle, F.D. no. 5, and Tappy pegmatites plotted with data from Tanco from Brown (2001). A) K/Rb ratio plotted against Li; B) K/Rb ratio plotted against Rb; C) K/Rb ratio plotted against Cs. In order of increasing fractionation, points go from the upper left to bottom right.

The data from the Tanco pegmatite shows roughly four times the maximum Li content as at Tappy, and around double that of Rb and Cs. Additionally, the K/Rb ratio in the Tanco data is considerably lower than the pegmatites investigated in this thesis. As lower K/Rb ratios are indicative of more evolved melts (e.g., Černý & Burt, 1984; Černý

et al., 1985), Tanco is much more evolved than the pegmatites in this study. The K/Rb ratio and concentrations of Li, Rb, and Cs in alkali-feldspar do not change from the intermediate to central zones of the Eagle and Tappy, suggesting that fractionation within each individual pegmatite, as recorded in alkali-feldspars during crystallization, was only marginal.

3.4.2 Muscovite Fractionation Indices

Figure 34 shows trace element data for muscovite from the Eagle, F.D. no. 5, and Tappy pegmatites plotted against muscovite data from the Tanco pegmatite (Van Lichtervelde et al., 2007), the Moose II pegmatite (Anderson, 2010), and Dike 1 (Benn et al., 2022). Tappy pegmatite is the most evolved in this study, followed by the Eagle and then the F.D. no. 5 pegmatites. The muscovite data from Tanco and Dike 1 from the Wekusko Lake area (Benn et al., 2022) shows similar concentrations to the Eagle and Tappy pegmatites as well as similar K/Rb ratios. The K/Rb ratio for the F.D. no. 5 pegmatite is more comparable to that of the Moose II pegmatite from the Slave craton (Anderson, 2010).

The K/Rb ratio in muscovite does not change drastically from the intermediate to central zones of the Eagle and Tappy, suggesting that K and Rb-based fractionation of the pegmatites during crystallization was only marginal. However, Li and Cs vary considerably in the Eagle and F.D. no. 5 and marginally in the Tappy. In the Eagle especially, Cs concentrations are highly enriched in the intermediate zone compared to the central zone. The high concentrations of Cs in micas observed in the intermediate zone may then be the result of processes other than fractional crystallization.

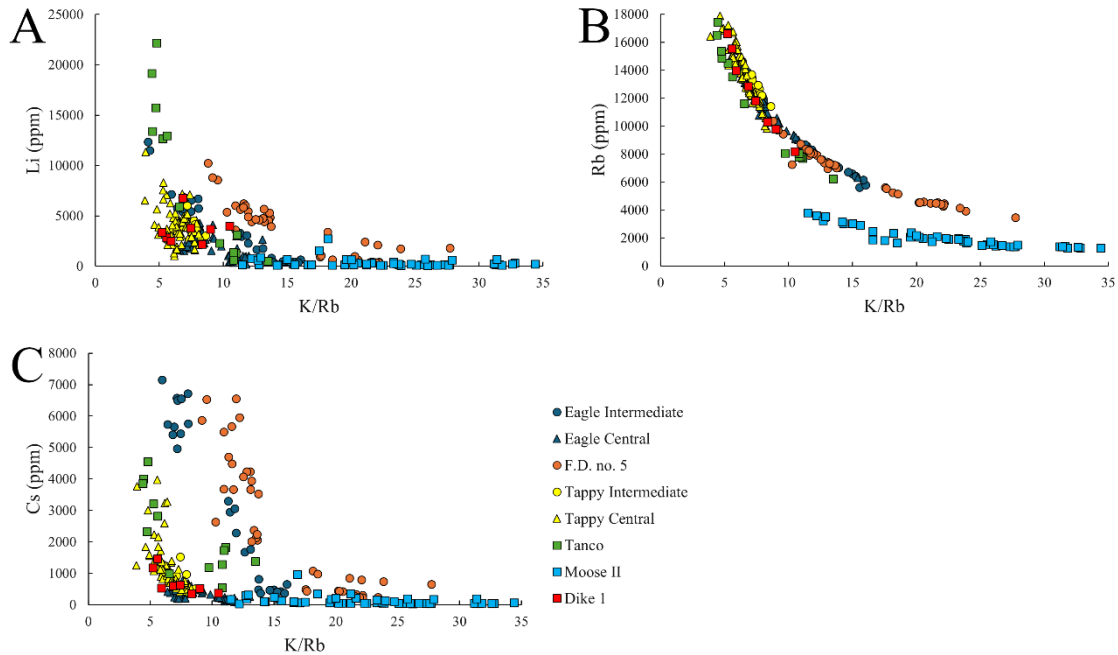


Figure 34: Trace element data for muscovite from the Eagle, F.D. no. 5, and Tappy pegmatites plotted with data from Tanco pegmatite (Van Lichtenvelde et al., 2007), the Moose II pegmatite (Anderson, 2010), and Dike 1 (Benn et al., 2022). A) K/Rb ratio plotted against Li; B) K/Rb ratio plotted against Rb; C) K/Rb ratio plotted against Cs. In order of increasing fractionation, points go from the upper left to the bottom right.

This phenomenon is similar to what is described in Benn et al. (2022), from the Wekusko Lake Pegmatites in northern Manitoba. They suggest that anomalously high Cs concentrations in white micas may be the result of boundary layers forming in front of zones of crystal growth. If Cs-free minerals, such as quartz crystallize in the growth front, the K/Cs ratio will remain constant, but the Cs content of the boundary layer will increase (London, 2022). Any petrographic evidence of this may have subsequently been erased as the majority of the phenocrysts in the dyke were recrystallized and made to appear more homogenous. Additionally, secondary mica crystals may have been mistaken for primary due to the same homogenization of crystal boundaries. Interestingly, a similar trend was seen in the REE profiles from the Eagle garnets, with more evolved profiles from the margin than from the central zone of the pegmatite.

3.4.3 Columbite Group Mineral Fractionation Indices

Representative $Mn/(Mn + Fe)$ and $Ta/(Ta + Nb)$ values from pegmatites throughout the Sebago granite–pegmatite system (Wise & Brown, 2010) and the Tanco Lower body (Van Lichtenvelde et al., 2007) are shown in the figure below. The compositions from the Sebago system range from predominantly columbite-(Fe) and columbite-(Mn) with narrow ranges of Nb–Ta substitution to subordinate tantalite-(Mn) with limited ranges of Fe–Mn substitution.

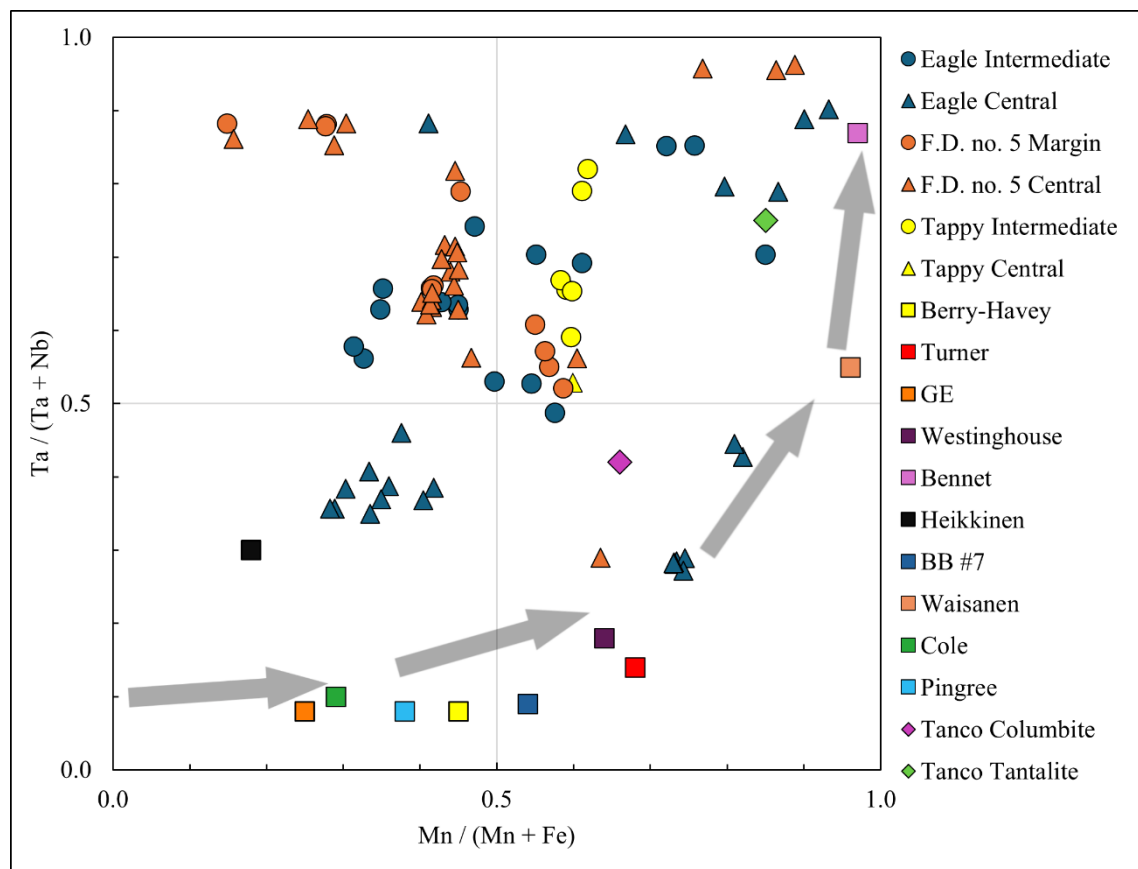


Figure 35: $Ta/(Ta+Nb)$ vs. $Mn/(Mn+Fe)$ for CGMs from the Eagle, F.D. no. 5, and Tappy pegmatites plotted with representative data points from assorted pegmatites from the Sebago granite–pegmatite system in Maine (Wise & Brown, 2010) and idealized average points from the lower Tanco body (van Lichtenvelde et al., 2007). The CGM fractionation trend is illustrated by the grey arrows and progresses from the least evolved in the lower left to the most evolved in the upper right.

This evolution trend is similar to what is observed in the Eagle, F.D. no. 5, and Tappy, with these CGMs likely representing a covariant fractionation trend between the $Mn/(Mn + Fe)$ and $Ta/(Ta + Nb)$ values, ranging from ferrocolumbite to manganotantalite. This comparison shows that the studied CGMs represent a similarly diverse chemical assemblage as those found in the Sebago granite–pegmatite system of south-eastern Maine. Additionally, the data points from the studied pegmatites have similar values to the average points from Tanco. These points align much more closely with the reported values from this study than the Sebago points do, reinforcing the relationship between these systems.

3.4.4 Garnet Fractionation Indices

Figure 36 shows trace element data for garnet from the Eagle pegmatite and the F.D. no. 5 pegmatite compared to data points from Filiberto et al. (2021) from the Oxford County pegmatite field (OCPF) in Maine. The trace element data shows the definition between the cores and rims of the garnet, however, this resolution shows no visible trends between the rims and cores.

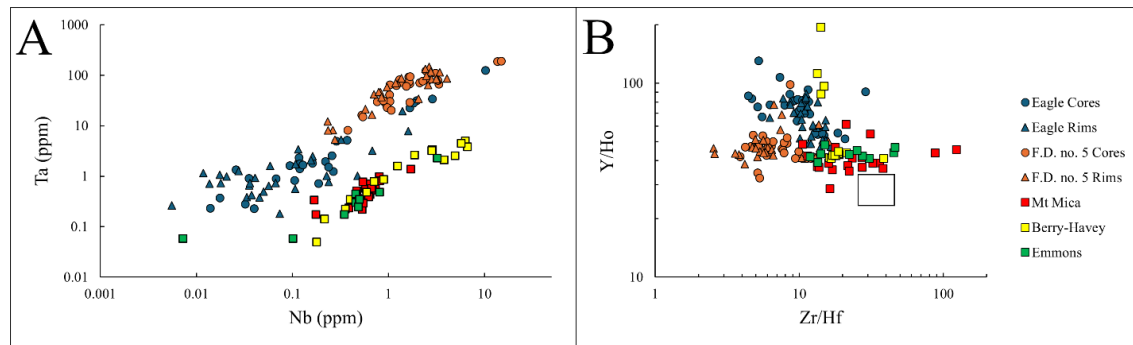


Figure 36: Trace element data for garnet from the Eagle pegmatite compared to that from the Oxford County pegmatite Field in Maine. A) Nb plotted against Ta in ppm; B) the Zr/Hf ratio plotted against the Y/Ho ratio. The CHARAC field proposed by (Bau, 1996) is denoted by a grey rectangle

Figure 36A shows the relationship between Nb and Ta in garnet as a method to track fractionation. Higher values of both Nb and Ta indicate a more evolved pegmatite (Filiberto et al., 2021). When plotted against data from the Oxford County pegmatite field, data points from the Eagle and F.D. no. 5 pegmatites show the same fractionation trend, with Nb and Ta increasing, albeit with an overall higher concentration of Ta. Compared to each other, the F.D. no. 5 pegmatite is much more enriched in Nb and Ta in garnet than the Eagle is on average, which is the inverse of the other fractionation indices listed. Magmatic fractionation and hydrothermal alteration are the two main processes responsible for the enrichment of Nb and Ta in granites and pegmatites (Černý et al., 2005; van Lichtenvelde et al., 2018). Due to the aforementioned differences between the Eagle and F.D. no. 5 pegmatites, there may be major differences in their petrogenetic histories that lead to different Nb and Ta contents.

Figure 36B shows the CHARAC field, denoted by a grey rectangle. If any data points from the Eagle or F.D. no. 5 plot within this area, then they may represent garnet that crystallized from a flux-poor melt. None of the samples from the Eagle pegmatite or the F.D. no. 5 pegmatite fall within the CHARAC field. This is attributed to higher fluid activity in the pegmatite melt, as suggested by Bau (1996).

3.5 Conclusions

Based on alkali-feldspar and muscovite trace element data, it is clear that the Eagle, F.D. no. 5, and Tappy pegmatites all have trace element concentrations that place them within the range of evolved pegmatites for alkali-feldspar and muscovite from Selway et al. (2005). However, the level of evolution is different in each dyke. The Tappy pegmatite has the highest trace element concentrations and lowest K/Rb ratio and falls within the

range of spodumene subtype pegmatites (Table 1; Selway et al., 2005). The Tappy is the most chemically evolved pegmatite in this study followed by the Eagle and F.D. no. 5 (Selway et al., 2005). In alkali-feldspar, the Tanco K/Rb ratio is considerably lower than the pegmatites investigated in this thesis. However, the muscovite K/Rb ratio from Tanco overlaps with the Tappy. The Tappy pegmatite has comparatively high P content in alkali-feldspar as phosphates, such as apatite and graftonite, were commonly observed in PTS.

One of the guiding questions posited at the beginning of this thesis was whether the Eagle and F.D. no. 5 pegmatites represented parts of the same pegmatite body with the central area obscured by cover. Differing mineralogical assemblages shown in Chapter 2 support the idea that the Eagle and F.D. no. 5 pegmatites are separate, unique bodies. The trace element data from the Eagle is consistently within the “spodumene-subtype pegmatite” range detailed in Selway et al. (2005), while data from the F.D. no. 5 is within the “beryl-type pegmatite” range.

The fractionation data from each dyke shows no overlap between the K/Rb ratios from the Eagle and F.D. no. 5 from alkali-feldspar and an intermediate level of overlap for the same comparison done in micas. For the other bivariate mineral alkali-feldspar and muscovite chemistry plots shown above, the Eagle and F.D. no. 5 demonstrate a relatively weak relationship with each other. However, the Eagle, F.D. no. 5, and Tappy pegmatites all appear to be a part of the same fractionation trend as their data points form a continuous line of evolution in the graphs for alkali-feldspar and muscovite. Tanco is part of the Winnipeg River pegmatite field and has had a similar history to that of the Tappy pegmatite despite its more evolved signature compared to the Tappy.

Regarding the relation between the Eagle and F.D. no. 5, the alkali-feldspar K/Rb ratio from the F.D. no. 5 falls between 34 – 47 while the reported K/Rb ratio from Černý et al. (1981) for the Beryl-Tourmaline (BET) group pegmatites is 35 ± 2.6 . The non-overlapping K/Rb ratios and trace elements shown above indicate that the F.D. no. 5 may be a member of the BET group, and is just spatially related to the Eagle dyke within the Eagle-Irgon group.

As described above, the higher Mn and Ta relative to Fe and Nb in CGMs indicate a higher level of fractionation for the pegmatite melt. The Eagle and F.D. no. 5 pegmatites have a wide range of these values, plotting across the CGM diagram. Meanwhile, the Tappy has very tight Mn/(Mn+Fe) values with variable Ta and Nb values. This may be the result of a comparatively small sample size from Tappy as HMS were not done at that occurrence, but it serves as a marked difference between the chemical signatures of the of the observed dykes.

The REE profiles of the CGM crystals also showed variation between the pegmatites, allowing for fractionation to be assessed. Based on the groupings of CGM REE profiles in Graupner et al. (2010), the Tappy and Eagle had profiles that are typical of highly evolved granitic pegmatites, while the REE pattern of CGMs from the F.D. no. 5 is found in granitic pegmatites with low degrees of evolution. The differences in REE profiles between the three pegmatites are another set of data that reinforce the F.D. no. 5 being less fractionated than the other two in this study. The suite of high LREE, negatively sloping profiles present in Figure 28D do not match any of the listed CGM REE types in Graupner et al. (2010) and could instead be due to inclusions in the CGMs that are preferentially enriched in LREEs such as monazite.

Garnets from the Eagle and F.D. no. 5 pegmatites exhibit a high level of geochemical differences, with F.D. no. 5 being more enriched in Ta than the majority of the analyzed points from the Eagle. Other plots presented above in Figure 30 show high levels of separation between the composition of the pegmatites regarding Fe, Zn, and Co. From the trace element comparison graphs, it is quite apparent that the Eagle and F.D. no. 5 pegmatites are separate bodies, garnet REE profiles also reinforce the previous assertion of the Eagle pegmatite being more fractionated than the F.D. no. 5 as observed by Filiberto et al. (2021) for the Oxford Country pegmatite field in Maine.

Chapter 4 – U-Pb Geochronology

4.1 Introduction

U-Pb geochronology was done on four mineral species in this study: CGMs, monazite, apatite, and zircon. Heavy Mineral Separates (HMS) were made for the Eagle and F.D. no. 5 pegmatites, aiding in the recovery of all the previously listed mineral species. In addition to analyses conducted on the HMS, *in situ* analyses of CGMs from each dyke were also done beforehand. All geochronological data in this study was plotted using the IsoplotR online software.

Columbite group minerals are well suited to pegmatite geochronology as they are common in evolved pegmatites and preferentially accommodate uranium while excluding Pb (Romer and Wright, 1992). Thus, CGMs do not commonly have high concentrations of common-Pb (Pb^{204}). With CGMs being the result of magmatic crystallization within the pegmatitic melt, they do not carry inherited xenocrystic domains the way the other minerals such as zircon or monazite can (Parrish, 1990; Romer and Wright, 1992). Additionally, with CGMs being one of the only oxide minerals within the studied pegmatites, they are very easily identified and relatively common.

Monazite is a light rare earth phosphate that occurs as an accessory mineral in a wide variety of rocks, including granites and pegmatites making it well suited to the study of pegmatitic systems. It is particularly useful in dating granitic rocks where zircon inheritance may preclude a precise U–Pb crystallization age (Parrish, 1990). Although monazite can sometimes have inherited domains, the monazite crystals from the studied dykes do not, and appear to be relatively uniform.

Apatite is a common accessory mineral in many geologic settings and has proven useful in the past for dating pegmatites (Krogstad & Walker, 1994). However, low U and radiogenic Pb concentrations, coupled with elevated common Pb can create challenges during dating by LA ICP-MS (Chew et al., 2011). When combined with apatite's comparatively low thermal closure temperature, it can be difficult to date as it may often record later thermal events and not retain U-Pb domains within the crystal that are indicative of pegmatite crystallization (Chew and Spikings, 2015).

Zircon is perhaps the most ubiquitous mineral when it comes to U-Pb geochronology as its high closure temperature (Lee et al., 1997) and robust nature allows for it to be relatively unaffected by later metamorphic events or weathering. Zircon has been used to date pegmatites (Van Lichtenvelde et al., 2017) and is a robust geochronometer. However, high-U zircon often found in pegmatites can become metamict as the U decays. Zircon's strengths can also be detrimental when dating pegmatites as certain crystals can be largely comprised of inherited domains that will show erroneously old ages. This can aid in the determination of pegmatite sources as ages may reflect the rock from which the pegmatite was derived, but may not be fully indicative of the pegmatite itself.

4.2 Methods

4.2.1 Laser Ablation Inductively Coupled Plasma-Mass Spectrometry (LA ICP-MS)

In situ trace element analyses of individual mineral grains were done at the Micro-Analysis of Natural Trace-Element and Isotope Systematics (MANTIS) Lab at the University of New Brunswick using an Agilent 8900 tandem ICP-MS and an Applied Spectra Inc RESolution™ 193nm M-50 laser ablation system. Data reduction was

performed using IoliteTM software, as described in Paton et al. (2011). The gas flow rates for all analyses were 900 mL of Ar per minute, 300 mL of He per minute, and 2 mL of N₂ per minute. The ablation time varied between 25 sec (CGM) to 30 sec (monazite), with a 25-second background period.

Laser ablation U-Pb geochronology on CGMs was performed using a beam diameter of 36-48 μm , a repetition rate of 2 Hz, and an energy of 2 J/cm². The in-house CGM standards Kragero Norway (1080 ± 5 Ma) and IPE Brazil (483 ± 3 Ma) were used for the CGM analyses. Kragero was used as the primary standard while IPE was used as the secondary. The standard BCR-2G was used for semi-quantitative trace-element concentrations.

Monazite analyses were performed using a beam diameter of 14-19 μm , a repetition rate of 2.5-3.5 Hz, and an energy of 3 J/cm². The standards Vermillion Monazite ($^{206}\text{Pb}^*/^{238}\text{U}$ age of 2668.4 ± 2.6 Ma from Mazoz et al., 2024) and monazite A276 (1915 ± 3 Ma from Huhma, 2019) and were used as primary and secondary standards, respectively. Concentrations in monazite were calculated relative to Vermillion monazite assuming a stoichiometric 12.9 wt% P in monazite.

Apatite analyses were performed using a beam diameter of 66 μm and a repetition rate of 5 Hz at an energy of 4 J/cm². Madagascar apatite (485 Ma from Thomson et al., 2012) was used as primary and in-house Phalaborwa apatite (2060 Ma from Heaman and LeCheminant, 1993) use as secondary. Concentrations were calculated relative to NIST610 and assuming a stoichiometric 39 wt% Ca in apatite.

Zircon was analyzed using a beam diameter of 19 μm , a repetition rate of 4 Hz, and an energy of 3 J/cm². The zircon standards GSC1242 ($^{207}\text{Pb}/^{206}\text{Pb}$ age of 2700 Ma

from Davis et al., 2019) and KVT zircon (3221 ± 11 Ma from Kamo and Davis, 1994) were used as primary and secondary standards respectively and NIST610 was used as a concentration standard assuming 48 wt% Zr in zircon.

Dwell times and analyzed isotopes are shown below for each analyzed mineral.

The complete analytical dataset for CGMs, monazite, apatite, and zircons is listed in Appendix III, with uncertainties on the ratios and ages at a 2-standard-error level.

Table 4: Isotopes and dwell times used for U-Pb geochronology on selected minerals in this thesis

CGMs		Monazite		Apatite		Zircon	
Isotope	Seconds	Isotope	Seconds	Isotope	Seconds	Isotope	Seconds
^{44}Ca	0.01	^{31}P	0.01	^{31}P	0.01	^{90}Zr	0.01
^{49}Ti	0.01	^{140}Ce	0.01	^{44}Ca	0.01	^{202}Hg	0.01
^{181}Ta	0.01	^{204}Pb	0.02	^{55}Mn	0.01	^{204}Pb	0.02
^{204}Pb	0.02	^{206}Pb	0.03	^{204}Pb	0.02	^{206}Pb	0.03
^{206}Pb	0.03	^{207}Pb	0.05	^{206}Pb	0.03	^{207}Pb	0.05
^{207}Pb	0.05	^{208}Pb	0.01	^{207}Pb	0.05	^{208}Pb	0.01
^{208}Pb	0.01	^{232}Th	0.01	^{208}Pb	0.01	^{232}Th	0.01
^{232}Th	0.01	^{238}U	0.02	^{232}Th	0.01	^{238}U	0.02
^{238}U	0.02			^{238}U	0.02		

4.2.2 Scanning Electron Microscope (SEM)

Analyses were performed at the UNB Microscopy and Microanalysis Facility on a Thermo Scientific Scios 2 Dualbeam, equipped with an Oxford Ultim Max 170 EDS detector and an Oxford Symmetry EBSD detector controller, using Aztec software.

Analyses on this machine were performed using an accelerating voltage of 15 kV with a

working distance of 7 mm. Samples were carbon-coated using an Edwards 306A carbon coater before observation in the microscope.

4.2.3 Sample Collection and Preparation

Seven channel samples were made into HMS for the Eagle and F.D. no. 5 pegmatites (Appendix I). At the Eagle, one sample each was taken from the meta-TTG host rock, the intermediate zone, and the central zone of the pegmatite, (CM24-15,16, and 17, respectively) all taken adjacent to each other. For the F.D. no. 5, four samples were made into HMS. One each from the pegmatite margin, the central zone of the pegmatite, the meta-TTG host rock at the southern margin of F.D. no. 5 and a meta-sedimentary host rock to the north of the pegmatite (CM24-10, 11, 12, and 13, respectively). The pegmatite samples from the F.D. no. 5 were taken directly adjacent to the southern sample of the host rock.

CGMs analyses were collected from thin sections and HMS at the Eagle and F.D. no. 5 pegmatites, and only from PTS at the Tappy. These polished thin sections were obtained from surface samples and drill cores, with CGMs originating from the intermediate and central zones of the pegmatites. In the thin section, CGMs were identified with a petrographic microscope and a Bruker Tornado μ -XRF. In the HMS, CGM grains were hand-picked and then analyzed with a Bruker Tornado μ -XRF to determine their composition. After positive identification, SEM-BSE images of the grains were taken to characterize their zoning and any inclusions that were present.

Monazite crystals from HMS and the monazite-biotite intergrowth from the host rock at Eagle were collected and analyzed for ages. Zircon and apatite were hand-picked from both heavy fractions and pan concentrates from the HMS taken at the Eagle and

F.D. no. 5 outcrops. Zircon and apatite crystals from the central and intermediate zones were analyzed by LA-ICP-MS. An assortment of picked zircons is shown below in Figure 37. These are indicative of the majority of zircons found in this study as they all had a very similar light purple-brown color with similar amounts of inclusions.

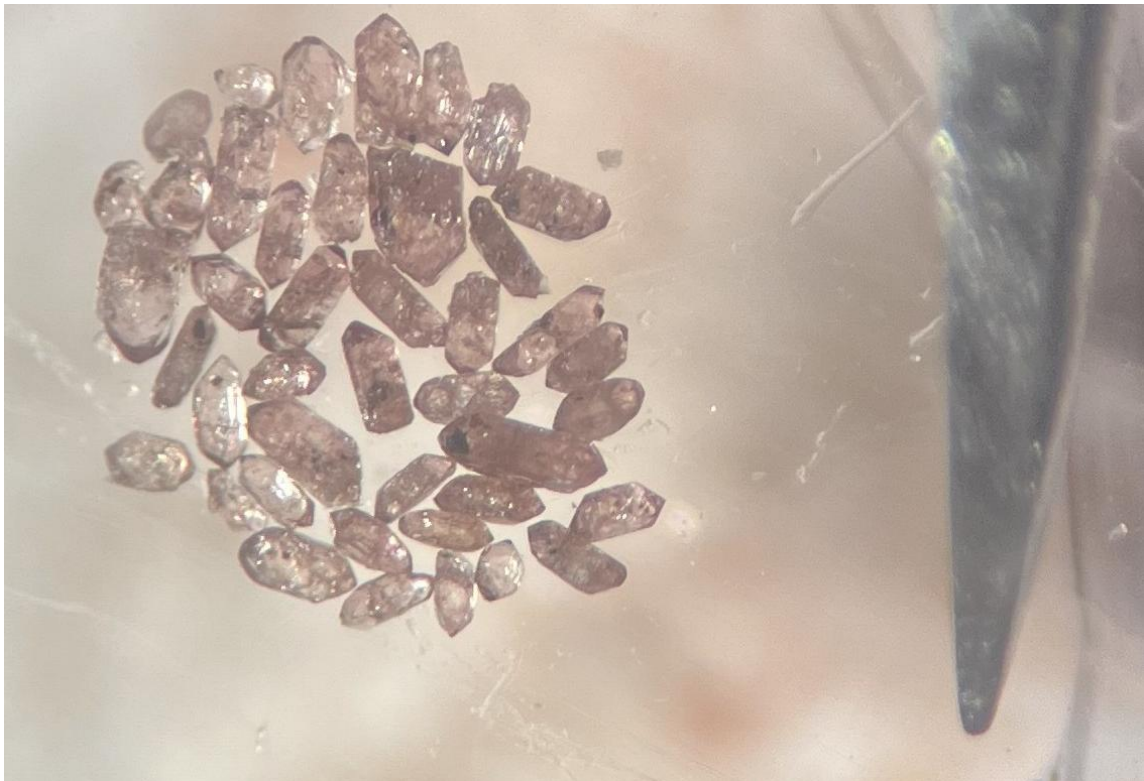


Figure 37: Zircon crystals from the Eagle pegmatite. These are a good representation of the sizes, shapes, colours and inclusions seen in all the analyzed zircons. Note that all zircons appeared similar to these regardless of if they were from the pegmatites or host rocks. End of needle-nose tweezers for scale.

4.3 Results

4.3.1 U-Pb Geochronology of the Eagle Pegmatite

4.3.1.1 Columbite Group Minerals

The CGMs in both the Eagle and F.D. no. 5 have variable levels of internal zoning and inclusions, so detailed SEM-BSE images like the one shown below were done for each before analysis. Domains within each crystal can range from being Ta-dominant (tantalite) to Nb-dominant (columbite). The image below shows a CGM crystal from the Eagle but the CGMs from the F.D. no. 5 and Tappy have similarly variable levels of internal zonation.

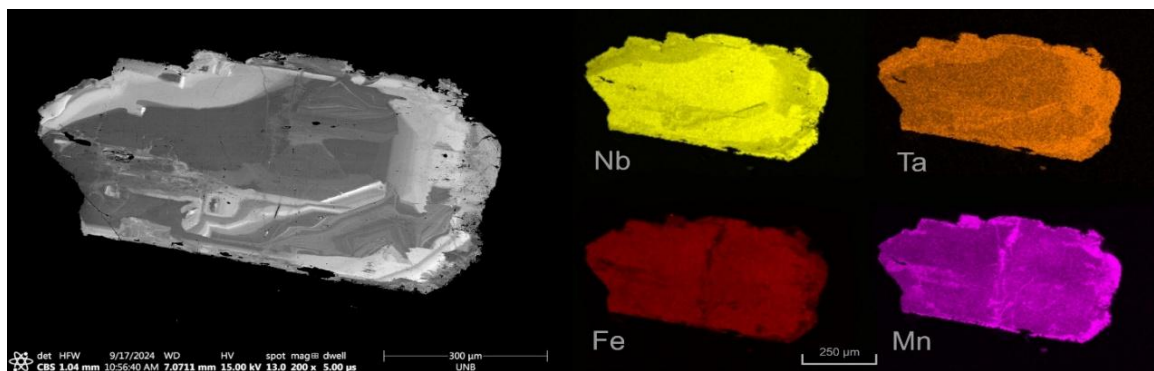


Figure 38: High contrast SEM-BSE image with major-element mapping images of a large CGM crystal from the Eagle dyke. All images in the figure are of the same crystal obtained from HMS.

Columbite-tantalite crystals from the Eagle pegmatite contain a range of uranium concentrations that spans from <100 to >1000 ppm (Appendix IV). In total, 119 LA ICP-MS craters were made, and a subset of 58 data points from both HMS and in situ analyses were utilized for an age determination. Reversely discordant points and points that did not plot on the discordia were omitted for this concordia diagram but are included in Appendix IV. These data points are from both uncorrected and Pb-corrected analyses.

The U–Pb data for the Eagle plot on a discordia line that intersects the concordia with an upper intercept age of 2657 ± 9 Ma and a lower intercept of 215 ± 197 Ma.

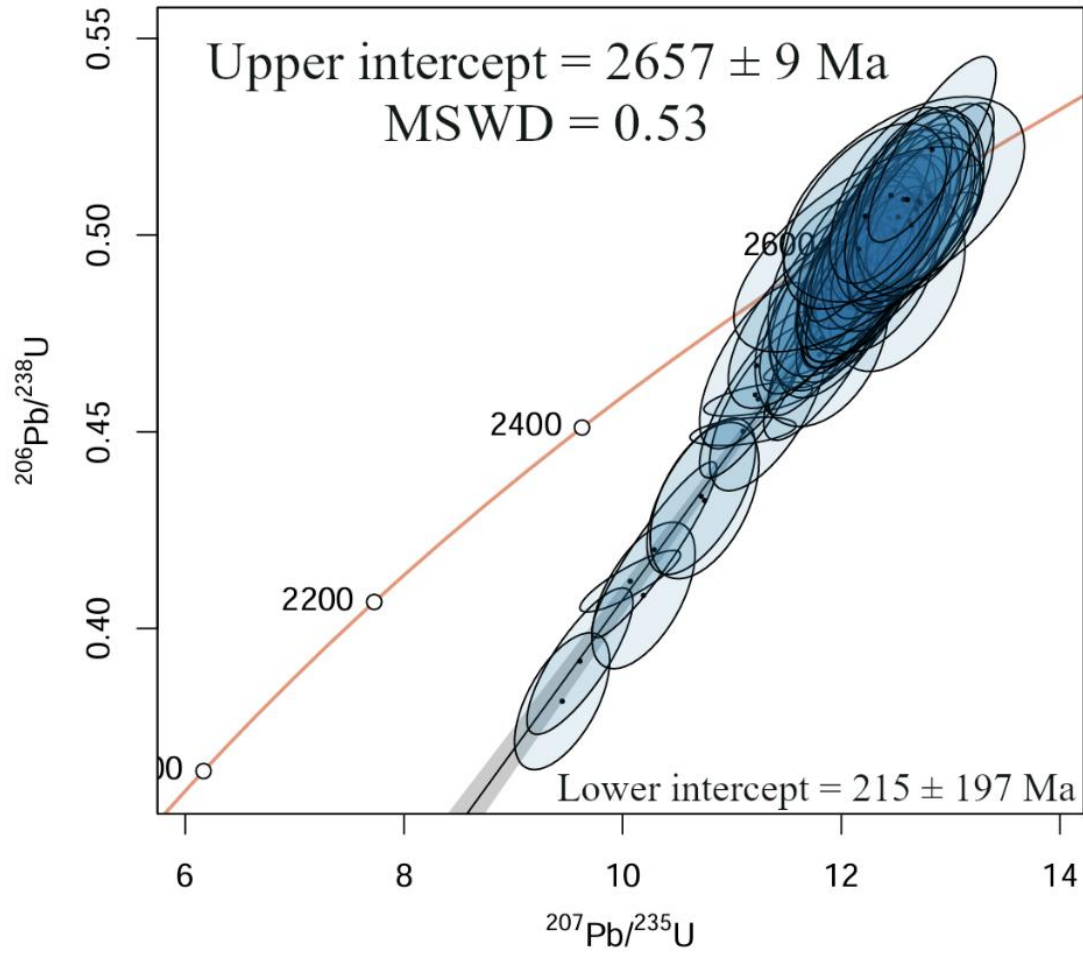


Figure 39: CGM U-Pb concordia diagram for the Eagle pegmatite. The reported age is based on the upper intercept.

4.3.1.2 Monazite

Two distinct types of monazite were recovered at the Eagle: monazite from HMS and monazite found in polished thin section from the host rock adjacent to the Eagle.

Monazite intergrowing with biotite is shown below in thin section. This sample was taken from drillcore in host rock directly adjacent to the Eagle dyke. Here, the monazite appears as small anhedral crystals within a larger biotite crystal. The monazite-biotite intergrowth is less than a centimeter away from the margin of the Eagle pegmatite within the host rock. This texture is thought to be the result of the breakdown of allanite in the presence of volatile-rich fluids (Skrzypek et al., 2017; Gieré & Sorensen, 2004), which exsolve out of the pegmatite as it crystallizes. This metasomatic monazite can be used as a proxy for pegmatite emplacement, as the inferred method of monazite growth directly results from the emplacement and crystallization of the Eagle pegmatite. This assemblage was only seen once despite multiple PTS made in host rock adjacent to the pegmatites.

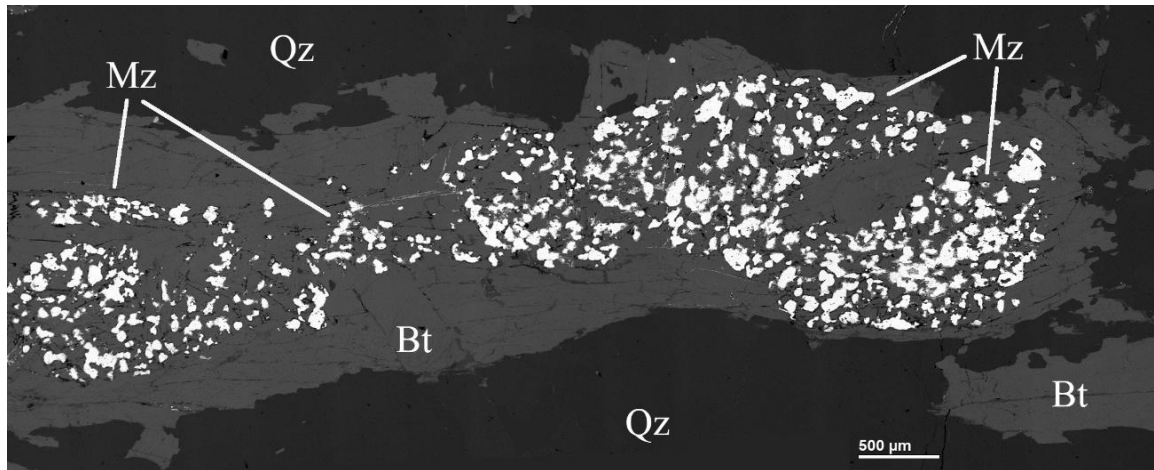


Figure 40: SEM-BSE image of the metasomatic monazite-biotite intergrowth from the margin of the Eagle pegmatite. Sample taken from polished thin section LT-21-09-65.8. Mz – monazite, Qz – Quartz, Bt – Biotite. Abbreviations after Whitney and Evans (2010)

In total, 32 LA ICP-MS craters were made for the HMS monazite and 60 for the biotite-monazite intergrowth. Four U-Pb points were found to be concordant from the HMS monazite, giving an age of 2645 ± 9 Ma. For the metasomatic monazite, 19 points were found to be within $\pm 1\%$ concordance, giving an age of 2647 ± 3 Ma. Both ages are within the margin of error of each other.

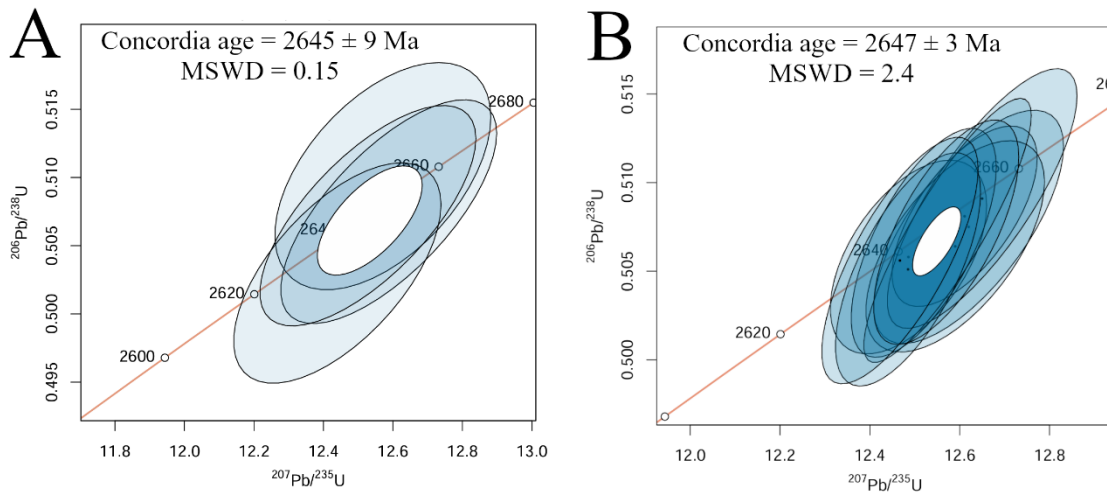


Figure 41: Monazite concordia diagrams from the Eagle pegmatite. Both ages are concordia ages. A) U-Pb concordia diagram for the HMS monazite from the Eagle pegmatite. B) U-Pb concordia for the monazite-biotite intergrowth from Eagle host rock.

4.3.1.3 Apatite

The apatite data for the Eagle pegmatite is shown on a Terra-Wasserburg concordia diagram in Figure 42. Twenty analyses from two samples were made, which display variable Pb^*/Pb^c . A discordia line was defined using a subset of nine of those points. This resulted in a lower intercept age of 2597 ± 40 Ma and a $^{207}Pb/^{206}Pb$ intercept of 1.026 ± 0.012 for the Eagle pegmatite.

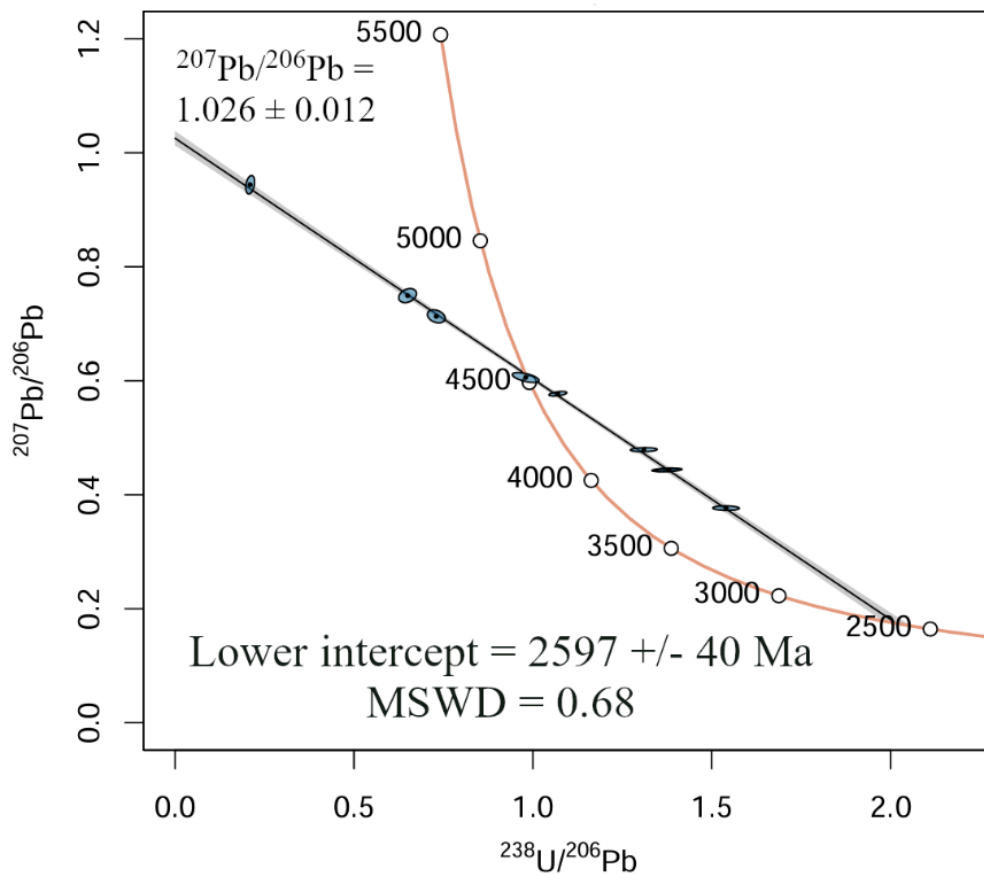


Figure 42: U-Pb Terra-Wasserburg concordia diagram for the HMS apatite from the Eagle pegmatite. Age derived from lower intercept.

4.3.1.4 Zircon

The cleanest, largest and most euhedral zircon crystals from the Eagle and F.D. no. 5 pegmatites were preferentially selected for age analyses. However, in the HMS, many of the crystals are fractured and have irregular to prismatic shapes but these more included crystals were identified under the optical microscope before analysis. Many of the analyzed zircons exhibit clear zonation and/or xenocrystic cores, as illustrated in Figure 43 below.

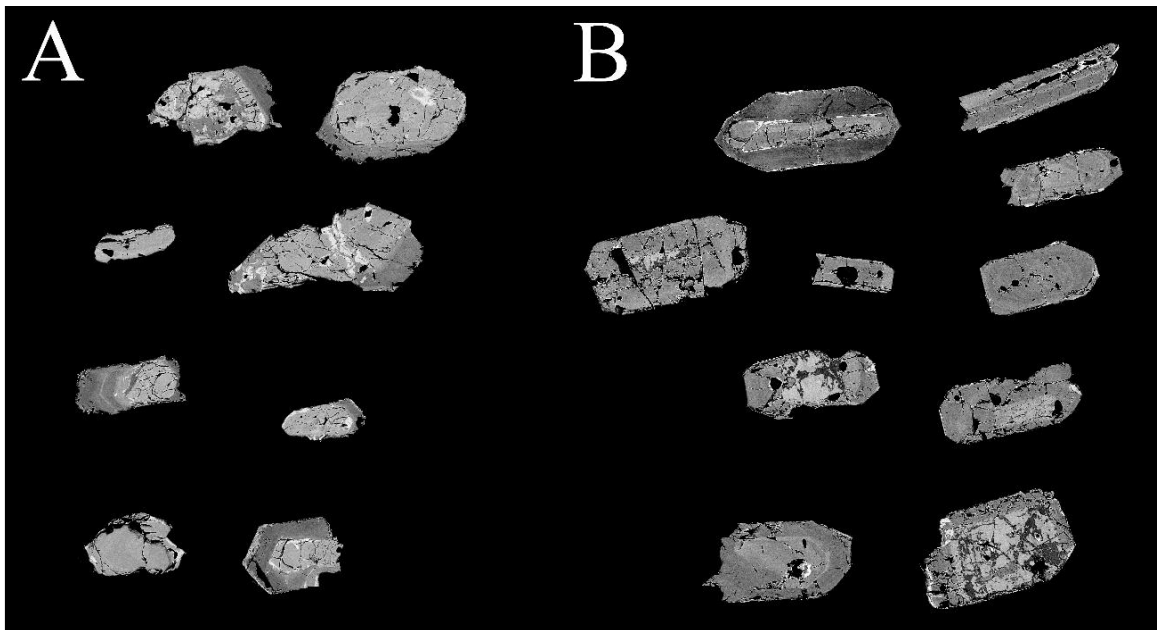


Figure 43: SEM-BSE images of zircons from the F.D. no. 5. A) Sample CM24-10. Zircons from the margin of the F.D. no. 5 pegmatite. B) Sample CM24-13. Zircons from host rock at the northern contact of the F.D. no. 5 pegmatite. The field of view is approximately 4mm.

Zircon was collected from both host rock and pegmatitic fractions of the HMS from the Eagle pegmatite. The zircons are largely elongate prisms, with only a small amount of the analyzed crystals having a comparatively shorter C axis: suggesting crystallization in a less evolved melt. In total, 124 analyses were made with 45 points

from the pegmatitic fraction and 46 from the host rock fraction used to determine ages.

Using these points, the age for the host rock at the Eagle is 2738 ± 5 Ma and 2733 ± 4 Ma for the Eagle pegmatite.

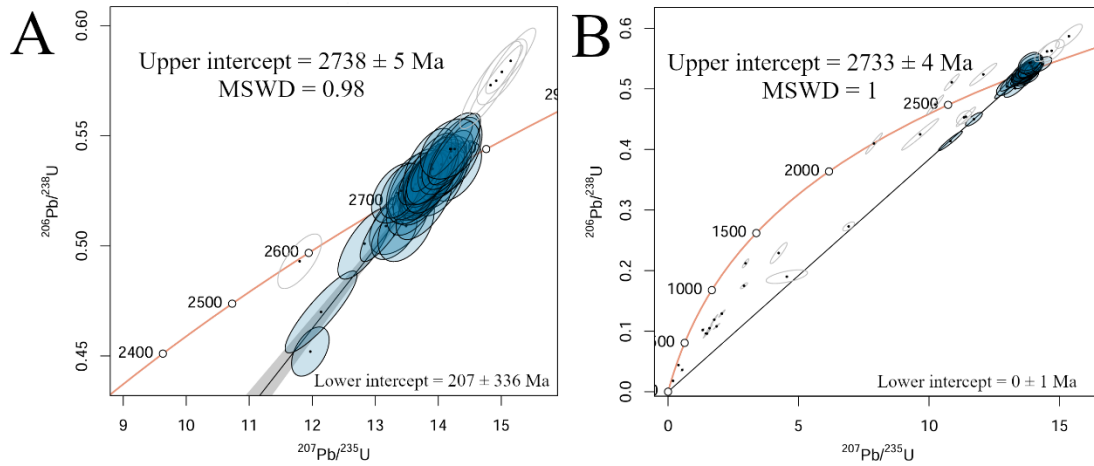


Figure 44: Zircon U-Pb concordia diagrams for the Eagle pegmatite. A) Zircon data from the Meta-TTG host rocks at the Eagle outcrop. B) Zircon data from the Eagle pegmatite. Both ages are concordia ages.

4.3.2 U-Pb Geochronology of the F.D. no. 5 Pegmatite

4.3.2.1 Columbite Group Minerals

Columbite-tantalite crystals from the F.D. no. 5 pegmatite contain variable levels of uranium ranging from <100 to >1000 ppm (Appendix III). In total, 133 LA ICP-MS craters were made on samples from the F.D. no. 5, and a subset of 27 data points from both HMS and *in situ* analyses were utilized for an age determination. These represent a mix of both uncorrected and ^{204}Pb -corrected data. The U-Pb data for the F.D. no. 5 plot on a discordia line that intersects the concordia with an upper intercept age of 2651 ± 9 Ma.

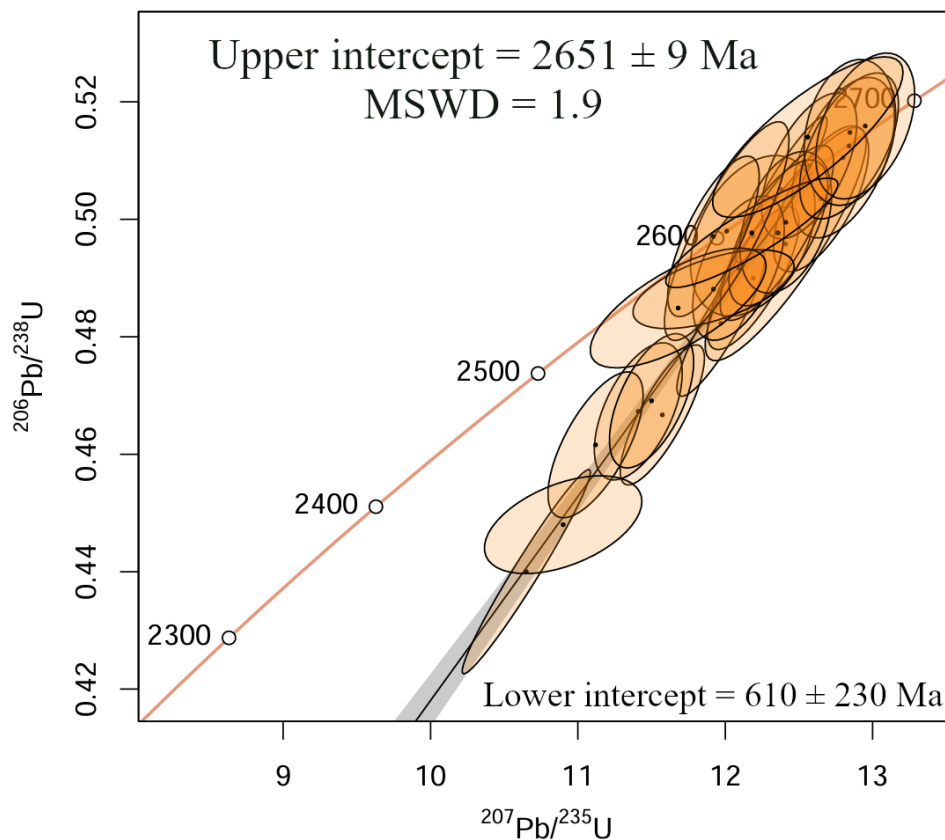


Figure 45: CGM U-Pb concordia diagram for the F.D. no. 5 pegmatite. The reported age is based on the upper intercept.

4.3.2.2 Monazite

U-Pb analyses from F.D. no. 5 monazite obtained from HMS are shown on a conventional concordia diagram in Figure 46 below. In total, 63 LA ICP-MS craters were made, and 18 were found to be within $\pm 1\%$ concordance from the HMS monazite. This gives an age of 2646 ± 4.5 Ma for the F.D. no. 5.

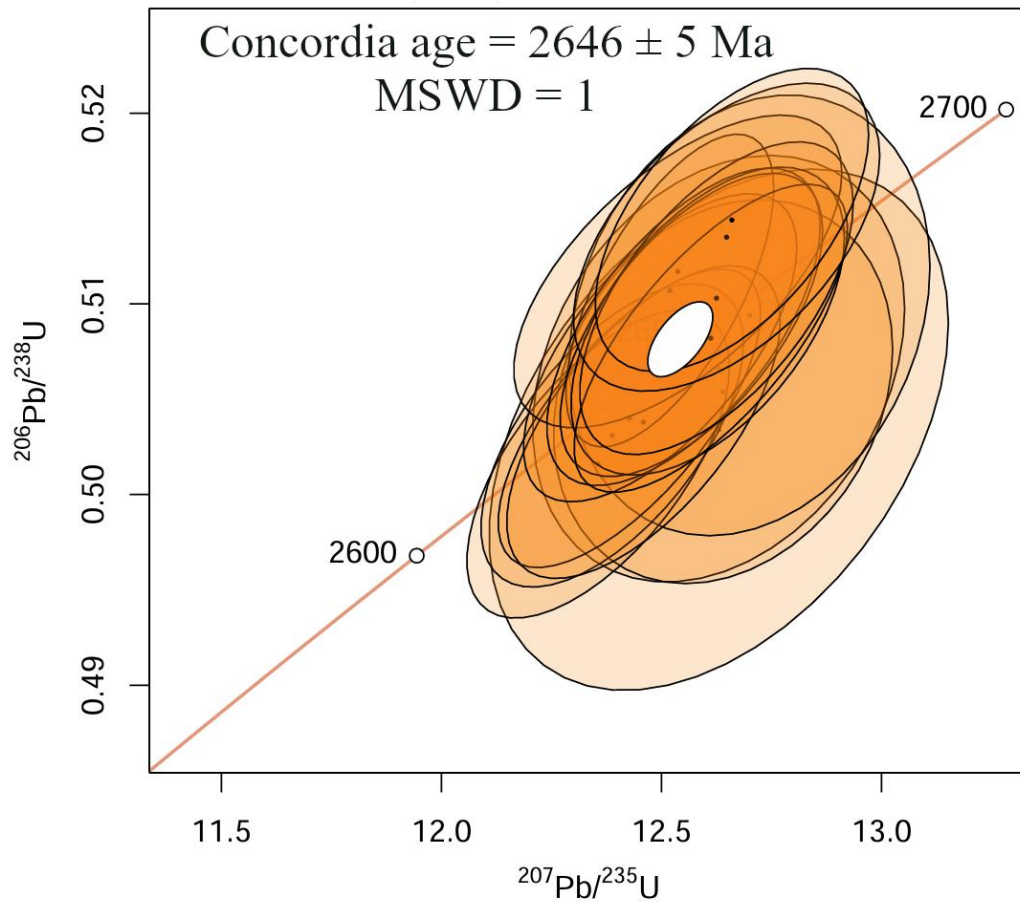


Figure 46: U-Pb concordia diagram for the HMS monazite from the F.D. no. 5 pegmatite.

4.3.2.3 Apatite

The apatite data for the F.D. no. 5 pegmatite is shown on a Terra-Wasserburg concordia diagram in Figure 47. In total, twenty-three analyses were done on apatite crystals from the F.D. no. 5, which displayed variable Pb^*/Pb^c . Nineteen of those points were plotted on a Terra-Wasserburg concordia diagram to form a discordia line. This data regression provided a lower intercept age of 2599 ± 21 Ma and a $^{207}Pb/^{206}Pb$ intercept of 1.056 ± 0.0078 for the F.D. no. 5.

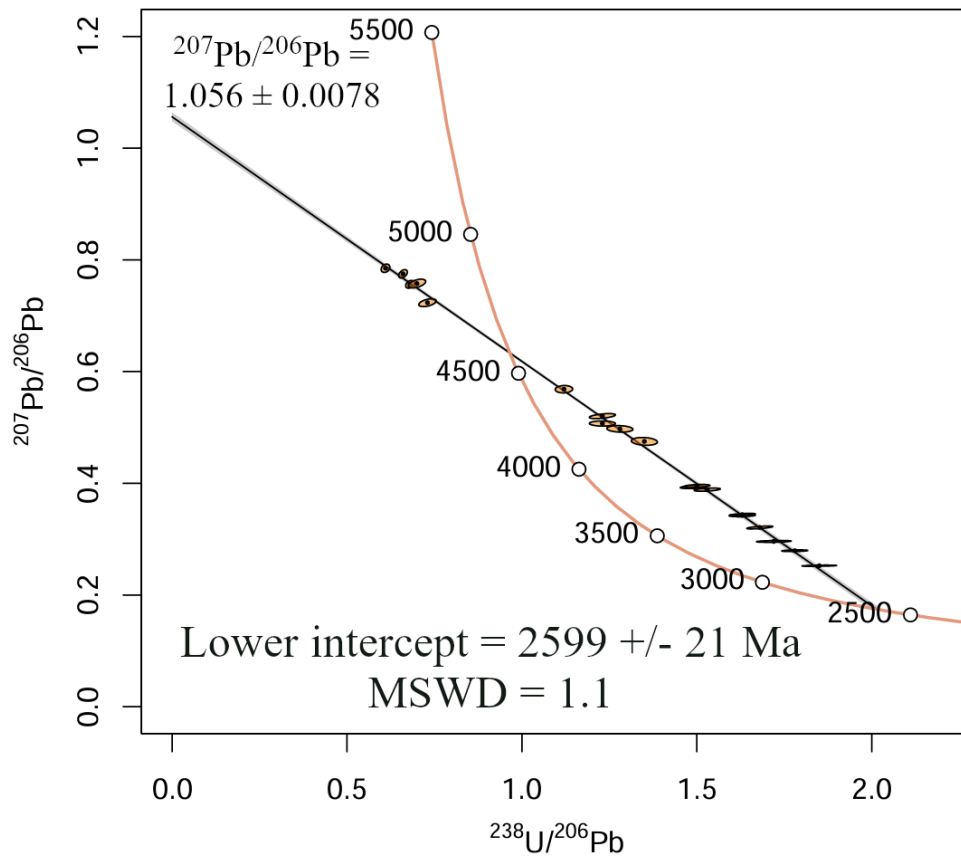


Figure 47: U-Pb Terra-Wasserburg concordia diagram for the HMS apatite from the F.D. no. 5 pegmatite. Age derived from lower intercept.

4.3.2.4 Zircon

Zircon was collected from both host rock and pegmatitic fractions of the HMS from the F.D. no. 5 pegmatite. The host rock samples were taken from the north and the south of the F.D. no. 5 pegmatite exposure. However, they plot at the same age, well within the error of each other. In total, 170 spots were analyzed on the selected zircons. Thirty-one samples were found to be within $\pm 1\%$ concordance for the host rock and six for the pegmatite. The concordant age for the host rock at the F.D. no. 5 is 2737 ± 4 Ma and 2726 ± 9 Ma for the F.D. no. 5 pegmatite. One zircon analysis from the central zone of the dyke plotted at 2657 ± 17 Ma. No other zircon analyses from either the F.D. no. 5 or the Eagle record an age near this. Additionally, due to the centroid on the diagrams being slightly below the concordia line, more recent metamorphic events could have impacted the U-Pb system. Therefore, the average $^{207}\text{Pb}/^{206}\text{Pb}$ ages for the concordant zircons are ~ 2737 Ma for both the pegmatite and host rock fractions. The full range of ages can be seen in Appendix IV.

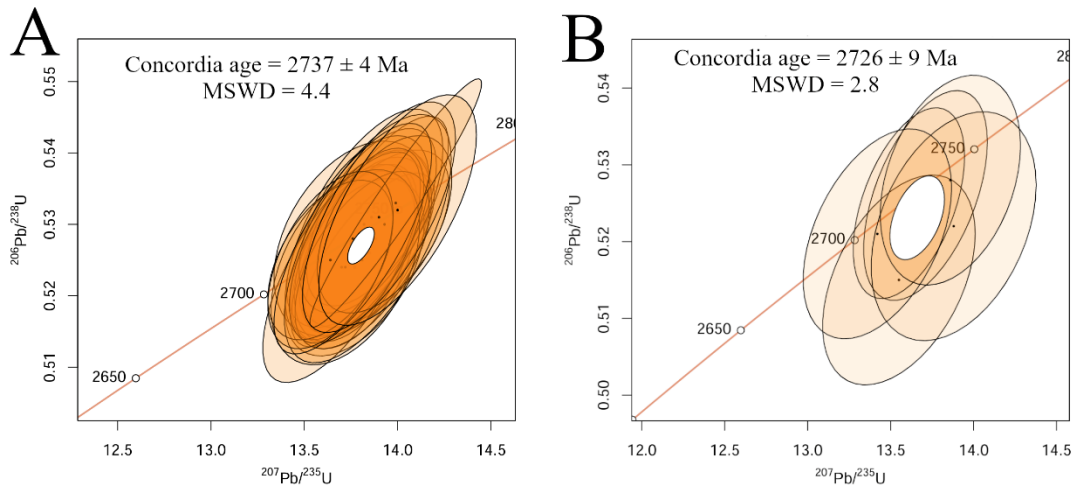


Figure 48: Zircon U-Pb concordia diagrams for the F.D. no. 5 pegmatite. A) Zircon data from the north and south host rocks at the F.D. no. 5 outcrop. Both rock units plot as the same age. B) Zircon data from the F.D. no. 5 pegmatite. Both ages are concordia ages.

4.3.3 U-Pb Geochronology of the Tappy Pegmatite

4.3.3.1 Columbite Group Minerals

Columbite group minerals from the Tappy pegmatite contain variable levels of uranium ranging from ~100 to just over 1000 ppm (Appendix IV). Tappy CGMs have a U/Th ratio that is, on average, double that of the Eagle and F.D. no 5 pegmatites due to higher Th at the Tappy. CGMs from the central and intermediate zones were analyzed by LA ICP-MS. In total, 29 LA ICP-MS craters were made, and a subset of 23 data points were plotted below. These points represent both concordant and discordant analyses and display variable common Pb. U-Pb data for the Eagle plot on a discordia line with an upper intercept age of 2647 ± 10 Ma for the Tappy pegmatite.

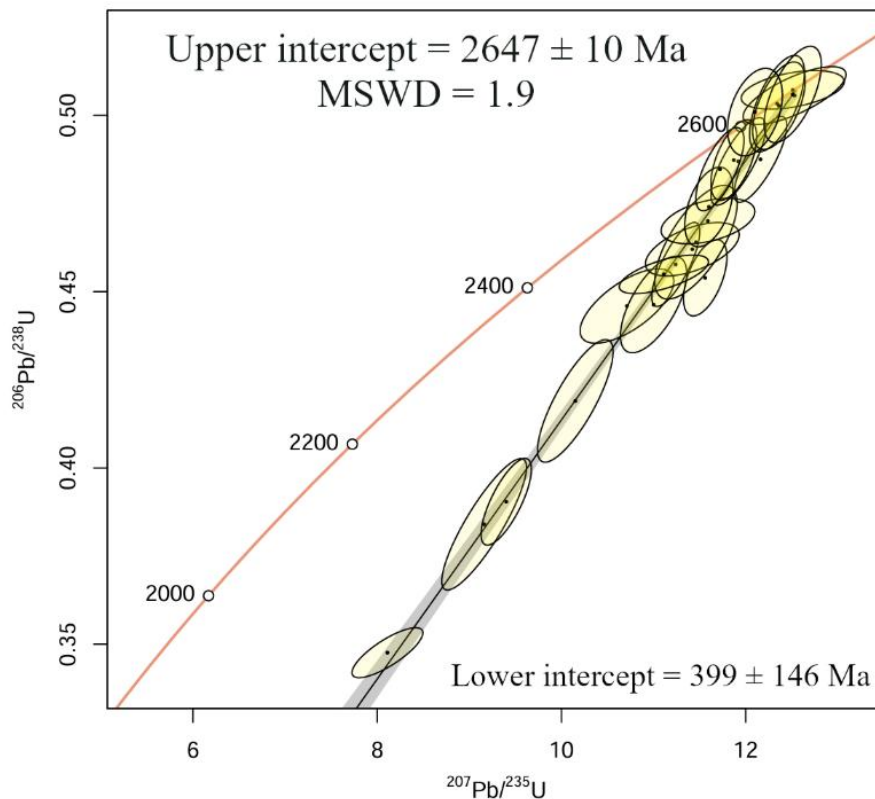


Figure 49: CGM U-Pb concordia diagram for the F.D. no. 5 pegmatite. Reported age is from the upper intercept.

4.4 Discussion: U-Pb Ages of the Eagle, F.D. no. 5, and Tappy pegmatites

A summary of the mineral ages from this thesis is shown in Table 5, from oldest to youngest. The concordant zircons from all the host rock samples give an average $^{207}\text{Pb}/^{206}\text{Pb}$ age of ~ 2737 Ma, while the zircon crystals collected from inside the pegmatites plot within error of each other at ~ 2730 Ma using the $^{207}\text{Pb}/^{206}\text{Pb}$ ages. The closure temperature for the U-Pb system is $\sim 900^\circ\text{C}$ in zircon (Lee et al., 1997), meaning that the comparatively cooler pegmatitic melts did not reset the U-Pb chronometer in the zircons. Instead, the dates recorded by these zircons most likely record the emplacement of the host rock for the Eagle and F.D. no. 5 pegmatites. Despite no host-rock xenoliths being seen at the Eagle or F.D. no. 5 pegmatites, the ages observed in the zircon point towards contamination from the host rock as they have very similar ages and were only found in the margin of the dykes. None of the zircons from the central zones of either pegmatites gave concordant ages within the realm of possibilities for the region, with the reported pegmatite zircon ages coming from the intermediate zones.

Table 5: Compiled list of all U-Pb geochronology analyses done in this thesis. Ages are shown from oldest to youngest. All analyses were done on LA-ICP-MS.

Sample No.	Rock Type	Mineral	Age (Ma)	Error (Ma)	Interpretation
CM24-12	Eagle Host Rock	Zr	2738	5	Emplacement
CM24-12,13	F.D. no.5 Host Rock	Zr	2737	4	Emplacement
CM24-15,16	Eagle Pegmatite	Zr	2733	4	Inheritance
CM24-10,11	F.D. no.5 Pegmatite	Zr	2726	9	Inheritance
CM24-15,16	Eagle Pegmatite	CGM	2657	9	Pegmatite Crystallization
CM24-10,11	F.D. no.5 Pegmatite	CGM	2651	9	Pegmatite Crystallization
LT-21-09-65.8	Eagle Metasomatic	Mz	2648	2	Pegmatite Crystallization
23-JR-35-44	Tappy Pegmatite	CGM	2647	10	Pegmatite Crystallization
CM24-10,11	F.D. no.5 Pegmatite	Mz	2646	5	Pegmatite Crystallization
CM24-15,16	Eagle Pegmatite	Mz	2645	9	Pegmatite Crystallization
CM24-10,11	F.D. no.5 Pegmatite	Ap	2599	21	Metamorphism
CM24-15	Eagle Pegmatite	Ap	2597	40	Metamorphism

All monazite and CGM analyses plot within error of each other at ~2650 Ma for both the Eagle and F.D. no. 5. The dates from these chronometers are interpreted to record the crystallization ages of the pegmatites themselves. Additionally, the ages for both the HMS and metasomatic monazite from the Eagle pegmatite plot within the margins of error for each other, just under 2650 Ma. When compared to both HMS monazite and CGM ages, the metasomatic monazite found adjacent to the Eagle is a robust and accurate geochronometer that reflects the crystallization age of the pegmatite it formed next to.

Despite analyzing both rims and cores of the zircons from the Eagle and F.D. no. 5 pegmatites, only one concordant analysis from the F.D. no. 5 plotted near 2650 Ma, but was not shown on a concordia diagram. The data for this analysis is included in Appendix III. More of the zircons from the pegmatite fractions of the HMS may contain domains within them that record the crystallization of the pegmatites, but further analysis would be needed to determine this, as one analysis out of over a hundred does not make for a robust representation.

Both apatite U-Pb analyses plot within error of each other around 2600 Ma and are the youngest dates. These dates are theorized to represent a later thermal event in the Cat Lake area. That happened ~50 Ma after D3 deformation. The closure temperature of Pb diffusion in apatite is ~350 - 570 °C (Chew and Spikings, 2015). Therefore, the U-Pb system in apatite is susceptible to being reset by post-crystallization thermal events. In this instance, it does not accurately record the crystallization of the pegmatites. This is one of the reasons that CGMs were prioritized over apatite at the Tappy pegmatite.

Chapter 5 – Conclusions

5.1 Primary Goals of this Study

The primary goals of this study were to characterize the mineral assemblages and mineral chemistry of the Eagle, F.D. no. 5, and Tappy pegmatites and to investigate their petrogenesis using these tools and multi-chronometer geochronology in order to understand relative and absolute timing of rare-element mineralization in the Cat Lake - Winnipeg River pegmatite field of the BRD. Furthermore, using the data generated from this study, the Eagle and F.D. no. 5 pegmatites were compared and contrasted to better determine their relationship. These two pegmatites are closely spatially associated, however, without detailed petrology and mineral chemistry assessments, as well as geochronology, their relationship beyond field observations could not be determined.

5.1.1 Mineralogy

The Eagle is a zoned LCT pegmatite hosted by a meta-tonalite. Small fibrous sunbursts of holmquistite are present as purple splotches throughout the host rock near the Eagle outcrop. The Eagle pegmatite is composed of quartz, plagioclase, alkali-feldspar, and spodumene. Garnet and regional muscovite constitute the minor phases, while tantalite, microlite, calcite, pyrite, zircon, apatite, and beryl make up the accessory minerals.

Spodumene at the Eagle pegmatite appears white to green in hand sample and is common throughout the central zone of the dyke. The crystals range in size from sub-centimeter to 4-5 cm at their largest. The Eagle has three major morphologies of spodumene. Roughly 80% of the spodumene is large, euhedral to semi-euhedral spodumene laths, while approximately 20% of the spodumene observed in the Eagle appears skeletal or almost dissolved, similar to the magmatic intergrowth texture

described in Brennan et al. (2024). The last spodumene morphology consists of small secondary crystals that preferentially grow as fine, acicular blades along the C-axis of other spodumene crystals. These three instances of spodumene morphology are not mutually exclusive, as small secondary crystals were observed growing along the C axis of both varieties of primary spodumene crystals within the Eagle.

The F.D. no.5 is a largely unzoned LCT pegmatite hosted by a meta-granodiorite (similar to the host of the Eagle pegmatite) and outcrops less than half a kilometre to the northeast of the Eagle. The F.D. no. 5 is composed of quartz, plagioclase, alkali-feldspar, spodumene, and zinnwaldite. Biotite, muscovite, schorl, and beryl make up the minor minerals in this dyke. Accessory minerals include tantalite, microlite, monazite, and zircon. Biotite and schorl occur mainly in veins crosscutting the dyke, but rarely also occur in the pegmatite and one emerald crystal was found in a biotite vein, outside of the pegmatite in the host rock.

Spodumene at the F.D. no.5 pegmatite appears apple-green in hand sample and is common throughout the dyke. The crystals range in size from around one centimeter up to 10 centimeters at their largest. The F.D. no. 5 pegmatite has 2 morphologies of spodumene. The majority of the crystals are relatively large, 1 to 10 cm long and euhedral, while 15% of the spodumene crystals at the F.D. no. 5 are riddled with 1-3mm inclusions of quartz. This morphology is similar to the magmatic intergrowth texture from the Eagle dyke, although it is, on average, much larger, with some of the crystals with magmatic intergrowths reaching 5 cm. The two morphologies of spodumene at the F.D no. 5 are, on average, the same size, with the only major difference being the inclusions of quartz.

The Tappy pegmatite is located in the south of the BRD in the Lac du Bonnet pegmatite group of the Winnipeg River pegmatite district. The Tappy pegmatite is composed of quartz, plagioclase, alkali-feldspar and spodumene. Minor minerals include muscovite, apatite and Mn-Fe phosphates described by Černý et al. (1981) as “altered triphylite-lithiophilite”. Small amounts of tantalite and zircon are also present as accessory minerals.

Spodumene at the Tappy pegmatite appears bright white in hand sample, lacking any of the green coloration found in spodumene from the other two studied dykes. Here, spodumene only exists as euhedral crystals. The only variance in spodumene at this dyke is its size, ranging from one to ten centimeters. Spodumene is generally clean with, on average, fewer inclusions than spodumene from the other dykes.

The Eagle, and F.D. no.5 and Tappy pegmatites are broadly ascribed to the LCT family, albite-spodumene type, according to the classification by Černý and Ercit (2005). According to the Wise et al. (2022) system, the Eagle, F.D. no. 5, and Tappy are all Group 1 pegmatites, further refined into type (ii) Li-rich spodumene dominant. The Tappy and Eagle pegmatites are further refined and determined to have the spodumene + albite mineral assemblage. Additionally, rare-element mineral assemblages within Group 1 may include the beryl + spodumene assemblage as expressed by F.D. no. 5 pegmatite (Wise et al., 2022).

5.1.2 Mineral Chemistry

A pegmatite’s evolution can be evaluated using a variety of trace elements including Li, Rb, Cs, and the K/Rb ratio measured in feldspars and micas (e.g., Roda-Robles et al., 2012, 2023). As previously mentioned, higher concentrations of these alkali-elements

indicates that a pegmatite crystallized from a more evolved melt. Additionally, the K/Rb ratio also aids in defining a pegmatite's fractionation levels. For the Eagle, F.D. no. 5, and Tappy pegmatites, these fractionation indices were evaluated against data from Ontario pegmatites from Selway et al. (2005). The Tappy pegmatite has the highest overall Li, Rb and Cs concentrations of the three dykes, while the F.D. no. 5 has the lowest. Regarding the K/Rb ratio, the Tappy again has the most evolved signature while the F.D. no. 5 has least evolved.

In addition to fractionation indices derived from the concentrations of Li, Rb and Cs in alkali-feldspar and muscovite, an extensive list of trace elements were analyzed for these minerals as well as in CGMs and garnet. For many of the graphs shown in Figures 23 and 25, the Eagle and the Tappy pegmatites have as much in common with each other as do the Eagle and F.D. no. 5. As the Tappy is in the Winnipeg River Pegmatite District while the Eagle and F.D. no. 5 are in the Cat Lake Maskwa Lake District, the difference between them is striking. For example, in Figure 23I, the range of alkali-feldspar Ta values for the Tappy and Eagle are nearly identical while the F.D. no. 5 has maximum values half that of the other dykes. However, when P concentrations are shown in Figure 23B, the Eagle and F.D. no. 5 are shown to have very similar concentrations, while the Tappy is the outlier with highly elevated levels compared to the others. This shows that while the two pegmatite districts have different chemical signatures, the adjacent Eagle and F.D. no. 5 can exhibit large trace element variations in their minerals.

5.1.3 Features of emplacement

The Eagle pegmatite is emplaced concordant with the tectonic fabric of its host rock, which is broadly east-west with a mildly undulose contact that is usually very sharp. All

pegmatites in the Eagle-Irgon group described by Černý et al. (1981) appear to follow this general trend.

The F.D. no. 5 pegmatite exhibits more complex host rock interactions than the Eagle does. At the F.D. no. 5, the pegmatite/host rock contact is both angular and undulose. The north side of the dyke has an undulose contact and the eastern and western margins are very straight and linear. The western contact with the host rock is very reminiscent of a fault contact, which is very different to the Eagle, which intrudes along the host rock foliations. Although the F.D. no. 5 pegmatite is relatively equidimensional in outcrop, the comb structured feldspars and the angular nature of the contacts gives it the impression of striking north-south.

Considering the above data, it is likely that the F.D. no. 5 pegmatite is not a member of the Eagle-Irgon group described in Černý et al. (1981). Bannatyne (1985) accurately describes the fault contact at the F.D. no. 5 as a “peculiarity of this deposit” and the presence of both zinnwaldite and beryl at the F.D. no. 5 serve to further differentiate it from the surrounding pegmatites in the Eagle-Irgon group. Instead, the F.D. no. 5 is most likely a member of the “Beryl-Tourmaline pegmatite group” (BET) described by Černý et al. (1981). The internal structure of the BET pegmatites is described as patchy, lacking any meaningful internal zoning, a description that also fits the F.D. no. 5. The main linking factor between all of the BET dykes is their N-S attitude and beryl content (Černý et al. 1981). Considering this, and the similar K/Rb ratios of the BET group to the F.D. no. 5, it does not seem the Eagle and F.D. no. 5 are genetically linked and instead, happen to be spatially associated.

The Tappy pegmatite cuts the foliation of its meta-pillow basalt host rock and broadly strikes north-south. This trend is concurrent with the rest of the Lac du Bonnet pegmatite group. These dykes are associated with a north-northwest trending right lateral fault that bisects both the Lac du Bonnet batholith to the south and the volcano-sedimentary layers to the north (Černý et al. 1981). The contacts with the wall rock at the Tappy are mostly sharp, with some mildly undulose areas and low levels of alteration of the pillow basalt as demonstrated by outcrop observations and thin section petrography.

5.1.4 Deformation and secondary units

The north-northwest-trending Cat Lake–Euclid Lake fault zone (CLELFZ) is thought to be coincident with the tectonic gradational contact between the BRD and the English River Subprovince to the north. The northwest-trending penetrative foliation in this area dips steeply south (Yang et al., 2013). The Eagle and F.D. no. 5 pegmatites are emplaced just south of the CLELFZ however neither of them trends in the same orientation as the CLELFZ proper. Instead, the Eagle follows the E-W foliation of its meta-TTG host rock which is parallel to a small shear zone seen in outcrop south of the Eagle. As discussed above, the Tappy pegmatite and the Lac du Bonnet group all intrude parallel to a nearby fault (Černý et al., 1981).

The Eagle dyke generally appears banded parallel to the contacts which in turn makes the intra-pegmatitic fabric similar to that of the host rock suggesting that the Eagle intruded the host rock prior to the end of metamorphic activity in the area at ~2630 Ma (Duguet et al., 2009). The F.D. no. 5 pegmatite is relatively homogeneous with a pervasive primary texture. It differs greatly from Eagle which shows banding in areas of the dyke, almost resembling a gneissic texture. The Tappy pegmatite shows very little

deformation, similar to the F.D. no. 5, with widespread primary textures from magmatic crystallization preserved in the dyke.

The Eagle pegmatite shows the most widespread microstructures out of the three studied dykes. It exhibits widespread recrystallization of quartz and, to a lesser extent, feldspar and micas. Some of the feldspars have bends in the crystal structure when viewed in polished thin section, and veins of fine-grained sericite are widespread. The F.D. no. 5 has similar microstructures to the Eagle but appears to be less deformed than the adjacent dyke. Recrystallized quartz is common in the F.D. no. 5 as well as recrystallized margins on micas and feldspars. Some of the feldspars have bends in the crystal structure when viewed in PTS, and veins of fine-grained sericite are common. However, unlike the Eagle, secondary spodumene was not seen in the F.D. no. 5. The Tappy pegmatite shows the least amount of deformation between the three dykes. Recrystallized quartz grains and recrystallized margins on micas and feldspars are present but appear to be to a much lesser extent than either the Eagle or F.D. no. 5. Sericite is also present at the Tappy, but the veins are thinner and less extensive than at the other studied dykes.

5.1.5 U-Pb Ages for the Eagle, F.D. no. and Tappy Pegmatites

The crystallization ages of the Eagle, F.D. no. 5, and Tappy pegmatites are all dated to ~2650 Ma based on U-Pb systematics done in CGMs and monazite. CGMs were used at all the dykes while monazite ages were only found for the Eagle and F.D. no. 5. The pegmatites are coeval with both the D3 deformation seen throughout the Bird River Domain and many of the granitoid bodies in the BRGB (Gilbert, 2008). With the suite of

late granites being coeval with the deformation going on at ~2650 Ma, an anatectic vs magmatic origin for the pegmatites cannot be effectively determined at this time.

There is no currently known granite dating to ~2650 Ma in the Cat Lake area. However, there is a section of the Maskwa Lake Batholith found to have a contemporaneous age to the xenocrystic zircons from the Eagle and F.D. no. 5 pegmatites. This, or another felsic to intermediate portion of the batholith, may be the source rock to the pegmatites in this area. It is therefore difficult to assign an origin to the dykes in the northern arm of the Bird River domain as there has not been enough geochemical and geochronological data generated in the area. Additionally, there are granitic bodies exposed in the continuation of the greenstone lithology further west of Cat Lake (Yang, 2012) that are as of yet undated.

With the Lac du Bonnet group pegmatites only occurring around a fault next to the Lac du Bonnet batholith, they may be exploiting the structural weaknesses present around the fault (Černý et al., 1981). However, further work would have to be done on the adjacent Lac du Bonnet batholith (2660 ± 3 Ma: Wang, 1993) to determine if this is a viable source for the Tappy pegmatite as both anatectic and more deeply sourced melts could exploit the same fault. As discussed in Černý et al. (1981), there is little confidence that the Tappy is derived from the Lac Du Bonnet Batholith.

5.1.6 U-Pb Ages for the Eagle, F.D. no. 5 and Tappy Pegmatites within the Bird River Domain

In addition to comparing the ages of the studied pegmatites and their analyzed chronometers, it is important to place the Eagle, F.D. no. 5, and Tappy within the broader BRD and compare their ages to other rock units and pegmatites. The ages of select

lithological units from the BRD are listed below, with the U-Pb ages from this study to better illustrate their temporal position and relationship.

In regard to the xenocrystic zircons from the Eagle and F.D. no. 5 dykes, the U-Pb age of ~2730 Ma corresponds closely to the tonalite hosting the Eagle and F.D. no. 5. Additionally, the slender morphology of the zircons points to them growing in an intermediate rock. Wang (1993), states that there was a major volcanic and igneous event in and around the BRD from 2740 to 2730 Ma meaning that igneous rocks of this age are widespread in the area and more could potentially be present at depth. According to Černý (1991), volcanism and sedimentation in the Bird River Greenstone belt lasted from 2745 to 2715 Ma, with the TTG ages comfortably sitting within the range of both of these described events. As the ages of the zircons from the pegmatitic fractions are a close but not perfect match to the ages of the host rock zircons, they may not represent direct assimilation of the host rock exposed at surface but of a similar, but temporally distinct unit at depth, closer to the site of melt generation.

The crystallization ages of ~2650 Ma recorded in CGMs and monazite crystals for the Eagle, F.D. no. 5, and Tappy pegmatites coincide with the suite of late intrusive granitoid rocks in the Bird River Greenstone Belt (BRGB) (Gilbert, 2008). These units are coeval with the D3 dextral strike-slip deformation event that occurred throughout the BRD, as described in Duguet et al. (2009), which occurred between 2670 and 2640 Ma. The Lac du Bonnet Batholith has an age of ~2660 Ma and intrudes just south of the Tappy pegmatite while a suite of pegmatitic granites are exposed on the eastern end of the BRGB, dating to 2640 ± 7 Ma (Baadsgaard and Černý, 1993) showing that granitic magmatism was widespread throughout this time interval. Taking into account the ages

and proximity of these granites, it is most likely that the Tappy is a result of fractional crystallization of a large granitic body coeval with those known in the BRGB.

There is not a suite of granites with similar dates in the comparatively smaller Cat Lake area north of the Maskwa Lake Batholith, although the D3 dextral deformation affected the area north of the MLB as well. If the environment in the BRGB is assumed to be uniform to that of the Cat Lake Region, but differentially exhumed, then granitic plutons feeding the Cat-Lake pegmatite field may be present at depth. In this scenario, volatile rich pegmatitic melts could be taken upwards by extensional jogs in the Cat Lake – Euclid Lake shear zone as described in Brown (1994). However, the proximity of these pegmatites to the Cat Lake Euclid Lake Fault Zone and their timing within the D3 deformation event also supports a potential anatectic origin until further study can be done in the Cat Lake area to better define their sources.

Source	Location in BRD	Rock Type	Mineral	Age (Ma)	Error (Ma)	Method	Interpretation
Gilbert, 2008	MLB	Maskwa Lake batholith (tonalite)	Zrn	2853	1.1	ID-TIMS	Pluton Emplacement
Gilbert, 2008	MLB	Maskwa Lake batholith (granodiorite)	Zrn	2832	0.9	ID-TIMS	Pluton Emplacement
Wang, 1993	MLB	Maskwa Lake Batholith II	Zrn	2782	1.1	ID-IC-TIMS	Emplacement
Wang, 1993	South of MLB	Bird River Sill	Zrn	2745	5	ID-IC-TIMS	Emplacement
This study	North of MLB	Eagle Host Rock	Zrn	2738	5	LA ICP-MS	Crystallization
This study	North of MLB	F.D. no.5 Host Rock	Zrn	2737	4	LA ICP-MS	Crystallization
Gilbert, 2008	South of MLB	Rhyolite, Peterson Creek Formation	Zrn	2731	1.0	ID-TIMS	Volcanism
This study	North of MLB	Eagle Pegmatite	Zrn	2733	4	LA ICP-MS	Inheritance
Wang, 1993	South of MLB	Point du Bois Batholith	Zrn	2729	9	ID-IC-TIMS	Emplacement
This study	North of MLB	F.D. no.5 Pegmatite	Zrn	2726	9	LA ICP-MS	Inheritance
Wang, 1993	South of MLB	Maskwa Lake Batholith I	Zrn	2725	6	ID-IC-TIMS	Emplacement
Gilbert, 2008	South of MLB	Dacite, Bernic Lake Formation	Zrn	2725	1.1	ID-TIMS	Volcanism
Gilbert, 2008	South of MLB	Birse Lake pluton (granodiorite)	Zrn	2723	0.7	ID-TIMS	Pluton Emplacement
Gilbert, 2008	South of MLB	Gabbro pegmatite	Zrn	2723	0.8	ID-TIMS	Pluton Emplacement
Gilbert et al. 2008	South of MLB	Tanco Gabbro	Zrn	2723	0.8	ID-TIMS	Emplacement
Gilbert, 2008	South of MLB	Syn-shear granite	Zrn	2714	13	ID-TIMS	Upper age of pluton emplacement
Gilbert, 2008	South of MLB	Syn-shear granite	Mz	2684	0.8	ID-TIMS	Upper age of pluton emplacement
Wang, 1993	South of MLB	Lac du Bonnet Batholith	Zrn	2660	3	ID-IC-TIMS	Emplacement
This study	North of MLB	Eagle Pegmatite	CGM	2657	9	LA ICP-MS	Crystallization
Gilbert, 2008	South of MLB	Maskwa Lake batholith (tonalite)	Ap	2652	2.0	ID-TIMS	Thermal closure, ~500 C
This study	North of MLB	F.D. no.5 Pegmatite	CGM	2651	9	LA ICP-MS	Crystallization
Gilbert, 2008	South of MLB	Granitoid pegmatite, shear-zone hosted	Zrn	2651	0.2	TE-TIMS	Pluton Emplacement
This study	North of MLB	Eagle Metasomatic	Mz	2648	2	LA ICP-MS	Pegmatite Crystallization
Gilbert, 2008	South of MLB	Granitoid pegmatite, post-shear	CGM	2647	1.0	ID-TIMS	Pluton Emplacement
This study	South of MLB	Tappy Pegmatite	CGM	2647	10	LA ICP-MS	Crystallization
This study	North of MLB	F.D. no.5 Pegmatite	Mz	2646	5	LA ICP-MS	Crystallization
Gilbert, 2008	South of MLB	Marijane Lake pluton (granodiorite)	Mz	2646	1.3	ID-TIMS	Pluton Emplacement
This study	North of MLB	Eagle Pegmatite	Mz	2645	9	LA ICP-MS	Crystallization
Canacho et al. 2012	South of MLB	Silverleaf Pegmatite	CGM	2645	7	ID-TIMS	Crystallization
Canacho et al. 2012	South of MLB	Tanco Pegmatite	CGM	2641	3	ID-TIMS	Crystallization
This study	North of MLB	F.D. no.5 Pegmatite	Ap	2599	21	LA ICP-MS	Metamorphism
This study	North of MLB	Eagle Pegmatite	Ap	2597	40	LA ICP-MS	Metamorphism

Table 6: Compiled list of all U-Pb geochronology analyses done in this thesis with other key ages for rock units and pegmatites in the Bird River Domain. Ages are shown from oldest to youngest. Ages from this study are colored gray. Note that samples are broken up by their location relative to the Maskwa Lake Batholith (MLB)

5.2 Suggestions for Future Work

Isotopic and geochronologic studies on the adjacent granites to both the Eagle and F.D. no. 5 as well as the Tappy would help to shed more light on the sources of the pegmatites in the Cat Lake - Winnipeg River Pegmatite field. Additionally, during the summer of 2023, many more samples were taken than were used in this study. Chiefly among them were host rock samples from the drill core at the Eagle pegmatite and from the exposure at the Tappy pegmatite. These host rock samples were taken, and their distances from the edge of the pegmatite were recorded. The trace element content of alkali-feldspar and muscovite in the surrounding host rocks could be analysed in future studies to determine fractionation similar to work done by Harmon et al. (2023), to potentially locate unknown pegmatites.

Comparing trace element data and whole rock data from the host rocks to that of the pegmatites considering distance from the dyke, would have allowed for rough interpretations of the metasomatic aureole from the dyke (Sweetapple et al., 2024). In addition to investigating how much fluid was exsolved by the pegmatites and released to the host rocks, having a robust model for enriched aureoles could aid exploration in the area as was recently done in the nearby Separations Rapids rare element pegmatite group (Bodeving et al., 2025).

As for mineralogical analyses, the apatite taken from the Eagle, F.D. no. 5 and Tappy pegmatites was not analyzed. Although extensive mineralogical analyses on mica, feldspars, CGMs and garnets was carried out during the current study, apatite can also be used to better understand pegmatite petrogenesis (e.g., Roda-Robles et al., 2024). The apatite collected from the Eagle and F.D. no. 5 is small and uncommon in the central part

of the pegmatites while the Tappy has larger crystals frequently observed in thin section. Utilizing apatite from throughout the pegmatites may provide more information on the intra-pegmatite evolution that was not prominently observed in the other minerals in this study. However, the relative scarcity of apatite in the Cat Lake pegmatites meant that it's analysis was of lesser importance compared to more ubiquitous minerals like CGMs and garnet.

Lastly, the presence of the singular emerald crystal from the outcrop at the F.D. no. 5 pegmatite should warrant more detailed field work in the vicinity of the Eagle-Irgon pegmatite group. North-south trending veins of biotite were observed at both the Eagle and F.D. no. 5, although only the singular vein at the F.D. no. 5 was observed to be mineralized in regard to emerald. Similarly trending veins filled with late spodumene were found at the Eagle outcrop although their relation to the biotite veins is not known. In the compendium of the Bird River pegmatites (Černý et al. 1981), N-S trending veins of black tourmaline and beryl are described at the Irgon and CATB pegmatites with local open vugs. One such small vug with black tourmaline was observed at the F.D. no. 5 outcrop, but once again, its relation to any emerald mineralization is not currently known.

Additionally, N-S faulting was widely observed throughout the area, both in outcrop and literature (Yang, 2013). With the gabbroic Cat Lake Intrusion just south of the F.D. no 5 (Yang, 2013) and ultramafic units to the west of the Eagle dyke, (Yang, 2012), the Cat Lake-Maskwa Lake Pegmatite District may be conducive to the formation of more emerald occurrences. The Ghost Lake emerald deposit in Dryden, Ontario (Brand et al., 2009) may serve as a similar case study due to its proximity to a rare-element pegmatite and ultramafic units. Considering all of this, a more detailed

investigation into the N-S running faults, especially those filled with biotite seen at the pegmatites around Cat Lake, may better define the emerald potential in the area. After diamond and ruby, emerald is the third most valuable gemstone in the world (Groat et al., 2008) and adding emerald to the growing list of mineralogical commodities in the Bird River would only enhance the already impressive mineralogical legacy of this region.

Bibliography

- Baadsgaard, H. & Černý, P. (1993): Geochronological studies in the Winnipeg River pegmatite populations, south-eastern Manitoba. Geol. Assoc. Can. – Mineral. Assoc. Can., Program Abstract. 18, A5.
- Bannatyne, B. (1985). Industrial minerals in rare-element pegmatites of Manitoba. Manitoba Energy and Mines, Geological Services, Economic Geology Report ER84-1, 96 p.
- Bau, M. (1996). Controls on the fractionation of isovalent trace elements in magmatic and aqueous systems: Evidence from Y/Ho, Zr/Hf, and lanthanide tetrad effect. *Contributions to Mineralogy and Petrology*, 123(3), 323–333.
<https://doi.org/10.1007/s004100050159>
- Bodeving, S., Vasyukova, O., & Williams-Jones, A. (2025). Controls on the origin and evolution of wall-rock alteration at the Big Whopper Li-Cs-Ta Pegmatite, Canada. *Economic Geology*. <https://doi.org/10.5382/econgeo.5142>
- Brand, A., Groat, L., Linnen, R., Garland, M., Breaks, F., & Gaston, G. (2009). Emerald mineralization associated with the Mavis Lake pegmatite group, near Dryden, Ontario. *The Canadian Mineralogist*, Volume 47, Abstract (p. 315).
- Brennan, C. J., Student, J. J., Hill, T., Martins, T., & Sirbescu, M.-L. C. (2024). Trace element concentrations and chemical zoning of spodumene from magmatic and hydrothermal origins. *Ore Geology Reviews*, 169, 106089.

- Brotzen, O. (1959). Outline of mineralization in zoned granitic pegmatites. A qualitative and comparative study. *Geologiska Foereningens i Stockholm Foerhandlingar*, 81, 3–98.
- Brown, J. A. (2001). Mineralogy and geochemistry of alkali feldspars from the Tanco pegmatite, southeastern Manitoba. MSc Thesis, *University of Manitoba, Winnipeg, MB*.
- Brown, J. A., Martins, T., & Černý, P. (2017). The Tanco Pegmatite at Bernic Lake, Manitoba. Xvii. Mineralogy and Geochemistry of Alkali Feldspars. *The Canadian Mineralogist*, 55(3), 483–500. <https://doi.org/10.3749/canmin.1700008>
- Brown, M. (1994). The generation, segregation, ascent and emplacement of granite magma: the migmatite-to-crustally-derived granite connection in thickened orogens. *Earth Science Reviews*, 36, 83–130
- Černý, P., (1991). Fertile granites of Precambrian rare-element pegmatite fields: is geochemistry controlled by tectonic setting or source lithologies?. *Precambrian Granitoids--Petrogenesis, Geochemistry and Metallogeny. Precambrian Res.*, 51 : 429–468.
- Černý, P., & Burt, D. M. (1984). Paragenesis, crystallochemical characteristics, and geochemical evolution of micas in granitic pegmatites. In Bailey S.W. Ed., *Micas. Mineralogical Society of America., Review in Mineralogy*, 13, 257–298.
- Černý, P. & Ercit, T.S. (2005). The classification of granitic pegmatites revisited; *The Canadian Mineralogist*, v. 43, p. 2005–2026.

- Černý, P., Ercit, T.S., & Vanstone, P.T. (1996). Petrology and Mineralization of the Tanco Rare Element Pegmatite; Southeastern Manitoba: - Field Trip Guidebook A4; Geological Association of Canada/Mineralogical Association of Canada Annual Meeting Winnipeg Manitoba, May 27-29; 1996.
- Černý, P., Meintzer, R. E., & Anderson, A. J. (1985). Extreme fractionation in rare-element granitic pegmatites; selected examples of data and mechanisms. *The Canadian Mineralogist*, 23(3), 381–421.
- Černý, P., Trueman, D.L., Zeihlke, D.V., Goad, B.E. and Paul, B.J. (1981). The Cat Lake-Winnipeg River and the Wekusko Lake pegmatite fields, Manitoba; Centre for Precambrian Studies, University of Manitoba; Manitoba Department of Energy and Mines, Mineral Resources Division, Economic Geology Report ER80-1, 216 p.
- Chew, D. M., Sylvester, P. J., & Tubrett, M. N. (2011). U–Pb and Th–Pb dating of apatite by LA-ICPMS. *Chemical Geology*, 280(1), 200–216.
<https://doi.org/10.1016/j.chemgeo.2010.11.010>
- Chew, D. M., & Spikings, R. A. (2015). Geochronology and Thermochronology Using Apatite: Time and Temperature, Lower Crust to Surface. *Elements*, 11(3), 189–194. <https://doi.org/10.2113/gselements.11.3.189>
- Cooper, D.G. (1964). The Geology of the Bikita pegmatite. in: The Geology of some Ore Deposits in southern Africa (S.H. Haughton, editor). Horters, Johannesburg, South Africa, pp. 441 461.

- Donald W. Davis, Sandra M. Barr, and Chris E. White. 2022. Constraints on the age of *Archaeozoon acadiense* and evidence for hydrothermally transported zircon in the Ashburn Formation (Green Head Group), Saint John, New Brunswick, Canada. *Canadian Journal of Earth Sciences*. **59**(6): 346-359. <https://doi.org/10.1139/cjes-2021-0100>
- Duguet, M., Lin, S., Davis, D. W., Corkery, M. T., & McDonald, J. (2009). Long-lived transpression in the Archean Bird River greenstone belt, western Superior Province, Southeastern Manitoba. *Precambrian Research*, *174*(3), 381–407. <https://doi.org/10.1016/j.precamres.2009.09.001>
- Filiberto, L., Roda-Robles, E., Simmons, W., & Webber, K. (2021). Garnet as Indicator of Pegmatite Evolution: The Case Study of Pegmatites from the Oxford Pegmatite Field (Maine, USA). *Minerals*, *11*, 802. <https://doi.org/10.3390/min11080802>
- Flude, S., Haschke, M., & Storey, M. (2017). Application of benchtop micro-XRF to geological materials. *Mineralogical Magazine*, *81*(4), 923–948. <https://doi.org/10.1180/minmag.2016.080.150>
- Garate-Olave, I., Roda-Robles, E., Gil-Crespo, P. P., & Pesquera, A. (2018). Mica and feldspar as indicators of the evolution of a highly evolved granite-pegmatite system in the Tres Arroyos area (Central Iberian Zone, Spain). *Journal of Iberian Geology*, *44*(3), 375–403. <https://doi.org/10.1007/s41513-018-0077-z>
- Gardiner, N. J., Jowitt, S. M., & Sykes, J. P. (2024). Lithium: Critical, or not so critical? *Geoenergy*, *2*(1), geoenergy2023-045. <https://doi.org/10.1144/geoenergy2023-045>

- Gieré, R., & Sorensen, S. S. (2004). Allanite and other REE-rich Epidote-Group minerals. *Reviews in Mineralogy and Geochemistry*, 56(1), 431–493.
<https://doi.org/10.2138/gsrmg.56.1.431>
- Gilbert, H.P. (2008). Stratigraphic investigations in the Bird River greenstone belt, Manitoba (part of NTS 52L5, 6); in Report of Activities 2008, Manitoba Science, Technology, Energy and Mines, Manitoba Geological Survey, p. 121–138.
- GIMP Development Team. 2025: GNU Image Manipulation Program (GIMP), Version 2.10.38. Community, Free Software. <https://gimp.org/>
- Groat, L. A., Giuliani, G., Marshall, D. D., & Turner, D. (2008). Emerald deposits and occurrences: A review. *The Genesis of Gem Deposits*, 34(1), 87–112.
<https://doi.org/10.1016/j.oregeorev.2007.09.003>
- Graupner, T., Melcher, F., Gäbler, H.-E., Sitnikova, M., Brätz, H., & Bahr, A. (2010). Rare earth element geochemistry of columbite-group minerals: LA-ICP-MS data. *Mineralogical Magazine*, 74(4), 691–713.
<https://doi.org/10.1180/minmag.2010.074.4.691>
- Heaman, L. M., & LeCheminant, A. N. (1993). Paragenesis and U-Pb systematics of baddeleyite (ZrO₂). *Geochemistry of Accessory Minerals*, 110(1), 95–126.
[https://doi.org/10.1016/0009-2541\(93\)90249-I](https://doi.org/10.1016/0009-2541(93)90249-I)
- Kaeter, D., Barros, R., Menuge, J. F., & Chew, D. M. (2018). The magmatic–hydrothermal transition in rare-element pegmatites from southeast Ireland: LA-ICP-MS chemical mapping of muscovite and columbite–tantalite. *Geochimica et Cosmochimica Acta*, 240, 98–130. <https://doi.org/10.1016/j.gca.2018.08.024>

- Kamo, S. L., & Davis, D. W. (1994). Reassessment of Archean crustal development in the Barberton Mountain Land, South Africa, based on U-Pb dating. *Tectonics*, 13(1), 167–192. <https://doi.org/10.1029/93TC02254>
- Kesler, S. E., Gruber, P. W., Medina, P. A., Keoleian, G. A., Everson, M. P., & Wallington, T. J. (2012). Global lithium resources: Relative importance of pegmatite, brine and other deposits. *Ore Geology Reviews*, 48, 55–69. <https://doi.org/10.1016/j.oregeorev.2012.05.006>
- Lee, J. K. W., Williams, I. S., & Ellis, D. J. (1997). Pb, U and Th diffusion in natural zircon. *Nature*, 390(6656), 159–162. <https://doi.org/10.1038/36554>
- Linnen, R. L., Van Lichtervelde, M., & Černý, P. (2012). Granitic Pegmatites as Sources of Strategic Metals. *Elements*, 8(4), 275–280. <https://doi.org/10.2113/gselements.8.4.275>
- London, D. (2022). A Rayleigh model of cesium fractionation in granite-pegmatite systems. *American Mineralogist*, 107(1), 82–91. <https://doi.org/10.2138/am-2021-7855>
- Martin, H.J. (1964) The Bikita tin field. Southern Rhodesia Geological Survey Bulletin, 58, 114-131.
- Martins, T., Kremer, P., & Vanstone, P. (2013). Field Trip Guidebook FT-C1. The Tanco Mine: Geological Setting, Internal Zonation and Mineralogy of a World-Class Rare Element Pegmatite Deposit. / Open File OF 2013-8
- McDonough, W. F., & Sun, S. (1995). The composition of the Earth. *Chemical Geology*, 120(3), 223–253. [https://doi.org/10.1016/0009-2541\(94\)00140-4](https://doi.org/10.1016/0009-2541(94)00140-4)

- McFarlane, C., & Luo, Y. (2012). U-Pb Geochronology Using 193 nm Excimer LA-ICP-MS Optimized for In Situ Accessory Mineral Dating in Thin Sections. *Geoscience Canada*, 39(3), 158–172.
- Parrish, R. (1990). U–Pb dating of monazite and its application to geological problems. *Canadian Journal of Earth Sciences*, 27(11), 1431–1450. <https://doi.org/10.1139/e90-152>
- Passchier, C., & Trouw, R. A. (1996). Microtectonics. In *Microtectonics*. <https://doi.org/10.1007/3-540-29359-0>
- Paton, C., Hellstrom, J., Paul, B., Woodhead, J., & Hergt, J. (2011). Iolite: Freeware for the Visualisation and Processing of Mass Spectrometric Data. *J. Anal. At. Spectrom. VL - IS -*, online. <https://doi.org/10.1039/C1JA10172B>
- Percival, J. A., Sanborn-Barrie, M., Skulski, T., Stott, G. M., Helmstaedt, H., & White, D. J. (2006). Tectonic evolution of the western Superior Province from NATMAP and Lithoprobe studies. *Canadian Journal of Earth Sciences*, 43(7), 1085–1117. <https://doi.org/10.1139/e06-062>
- Percival, J. (2007). Geology and Metallogeny of the Superior Province, Canada. *Mineral Deposits of Canada. A synthesis of major deposit types, district metallogeny, the evolution of geological provinces and exploration methods*
- Roda-Robles, E., Pesquera, A., Gil-Crespo, P., & Torres-Ruiz, J. (2012). From granite to highly evolved pegmatite: A case study of the Pinilla de Fermoselle granite–pegmatite system (Zamora, Spain). *Seventh Hutton Symposium on Granites and Related Rocks*, 153, 192–207. <https://doi.org/10.1016/j.lithos.2012.04.027>

- Romer, R.L., & Smeds, S.-A. (1996) U-Pb columbite ages of pegmatites from Sveconorwegian terrains in south-western Sweden. *Precambrian Research*, 76, 15-30.
- Romer, R. L., & Wright, J. E. (1992). U-Pb dating of columbites: A geochronologic tool to date magmatism and ore deposits. *Geochimica et Cosmochimica Acta*, 56(5), 2137–2142. [https://doi.org/10.1016/0016-7037\(92\)90337-I](https://doi.org/10.1016/0016-7037(92)90337-I)
- Selway, J., Breaks, F., & Tindle, A. (2005). A review of rare-element (Li-Cs-Ta) pegmatite exploration techniques for the Superior Province, Canada, and large worldwide tantalum deposits. *Exploration and Mining Geology*, 14, 1-30.
- Skrzypek, E., Bosse, V., Kawakami, T., Martelat, J.-E., & Štípská, P. (2017). Transient allanite replacement and prograde to retrograde monazite (re)crystallization in medium-grade metasedimentary rocks from the Orlica-Śnieżnik Dome (Czech Republic/Poland): Textural and geochronological arguments. *Chemical Geology*, 449, 41–57. <https://doi.org/10.1016/j.chemgeo.2016.11.033>
- Sweetapple, M. T., Vanstone, P.J., Lumpkin, G.R., & Collins, P.L.F. (2024). A review of lithogeochemical dispersion haloes of LCT pegmatites, and their application to rare metal exploration, with special reference to lithium in an Australian context. *Australian Journal of Earth Sciences*, 71(8), 1050–1084. <https://doi.org/10.1080/08120099.2024.2379834>
- Rieder, M., Cavazzini, G., D'yakonov, Y. S., Frank-Kamenetskii, V. A., Gottardi, G., Guggenheim, S., Koval', P. W., Müller, G., Neiva, A. M. R., Radoslovich, E. W., Robert, J.-L., Sassi, F. P., Takeda, H., Weiss, Z., & Wones, D. R. (1998).

Nomenclature of the Micas. *Clays and Clay Minerals*, 46(5), 586–595.

Cambridge Core. <https://doi.org/10.1346/CCMN.1998.0460513>

Roush, J., Martins, T., McFarlane, C.R.M., Rinne, M.L. and Groat, L. 2023. Preliminary examination of the Tappy, Eagle and F.D. no. 5 pegmatites in the Cat Lake–Winnipeg River pegmatite field, southeastern Manitoba (parts of NTS 52L5, 11); in Report of Activities 2023, Manitoba Economic Development, Investment, Trade and Natural Resources, Manitoba Geological Survey, p. 20–26.

Simmons, W.B., & Webber, K. L. (2008). Pegmatite genesis: State of the art. *European Journal of Mineralogy*, 20(4), 421–438. <https://doi.org/10.1127/0935-1221/2008/0020-1833>

Skrzypek, E., Bosse, V., Kawakami, T., Martelat, J.-E., & Štípská, P. (2017). Transient allanite replacement and prograde to retrograde monazite (re)crystallization in medium-grade metasedimentary rocks from the Orlica-Śnieżnik Dome (Czech Republic/Poland): Textural and geochronological arguments. *Chemical Geology*, 449, 41–57. <https://doi.org/10.1016/j.chemgeo.2016.11.033>

Smith, S.R., Foster, G.L., Romer, R.L., Tindle, A.G., Kelley, S.P., Noble, S.R., Horstwood, M., & Breaks, F.W. (2004). U-Pb columbite-tantalite chronology of rare-element pegmatites using TIMS and Laser Ablation-Multi Collector-ICP-MS. *Contributions to Mineralogy and Petrology*, 147(5), 549–564. <https://doi.org/10.1007/s00410-003-0538-y>

Steiner, B.M. (2019). Tools and Workflows for Grassroots Li–Cs–Ta (LCT) Pegmatite Exploration. *Minerals*, 9(8). <https://doi.org/10.3390/min9080499>

- Stilling, A., Černý, P., & Vanstone, P.J. (2006). The Tanco pegmatite at Bernic Lake, Manitoba. XVI. Zonal and bulk compositions and their Petrogenetic significance. *The Canadian Mineralogist*, 44(3), 599–623.
- Sweetapple, M.T., & Collins, P.L.F. (2002) Genetic framework for the classification and distribution of Archaean rare metal pegmatites in the North Pilbara Craton, Western Australia. *Economic Geology*, 97, 873- 895.
- Thomson, S. N., Gehrels, G. E., Ruiz, J., & Buchwaladt, R. (2012). Routine low-damage apatite U-Pb dating using laser ablation–multicollector–ICPMS. *Geochemistry, Geophysics, Geosystems*, 13(2). <https://doi.org/10.1029/2011GC003928>
- Tindle, A. G., & Breaks, F.W. (1998). Oxide minerals of the separation rapids rare-element granitic pegmatite group, northwestern Ontario. *The Canadian Mineralogist*, 36(2), 609–635.
- U.S. Geological Survey, 2024, Mineral commodity summaries 2024: U.S. Geological Survey, 212 p., <https://doi.org/10.3133/mcs2024>.
- U.S. Geological Survey, 2025, Mineral commodity summaries 2025 (ver. 1.2, March 2025): U.S. Geological Survey, 212 p., <https://doi.org/10.3133/mcs2025>
- Van Lichtenvelde, M., Salvi, S., Beziat, D., & Linnen, R. L. (2007). Textural features and chemical evolution in tantalum oxides: magmatic versus hydrothermal origins for Ta mineralization in the Tanco Lower Pegmatite, Manitoba, Canada. *Economic Geology*, 102(2), 257–276. <https://doi.org/10.2113/gsecongeo.102.2.257>
- Van Lichtenvelde, M., Grégoire, M., Linnen, R. L., Béziat, D., & Salvi, S. (2008). Trace element geochemistry by laser ablation ICP-MS of micas associated with Ta

mineralization in the Tanco pegmatite, Manitoba, Canada. *Contributions to Mineralogy and Petrology*, 155(6), 791–806. <https://doi.org/10.1007/s00410-007-0271-z>

Vasil'ev, N.V., Chevychelov, V.Yu., Zarskiy, G.P., Borodulin, G.P., & Udoratina, O.V. (2008) Peculiarities of tantalum-niobium mineralization of Taikovsky ore cluster (the Polar Urals). *Zapiski Rossiiskogo Mineralogitscheskogo Obshchestva*, 137, 1–16 (in Russian).

Vasil'ev, N.V., Chevychelov, V.Yu., Zarskiy, G.P., Borodulin, G.P., & Udoratina, O.V. (2009) Tantalum-Niobium mineralization of the Taikovsky ore cluster, the Polar Urals. *Geology of Ore Deposits*, 51, 537–548.

Wang, Xiaodong, "Uranium-lead zircon geochronology study of the Bird River greenstone belt, southeastern Manitoba." (1993). *Electronic Theses and Dissertations*. 4465. <https://scholar.uwindsor.ca/etd/4465>

Webber, K. L., Falster, A. U., Simmons, W. B., & Foord, E. E. (1997). The role of diffusion-controlled oscillatory nucleation in the formation of line rock in pegmatite–aplite dikes. *Journal of Petrology*, 38(12), 1777–1791. <https://doi.org/10.1093/petroj/38.12.1777>

Wise, M., & Brown, C. (2010). Mineral chemistry, petrology and geochemistry of the Sebago granite-pegmatite system, Southern Maine, USA. *Journal of Geosciences*, 55. <https://doi.org/10.3190/jgeosci.061>

- Wise, M., Curry, A., & Harmon, R. (2024). Reevaluation of the K/Rb-Li Systematics in Muscovite as a Potential Exploration Tool for Identifying Li Mineralization in Granitic Pegmatites. *Minerals*, 14, 117. <https://doi.org/10.3390/min14010117>
- Wise, M., Müller, A., & Simmons, W. 2022. A proposed new mineralogical classification system for granitic pegmatites. *The Canadian Mineralogist* v. 60, p. 229-248.
- Woodhead, J. D., Hellstrom, J., Hergt, J. M., Greig, A., & Maas, R. (2007). Isotopic and Elemental Imaging of Geological Materials by Laser Ablation Inductively Coupled Plasma-Mass Spectrometry. *Geostandards and Geoanalytical Research*, 31(4), 331–343. <https://doi.org/10.1111/j.1751-908X.2007.00104.x>
- Yang, X.M. (2012). Bedrock geology of the Cat Creek area, Bird River greenstone belt, southeastern Manitoba (part of NTS 52L12); Manitoba Innovation, Energy and Mines, Manitoba Geological Survey, Preliminary Map PMAP2012-3, scale 1:12 500
- Yang, X.M., Gilbert, H.P. and Houlé, M.G. 2013: Cat Lake–Euclid Lake area in the Neoproterozoic Bird River greenstone belt, southeastern Manitoba (parts of NTS 52L11, 12): preliminary results of bedrock geological mapping and their implications for geodynamic evolution and metallogeny; in Report of Activities 2013, Manitoba Mineral Resources, Manitoba Geological Survey, p. 70–84.

Appendix I – Sample List

Outcrop Samples	Location	Lithology	Used For	Drillcore Samples	Lithology	Used For
23-JR-002A	Eagle	Amphibolite HR	PTS, PF	LT-21-09-22.25	Pegmatite	PTS
23-JR-005A	Eagle	Pegmatite	PTS	LT-21-09-32.65	Pegmatite	PTS
23-JR-005B	Eagle	Pegmatite	PTS	LT-21-09-49.5	Pegmatite	PTS
23-JR-008	Eagle	Pegmatite	PTS	LT-21-09-51	Host Rock	Unused
23-JR-010	Eagle	Pegmatite	PTS	LT-21-09-55.8	Host Rock	Unused
23-JR-011	Eagle	Pegmatite	PTS, PF	LT-21-09-56.65	Host Rock	Unused
23-JR-011B	Eagle	Pegmatite	PTS	LT-21-09-57.1	Pegmatite	PTS
23-JR-013	Eagle	Pegmatite	PTS, PF	LT-21-09-57.35	Pegmatite	PTS
23-JR-014	Eagle	Mafic Lense	PTS	LT-21-09-57.4	Pegmatite	PTS
23-JR-019	Eagle	Pegmatite	PTS, PF	LT-21-09-58.55	Pegmatite	PTS
23-JR-020	Eagle	Pegmatite	PTS	LT-21-09-60.4	Pegmatite	PTS
23-JR-021	Eagle	Pegmatite	PTS	LT-21-09-61.8	Pegmatite	PTS
23-JR-023	Eagle	Pegmatite	PTS	LT-21-09-65.8	Contact	PTS
23-JR-024	Eagle	TTG HR	PTS, PF	LT-21-09-72.25	Pegmatite	PTS
23-JR-025	Eagle	Pegmatite	PTS, PF	LT-21-09-72.8	Host Rock	Unused
23-JR-027	Eagle	Pegmatite	PTS	LT-21-09-73.05	Host Rock	Unused
23-JR-029	F.D.no.5	Pegmatite	PTS	LT-21-09-77.1	Host Rock	Unused
23-JR-030	F.D.no.5	Pegmatite	PTS, PF	LT-21-09-81.55	Host Rock	Unused
23-JR-030A	F.D.no.5	Pegmatite	PTS	LT-21-09-85.0	Host Rock	Unused
23-JR-030B	F.D.no.5	Pegmatite	PTS	LT-21-09-89.0	Host Rock	Unused
23-JR-031-BT	F.D.no.5	Pegmatite	PTS			
23-JR-031	F.D.no.5	Pegmatite	PTS, PF	LT-21-10-105.4	Pegmatite	PTS
23-JR-032	F.D.no.5	Pegmatite	PTS, PF	LT-21-10-105.97	Pegmatite	PTS
23-JR-033	F.D.no.5	Pegmatite	PTS	LT-21-10-109.25	Pegmatite	PTS
23-JR-034	F.D.no.5	Pegmatite	PTS	LT-21-10-109.85	Pegmatite	PTS
24-JR-Schorl-GR	F.D.no.5	Pegmatite	PTS	LT-21-10-116.58	Pegmatite	PTS
FD5-Emer	F.D.no.5	Biotite Veinlet	PTS	LT-21-10-117.05	Pegmatite	PTS
FD5-Bio	F.D.no.5	Biotite Veinlet	PTS			
23-JR-035	Tappy	Pegmatite	PTS, PF	LT-21-11-6.05	Pegmatite	PTS
23-JR-036	Tappy	Pegmatite	PTS, PF	LT-21-11-42.8	Pegmatite	PTS, PF
23-JR-037	Tappy	Pegmatite	PTS, PF	LT-21-11-46.0	Contact	PTS, PF
23-JR-038	Tappy	Pegmatite	PTS	LT-21-11-49.4	Pegmatite	PTS
23-JR-039	Tappy	Pegmatite	PTS	LT-21-11-49.95	Pegmatite	PTS
23-JR-040	Tappy	Pegmatite	PTS, PF	LT-21-11-59.6	Pegmatite	PTS, PF
23-JR-041	Tappy	Pegmatite	PTS, PF	LT-21-11-62.5	Pegmatite	PTS
23-JR-041B	Tappy	Pegmatite	PTS	LT-21-11-69.5	Pegmatite	PTS, PF
23-JR-041C	Tappy	Pegmatite	PTS	LT-21-11-76.5	Pegmatite	PTS
23-JR-042	Tappy	Pegmatite	PTS, PF	LT-21-11-76.85	Pegmatite	PTS
23-JR-044	Tappy	Pegmatite	PTS	LT-21-11-79.9	Pegmatite	PTS
23-JR-045	Tappy	HR Contact	PTS	LT-21-11-80.8	Pegmatite	PTS
23-JR-046	Tappy	HR at 20 cm	Unused	LT-21-11-81.3	Pegmatite	PTS
23-JR-047	Tappy	HR at 80 cm	Unused	LT-21-11-82.5	Pegmatite	PTS
23-JR-048	Tappy	HR at 4 M	Unused	LT-21-11-95.85	Pegmatite	PTS
23-JR-049	Tappy	HR at 7.8M	Unused			
23-JR-050	Tappy	HR at 9.3 M	Unused	Channel Samples	Pegmatite	Location
23-JR-051	Tappy	HR at contact	Unused	CM24-10	F.D. no. 5	Margin
23-JR-052	Tappy	HR at 10cm	Unused	CM24-11	F.D. no. 5	Center
23-JR-053	Tappy	HR at 60 cm	Unused	CM24-12	F.D. no. 5	S. Host
23-JR-054	Tappy	HR at 1.7 M	Unused	CM24-13	F.D. no. 5	N. Host
23-JR-055	Tappy	HR at 6 M	Unused	CM24-15	Eagle	Margin
23-JR-056	Tappy	HR at 9.2 M	Unused	CM24-16	Eagle	Center
23-JR-057	Tappy	Small Pegmatite	PF	CM24-17	Eagle	HR

Abbreviations: PTS - Polished Thin Section, PF - Polished Face, HR - Host Rock
All channel samples were used for heavy mineral separates

Appendix II – Drill Hole Logs

Unit: Meters		Core no: LT-21-09
From	To	Description
0	2.5	Meta TTG - Dark in color and oriented 45* to core
2.5	2.87	Thin unmineralized dyke roughly parallel to core. Undulatory contact. Feldspar and quartz up to about 1 cm in size. Border of 0.5cm CM
2.87	3.77	Meta TTG
3.77	4.27	Thin about 7cm dyke similar to dyke at 2.5. No CM
4.27	9.57	Meta TTG
9.57	10	Fine grained unmineralized dyke. Increased hematization compared to previous dykes
10	10.5	Other dyke with 1cm crystals and CM
10.5	14.15	Meta TTG
14.15	14.33	Fine grained pink dyke with same composition to previous dykes. Contact at 30*
14.33	14.69	Same dyke but has zone of larger minerals. Feldspar and quartz up to 1.5cm
14.69	14.74	Meta TTG
14.74	15.24	Crenulated mafics
15.24	15.49	Meta TTG
15.49	15.6	Crenulated mafics
15.6	16.17	Meta TTG
16.17	16.44	Dike at 20 degrees. Half aplitic half pegmatitic. Mainly qtz and feldspar
16.44	19.15	Meta TTG with minor dykes
19.15	19.63	Crenulated mafics
19.63	20.82	Meta TTG
20.82	21.32	Mainly aplitic dyke with minor pegmatitic zones. Mostly qtz and feldspar
21.32	21.69	Meta TTG
21.69	22.64	Dyke of mixed aplite and pegmatitic texture. Locally intensely hematized. Feldspar, quartz, minor spodumene and biotite
22.64	32.15	Meta TTG with minor dykes and minor mafics
32.15	33.05	Dyke at 30 degrees. Mixed aplite and pegmatitic texture. Locally intensely hematized. Feldspar, quartz, minor spodumene and biotite
33.05	45.45	Meta TTG with minor dykes
45.45	45.95	Minor dyke at 30 degrees. Simple unmineralized
45.95	49.5	Meta TTG with minor mafics
49.5	49.88	Dyke with bulbous contact. Pegmatitic texture, xtals up to 2cm. Feldspar quartz and minor spodumene
49.88	53.4	Meta TTG with mafics
53.4	53.88	Dyke at 30 degrees. Aplite and pegmatitic zones. Feldspar, quartz, spodumene up to 3cm and minor biotite
53.88	56.91	Meta TTG with minor dykes
56.91	65.6	Main Dyke at 45 degrees. Large, zoned, mineralized dyke. Contains variable spodumene in different zones. Composed of Feldspar with varying amounts of hematization, smoky quartz, spodumene, minor biotite garnet and green mica.
65.6	66.25	Meta TTG
66.25	68.3	Dyke with minor spodumene and green mica. Hematized
68.3	69.45	Meta TTG
69.45	72.5	Fine grained spodumene bearing dyke. >10% spodumene
72.5	72.73	Simple dyke at 25 degrees
72.73	73.18	Meta TTG
73.18	73.46	Simple dyke at 25 degrees
73.46	89	Meta TTG with mafics
EOC		

Drill Hole Log

Unit: Meters		Core no: LT-21-11
From	To	Description
0	2.7	Meta TTG
2.7	3	Crenulated mafics
3	3.05	Small dyke/vein
3.05	4.47	Crenulated mafics
4.47	4.83	Meta TTG
4.83	5.6	Simple Pegmatite at 25* to core. Plagioclase, pink feldspar, smoky quartz minor mica. 1cm CM, plag up to 4cm minor hematization present
5.6	29.3	Meta TTG with minor crenulated mafics
29.3	29.88	Pink dyke at 10* to core. Hematized feldspar and smoky quartz up to 2cm. Small CM
29.88	42.43	Meta TTG with minor mafics
42.43	43.13	Aplitic pegmatite. White dyke with minor spodumene up to 1 cm. Minor Fe-ization. Foliation at 45 degrees to the core
43.13	45.9	Meta TTG
45.9	46	Minor aplitic dyke with small garnets
46	49.13	Meta TTG with minor dykes
49.13	50.25	White dyke - Feldspar, gray quartz and spod. Minor garnet in aplitic, minor biotite. CZ of dyke has 10cm albite, green spodumene up to 2 cm
50.25	51.3	Meta TTG with minor mafics
51.3	51.37	Simple dyke. Uniform xtl size from 0.5 to 2 cm
51.37	51.45	Crenulated mafics
51.45	51.5	Simple dyke. Uniform xtl size from 0.5 to 2 cm
51.5	59.3	Meta TTG with minor mafics
59.3	59.96	Dike at 45 degrees. Hematized. CM, Intermediate zone and CZ. Spodumene bearing in CZ. Green mica present
59.96	62	Meta TTG with minor mafics
62	62.8	Dyke at 45 degrees. Spodumene bearing with foliated spodumene at 45 degrees. Spodumene up to 3cm
62.8	67.2	Meta TTG with minor mafics
67.2	67.3	Dyke at 45 degrees. Crystals up to 2.5 cm. Simple composition
67.3	69.15	Meta TTG with minor dykes
69.15	69.77	Dyke at 45 degrees. Spodumene bearing with foliated spodumene at 45 degrees. Spodumene up to 3cm
69.77	70.6	Meta TTG
70.6	70.85	Dyke at 45 degrees. Spodumene bearing with foliated spodumene at 45 degrees. Spodumene up to 1cm
70.85	71.62	Meta TTG
71.62	71.97	Dyke at 45 degrees. Spodumene bearing with foliated spodumene at 45 degrees. Spodumene up to 3cm
71.97	72.35	Meta TTG
72.35	72.73	Dyke at 45 degrees. Aplitic compstion with spodumene bearing central zone - up to 4cm
72.73	76.4	Meta TTG
76.4	84.2	Main Dyke at 45 degrees. Large, zoned, mineralized dyke. Contains variable spodumene in different zones. Composed of feldspar with varying amounts of hematization, smoky quartz, spodumene, minor biotite garnet and green mica.
84.2	95.82	Meta TTG with minor mafics
95.82	96.12	Dyke at 45 degrees. Potentially hematized. Qtz, feldspar, minor beryl, minor green mica
96.12	119	Meta TTG with minor mafics
EOC		

Appendix III – LA ICP-MS Data for Trace Element Analyses on Alkali-Feldspar Li – Rb

Sample Name	Li	Be	B	Na	Mg	Al	P	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Ga	Ge	Rb
Eagle																		
23-JR-08-1	22.598	0.266	75.737	2747.886	37.194	96147.361	92.962	137464.596	228.847	0.527	1.076	<LOD	3.482	2.518	13.441	12.616	4.819	9236.451
23-JR-08-2	1032.393	0.884	81.137	5762.632	19.192	98380.688	<LOD	127961.268	269.189	0.461	4.208	0.195	2.354	52.936	521.293	15.395	4.147	7874.452
23-JR-08-3	5008.471	1.315	63.656	11019.663	1.931	102057.061	177.791	98866.166	235.098	0.478	12.667	0.174	2.448	39.334	873.224	48.772	5.460	6008.100
23-JR-08-4	4094.578	0.580	39.854	26646.213	36.458	64273.780	<LOD	19430.069	150.634	0.545	17.187	0.479	3.633	35.761	920.012	21.888	4.073	984.840
23-JR-08-5	36.670	0.178	74.927	1929.046	1.818	85273.539	27.087	134776.819	216.732	0.407	<LOD	<LOD	2.482	12.782	8.021	10.918	3.800	8466.072
23-JR-08-6	26.050	0.259	78.277	1594.747	10.322	85185.425	<LOD	131524.805	656.423	0.352	0.625	<LOD	2.355	61.096	13.471	12.330	4.001	8205.407
23-JR-08-7	20.976	0.072	61.561	5091.009	4.455	60070.247	<LOD	94688.513	95.774	0.460	7.632	<LOD	2.252	7.200	41.926	8.903	2.603	4724.051
23-JR-08-8	23.326	0.075	64.303	1879.525	9.086	66765.006	<LOD	113782.487	145.316	0.586	2.946	0.043	2.284	9.675	31.136	9.174	2.408	5296.970
23-JR-08-9	12.758	0.100	64.167	10560.567	1.205	69270.517	<LOD	98644.693	243.984	0.452	110.349	<LOD	2.510	20.608	16.160	7.817	2.069	5292.028
23-JR-10_g1-1	5.769	1.644	22.736	2036.944	1.633	98273.416	560.169	165347.584	121.814	0.433	7.111	<LOD	<LOD	6.535	9.720	66.479	7.057	10473.620
23-JR-10_g10-1	10.505	1.633	19.732	2892.150	0.227	99433.601	442.973	155835.546	97.895	0.350	3.882	<LOD	<LOD	10.051	26.522	66.858	6.537	9812.763
23-JR-10_g2-1	9.298	2.026	21.889	2817.936	0.449	98034.004	594.563	154671.816	113.586	0.394	5.105	<LOD	<LOD	8.156	51.409	65.805	6.749	9673.369
23-JR-10_g3-1	8.392	1.359	21.434	2526.113	1.396	87973.538	271.778	154848.495	163.657	0.427	7.260	<LOD	2.585	13.118	32.987	57.354	5.543	10015.458
23-JR-10_g4-1	9.674	2.269	21.096	3319.108	5.487	90559.791	346.059	156102.975	112.375	0.447	9.157	<LOD	2.452	10.761	56.409	59.187	6.184	10280.960
23-JR-10_g5-1	8.404	1.745	21.878	2561.769	1.677	97001.952	262.538	164696.445	196.299	0.482	9.580	<LOD	2.626	8.878	45.646	58.341	6.185	10635.286
23-JR-10_g6-1	7160.464	18.931	20.005	2556.537	1034.835	217774.318	43.093	145225.954	<LOD	1.555	1839.760	0.984	3.601	3569.352	74931.242	405.749	9.798	19066.749
23-JR-10_g7-1	8.761	1.422	19.850	3501.505	0.405	91294.825	328.656	158499.118	230.083	0.446	4.904	<LOD	1.851	15.637	16.931	58.895	6.255	9378.721
23-JR-10_g8-1	12.212	1.602	20.349	2452.422	0.122	91811.116	523.293	154173.787	115.933	0.402	3.062	<LOD	3.029	10.269	25.188	56.241	6.764	10191.525
23-JR-10_g9-1	11.661	2.228	20.740	2720.227	0.358	98067.935	336.981	153637.769	118.598	0.363	3.548	<LOD	2.965	9.753	43.282	63.212	6.806	9528.292
23-JR-11-1	17.708	2.044	94.429	2462.796	0.186	102045.961	504.689	136115.219	161.782	0.384	5.689	<LOD	3.491	20.391	83.528	51.551	7.811	7546.146
23-JR-11-2	20.411	2.045	97.182	2416.093	0.203	98650.291	283.975	153817.627	204.094	0.371	6.891	<LOD	3.423	20.607	19.639	60.177	6.999	7722.768
23-JR-11-3	22.866	1.180	93.626	2147.581	0.267	99994.022	613.776	143616.571	697.990	0.435	5.300	<LOD	3.380	89.949	25.658	53.151	8.471	8071.717
23-JR-11-4	23.565	2.060	88.588	2150.790	0.295	96142.060	591.949	136538.781	117.877	0.395	4.492	<LOD	3.074	6.510	20.567	53.897	9.306	7475.636
23-JR-11-5	12.175	0.187	97.009	1620.634	0.570	93622.499	139.531	150681.713	275.222	0.440	1.072	0.053	2.783	42.704	29.977	31.075	7.249	8691.274
23-JR-11-6	20.998	1.740	95.632	2347.243	2.668	97445.780	272.293	145391.871	341.726	0.426	5.468	<LOD	2.637	32.102	13.908	50.793	7.574	8550.888
23-JR-11-7	20.519	3.056	93.856	3855.511	0.312	96664.477	396.358	131667.597	493.848	0.421	4.325	<LOD	3.147	49.734	30.542	48.949	7.759	7644.331
23-JR-11-8	15.318	1.190	99.025	3588.830	0.413	96403.237	234.275	137696.326	90.849	0.447	3.483	<LOD	3.655	4.536	26.332	35.069	6.735	7895.627
23-JR-11-9	25.205	2.637	90.873	3772.065	0.490	102028.315	197.526	131007.092	109.456	0.280	5.709	<LOD	3.869	22.894	46.891	37.667	5.371	6904.875
23-JR-11-10	1.251	5.892	69.743	77493.262	0.341	103979.602	64.930	543.975	2967.331	0.323	1.490	<LOD	3.862	30.017	21.311	40.801	6.156	2.053
23-JR-13_g1-1	60.282	0.492	21.708	2483.412	0.680	95551.653	<LOD	158742.703	123.620	0.427	0.797	<LOD	2.438	4.769	6.932	9.612	3.458	7536.840
23-JR-13_g1-2	51.280	0.436	22.903	2535.337	0.353	94780.672	<LOD	166056.610	185.020	0.423	0.937	<LOD	2.374	8.000	<LOD	10.238	3.671	7667.867
23-JR-13_g2-1	47.720	0.255	21.397	2448.126	0.659	94890.699	<LOD	156055.998	202.193	0.436	0.550	<LOD	2.805	8.350	<LOD	10.414	3.722	7152.277
23-JR-13_g2-2	68.001	<LOD	22.906	2760.032	1.165	93533.435	<LOD	157705.826	356.125	0.405	0.450	<LOD	1.416	18.974	11.625	8.446	4.103	7065.846
23-JR-13_g3-1	47.844	0.220	21.383	1934.782	10.956	90238.776	<LOD	162619.279	303.533	0.465	0.673	<LOD	2.438	14.677	<LOD	11.243	3.499	7075.523
23-JR-13_g3-2	47.369	0.219	21.274	2640.323	0.171	98231.175	<LOD	156507.740	251.109	0.375	0.459	<LOD	3.261	8.205	<LOD	9.698	4.604	6936.400
23-JR-13_g4-1	32.228	0.478	23.182	2309.411	7.474	97977.883	34.339	156290.403	194.904	0.396	1.141	<LOD	<LOD	6.776	<LOD	15.888	4.021	6571.439
23-JR-13_g4-2	54.299	2.588	23.609	2610.599	0.959	95581.378	297.769	160747.203	119.559	0.418	4.952	<LOD	1.685	2.869	21.467	75.790	8.865	5939.657
23-JR-13_g5-1	33.969	0.315	19.769	2361.289	0.874	86241.919	<LOD	157139.961	215.880	0.428	0.369	<LOD	2.859	7.634	<LOD	9.964	4.532	6876.632
23-JR-13_g5-2	30.369	<LOD	21.619	2515.521	0.336	92687.013	33.258	172221.470	174.897	0.463	0.570	<LOD	1.912	5.068	<LOD	9.314	4.655	6885.526
23-JR-19-GrainA-1	11.379	1.894	79.857	2059.194	0.622	99193.794	263.326	143627.016	91.725	0.521	4.356	0.003	2.348	1.468	35.289	68.923	7.128	5193.146
23-JR-19-GrainA-2	11.165	2.507	73.892	2723.340	0.243	99661.669	316.787	145427.784	68.455	0.506	5.173	0.018	2.734	1.265	41.633	70.536	7.664	5173.572

23-JR-19-GrainA-3	10.275	2.680	73.075	2140.318	2.301	102029.596	74.288	140427.895	65.282	0.506	5.117	0.011	3.772	2.298	69.368	46.036	6.584	5366.994
23-JR-19-GrainB-1	8.424	1.714	69.147	1843.552	0.104	97965.536	291.920	142870.829	84.020	0.455	4.791	0.010	2.420	0.863	31.289	69.768	7.976	5112.336
23-JR-19-GrainB-2	7.115	3.424	64.651	15669.998	5.075	101386.955	313.059	122546.269	633.547	0.543	6.281	-0.006	3.230	1.403	33.268	74.790	7.964	4372.672
23-JR-19-GrainB-3	10.873	2.053	61.089	6534.139	0.502	94132.353	329.872	133677.713	124.566	0.567	4.436	-0.001	3.223	4.707	47.456	73.826	7.976	5485.486
23-JR-19-GrainB-4	10.443	2.327	63.672	2278.951	0.883	99101.882	392.405	141006.677	109.385	0.527	5.425	0.005	2.957	2.690	64.280	70.975	8.638	5664.578
23-JR-19-GrainC-1	8.009	3.006	59.327	15074.110	78.476	101223.215	108.659	118631.435	250.786	0.464	4.161	0.024	2.126	5.845	348.125	47.763	4.892	3657.044
23-JR-19-GrainC-2	22.012	2.984	64.844	2848.386	1.523	100164.962	192.172	139521.096	50.400	0.498	5.965	-0.004	2.649	5.811	126.682	45.446	4.327	5160.786
23-JR-19-GrainC-3	13.747	2.498	61.365	2844.458	0.774	101795.850	107.201	135333.583	73.912	0.429	5.826	-0.003	3.107	5.358	73.467	48.358	6.222	5642.935
23-JR-19-GrainC-4	14.877	3.427	59.026	2364.835	4.085	100076.152	208.592	140801.353	77.832	0.422	6.256	-0.002	3.331	10.608	87.618	47.075	5.096	5611.792
23-JR-19-GrainC-5	12.070	3.111	61.242	11194.640	1.112	102910.379	167.853	122370.724	189.058	0.450	4.669	-0.002	3.435	4.102	52.478	46.473	4.520	4153.431
23-JR-19-GrainC-6	14.560	2.377	60.077	2555.533	1.119	104395.036	200.110	143386.124	125.790	0.423	5.642	0.009	2.286	4.864	145.682	49.118	5.994	5761.528
23-JR-19-GrainD-1	7.233	1.143	57.269	2749.178	0.089	96062.285	272.470	142842.716	40.178	0.445	5.770	0.001	3.015	0.386	32.219	69.967	7.378	5377.922
23-JR-19-GrainD-2	8.901	1.816	53.141	2227.772	1.980	96456.383	441.210	151683.938	143.466	0.588	7.079	0.025	3.151	2.873	43.035	74.838	9.180	5780.867
23-JR-19-GrainD-3	9.264	1.717	54.866	3072.926	0.294	92935.350	200.448	149074.321	124.624	0.487	6.059	0.009	-0.679	8.232	36.585	76.682	7.577	5139.138
23-JR-19-GrainD-4	8.193	2.201	52.661	1934.818	1.082	92768.946	79.517	148328.485	171.209	0.518	5.483	0.008	0.572	103.741	53.225	65.642	6.838	5355.330
23-JR-25-GrainA-1	50.205	1.565	58.332	2950.519	0.693	98514.636	68.019	137386.822	79.905	0.435	4.272	-0.002	2.831	1.257	63.213	44.114	7.443	7404.462
23-JR-25-GrainA-2	55.970	2.881	59.990	3577.054	5.021	99325.545	135.852	142495.555	79.263	0.457	5.644	-0.002	5.511	23.934	48.081	53.082	8.509	7291.624
23-JR-25-GrainA-3	49.114	1.999	57.655	12996.257	2.287	96738.467	119.457	124247.765	116.747	0.535	4.219	0.025	2.642	10.091	97.483	47.236	8.075	6456.135
23-JR-25-GrainA-4	41.545	1.131	53.439	11373.074	919.642	88918.251	226.659	130548.947	1853.343	0.479	8.204	0.039	3.109	1.352	121.745	51.355	8.004	6714.767
23-JR-25-GrainB-1	60.926	1.892	59.613	2179.096	0.396	96848.373	125.983	144401.874	76.529	0.465	2.184	0.019	2.586	1.043	5.233	22.463	7.669	7461.390
23-JR-25-GrainB-2	45.957	0.837	62.312	1517.686	0.948	98951.042	143.582	150237.226	62.620	0.423	4.015	-0.004	2.853	0.322	24.410	48.431	8.300	7732.239
23-JR-25-GrainB-3	40.188	0.810	58.310	2353.370	0.965	97445.305	122.049	143683.394	79.266	0.453	3.001	0.019	2.906	0.486	29.350	22.681	6.781	7412.708
23-JR-25-GrainB-4	63.053	1.827	57.093	1962.049	0.705	93492.951	118.047	141684.144	59.624	0.426	2.999	-0.011	2.684	1.721	16.794	21.714	6.851	6927.691
23-JR-25-GrainB-5	60.370	1.957	57.340	2133.293	0.194	96863.138	156.243	152663.616	77.080	0.379	2.476	0.010	3.076	1.716	5.938	24.449	7.065	6594.177
23-JR-25-GrainB-6	73.764	2.694	59.309	2352.563	1.136	97483.336	122.689	143042.772	92.113	0.469	2.568	-0.010	2.421	5.291	16.587	21.674	7.150	6627.897
23-JR-25-GrainC-1	54.541	0.673	59.648	1815.010	4.919	97814.360	78.567	138157.713	48.695	0.408	2.144	0.000	2.868	3.767	92.077	50.462	7.215	7316.363
23-JR-25-GrainC-2	56.205	3.045	57.600	1803.379	1.621	98219.337	142.172	141654.527	91.700	0.394	5.108	0.006	3.221	7.204	110.359	58.933	8.046	7254.094
23-JR-25-GrainC-3	59.398	1.252	53.432	2059.970	0.280	94122.465	97.181	139410.824	54.070	0.445	5.395	0.006	2.499	3.098	120.156	68.912	9.041	6594.531
23-JR-25-GrainC-4	67.456	2.220	57.011	2317.473	0.405	99776.928	88.956	138269.169	43.823	0.424	4.259	-0.006	3.071	3.901	23.814	78.292	8.803	6681.772
23-JR-25-GrainC-5	46.001	1.348	55.402	9784.042	0.562	96311.923	95.473	133267.054	98.429	0.461	4.160	0.006	2.500	1.115	1.983	67.839	8.939	6688.257
23-JR-25-GrainD-1	50.395	1.340	51.301	4502.654	0.216	101833.973	548.330	134340.200	84.322	0.383	3.164	0.001	2.934	0.935	1.038	44.424	8.913	6985.240
23-JR-25-GrainD-2	51.385	1.942	53.632	2776.407	5.768	98568.163	392.955	139300.818	104.532	0.412	3.884	0.011	2.928	1.712	2.379	46.958	9.161	7329.093
23-JR-25-GrainD-3	39.614	1.879	51.081	17802.717	0.365	102018.416	400.069	112011.226	331.145	0.372	3.284	0.006	2.987	39.990	7.771	46.872	8.928	5577.070
23-JR-25-GrainD-4	50.018	2.284	54.406	2639.896	0.401	101927.049	467.690	138858.994	91.648	0.358	2.445	0.007	2.288	11.253	6.140	44.631	9.264	6776.552
23-JR-25-GrainE-1	40.504	1.155	51.839	9760.991	1.921	99876.072	110.540	125575.713	78.789	0.368	3.833	0.007	2.485	1.468	129.816	63.811	8.578	6520.944
23-JR-25-GrainE-2	47.725	1.664	54.944	1583.039	0.551	100827.677	125.007	140934.186	29.391	0.396	4.481	0.005	3.326	1.024	24.744	79.333	8.313	7262.253
23-JR-25-GrainE-3	47.541	2.249	51.628	16141.259	29.637	99942.507	98.316	113520.006	174.088	0.386	6.780	0.037	3.299	197.763	424.900	80.687	7.453	5838.567
LT-21-11-49.4-g1-1	14.276	2.425	16.130	5258.570	0.698	90966.297	212.923	153562.749	201.591	0.351	1.653	<LOD	3.189	<LOD	30.606	30.987	7.805	4204.040
LT-21-11-49.4-g1-2	16.424	3.099	15.989	3722.857	1.595	92567.506	171.414	157343.735	281.046	0.355	1.262	<LOD	2.866	6.487	57.033	33.358	7.258	3952.261
LT-21-11-49.4-g2-1	8.603	1.820	17.257	5222.815	1.556	89054.427	348.977	146630.770	375.297	0.332	1.947	<LOD	2.424	3.928	21.927	42.771	6.014	4235.435
LT-21-11-49.4-g2-2	9.660	3.607	16.603	15495.812	18.657	90174.730	329.435	125370.150	275.565	0.332	1.516	<LOD	4.682	3.250	90.654	43.445	6.362	4745.062
LT-21-11-49.4-g2-3	10.588	3.503	16.294	5167.110	2.709	92226.930	370.324	156129.181	190.935	0.361	1.658	<LOD	6.624	3.689	94.615	40.238	6.497	6106.810
LT-21-11-49.4-g3-1	9.348	4.196	16.817	2492.425	3.509	92915.198	31.797	147597.665	107.052	0.327	7.019	<LOD	3.654	2.526	92.229	42.977	6.176	4203.600
LT-21-11-49.4-g3-2	6.519	1.982	15.858	1739.764	7.444	91421.752	33.342	150153.376	129.732	0.301	4.610	<LOD	3.056	4.616	79.407	36.701	6.030	4428.638
LT-21-11-49.4-g4-1	7.807	5.175	17.810	2714.208	1.623	102349.528	39.829	151814.497	77.069	0.253	6.131	<LOD	2.978	6.567	131.418	42.642	5.128	4202.642
LT-21-11-49.4-g4-2	7.059	4.810	15.468	2845.980	1.272	94417.995	122.057	174471.239	120.359	0.273	7.105	<LOD	1.847	3.717	125.464	52.240	7.072	4234.829
LT-21-11-62.5-g1-1	27.689	2.837	16.442	3165.432	1.174	98044.595	544.186	154053.317	169.767	0.337	4.231	<LOD	3.113	11.326	60.052	66.158	7.565	6421.866
LT-21-11-62.5-g1-2	31.551	2.938	15.540	3016.921	0.462	96723.597	526.738	146321.495	107.652	0.281	3.752	<LOD	3.393	8.322	44.225	63.317	7.449	6889.828

LT-21-11-62.5-g2-1	10.264	0.886	13.457	22578.748	1.194	94067.615	38.834	109143.246	159.795	0.278	0.688	<LOD	3.090	2.455	246.818	44.094	6.618	4602.381
LT-21-11-62.5-g2-2	33.056	2.599	15.133	3820.666	0.367	98625.031	357.307	142877.625	80.047	0.267	1.927	<LOD	3.367	11.130	66.962	35.122	5.807	6872.050
LT-21-11-62.5-g3-1	12.154	2.923	15.460	8151.666	0.856	91316.654	495.764	155844.359	146.316	0.309	1.695	<LOD	4.305	<LOD	27.258	38.736	7.158	6499.904
LT-21-11-62.5-g3-2	13.105	1.019	14.613	2271.311	1.654	90675.478	238.017	158586.996	386.989	0.322	0.752	<LOD	4.137	8.177	83.074	30.363	6.447	7029.997
LT-21-11-62.5-g3-3	19.612	1.833	13.450	22122.050	5218.828	74677.380	600.077	119749.385	8505.602	0.323	18.705	0.124	2.780	3.564	61.236	25.660	4.918	5334.518
LT-21-11-62.5-g4-1	36.845	2.060	14.654	2256.052	0.186	89301.946	373.004	154774.157	92.238	0.291	4.017	<LOD	2.857	1.034	22.838	57.830	6.622	6713.443
LT-21-11-62.5-g4-2	36.169	2.638	15.151	3141.142	0.196	91567.086	489.158	161361.670	92.152	0.278	2.687	<LOD	3.947	3.869	39.440	37.614	6.831	6867.026
LT-21-11-62.5-g4-3	15.638	0.997	13.060	68083.440	18800.899	28934.264	654.617	44696.453	29997.005	0.327	60.934	0.401	5.386	11.253	94.953	11.648	2.633	1520.177
LT-21-11-62.5-g4-4	28.609	2.685	13.015	3254.033	0.103	91369.657	518.020	147023.015	113.729	0.321	3.018	<LOD	2.566	1.909	15.498	38.917	7.991	6396.746

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23-JR-29-G1-1	36.896	3.407	90.174	3902.211	1.617	94236.255	110.766	128068.880	186.542	0.448	6.076	<LOD	3.182	1.793	107.007	31.140	3.720	2941.033
23-JR-29-G1-2	33.764	3.448	97.430	2347.459	0.475	98539.785	94.951	137759.786	76.263	0.399	5.915	<LOD	3.110	3.906	97.798	30.857	3.880	3346.260
23-JR-29-G1-3	33.725	3.483	90.888	2399.214	0.432	97825.860	98.547	135376.704	45.853	0.374	5.657	<LOD	3.322	3.039	68.338	30.755	4.172	3671.756
23-JR-29-G1-4	46.600	3.682	91.777	2288.144	1.066	98322.792	127.936	138429.533	154.506	0.388	5.559	<LOD	3.278	6.771	125.779	30.840	3.674	3293.950
23-JR-29-G1-5	36.371	2.793	88.377	2674.904	0.768	95448.431	140.993	140021.960	106.438	0.444	4.178	<LOD	3.540	3.612	103.601	31.453	3.990	3099.093
23-JR-29-G1-6	28.847	2.858	87.176	3186.450	1.170	98433.009	110.823	131646.810	74.127	0.363	5.388	<LOD	3.344	1.592	118.505	29.801	3.950	3133.703
23-JR-29-G1-7	35.638	3.152	82.943	2496.844	3.644	90189.517	167.764	144550.805	106.072	0.368	4.346	<LOD	3.001	1.405	166.574	30.770	3.569	3245.367
23-JR-29-G1-8	42.875	2.339	77.325	2024.305	0.906	87359.624	111.364	133688.360	138.307	0.378	4.048	<LOD	2.872	3.734	110.053	29.853	3.922	3393.748
23-JR-29-G1-9	49.699	2.912	84.164	2232.609	0.795	96758.127	94.822	151714.599	75.065	0.420	4.598	<LOD	3.496	3.742	111.739	32.056	4.327	3479.225
23-JR-32_g1-1	42.883	2.081	22.585	2711.514	0.480	95973.658	154.393	149530.307	95.073	0.360	2.289	<LOD	1.555	3.968	54.590	58.533	6.513	4025.883
23-JR-32_g1-2	27.026	1.011	22.138	3111.017	7.116	97870.406	131.658	148800.713	78.451	0.365	2.565	<LOD	2.177	<LOD	21.464	64.991	7.591	4018.463
23-JR-32_g2-1	35.910	1.435	21.421	4297.747	0.349	93124.427	155.429	148829.236	183.914	0.330	2.463	<LOD	2.891	9.235	46.129	55.884	5.586	3750.903
23-JR-32_g2-2	43.201	2.666	22.292	2673.554	1.443	99065.241	103.080	150166.455	125.302	0.354	3.462	<LOD	2.889	11.048	110.387	37.440	4.204	3473.332
23-JR-32_g2-3	1.068	1.720	16.949	79300.288	0.134	97764.835	78.526	441.804	532.472	0.327	2.995	<LOD	2.826	<LOD	<LOD	37.346	4.421	1.421
23-JR-32_g2-4	35.279	2.182	21.243	2784.556	2.194	96653.005	109.232	148925.003	171.413	0.384	2.777	<LOD	3.249	16.510	77.116	39.443	4.659	3608.082
23-JR-32_g3-1	22.649	1.303	20.174	3828.745	0.242	88000.044	164.738	167184.285	123.042	0.439	2.495	<LOD	3.690	2.574	47.417	64.829	7.273	3919.628
23-JR-32_g3-2	35.264	0.784	18.372	3963.762	0.353	87272.604	70.062	150894.126	132.725	0.373	0.858	<LOD	2.385	2.619	25.166	32.479	5.158	3989.433
23-JR-33-GrainA-1	32.570	1.268	53.363	2378.471	0.387	98373.343	61.904	146363.929	144.160	0.357	3.552	-0.004	2.792	2.572	46.001	22.498	4.735	3493.779
23-JR-33-GrainA-2	37.768	0.002	51.878	2099.948	0.124	96897.061	33.359	153739.547	85.999	0.424	0.422	0.004	2.347	0.415	14.319	12.203	5.043	3724.924
23-JR-33-GrainA-3	38.126	3.703	52.675	3992.002	1.106	101613.657	99.619	138467.492	96.183	0.380	5.196	0.002	2.931	7.573	132.945	31.973	3.978	3203.044
23-JR-33-GrainA-4	39.739	4.130	52.762	4065.976	2.188	100869.144	92.403	139598.262	42.096	0.412	5.007	-0.003	2.754	6.010	147.702	32.986	4.034	2984.364
23-JR-33-GrainA-5	38.939	4.230	48.806	5364.170	0.619	98731.917	96.054	138357.251	138.955	0.386	5.829	-0.002	2.679	10.977	102.179	32.436	3.910	3305.174
23-JR-33-GrainA-6	27.190	1.127	50.350	4760.808	3.119	98711.147	84.846	148670.661	83.688	0.453	2.822	-0.002	2.181	1.045	72.502	27.503	4.910	3645.248
23-JR-33-GrainB-1	24.283	3.728	51.966	4299.911	0.623	99538.249	72.900	140184.334	53.129	0.361	5.685	-0.002	2.671	2.824	117.114	33.496	4.212	3439.747
23-JR-33-GrainB-2	35.242	3.376	51.861	2602.766	1.199	101866.554	70.097	143057.365	70.748	0.334	4.530	-0.015	2.616	3.997	141.640	32.136	4.394	3355.994
23-JR-33-GrainB-3	32.996	3.849	51.789	3388.376	1.563	102515.973	87.400	140385.818	74.977	0.342	6.370	-0.010	2.787	6.506	130.627	31.943	4.002	2945.560
23-JR-33-GrainB-4	32.395	3.581	46.290	2812.514	1.234	102179.593	71.621	139965.013	143.809	0.396	5.168	0.028	2.282	8.525	135.443	31.244	4.057	3292.599
23-JR-33-GrainB-5	35.196	2.800	44.500	2276.020	0.457	103049.019	92.270	144978.452	52.890	0.337	5.148	0.001	3.229	1.634	103.851	31.456	3.949	3814.705
23-JR-34-GrainA-1	37.993	0.993	36.598	2984.407	0.072	100331.594	208.144	148761.179	65.054	0.359	1.426	0.003	3.249	1.172	33.993	66.090	6.700	3792.040
23-JR-34-GrainA-2	50.345	1.902	33.903	2168.336	1.436	100891.025	160.881	149354.949	87.853	0.305	1.905	-0.024	2.802	6.768	103.745	44.367	6.010	3873.376
23-JR-34-GrainA-3	34.765	1.863	32.101	1929.447	0.425	102383.574	82.731	155506.050	56.204	0.308	4.965	-0.010	3.200	0.975	68.955	31.083	4.122	3968.511
23-JR-34-GrainA-4	39.088	3.154	32.032	3649.146	0.233	100811.982	92.789	145775.867	35.402	0.285	5.088	-0.005	2.743	0.977	95.689	32.662	4.294	3408.900
23-JR-34-GrainA-5	58.303	4.285	30.665	2495.475	0.286	96955.260	109.758	149939.337	52.138	0.279	5.229	-0.002	2.791	3.632	88.732	33.545	4.181	4143.417
23-JR-34-GrainA-6	64.436	1.415	33.539	1805.187	0.278	103010.216	204.235	148033.342	41.863	0.298	2.279	0.020	2.789	1.913	45.885	55.541	6.498	4293.896
23-JR-34-GrainA-7	52.482	2.063	29.726	3873.941	0.260	100987.759	323.943	141772.434	90.132	0.289	2.370	0.020	2.052	4.145	40.006	56.118	5.192	3617.169

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23-JR-35-G1-1	34.080	6.595	75.917	2025.604	6.361	93963.560	1026.475	141857.736	247.385	0.411	0.952	<LOD	2.636	67.179	76.945	24.673	6.859	10814.431
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23-JR-35-G1-2	49.039	2.132	76.794	2957.463	0.733	101782.271	1296.832	139732.130	38.331	0.371	0.664	<LOD	3.021	10.015	9.629	27.142	6.930	9924.973
23-JR-35-G2-1	52.791	2.379	80.062	3220.418	0.203	101729.702	1270.169	134475.144	56.176	0.294	0.957	<LOD	4.066	9.320	12.700	25.262	8.324	9055.866
23-JR-35-G2-2	51.996	3.090	78.289	3240.472	<LOD	102887.950	1227.417	139761.455	25.706	0.325	0.992	<LOD	3.848	1.822	<LOD	25.738	7.145	9636.407
23-JR-35-G2-3	48.832	2.824	73.745	2722.440	1.412	99606.915	1405.546	143906.711	262.846	0.354	1.420	<LOD	3.440	9.729	8.070	28.128	8.197	10404.920
23-JR-35-G3-1	35.486	1.544	80.266	2011.037	1.196	102455.904	1439.954	134321.074	50.059	0.343	1.254	<LOD	4.346	12.867	26.112	26.434	10.408	11923.942
23-JR-35-G3-2	52.745	2.097	73.039	2342.356	0.187	106372.090	1553.757	136565.822	32.060	0.352	0.627	<LOD	3.001	<LOD	<LOD	27.658	9.843	11372.154
23-JR-35-G3-3	32.015	1.325	73.161	2599.479	2.495	102568.667	1431.546	135895.934	63.054	0.313	<LOD	<LOD	2.898	7.237	184.398	25.723	10.452	11523.021
23-JR-35-G3-4	49.517	3.099	72.140	3450.631	0.110	105189.241	1763.610	134628.382	30.677	0.339	0.844	<LOD	3.511	4.862	7.421	28.973	11.426	10858.935
23-JR-35-G3-5	46.660	1.777	67.548	1834.969	2.759	95754.926	1589.336	139826.517	108.019	0.343	0.864	<LOD	2.386	2.449	45.608	27.516	11.840	11917.359
23-JR-35-G3-6	49.220	6.244	73.640	3060.852	11.490	103642.973	1943.901	134980.301	161.354	0.385	1.017	<LOD	3.003	4.074	<LOD	30.484	12.629	11313.226
23-JR-36-G1-1	51.655	2.234	76.710	3196.061	0.554	104915.078	820.668	136097.568	<LOD	0.364	0.881	0.110	4.167	72.325	13.476	15.365	5.189	10556.470
23-JR-36-G1-2	46.121	2.014	77.910	3351.710	0.102	101769.153	1099.090	133861.318	37.283	0.320	0.972	<LOD	4.127	2.881	5.759	16.918	5.856	9964.163
23-JR-36-G1-4	47.809	2.586	80.346	3162.244	0.108	102021.069	1036.627	141295.183	35.632	0.308	1.345	<LOD	3.245	5.169	32.479	25.501	6.813	11531.820
23-JR-36-G1-5	58.460	2.217	76.270	3331.434	<LOD	99952.874	1032.616	139191.266	33.719	0.358	1.352	0.042	3.534	11.364	10.232	27.000	7.020	11495.052
23-JR-36-G1-6	53.931	2.072	82.339	1562.165	4.855	97919.675	1125.941	138981.074	940.382	0.389	1.055	0.088	3.379	21.040	470.758	24.445	9.404	11116.654
23-JR-36-G2-2	52.205	1.428	73.785	2715.856	0.250	95012.807	1112.407	135580.571	86.255	0.385	0.987	<LOD	3.084	2.802	7.697	27.358	7.631	11015.322
23-JR-36-G2-3	41.268	1.255	70.641	2457.978	0.180	92871.115	1079.156	138083.041	121.557	0.370	1.177	<LOD	3.307	6.089	72.442	25.363	7.061	10834.289
23-JR-36-G2-4	21.951	1.107	65.413	21768.816	156.462	95076.469	617.588	109190.239	318.441	0.416	0.733	0.731	2.529	12.211	550.716	20.894	6.885	7507.922
23-JR-36-G2-5	62.116	3.023	79.854	4912.852	3.692	98937.002	1014.340	138021.358	45.795	0.418	0.986	<LOD	3.349	7.972	22.750	26.348	7.133	12478.405
23-JR-38-GrainA-1	3.634	0.050	26.704	90721.441	21686.131	6089.782	137.386	7273.583	39922.960	0.350	74.376	0.589	2.859	13.311	99.880	0.930	0.862	35.401
23-JR-38-GrainA-2	3.708	0.008	25.965	91374.562	21702.383	6108.081	174.393	7497.865	40060.621	0.344	75.139	0.581	3.022	13.396	110.453	0.947	0.932	30.039
23-JR-38-GrainA-3	72.748	0.263	32.867	2215.205	6.059	99000.221	793.776	140193.665	38.525	0.328	0.628	0.007	2.710	0.477	2.410	12.915	6.767	15973.854
23-JR-38-GrainA-4	77.151	0.608	32.656	3513.435	0.133	101498.072	978.532	137876.197	66.632	0.261	0.649	-0.010	3.221	0.504	0.073	16.506	7.125	15650.095
23-JR-38-GrainA-5	3.702	0.079	26.851	90113.708	21763.611	6141.996	126.552	7345.620	40259.626	0.342	73.205	0.613	3.136	14.486	106.646	0.931	0.876	35.913
23-JR-38-GrainA-6	279.746	1.215	33.829	1687.044	11.469	99787.156	1136.457	156938.346	120.781	0.407	1.539	0.009	2.740	1.363	70.352	14.125	7.621	16411.932
23-JR-39_g1-1	60.081	1.747	17.844	1969.704	0.854	97129.724	1219.657	153006.893	159.263	0.362	1.113	<LOD	3.135	15.027	3.752	26.823	5.998	12124.469
23-JR-39_g10-1	79.501	2.617	16.877	3070.518	96.477	99077.128	2194.967	140954.594	299.029	0.242	1.359	<LOD	3.714	17.226	30.636	29.568	11.824	10985.008
23-JR-39_g11-1	39.556	1.121	15.058	28771.389	7300.545	74771.481	1126.070	107759.549	11576.445	0.294	22.653	0.179	3.128	5.409	42.262	18.283	5.401	8611.150
23-JR-39_g2-1	50.436	2.312	15.546	3178.518	0.514	93065.444	1527.252	152235.181	110.108	0.352	1.073	<LOD	4.374	1.666	36.017	26.799	6.763	11373.130
23-JR-39_g3-1	48.269	0.724	16.424	1395.313	2.238	93514.398	1197.774	158782.937	273.006	0.351	0.956	<LOD	3.852	5.005	53.712	27.207	6.327	13615.276
23-JR-39_g4-1	58.900	0.679	16.356	2349.506	0.699	97229.915	1256.412	155146.355	99.031	0.310	1.318	<LOD	3.559	1.658	7.121	27.149	7.072	12792.433
23-JR-39_g5-1	63.299	0.943	15.092	9947.104	2151.815	88294.322	1661.930	142815.722	3946.131	0.360	8.573	0.060	4.622	3.074	39.765	23.784	7.020	11063.530
23-JR-39_g6-1	50.852	0.849	16.760	2284.092	1.079	99117.614	1222.609	151072.818	124.676	0.287	0.973	<LOD	4.272	1.600	<LOD	27.226	6.809	12325.036
23-JR-39_g7-1	56.429	2.283	17.161	3004.904	0.466	96083.154	1573.139	145583.362	113.787	0.313	0.730	<LOD	3.488	4.295	<LOD	26.880	7.629	11046.897
23-JR-39_g8-1	65.951	2.022	16.562	3888.174	0.158	95941.209	1448.665	148753.459	76.809	0.325	0.787	<LOD	3.377	3.937	<LOD	25.899	7.465	11527.222
23-JR-39_g9-1	8.851	0.200	14.928	79603.368	22727.499	15746.351	305.338	24366.698	36337.667	0.348	72.459	0.495	3.972	11.837	113.689	3.640	1.532	1391.458
23-JR-40-Horiz-1	56.519	1.767	72.005	1610.430	1.049	96546.644	923.239	139331.679	74.926	0.338	0.985	0.035	2.873	3.270	252.715	29.327	8.071	12647.156
23-JR-40-Horiz-2	43.431	2.853	75.144	7899.522	25.341	100114.197	1277.421	129481.244	308.524	0.323	0.692	0.063	3.452	32.916	678.584	31.429	8.072	11131.431
23-JR-40-Horiz-3	52.693	2.409	80.756	2281.744	0.551	100833.153	1147.019	133063.020	37.915	0.332	1.173	<LOD	3.542	8.327	14.711	32.001	7.606	11501.031
23-JR-40-Horiz-4	74.061	2.300	79.742	2145.762	1.478	102237.499	1316.875	136257.911	326.726	0.346	1.167	<LOD	3.692	5.759	12.224	31.975	7.458	11997.689
23-JR-40-Horiz-5	52.833	1.612	72.642	9312.360	17.066	101922.209	868.344	122604.502	158.376	0.326	1.018	<LOD	3.069	17.403	72.356	31.137	7.667	11096.164
23-JR-40-Horiz-6	48.843	1.770	74.222	1771.304	3.586	99311.022	874.614	134912.624	84.185	0.355	0.758	<LOD	3.197	4.313	235.341	30.130	7.224	12076.496
23-JR-40-Horiz-7	51.863	2.560	76.407	2295.297	11.191	102084.051	1205.862	136830.407	174.175	0.311	0.786	<LOD	3.505	4.628	21.234	28.995	7.780	12465.464
23-JR-40-Vert-1	62.414	2.061	75.083	1795.282	0.727	100623.255	922.367	134089.412	116.392	0.347	1.475	<LOD	3.357	7.621	21.346	33.128	7.880	11951.796
23-JR-40-Vert-2	72.624	2.237	73.980	1955.761	2.809	104750.717	1253.061	134955.155	619.272	0.316	1.260	<LOD	4.256	10.437	21.082	31.551	8.089	11954.720
23-JR-40-Vert-3	56.884	2.784	65.448	9654.713	1604.246	90649.000	1498.511	125522.935	3192.866	0.285	7.991	0.059	4.821	20.477	82.446	32.345	7.413	10293.869
23-JR-40-Vert-4	75.407	2.143	73.145	1907.023	1.904	95968.341	1024.942	137524.350	328.107	0.337	1.233	<LOD	3.498	9.164	45.034	31.813	7.541	11112.334
23-JR-40-Vert-6	44.729	1.973	71.606	1793.987	5.647	103132.405	1158.158	137994.072	268.976	0.334	1.141	<LOD	3.644	1232.342	66.957	28.825	7.875	11962.540

23-JR-41-GrainA-1	70.981	1.204	34.247	2157.619	26.814	101279.255	888.024	147684.067	275.660	0.239	0.770	0.004	2.699	66.352	25.989	6.842	3.872	14581.252
23-JR-41-GrainA-2	181.719	3.097	62.070	1358.584	21.598	110103.492	737.536	143072.740	361.982	0.328	1.014	0.021	2.121	127.164	405.516	14.329	5.108	14086.143
23-JR-41-GrainA-3	252.643	2.174	47.767	1789.402	26.513	103375.122	1190.489	144446.468	120.769	0.358	1.576	0.026	3.910	2.088	110.868	29.627	8.265	14387.033
23-JR-41-GrainA-4	61.605	1.500	33.813	2015.598	36.201	101686.925	2759.646	136968.459	170.647	0.301	1.209	-0.001	3.262	44.032	13.312	29.635	8.711	13249.540
23-JR-41-GrainA-5	5497.240	1.512	24.011	69023.141	884.898	97872.420	440.690	832.352	1967.751	0.292	9.462	0.108	2.420	423.417	273.794	39.480	6.782	8.708
23-JR-41-GrainB-1	994.026	23.577	133.669	1955.397	6957.539	106171.819	881.621	103134.576	1370.828	0.462	14.861	0.030	2.814	1048.941	9178.746	35.538	6.491	9934.067
23-JR-41-GrainB-2	29.126	10.713	24.247	51950.488	12838.480	6505.308	2368.121	5154.282	26236.636	0.425	50.633	2.613	6.279	4774.869	1961.194	1.643	1.941	37.113
23-JR-41-GrainB-3	160.004	4.330	33.905	55444.272	11729.039	45710.575	2862.350	54323.166	24452.019	0.345	40.887	0.484	5.279	731.632	339.112	11.321	4.710	4551.734
23-JR-41-GrainB-4	67.840	4.325	27.820	14791.057	2573.125	75862.727	25415.737	119787.261	6267.575	4.137	14.565	2.934	75.186	156.792	513.418	26.129	14.258	10337.885
23-JR-41-GrainB-5	71.375	2.055	28.287	7686.739	1321.076	92168.091	8131.317	146333.930	3609.092	0.230	10.777	0.989	24.012	4598.134	687.276	24.866	7.641	12943.381
23-JR-41-GrainC-1	52.591	0.772	32.372	1482.751	3.659	99013.920	1116.455	148479.512	288.508	0.296	1.459	-0.009	2.819	14.899	29.272	28.407	6.432	13571.283
23-JR-41-GrainC-2	56.449	1.147	31.520	1970.437	2.137	99960.524	1063.623	147958.003	118.814	0.372	1.896	0.018	2.753	2.026	0.500	27.581	5.929	14279.685
23-JR-41-GrainC-3	54.052	0.634	33.092	1440.436	2.508	96291.210	761.150	150451.359	311.680	0.339	0.872	-0.010	2.658	45.945	36.815	19.737	6.448	15165.894
23-JR-41-GrainC-4	87.492	2.027	30.806	2462.062	4.472	97941.032	1499.239	146496.205	93.804	0.277	1.243	-0.002	2.708	2.289	7.863	30.603	10.144	13992.253
23-JR-41-GrainC-5	456.600	1.331	25.586	51406.388	17.046	104455.541	437.334	56306.105	116.204	0.295	7.218	0.009	1.726	42.193	424.856	31.076	5.575	5334.994

LA ICP-MS Data for Trace Element Analyses on Alkali-Feldspar Sr – U

Sample Name	Sr	Y	Nb	Sn	Cs	Ba	La	Ce0	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Ta	Ti0	Pb0	U
Eagle																								
23-JR-08-1	10.066	0.009	0.012	<LOD	207.794	247.048	0.020	0.018	<LOD	<LOD	<LOD	0.014	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.007	43.863	31.572	<LOD
23-JR-08-2	44.542	0.015	0.060	1.203	212.027	361.210	0.034	0.025	<LOD	<LOD	<LOD	0.040	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.093	44.144	89.556	<LOD
23-JR-08-3	16.552	0.034	0.029	2.086	134.852	111.043	0.041	0.068	0.005	0.026	0.018	0.020	<LOD	0.002	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.165	34.244	45.321	<LOD
23-JR-08-4	29.064	0.022	0.039	1.773	14.656	88.188	0.004	0.005	0.003	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.319	5.742	2.589	<LOD
23-JR-08-5	47.949	0.007	0.002	0.063	224.575	285.743	0.029	0.024	<LOD	<LOD	<LOD	0.029	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.019	47.504	93.534	0.007
23-JR-08-6	50.153	0.145	<LOD	<LOD	182.233	302.625	0.039	0.052	0.004	0.028	0.025	0.025	0.054	0.006	0.015	<LOD	0.004	<LOD	<LOD	<LOD	0.047	43.370	79.465	0.009
23-JR-08-7	12.753	0.004	0.317	0.167	124.208	173.335	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.207	28.476	7.536	0.004
23-JR-08-8	9.076	0.004	0.056	0.079	166.437	149.662	0.001	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.071	34.037	10.587	0.009
23-JR-08-9	16.794	0.008	4.980	0.117	150.190	95.902	<LOD	<LOD	<LOD	<LOD	<LOD	0.002	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	3.032	25.987	7.669	<LOD
23-JR-10_g1-1	10.466	0.010	0.005	0.299	223.140	45.106	0.020	0.017	0.001	<LOD	<LOD	0.009	<LOD	0.001	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.020	51.935	49.432	0.017
23-JR-10_g10-1	9.714	0.004	0.006	0.298	254.987	57.111	0.015	0.016	<LOD	<LOD	<LOD	0.013	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.020	53.846	67.248	<LOD
23-JR-10_g2-1	7.796	<LOD	0.004	1.099	213.153	41.647	0.012	0.011	0.001	<LOD	<LOD	0.015	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.013	53.739	50.399	<LOD
23-JR-10_g3-1	7.736	0.005	0.004	0.234	219.159	95.337	0.027	0.023	0.001	<LOD	<LOD	0.007	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.026	55.101	58.198	0.013
23-JR-10_g4-1	8.271	<LOD	0.004	0.792	222.368	97.761	0.032	0.031	0.002	<LOD	<LOD	0.017	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.007	56.509	53.341	<LOD
23-JR-10_g5-1	7.339	<LOD	0.002	0.745	217.714	89.670	0.028	0.034	0.001	<LOD	<LOD	0.015	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	59.557	58.506	<LOD
23-JR-10_g6-1	1.688	0.021	404.633	1052.440	1046.183	37.282	0.002	0.005	<LOD	<LOD	<LOD	<LOD	0.007	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	308.449	79.226	10.535	0.038
23-JR-10_g7-1	12.078	0.007	0.028	0.686	202.128	51.156	0.016	0.020	0.001	<LOD	<LOD	0.015	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.094	50.669	87.338	<LOD
23-JR-10_g8-1	12.343	0.009	0.003	0.437	233.910	61.126	0.026	0.029	0.001	<LOD	<LOD	0.012	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.016	53.940	90.453	<LOD
23-JR-10_g9-1	12.016	0.002	0.002	0.589	234.167	61.600	0.025	0.021	0.001	<LOD	<LOD	0.017	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.008	52.143	73.163	<LOD
23-JR-11-1	24.065	0.036	0.009	0.798	310.146	167.528	0.038	0.061	0.008	0.012	0.017	0.030	0.010	0.002	0.006	<LOD	<LOD	<LOD	<LOD	<LOD	0.062	43.619	61.403	<LOD
23-JR-11-2	14.282	0.004	0.003	0.292	346.864	52.758	0.027	0.022	0.001	<LOD	<LOD	0.046	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.016	45.108	50.553	<LOD
23-JR-11-3	26.083	0.022	0.006	0.125	337.318	59.522	0.023	0.036	0.001	0.009	<LOD	0.032	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.070	47.527	54.649	<LOD
23-JR-11-4	23.196	0.003	0.007	0.372	369.391	69.525	0.017	0.022	<LOD	<LOD	<LOD	0.060	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.014	45.011	60.507	<LOD
23-JR-11-5	9.509	0.036	0.077	0.093	135.674	123.949	0.017	0.031	0.004	<LOD	0.019	0.009	0.017	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.151	44.955	24.544	<LOD
23-JR-11-6	21.299		0.005	<LOD	347.683	158.593	0.019	0.025	0.003	0.016	<LOD	0.027	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.008	47.230	71.761	<LOD
23-JR-11-7	26.739	0.005	0.010	0.300	290.260	115.388	0.022	0.017	<LOD	<LOD	<LOD	0.063	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.018	44.634	72.219	<LOD
23-JR-11-8	17.052	0.014	0.014	<LOD	319.558	167.072	0.029	0.029	0.004	<LOD	<LOD	0.028	0.014	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.017	44.490	53.924	0.007
23-JR-11-9	20.986	0.004	<LOD	0.548	333.276	132.589	0.031	0.022	0.001	<LOD	<LOD	0.066	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.007	42.409	52.206	<LOD
23-JR-11-10	14.737	0.009	<LOD	<LOD	0.672	2.117	0.030	0.078	0.009	0.017	0.019	0.015	<LOD	0.002	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.007	<LOD	5.242	<LOD
23-JR-13_g1-1	6.432	0.005	0.004	<LOD	259.794	230.765	0.001	<LOD	<LOD	<LOD	<LOD	0.011	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.006	40.421	32.425	<LOD
23-JR-13_g1-2	48.843	0.006	0.007	<LOD	270.239	287.388	0.002	<LOD	<LOD	<LOD	<LOD	0.043	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.010	41.307	54.314	0.007
23-JR-13_g2-1	73.237	0.016	0.005	0.119	133.644	661.899	0.006	0.004	<LOD	<LOD	<LOD	0.058	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.017	37.717	66.964	<LOD
23-JR-13_g2-2	122.370	0.028	0.012	0.059	138.812	493.897	0.023	0.004	0.006	0.015	0.006	0.090	0.007	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.014	36.441	84.127	0.030
23-JR-13_g3-1	14.596	0.017	0.010	<LOD	150.748	505.646	0.006	0.002	<LOD	<LOD	<LOD	0.017	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.018	37.560	40.769	0.067
23-JR-13_g3-2	77.756	0.013	<LOD	<LOD	145.078	536.735	0.004	<LOD	<LOD	<LOD	<LOD	0.050	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.018	37.333	77.042	<LOD
23-JR-13_g4-1	17.473	0.007	0.012	<LOD	282.321	365.539	0.006	0.003	0.001	<LOD	0.008	0.010	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.059	34.409	29.845	0.005
23-JR-13_g4-2	41.780	0.007	0.003	0.358	184.741	155.544	0.036	0.032	<LOD	<LOD	<LOD	0.069	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.018	35.137	46.613	<LOD
23-JR-13_g5-1	68.017	0.017	0.013	<LOD	170.885	656.813	0.006	0.002	<LOD	<LOD	<LOD	0.041	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.038	35.208	82.019	<LOD
23-JR-13_g5-2	8.381	0.017	0.008	<LOD	151.845	306.607	0.020	<LOD	0.004	0.009	<LOD	0.006	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.014	36.296	23.421	0.017
23-JR-19-GrainA-1	30.193	0.017	0.004	0.248	162.446	344.280	0.078	0.048	0.005	0.008	0.000	0.035	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.028	27.823	31.257	0.000
23-JR-19-GrainA-2	36.818	0.007	0.002	0.087	165.998	236.309	0.072	0.044	0.001	0.002	0.000	0.051	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	29.418	38.275	0.000

23-JR-19-GrainA-3	20.265	0.021	0.003	0.084	143.683	1092.203	0.035	0.030	0.002	0.000	0.004	0.056	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.014	29.243	27.020	0.000
23-JR-19-GrainB-1	8.855	0.037	0.002	0.049	138.003	463.568	0.061	0.039	0.002	0.005	0.000	0.037	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.042	25.148	6.063	0.000
23-JR-19-GrainB-2	25.899	0.089	0.004	0.046	133.342	160.535	0.092	0.125	0.018	0.059	0.066	0.077	0.067	0.008	0.011	0.001	0.000	0.000	0.000	0.000	0.009	22.531	13.534	0.000
23-JR-19-GrainB-3	37.927	0.018	0.003	0.067	176.574	206.447	0.077	0.048	0.002	0.004	0.004	0.049	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	26.663	46.744	0.000
23-JR-19-GrainB-4	9.822	0.014	0.000	0.088	172.136	436.560	0.061	0.054	0.003	0.004	0.000	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012	29.729	24.762	0.001
23-JR-19-GrainC-1	25.142	0.065	0.044	0.245	101.275	391.162	0.153	0.245	0.048	0.115	0.036	0.036	0.023	0.001	0.015	0.002	0.000	0.000	0.000	0.000	0.093	19.316	10.838	0.063
23-JR-19-GrainC-2	25.708	0.011	0.019	0.549	141.638	261.948	0.053	0.029	0.000	0.000	0.000	0.038	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.039	24.933	47.456	0.022
23-JR-19-GrainC-3	19.517	0.006	0.000	0.497	157.009	309.198	0.043	0.027	0.001	0.000	0.000	0.031	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	26.836	27.003	0.000
23-JR-19-GrainC-4	29.285	0.013	0.003	0.518	135.350	331.625	0.061	0.051	0.004	0.015	0.000	0.043	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	27.228	45.394	0.002
23-JR-19-GrainC-5	51.919	0.010	0.001	0.285	130.667	247.986	0.071	0.059	0.003	0.000	0.000	0.113	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	21.688	53.616	0.000
23-JR-19-GrainC-6	72.318	0.030	0.011	0.645	164.962	858.704	0.084	0.047	0.005	0.026	0.000	0.102	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021	27.389	52.629	0.000
23-JR-19-GrainD-1	3.797	0.006	0.001	0.024	144.193	253.378	0.040	0.013	0.000	0.000	0.000	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	26.810	7.507	0.000
23-JR-19-GrainD-2	19.001	0.090	0.021	0.053	156.849	296.250	0.193	0.148	0.030	0.149	0.032	0.044	0.016	0.002	0.015	0.000	0.003	0.001	0.000	0.000	0.061	29.234	29.346	0.012
23-JR-19-GrainD-3	8.322	0.034	0.001	0.034	159.223	198.863	0.088	0.070	0.007	0.022	0.026	0.060	0.023	0.000	0.009	0.000	0.000	0.000	0.000	0.000	0.007	26.873	26.631	0.000
23-JR-19-GrainD-4	23.346	0.197	0.013	0.043	144.053	585.126	0.373	1.996	0.049	0.213	0.051	0.060	0.090	0.011	0.033	0.002	0.009	0.001	0.009	0.002	0.024	26.719	26.609	0.007
23-JR-25-GrainA-1	5.073	0.012	0.050	0.227	211.107	247.762	0.019	0.010	0.002	0.000	0.000	0.016	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.030	35.778	33.556	0.003
23-JR-25-GrainA-2	17.837	0.154	0.145	0.588	193.888	309.268	0.038	0.069	0.006	0.014	0.024	0.053	0.043	0.009	0.033	0.001	0.000	0.000	0.000	0.000	0.096	37.220	55.634	0.333
23-JR-25-GrainA-3	7.734	0.082	0.282	0.418	169.681	208.143	0.049	0.045	0.009	0.027	0.038	0.021	0.045	0.004	0.010	0.001	0.000	0.000	0.000	0.000	0.182	34.190	37.195	0.014
23-JR-25-GrainA-4	6.196	0.053	0.068	0.566	170.774	216.926	0.066	0.101	0.008	0.031	0.004	0.018	0.008	0.000	0.009	0.001	0.003	0.000	0.001	0.000	0.101	35.420	22.734	0.018
23-JR-25-GrainB-1	24.161	0.001	0.002	0.288	193.917	22.584	0.027	0.020	0.000	0.000	0.000	0.052	-0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.027	36.442	62.316	0.000
23-JR-25-GrainB-2	7.998	0.010	0.019	0.132	209.565	235.522	0.025	0.014	0.000	0.005	0.004	0.017	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.029	39.316	44.288	0.000
23-JR-25-GrainB-3	7.337	0.012	0.040	0.188	184.333	112.930	0.036	0.033	0.002	0.011	0.002	0.010	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.175	35.640	29.884	0.000
23-JR-25-GrainB-4	14.640	0.000	0.003	0.335	199.622	18.534	0.030	0.018	0.000	0.000	0.000	0.040	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.014	36.272	41.352	0.000
23-JR-25-GrainB-5	20.976	0.000	0.002	0.378	178.473	28.168	0.028	0.023	0.000	0.000	0.000	0.042	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.039	34.433	52.313	0.000
23-JR-25-GrainB-6	31.835	0.003	0.002	0.660	180.930	51.303	0.036	0.029	0.000	0.003	0.000	0.062	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.019	35.514	52.119	0.000
23-JR-25-GrainC-1	3.526	0.038	0.361	0.438	149.679	256.520	0.026	0.026	0.006	0.010	0.014	0.009	0.025	0.004	0.010	0.000	0.000	0.000	0.000	0.000	0.204	36.499	23.509	0.012
23-JR-25-GrainC-2	14.718	0.019	0.010	0.653	165.054	286.223	0.028	0.024	0.000	0.000	0.000	0.056	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.038	36.907	42.773	0.007
23-JR-25-GrainC-3	17.752	0.010	0.142	0.315	210.609	272.869	0.025	0.015	0.001	0.000	0.000	0.039	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.088	37.467	48.197	0.004
23-JR-25-GrainC-4	21.349	0.005	0.001	0.257	199.121	211.233	0.025	0.017	0.000	0.000	0.000	0.057	-0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012	34.620	44.953	0.000
23-JR-25-GrainC-5	8.404	0.011	0.003	0.040	196.718	263.176	0.016	0.016	0.001	0.000	0.000	0.020	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.087	35.143	39.576	0.000
23-JR-25-GrainD-1	14.531	0.049	0.000	0.110	188.152	102.025	0.056	0.063	0.007	0.020	0.033	0.026	0.047	0.005	0.008	0.000	0.000	0.000	0.000	0.000	0.031	34.884	53.398	0.000
23-JR-25-GrainD-2	15.939	0.028	0.002	0.070	200.455	79.463	0.042	0.050	0.002	0.016	0.007	0.044	0.018	0.002	0.003	0.000	0.000	0.000	0.000	0.000	0.032	38.010	73.580	0.000
23-JR-25-GrainD-3	20.715	0.145	0.000	0.095	158.473	21.591	0.056	0.085	0.014	0.037	0.081	0.034	0.116	0.016	0.042	0.001	0.000	0.000	0.000	0.000	0.011	27.935	44.251	0.000
23-JR-25-GrainD-4	20.237	0.029	0.000	0.257	196.216	47.731	0.044	0.043	0.005	0.017	0.023	0.049	0.031	0.004	0.009	0.000	0.000	0.000	0.000	0.000	0.010	34.462	47.267	0.000
23-JR-25-GrainE-1	6.953	0.845	0.150	0.213	185.718	279.975	0.055	0.126	0.018	0.092	0.447	0.027	0.542	0.058	0.137	0.007	0.010	0.002	0.012	0.000	0.204	33.037	29.535	17.776
23-JR-25-GrainE-2	14.104	0.008	0.152	0.120	208.728	240.779	0.031	0.018	0.000	0.000	0.000	0.009	-0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.191	38.238	44.020	0.008
23-JR-25-GrainE-3	12.956	0.126	0.174	1.831	151.871	254.352	0.043	0.086	0.008	0.040	0.043	0.038	0.053	0.012	0.021	0.000	0.000	0.000	0.000	0.000	0.227	29.379	43.595	0.033
LT-21-11-49.4-g1-1	27.367	0.018	0.004	0.062	203.945	162.898	0.078	0.071	0.004	0.016	0.007	0.034	<LOD	0.002	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.026	23.686	18.686	<LOD
LT-21-11-49.4-g1-2	83.450	0.004	0.006	0.403	215.527	38.531	0.048	0.056	0.003	0.004	<LOD	0.080	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.008	24.971	46.045	<LOD
LT-21-11-49.4-g2-1	78.468	0.053	<LOD	0.139	203.519	434.002	0.122	0.185	<LOD	0.078	<LOD	0.083	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	23.677	167.026	<LOD
LT-21-11-49.4-g2-2	11.471	0.036	0.060	0.210	189.828	103.323	0.066	0.102	0.008	0.014	0.010	0.018	0.006	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.096	23.112	7.683	0.051
LT-21-11-49.4-g2-3	6.647	0.009	0.007	0.390	265.713	36.819	0.036	0.058	0.002	<LOD	<LOD	0.012	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.009	29.074	11.569	<LOD
LT-21-11-49.4-g3-1	4.883	0.016	0.009	0.212	188.097	614.196	0.080	0.045	0.003	<LOD	<LOD	0.013	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.032	22.635	7.404	<LOD
LT-21-11-49.4-g3-2	6.071	0.034	0.020	0.292	185.267	833.293	0.048	0.026	0.000	0.005	<LOD	0.015	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.034	22.388	6.573	0.233
LT-21-11-49.4-g4-1	0.921	0.010	0.002	0.271	207.342	557.495	0.065	0.039	0.001	<LOD	<LOD	0.013	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.011	23.696	15.353	<LOD
LT-21-11-49.4-g4-2	0.235	<LOD	<LOD	0.300	137.828	74.380	0.031	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	23.303	2.262	<LOD

LT-21-11-62.5-g2-1	7.991	0.035	0.008	0.219	78.781	89.167	0.019	0.042	0.006	0.017	0.016	<LOD	0.011	0.002	0.004	<LOD	<LOD	<LOD	<LOD	<LOD	0.258	24.462	20.473	0.026
LT-21-11-62.5-g2-2	6.753	<LOD	0.002	0.639	234.627	3.520	0.014	0.018	<LOD	<LOD	<LOD	0.006	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.006	36.850	36.350	<LOD	
LT-21-11-62.5-g3-1	21.097	0.008	0.006	0.134	175.682	47.478	0.023	0.022	<LOD	<LOD	<LOD	0.002	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.062	32.654	61.937	<LOD	
LT-21-11-62.5-g3-2	10.589	0.025	0.004	0.394	134.640	146.733	0.027	0.047	0.005	0.012	0.006	0.003	0.008	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.065	34.095	43.986	0.003	
LT-21-11-62.5-g3-3	10.596	0.204	0.054	0.171	123.513	75.545	0.236	0.380	0.043	0.186	<LOD	0.025	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	25.037	17.384	<LOD	
LT-21-11-62.5-g4-1	0.035	<LOD	0.001	0.028	179.850	2.247	0.007	0.004	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.004	34.426	0.310	<LOD	
LT-21-11-62.5-g4-2	5.366	<LOD	0.001	0.222	161.060	7.717	0.019	0.015	<LOD	<LOD	<LOD	0.004	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.003	35.397	33.118	<LOD	
LT-21-11-62.5-g4-3	22.495	0.665	0.182	0.237	41.311	145.913	0.756	1.328	0.142	0.553	0.111	0.091	0.100	0.016	0.094	0.022	0.071	0.011	0.083	0.014	0.018	8.109	13.094	0.138
LT-21-11-62.5-g4-4	1.817	0.003	0.001	0.082	149.989	20.594	0.017	0.012	<LOD	<LOD	<LOD	0.002	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	34.181	14.800	<LOD	

F.D. no. 5

23-JR-29-G1-1	18.548	0.015	<LOD	0.464	126.382	911.973	0.076	0.058	0.003	<LOD	<LOD	0.060	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.006	21.790	11.276	<LOD
23-JR-29-G1-2	14.012	0.014	<LOD	0.139	142.605	841.497	0.086	0.057	0.001	<LOD	<LOD	0.066	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.006	21.310	14.209	<LOD
23-JR-29-G1-3	19.485	0.020	0.002	0.195	237.385	950.003	0.079	0.060	<LOD	<LOD	<LOD	0.091	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.007	26.005	17.085	<LOD
23-JR-29-G1-4	13.958	0.020	<LOD	0.317	97.917	889.550	0.084	0.063	0.003	<LOD	<LOD	0.040	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.007	21.988	8.808	<LOD
23-JR-29-G1-5	17.433	0.026	0.001	0.317	123.397	967.835	0.091	0.072	0.003	<LOD	<LOD	0.083	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.016	22.047	15.051	<LOD
23-JR-29-G1-6	16.937	0.030	0.007	0.191	124.749	952.404	0.094	0.072	0.005	0.023	<LOD	0.061	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.022	21.510	9.992	<LOD
23-JR-29-G1-7	13.899	0.035	0.004	0.152	179.227	1027.069	0.091	0.077	0.005	0.012	<LOD	0.068	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.022	22.549	8.491	<LOD
23-JR-29-G1-8	12.959	0.018	0.003	0.211	155.083	999.032	0.081	0.045	<LOD	0.007	<LOD	0.051	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.016	23.827	8.942	<LOD
23-JR-29-G1-9	15.191	0.023	0.003	0.182	133.926	885.630	0.081	0.062	0.002	0.011	<LOD	0.042	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.020	25.378	9.319	<LOD
23-JR-32_g1-1	11.767	0.005	<LOD	0.274	536.946	166.997	0.045	0.028	<LOD	<LOD	<LOD	0.013	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	24.129	14.646	<LOD
23-JR-32_g1-2	22.266	0.006	0.001	0.086	843.314	149.541	0.064	0.031	<LOD	<LOD	<LOD	0.025	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.014	24.244	24.534	<LOD
23-JR-32_g2-1	24.865	0.007	0.001	0.367	334.116	172.743	0.044	0.033	0.001	<LOD	<LOD	0.035	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.018	22.362	30.230	<LOD
23-JR-32_g2-2	8.712	0.004	0.001	0.584	165.844	203.406	0.051	0.037	0.001	<LOD	<LOD	0.031	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.005	21.938	20.108	<LOD
23-JR-32_g2-3	19.457	0.021	0.005	<LOD	1.444	3.807	0.032	0.036	0.002	0.015	<LOD	0.019	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.005	<LOD	1.181	<LOD
23-JR-32_g2-4	10.757	0.044	<LOD	0.222	326.570	183.686	0.060	0.054	0.003	0.009	<LOD	0.018	<LOD	0.001	0.006	0.001	<LOD	0.001	<LOD	0.018	22.309	12.665	<LOD
23-JR-32_g3-1	21.922	0.008	0.006	0.230	486.961	191.170	0.044	0.033	<LOD	<LOD	<LOD	0.017	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.023	22.386	27.867	<LOD
23-JR-32_g3-2	16.068	<LOD	<LOD	0.184	297.678	285.718	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	23.591	20.557	<LOD
23-JR-33-GrainA-1	25.483	0.037	0.006	0.098	193.042	1923.844	0.051	0.033	0.002	0.004	0.000	0.065	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.061	21.481	17.825	0.000
23-JR-33-GrainA-2	29.763	0.060	0.026	0.043	213.085	2449.551	0.033	0.058	0.006	0.014	0.007	0.098	0.009	0.001	0.006	0.000	0.000	0.001	0.000	0.077	22.559	19.555	0.001
23-JR-33-GrainA-3	20.633	0.016	0.000	0.413	92.877	978.845	0.081	0.057	0.002	0.009	0.000	0.112	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.011	20.803	19.403	0.000
23-JR-33-GrainA-4	21.671	0.020	0.002	0.714	88.265	1003.182	0.089	0.064	0.001	0.006	0.000	0.122	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.013	18.503	17.223	0.000
23-JR-33-GrainA-5	19.035	0.023	0.002	0.319	135.357	1102.938	0.074	0.060	0.001	0.000	0.000	0.093	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.024	21.105	18.929	0.000
23-JR-33-GrainA-6	22.243	0.049	0.124	0.072	272.909	1765.946	0.104	0.170	0.013	0.049	0.006	0.063	0.009	0.001	0.000	0.000	0.000	0.000	0.000	0.132	20.845	12.155	0.011
23-JR-33-GrainB-1	16.096	0.021	0.002	0.332	125.229	1084.028	0.121	0.077	0.002	0.000	0.000	0.061	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.028	22.083	15.804	0.000
23-JR-33-GrainB-2	12.598	0.019	0.004	0.272	114.970	1078.437	0.104	0.079	0.004	0.015	0.000	0.073	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.027	21.204	14.565	0.000
23-JR-33-GrainB-3	13.286	0.019	0.001	0.388	90.126	1029.256	0.115	0.071	0.003	0.000	0.000	0.079	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007	18.112	14.433	0.000
23-JR-33-GrainB-4	10.312	0.025	0.008	0.343	103.584	965.600	0.107	0.074	0.002	0.005	0.000	0.038	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011	20.152	12.269	0.000
23-JR-33-GrainB-5	14.154	0.025	0.008	0.120	260.889	1260.049	0.097	0.065	0.002	0.000	0.000	0.042	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.063	22.924	10.331	0.000
23-JR-34-GrainA-1	11.046	0.037	0.003	0.080	409.668	518.614	0.054	0.055	0.004	0.011	0.000	0.025	-0.003	0.001	0.003	0.000	0.005	0.000	0.010	0.067	21.117	15.594	0.000
23-JR-34-GrainA-2	31.736	0.020	0.003	0.556	283.257	779.580	0.044	0.038	0.001	0.006	0.000	0.062	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.033	22.094	35.193	0.000
23-JR-34-GrainA-3	11.890	0.033	0.005	0.027	230.998	1247.659	0.080	0.042	0.001	0.008	0.000	0.034	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.066	21.735	14.083	0.000
23-JR-34-GrainA-4	10.108	0.026	0.005	0.145	176.958	1015.343	0.113	0.059	0.003	0.000	0.000	0.047	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.023	20.076	13.286	0.000
23-JR-34-GrainA-5	6.709	0.018	0.003	0.117	218.575	955.144	0.098	0.052	0.002	0.002	0.000	0.032	-0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.018	24.463	16.037	0.000
23-JR-34-GrainA-6	31.469	0.045	0.004	0.121	531.800	1036.083	0.054	0.046	0.003	0.016	0.000	0.081	-0.001	0.000	0.005	0.001	0.009	0.000	0.006	0.052	24.919	25.411	0.000
23-JR-34-GrainA-7	40.866	0.004	0.002	0.530	257.090	294.424	0.047	0.038	0.002	0.000	0.000	0.051	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.019	20.705	41.229	0.000

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23-JR-35-G1-1	3.798	0.002	0.034	0.276	741.792	17.159	0.041	0.138	0.017	0.088	0.010	0.002	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.289	92.275	2.389	0.031
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23-JR-35-G1-2	3.602	<LOD	<LOD	10.706	327.391	10.484	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.030	85.308	5.027	<LOD	
23-JR-35-G2-1	3.193	<LOD	0.003	12.808	242.119	10.333	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.006	78.698	5.057	0.010	
23-JR-35-G2-2	2.629	<LOD	0.002	3.012	334.144	8.582	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.004	83.127	4.843	<LOD	
23-JR-35-G2-3	5.381	<LOD	0.007	10.405	298.767	11.982	0.007	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.012	96.226	11.579	0.335	
23-JR-35-G3-1	0.958	<LOD	0.003	<LOD	795.608	6.778	0.003	0.005	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.037	100.455	2.472	0.022	
23-JR-35-G3-2	1.199	<LOD	0.006	8.606	549.062	5.939	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.029	96.331	2.898	<LOD	
23-JR-35-G3-3	1.807	<LOD	0.009	1.379	681.321	12.901	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.104	95.283	3.942	0.014	
23-JR-35-G3-4	2.210	<LOD	0.003	10.283	479.400	7.230	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.009	90.383	3.988	<LOD	
23-JR-35-G3-5	1.404	<LOD	0.023	1.093	737.972	9.832	0.002	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.039	98.513	3.914	0.048	
23-JR-35-G3-6	7.035	<LOD	0.003	5.521	621.047	17.225	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.016	94.177	5.795	0.031	
23-JR-36-G1-1	6.297	0.008	0.011	7.532	303.818	68.438	0.011	0.027	0.001	0.011	0.019	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.010	93.181	10.236	0.159	
23-JR-36-G1-2	3.465	<LOD	0.005	13.265	324.187	40.123	<LOD	<LOD	<LOD	<LOD	<LOD	0.004	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.007	94.504	6.376	<LOD	
23-JR-36-G1-4	3.724	<LOD	0.002	6.593	301.868	15.629	0.007	0.005	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.006	102.721	6.033	<LOD	
23-JR-36-G1-5	5.531	<LOD	0.006	5.812	279.511	12.346	<LOD	0.003	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.005	99.094	8.220	0.005	
23-JR-36-G1-6	3.998	0.330	0.014	4.079	408.685	36.052	0.349	0.664	0.065	0.236	0.055	0.007	0.051	0.008	0.032	0.005	0.009	0.002	<LOD	<LOD	0.028	101.733	3.837	1.228
23-JR-36-G2-2	1.797	<LOD	0.002	6.675	283.376	13.754	0.004	0.005	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.009	100.440	4.108	<LOD	
23-JR-36-G2-3	5.541	0.099	0.011	2.779	700.567	108.502	0.301	0.136	0.041	0.168	0.018	0.006	0.033	0.002	0.015	<LOD	<LOD	<LOD	<LOD	<LOD	0.077	103.725	7.631	0.045
23-JR-36-G2-4	2.240	0.229	0.238	0.454	504.393	47.196	0.305	0.658	0.087	0.304	0.062	0.019	0.104	0.010	0.039	0.005	0.009	<LOD	<LOD	<LOD	0.143	70.556	3.686	1.305
23-JR-36-G2-5	4.832	0.002	0.012	10.945	189.578	13.070	0.008	0.007	0.001	<LOD	<LOD	0.004	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.003	110.679	6.082	0.008	
23-JR-38-GrainA-1	28.439	0.911	0.257	0.181	0.781	196.431	1.050	1.785	0.196	0.719	0.133	0.113	0.148	0.019	0.150	0.032	0.096	0.013	0.109	0.022	0.021	0.224	6.721	0.178
23-JR-38-GrainA-2	28.505	0.913	0.256	0.165	0.509	197.919	1.078	1.784	0.188	0.668	0.128	0.121	0.126	0.021	0.130	0.029	0.093	0.016	0.122	0.018	0.023	0.206	6.839	0.183
23-JR-38-GrainA-3	10.159	0.002	0.002	0.150	1114.365	8.271	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.240	109.721	50.662	0.000
23-JR-38-GrainA-4	0.992	0.000	0.000	0.146	1202.303	0.737	0.000	0.000	0.000	0.000	0.000	0.000	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	107.419	3.685	0.003
23-JR-38-GrainA-5	28.521	0.922	0.260	0.240	1.661	197.184	1.031	1.785	0.187	0.764	0.136	0.118	0.120	0.019	0.129	0.028	0.101	0.018	0.144	0.022	0.020	0.303	6.833	0.189
23-JR-38-GrainA-6	1.156	0.004	0.005	0.870	983.031	11.000	0.013	0.024	0.008	0.012	0.000	0.000	-0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.092	122.001	0.385	0.006
23-JR-39_g1-1	2.303	<LOD	0.012	10.514	428.921	8.646	0.001	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.051	102.291	6.825	<LOD
23-JR-39_g10-1	3.756	0.004	0.010	3.850	1097.895	5.031	0.003	0.008	<LOD	0.006	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.036	89.192	6.280	0.457
23-JR-39_g11-1	9.903	0.258	0.095	0.965	818.465	61.664	0.301	0.523	0.056	0.189	0.050	0.035	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	66.352	6.666	<LOD
23-JR-39_g2-1	2.631	0.001	0.007	9.651	296.730	3.900	<LOD	0.001	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.014	92.166	7.876	<LOD
23-JR-39_g3-1	1.822	<LOD	0.022	0.326	1154.946	7.649	0.007	0.008	0.001	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.072	101.916	6.044	1.529
23-JR-39_g4-1	1.166	<LOD	0.005	0.249	1326.543	6.725	0.001	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.013	100.371	5.686	0.019
23-JR-39_g5-1	4.465	0.080	0.030	0.968	1223.017	25.023	0.086	0.167	0.011	0.061	0.008	0.007	0.008	<LOD	0.012	0.003	0.008	0.001	0.012	0.001	0.023	83.263	6.436	0.018
23-JR-39_g6-1	1.543	<LOD	0.003	0.445	1219.291	7.646	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.047	97.617	7.101	0.024
23-JR-39_g7-1	3.210	<LOD	0.003	3.159	992.760	5.462	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.007	90.095	5.748	<LOD
23-JR-39_g8-1	3.205	<LOD	0.004	1.990	1224.806	5.163	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.007	91.149	6.334	<LOD
23-JR-39_g9-1	25.447	0.810	0.230	0.320	91.249	174.699	0.922	1.563	0.176	0.630	0.103	0.111	0.090	0.015	0.109	0.025	0.095	0.014	0.099	0.017	0.022	10.445	6.923	0.164
23-JR-40-Horiz-1	1.685	0.003	0.016	4.646	555.826	22.369	0.004	0.007	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.186	119.796	5.216	0.022
23-JR-40-Horiz-2	4.704	0.073	0.180	12.431	539.427	25.408	0.040	0.065	0.003	0.029	0.014	0.005	0.031	0.002	0.007	<LOD	<LOD	<LOD	<LOD	<LOD	0.309	102.810	5.454	1.711
23-JR-40-Horiz-3	2.941	<LOD	0.003	10.073	449.663	19.499	<LOD	<LOD	<LOD	<LOD	<LOD	0.003	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.022	100.868	7.017	<LOD
23-JR-40-Horiz-4	3.850	0.001	0.005	7.747	490.214	19.463	0.008	0.007	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.025	109.737	7.827	0.086
23-JR-40-Horiz-5	3.639	<LOD	0.017	5.139	557.359	29.086	0.004	0.004	<LOD	<LOD	<LOD	0.015	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.076	98.401	4.835	0.072
23-JR-40-Horiz-6	2.274	0.002	0.005	2.323	696.913	22.724	<LOD	0.002	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.026	105.342	5.423	0.058
23-JR-40-Horiz-7	3.176	0.003	0.003	3.893	549.946	19.982	0.010	<LOD	0.002	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.019	109.014	6.057	0.056
23-JR-40-Vert-1	4.319	<LOD	0.002	8.702	521.739	20.161	0.006	0.006	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.039	110.837	10.211	0.031
23-JR-40-Vert-2	7.753	0.011	0.014	10.479	436.305	18.556	0.027	0.027	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.021	108.559	6.255	0.159
23-JR-40-Vert-3	4.905	0.066	0.029	17.785	416.164	36.524	0.098	0.144	0.019	0.042	<LOD	0.005	<LOD	<LOD	<LOD	0.003	0.005	<LOD	<LOD	<LOD	0.035	104.973	8.350	0.071
23-JR-40-Vert-4	6.542	0.019	0.017	8.893	434.247	17.710	0.035	0.036	0.004	0.027	<LOD	<LOD	<LOD	<LOD	0.008	<LOD	<LOD	<LOD	<LOD	<LOD	0.040	101.248	4.942	0.207
23-JR-40-Vert-6	3.734	0.012	0.014	9.404	554.563	61.885	0.046	0.134	0.006	0.012	0.010	0.003	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.091	103.923	9.688	0.169

23-JR-41-GrainA-1	5.120	0.005	0.012	0.295	901.469	19.415	0.003	0.010	0.000	0.004	0.000	0.000	0.014	0.000	0.000	0.000	0.000	0.000	-0.001	0.000	0.066	107.783	9.703	0.123
23-JR-41-GrainA-2	4.830	0.047	0.126	31.250	711.133	22.210	0.165	0.241	0.016	0.080	0.036	0.000	0.038	0.003	0.003	0.001	0.000	0.000	0.000	0.000	0.887	109.530	2.901	0.589
23-JR-41-GrainA-3	2.142	0.003	0.092	7.829	685.510	15.782	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.329	109.305	7.611	0.065
23-JR-41-GrainA-4	1.647	0.005	0.012	1.089	539.004	9.687	0.007	0.003	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.061	104.647	3.835	0.496
23-JR-41-GrainA-5	5.721	0.034	0.117	7.677	1.768	21.088	0.050	0.112	0.008	0.051	0.013	0.006	0.012	0.001	0.002	0.002	0.000	0.000	0.000	0.001	0.642	0.077	1.974	0.366
23-JR-41-GrainB-1	10.677	0.126	7.450	23.556	508.381	44.595	0.120	0.182	0.031	0.112	0.045	0.001	0.060	0.009	0.032	0.002	0.002	0.000	0.005	0.000	5.345	72.632	3.517	2.373
23-JR-41-GrainB-2	25.995	1.112	1.952	1.605	3.089	303.926	0.768	1.416	0.151	0.641	0.187	0.093	0.180	0.028	0.108	0.028	0.069	0.012	0.105	0.017	0.594	0.153	7.946	23.668
23-JR-41-GrainB-3	22.545	0.664	0.580	2.296	193.644	130.860	0.598	1.009	0.119	0.399	0.131	0.074	0.133	0.019	0.114	0.018	0.062	0.011	0.057	0.012	0.265	30.427	6.824	48.540
23-JR-41-GrainB-4	15.904	0.449	0.467	10.603	341.635	69.646	0.309	0.868	0.140	0.382	0.112	0.000	0.121	0.020	0.068	0.021	0.000	0.018	-0.001	0.018	0.178	115.369	19.069	1.933
23-JR-41-GrainB-5	11.513	0.533	0.131	1.834	684.877	112.826	0.158	0.473	0.044	0.107	0.018	0.025	0.036	0.014	0.026	0.000	0.028	0.003	0.025	0.008	0.175	91.024	18.344	4.185
23-JR-41-GrainC-1	2.593	0.007	0.016	0.169	486.630	18.584	0.039	0.103	0.008	0.018	0.000	0.000	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.094	112.275	8.002	0.059
23-JR-41-GrainC-2	3.514	0.000	0.003	0.993	518.294	14.390	0.008	0.003	0.000	0.000	0.000	0.003	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.043	107.151	11.792	0.013
23-JR-41-GrainC-3	5.691	0.003	0.011	0.130	554.257	19.737	0.004	0.001	0.001	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.146	113.860	15.816	0.509
23-JR-41-GrainC-4	3.132	0.003	0.006	1.184	724.265	8.684	0.000	0.001	0.000	0.000	0.000	0.001	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.015	112.844	8.357	0.073
23-JR-41-GrainC-5	5.316	0.005	1.036	1.628	253.911	18.872	0.008	0.028	0.002	0.001	-0.001	0.000	0.001	0.000	-0.001	0.000	0.000	0.000	0.000	-0.001	0.890	40.841	7.355	0.082

LA ICP-MS Data for Trace Element Analyses on Muscovite Li - Sr

Eagle	Li	Be	B	Na	Mg	Al	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Ga	Ge	Rb	Sr
23-JR-08-G1-1	3974.06	14.10	126.03	878.61	5412.90	165454.42	90064.06	70.64	9.01	3232.36	10.93	2.88	1974.17	30653.09	190.42	3.85	12505.99	1.08
23-JR-08-G1-2	4551.15	15.66	117.69	831.01	5806.13	163804.39	89991.08	45.78	9.51	3546.45	14.47	2.13	2285.09	34499.30	207.25	4.23	13220.68	0.70
23-JR-08-G1-3	2303.24	13.80	154.25	1130.68	4349.87	174398.49	92878.35	43.30	4.84	786.63	6.94	3.08	1307.10	21663.39	222.21	3.80	10529.43	0.92
23-JR-08-G1-4	4343.02	16.37	125.21	997.67	6112.38	166044.32	91226.91	<LOD	10.29	3229.99	9.68	2.46	2075.25	31438.34	169.68	3.28	12752.92	0.59
23-JR-08-G1-5	3115.68	14.78	135.63	1178.71	4957.41	171056.41	91589.00	35.21	6.52	937.64	8.40	<LOD	1812.79	26627.09	299.73	5.37	11382.03	0.68
23-JR-08-G2-1	2921.60	14.24	121.34	1276.30	4333.02	169028.32	90957.99	46.93	1.77	1065.85	3.01	2.48	1836.91	24431.28	172.52	4.83	10732.68	0.91
23-JR-08-G2-2	2696.91	13.82	126.31	1605.30	4440.76	171836.60	91128.69	32.46	2.05	1276.81	3.76	3.79	2298.48	24857.03	168.77	3.87	10952.71	0.66
23-JR-08-G2-3	2737.36	13.56	123.89	1296.19	3657.42	173223.96	91501.60	<LOD	2.71	1447.64	4.67	2.60	1957.16	25172.83	199.98	5.51	10592.18	0.91
23-JR-08-G2-4	2827.85	12.52	108.96	1055.46	3649.45	160158.32	84763.32	42.21	2.09	1554.03	3.87	2.89	1670.14	25041.62	197.08	6.37	10861.58	0.75
23-JR-08-G3-1	2850.96	12.67	133.97	1141.48	4223.39	161851.80	90932.03	42.90	2.27	1456.29	3.82	<LOD	1852.18	25775.39	172.62	4.89	11746.81	0.56
23-JR-08-G3-2	2621.06	15.07	136.33	1716.18	4224.69	167535.37	91707.21	<LOD	1.70	924.01	2.01	2.38	2233.21	23262.90	151.29	2.93	10523.36	0.55
23-JR-08-G4-1	3144.90	11.13	112.82	994.36	3629.70	166416.38	90723.97	53.00	2.89	1779.90	4.90	3.08	1741.97	28455.34	238.26	9.69	12114.72	0.89
23-JR-08-G4-2	3121.48	11.97	120.07	1264.11	3730.96	169525.01	90944.23	40.66	3.65	1708.37	5.48	3.14	1993.75	28121.25	228.62	7.13	11226.72	0.86
23-JR-08-G4-3	3547.99	13.49	107.12	1319.65	4180.71	165933.99	90530.53	<LOD	3.89	1940.52	6.09	2.23	2304.76	30424.32	221.11	7.09	11592.00	0.68
23-JR-08-G5-1	3493.34	15.24	127.10	1089.96	5697.77	167071.97	91555.76	<LOD	0.97	850.88	2.31	2.64	1974.20	26344.86	138.14	3.77	11156.44	0.66
23-JR-08-G5-2	3286.72	11.49	118.68	1020.26	3699.48	162196.69	90628.32	<LOD	2.60	1741.99	4.36	3.15	1932.76	27937.58	193.32	6.63	11752.82	0.64
23-JR-08-G5-3	2985.86	12.23	130.05	1364.93	3677.10	164405.74	90749.78	40.53	2.39	1557.56	4.23	2.57	2013.13	26688.70	183.53	6.14	11129.66	0.63
23-JR-08-G5-4	2845.46	11.09	126.23	1253.42	4214.53	167964.01	91521.07	49.30	1.52	874.27	2.64	2.42	1676.64	23326.30	173.60	6.10	10066.09	0.92
23-JR-08-G5-5	3856.87	14.16	112.56	1375.83	6715.01	159807.04	89718.13	<LOD	0.99	871.58	2.16	3.65	2335.11	25722.41	127.67	3.43	11082.18	0.45
23-JR-08-G5-6	2936.12	10.29	121.28	1361.22	3581.23	164370.32	90614.13	<LOD	2.25	1339.05	3.93	3.28	1966.30	26325.35	183.08	7.74	11027.97	0.61
23-JR-08-G5-7	4095.51	11.06	108.70	807.59	3674.33	156798.85	89565.17	31.62	2.41	1919.89	4.42	2.82	1699.63	28836.10	201.07	8.90	12654.19	0.63
23-JR-08-G6-1	4203.35	12.26	111.65	766.92	4256.19	162183.36	91880.58	54.66	5.10	1888.88	9.11	2.31	2117.89	30443.14	225.91	5.01	11486.65	2.93
23-JR-08-G6-2	3743.75	12.74	124.59	681.10	4349.84	165712.16	92319.35	<LOD	6.50	2958.50	18.97	3.04	1614.37	31440.65	189.23	3.28	12488.28	0.54
23-JR-08-G6-3	141.86	0.77	85.44	46767.31	103.81	69691.27	11070.14	224.73	0.48	95.88	0.31	3.07	38.88	851.53	17.64	2.06	827.60	7.10
23-JR-08-G6-4	4472.08	14.77	117.53	1052.81	7327.76	160986.01	90930.09	<LOD	1.07	1054.57	2.33	3.37	2432.45	30769.30	124.01	3.46	11887.06	0.51
23-JR-08-G7-1	3395.40	13.99	128.48	692.28	3840.19	166465.63	90991.88	43.56	3.95	2482.71	13.09	<LOD	1518.73	27547.18	193.92	3.75	11648.94	1.14
23-JR-08-G7-2	590.84	5.68	81.31	44860.23	918.05	91784.35	18838.70	1362.03	0.74	212.27	0.62	2.66	375.56	5277.69	75.96	3.40	2231.28	5.96
23-JR-08-G8-1	5968.88	16.61	105.59	819.49	6624.46	160817.92	91787.34	39.09	9.13	3810.22	15.06	2.19	3087.79	39487.39	223.15	5.38	13389.72	0.47
23-JR-08-G8-2	3465.23	16.33	128.24	1173.90	5880.99	167537.22	91940.91	54.91	2.07	820.07	3.67	3.17	2165.89	27387.55	153.84	3.64	11447.37	0.76
23-JR-08-G8-3	3859.81	15.52	124.30	1097.44	5940.01	166859.06	91494.67	<LOD	3.13	1375.81	6.45	3.24	2237.03	29157.85	170.59	4.12	11657.57	0.84
23-JR-08-G8-4	2695.33	13.65	147.96	1497.08	5818.84	170444.63	91805.75	<LOD	0.83	513.49	1.82	2.84	1832.95	20906.83	131.12	2.95	10215.61	0.99
23-JR-10-1	4963.32	15.59	11.03	2381.11	870.70	168886.86	93489.78	<LOD	1.59	352.44	0.13	4.06	2647.91	49276.91	510.71	5.34	13059.60	0.15
23-JR-10-2	5444.72	15.02	24.78	1616.74	915.35	167400.05	94445.05	<LOD	2.18	765.51	0.20	3.79	2581.04	52945.35	543.88	5.83	12659.74	0.29
23-JR-10-3	6713.39	15.43	27.65	1153.53	909.41	164770.12	95998.29	<LOD	2.13	1223.38	0.64	4.71	2720.70	59440.61	532.01	6.17	11960.41	0.29
23-JR-10-4	5754.25	16.18	37.88	2142.29	846.43	167053.70	94248.03	<LOD	2.20	778.67	0.20	4.55	2581.16	53528.99	567.72	5.66	11700.85	0.26
23-JR-10-5	5411.00	15.45	16.83	1059.03	829.40	167218.42	94214.48	<LOD	0.91	1062.76	0.18	4.41	2765.79	54253.28	475.26	5.70	13831.79	0.28
23-JR-10-6	5662.51	16.30	15.58	1546.02	905.58	165374.88	94561.32	<LOD	0.66	833.73	0.12	5.73	3047.83	54665.17	479.41	6.06	13665.83	0.30
23-JR-10-7	7149.90	16.10	14.99	1424.08	851.95	158155.39	91733.60	<LOD	1.40	2195.55	0.13	5.04	3476.29	59752.85	418.41	7.80	15439.65	0.20
23-JR-10_g10-1	6573.74	16.69	17.96	1021.81	964.77	164036.30	96251.20	<LOD	1.61	1202.00	0.06	4.25	3000.57	59700.78	527.36	5.69	13479.83	0.31
23-JR-10_g4-1	12336.62	8.28	9.94	424.00	613.59	152005.27	94956.09	<LOD	0.80	13010.68	77.39	4.04	6685.63	160283.05	175.95	15.27	23116.84	0.25
23-JR-10_g6-1	6497.91	15.65	24.73	1642.04	858.24	166302.52	94380.72	<LOD	2.30	1107.03	1.32	3.28	2714.33	58764.72	516.59	6.18	13131.44	0.27
23-JR-10_g7-1	11493.61	12.87	22.98	371.48	884.27	140614.71	89193.56	38.04	0.27	3679.72	0.25	3.90	2980.37	82578.95	198.79	12.00	20999.57	0.39
23-JR-10_g8-1	5741.09	17.10	10.52	2128.16	789.52	167903.74	93450.37	<LOD	0.95	502.97	0.08	2.46	2872.29	55249.78	471.65	5.54	14635.48	0.17

23-JR-10_g9-1	6549.83	17.90	15.25	1425.28	861.86	165428.15	96918.03	<LOD	2.12	985.32	0.24	2.85	3101.29	59672.44	528.93	5.87	12937.01	0.22
23-JR-11-G1-1	1815.55	17.21	84.61	2795.46	1419.47	180166.31	90339.61	42.29	0.69	318.93	0.31	2.84	857.56	24480.63	431.04	6.53	12750.60	0.45
23-JR-11-G1-2	1948.64	18.36	85.25	2765.36	1596.16	182969.24	90757.25	<LOD	0.79	314.18	0.22	3.06	845.22	24688.15	447.22	7.93	12306.55	0.33
23-JR-11-G1-3	1723.36	15.89	80.63	3073.32	1470.29	181678.51	89517.38	41.91	0.65	156.01	<LOD	2.54	825.35	23742.12	386.48	7.08	12288.89	0.36
23-JR-11-G2-1	1515.96	17.42	86.95	2991.57	766.92	180632.86	89515.52	36.48	0.50	140.79	<LOD	3.30	730.66	25062.42	348.76	5.72	13311.98	0.30
23-JR-11-G2-2	1558.82	16.52	102.00	3511.37	908.47	181110.00	88090.20	37.63	0.49	180.56	<LOD	1.95	791.48	24236.34	371.96	6.21	13747.04	0.36
23-JR-11-G2-3	1720.14	17.21	97.36	3555.43	932.46	182028.81	87389.52	<LOD	0.43	180.84	<LOD	1.97	841.04	24298.12	372.53	6.17	14087.26	0.36
23-JR-11-G3-1	2447.53	22.61	102.49	1879.88	2017.88	171976.97	91409.95	69.97	1.06	1302.80	2.02	2.58	1105.52	25976.39	511.43	6.82	11655.98	1.44
23-JR-11-G3-2	2067.54	18.70	109.99	2351.31	1779.44	179979.11	91146.55	<LOD	0.95	592.80	0.97	3.63	870.65	25159.24	483.24	7.30	13349.60	0.46
23-JR-11-G4-1	2461.11	17.78	100.76	1760.40	2539.43	173637.57	91810.19	52.10	0.76	175.22	0.23	3.33	808.80	21424.75	337.83	8.66	12794.08	0.37
23-JR-11-G4-2	2246.38	16.10	128.98	2399.17	2333.69	175896.30	90422.92	<LOD	0.79	382.53	0.20	2.00	784.72	20645.01	396.95	6.52	11496.17	0.24
23-JR-11-G4-3	2845.28	19.93	101.43	2333.97	2724.13	169067.24	91217.18	<LOD	0.77	190.60	0.24	2.57	1060.52	22804.92	328.47	6.42	11917.17	0.31
23-JR-11-G4-4	2966.38	18.47	84.54	2377.51	2851.80	174695.79	92212.62	<LOD	1.58	1335.58	1.44	2.93	1009.52	24118.06	456.44	5.49	8563.87	0.59
23-JR-11-G4-5	1935.25	15.39	82.01	3373.35	1807.25	173082.96	88865.17	<LOD	0.60	215.23	0.16	2.73	870.73	22366.05	334.81	7.60	12637.74	0.17
23-JR-11-G4-6	2345.03	19.27	83.27	2910.78	2092.43	182650.73	90801.36	<LOD	0.67	177.55	0.14	2.36	1171.37	21702.23	349.48	7.02	12588.15	0.34
23-JR-11-G4-7	2641.99	21.55	91.75	1376.16	2915.38	177270.11	94811.97	<LOD	1.22	1295.69	0.87	2.67	763.70	21002.05	442.43	5.72	7333.62	0.97
23-JR-13-1	820.22	9.95	129.75	1421.47	1878.41	172809.46	95880.98	<LOD	1.94	235.99	1.78	2.37	851.79	17799.44	333.70	5.41	8729.82	2.58
23-JR-13-10	2116.10	8.23	105.08	909.09	3567.37	162678.68	94325.19	32.32	2.81	1099.95	6.02	3.22	1003.27	32824.09	278.21	6.77	11750.88	1.00
23-JR-13-11	1521.40	9.33	119.00	1095.42	2418.62	166290.94	96215.34	<LOD	2.83	1058.81	4.80	4.13	854.24	29049.20	273.59	7.59	10586.47	1.42
23-JR-13-12	1003.76	10.71	130.28	1434.54	2437.21	174361.31	97348.10	<LOD	3.20	545.95	2.54	5.52	1236.90	18516.30	284.50	3.83	9365.26	2.22
23-JR-13-2	1190.82	9.45	101.59	1333.02	1719.77	175009.15	95561.41	<LOD	2.78	681.04	4.04	3.69	858.44	24956.84	288.26	6.58	9076.77	2.21
23-JR-13-3	995.28	11.08	113.49	1505.17	1402.96	177336.92	96159.03	<LOD	3.81	267.04	2.35	4.15	832.95	19985.17	296.62	6.42	8158.42	3.05
23-JR-13-4	1977.43	10.12	74.51	1203.75	2703.55	171461.25	95227.00	<LOD	1.98	435.01	3.54	3.80	903.17	30954.69	225.03	6.97	9665.53	1.48
23-JR-13-5	4128.60	13.61	78.62	938.18	8882.84	158614.20	94356.53	<LOD	8.98	3626.71	22.34	6.81	1661.85	36146.38	174.93	4.89	10285.44	1.19
23-JR-13-6	1013.93	10.21	110.26	1241.41	1695.19	176631.26	96593.16	38.55	2.70	592.72	3.78	2.90	748.18	21848.98	298.48	5.95	8373.36	2.58
23-JR-13-7	1035.64	11.25	121.33	1449.39	1447.48	178846.83	96561.74	57.08	3.95	247.40	2.18	2.66	994.92	19190.36	304.55	5.20	8040.18	3.31
23-JR-13-8	1760.87	15.68	121.55	1408.61	1688.79	177991.73	93743.77	44.12	3.05	454.57	3.21	4.11	1135.48	22626.60	300.87	5.81	8448.16	2.78
23-JR-13-9	915.00	11.52	104.71	1379.18	2230.33	174658.74	96065.58	165.64	3.07	309.75	2.33	4.05	986.95	20099.35	311.95	5.50	8212.42	3.39
23-JR-13_g4-1	961.41	10.26	123.83	1357.05	1782.47	174976.73	96143.80	32.23	2.78	387.79	2.66	4.09	851.90	20114.02	315.97	5.28	8690.94	2.77
23-JR-19-G-A-1	2950.20	21.78	129.77	889.53	4785.87	169955.95	97918.34	<LOD	20.73	4100.97	44.28	6.99	1037.88	43330.14	224.50	6.89	8570.24	3.56
23-JR-19-G-A-2	3303.37	21.02	126.98	942.41	5500.11	168955.45	97990.75	<LOD	22.87	4651.75	52.55	6.37	1081.79	45579.76	217.43	7.17	8680.84	3.29
23-JR-19-G-A-3	3064.78	21.19	115.52	908.97	5032.94	170342.05	98259.39	60.42	17.96	4361.86	50.80	5.75	1043.60	43504.13	220.83	6.67	8309.69	3.71
23-JR-19-G-B-1	819.24	12.36	252.61	1573.37	1517.32	184934.30	96825.16	69.78	5.68	512.53	9.24	3.29	847.72	24994.10	292.05	6.22	7036.11	5.05
23-JR-19-G-B-2	1675.65	15.43	176.03	1325.91	2904.70	178655.29	96026.79	162.26	5.32	1193.74	20.43	2.66	879.02	34769.47	301.18	6.75	7605.45	5.18
23-JR-19-G-B-3	1765.87	15.95	186.33	1316.87	3036.61	179941.37	96518.36	133.33	5.30	1338.40	20.85	2.90	924.57	35741.48	260.61	6.99	7370.54	5.80
23-JR-19-G-B-4	427.19	17.65	282.90	9167.93	1200.70	200239.15	87297.95	285.18	2.62	317.44	5.36	3.03	464.38	14106.83	263.17	6.46	5616.57	18.10
23-JR-19-G-B-5	655.25	13.90	251.67	5241.24	1060.83	189386.93	92664.64	90.12	3.62	290.79	6.42	2.94	589.12	19364.62	252.09	6.05	5778.24	10.22
23-JR-19-G-C-1	2285.21	37.48	131.58	863.88	4210.53	175186.88	96617.88	83.73	18.36	4939.80	52.14	2.65	958.94	35666.54	192.00	7.06	8084.01	4.72
23-JR-19-G-D-1	480.81	12.50	294.81	1713.98	925.13	187376.67	98430.90	<LOD	1.54	412.23	5.02	2.57	467.42	17259.12	288.85	7.25	7162.02	12.28
23-JR-19-G-D-2	483.62	13.20	273.12	1596.46	1052.25	186713.11	98619.14	50.77	1.29	319.49	4.51	2.05	405.11	16393.61	320.77	7.28	6586.27	9.41
23-JR-19-G-D-3	420.33	34.17	268.73	1867.86	905.90	195083.92	98020.83	105.29	0.76	218.42	4.60	2.03	365.74	15127.97	276.86	6.71	6429.53	10.34
23-JR-19-G-E-1	419.18	14.34	275.33	1776.12	1037.57	192888.12	97682.95	100.82	0.92	241.70	4.75	3.22	486.81	15267.75	299.14	8.24	6404.63	14.30
23-JR-19-G-F-1	374.36	13.46	285.06	1728.30	1178.70	191649.03	97791.23	<LOD	0.63	195.03	2.93	2.66	529.81	15309.01	296.29	6.51	7026.33	7.27
23-JR-19-G-F-2	470.54	13.43	266.69	1776.46	992.50	193395.21	98527.02	<LOD	2.44	2139.18	7.44	2.31	418.52	16339.29	285.41	7.68	6720.42	11.45
23-JR-19-G-F-3	366.76	14.92	299.96	1829.36	1582.55	192922.53	97543.54	157.57	0.80	185.61	3.48	<LOD	388.18	13842.66	301.37	7.67	6154.33	13.15
23-JR-25-G-A-1	346.01	13.29	268.78	1355.32	219.49	193384.37	97038.21	<LOD	0.17	79.37	0.09	2.19	743.35	17457.41	156.95	11.99	9007.00	2.98
23-JR-25-G-A-2	3185.88	<LOD	<LOD	8326.65	2416.49	169930.48	481	<LOD	117.28	<LOD	<LOD	1244	1427.24	19059.05	311.44	2583	8306.56	<LOD
23-JR-25-G-B-1	175.62	17.22	309.96	1580.57	164.43	202297.33	96210.14	<LOD	<LOD	48.97	<LOD	2.40	533.83	9185.88	162.64	6.82	8151.20	2.59

23-JR-25-G-C-1	156.31	4.46	97.40	2368.88	281.13	103153.08	96964.39	71.46	0.33	109.36	0.18	1.63	143.34	6543.24	132.29	7.07	6290.31	1.66
23-JR-25-G-C-2	375.49	9.29	195.85	1208.97	292.97	189766.04	97504.70	72.11	0.21	58.58	0.12	2.10	592.29	21146.53	241.23	13.57	9340.86	2.52
23-JR-25-G-C-3	450.87	10.88	203.93	1291.93	573.15	190125.14	97270.28	105.10	0.16	43.30	0.12	2.16	1571.60	21972.89	239.32	11.55	9205.31	3.37
F.D. no. 5																		
23-JR-29-G1-1	3365.75	31.91	116.70	886.89	5740.53	155638.38	92912.26	<LOD	14.74	1707.61	16.93	2.81	488.37	38868.93	153.01	5.43	5159.22	2.16
23-JR-29-G1-2	1788.85	26.79	190.26	1063.40	3817.95	165713.19	93768.49	42.75	17.50	1154.40	16.68	2.88	304.60	23899.95	227.10	5.94	3402.26	3.42
23-JR-29-G1-3	2390.62	32.42	145.03	1243.36	4321.22	161935.28	92480.08	<LOD	12.06	1088.34	12.22	2.57	518.87	31122.76	162.75	5.56	4401.44	3.08
23-JR-29-G1-4	1714.12	32.99	166.60	1350.44	3590.01	164513.60	91648.98	<LOD	15.51	625.38	12.17	3.14	472.06	24558.23	190.40	5.67	3848.88	3.56
23-JR-29-G1-5	2078.97	31.53	151.97	1051.90	4295.66	162806.51	92681.08	32.70	27.54	1478.18	22.41	3.08	418.99	29157.56	194.50	5.36	4198.16	3.00
23-JR-29-G2-1	4668.81	15.21	89.95	546.09	7551.13	143477.94	89661.54	106.75	43.15	4944.20	77.40	5.57	1589.93	48635.06	187.63	9.94	6850.12	1.25
23-JR-29-G2-2	3568.69	13.13	91.67	353.88	7250.53	138565.00	85166.52	214.75	31.97	4725.88	71.54	5.36	1416.40	43606.58	159.40	10.51	7754.92	1.68
23-JR-29-G3-1	210.22	14.31	280.40	9207.44	129.33	184043.14	81816.25	155.46	0.71	49.76	<LOD	<LOD	120.30	4786.93	279.66	4.89	1475.76	14.06
23-JR-29-G4-1	616.66	15.39	225.14	1436.66	1030.25	181747.29	93707.13	43.91	0.81	47.06	2.08	<LOD	294.40	15816.25	155.89	5.35	4522.23	9.09
23-JR-29-G4-2	779.62	17.72	201.14	1788.21	750.84	182402.59	91273.48	<LOD	0.54	20.17	0.84	2.07	296.58	17742.68	142.12	6.14	4477.22	11.08
23-JR-29-G4-3	975.28	19.96	193.74	1640.59	917.58	184646.11	91837.40	<LOD	0.76	30.83	1.49	2.39	301.32	16891.13	150.42	6.03	4478.42	9.98
23-JR-32-1	5770.78	13.96	29.91	823.18	10392.45	157518.65	97345.33	<LOD	7.57	4017.09	20.89	3.21	2861.12	48112.92	223.05	7.69	7880.27	1.00
23-JR-32-2	5626.27	16.30	41.85	1560.87	10562.16	155347.62	96311.62	<LOD	32.91	4197.24	61.61	3.30	2667.83	48514.44	216.24	4.84	6733.24	1.49
23-JR-32-3	6291.98	13.86	33.80	730.34	10455.85	155948.70	97939.18	<LOD	7.30	4332.54	26.16	4.22	3329.18	50368.54	215.65	7.65	7345.01	1.26
23-JR-32-4	4990.04	13.70	71.05	839.34	10360.12	153903.93	96614.84	34.60	8.62	3056.61	25.01	3.33	2571.10	42760.61	195.82	5.18	6750.73	1.63
23-JR-32_g2-1	4941.00	14.33	44.26	1481.33	9672.98	157420.55	97727.36	<LOD	17.77	3445.18	26.22	2.18	2242.10	43596.38	168.60	3.83	7097.13	1.46
23-JR-32_g2-2	5052.47	14.20	44.38	828.28	10097.80	159553.45	98789.11	<LOD	14.12	2883.71	15.35	2.02	2038.31	43353.85	189.65	5.33	7275.33	1.41
23-JR-32_g2-3	4612.55	14.35	49.86	1010.39	10175.74	158771.56	98344.42	44.58	11.84	3003.67	15.75	3.35	1915.24	39222.59	184.40	5.01	7010.50	1.43
23-JR-32_g2-4	4345.62	15.19	49.66	1580.76	9414.28	161532.09	96781.59	<LOD	14.26	2847.10	13.38	4.12	1891.36	38548.82	160.84	3.76	6963.53	1.45
23-JR-32_g3-1	6282.46	15.33	29.70	802.38	11432.04	156251.32	98212.78	37.52	6.20	4564.68	20.57	3.08	2945.53	51639.00	228.30	7.86	7958.28	1.28
23-JR-32_g3-2	5549.25	14.44	30.62	798.03	9687.24	155976.95	98896.65	<LOD	9.13	3914.15	26.69	3.01	2713.26	47873.05	220.26	7.34	7193.90	1.27
23-JR-33-G-A-1	4814.15	18.13	63.80	998.04	8045.41	169039.51	97067.81	<LOD	22.57	3451.51	54.29	4.03	1532.58	50238.77	222.48	6.23	7101.18	1.80
23-JR-33-G-A-2	5012.68	18.52	73.25	854.02	7902.29	167930.53	97037.69	<LOD	26.62	3463.27	65.57	16.64	1647.20	52324.06	221.01	5.84	7249.01	1.73
23-JR-33-G-A-3	5457.32	17.71	60.20	958.39	8293.18	171980.60	95972.62	<LOD	32.14	2853.66	29.48	3.21	1933.58	56538.39	196.30	5.61	8028.92	1.25
23-JR-33-G-A-4	4532.60	18.55	66.88	930.94	7773.18	169265.25	97355.75	<LOD	21.70	3485.43	51.65	7.84	1432.44	48781.58	224.08	5.83	7189.31	1.85
23-JR-33-G-B-1	4430.51	17.19	70.73	947.05	6602.85	173225.93	96901.49	<LOD	20.77	3243.85	33.22	2.29	1447.18	44954.72	200.99	4.93	7345.12	2.22
23-JR-33-G-B-2	4425.68	19.43	71.41	994.79	6907.90	173842.46	96664.85	<LOD	15.94	3217.74	19.22	1.66	1469.28	45094.08	190.42	5.47	7910.80	2.19
23-JR-33-G-B-3	3942.82	21.04	96.19	745.92	7169.21	172663.75	96352.21	<LOD	25.43	3309.45	42.88	2.85	1271.69	42723.06	226.32	6.50	7006.84	2.54
23-JR-33-G-B-4	4764.56	18.77	67.88	1136.55	7097.68	172537.46	97098.67	<LOD	20.24	3325.37	34.78	2.08	1706.75	46414.33	214.40	5.49	7411.78	1.76
23-JR-33-G-B-5	5319.42	20.33	60.57	867.03	7976.42	167320.22	98057.73	<LOD	25.58	3762.20	58.24	1.88	1874.63	50728.81	224.68	5.59	7202.58	1.61
23-JR-33-G-C-1	919.51	12.64	160.12	1384.52	1998.48	181332.76	98458.60	<LOD	0.46	84.96	1.45	2.13	470.56	22517.75	151.58	5.96	5606.28	6.32
23-JR-33-G-C-2	1039.67	14.88	175.73	1390.20	1725.12	185446.67	97779.12	<LOD	0.30	42.18	0.70	2.84	452.83	24985.80	127.04	7.13	5543.29	8.37
23-JR-33-G-D-1	416.07	13.44	261.45	1517.74	1400.19	190736.85	99013.76	<LOD	0.97	123.11	2.08	2.32	311.20	12525.74	146.58	7.08	4465.55	7.05
23-JR-33-G-D-2	428.74	10.63	302.82	1340.62	1335.33	179756.14	98341.44	<LOD	0.95	129.83	1.98	2.27	302.61	11934.18	140.68	6.13	4540.87	6.35
23-JR-33-G-D-3	638.56	11.18	287.91	1516.06	1809.78	192988.72	95530.45	<LOD	0.94	156.89	2.03	2.60	385.40	14308.57	147.35	6.21	5154.53	5.11
23-JR-33-G-E-1	365.74	12.58	188.48	1780.36	1068.69	186468.51	96511.72	<LOD	0.36	71.36	0.99	2.38	347.12	11027.63	137.97	5.61	4357.60	5.64
23-JR-33-G-E-2	188.95	12.25	232.46	1924.73	569.06	204442.92	97127.84	<LOD	0.46	49.61	0.76	1.94	320.57	7412.48	167.45	6.39	4151.13	5.29
23-JR-33-G-E-3	366.21	12.48	202.99	1799.31	997.53	199481.94	97006.18	<LOD	0.38	76.19	1.09	2.35	323.49	11036.61	134.90	5.79	4425.04	7.57
23-JR-33-G-E-4	407.47	11.23	261.59	1794.96	1190.22	196722.69	96442.55	<LOD	0.52	77.32	1.20	2.95	340.84	11923.93	133.27	6.02	4478.76	8.45
23-JR-34-G-A-1	4898.01	14.84	73.56	629.19	6301.78	173522.54	95845.48	<LOD	34.37	3815.42	18.00	2.71	2643.23	46519.05	188.43	6.44	8030.64	1.84
23-JR-34-G-A-2	4601.47	18.75	73.50	865.30	6916.45	172207.49	94518.56	<LOD	33.20	3157.96	27.58	2.01	2325.35	45131.76	198.21	5.70	7385.19	2.04
23-JR-34-G-A-3	4653.06	17.46	65.79	1023.94	7019.54	172902.59	95362.43	<LOD	31.18	2831.53	25.88	2.94	2345.46	45096.59	193.27	5.41	7613.76	1.91
23-JR-34-G-B-1	6226.36	17.04	47.23	515.60	10488.93	160054.39	91851.66	<LOD	53.13	3299.02	48.31	4.45	3188.35	69074.25	197.04	6.93	7919.00	1.35

23-JR-34-G-B-2	5363.56	16.51	47.70	618.77	10394.95	160274.71	74440.22	<LOD	59.53	5223.21	63.26	11.50	2663.70	62287.65	192.63	7.28	7243.21	1.61
23-JR-34-G-B-3	8573.50	21.38	50.29	400.85	14659.34	152309.62	90299.45	67.32	31.52	10584.42	65.95	38.11	5638.61	115256.20	141.62	9.78	9438.22	1.62
23-JR-34-G-B-4	8791.40	9.82	23.63	176.65	13154.70	145459.26	89071.27	62.33	25.71	11158.06	106.06	20.94	8226.85	162298.35	130.72	13.44	9714.98	0.90
23-JR-34-G-C-1	6017.17	18.75	51.42	744.57	9516.71	166231.94	95590.72	<LOD	30.25	3709.46	26.75	3.72	2862.78	62246.92	150.26	5.18	8735.30	1.45
23-JR-34-G-C-2	5634.75	20.45	61.53	927.45	10094.36	168584.18	94728.14	<LOD	37.10	3420.94	31.61	3.83	2717.65	59481.81	170.83	6.31	8359.30	1.87
23-JR-34-G-C-3	10234.64	13.60	26.68	201.64	12156.46	152398.98	91307.26	<LOD	22.70	6669.78	44.45	15.63	6569.26	126781.79	120.71	8.58	10367.89	0.62
23-JR-34-G-D-1	5691.70	16.91	54.39	715.75	9829.80	162321.12	96426.76	<LOD	45.85	2942.88	61.52	13.48	2449.73	60116.51	225.64	6.65	7318.39	1.57
23-JR-34-G-D-2	6010.35	17.42	53.63	1101.49	10598.37	166219.10	94579.04	<LOD	44.52	2629.88	55.86	7.75	2832.47	62247.15	211.46	6.37	8068.95	1.59
23-JR-34-G-D-3	5858.88	19.17	65.35	641.69	10522.40	167426.57	95642.00	<LOD	45.72	1864.38	47.89	3.44	2312.58	61921.98	217.75	6.45	8267.47	1.75
Tappy																		
23-JR-35-G1-1	2851.55	20.80	135.93	2141.73	63.62	184522.83	90088.67	<LOD	0.65	110.71	<LOD	<LOD	957.64	13734.08	269.49	7.66	12203.35	0.35
23-JR-35-G1-2	2366.42	27.55	173.22	1275.51	62.40	186455.88	91873.43	<LOD	0.60	111.77	<LOD	2.31	624.50	11450.01	280.10	7.59	11641.83	0.51
23-JR-35-G1-3	3829.09	29.05	153.51	1323.62	560.64	178013.72	89145.85	201.33	0.56	109.47	0.87	2.75	643.45	12320.02	272.63	10.25	13116.38	0.91
23-JR-35-G1-4	4779.75	25.81	136.49	1141.43	84.37	177527.96	89698.90	<LOD	0.54	119.53	0.08	<LOD	886.34	14775.44	261.46	10.14	14452.13	0.38
23-JR-35-G1-5	4625.92	25.38	111.66	1151.60	76.64	175766.67	89726.83	<LOD	0.53	110.98	<LOD	<LOD	932.95	15776.23	250.06	9.28	13739.12	0.39
23-JR-35-G2-1	3084.53	21.10	157.25	1680.78	135.71	173889.68	89339.63	<LOD	0.71	100.30	0.34	2.29	767.47	12184.37	257.54	9.35	12965.61	0.25
23-JR-35-G2-2	4841.25	21.31	105.73	2609.23	83.25	174281.95	89835.58	<LOD	0.77	130.61	0.11	<LOD	1402.48	17389.78	254.67	6.64	12428.93	0.11
23-JR-35-G2-3	3296.75	22.44	118.52	1955.33	75.35	172912.40	91109.17	<LOD	0.71	135.48	0.09	<LOD	934.77	13858.49	260.76	6.35	11714.81	0.15
23-JR-35-G2-4	4741.59	22.84	115.57	2845.00	82.46	172598.75	89225.94	<LOD	0.74	125.98	0.08	2.82	1745.14	17503.19	253.23	7.29	12219.45	0.23
23-JR-35-G3-1	3911.80	25.65	137.55	1556.02	117.40	182321.22	90659.38	<LOD	0.56	126.89	0.11	<LOD	775.86	14718.71	286.71	8.49	13468.74	0.21
23-JR-35-G3-2	3764.56	21.11	134.83	2240.59	78.63	182629.23	89882.05	<LOD	0.62	115.89	<LOD	2.50	1084.17	15831.12	261.27	8.36	12922.91	0.19
23-JR-35-G3-3	1590.40	25.38	184.00	1376.64	61.79	191572.29	92698.16	<LOD	0.66	115.25	0.11	<LOD	479.77	10040.14	332.64	9.55	11525.50	0.34
23-JR-35-G3-4	1655.11	24.37	182.52	1271.65	172.03	190286.86	92166.66	<LOD	0.73	109.51	0.69	2.25	496.85	10011.68	329.00	8.83	11465.98	0.28
23-JR-35-G4-1	5221.67	22.54	146.17	1854.29	90.25	177872.31	89216.40	<LOD	0.68	119.70	0.09	2.58	1214.44	17399.25	279.88	9.26	13757.65	0.35
23-JR-35-G4-2	4304.27	23.41	129.25	1751.44	102.83	178010.80	89002.40	107.90	0.55	128.05	<LOD	2.26	1076.39	15874.24	272.02	8.54	13326.57	0.64
23-JR-35-G4-3	6220.50	24.09	124.16	1106.13	120.65	172506.57	89315.40	<LOD	0.53	130.92	<LOD	<LOD	1223.63	20059.19	259.41	9.75	14711.76	0.44
23-JR-35-G4-4	7014.59	25.83	119.53	1072.17	255.88	167579.15	86657.40	50.93	0.63	126.13	0.77	<LOD	1527.35	21093.89	247.42	11.96	15056.93	0.50
23-JR-36-G1-1	4942.65	20.65	106.26	1763.22	302.82	178072.65	89619.27	119.06	2.05	186.88	1.55	2.18	956.60	21237.66	241.44	6.35	12525.14	1.41
23-JR-36-G1-2	4314.37	21.12	115.15	1292.33	294.45	178557.27	90185.99	422.14	2.17	215.60	1.59	2.03	724.47	17666.12	249.51	6.23	12755.35	1.86
23-JR-36-G1-3	4663.46	28.71	123.39	1472.13	209.27	177226.08	89954.07	8583.59	1.74	159.17	0.39	3.16	859.22	18098.40	236.34	6.23	12212.65	19.97
23-JR-36-G1-4	3422.42	23.75	112.02	1359.01	292.69	180500.68	91073.31	4382.18	1.80	168.45	2.10	2.52	727.61	16625.15	261.17	6.53	11675.28	9.46
23-JR-36-G2-1	3869.60	20.78	106.60	1236.89	245.76	180975.95	90754.22	<LOD	1.69	179.89	0.57	<LOD	722.10	16863.77	286.01	6.12	12338.15	0.38
23-JR-36-G2-2	3881.59	20.41	100.34	1207.81	132.10	181198.01	90728.47	<LOD	1.76	189.04	0.50	3.29	666.83	15466.57	262.57	6.49	12369.12	0.35
23-JR-36-G2-3	3398.88	18.80	106.64	1387.94	146.87	184768.75	91842.71	<LOD	1.66	181.09	0.46	<LOD	657.80	15383.33	276.72	6.03	11460.96	0.34
23-JR-36-G3-1	3866.39	19.95	114.77	1393.51	117.60	183556.08	91468.84	<LOD	1.17	136.36	0.18	2.66	768.17	15617.75	296.92	6.33	12225.96	0.15
23-JR-36-G3-2	6854.51	15.94	82.81	1240.37	174.63	176661.17	90962.34	<LOD	0.96	145.22	0.12	2.33	1931.76	26177.54	236.32	6.27	12512.33	0.30
23-JR-36-G3-3	7078.97	17.52	85.71	2055.98	156.71	176200.69	90278.51	<LOD	0.79	139.08	<LOD	2.60	2521.59	28951.72	216.36	6.21	11733.10	0.21
23-JR-36-G3-4	7145.82	20.64	86.81	1319.57	169.23	174675.04	91155.78	<LOD	0.81	134.72	0.07	2.91	1762.40	26362.94	218.30	5.73	12890.09	0.17
23-JR-36-G4-1	2946.13	26.55	127.74	1656.97	238.93	182160.12	91193.04	5908.94	1.46	144.48	0.69	3.06	904.89	15121.68	245.31	5.55	10669.87	19.34
23-JR-36-G4-2	3192.86	23.74	126.44	1625.62	222.21	183119.46	91324.58	855.48	1.54	141.49	0.45	2.48	776.90	15660.50	238.51	5.50	10831.09	6.65
23-JR-36-G4-3	4238.99	22.04	119.79	1667.44	261.18	179346.08	90675.42	<LOD	1.72	161.58	0.15	<LOD	968.54	19521.26	240.23	6.25	10971.20	0.30
23-JR-36-G4-4	5155.99	24.56	103.36	1338.18	281.01	176741.08	91439.87	2882.54	1.56	165.89	0.33	2.56	1220.35	22433.43	240.64	5.97	12306.99	10.73
23-JR-36-G4-5	2900.67	19.31	127.89	1334.72	178.47	184596.51	92011.53	<LOD	1.49	155.82	0.14	2.88	759.65	15489.46	256.29	5.95	11679.17	0.30
23-JR-36-G5-1	4738.28	20.42	126.12	1519.45	207.30	178355.41	90647.39	<LOD	1.56	132.80	0.28	3.37	1255.76	17660.42	201.70	6.31	12436.74	0.45
23-JR-36-G5-2	5171.39	20.53	101.57	2286.25	389.94	175374.15	88434.81	<LOD	1.80	175.89	3.04	2.30	2031.88	20141.37	222.10	6.09	11705.51	0.38
23-JR-36-G5-3	3294.69	21.88	147.91	1286.13	335.91	179280.03	89455.18	102.74	1.36	110.83	1.77	2.75	1035.61	14539.57	197.21	6.45	12804.52	0.78
23-JR-36-G5-4	4434.78	20.84	139.75	1828.11	370.69	179890.42	88514.12	393.53	1.49	138.67	3.38	2.78	1279.15	17428.46	204.72	7.03	13423.15	1.56

23-JR-36-G5-5	8284.92	20.86	91.00	1196.75	234.32	165016.61	86810.69	<LOD	1.22	121.19	0.96	3.22	1912.84	23538.52	155.61	7.72	15512.37	0.23
23-JR-38-G-A-1	11336.50	23.09	182.03	1420.95	211.45	183977.74	85196.63	<LOD	0.36	246.76	0.13	2.47	670.88	10538.43	312.38	11.85	21663.89	0.82
23-JR-38-G-A-2	1009.65	19.24	243.66	2528.88	65.65	209682.44	92741.45	<LOD	0.99	488.32	0.22	2.34	470.96	9127.13	381.33	10.27	15031.56	0.68
23-JR-38-G-A-3	1934.93	18.73	244.83	2319.85	90.86	205802.04	92960.66	<LOD	0.53	287.53	0.18	2.46	529.75	9975.08	340.11	8.71	14622.30	0.37
23-JR-38-G-A-4	1295.81	19.41	244.24	2607.07	59.15	211338.35	92187.35	<LOD	0.73	438.95	0.24	2.49	463.50	9159.22	452.75	9.14	14986.25	0.43
23-JR-39-1	2993.21	19.27	87.63	1629.47	76.70	178165.58	98304.02	<LOD	0.85	145.41	<LOD	3.46	873.16	14933.06	254.95	6.29	12785.93	0.13
23-JR-39-2	3454.29	19.96	92.52	1422.01	81.63	175222.54	98317.97	<LOD	0.99	160.75	<LOD	2.31	910.45	16877.71	249.24	5.56	12306.63	0.13
23-JR-39-3	4117.81	20.88	89.53	2340.90	100.16	171954.68	94076.87	<LOD	0.54	147.54	<LOD	<LOD	1173.74	17659.85	255.43	6.12	11926.67	0.10
23-JR-39-4	4334.55	20.71	98.83	2476.59	105.52	172983.68	92341.91	<LOD	0.94	125.47	<LOD	13.97	1526.30	19505.32	238.02	7.11	13047.76	0.12
23-JR-39-5	4225.82	20.75	56.65	1555.82	85.28	172479.64	92313.80	<LOD	0.98	175.78	<LOD	<LOD	1326.88	18677.85	242.12	6.28	13562.00	0.15
23-JR-39-6	3562.21	20.41	87.47	1448.32	73.89	176346.64	93137.58	<LOD	1.01	163.00	<LOD	14.15	1110.02	17141.35	247.39	5.86	12557.82	0.15
23-JR-39_g10-1	4533.52	19.72	72.08	1799.88	107.88	173288.13	97526.92	34.50	0.60	141.94	<LOD	3.09	1439.23	17674.88	256.90	5.94	12632.04	0.29
23-JR-39_g11-1	3554.93	20.71	95.42	1663.32	115.03	174941.09	96365.44	38.77	0.68	129.03	<LOD	4.11	850.66	15669.85	241.80	6.21	12154.11	0.16
23-JR-39_g11-2	2837.34	19.99	67.21	1569.08	83.39	175330.33	96399.82	<LOD	1.08	167.86	<LOD	3.61	745.58	15040.03	255.44	5.86	12971.14	0.16
23-JR-39_g6-1	3033.86	20.70	104.50	1613.45	81.19	177940.05	98280.52	<LOD	0.89	135.27	<LOD	4.73	766.93	14781.23	258.99	5.80	11417.64	0.18
23-JR-39_g6-2	3606.49	18.99	71.78	1326.49	88.71	175380.90	98359.57	<LOD	0.80	149.77	<LOD	3.86	865.50	17334.97	247.52	5.82	12933.90	0.12
23-JR-39_g7-1	4142.04	22.28	109.16	1808.46	87.03	175023.74	95630.22	<LOD	0.58	118.06	<LOD	5.91	1366.78	17013.72	253.52	6.69	12295.79	0.25
23-JR-39_g7-2	6030.91	21.21	58.18	1306.51	104.76	173837.41	95303.32	<LOD	0.58	172.48	<LOD	3.17	1779.98	23921.98	238.65	6.21	13301.70	0.11
23-JR-39_g8-1	3985.85	19.09	73.66	1736.69	115.67	174345.00	97345.05	<LOD	1.36	199.04	<LOD	3.91	1381.06	19113.22	263.87	5.90	13692.90	0.20
23-JR-39_g8-2	3621.67	19.53	70.33	2406.54	101.49	176004.12	96368.98	<LOD	1.23	177.60	<LOD	2.78	1674.73	19667.35	255.58	5.51	12196.89	0.19
23-JR-40-G1-1	2136.47	19.38	144.52	1278.12	406.98	181952.54	90261.76	66.87	1.07	230.41	0.28	3.55	1380.43	19017.89	277.48	7.39	14309.25	0.85
23-JR-40-G1-2	2693.37	18.77	138.03	1094.20	262.26	179138.91	89898.06	<LOD	1.07	245.79	0.09	<LOD	1446.04	20908.98	269.05	7.39	15106.85	1.19
23-JR-40-G1-3	1673.91	17.92	159.59	1258.85	174.66	184310.87	90968.26	73.42	1.09	218.30	0.10	2.02	1155.58	16601.86	275.95	6.89	13492.65	1.88
23-JR-40-G2-1	2625.90	19.84	140.55	1123.77	192.13	180854.98	90247.95	<LOD	1.12	215.23	0.07	<LOD	1997.81	21182.70	266.77	7.09	14676.49	4.42
23-JR-40-G2-2	3304.79	18.67	152.31	1054.07	234.68	177830.44	89254.16	<LOD	0.93	220.79	0.14	<LOD	1130.31	20679.10	251.78	7.19	14428.07	0.29
23-JR-40-G3-1	6632.68	18.37	92.91	4266.51	246.24	153921.27	80812.29	49.61	1.27	297.28	0.18	2.50	1052.53	18744.10	197.26	8.92	14327.96	0.40
23-JR-40-G3-2	4120.51	16.25	85.64	914.36	276.03	173394.89	87659.45	40.55	1.39	343.16	0.15	2.06	1726.86	24067.60	232.68	9.09	17825.28	0.51
23-JR-40-G3-3	3873.00	17.34	90.25	986.50	205.48	175942.30	88268.74	<LOD	1.38	319.97	0.08	<LOD	1482.69	22212.65	234.74	9.18	16775.06	0.40
23-JR-40-G4-1	3113.87	17.32	98.19	1029.81	304.43	178057.89	88652.48	62.51	1.44	360.23	0.10	3.27	1803.10	21603.13	248.46	9.46	16915.93	0.52
23-JR-40-G4-2	2113.72	17.61	129.99	1193.61	213.35	181616.38	89375.50	<LOD	1.43	361.25	0.09	2.75	1259.62	18367.47	265.84	8.44	14822.30	0.38
23-JR-40-G4-3	5650.87	18.96	93.83	885.52	259.67	170892.10	86262.06	<LOD	1.36	394.24	0.13	3.53	1735.22	24366.81	224.77	8.53	16821.45	0.37
23-JR-41-G-A-1	3626.94	19.34	123.59	1193.65	381.88	194213.45	94689.44	<LOD	2.37	214.39	<LOD	1.92	1163.90	22579.78	272.46	7.86	14799.37	0.26
23-JR-41-G-A-2	3394.85	20.17	110.68	1257.21	398.71	196124.75	94562.88	<LOD	2.22	218.09	<LOD	1.92	1015.69	20600.13	279.01	7.51	14608.95	0.26
23-JR-41-G-A-3	2214.07	17.07	106.86	9491.54	364.31	205289.04	81686.40	<LOD	7.66	248.21	0.14	2.83	887.56	15986.30	267.82	6.19	9816.48	0.77
23-JR-41-G-A-4	6539.93	15.85	134.04	25665.59	510.72	219273.83	63715.84	<LOD	2.57	203.35	0.14	2.81	839.50	17338.23	251.51	8.65	16412.36	1.45
23-JR-41-G-A-5	2097.70	18.74	95.35	3240.22	600.92	200613.28	91744.73	139.12	2.60	234.22	0.15	<LOD	797.03	16567.21	285.91	6.93	13613.16	1.00
23-JR-41-G-A-6	3498.13	20.70	117.40	1175.77	430.42	194786.79	94626.32	67.56	2.04	196.63	0.07	2.37	1067.67	20924.31	276.63	7.65	14904.87	1.02
23-JR-41-G-B-1	3579.42	23.15	112.57	999.02	418.33	196142.77	94466.24	715.09	2.39	269.41	<LOD	2.32	1084.83	20816.37	285.42	6.99	16108.95	1.87
23-JR-41-G-B-2	3822.11	19.96	116.86	1081.24	403.92	195649.16	94399.71	<LOD	2.29	263.29	<LOD	2.17	1077.17	20459.44	280.65	7.32	15705.16	0.26
23-JR-41-G-B-3	11273.78	3.76	178.73	802688.8	192428.9	98906.48	7679.82	353472	2.73	733.76	5.00	26.02	829.36	15439.01	26.60	12.67	11758.50	247.42
23-JR-41-G-B-4	7563.45	20.04	135.88	1051.65	561.08	185639.05	91092.71	72.87	1.81	228.09	<LOD	2.89	1110.30	20946.75	235.85	7.86	17212.79	0.51
23-JR-41-G-C-1	3041.97	16.96	104.64	1321.22	389.58	196674.37	95064.28	<LOD	2.49	241.91	0.16	3.03	1063.08	20167.48	280.66	7.08	16024.23	0.57
23-JR-41-G-C-2	3897.66	17.45	103.46	1300.16	459.30	191461.49	94969.36	<LOD	2.43	233.88	<LOD	3.27	1275.44	22556.09	274.81	7.94	14975.23	0.64
23-JR-41-G-C-3	2908.68	19.02	85.99	3186.92	412.72	197449.65	93281.00	<LOD	2.61	248.53	0.16	2.89	1053.56	19897.18	277.06	6.95	14088.17	0.72
23-JR-41-G-D-1	4066.29	19.53	94.40	1503.93	490.41	194258.68	93042.17	77.09	2.84	253.40	0.18	3.57	953.39	19197.61	276.04	7.39	15465.26	0.55
23-JR-41-G-D-2	3258.91	21.81	122.58	1299.86	382.30	196394.31	94488.66	100.26	2.66	245.33	0.15	3.30	1629.72	15661.05	279.96	7.15	14623.42	1.78
23-JR-41-G-D-3	2154.80	19.70	78.88	13414.58	448.49	210473.45	81418.92	332.46	5.16	262.56	0.15	2.37	812.10	16613.05	284.32	5.64	9991.36	1.47
23-JR-41-G-D-4	3714.17	18.46	96.37	1097.85	392.34	197268.93	93273.94	<LOD	2.50	239.34	0.12	2.18	1088.17	20470.56	268.52	7.14	16672.99	0.30

23-JR-41-G-E-1	3078.01	18.91	88.24	1299.61	429.80	197577.89	94672.60	<LOD	2.61	263.17	0.14	2.67	1099.83	21349.83	321.62	7.85	16761.98	0.38
23-JR-41-G-E-2	3264.20	19.05	96.29	1274.39	444.51	194260.98	95173.48	95.92	2.77	270.28	0.21	2.39	2663.89	18226.54	295.88	7.13	14372.96	1.88
23-JR-41-G-E-3	5199.21	19.42	104.08	1173.81	564.57	191862.14	92246.11	<LOD	2.55	292.53	0.15	2.74	1045.68	19387.57	282.04	6.96	15843.18	0.41

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Eagle	Y	Nb	Mo	Sn	Cs	Ba	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Ta	W
23-JR-08-G1-1	0.10	165.39	0.10	62.71	714.49	41.81	0.01	0.01	<LOD	<LOD	<LOD	<LOD	0.01	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	78.13	29.21
23-JR-08-G1-2	0.03	184.76	0.08	64.04	821.96	39.20	0.00	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	96.24	33.80
23-JR-08-G1-3	0.02	120.80	0.12	113.32	467.85	27.30	0.00	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	72.43	17.09
23-JR-08-G1-4	0.01	176.42	0.12	46.69	740.04	34.71	0.00	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	74.73	30.32
23-JR-08-G1-5	0.01	109.49	0.06	247.40	553.13	56.97	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	72.76	30.16
23-JR-08-G2-1	0.03	86.21	0.13	50.70	394.35	68.53	0.00	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	23.71	17.71
23-JR-08-G2-2	0.01	107.35	0.11	42.99	461.71	97.61	0.00	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	25.26	19.14
23-JR-08-G2-3	0.02	97.46	0.10	95.28	371.27	96.60	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	23.63	19.82
23-JR-08-G2-4	0.03	71.53	0.09	74.76	378.33	59.44	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	0.02	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	17.20	19.05
23-JR-08-G3-1	0.02	99.84	0.12	47.87	534.34	100.19	0.01	0.00	<LOD	<LOD	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	22.04	22.41
23-JR-08-G3-2	0.00	100.33	0.14	20.58	454.08	117.62	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	21.19	16.91
23-JR-08-G4-1	0.04	82.79	0.09	177.50	400.11	53.79	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	19.55	25.09
23-JR-08-G4-2	0.02	102.53	<LOD	153.27	454.37	55.17	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	0.01	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	25.55	21.94
23-JR-08-G4-3	0.01	115.41	0.10	162.76	427.87	54.82	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	29.28	25.70
23-JR-08-G5-1	0.00	108.50	0.11	30.02	529.92	44.78	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	34.84	20.26
23-JR-08-G5-2	0.02	88.53	0.13	99.05	465.20	78.66	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	22.91	24.51
23-JR-08-G5-3	0.01	88.41	0.16	75.41	437.73	86.89	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	21.38	22.75
23-JR-08-G5-4	0.01	73.83	0.08	47.76	361.02	46.44	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	22.92	15.59
23-JR-08-G5-5	0.01	104.15	0.12	28.12	513.49	37.39	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	31.36	18.99
23-JR-08-G5-6	0.01	84.37	0.08	73.97	422.11	85.29	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	20.68	19.00
23-JR-08-G5-7	0.02	78.84	0.11	108.80	504.18	54.55	0.00	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	20.82	26.14
23-JR-08-G6-1	0.12	166.31	0.13	189.59	521.56	62.82	0.11	0.29	0.05	0.19	0.13	<LOD	0.07	0.01	0.01	<LOD	<LOD	<LOD	0.01	<LOD	143.03	24.52
23-JR-08-G6-2	0.01	212.26	0.07	58.79	744.80	30.36	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	109.15	26.37
23-JR-08-G6-3	0.00	1.98	<LOD	2.02	29.80	18.50	<LOD	<LOD	<LOD	<LOD	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.61	0.51
23-JR-08-G6-4	0.01	121.51	0.13	29.45	651.08	31.81	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	43.06	22.55
23-JR-08-G7-1	0.06	133.55	0.04	79.61	570.88	51.82	0.02	0.07	0.00	<LOD	<LOD	0.00	0.01	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	54.37	22.98
23-JR-08-G7-2	0.02	19.82	0.05	10.39	95.34	10.09	0.02	0.04	<LOD	0.02	<LOD	0.01	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	5.72	4.18
23-JR-08-G8-1	0.01	180.60	0.15	140.71	819.81	51.56	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	111.41	35.94
23-JR-08-G8-2	0.01	111.31	0.14	93.62	572.82	44.68	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	50.82	23.62
23-JR-08-G8-3	0.01	125.06	0.14	91.71	617.69	47.60	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	60.00	25.07
23-JR-08-G8-4	0.01	77.41	0.15	17.65	416.80	46.52	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	23.36	14.15
23-JR-10-1	0.00	55.58	0.14	626.94	205.84	0.56	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	8.67	9.28
23-JR-10-2	0.01	187.31	0.15	1163.58	622.52	16.48	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	105.09	34.75
23-JR-10-3	0.00	243.53	0.19	1368.26	395.75	8.44	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	127.30	45.67
23-JR-10-4	0.01	129.32	0.15	893.03	510.22	6.71	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	72.90	36.55
23-JR-10-5	0.01	210.98	0.19	1192.81	956.56	1.73	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	151.78	26.61
23-JR-10-6	0.03	293.99	0.24	1327.83	500.11	15.78	0.00	0.00	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	263.14	44.04
23-JR-10-7	0.03	399.01	0.21	953.65	976.27	10.62	0.00	0.00	<LOD	<LOD	<LOD	0.01	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	327.71	36.71
23-JR-10_g10-1	0.09	267.95	0.17	1249.83	307.42	2.89	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	0.01	<LOD	0.01	<LOD	<LOD	<LOD	0.00	<LOD	117.95	22.83
23-JR-10_g4-1	0.06	800.79	0.40	737.74	2386.37	20.48	0.01	0.02	0.00	0.01	0.01	<LOD	0.02	0.00	0.01	<LOD	<LOD	<LOD	<LOD	<LOD	727.57	58.62
23-JR-10_g6-1	0.01	283.51	0.15	1111.53	723.78	13.35	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	156.94	37.41
23-JR-10_g7-1	0.08	353.76	0.17	425.15	1607.45	11.80	0.01	0.01	0.00	0.00	0.01	<LOD	0.02	0.00	0.01	<LOD	<LOD	<LOD	<LOD	<LOD	456.64	49.45
23-JR-10_g8-1	0.01	107.32	0.17	611.01	298.60	0.46	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	32.27	13.62

23-JR-25-G-C-1	0.08	8.89	<LOD	53.53	159.84	89.74	0.03	0.04	0.01	0.03	0.04	0.01	0.03	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	4.95	4.02
23-JR-25-G-C-2	0.03	17.97	0.03	185.83	237.13	143.54	0.00	0.02	0.00	<LOD	0.03	0.00	0.02	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	12.22	13.94
23-JR-25-G-C-3	1.89	16.31	0.54	211.95	228.11	127.14	0.07	1.01	0.03	0.15	0.23	0.00	0.52	0.10	0.32	0.03	0.05	0.00	0.02	0.00		17.81	13.81
F.D. no. 5																							
23-JR-29-G1-1	0.02	153.42	0.01	178.89	1026.46	364.78	0.01	0.02	0.00	<LOD	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.01	<LOD		46.14	31.85
23-JR-29-G1-2	0.11	98.24	<LOD	171.60	627.99	357.73	0.05	0.09	0.01	0.02	0.01	0.01	0.01	0.00	<LOD	0.00	0.01	<LOD	0.04	0.00		22.02	18.46
23-JR-29-G1-3	0.02	101.09	0.06	164.41	807.88	334.78	0.01	0.01	<LOD	<LOD	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.00		28.19	23.07
23-JR-29-G1-4	0.07	67.96	0.03	177.74	707.29	363.05	0.08	0.12	0.01	0.02	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	0.01	0.00	<LOD	0.00		16.94	16.60
23-JR-29-G1-5	0.07	141.46	0.05	169.53	762.44	399.91	0.08	0.10	0.02	0.02	<LOD	0.01	<LOD	<LOD	0.01	<LOD	0.01	<LOD	<LOD	<LOD		55.13	26.13
23-JR-29-G2-1	19.04	331.00	0.07	250.41	4039.54	265.78	0.25	1.33	0.30	2.54	2.47	0.98	3.72	0.66	3.34	0.52	1.40	0.19	1.43	0.18		330.36	22.90
23-JR-29-G2-2	0.80	354.23	0.09	217.74	3511.88	240.16	0.53	3.01	0.45	1.95	0.60	0.17	0.28	0.04	0.12	0.02	0.05	0.01	0.06	0.01		517.42	17.59
23-JR-29-G3-1	0.00	0.90	0.03	4.35	565.92	240.70	0.01	<LOD	<LOD	<LOD	<LOD	0.02	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD		3.00	3.69
23-JR-29-G4-1	0.06	12.23	0.01	37.06	401.33	2005.76	0.03	0.03	0.00	0.02	<LOD	0.05	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD		4.13	4.13
23-JR-29-G4-2	0.07	8.25	0.01	45.02	424.01	2124.18	0.04	0.05	0.01	0.02	<LOD	0.03	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD		6.50	5.51
23-JR-29-G4-3	0.08	8.92	0.05	38.62	419.37	2363.18	0.04	0.05	0.01	0.03	<LOD	0.05	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD		4.30	4.42
23-JR-32-1	0.01	230.36	0.20	432.81	4773.51	61.99	<LOD	<LOD	<LOD	<LOD	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	0.00	0.01	0.01		306.57	32.32
23-JR-32-2	0.04	263.44	0.11	439.71	2299.26	140.73	<LOD	<LOD	<LOD	<LOD	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	0.00	<LOD	0.01	0.01		75.84	44.03
23-JR-32-3	0.01	255.03	0.21	470.76	4619.79	58.66	<LOD	<LOD	<LOD	<LOD	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.01	0.00		314.16	32.31
23-JR-32-4	0.14	190.19	0.16	325.01	2655.43	183.53	0.00	0.00	<LOD	<LOD	<LOD	0.00	<LOD	0.00	0.01	<LOD	0.02	0.00	0.03	0.01		128.45	40.26
23-JR-32_g2-1	0.03	224.66	0.11	201.40	2982.91	193.65	0.00	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.00	0.02	0.01		87.15	38.88
23-JR-32_g2-2	0.04	202.09	0.15	355.86	4349.87	118.83	0.00	0.00	<LOD	<LOD	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	0.00	0.03	0.01		193.60	33.72
23-JR-32_g2-3	0.09	199.66	0.12	311.37	3971.65	129.33	0.00	0.00	<LOD	<LOD	<LOD	0.00	<LOD	0.00	0.00	0.00	0.01	0.00	0.09	0.02		163.69	35.67
23-JR-32_g2-4	0.04	174.64	0.12	152.35	3564.41	275.15	0.00	0.00	<LOD	<LOD	<LOD	0.01	<LOD	<LOD	<LOD	<LOD	0.00	0.00	0.03	0.01		106.95	32.55
23-JR-32_g3-1	0.10	268.58	0.19	449.12	4953.36	48.01	0.00	0.00	0.00	0.00	<LOD	0.00	<LOD	0.00	0.01	0.00	0.01	0.00	0.03	0.01		356.43	33.60
23-JR-32_g3-2	0.06	233.30	0.17	473.58	3953.29	64.77	0.00	0.01	0.00	0.00	<LOD	0.00	<LOD	<LOD	0.00	0.00	0.00	0.00	0.02	0.01		287.19	35.21
23-JR-33-G-A-1	0.09	261.26	0.09	452.63	2058.10	369.32	0.13	0.10	0.02	0.06	<LOD	0.01	<LOD	<LOD	0.01	0.00	0.01	0.00	0.01	0.00		75.88	40.35
23-JR-33-G-A-2	0.11	263.22	0.08	443.92	2377.39	380.37	0.06	0.11	0.01	0.04	<LOD	0.01	<LOD	<LOD	<LOD	0.00	0.00	0.00	0.07	0.01		150.37	39.25
23-JR-33-G-A-3	0.02	206.79	0.13	368.62	8648.89	516.66	<LOD	0.00	<LOD	<LOD	<LOD	0.01	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.01	0.01		304.57	36.60
23-JR-33-G-A-4	0.06	265.59	0.04	470.31	2131.63	384.51	0.03	0.04	0.00	0.02	<LOD	0.01	<LOD	<LOD	0.01	0.00	<LOD	<LOD	0.02	0.00		73.46	45.31
23-JR-33-G-B-1	0.03	203.70	0.07	259.94	3937.88	437.31	0.01	0.01	0.00	0.01	<LOD	0.01	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.01	0.00		111.96	33.09
23-JR-33-G-B-2	0.05	217.74	0.05	346.87	5949.57	531.51	0.01	0.03	0.00	<LOD	<LOD	0.01	<LOD	<LOD	<LOD	<LOD	0.00	0.00	0.01	0.01		195.33	38.70
23-JR-33-G-B-3	0.13	236.98	0.07	371.73	3524.21	527.50	0.03	0.05	0.00	0.01	0.01	0.01	0.02	0.00	0.02	0.00	0.01	0.00	0.04	0.00		156.75	36.74
23-JR-33-G-B-4	0.05	233.87	0.06	397.27	3666.95	419.74	0.01	0.02	0.00	<LOD	<LOD	0.01	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.01		130.01	41.17
23-JR-33-G-B-5	0.04	253.27	0.10	392.16	2243.46	334.81	0.02	0.05	0.01	0.01	<LOD	0.01	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.00		80.96	38.26
23-JR-33-G-C-1	0.05	25.87	<LOD	113.82	487.51	903.34	0.02	0.05	0.00	0.02	<LOD	0.02	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.01	<LOD		15.48	13.79
23-JR-33-G-C-2	0.03	17.44	<LOD	105.24	434.24	1250.46	0.01	0.01	<LOD	<LOD	<LOD	0.03	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD		14.57	14.97
23-JR-33-G-D-1	0.06	23.90	<LOD	81.23	307.37	1157.27	0.04	0.05	0.00	0.01	<LOD	0.02	<LOD	<LOD	<LOD	<LOD	0.01	<LOD	0.01	<LOD		8.93	8.04
23-JR-33-G-D-2	0.04	23.14	<LOD	76.77	328.27	1214.17	0.05	0.05	0.01	0.02	<LOD	0.02	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD		6.75	6.38
23-JR-33-G-D-3	0.12	47.26	<LOD	103.44	983.73	975.35	0.28	0.38	0.04	0.14	0.02	0.03	<LOD	0.01	0.02	0.00	<LOD	<LOD	<LOD	0.00		10.70	11.45
23-JR-33-G-E-1	0.01	13.05	0.03	66.54	229.52	560.39	0.00	<LOD	<LOD	<LOD	<LOD	0.01	0.02	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD		9.74	8.91
23-JR-33-G-E-2	0.02	11.99	<LOD	33.53	237.70	370.31	0.01	0.02	0.00	<LOD	<LOD	0.01	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD		9.08	6.53
23-JR-33-G-E-3	0.01	13.73	<LOD	67.77	246.33	631.01	<LOD	<LOD	<LOD	<LOD	<LOD	0.01	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD		10.60	8.94
23-JR-33-G-E-4	0.01	15.17	<LOD	61.84	278.58	882.33	<LOD	<LOD	<LOD	<LOD	<LOD	0.02	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD		8.77	7.35
23-JR-34-G-A-1	0.03	212.37	0.13	314.79	6552.80	478.86	0.00	0.00	<LOD	<LOD	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.02	0.00		181.21	38.55
23-JR-34-G-A-2	0.02	227.62	0.09	318.66	4229.64	543.98	0.01	0.01	<LOD	<LOD	<LOD	0.01	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.01	<LOD		127.18	38.69
23-JR-34-G-A-3	0.04	239.55	0.14	303.28	4075.23	508.88	0.01	0.00	<LOD	<LOD	<LOD	0.01	<LOD	<LOD	<LOD	<LOD	<LOD	0.00	0.02	0.00		136.09	46.47
23-JR-34-G-B-1	0.77	287.49	0.16	398.39	4482.14	351.17	0.04	0.06	0.01	0.09	0.08	0.03	0.11	0.03	0.14	0.02	0.08	0.01	0.07	0.01		169.18	47.42

23-JR-34-G-B-2	0.28	280.45	<LOD	357.92	2637.80	357.18	0.13	0.10	0.03	0.10	0.02	<LOD	0.03	0.01	0.04	0.01	0.03	0.00	0.01	0.01	77.26	30.61
23-JR-34-G-B-3	1.17	480.91	0.28	277.84	6527.60	235.11	0.74	0.83	0.14	0.46	0.18	0.03	0.20	0.03	0.25	0.04	0.16	0.02	0.14	0.02	272.83	40.12
23-JR-34-G-B-4	0.49	982.89	0.41	346.98	5863.28	192.64	0.13	0.13	0.03	0.10	0.03	0.01	0.10	0.01	0.10	0.01	0.05	0.01	0.05	0.01	1114.17	25.84
23-JR-34-G-C-1	0.49	254.88	0.15	181.03	5496.77	423.86	0.01	0.02	0.01	0.02	<LOD	0.01	0.03	0.01	0.04	0.01	0.07	0.01	0.10	0.02	184.06	45.47
23-JR-34-G-C-2	0.18	270.55	0.12	232.45	4704.42	465.56	0.04	0.03	0.01	0.03	<LOD	0.01	0.02	<LOD	0.02	0.00	0.01	0.00	0.04	0.01	170.48	50.83
23-JR-34-G-C-3	1.32	513.13	0.30	347.33	10269.40	168.34	0.02	0.03	0.01	0.05	0.11	0.06	0.22	0.05	0.25	0.04	0.12	0.01	0.08	0.01	477.30	19.14
23-JR-34-G-D-1	0.02	216.79	0.11	445.53	2015.40	447.44	0.00	0.00	<LOD	<LOD	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.00	71.12	39.51
23-JR-34-G-D-2	0.06	250.96	0.12	460.73	3664.29	330.77	0.04	0.04	0.00	0.03	<LOD	0.01	0.01	<LOD	0.01	<LOD	<LOD	<LOD	0.03	0.01	147.72	48.28
23-JR-34-G-D-3	0.53	232.69	0.08	393.84	5671.70	408.09	0.08	0.09	0.02	0.10	0.10	0.02	0.11	0.02	0.15	0.03	0.12	0.01	0.08	0.01	220.19	51.61
Tappy																						
23-JR-35-G1-1	<LOD	145.48	0.02	722.74	1080.42	1.97	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	75.71	24.79
23-JR-35-G1-2	<LOD	127.60	0.03	546.55	724.76	2.64	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	81.55	24.50
23-JR-35-G1-3	0.11	111.50	<LOD	570.96	1276.75	2.52	0.03	0.04	0.01	0.03	<LOD	<LOD	0.03	<LOD	0.01	<LOD	0.01	<LOD	<LOD	<LOD	109.41	26.56
23-JR-35-G1-4	<LOD	128.10	0.05	573.01	1240.05	2.13	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	110.14	31.05
23-JR-35-G1-5	<LOD	141.18	0.04	635.17	1170.27	1.83	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	109.80	30.59
23-JR-35-G2-1	<LOD	117.50	0.03	501.50	1332.19	2.09	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	86.44	25.67
23-JR-35-G2-2	<LOD	204.41	0.10	836.26	596.46	1.63	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	72.30	27.51
23-JR-35-G2-3	<LOD	202.77	0.04	734.08	491.01	1.83	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	61.47	29.34
23-JR-35-G2-4	<LOD	196.32	0.09	797.63	527.20	1.82	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	67.73	28.04
23-JR-35-G3-1	<LOD	154.10	0.03	665.02	1065.08	1.43	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	101.48	29.78
23-JR-35-G3-2	0.01	139.67	0.07	684.38	787.81	1.59	0.01	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	78.57	25.97
23-JR-35-G3-3	0.01	114.11	0.02	541.15	685.32	1.26	0.00	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	86.31	22.10
23-JR-35-G3-4	0.00	106.42	0.03	494.70	733.76	1.30	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	88.15	22.94
23-JR-35-G4-1	<LOD	119.30	<LOD	562.28	1216.84	2.70	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	114.24	33.06
23-JR-35-G4-2	0.07	145.69	0.05	701.07	982.22	2.37	0.06	0.01	0.00	0.04	<LOD	<LOD	<LOD	<LOD	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	94.34	26.27
23-JR-35-G4-3	0.00	144.89	0.08	576.81	1254.49	2.44	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	133.42	36.79
23-JR-35-G4-4	0.02	99.50	0.11	467.65	3837.89	3.20	0.01	0.00	0.00	0.01	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	159.04	32.20
23-JR-36-G1-1	0.93	181.87	0.09	684.66	645.09	9.43	0.71	1.05	0.18	0.83	0.11	0.03	0.17	0.02	0.12	0.02	0.05	0.00	0.02	<LOD	85.57	31.89
23-JR-36-G1-2	1.20	180.19	0.03	656.08	749.30	9.05	1.00	1.56	0.26	1.18	0.19	0.05	0.27	0.03	0.12	0.02	0.05	<LOD	0.02	0.00	91.00	36.90
23-JR-36-G1-3	7.71	160.37	0.03	584.28	666.86	13.23	10.02	22.88	3.01	12.82	2.63	0.39	2.60	0.26	1.06	0.18	0.39	0.03	0.10	0.01	81.71	31.43
23-JR-36-G1-4	3.79	209.47	<LOD	647.82	522.54	7.63	4.24	10.23	1.52	6.49	1.52	0.22	1.53	0.14	0.56	0.09	0.14	0.01	0.03	0.01	94.98	34.11
23-JR-36-G2-1	0.23	206.75	<LOD	657.29	746.39	5.43	0.12	0.16	0.04	0.18	0.04	0.01	0.07	<LOD	<LOD	0.01	0.01	<LOD	<LOD	<LOD	71.67	28.23
23-JR-36-G2-2	0.01	211.74	0.06	658.60	807.95	2.72	0.00	0.01	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	81.97	34.05
23-JR-36-G2-3	0.04	211.99	0.03	654.06	517.15	3.79	0.04	0.05	0.01	0.05	<LOD	<LOD	0.02	<LOD	<LOD	<LOD	<LOD	<LOD	0.01	<LOD	67.31	30.20
23-JR-36-G3-1	0.00	200.86	0.06	649.96	606.47	1.61	<LOD	0.01	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	63.54	28.65
23-JR-36-G3-2	<LOD	197.04	0.09	625.83	559.06	1.11	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	61.77	27.78
23-JR-36-G3-3	<LOD	194.75	0.12	566.64	401.92	1.56	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	53.11	28.18
23-JR-36-G3-4	0.01	187.40	0.14	666.82	553.52	1.92	0.00	0.01	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	59.25	25.36
23-JR-36-G4-1	7.07	202.94	0.07	594.04	563.69	9.32	8.42	18.97	2.46	10.52	2.46	0.36	2.09	0.24	1.03	0.18	0.34	0.03	0.09	0.01	52.64	28.61
23-JR-36-G4-2	3.86	214.88	0.05	608.65	459.37	8.65	5.29	9.46	1.40	6.01	1.20	0.34	1.30	0.13	0.61	0.10	0.12	0.01	0.04	0.01	60.51	29.40
23-JR-36-G4-3	0.12	217.71	0.05	638.63	410.83	2.51	0.04	0.06	0.03	0.07	0.04	<LOD	<LOD	0.00	0.01	0.00	0.01	<LOD	<LOD	<LOD	59.91	29.31
23-JR-36-G4-4	2.41	224.81	0.06	673.28	509.47	7.14	3.47	7.90	1.02	4.01	0.94	0.16	0.87	0.08	0.37	0.05	0.13	0.01	0.08	0.00	62.88	30.10
23-JR-36-G4-5	0.01	213.36	0.02	636.59	465.18	2.55	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	66.32	30.54
23-JR-36-G5-1	<LOD	174.68	0.07	643.85	658.02	5.96	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	73.22	34.67
23-JR-36-G5-2	0.07	134.34	0.10	692.52	712.42	8.07	0.04	0.06	0.01	0.03	<LOD	<LOD	<LOD	0.00	0.01	<LOD	<LOD	<LOD	<LOD	<LOD	124.88	25.88
23-JR-36-G5-3	0.16	159.00	0.07	669.60	954.68	9.40	0.11	0.17	0.03	0.22	0.03	0.01	0.06	0.00	0.01	0.00	0.01	<LOD	<LOD	<LOD	75.73	35.22
23-JR-36-G5-4	0.67	177.62	0.03	709.00	904.14	10.30	0.51	1.01	0.17	0.80	0.13	0.03	0.16	0.02	0.05	0.01	0.02	<LOD	<LOD	<LOD	79.19	42.46

23-JR-36-G5-5	0.03	140.11	0.12	602.85	2173.48	7.77	0.00	0.02	0.00	0.02	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	173.00	36.80
23-JR-38-G-A-1	<LOD	47.19	0.05	382.87	3764.65	0.97	0.01	0.01	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	114.14	16.97
23-JR-38-G-A-2	<LOD	37.64	<LOD	510.22	3229.91	2.14	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	76.04	7.98
23-JR-38-G-A-3	0.00	36.59	<LOD	406.43	3275.24	2.21	0.01	0.01	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	71.87	11.64
23-JR-38-G-A-4	0.00	36.67	<LOD	512.04	2593.47	1.50	0.01	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	75.40	9.36
23-JR-39-1	<LOD	164.23	0.06	509.46	598.73	0.72	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	67.68	24.26
23-JR-39-2	<LOD	205.30	0.05	490.76	629.70	2.03	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	61.39	24.52
23-JR-39-3	<LOD	182.61	0.05	663.55	556.81	0.52	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	60.24	25.11
23-JR-39-4	<LOD	155.85	0.08	821.09	1013.29	0.94	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	85.09	24.80
23-JR-39-5	<LOD	195.93	0.07	515.50	623.31	1.26	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	65.66	26.42
23-JR-39-6	<LOD	209.55	0.07	532.59	527.76	1.74	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	62.23	25.90
23-JR-39_g10-1	<LOD	179.11	0.09	635.66	527.86	0.79	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	63.65	27.00
23-JR-39_g11-1	<LOD	172.86	0.06	637.00	973.55	1.12	0.00	0.01	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	65.21	25.28
23-JR-39_g11-2	<LOD	177.13	0.04	500.14	1525.35	1.44	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	56.33	24.39
23-JR-39_g6-1	<LOD	149.29	0.04	467.09	515.19	0.90	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	56.07	21.56
23-JR-39_g6-2	<LOD	188.01	0.06	552.10	604.27	1.55	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	63.82	25.89
23-JR-39_g7-1	<LOD	160.31	0.10	670.94	539.88	0.63	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	64.20	25.11
23-JR-39_g7-2	<LOD	197.53	0.08	652.06	590.49	0.64	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	74.80	28.75
23-JR-39_g8-1	<LOD	174.70	0.10	664.56	924.40	1.65	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	76.84	26.30
23-JR-39_g8-2	<LOD	188.89	0.11	573.04	583.31	1.48	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	63.93	26.35
23-JR-40-G1-1	0.02	149.11	0.06	695.80	1013.41	1.44	0.00	0.00	0.00	0.02	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	71.85	25.89
23-JR-40-G1-2	0.02	146.92	0.06	702.07	1131.65	1.55	0.00	0.01	0.00	0.01	0.02	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	86.96	28.17
23-JR-40-G1-3	0.03	137.97	0.09	602.33	872.90	1.42	0.01	0.01	0.00	<LOD	0.02	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	73.88	25.54
23-JR-40-G2-1	0.01	144.56	0.08	668.56	1085.70	12.12	<LOD	0.02	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	82.12	27.34
23-JR-40-G2-2	0.00	134.63	0.05	582.05	1667.55	1.30	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	100.40	29.08
23-JR-40-G3-1	0.02	118.05	0.06	512.90	1338.35	1.88	0.00	0.00	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	171.91	47.67
23-JR-40-G3-2	0.02	180.83	0.11	717.80	1780.63	5.80	0.00	0.00	<LOD	<LOD	0.02	<LOD	<LOD	<LOD	<LOD	0.01	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	237.60	73.64
23-JR-40-G3-3	<LOD	171.53	0.07	707.60	1501.26	4.41	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	201.67	51.94
23-JR-40-G4-1	0.00	163.73	0.09	710.64	1530.01	7.25	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	214.71	61.49
23-JR-40-G4-2	0.00	137.76	0.06	630.10	2072.68	2.31	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	167.99	45.32
23-JR-40-G4-3	<LOD	155.28	0.08	626.10	2892.65	2.39	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	229.80	55.79
23-JR-41-G-A-1	<LOD	120.15	<LOD	642.43	714.17	1.65	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	116.60	25.53
23-JR-41-G-A-2	<LOD	160.75	0.07	612.37	752.70	2.59	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	104.92	27.16
23-JR-41-G-A-3	<LOD	184.73	0.05	336.02	527.79	2.43	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	49.27	27.17
23-JR-41-G-A-4	0.00	122.29	0.08	378.19	1257.98	2.58	<LOD	0.01	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	63.60	26.41
23-JR-41-G-A-5	<LOD	186.42	<LOD	642.59	739.29	2.67	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	86.24	31.95
23-JR-41-G-A-6	0.00	144.77	<LOD	627.20	948.92	2.61	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	128.37	27.03
23-JR-41-G-B-1	0.02	174.15	<LOD	689.84	906.57	2.79	<LOD	0.00	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	106.00	34.02
23-JR-41-G-B-2	<LOD	181.31	0.03	654.19	823.43	2.25	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	99.92	31.10
23-JR-41-G-B-3	7.89	21.44	0.20	16.20	1166.74	1722	8.79	15.83	1.70	6.85	1.35	1.00	0.98	0.16	1.39	0.34	0.91	0.16	1.04	0.19				13.46	4.93
23-JR-41-G-B-4	0.00	138.67	0.05	520.20	1075.48	2.23	0.01	0.05	0.00	0.02	<LOD	<LOD	0.01	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	85.01	29.19
23-JR-41-G-C-1	<LOD	138.26	0.06	770.54	1382.68	2.11	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	122.76	29.84
23-JR-41-G-C-2	<LOD	170.76	0.08	583.49	933.77	2.52	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	95.61	27.32
23-JR-41-G-C-3	<LOD	200.65	<LOD	633.19	814.36	2.66	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	92.42	32.16
23-JR-41-G-D-1	<LOD	186.68	<LOD	620.93	1124.01	2.14	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	97.96	33.30
23-JR-41-G-D-2	<LOD	183.14	0.09	570.91	826.33	26.98	0.01	0.03	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	86.33	32.53
23-JR-41-G-D-3	0.11	222.21	0.07	448.71	403.12	2.64	0.02	0.04	0.00	0.02	<LOD	<LOD	<LOD	0.00	<LOD	0.00	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	60.28	33.84
23-JR-41-G-D-4	<LOD	162.57	0.05	661.00	1173.24	2.16	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	124.55	32.86

LA ICP-MS Data for Trace Element Analyses on CGMs Li - La

Eagle	Li	Mg	Sc	Ti	V	Cr	Mn	Fe	Ge	Y	Zr	Nb	Mo	Sn	Ba	La
23-JR-020-UpMid-1	28.56	92.46	1.15	42120.45	1.51	<LOD	17724.90	1964.41	42.32	2287.71	65.46	176012.81	1.41	33615.14	2358.64	1131.34
23-JR-020-UpMid-2	28.80	17.05	1.24	37302.08	1.33	<LOD	18819.24	1366.43	48.50	2810.92	96.95	162001.54	1.47	40742.48	263.53	1508.20
23-JR-025-L-1	166.62	92.89	2.68	10904.62	<LOD	<LOD	90958.06	45259.65	<LOD	1451.09	2879.03	102570.29	8.69	3332.51	10.51	0.28
23-JR-025-L-2	165.07	430.01	10.03	9714.94	<LOD	<LOD	53736.94	77058.79	<LOD	290.77	3315.34	86312.61	5.62	13065.75	5.01	0.33
23-JR-025-D-1	149.42	10.93	1.42	7105.52	<LOD	<LOD	112863.56	28757.52	<LOD	601.17	4018.83	158867.59	10.11	2311.20	43.54	0.43
23-JR-025-D-2	77.58	2.42	2.37	7832.96	<LOD	<LOD	119550.27	18360.63	<LOD	753.75	4693.65	157584.19	11.19	2931.78	3.02	0.04
CM24-15 - 1	77.73	246.22	4.39	10991.64	<LOD	<LOD	89386.85	74709.02	<LOD	1037.35	2673.78	381116.81	4.81	2647.78	497.51	39.75
CM24-15 - 10	149.47	9.37	11.09	6278.69	<LOD	<LOD	97791.08	31324.85	<LOD	704.40	1583.01	125756.37	4.92	4415.99	0.35	0.10
CM24-15 - 11	130.77	19.60	12.01	6120.33	<LOD	<LOD	95367.32	36935.80	<LOD	611.79	1473.92	126022.67	5.16	5391.40	0.27	0.04
CM24-15 - 12	33.47	567.64	5.95	3039.46	0.47	<LOD	50436.27	93057.06	<LOD	111.96	390.46	290931.91	2.42	1308.68	16.51	6.29
CM24-15 - 13	64.86	54.57	5.62	7721.10	<LOD	<LOD	68115.17	83316.49	<LOD	588.03	2881.86	295024.11	5.07	3359.28	18.80	6.41
CM24-15 - 14	6.93	77.74	5.66	8520.22	<LOD	<LOD	69925.10	85889.21	<LOD	441.47	3109.36	299565.69	5.47	3465.30	<LOD	<LOD
CM24-15 - 15	126.01	122.64	6.01	7946.35	<LOD	<LOD	81563.61	66531.18	<LOD	597.88	3900.44	243551.63	4.19	5716.52	<LOD	0.10
CM24-15 - 16	125.02	259.87	4.97	8284.01	<LOD	16.46	65802.07	73933.42	<LOD	581.38	4511.97	212057.04	4.04	7302.37	46.68	1.15
CM24-15 - 2	36.09	389.37	13.53	5258.09	<LOD	<LOD	80958.36	81997.87	<LOD	769.75	625.45	385676.78	3.56	763.19	573.46	21.62
CM24-15 - 3	58.82	84.68	8.61	10182.73	<LOD	<LOD	96383.19	71226.19	<LOD	1366.84	3187.67	412684.91	4.73	1978.54	<LOD	0.08
CM24-15 - 4	89.55	4.33	6.78	10280.50	<LOD	<LOD	123032.95	21730.49	<LOD	631.37	6268.60	241314.49	6.29	8477.20	38.11	1.20
CM24-15 - 5	90.96	132.39	6.36	9233.19	<LOD	<LOD	84059.40	53654.19	5.63	523.03	4782.17	254663.11	4.18	6087.82	1487.66	58.61
CM24-15 - 6	42.25	812.39	12.14	5028.84	4.58	<LOD	53267.39	99839.03	3.10	386.63	1592.18	306854.18	3.39	1691.11	690.81	16.71
CM24-15 - 7	36.87	732.90	491.92	8577.28	18.57	<LOD	66131.21	88523.93	<LOD	505.11	728.93	297078.87	4.31	2098.91	6.16	0.54
CM24-15 - 8	49.06	938.27	103.60	8604.42	24.53	<LOD	51681.82	106702.87	<LOD	240.50	1288.79	358672.60	5.01	2057.50	0.66	0.34
CM24-15 - 9	310.54	927.42	203.72	7560.54	23.75	<LOD	47152.49	103497.18	<LOD	300.86	733.54	319151.88	5.50	2078.81	7.53	0.76
CM24-16 - 1	53.16	285.94	13.86	7193.63	<LOD	<LOD	133977.15	48463.44	<LOD	3382.75	198.88	572833.87	5.59	180.10	0.06	0.28
CM24-16 - 10	54.06	699.83	930.18	10171.29	13.43	<LOD	75425.92	105056.16	<LOD	436.75	931.33	489739.40	5.00	1855.15	<LOD	0.06
CM24-16 - 11	26.63	643.59	652.37	9463.44	8.78	<LOD	64729.42	115345.50	<LOD	279.61	899.64	488186.68	5.10	2156.62	4.86	2.14
CM24-16 - 12	32.30	434.88	573.34	10006.08	6.56	<LOD	73685.66	108530.32	<LOD	352.99	1145.16	501275.91	4.27	2624.16	1.88	0.58
CM24-16 - 13	76.53	802.64	647.86	16293.89	131.77	47.66	63738.89	118632.11	<LOD	542.40	2320.40	495099.08	4.10	3826.55	<LOD	0.03
CM24-16 - 14	79.27	1105.10	655.65	13894.72	81.63	<LOD	61495.16	122089.62	<LOD	461.23	1794.59	510495.23	4.03	3301.09	1.88	4.74
CM24-16 - 15	24.80	728.22	976.16	9728.00	14.72	<LOD	53164.39	131014.78	<LOD	649.92	816.26	509295.77	6.86	1333.48	<LOD	0.66
CM24-16 - 16	39.45	722.89	1143.85	11685.22	15.50	<LOD	51070.14	129613.34	<LOD	571.81	1434.11	508423.50	7.06	1789.26	<LOD	0.01
CM24-16 - 17	52.57	163.96	28.53	2969.88	1.07	<LOD	144007.48	31502.24	<LOD	2693.56	98.32	465835.48	6.16	70.47	1.07	1.22
CM24-16 - 18	68.99	174.27	41.77	4954.91	1.00	<LOD	143037.54	33603.58	<LOD	3409.69	232.20	447881.67	5.46	183.90	2.81	0.96
CM24-16 - 2	63.80	1224.48	26.39	6619.02	1.39	<LOD	136603.66	46798.90	3.44	2962.55	336.06	565210.89	5.75	145.06	139.01	113.54
CM24-16 - 3	14.33	307.57	13.27	7206.82	<LOD	<LOD	133739.20	49054.89	<LOD	3510.31	214.62	574817.49	5.08	137.51	<LOD	0.06
CM24-16 - 4	12.46	294.75	14.12	7499.60	<LOD	<LOD	133421.69	46070.37	<LOD	5605.66	204.04	581171.12	5.86	106.66	<LOD	0.27
CM24-16 - 5	44.39	303.28	14.35	7369.25	0.48	<LOD	134220.05	49358.74	<LOD	4258.70	297.14	569295.39	5.72	217.72	0.36	0.20

CM24-16 - 6	48.76	320.92	13.75	7494.01	0.52	<LOD	135047.03	49879.93	<LOD	3650.59	232.30	572057.99	5.63	183.23	20.29	6.92
CM24-16 - 7	43.22	491.38	811.98	8717.82	10.19	<LOD	65480.66	108747.94	<LOD	440.67	803.36	434966.92	5.22	1654.35	<LOD	0.09
CM24-16 - 8	21.60	685.23	899.59	8529.92	14.27	<LOD	55381.64	127187.61	<LOD	413.52	716.49	490397.60	7.21	1330.93	<LOD	0.09
CM24-16 - 9	53.21	906.86	665.90	9495.62	11.83	<LOD	60101.63	119953.51	<LOD	288.01	880.96	473025.35	4.33	1999.04	0.13	0.12
F.D. no. 5																
23-JR-031-BottomLeft-L	42.87	153.40	1812.70	9240.01	3.10	<LOD	89135.43	58349.89	<LOD	2634.23	517.54	294156.10	7.10	1089.73	0.27	0.55
23-JR-031-BottomLeft-D	12.56	229.13	671.73	9869.86	3.56	<LOD	103544.78	59467.88	<LOD	4062.26	377.10	460392.58	7.76	426.18	<LOD	0.31
23-JR-031-MidRight-D	22.38	618.14	1995.80	10192.39	12.00	<LOD	67076.20	76602.03	<LOD	1468.91	1196.19	285219.33	7.83	1101.12	51.01	8.12
23-JR-031-MidRight-L	90.52	143.74	1.24	49833.51	3.36	<LOD	4229.39	10456.54	48.08	1041.10	247.14	212155.57	0.34	13406.07	5573.50	1539.68
23-JR-033-Bottom-1	67.68	659.67	2.44	55365.75	4.36	<LOD	5323.27	12201.99	12.01	852.93	103.86	188923.43	0.46	21279.72	8292.71	994.34
23-JR-033-Bottom-2	12.25	281.66	1.54	52283.51	2.83	<LOD	5478.20	16061.78	15.86	800.19	112.95	183822.76	0.46	19130.81	8753.99	1018.23
23-JR-033-Bottom-3	<LOD	313.61	1.16	59795.84	2.14	<LOD	4653.32	25008.34	18.65	978.38	108.02	229658.93	0.29	18981.39	12040.73	1190.06
23-JR-033-Top-1	144.39	12.87	<LOD	19207.93	0.84	<LOD	2353.76	710.10	14.02	210.61	47.25	58364.56	0.16	7414.31	167.23	839.31
23-JR-033-Top-2	175.84	7.43	<LOD	21692.14	1.12	<LOD	2785.03	349.98	15.52	251.55	53.09	60877.28	0.33	8107.63	1.55	891.97
23-JR-033-Top-3	156.54	6.81	<LOD	20409.33	<LOD	<LOD	2527.70	397.35	16.68	281.08	49.80	63401.64	0.23	8769.38	1.88	706.38
CM24-10 - 1	4.67	983.60	2012.64	12421.60	13.81	<LOD	60633.64	85912.85	<LOD	1290.72	1918.97	282242.45	7.40	2710.23	<LOD	0.02
CM24-10 - 10	6.18	450.15	2843.20	19342.21	5.95	21.32	80331.20	65779.56	<LOD	4951.16	2586.99	317014.71	3.98	2405.37	144.22	66.86
CM24-10 - 11	20.20	64.75	120.36	211038.50	180.00	<LOD	12523.93	71733.65	<LOD	76.90	515.20	80394.98	1.31	17275.54	3.80	118.79
CM24-10 - 2	6.20	959.87	1980.19	12171.77	13.36	<LOD	60026.99	83908.91	<LOD	1218.40	1857.30	279967.94	7.77	2651.80	10.35	0.91
CM24-10 - 3	4.77	960.46	1915.34	12334.41	14.12	<LOD	61016.33	85946.24	<LOD	1114.95	1662.11	283404.69	6.88	2763.98	<LOD	0.01
CM24-10 - 4	40.15	549.59	1886.70	16721.70	10.01	5.75	57090.54	69017.73	<LOD	2464.89	1687.67	175754.18	3.89	7187.86	42.93	10.60
CM24-10 - 5	17.90	648.72	2896.87	14420.99	47.69	<LOD	36325.08	94282.64	<LOD	405.06	8125.94	87585.74	4.57	91844.93	43.15	4.31
CM24-10 - 6	19.72	656.43	2814.79	14586.18	50.00	6.84	36350.87	94930.15	<LOD	590.02	7898.00	89764.62	4.65	86971.01	832.05	74.14
CM24-10 - 7	6.42	390.21	3555.31	16656.88	4.15	<LOD	91216.90	64350.75	<LOD	4801.57	2646.60	384898.39	4.24	1462.36	18.73	10.62
CM24-10 - 8	9.32	408.47	2908.99	16768.41	5.99	9.27	86253.07	65592.89	<LOD	4949.95	2084.04	363501.26	4.18	1724.01	16.36	4.41
CM24-10 - 9	5.51	438.10	2877.26	18231.97	6.34	<LOD	86875.06	67581.96	<LOD	4890.26	2273.24	343588.05	4.16	2452.26	143.90	42.70
CM24-11 - 1	62.48	865.89	1808.60	13436.99	17.97	<LOD	62574.99	82261.24	<LOD	1087.47	2403.08	233736.30	7.21	4495.03	322.84	33.00
CM24-11 - 10	59.72	981.66	1985.01	13114.92	15.48	15.52	63448.41	89021.64	<LOD	1188.54	1818.08	301289.05	7.31	3043.45	5.58	0.63
CM24-11 - 11	35.06	942.78	1268.96	15756.22	11.54	<LOD	65481.30	83492.29	<LOD	1167.96	1397.24	261995.59	6.52	5805.46	7.12	1.69
CM24-11 - 12	262.07	1101.95	1381.19	13564.29	12.70	10.88	69086.26	86418.63	<LOD	1500.23	1406.45	276667.06	6.16	3882.66	39.23	11.04
CM24-11 - 13	33.11	897.69	1323.89	15090.75	11.46	<LOD	66961.09	81722.27	<LOD	1944.12	1718.49	259576.62	6.28	4393.58	11.46	7.30
CM24-11 - 14	36.51	994.97	1976.43	13779.17	17.24	8.77	60126.08	89560.76	<LOD	1022.78	1793.21	295858.08	6.85	3148.20	0.10	0.05
CM24-11 - 15	19.49	1159.93	1877.33	11995.86	14.47	<LOD	63652.96	92231.99	<LOD	869.82	1511.46	309214.45	7.07	2638.23	1.73	0.51
CM24-11 - 2	92.48	841.26	1856.57	12740.10	14.96	<LOD	63488.25	84739.36	<LOD	1093.16	2081.53	246057.66	8.16	4252.49	<LOD	0.17
CM24-11 - 3	94.18	572.96	1786.16	15347.35	29.85	12.50	43302.66	53829.49	<LOD	1073.21	5984.32	148330.80	5.39	52213.97	568.55	96.13
CM24-11 - 4	5.61	841.23	1729.49	12351.86	13.46	<LOD	64854.98	80724.84	<LOD	1255.27	2260.70	236405.31	7.36	3400.47	<LOD	0.01
CM24-11 - 5	6.67	847.10	1702.51	12063.86	12.43	21.96	65756.92	80942.75	<LOD	1102.02	1955.63	242179.07	6.76	3412.92	1.38	0.22
CM24-11 - 6	18.13	989.38	2020.05	13543.92	15.79	<LOD	62718.09	88402.43	<LOD	1252.69	2052.21	293381.19	7.42	3045.55	<LOD	0.01
CM24-11 - 7	<LOD	1000.05	1860.21	12265.00	14.51	<LOD	62547.00	88864.75	<LOD	857.22	1612.86	300281.12	7.05	2792.34	<LOD	<LOD
CM24-11 - 8	38.01	968.62	1973.09	12896.94	15.08	<LOD	62060.08	87100.30	<LOD	1179.85	1899.32	287091.34	7.27	2810.55	<LOD	0.06
CM24-11 - 9	25.65	897.68	1701.76	10888.83	12.69	<LOD	68381.04	83605.09	<LOD	694.16	1224.98	307018.54	6.77	2213.32	3.49	0.53

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23-JR-035-Left	36.52	17.16	7.59	2638.57	10.39	<LOD	105508.07	70438.64	<LOD	1.05	675.58	368758.75	8.14	1743.46	181.84	3.16
23-JR-042-BottomMid-L	<LOD	34.01	93.62	4658.39	<LOD	<LOD	90383.32	55767.73	<LOD	221.84	1204.97	145728.08	6.94	2236.31	0.17	<LOD
23-JR-042-BottomMid-D	<LOD	26.24	81.04	4010.23	<LOD	<LOD	92826.67	64347.14	<LOD	111.90	550.68	266585.00	6.81	1224.69	<LOD	<LOD
23-JR-042-BottomRight-L	6.83	31.85	117.67	4532.02	<LOD	<LOD	97130.91	69531.02	<LOD	162.03	859.45	277923.29	6.54	1269.35	<LOD	<LOD
23-JR-042-BottomRight-D	15.52	26.15	87.52	3374.86	1.03	25.34	93729.67	63084.56	<LOD	123.57	637.53	262735.12	6.78	975.10	68.64	1.29
23-JR-042-UpperLeft-Der	<LOD	36.08	58.49	2406.35	<LOD	<LOD	85874.77	58178.35	<LOD	98.11	459.49	280383.75	6.50	574.36	617.82	4.00
23-JR-042-UpperLeft-L	76.71	32.01	69.67	3761.21	<LOD	<LOD	87652.65	55876.87	<LOD	86.52	1400.97	162543.87	6.79	6346.48	94.49	1.47

LA ICP-MS Data for Trace Element Analyses on CGMs Ce - U

Eagle	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Hf	Ta	W	Pb	Bi	Th	U
23-JR-020-UpMid-1	4925.66	784.45	3258.23	2615.53	184.71	1931.37	280.11	816.28	54.82	80.99	6.68	30.49	2.23	316.23	1400615.21	6801.03	1727.19	361.90	6114.62	5520.84
23-JR-020-UpMid-2	6059.96	937.38	3878.47	3077.97	230.90	2223.96	328.31	940.68	64.00	94.58	8.11	39.63	2.81	242.79	1484830.60	5016.42	2510.06	321.59	10334.43	4530.90
23-JR-025-L-1	1.34	0.65	8.27	135.29	0.47	535.33	138.17	404.96	19.66	19.72	1.58	6.83	0.50	1065.70	670458.22	3040.97	110.81	2.56	300.18	4415.07
23-JR-025-L-2	0.71	0.19	2.03	27.24	0.02	100.47	28.75	82.81	3.45	3.70	0.38	1.95	0.18	1053.23	649826.26	4520.76	59.95	1.52	133.84	2354.23
23-JR-025-D-1	0.96	0.26	3.81	44.81	0.07	153.47	47.62	162.79	7.89	8.89	0.83	4.84	0.37	934.33	622051.80	4241.68	81.35	1.72	217.76	4144.16
23-JR-025-D-2	0.61	0.40	4.31	55.87	<LOD	185.93	55.65	194.49	10.01	11.58	1.09	6.86	0.47	1044.09	589938.15	5493.35	98.47	2.33	267.33	4709.56
CM24-15 - 1	112.92	14.72	58.73	64.16	3.86	200.42	63.53	273.22	24.20	44.57	5.19	32.66	3.60	341.28	425685.01	4545.52	86.44	<LOD	210.44	3235.72
CM24-15 - 10	0.59	0.25	2.67	17.88	0.16	62.20	25.20	123.22	10.47	19.55	2.67	15.56	1.80	599.06	727178.89	1467.38	54.28	<LOD	128.24	1943.40
CM24-15 - 11	0.49	0.23	1.69	13.81	0.16	49.51	21.12	102.39	8.89	17.43	2.28	14.80	1.72	568.41	723890.02	1544.61	33.04	<LOD	73.66	1493.14
CM24-15 - 12	22.26	3.19	11.13	13.32	1.64	15.98	4.28	19.28	1.72	3.79	0.55	3.74	0.34	111.91	557368.66	2246.33	9.34	<LOD	16.58	230.48
CM24-15 - 13	26.16	4.53	23.77	69.91	0.27	145.23	45.40	171.80	11.84	19.12	2.34	13.74	1.36	450.41	499254.46	5175.22	639.35	<LOD	1445.67	26184.44
CM24-15 - 14	0.10	0.05	0.53	6.25	<LOD	34.65	18.22	92.72	8.28	15.85	2.00	13.66	1.26	502.68	521352.50	5454.85	0.99	<LOD	2.41	213.56
CM24-15 - 15	0.82	0.35	3.16	28.59	0.11	102.58	36.29	143.71	10.02	15.69	2.18	13.27	1.33	714.65	577596.98	6794.17	46.39	<LOD	112.01	3427.34
CM24-15 - 16	5.69	1.27	5.55	34.57	0.48	104.78	35.76	132.79	9.36	14.85	1.81	11.49	1.03	837.99	610914.09	8424.56	70.94	<LOD	121.23	3823.65
CM24-15 - 2	66.37	10.02	43.03	44.25	5.60	123.72	44.29	203.90	17.80	34.96	4.28	26.07	3.07	97.17	435723.57	5703.15	14.20	<LOD	91.55	593.31
CM24-15 - 3	0.53	0.21	2.56	29.34	2.17	180.26	68.10	318.03	26.57	46.94	6.08	37.88	4.23	401.42	392905.79	5632.84	13.93	<LOD	29.26	773.06
CM24-15 - 4	2.55	0.56	4.60	39.06	0.06	127.46	41.23	155.77	10.56	16.72	2.03	12.03	1.14	1015.41	573169.60	5976.08	101.46	<LOD	238.54	6959.26
CM24-15 - 5	88.17	7.55	20.32	34.71	0.44	104.90	33.75	130.33	8.70	13.65	1.78	11.11	0.97	803.11	573593.86	5086.10	82.55	<LOD	187.76	4911.32
CM24-15 - 6	30.28	3.83	14.09	29.36	0.29	72.49	22.93	94.47	7.17	12.84	1.64	10.22	0.99	264.62	519614.78	2255.45	77.19	<LOD	356.56	4595.24
CM24-15 - 7	1.26	0.41	3.45	27.34	0.82	104.59	28.36	101.94	7.83	16.57	2.59	19.89	2.77	178.42	524915.13	6909.35	9.48	<LOD	22.66	328.05
CM24-15 - 8	0.62	0.17	1.27	8.09	0.08	36.92	12.46	53.28	5.08	11.04	1.65	10.51	1.47	196.43	460240.97	4449.29	7.32	<LOD	20.71	411.08
CM24-15 - 9	12.15	3.72	29.12	114.57	0.60	231.91	46.71	119.75	7.45	13.36	1.64	10.10	1.40	122.03	436985.53	3573.76	2674.70	<LOD	7146.08	65199.76
CM24-16 - 1	1.80	0.78	9.73	70.07	3.75	317.01	92.81	446.06	57.52	182.15	36.81	337.76	49.14	6.57	227683.49	3788.18	6.67	<LOD	15.96	264.74
CM24-16 - 10	0.55	0.27	2.46	10.91	2.35	33.58	11.98	67.79	10.10	33.79	7.41	70.39	11.15	128.38	307119.53	7335.09	3.74	<LOD	7.03	267.57
CM24-16 - 11	2.34	0.69	2.90	6.71	0.13	20.42	7.75	44.53	6.88	25.07	5.54	54.13	8.71	144.26	308829.24	6676.75	27.46	<LOD	13.36	380.17
CM24-16 - 12	0.31	0.25	1.58	7.31	0.15	30.91	13.17	68.67	8.16	26.11	4.97	41.63	6.68	171.27	292021.52	5493.52	7.77	<LOD	25.52	523.87
CM24-16 - 13	0.48	0.22	2.54	17.18	0.43	75.33	28.06	123.12	12.82	32.36	5.75	43.67	6.85	334.38	290011.44	4742.63	13.12	<LOD	34.98	953.35
CM24-16 - 14	4.39	0.43	2.52	14.60	0.28	61.35	22.45	100.34	10.73	28.72	4.82	39.52	6.21	256.47	274015.23	4243.67	13.61	<LOD	57.69	902.04
CM24-16 - 15	4.55	1.77	13.60	28.89	1.84	60.76	18.99	103.10	14.59	46.58	9.36	86.43	13.65	108.92	282153.44	8498.74	3.80	<LOD	9.58	221.28
CM24-16 - 16	0.16	0.07	1.03	8.06	0.07	36.51	15.04	93.63	14.85	50.35	10.94	101.11	16.23	194.52	281437.56	9611.02	4.02	<LOD	10.69	335.97
CM24-16 - 17	5.88	2.14	22.91	81.05	2.58	212.85	65.30	379.77	56.20	177.11	33.87	295.71	45.99	5.47	346978.55	2877.32	19.43	<LOD	17.21	92.31
CM24-16 - 18	9.10	3.98	48.26	166.87	5.66	399.59	96.59	491.56	68.99	211.12	40.97	350.65	54.26	21.53	358855.08	4962.62	35.42	<LOD	52.59	282.91
CM24-16 - 2	57.03	28.22	84.69	115.16	5.52	305.11	83.68	400.20	52.74	172.53	34.95	333.28	50.77	26.18	229723.90	4219.85	1716.88	<LOD	96.26	1772.72
CM24-16 - 3	1.22	0.78	10.39	73.58	3.72	336.62	95.44	461.59	59.41	184.90	36.77	343.50	50.45	7.22	224855.86	4007.09	5.86	<LOD	19.18	265.42
CM24-16 - 4	5.39	2.95	35.79	202.82	8.52	767.89	192.55	842.15	104.67	305.71	56.30	485.09	70.39	7.14	217196.55	4236.95	20.00	<LOD	64.24	507.77
CM24-16 - 5	1.97	1.22	14.38	99.91	5.45	433.02	121.61	579.05	73.86	223.87	44.34	400.60	57.50	11.01	224839.90	5239.03	9.55	<LOD	25.48	345.16

CM24-16 - 6	11.36	2.21	16.82	82.40	4.18	353.54	104.33	490.79	63.64	194.87	38.49	349.65	52.06	8.65	224409.34	4398.01	20.64	<LOD	22.39	393.38
CM24-16 - 7	0.63	0.24	2.02	10.15	1.74	30.29	11.41	66.33	9.15	31.16	6.97	67.85	9.93	119.99	370144.78	7067.85	2.80	<LOD	5.98	175.83
CM24-16 - 8	0.79	0.32	2.48	10.33	0.44	34.17	12.06	68.21	10.51	34.49	7.15	71.67	11.06	98.39	305530.83	7625.89	2.05	<LOD	4.36	162.61
CM24-16 - 9	0.67	0.20	1.52	6.75	0.12	22.44	8.43	47.83	7.34	26.05	5.66	55.09	8.87	140.04	324984.16	6579.43	3.42	<LOD	8.06	301.64
F.D. no. 5																				
23-JR-031-BottomLeft-L	3.45	1.26	13.07	22.72	4.52	68.15	25.08	250.86	72.03	369.49	99.68	1241.65	250.49	66.01	377145.93	3956.17	18.54	<LOD	49.30	107.37
23-JR-031-BottomLeft-D	1.64	0.72	8.23	25.14	5.80	125.69	52.79	529.08	138.76	588.15	123.57	1204.17	216.42	41.68	187806.28	4822.18	20.70	<LOD	65.97	20.03
23-JR-031-MidRight-D	22.44	4.05	20.78	19.79	1.99	56.59	21.57	202.44	53.31	241.29	55.66	592.08	112.33	127.11	366342.07	3878.56	116.10	6.53	14.96	216.97
23-JR-031-MidRight-L	7225.58	1114.35	4255.93	1047.22	137.26	471.48	53.60	214.52	24.74	53.45	6.16	36.78	3.28	273.31	1225818.32	4759.77	1569.04	462.62	3117.88	13966.28
23-JR-033-Bottom-1	2092.22	242.67	955.39	437.43	962.59	421.34	64.03	250.35	22.68	35.84	3.45	18.95	1.37	204.06	1422058.21	5634.88	2908.77	279.49	10527.74	43792.73
23-JR-033-Bottom-2	2107.70	237.07	928.31	422.12	900.41	396.45	60.95	231.27	21.42	34.31	3.43	18.94	1.67	203.76	1457510.79	5169.77	2770.65	317.41	9614.44	38032.26
23-JR-033-Bottom-3	2473.14	282.91	1133.74	522.60	1128.68	491.67	73.95	283.99	25.38	42.87	4.29	23.89	1.92	221.98	1427064.55	5657.50	2846.15	463.22	10311.10	40190.89
23-JR-033-Top-1	2853.08	404.19	1613.21	554.97	246.91	330.10	35.87	103.69	7.93	9.88	0.75	3.37	0.34	81.41	1311291.39	1924.11	1504.25	47.85	5543.73	4839.80
23-JR-033-Top-2	3180.62	455.27	1872.39	663.09	293.02	401.91	43.33	128.71	9.51	11.37	0.69	2.27	0.13	77.45	1545528.19	1441.53	1950.46	9.38	8718.37	2715.28
23-JR-033-Top-3	2856.76	434.03	1817.49	667.07	291.39	417.42	46.29	138.69	10.58	12.65	0.89	3.03	0.13	87.51	1352731.78	2067.14	1911.92	10.75	8134.55	2876.24
CM24-10 - 1	0.53	0.24	2.67	8.29	0.54	33.13	14.46	154.11	45.69	213.53	50.53	586.21	110.29	208.53	543707.64	3880.00	7.44	0.19	20.96	391.24
CM24-10 - 10	210.05	27.82	114.33	56.06	10.31	160.46	57.06	534.19	141.13	626.76	134.35	1255.46	215.02	543.42	492749.21	5826.32	72.30	3.75	90.36	360.03
CM24-10 - 11	307.90	36.88	127.39	35.03	65.34	25.38	3.09	11.83	1.39	3.42	0.44	3.23	0.41	195.25	603980.06	1030.60	77.33	5.66	10.03	7.59
CM24-10 - 2	2.69	0.43	3.47	8.01	0.59	31.77	13.99	145.77	42.82	200.96	47.56	557.80	105.62	210.14	547880.42	3791.57	6.64	0.19	18.72	374.27
CM24-10 - 3	0.39	0.21	2.59	6.16	0.47	26.36	12.12	128.93	39.24	189.82	45.93	539.29	103.29	193.31	541257.93	4446.65	5.98	0.20	17.10	408.32
CM24-10 - 4	25.30	2.96	14.55	25.57	3.96	88.90	37.62	357.72	95.30	415.90	90.90	954.91	160.71	306.33	661504.67	2756.11	57.91	0.57	69.09	541.94
CM24-10 - 5	7.22	0.74	4.50	5.60	1.18	16.89	5.69	48.32	11.96	57.20	13.81	163.24	31.65	1714.84	651686.17	8820.26	9.21	<LOD	22.93	627.04
CM24-10 - 6	160.13	14.29	43.45	23.45	2.26	44.83	12.97	99.56	22.78	88.83	18.73	200.79	35.29	1652.56	650083.46	8478.61	65.04	0.89	648.70	2340.88
CM24-10 - 7	18.70	3.71	23.96	37.14	6.35	139.29	52.26	497.73	139.17	630.87	143.08	1448.56	263.89	365.62	418828.00	6459.48	13.71	1.02	26.80	35.99
CM24-10 - 8	16.70	4.29	33.12	47.70	10.26	166.65	57.89	532.35	145.23	656.14	144.62	1384.14	242.95	411.60	444622.58	6525.19	18.53	0.16	41.80	39.60
CM24-10 - 9	99.60	14.58	68.82	57.38	12.40	170.09	59.82	532.15	144.52	636.88	137.55	1297.87	224.78	467.98	458605.20	6549.12	43.35	<LOD	103.44	450.09
CM24-11 - 1	54.32	4.21	13.69	9.72	1.41	32.12	12.55	120.40	33.24	162.03	40.74	422.78	83.25	328.53	591283.96	3334.11	9.10	0.39	42.94	702.12
CM24-11 - 10	1.94	0.37	3.49	8.32	0.60	33.47	14.17	139.25	38.95	191.94	47.01	496.95	95.46	206.17	517078.14	4376.95	10.58	0.77	26.94	463.61
CM24-11 - 11	5.07	1.27	9.79	17.74	0.80	56.46	19.69	158.88	38.30	174.64	40.86	414.21	76.41	224.60	557395.98	3457.86	69.53	<LOD	53.37	409.83
CM24-11 - 12	39.00	5.83	35.66	34.21	5.66	86.65	27.30	206.85	48.23	209.77	48.34	487.18	88.27	210.66	538494.99	3512.26	460.94	<LOD	82.20	404.84
CM24-11 - 13	34.81	6.33	39.89	46.84	3.48	120.00	39.44	301.75	67.60	287.10	65.45	643.72	112.68	255.11	559107.46	3752.18	60.04	<LOD	130.62	538.45
CM24-11 - 14	0.41	0.20	1.82	5.78	0.39	26.42	11.81	117.85	33.59	173.08	43.06	466.75	90.81	203.02	522915.04	4070.91	6.88	<LOD	18.88	491.28
CM24-11 - 15	1.21	0.29	2.10	5.17	0.43	21.85	9.96	97.51	28.82	145.04	37.05	398.82	78.89	180.94	508847.23	4574.86	4.90	<LOD	13.33	320.28
CM24-11 - 2	0.83	0.31	3.06	7.53	0.56	32.59	12.81	120.17	33.07	160.72	39.81	419.45	82.56	285.61	567556.63	3683.43	10.48	0.47	24.34	434.55
CM24-11 - 3	240.10	30.60	155.91	145.54	19.62	188.18	34.84	180.74	30.92	108.74	21.52	204.52	37.37	1198.30	665053.93	5801.17	180.94	41.21	461.40	1476.23
CM24-11 - 4	0.42	0.20	2.38	5.65	0.39	30.24	13.62	132.43	36.98	186.82	45.92	479.23	93.62	302.22	590368.88	3933.85	9.81	0.21	27.76	482.33
CM24-11 - 5	0.86	0.21	2.31	6.38	0.36	27.02	11.77	118.22	33.36	163.49	40.39	436.02	83.88	259.67	583894.07	4128.66	9.54	0.63	21.38	453.54
CM24-11 - 6	0.47	0.26	2.57	6.65	0.45	32.85	14.26	142.12	41.06	207.13	51.10	531.63	104.70	239.99	526049.29	4589.22	7.81	0.51	23.63	500.39
CM24-11 - 7	0.40	0.15	1.63	4.99	0.32	21.02	9.06	95.11	27.76	143.49	35.90	387.09	78.73	209.96	522249.63	4130.18	4.04	0.36	11.61	339.64
CM24-11 - 8	0.68	0.27	2.83	7.06	0.64	31.84	13.95	136.04	38.59	192.02	48.11	500.24	98.09	223.11	536256.44	3925.12	7.20	0.50	19.92	412.70
CM24-11 - 9	1.60	0.31	2.22	4.41	0.31	18.19	7.87	78.06	22.67	117.24	29.35	322.64	64.96	175.53	518722.26	3693.33	4.08	0.43	11.57	265.99

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23-JR-035-Left	3.45	0.27	0.75	0.11	0.01	0.09	0.02	0.15	0.02	0.06	0.02	0.34	0.05	105.76	412295.11	4446.62	13.13	1.84	18.10	540.21
23-JR-042-BottomMid-L	0.02	0.01	0.15	1.31	<LOD	6.54	4.47	40.33	6.09	20.12	4.59	45.04	5.52	353.71	667470.13	1927.98	4.48	0.17	11.09	512.45
23-JR-042-BottomMid-D	0.02	0.01	0.06	0.81	<LOD	4.12	2.84	22.88	3.07	8.89	1.84	18.06	2.07	101.35	507767.99	2418.51	1.56	0.18	3.78	238.10
23-JR-042-BottomRight-L	0.04	<LOD	0.17	2.12	<LOD	8.88	5.41	38.69	4.72	12.99	3.02	29.02	3.68	178.35	560359.40	2975.75	1.58	0.20	4.05	294.25
23-JR-042-BottomRight-D	3.59	0.37	1.27	1.67	<LOD	6.06	3.98	29.57	3.50	9.42	1.77	16.95	1.92	118.64	496844.87	3581.17	1.83	<LOD	11.32	269.14
23-JR-042-UpperLeft-Der	8.21	0.63	1.79	1.66	<LOD	4.82	2.98	22.35	2.79	7.44	1.52	15.03	1.82	83.96	405527.46	2747.43	34.55	<LOD	408.99	1080.72
23-JR-042-UpperLeft-L	3.86	0.30	0.73	0.66	0.01	3.16	1.96	16.30	2.18	7.76	1.69	19.70	2.54	376.27	614214.13	1691.35	6.49	<LOD	34.17	534.52

LA ICP-MS Data for Trace Element Analyses on Garnet Li - Sr

Eagle	Li	Na	Mg	Al	P	Ca	Sc	Ti	Cr	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Rb	Sr
CM24-15-Core - 1	71.392	8.349	623.700	105217.938	247.633	3630.431	8.577	135.655	81.740	0.473	<LOD	124965.716	165726.590	0.555	<LOD	<LOD	390.749	<LOD	<LOD
CM24-15-Core - 10	152.198	22.073	12.588	106464.503	649.686	1648.977	0.729	427.788	254.784	<LOD	4.703	273353.293	37963.506	<LOD	<LOD	0.176	173.090	<LOD	<LOD
CM24-15-Core - 11	39.286	6.677	1208.827	106837.104	<LOD	4700.344	2.406	38.508	<LOD	<LOD	4.740	169841.768	122224.211	1.195	<LOD	0.167	223.816	<LOD	<LOD
CM24-15-Core - 12	147.201	18.474	1708.966	105973.673	159.509	3416.595	51.800	283.750	168.858	17.932	<LOD	145526.848	143981.581	1.429	<LOD	0.138	223.690	<LOD	<LOD
CM24-15-Core - 13	28.565	<LOD	1415.198	110761.665	117.055	5319.585	1.253	72.489	<LOD	<LOD	<LOD	160690.679	138623.351	1.063	<LOD	<LOD	264.038	<LOD	<LOD
CM24-15-Core - 14	74.693	10.134	1373.746	105022.169	80.184	4219.469	3.920	103.242	45.570	0.421	5.157	154326.631	134389.443	1.435	<LOD	<LOD	247.311	<LOD	<LOD
CM24-15-Core - 15	26.812	4.749	1302.191	104992.252	<LOD	6412.155	2.765	50.812	35.172	<LOD	<LOD	138361.227	145304.641	2.073	<LOD	<LOD	225.719	<LOD	<LOD
CM24-15-Core - 2	54.428	8.292	1747.654	105019.410	280.878	1134.612	1.252	61.375	38.276	<LOD	5.342	150648.290	140860.627	1.499	<LOD	<LOD	216.926	<LOD	<LOD
CM24-15-Core - 3	73.185	9.147	1691.805	105437.024	160.827	3270.622	27.434	156.467	85.684	1.875	7.114	147425.206	141765.769	1.569	<LOD	<LOD	216.746	<LOD	<LOD
CM24-15-Core - 4	69.421	8.075	1062.770	105665.457	245.967	3465.792	4.935	207.137	129.332	0.313	<LOD	139532.600	150817.991	1.389	<LOD	<LOD	289.497	<LOD	<LOD
CM24-15-Core - 5	53.852	6.782	1454.477	105219.913	73.442	5220.493	3.763	163.960	90.216	0.243	<LOD	155178.705	133742.402	1.342	<LOD	<LOD	225.299	<LOD	<LOD
CM24-15-Core - 6	25.219	3.525	457.835	105284.270	<LOD	5034.239	1.336	65.172	<LOD	<LOD	<LOD	193013.462	101365.630	0.503	<LOD	<LOD	288.901	<LOD	<LOD
CM24-15-Core - 7	55.078	7.836	1071.727	105770.604	55.529	4798.422	5.585	164.069	105.579	0.558	<LOD	168061.736	121572.775	1.186	<LOD	<LOD	244.169	<LOD	<LOD
CM24-15-Core - 8	47.855	5.675	943.875	105457.482	51.381	6686.002	4.924	42.874	<LOD	0.346	5.235	113014.299	169571.982	1.301	<LOD	<LOD	405.854	<LOD	<LOD
CM24-15-Core - 9	58.077	6.824	879.871	104916.141	115.188	4306.453	5.443	150.761	72.952	0.351	4.641	156302.421	134110.029	1.074	<LOD	0.159	266.966	<LOD	<LOD
CM24-15-Rim - 1	56.467	5.859	896.300	104796.311	238.156	3311.070	4.849	115.414	68.519	0.457	<LOD	121796.770	166678.951	0.990	<LOD	<LOD	417.887	<LOD	<LOD
CM24-15-Rim - 10	61.630	7.934	1271.446	104464.346	193.969	3979.298	5.210	162.271	88.505	<LOD	3.981	140958.046	148860.286	1.691	<LOD	<LOD	239.911	<LOD	<LOD
CM24-15-Rim - 11	76.825	11.619	1917.711	105453.589	175.882	3515.995	28.835	141.620	88.155	3.512	7.071	142939.674	149430.174	1.493	<LOD	0.337	227.895	<LOD	<LOD
CM24-15-Rim - 12	132.460	16.464	1738.015	104931.001	167.248	3028.310	77.391	174.047	100.356	9.502	5.544	140552.449	149192.013	1.583	<LOD	<LOD	244.674	<LOD	<LOD
CM24-15-Rim - 13	63.460	10.055	1461.944	105759.645	209.446	3403.689	9.093	140.870	90.337	0.433	<LOD	136690.309	154837.866	1.322	<LOD	<LOD	315.594	<LOD	<LOD
CM24-15-Rim - 14	76.622	10.380	1666.166	104546.663	201.867	3235.118	6.651	173.622	104.370	0.785	5.140	140898.769	146840.298	1.410	<LOD	<LOD	266.803	<LOD	<LOD
CM24-15-Rim - 15	51.414	6.533	942.193	105492.063	164.484	4083.585	5.291	90.225	54.303	<LOD	<LOD	122743.262	166261.870	1.444	<LOD	<LOD	307.690	<LOD	<LOD
CM24-15-Rim - 2	62.558	7.051	1262.809	104991.729	247.396	3781.977	2.792	163.848	89.081	0.308	5.264	138969.774	151098.596	1.262	<LOD	<LOD	284.914	<LOD	<LOD
CM24-15-Rim - 3	118.619	15.675	1537.943	104853.992	239.428	3071.567	48.043	187.061	112.696	4.865	5.711	140844.080	148085.539	1.772	<LOD	0.081	243.801	<LOD	<LOD
CM24-15-Rim - 4	79.699	10.184	1684.286	105202.868	196.725	3157.772	13.909	179.557	113.990	<LOD	<LOD	139562.423	151803.880	1.840	<LOD	<LOD	250.313	<LOD	<LOD
CM24-15-Rim - 5	120.622	14.760	1669.748	103908.992	156.723	3125.117	42.751	216.676	142.206	10.627	4.657	139494.322	148908.471	1.891	<LOD	<LOD	241.660	<LOD	<LOD
CM24-15-Rim - 6	52.794	6.058	639.338	105231.716	214.231	3747.205	2.445	106.373	62.064	<LOD	4.275	136356.192	155101.081	0.824	<LOD	<LOD	376.773	<LOD	<LOD
CM24-15-Rim - 7	59.916	8.716	1549.614	105424.314	332.680	3560.639	4.389	124.279	73.026	0.431	5.428	133569.438	157738.418	1.703	<LOD	<LOD	320.275	<LOD	<LOD
CM24-15-Rim - 8	52.884	5.853	901.102	104045.135	83.753	6195.164	4.467	53.095	41.095	0.440	<LOD	110865.982	173745.220	1.186	<LOD	<LOD	421.034	<LOD	<LOD

CM24-15-Rim - 9	103.270	13.767	1726.936	104438.521	233.775	3213.569	28.697	215.704	115.799	2.164	<LOD	140283.992	148097.164	1.647	<LOD	<LOD	253.316	<LOD	<LOD
CM24-16-Core - 1	143.288	16.443	0.917	105724.722	600.758	2146.845	1.117	135.380	81.052	<LOD	<LOD	266887.223	39335.778	<LOD	<LOD	<LOD	139.686	<LOD	<LOD
CM24-16-Core - 10	250.417	29.065	1177.501	104880.731	118.980	2758.611	194.963	252.082	129.501	10.932	<LOD	141789.506	142672.128	2.096	<LOD	<LOD	208.268	<LOD	0.103
CM24-16-Core - 11	146.581	19.429	1156.914	105301.378	194.687	2829.473	55.653	175.170	89.993	7.588	6.230	143634.756	143159.994	1.797	<LOD	<LOD	215.750	<LOD	<LOD
CM24-16-Core - 12	165.490	21.504	1012.598	105220.636	237.697	2742.834	78.304	193.510	103.025	7.605	5.384	148505.076	138899.601	1.868	<LOD	<LOD	177.593	<LOD	<LOD
CM24-16-Core - 13	110.324	13.447	380.803	105898.854	161.926	3415.798	9.563	174.446	74.223	1.806	4.832	162633.308	129846.779	1.131	<LOD	<LOD	241.739	<LOD	0.036
CM24-16-Core - 14	275.115	33.892	1165.319	106321.822	122.470	2743.414	204.583	214.965	111.009	12.791	<LOD	143199.563	142247.638	2.031	<LOD	<LOD	206.365	<LOD	0.156
CM24-16-Core - 15	125.349	12.564	453.539	105750.091	302.237	4065.600	19.592	612.388	327.534	5.775	7.675	154382.701	135825.827	1.745	<LOD	<LOD	194.095	<LOD	<LOD
CM24-16-Core - 2	182.677	22.790	1107.283	105378.626	278.507	2799.148	67.784	204.680	113.578	7.908	6.550	145607.649	142325.947	1.659	<LOD	<LOD	204.667	<LOD	0.085
CM24-16-Core - 3	139.888	13.831	643.063	104466.391	307.444	3484.155	69.746	280.840	147.917	3.431	4.226	154571.921	136761.440	1.744	<LOD	<LOD	204.130	<LOD	<LOD
CM24-16-Core - 4	177.222	21.546	1067.647	106145.392	242.318	2805.002	71.988	195.796	108.622	7.859	4.005	144605.431	145182.380	1.437	<LOD	<LOD	227.258	<LOD	<LOD
CM24-16-Core - 5	118.044	14.954	725.142	104729.707	99.658	3535.739	10.486	77.477	43.832	2.819	4.575	162849.521	126857.432	1.215	<LOD	<LOD	178.303	<LOD	<LOD
CM24-16-Core - 6	179.847	22.650	1129.391	105616.660	235.582	2836.516	68.774	199.918	110.260	7.880	4.747	145491.188	142911.970	1.744	<LOD	<LOD	200.728	<LOD	0.057
CM24-16-Core - 7	104.175	16.171	1100.013	106286.873	447.780	2905.996	1.164	118.634	73.021	0.319	4.295	155895.396	134344.179	1.472	<LOD	<LOD	162.089	<LOD	<LOD
CM24-16-Core - 8	132.551	12.954	334.055	105325.444	248.298	4639.834	3.520	341.048	196.475	3.499	5.052	164890.257	127371.384	1.279	<LOD	<LOD	191.248	<LOD	<LOD
CM24-16-Core - 9	222.249	25.410	921.344	106061.096	199.185	3333.460	64.221	368.279	214.973	24.375	23.723	153102.273	135812.832	1.432	<LOD	<LOD	237.968	<LOD	0.100
CM24-16-Rim - 1	105.984	16.279	0.871	105731.811	388.115	1547.437	0.550	85.466	65.340	<LOD	4.426	272171.313	34810.285	0.036	<LOD	<LOD	169.411	<LOD	<LOD
CM24-16-Rim - 10	47.417	5.460	1235.156	105501.992	167.893	3069.925	10.562	110.810	70.542	0.781	<LOD	149880.543	141081.988	1.460	<LOD	<LOD	213.378	<LOD	<LOD
CM24-16-Rim - 11	79.506	11.047	1905.472	108690.885	129.497	2840.396	69.322	75.223	<LOD	4.573	8.402	147588.414	147272.405	0.784	<LOD	0.494	184.963	19.326	<LOD
CM24-16-Rim - 12	194.113	23.586	1123.205	104206.764	279.531	3839.306	63.003	326.365	184.401	7.186	6.422	150699.209	135423.383	1.293	<LOD	<LOD	166.981	<LOD	<LOD
CM24-16-Rim - 13	181.391	22.909	948.193	104914.523	180.302	3038.995	68.029	191.883	111.605	12.524	9.236	147329.226	140282.961	1.521	<LOD	<LOD	216.615	<LOD	<LOD
CM24-16-Rim - 14	104.347	11.079	599.664	104897.642	229.511	3202.140	37.605	187.807	105.334	2.210	4.509	154825.902	135183.784	1.841	<LOD	<LOD	212.409	<LOD	<LOD
CM24-16-Rim - 15	282.149	30.767	2051.418	104531.464	146.356	2977.358	193.028	259.165	154.319	20.454	4.124	123456.615	158509.352	0.820	<LOD	<LOD	234.840	<LOD	0.093
CM24-16-Rim - 2	205.482	27.240	1072.762	105030.913	124.474	2829.752	115.307	130.312	83.830	5.653	4.172	143787.971	143509.576	2.101	<LOD	<LOD	211.501	0.182	0.157
CM24-16-Rim - 3	313.120	37.479	1182.415	105564.520	125.128	2983.775	182.957	190.965	108.625	12.055	6.235	144221.816	143847.048	1.809	<LOD	0.266	186.987	4.502	0.235
CM24-16-Rim - 4	245.383	25.209	849.810	106584.967	286.812	3889.483	101.051	395.604	234.349	10.980	9.944	158414.273	134051.090	1.466	<LOD	0.631	188.298	<LOD	<LOD
CM24-16-Rim - 5	172.929	21.155	1695.739	104921.276	114.150	2932.505	114.006	147.106	88.923	10.025	5.780	147368.121	139421.645	1.169	<LOD	<LOD	177.479	<LOD	0.096
CM24-16-Rim - 6	201.226	26.776	1185.789	104549.294	128.494	2776.355	118.149	119.909	64.287	6.070	4.113	139303.572	145256.717	2.338	<LOD	0.140	224.229	<LOD	0.167
CM24-16-Rim - 7	126.908	13.787	879.764	105585.108	277.614	3581.435	53.649	266.762	152.046	2.326	<LOD	153835.126	138024.025	1.448	<LOD	<LOD	206.693	<LOD	0.061
CM24-16-Rim - 8	191.942	24.212	1006.608	104609.532	164.857	3286.018	50.408	297.473	179.166	13.088	6.436	150688.663	138110.929	1.545	<LOD	<LOD	214.895	0.383	0.066
CM24-16-Rim - 9	259.185	31.661	1079.971	104491.817	93.605	2757.241	172.445	173.627	103.206	9.636	5.942	140855.735	144756.523	1.902	<LOD	<LOD	230.030	0.248	0.195
F.D. no. 5																			
CM24-10-Core - 1	192.864	18.801	1163.375	104728.776	208.681	6456.981	65.170	815.202	432.288	10.675	<LOD	190735.374	104537.583	2.807	<LOD	<LOD	81.428	<LOD	<LOD

CM24-10-Core - 10	140.623	14.026	1415.779	106325.803	144.030	4558.784	85.020	746.547	395.193	13.799	4.556	182180.684	112349.031	3.430	<LOD	<LOD	86.412	<LOD	<LOD
CM24-10-Core - 11	329.049	31.110	1174.841	104865.468	202.432	5095.434	216.395	387.722	195.878	7.872	<LOD	188141.973	104117.100	2.801	<LOD	<LOD	71.601	0.288	0.179
CM24-10-Core - 12	257.573	46.409	470.848	107172.376	1323.060	1521.124	3.154	237.529	127.211	0.297	6.369	161814.765	132027.098	0.382	<LOD	<LOD	192.559	<LOD	<LOD
CM24-10-Core - 13	183.616	19.090	1287.878	106432.160	75.076	4816.855	167.033	514.344	272.417	12.097	5.266	179808.516	111673.672	3.498	<LOD	0.133	82.317	<LOD	0.046
CM24-10-Core - 14	357.204	34.133	1314.017	105379.710	202.985	5073.138	217.220	414.621	226.763	6.324	6.525	186184.617	105983.524	3.327	<LOD	0.150	75.052	0.436	0.287
CM24-10-Core - 15	422.590	38.960	1255.478	105435.142	211.386	4843.928	312.314	459.041	240.934	9.306	<LOD	187737.122	103996.535	3.064	<LOD	<LOD	74.790	0.438	0.433
CM24-10-Core - 2	127.460	13.294	1105.057	104747.994	214.465	6351.580	75.122	292.384	166.599	5.117	<LOD	190525.916	101912.910	2.418	<LOD	<LOD	76.494	<LOD	<LOD
CM24-10-Core - 3	382.208	37.939	1478.632	105526.386	166.625	5215.205	225.176	413.970	218.726	11.846	4.150	181453.737	108601.289	3.420	<LOD	<LOD	74.314	0.426	0.403
CM24-10-Core - 4	395.140	36.158	1235.928	105802.180	200.724	4805.842	247.187	418.816	229.953	11.362	3.649	188904.431	103591.832	3.062	<LOD	<LOD	73.215	0.381	0.349
CM24-10-Core - 5	477.001	53.261	1616.299	106869.630	139.800	5296.362	224.463	477.785	255.237	12.234	3.642	178733.469	111472.344	3.754	<LOD	<LOD	75.776	0.605	0.664
CM24-10-Core - 6	286.912	25.657	1084.286	105535.489	205.185	5567.313	118.532	353.208	186.979	5.318	<LOD	192069.211	102603.765	2.475	<LOD	<LOD	75.745	0.294	0.132
CM24-10-Core - 7	243.739	23.897	1034.168	104915.480	208.921	5864.975	82.635	330.808	172.629	3.143	<LOD	193140.060	99960.132	2.334	<LOD	<LOD	78.871	<LOD	0.078
CM24-10-Core - 8	185.671	18.483	1323.435	105706.043	170.606	4665.009	84.158	337.760	181.492	4.662	5.516	186000.827	107732.341	2.923	<LOD	<LOD	81.083	<LOD	0.048
CM24-10-Core - 9	427.801	40.729	1175.014	105511.690	146.340	5695.592	326.810	352.283	190.289	9.630	<LOD	182259.286	107244.265	2.938	<LOD	<LOD	73.992	0.497	0.523
CM24-10-Rim - 1	193.891	19.273	1143.014	103737.069	226.749	6227.103	49.438	794.871	435.291	10.562	6.084	188146.303	104644.850	2.796	<LOD	0.096	79.621	<LOD	<LOD
CM24-10-Rim - 10	165.194	15.887	1328.565	105833.643	158.560	4846.491	93.049	679.530	380.232	10.848	5.433	184299.401	110807.912	3.459	<LOD	0.207	79.618	<LOD	<LOD
CM24-10-Rim - 11	457.746	45.777	741.132	106261.260	47.402	12004.278	65.049	259.853	140.427	5.086	4.265	184822.138	93755.560	3.499	<LOD	0.139	60.847	0.605	0.529
CM24-10-Rim - 12	261.516	45.994	380.387	108236.668	1484.219	1719.280	3.147	263.148	146.449	<LOD	5.150	160196.717	136925.796	0.289	<LOD	<LOD	212.552	<LOD	<LOD
CM24-10-Rim - 13	169.873	15.666	1577.848	105348.759	108.740	5768.944	80.837	679.381	364.969	11.866	<LOD	174123.161	114188.649	3.626	<LOD	0.119	77.595	<LOD	<LOD
CM24-10-Rim - 14	53.005	6.302	1325.887	106039.884	134.049	4184.000	8.088	120.015	71.027	0.633	<LOD	187198.964	106590.915	3.268	<LOD	<LOD	82.773	<LOD	<LOD
CM24-10-Rim - 15	402.064	47.249	1243.453	105036.889	205.173	4372.666	182.441	463.835	258.434	10.910	5.031	188223.291	103807.855	2.993	<LOD	<LOD	76.266	0.363	0.379
CM24-10-Rim - 2	332.666	31.274	1112.870	102771.855	220.764	6213.384	314.077	534.123	293.250	10.743	6.568	187117.937	102361.831	2.548	<LOD	<LOD	72.720	0.186	0.109
CM24-10-Rim - 3	474.547	51.755	1593.468	103759.110	178.867	5126.433	242.126	491.882	267.437	11.998	5.479	176722.690	109720.493	3.645	<LOD	<LOD	76.064	0.532	0.625
CM24-10-Rim - 4	409.942	43.505	1229.030	104185.160	234.317	4401.391	238.964	465.664	253.267	11.223	6.304	186469.666	103456.295	3.066	<LOD	0.132	78.404	0.464	0.392
CM24-10-Rim - 5	438.551	48.526	1587.810	104524.712	135.563	5232.343	210.816	447.316	234.445	11.381	<LOD	175724.597	109326.481	3.817	<LOD	<LOD	73.015	0.515	0.607
CM24-10-Rim - 6	345.808	31.155	1107.403	104186.035	200.823	6161.728	289.907	478.243	264.621	11.367	4.523	187866.770	103268.903	2.508	<LOD	<LOD	77.832	0.819	0.202
CM24-10-Rim - 7	126.036	11.904	1086.374	104369.769	248.278	6051.130	77.745	292.897	165.656	4.262	<LOD	190768.455	101641.512	2.308	<LOD	<LOD	79.591	<LOD	<LOD
CM24-10-Rim - 8	207.029	23.196	1256.012	105123.023	237.528	4483.238	86.266	373.401	206.540	5.007	3.677	187028.368	107108.937	3.272	<LOD	<LOD	84.242	<LOD	0.051
CM24-10-Rim - 9	409.935	39.094	1235.869	104455.828	178.336	5333.653	375.466	351.517	192.982	11.060	<LOD	181572.652	107262.524	3.016	<LOD	<LOD	71.969	0.384	0.407
CM24-11-Core - 1	264.870	24.888	1107.412	103988.387	618.187	4968.510	271.951	364.463	232.158	12.452	<LOD	181632.568	112208.760	2.540	<LOD	<LOD	78.240	0.167	0.129
CM24-11-Core - 10	231.990	23.129	1143.618	103992.237	366.093	4725.110	129.385	343.197	203.093	5.814	<LOD	187462.632	108712.398	2.747	<LOD	<LOD	76.844	<LOD	0.125
CM24-11-Core - 11	347.184	31.205	1176.444	102586.275	365.144	4729.447	234.439	388.253	235.226	9.953	<LOD	184716.772	106675.246	2.707	<LOD	0.122	75.532	0.327	0.295
CM24-11-Core - 12	331.367	29.415	1048.906	102707.467	340.369	4852.573	241.802	377.895	224.892	10.543	6.559	184553.825	106916.069	2.560	<LOD	0.160	76.292	0.311	0.229

CM24-11-Core - 13	230.344	21.349	1073.098	103285.136	312.016	4932.073	230.038	345.322	215.018	7.130	<LOD	184148.397	109445.053	2.484	<LOD	0.182	79.880	0.147	0.139
CM24-11-Core - 14	347.856	35.810	1414.743	101785.334	256.169	5208.478	208.622	398.744	242.625	7.051	4.735	175379.730	110466.716	3.206	<LOD	0.134	74.695	0.420	0.325
CM24-11-Core - 15	213.967	19.410	1144.610	102260.418	345.888	4887.513	182.625	363.372	239.251	6.694	4.800	182515.151	110283.706	2.742	<LOD	<LOD	80.355	<LOD	0.055
CM24-11-Core - 2	447.536	45.942	1488.854	104195.972	368.041	5448.899	293.475	433.770	264.487	11.368	<LOD	175473.009	114716.133	3.518	<LOD	<LOD	74.281	0.839	0.645
CM24-11-Core - 3	144.328	14.258	1158.016	103715.685	491.314	4796.656	59.053	201.929	139.258	2.550	5.032	185415.787	111095.098	2.868	<LOD	<LOD	80.378	<LOD	0.058
CM24-11-Core - 4	412.207	45.430	1544.145	103530.495	366.348	5337.435	255.157	431.011	249.929	10.925	<LOD	173069.534	114490.693	3.325	<LOD	<LOD	75.568	0.779	0.588
CM24-11-Core - 5	354.079	36.176	1257.898	102983.223	266.537	4733.650	220.891	374.902	214.362	9.763	<LOD	178127.614	110126.012	3.109	<LOD	0.187	77.951	0.368	0.174
CM24-11-Core - 6	211.512	19.782	1075.942	103321.689	453.078	4829.082	211.528	340.352	196.085	9.388	5.475	182912.946	111447.281	2.643	<LOD	<LOD	82.622	<LOD	0.063
CM24-11-Core - 7	107.970	15.561	1144.633	103950.241	406.800	4439.324	46.238	200.134	126.383	2.089	<LOD	184372.366	110797.813	2.519	<LOD	0.149	85.387	0.407	0.040
CM24-11-Core - 8	354.574	36.515	1456.001	103791.378	220.531	6422.517	85.624	471.868	273.966	12.764	<LOD	170443.156	114443.895	3.361	<LOD	<LOD	76.533	0.302	0.149
CM24-11-Core - 9	366.304	34.539	1233.262	102771.744	376.040	4523.157	239.430	447.196	280.508	10.507	6.271	181498.084	107126.620	3.136	<LOD	<LOD	77.449	0.369	0.248
CM24-11-Rim - 1	302.060	30.053	1070.147	103390.970	<LOD	4887.818	265.083	357.560	225.972	11.289	<LOD	181856.027	117892.467	2.568	<LOD	<LOD	78.181	0.309	0.266
CM24-11-Rim - 10	257.570	24.641	1142.143	103750.420	858.594	4614.801	178.381	333.454	200.428	6.822	4.866	181363.343	115847.674	2.732	<LOD	<LOD	84.905	0.252	0.147
CM24-11-Rim - 11	187.288	17.658	1192.595	104802.080	710.187	4742.679	92.815	237.199	143.100	4.060	7.052	182858.320	114663.085	2.870	<LOD	<LOD	86.172	0.164	0.083
CM24-11-Rim - 12	180.288	19.772	1058.050	103674.487	658.824	5040.820	154.606	305.536	188.896	11.816	4.904	182450.201	117341.880	2.430	<LOD	<LOD	84.638	<LOD	<LOD
CM24-11-Rim - 13	163.774	17.292	1115.221	103447.482	660.782	4653.455	101.211	282.026	177.795	5.461	<LOD	182906.156	113168.697	2.524	<LOD	<LOD	85.297	<LOD	0.036
CM24-11-Rim - 14	327.364	29.850	1298.949	103849.259	330.503	4560.911	203.066	286.392	177.679	7.916	5.072	176711.515	114241.162	3.309	<LOD	<LOD	85.180	0.324	0.206
CM24-11-Rim - 15	188.934	17.720	1139.561	102910.279	645.777	4978.574	135.418	353.967	221.257	5.223	<LOD	180680.590	113815.606	2.812	<LOD	0.118	84.320	0.121	0.057
CM24-11-Rim - 2	255.249	24.461	1227.890	104022.363	14609.021	4433.138	96.542	327.346	194.676	8.429	4.935	178858.427	120410.631	2.986	<LOD	<LOD	83.462	0.192	0.127
CM24-11-Rim - 3	313.698	30.288	1102.661	102864.205	5169.363	4487.209	207.089	312.959	182.345	13.700	4.375	181031.972	117066.578	2.576	<LOD	<LOD	80.299	0.371	0.166
CM24-11-Rim - 4	260.772	47.612	1645.094	101788.207	1492.880	4833.233	133.417	287.098	160.733	5.952	21.066	168322.549	111535.340	3.201	<LOD	3.021	42.504	3.384	0.747
CM24-11-Rim - 5	357.352	34.582	1260.762	103376.389	1501.396	4826.375	222.673	378.204	228.587	9.786	6.512	176705.905	116792.996	2.926	<LOD	<LOD	81.252	0.344	0.173
CM24-11-Rim - 6	217.282	20.097	1058.394	104045.175	1744.575	4928.919	211.526	344.166	197.037	9.814	<LOD	181371.460	116953.357	2.465	<LOD	<LOD	81.294	0.151	0.052
CM24-11-Rim - 7	110.881	14.984	1483.952	102679.318	527.227	5630.718	30.794	219.363	143.384	3.180	<LOD	166589.135	122286.508	3.497	<LOD	0.151	76.950	2.724	0.051
CM24-11-Rim - 8	340.287	36.435	1507.060	104865.624	546.545	5734.878	45.309	343.533	204.000	10.089	4.819	171073.492	122892.795	3.574	<LOD	<LOD	77.316	0.374	0.195
CM24-11-Rim - 9	357.821	35.539	1231.427	102932.578	861.438	4657.948	283.600	431.709	263.096	10.031	6.849	180008.292	113983.785	2.989	<LOD	<LOD	77.664	0.264	0.187

LA ICP-MS Data for Trace Element Analyses on Garnet Y - U

Eagle	Y	Zr	Nb	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Hf	Ta	Pb	Th	U
CM24-15-Core - 1	165.934	8.080	0.117	<LOD	<LOD	<LOD	0.115	3.916	0.042	26.249	8.005	31.123	2.386	3.134	0.321	1.453	0.128	0.685	2.347	<LOD	<LOD	<LOD
CM24-15-Core - 10	148.153	8.632	10.205	<LOD	<LOD	<LOD	0.248	8.683	<LOD	36.887	8.309	28.059	1.778	2.252	0.177	0.870	0.070	1.847	124.810	<LOD	<LOD	0.180
CM24-15-Core - 11	241.948	0.830	0.032	<LOD	0.007	<LOD	0.081	3.443	<LOD	26.718	10.016	41.078	2.752	3.689	0.358	1.952	0.159	0.097	0.281	<LOD	<LOD	<LOD
CM24-15-Core - 12	881.251	4.827	0.105	<LOD	<LOD	<LOD	0.091	4.102	0.096	54.167	25.655	138.205	16.336	37.245	5.417	35.701	4.736	0.325	0.836	<LOD	<LOD	<LOD
CM24-15-Core - 13	122.344	1.026	0.040	0.014	0.116	0.030	0.054	2.709	<LOD	14.772	4.728	18.911	1.498	2.636	0.294	2.034	0.146	0.110	0.228	<LOD	<LOD	<LOD
CM24-15-Core - 14	555.798	2.039	<LOD	<LOD	<LOD	<LOD	0.050	3.100	0.009	34.100	17.147	89.916	7.195	9.687	0.994	4.859	0.429	0.259	0.608	<LOD	<LOD	0.005
CM24-15-Core - 15	147.328	0.834	<LOD	<LOD	0.009	<LOD	0.230	7.257	0.010	37.995	8.739	28.446	1.628	2.030	0.226	1.075	0.094	0.029	0.150	<LOD	<LOD	<LOD
CM24-15-Core - 2	81.123	1.871	0.287	<LOD	<LOD	<LOD	<LOD	1.961	<LOD	18.642	5.307	16.044	0.753	0.710	0.045	0.226	0.014	0.256	4.984	<LOD	<LOD	0.014
CM24-15-Core - 3	321.476	2.973	0.017	<LOD	<LOD	<LOD	0.082	3.784	0.060	36.603	13.474	57.648	5.026	9.382	1.212	7.636	0.843	0.308	0.376	<LOD	<LOD	<LOD
CM24-15-Core - 4	86.234	6.921	0.026	<LOD	<LOD	<LOD	0.071	4.214	0.055	25.629	6.788	20.282	1.069	1.133	0.105	0.437	0.046	0.772	1.345	<LOD	<LOD	0.013
CM24-15-Core - 5	278.807	2.084	0.035	<LOD	<LOD	<LOD	0.027	2.341	<LOD	23.232	9.614	46.560	3.867	5.490	0.660	3.535	0.368	0.211	0.911	<LOD	<LOD	<LOD
CM24-15-Core - 6	99.526	0.678	0.014	<LOD	<LOD	<LOD	0.042	3.781	<LOD	24.893	7.274	20.765	1.074	1.104	0.099	0.541	0.031	0.059	0.233	<LOD	<LOD	<LOD
CM24-15-Core - 7	220.727	1.975	0.257	<LOD	<LOD	<LOD	0.219	8.418	<LOD	49.340	11.801	39.845	2.748	3.858	0.508	2.687	0.231	0.171	2.571	<LOD	<LOD	<LOD
CM24-15-Core - 8	376.470	2.063	<LOD	<LOD	<LOD	<LOD	0.047	4.538	0.092	28.467	12.229	58.082	4.555	6.766	0.919	6.442	0.743	0.212	0.201	<LOD	<LOD	<LOD
CM24-15-Core - 9	220.717	3.992	0.119	<LOD	<LOD	0.009	0.199	5.640	0.043	47.205	14.862	49.735	2.705	3.002	0.266	1.162	0.113	0.381	1.776	<LOD	<LOD	<LOD
CM24-15-Rim - 1	109.046	5.818	0.028	<LOD	<LOD	<LOD	0.060	2.834	0.046	21.254	6.112	20.879	1.510	1.859	0.210	0.998	0.083	0.532	1.273	<LOD	<LOD	0.011
CM24-15-Rim - 10	122.645	5.462	0.108	<LOD	<LOD	0.006	0.162	5.897	0.120	30.918	7.834	24.647	1.524	2.043	0.203	1.209	0.118	0.628	1.736	<LOD	<LOD	<LOD
CM24-15-Rim - 11	295.345	3.467	0.033	0.012	0.014	0.006	0.051	3.235	0.082	36.941	13.778	56.172	4.201	5.727	0.546	3.080	0.278	0.377	0.383	<LOD	0.045	0.016
CM24-15-Rim - 12	863.572	5.010	0.067	<LOD	<LOD	0.004	0.063	4.490	0.051	45.422	18.695	107.938	14.651	35.662	5.906	44.032	4.933	0.378	0.730	<LOD	<LOD	0.006
CM24-15-Rim - 13	198.413	4.482	0.018	<LOD	<LOD	<LOD	0.112	3.661	0.081	31.817	10.891	38.559	2.476	3.183	0.327	1.639	0.128	0.423	0.737	<LOD	<LOD	<LOD
CM24-15-Rim - 14	274.131	4.613	0.014	<LOD	<LOD	<LOD	0.060	3.332	0.079	35.266	12.927	52.131	3.441	4.461	0.461	2.640	0.192	0.343	0.708	<LOD	<LOD	<LOD
CM24-15-Rim - 15	141.209	5.510	0.018	<LOD	<LOD	0.004	0.142	3.962	0.025	22.820	6.349	23.683	1.788	2.496	0.263	1.762	0.169	0.534	1.067	<LOD	<LOD	<LOD
CM24-15-Rim - 2	94.081	6.663	0.163	<LOD	<LOD	0.008	0.183	4.468	0.053	26.826	7.409	21.077	1.063	1.143	0.082	0.423	0.032	0.598	2.501	<LOD	<LOD	0.019
CM24-15-Rim - 3	645.085	4.666	0.036	<LOD	<LOD	<LOD	0.084	3.998	0.080	41.550	17.641	89.201	9.998	21.302	3.370	23.617	2.615	0.306	0.656	<LOD	<LOD	0.009
CM24-15-Rim - 4	310.492	4.576	0.021	<LOD	<LOD	<LOD	0.055	3.395	0.069	34.263	13.611	55.694	4.457	6.373	0.676	3.445	0.312	0.447	0.984	<LOD	<LOD	<LOD
CM24-15-Rim - 5	654.638	4.352	0.057	<LOD	<LOD	<LOD	0.051	4.048	0.063	49.150	22.181	108.662	11.013	20.935	2.665	16.023	1.800	0.287	0.650	<LOD	<LOD	<LOD
CM24-15-Rim - 6	124.778	4.832	0.036	<LOD	<LOD	<LOD	0.072	3.725	0.024	26.180	7.820	25.036	1.507	1.530	0.120	0.630	0.049	0.439	0.732	<LOD	<LOD	0.015
CM24-15-Rim - 7	122.624	5.971	0.058	0.005	0.047	0.006	0.083	3.773	0.031	26.209	7.668	26.031	1.612	1.871	0.134	0.662	0.057	0.525	1.616	<LOD	<LOD	<LOD
CM24-15-Rim - 8	399.312	3.157	0.006	<LOD	<LOD	0.007	0.147	4.007	0.104	30.270	12.249	57.339	4.731	7.915	0.975	7.095	0.793	0.284	0.266	<LOD	<LOD	<LOD

CM24-15-Rim - 9	472.602	4.776	0.041	<LOD	<LOD	<LOD	0.105	4.200	0.036	44.448	18.325	81.905	7.256	12.643	1.500	8.253	0.847	0.460	0.928	<LOD	<LOD	<LOD
CM24-16-Core - 1	378.453	4.699	1.667	<LOD	<LOD	<LOD	0.037	1.086	<LOD	13.836	7.435	47.812	5.011	8.802	1.148	6.624	0.632	0.915	22.748	<LOD	<LOD	0.046
CM24-16-Core - 10	1965.562	9.212	0.266	<LOD	<LOD	0.004	0.359	7.724	0.083	60.245	26.193	203.097	35.449	106.135	21.430	195.365	25.335	0.499	1.253	<LOD	<LOD	0.009
CM24-16-Core - 11	973.892	5.799	0.068	<LOD	<LOD	<LOD	0.034	3.998	0.054	57.243	29.325	153.309	17.799	41.683	6.402	46.363	6.736	0.421	0.901	<LOD	<LOD	0.006
CM24-16-Core - 12	1106.298	6.731	0.119	<LOD	<LOD	<LOD	0.063	3.582	0.027	58.787	31.287	172.905	19.681	46.068	6.405	45.889	6.227	0.467	1.424	<LOD	<LOD	0.005
CM24-16-Core - 13	685.309	4.821	0.220	<LOD	<LOD	<LOD	0.118	5.882	0.027	64.794	27.900	126.906	9.804	13.833	1.392	7.945	0.932	0.446	1.974	<LOD	<LOD	<LOD
CM24-16-Core - 14	2213.199	7.940	0.187	<LOD	<LOD	0.008	0.278	6.782	0.069	56.821	25.569	217.610	42.832	149.511	33.341	334.106	48.986	0.383	0.721	<LOD	<LOD	0.008
CM24-16-Core - 15	4.822	7.383	2.855	<LOD	<LOD	<LOD	0.107	2.079	0.091	3.958	0.538	1.077	0.037	0.038	0.003	<LOD	<LOD	1.418	34.322	<LOD	<LOD	0.031
CM24-16-Core - 2	1271.355	7.693	0.161	<LOD	<LOD	<LOD	0.027	4.106	0.047	62.493	33.497	191.630	23.327	57.955	8.998	68.220	10.041	0.575	1.823	<LOD	<LOD	0.010
CM24-16-Core - 3	561.143	9.353	0.370	<LOD	<LOD	<LOD	0.057	2.692	0.095	20.068	10.037	63.955	7.535	16.449	2.446	17.502	1.614	0.918	5.226	<LOD	<LOD	0.023
CM24-16-Core - 4	1220.752	7.254	0.093	<LOD	<LOD	<LOD	0.043	3.862	0.076	61.042	32.459	184.324	22.132	54.217	8.431	62.198	8.936	0.505	1.629	<LOD	<LOD	0.016
CM24-16-Core - 5	1064.356	1.796	<LOD	<LOD	0.004	<LOD	0.096	5.368	0.026	75.443	35.750	176.148	15.856	30.911	5.289	55.874	10.488	0.326	0.761	<LOD	<LOD	<LOD
CM24-16-Core - 6	1236.067	7.039	0.128	<LOD	<LOD	<LOD	0.034	3.844	0.045	61.819	32.596	186.063	22.387	57.275	8.618	67.622	9.591	0.551	1.692	<LOD	<LOD	0.015
CM24-16-Core - 7	284.943	6.494	1.954	<LOD	0.019	<LOD	0.072	3.871	<LOD	28.949	10.697	46.679	3.304	4.788	0.556	3.602	0.309	1.472	31.651	<LOD	<LOD	0.065
CM24-16-Core - 8	440.887	8.377	1.819	<LOD	<LOD	0.006	0.220	12.860	0.020	83.280	25.107	89.714	5.676	7.659	0.739	4.141	0.368	1.343	28.384	<LOD	<LOD	0.052
CM24-16-Core - 9	1511.223	6.464	0.237	<LOD	<LOD	<LOD	0.165	4.860	0.073	64.396	32.110	206.608	29.786	89.069	15.838	131.986	21.367	0.430	1.525	<LOD	<LOD	0.008
CM24-16-Rim - 1	371.087	5.642	1.397	<LOD	<LOD	<LOD	<LOD	2.910	<LOD	23.524	10.678	53.979	4.442	7.556	1.045	7.050	0.649	0.729	19.321	<LOD	<LOD	0.056
CM24-16-Rim - 10	43.016	3.079	0.012	<LOD	<LOD	<LOD	0.076	1.816	0.059	7.641	1.866	7.385	0.648	1.117	0.161	1.020	0.115	0.493	1.155	<LOD	<LOD	0.006
CM24-16-Rim - 11	471.372	1.063	0.074	0.009	0.019	<LOD	0.064	1.272	0.027	16.790	8.727	58.579	7.851	20.178	3.503	26.777	2.941	0.085	0.182	0.379	<LOD	<LOD
CM24-16-Rim - 12	1130.752	8.827	0.677	<LOD	<LOD	<LOD	0.154	7.390	0.077	79.934	34.904	179.509	18.579	39.913	5.808	41.379	5.794	0.709	3.189	<LOD	<LOD	0.023
CM24-16-Rim - 13	1303.176	5.387	0.240	<LOD	<LOD	<LOD	0.102	3.733	0.052	58.074	30.215	185.122	25.649	73.153	12.424	101.434	16.225	0.353	0.767	0.243	<LOD	0.011
CM24-16-Rim - 14	452.638	6.683	0.156	<LOD	<LOD	<LOD	0.072	2.142	0.103	18.898	9.185	55.521	6.415	14.707	2.241	15.773	1.533	0.731	2.090	<LOD	<LOD	0.010
CM24-16-Rim - 15	2169.285	7.907	0.115	<LOD	<LOD	0.003	0.124	6.188	0.053	73.681	38.134	266.784	40.765	111.055	18.323	144.743	20.005	0.652	3.399	<LOD	<LOD	<LOD
CM24-16-Rim - 2	1577.754	4.252	0.038	<LOD	<LOD	<LOD	0.073	2.246	0.043	34.493	19.606	167.876	32.345	119.166	25.656	246.188	37.713	0.366	0.421	<LOD	<LOD	<LOD
CM24-16-Rim - 3	2218.482	7.104	0.476	0.025	0.068	0.006	0.204	5.949	0.090	53.478	24.971	216.804	45.630	166.399	38.921	398.412	61.714	0.591	1.013	0.723	0.220	0.023
CM24-16-Rim - 4	1344.659	9.828	1.610	0.015	0.021	<LOD	0.215	7.616	0.066	77.816	35.482	199.320	22.604	51.792	7.981	58.886	8.236	0.936	7.837	<LOD	0.491	0.039
CM24-16-Rim - 5	1304.913	3.505	0.050	<LOD	<LOD	<LOD	<LOD	3.299	0.056	38.590	19.845	146.490	25.672	85.617	17.546	161.756	23.526	0.241	0.496	<LOD	<LOD	<LOD
CM24-16-Rim - 6	1607.971	4.012	0.045	0.012	0.013	<LOD	<LOD	2.490	0.055	36.241	20.205	172.884	34.875	123.388	25.746	246.026	36.042	0.288	0.378	<LOD	<LOD	<LOD
CM24-16-Rim - 7	392.096	8.657	0.322	0.022	0.048	0.013	0.097	2.182	0.107	15.306	7.927	46.017	5.050	10.207	1.508	9.392	0.845	0.998	5.319	<LOD	<LOD	0.014
CM24-16-Rim - 8	1196.071	5.704	0.228	0.016	0.014	<LOD	0.107	4.131	0.073	60.073	28.753	175.091	23.019	60.382	9.745	75.445	11.219	0.563	1.019	0.230	0.127	0.016
CM24-16-Rim - 9	2021.979	5.956	0.106	<LOD	<LOD	<LOD	0.140	4.757	0.080	47.534	23.449	200.500	42.949	161.553	36.715	380.989	59.824	0.360	0.564	<LOD	<LOD	<LOD
F.D. no. 5																						
CM24-10-Core - 1	242.722	12.605	13.650	<LOD	0.033	0.036	0.684	5.147	0.518	16.598	4.564	26.338	4.478	13.886	2.487	23.306	3.574	2.645	190.122	<LOD	<LOD	0.149

CM24-10-Core - 10	19.648	7.032	1.026	<LOD	<LOD	<LOD	0.180	2.057	0.270	7.018	1.455	4.193	0.199	0.223	0.019	0.123	0.010	0.815	41.037	<LOD	<LOD	0.037
CM24-10-Core - 11	2166.714	11.249	1.624	<LOD	<LOD	0.012	0.354	3.533	0.249	27.073	15.422	163.312	45.750	191.882	41.215	378.404	55.457	2.439	92.899	<LOD	<LOD	0.087
CM24-10-Core - 12	71.183	12.127	4.865	<LOD	<LOD	<LOD	<LOD	0.218	<LOD	1.636	0.830	7.656	1.794	6.505	1.521	14.104	1.936	0.723	3.172	<LOD	<LOD	0.278
CM24-10-Core - 13	848.818	4.448	0.377	<LOD	0.008	<LOD	0.212	4.029	0.306	37.210	15.187	104.103	17.279	42.884	5.493	32.856	3.726	0.541	8.223	<LOD	<LOD	<LOD
CM24-10-Core - 14	2291.041	12.940	3.345	<LOD	<LOD	0.014	0.552	4.158	0.319	30.371	15.756	165.877	49.815	241.543	60.882	676.333	121.843	1.713	66.984	<LOD	<LOD	0.054
CM24-10-Core - 15	2724.517	11.680	2.117	<LOD	0.007	0.011	0.325	3.776	0.238	27.144	15.572	180.889	60.185	316.167	89.045	1040.325	197.606	1.515	71.667	<LOD	<LOD	0.056
CM24-10-Core - 2	142.283	13.285	2.454	<LOD	0.012	0.030	0.634	4.502	0.472	12.885	3.273	17.657	2.984	9.135	1.758	15.799	2.360	2.602	124.542	<LOD	<LOD	0.127
CM24-10-Core - 3	2629.491	9.979	0.917	<LOD	0.007	0.005	0.285	3.909	0.304	27.409	15.636	184.697	61.313	317.859	86.991	977.524	182.395	0.977	28.730	<LOD	<LOD	0.046
CM24-10-Core - 4	2582.645	10.596	1.669	<LOD	0.010	0.018	0.276	3.565	0.318	27.052	15.849	179.013	54.585	271.396	72.210	799.543	140.686	1.660	68.333	<LOD	<LOD	0.067
CM24-10-Core - 5	3412.276	9.069	1.662	<LOD	0.007	0.011	0.263	2.979	0.326	29.600	18.435	231.697	83.285	443.704	122.445	1399.867	266.848	0.753	29.057	<LOD	<LOD	0.016
CM24-10-Core - 6	1814.223	13.151	3.076	<LOD	0.009	0.027	0.442	7.187	0.344	50.264	24.600	222.617	52.443	191.394	35.837	286.612	38.346	2.559	110.501	<LOD	<LOD	0.106
CM24-10-Core - 7	1361.915	16.244	14.858	<LOD	0.028	0.017	0.996	15.712	0.540	113.983	40.874	262.170	41.964	107.939	15.563	103.765	12.055	3.062	191.299	<LOD	<LOD	0.207
CM24-10-Core - 8	928.523	10.696	0.763	<LOD	<LOD	0.015	0.281	3.565	0.363	24.866	12.059	97.892	18.794	57.265	9.141	66.026	7.626	1.366	30.393	<LOD	<LOD	0.035
CM24-10-Core - 9	2917.129	10.388	1.633	<LOD	0.019	0.018	0.410	3.155	0.308	23.464	14.927	186.150	64.744	352.171	100.149	1164.258	211.077	1.827	75.269	<LOD	<LOD	0.057
CM24-10-Rim - 1	310.170	10.055	3.412	<LOD	0.018	0.027	0.572	3.856	0.411	14.915	5.343	39.609	7.426	24.685	4.431	36.552	4.728	1.963	113.596	<LOD	<LOD	0.100
CM24-10-Rim - 10	264.781	10.423	0.705	0.007	0.018	0.013	0.204	2.922	0.357	15.342	5.874	32.310	3.422	4.990	0.385	1.492	0.088	1.567	41.792	0.183	<LOD	0.044
CM24-10-Rim - 11	4091.397	2.202	0.234	<LOD	0.005	0.007	0.079	2.350	0.433	23.802	15.876	222.448	87.397	479.176	123.528	1263.387	217.493	0.467	12.187	<LOD	<LOD	<LOD
CM24-10-Rim - 12	179.360	17.540	5.854	<LOD	<LOD	<LOD	0.064	0.867	<LOD	7.084	3.689	30.314	4.139	9.179	1.343	8.848	0.852	0.918	3.988	<LOD	<LOD	0.294
CM24-10-Rim - 13	509.926	6.037	0.830	<LOD	<LOD	0.008	0.407	7.388	0.396	49.654	13.991	65.735	7.393	13.039	1.381	7.172	0.732	0.797	46.337	<LOD	<LOD	0.015
CM24-10-Rim - 14	69.978	5.259	0.264	<LOD	0.015	0.007	0.169	2.671	0.374	9.492	2.481	11.247	1.145	2.065	0.283	1.886	0.185	0.385	8.254	<LOD	<LOD	0.012
CM24-10-Rim - 15	2761.046	10.023	3.225	<LOD	<LOD	0.010	0.303	3.376	0.245	28.313	16.758	190.436	59.332	284.980	72.448	778.378	134.407	1.660	84.101	<LOD	<LOD	0.058
CM24-10-Rim - 2	1909.099	9.743	2.652	<LOD	0.025	0.035	1.104	10.075	0.436	67.576	27.534	217.303	44.464	139.309	23.000	175.176	23.800	2.551	146.781	<LOD	<LOD	0.117
CM24-10-Rim - 3	3335.451	8.919	2.064	<LOD	0.005	0.004	0.256	3.113	0.293	28.325	18.432	234.550	81.510	433.793	115.975	1324.914	246.130	0.816	34.190	<LOD	<LOD	0.047
CM24-10-Rim - 4	2779.643	9.809	4.083	<LOD	0.014	<LOD	0.216	3.147	0.334	28.130	17.260	203.516	61.215	294.373	73.445	783.910	130.681	1.517	86.540	<LOD	<LOD	0.063
CM24-10-Rim - 5	3087.797	8.605	0.674	<LOD	<LOD	0.007	0.327	3.328	0.304	27.314	16.858	215.040	75.110	402.248	110.630	1277.653	240.627	0.829	16.753	<LOD	<LOD	0.024
CM24-10-Rim - 6	2208.617	10.331	2.426	<LOD	0.013	0.031	0.953	10.700	0.496	73.783	30.958	247.808	50.941	156.621	25.739	192.678	26.267	2.883	133.323	<LOD	<LOD	0.113
CM24-10-Rim - 7	159.307	13.445	2.757	<LOD	0.019	0.022	0.450	5.311	0.443	16.163	4.078	22.231	3.610	10.302	1.841	18.096	2.552	2.301	118.802	<LOD	<LOD	0.119
CM24-10-Rim - 8	1006.456	11.424	2.818	<LOD	0.009	0.010	0.237	3.644	0.314	25.749	13.145	113.863	22.578	71.752	12.008	87.129	11.026	2.144	83.476	<LOD	<LOD	0.061
CM24-10-Rim - 9	2730.640	8.156	1.189	<LOD	<LOD	0.011	0.368	3.234	0.379	23.894	14.695	183.171	59.238	296.056	79.713	869.252	142.846	1.637	70.428	<LOD	<LOD	0.057
CM24-11-Core - 1	1321.916	14.621	1.294	<LOD	0.010	0.012	0.154	1.713	0.264	12.406	8.647	98.201	27.218	121.261	27.706	255.425	35.855	2.793	82.817	<LOD	<LOD	0.097
CM24-11-Core - 10	1198.068	13.975	2.583	<LOD	<LOD	0.011	0.295	3.414	0.301	22.475	11.094	99.022	23.914	96.936	21.536	209.056	31.435	2.127	80.815	<LOD	<LOD	0.073
CM24-11-Core - 11	2237.851	12.718	1.356	<LOD	<LOD	0.005	0.359	3.040	0.305	23.592	14.576	165.048	48.172	220.103	51.626	514.421	79.265	2.100	72.878	<LOD	<LOD	0.079
CM24-11-Core - 12	2010.048	16.964	1.673	<LOD	0.017	0.009	0.299	2.890	0.207	18.941	11.945	136.643	40.003	190.564	47.662	500.762	79.311	2.897	94.791	<LOD	<LOD	0.077

CM24-11-Core - 13	992.373	13.153	1.203	<LOD	0.007	0.004	0.188	1.353	0.231	10.199	6.933	76.836	21.062	90.108	20.139	180.486	25.066	2.532	63.507	<LOD	<LOD	0.080
CM24-11-Core - 14	2292.065	10.137	1.032	<LOD	<LOD	0.012	0.398	3.559	0.343	27.412	15.684	171.984	51.582	245.644	60.001	621.864	103.357	1.027	30.578	<LOD	<LOD	0.040
CM24-11-Core - 15	961.760	14.283	2.271	<LOD	0.011	<LOD	0.262	2.003	0.313	13.976	9.043	86.522	19.101	60.340	10.173	71.565	7.350	2.424	77.303	<LOD	<LOD	0.081
CM24-11-Core - 2	3101.171	9.863	0.966	0.082	0.158	0.045	0.357	3.682	0.250	28.379	17.316	217.169	75.502	402.286	108.253	1240.567	235.472	1.054	23.231	<LOD	0.049	0.038
CM24-11-Core - 3	629.253	12.487	0.880	<LOD	<LOD	<LOD	0.300	3.785	0.396	17.116	6.782	55.832	11.999	43.299	8.788	72.982	9.593	1.519	31.736	<LOD	<LOD	0.071
CM24-11-Core - 4	2796.124	9.402	1.067	0.034	0.041	0.013	0.433	3.507	0.333	28.817	17.325	201.168	67.372	354.041	94.348	1076.928	202.098	0.732	20.299	<LOD	<LOD	0.040
CM24-11-Core - 5	2708.744	5.239	0.526	<LOD	<LOD	<LOD	0.283	5.065	0.269	50.580	28.379	269.077	64.636	222.487	38.287	287.684	40.081	1.352	16.442	<LOD	<LOD	0.012
CM24-11-Core - 6	833.035	12.817	1.035	<LOD	0.010	<LOD	0.131	1.963	0.236	12.375	7.697	77.154	17.749	63.616	12.118	95.877	12.457	3.048	64.823	<LOD	<LOD	0.086
CM24-11-Core - 7	208.021	12.357	1.528	0.033	0.060	0.009	0.128	1.502	0.244	6.623	3.277	23.886	3.882	10.902	1.643	10.689	1.139	2.220	61.497	0.380	0.126	0.050
CM24-11-Core - 8	2955.700	5.293	0.541	<LOD	<LOD	0.014	0.507	8.040	0.392	75.485	34.547	292.124	67.575	223.921	36.961	273.141	38.347	0.677	15.177	<LOD	<LOD	0.023
CM24-11-Core - 9	2424.846	11.323	3.260	<LOD	0.004	0.022	0.238	2.954	0.263	26.076	16.674	194.322	57.067	244.111	51.790	457.188	66.809	1.911	79.361	<LOD	<LOD	0.059
CM24-11-Rim - 1	1673.980	16.425	1.369	<LOD	0.019	0.005	0.266	2.161	0.188	14.198	9.483	112.836	32.874	156.791	38.688	399.098	61.099	2.919	87.819	<LOD	<LOD	0.094
CM24-11-Rim - 10	1444.169	13.377	0.792	<LOD	<LOD	<LOD	0.167	2.055	0.267	16.418	10.572	121.763	33.931	146.670	32.053	289.610	41.510	2.030	46.932	<LOD	<LOD	0.051
CM24-11-Rim - 11	948.825	11.752	0.844	<LOD	<LOD	0.014	0.258	3.445	0.332	20.076	9.976	92.491	24.765	102.664	20.687	172.082	24.729	2.803	36.747	<LOD	<LOD	0.033
CM24-11-Rim - 12	632.013	11.297	2.481	<LOD	0.013	0.013	0.258	1.875	0.222	14.271	8.333	70.499	13.665	42.991	7.229	55.017	7.225	4.430	97.621	<LOD	<LOD	0.093
CM24-11-Rim - 13	666.226	14.014	0.966	<LOD	0.005	0.008	0.267	2.163	0.212	14.083	7.607	62.646	11.561	34.271	5.728	40.949	4.213	1.898	58.426	<LOD	<LOD	0.066
CM24-11-Rim - 14	2613.696	4.706	0.574	<LOD	<LOD	<LOD	0.183	3.948	0.233	37.950	22.336	226.772	59.812	229.789	42.768	348.306	50.040	0.834	21.489	<LOD	<LOD	0.028
CM24-11-Rim - 15	711.946	14.190	3.150	<LOD	0.005	0.013	0.206	2.096	0.297	14.053	7.871	70.740	13.862	42.011	6.779	47.216	4.936	2.868	85.450	0.293	<LOD	0.091
CM24-11-Rim - 2	1699.105	7.159	0.633	<LOD	<LOD	0.006	0.341	4.758	0.296	46.027	24.368	213.393	46.305	147.069	23.736	164.824	20.626	1.887	27.625	<LOD	<LOD	0.034
CM24-11-Rim - 3	2018.215	18.599	1.268	<LOD	0.004	0.009	0.385	3.598	0.188	30.046	18.358	194.365	52.404	207.964	40.698	329.063	45.654	4.145	92.662	<LOD	<LOD	0.074
CM24-11-Rim - 4	1365.715	8.691	0.993	0.202	0.131	0.048	0.410	3.248	0.320	18.488	9.396	102.799	32.681	161.906	41.814	462.468	83.968	0.804	17.496	2.045	0.059	0.112
CM24-11-Rim - 5	2710.097	5.210	0.580	<LOD	<LOD	0.004	0.266	5.111	0.272	49.231	28.217	268.266	65.200	224.776	39.005	291.811	39.792	1.366	18.477	<LOD	<LOD	0.019
CM24-11-Rim - 6	852.522	12.934	1.036	<LOD	0.026	0.013	0.161	1.806	0.173	12.342	7.951	79.300	18.407	64.713	12.278	98.353	12.851	3.098	73.608	<LOD	<LOD	0.090
CM24-11-Rim - 7	527.541	4.986	0.278	0.021	0.071	0.028	0.584	7.303	0.465	43.000	13.191	71.875	10.545	25.640	3.381	22.197	2.630	0.313	5.316	<LOD	0.018	0.017
CM24-11-Rim - 8	2917.617	4.277	0.234	<LOD	0.005	0.007	0.210	5.246	0.371	53.851	28.715	273.611	70.696	262.110	45.687	352.600	51.972	0.331	8.042	<LOD	<LOD	0.006
CM24-11-Rim - 9	2322.746	6.378	2.590	<LOD	<LOD	0.007	0.237	3.231	0.258	26.721	18.256	199.782	53.760	214.504	43.152	368.482	54.367	2.470	64.464	<LOD	<LOD	0.068

**Mean Levels of Detection (LOD) for Trace Element LA ICP-MS
Analyses in Parts Per Million (ppm)**

Afs		Ms		CGMs		Grt	
Li	0.554	Li	0.843	Li	5.002	Li	0.758
Be	0.104	Be	0.150	Mg	1.629	Na	3.171
B	4.416	B	6.910	Sc	0.603	Mg	0.388
Na	2.305	Na	1.578	Ti	4.885	Al	0.862
Mg	0.098	Mg	0.150	V	0.445	P	155.5
Al	0.814	Al	1.140	Cr	20.51	Ca	51.63
P	17.70	K	21.25	Mn	8.710	Sc	0.111
K	13.69	Ca	37.12	Fe	20.10	Ti	0.670
Ca	25.18	Sc	0.116	Ge	2.343	Cr	32.95
Sc	0.072	Ti	1.263	Y	0.021	V	0.240
Ti	0.657	V	0.069	Zr	0.024	Cr	3.776
V	0.046	Cr	1.858	Nb	0.074	Mn	4.240
Cr	1.242	Mn	1.370	Mo	0.096	Fe	13.89
Mn	0.930	Fe	9.655	Sn	0.656	Co	0.036
Fe	5.361	Ga	0.027	Ba	0.071	Ni	1.047
Ga	0.008	Ge	0.507	La	0.007	Cu	0.126
Ge	0.350	Rb	0.146	Ce	0.007	Zn	0.900
Rb	0.104	Sr	0.023	Pr	0.005	Rb	0.148
Sr	0.015	Y	0.002	Nd	0.029	Sr	0.038
Y	0.001	Nb	0.006	Sm	0.034	Y	0.008
Nb	0.002	Mo	0.019	Eu	0.010	Zr	0.017
Sn	0.101	Sn	0.185	Gd	0.036	Nb	0.007
Cs	0.017	Cs	0.027	Tb	0.006	La	0.006
Ba	0.016	Ba	0.024	Dy	0.019	Ce	0.004
La	0.001	La	0.002	Ho	0.004	Pr	0.003
Ce	0.002	Ce	0.002	Er	0.014	Nd	0.020
Pr	0.001	Pr	0.002	Tm	0.004	Sm	0.022
Nd	0.008	Nd	0.013	Yb	0.032	Eu	0.007
Sm	0.010	Sm	0.015	Lu	0.005	Gd	0.022
Eu	0.003	Eu	0.004	Hf	0.018	Tb	0.003
Gd	0.009	Gd	0.014	Ta	0.130	Dy	0.014
Tb	0.001	Tb	0.002	W	0.084	Ho	0.003
Dy	0.006	Dy	0.009	Pb ²⁰⁸	0.386	Er	0.010
Ho	0.001	Ho	0.002	Bi	0.170	Tm	0.003
Er	0.005	Er	0.007	Th ²³²	0.007	Yb	0.017
Tm	0.001	Tm	0.002	U ²³⁸	0.012	Lu	0.003
Yb	0.007	Yb	0.011			Hf	0.012
Lu	0.002	Lu	0.003			Ta	0.004
Ta	0.002	Ta	0.005			Pb ²⁰⁸	0.231
Tl	0.022	W	0.037			Th ²³²	0.005
Pb ²⁰⁸	0.023					U ²³⁸	0.005
U ²³⁸	0.005						

Appendix IV– LA ICP-MS Data for U-Pb Geochronology on CGMs

Sample	Concentrations		Common-Pb Regimes						Final Isotope Ratios						Final Ages (Ma)						
	U (ppm)	Th (ppm)	²⁰⁴ Pb cps	2σ int	%	²⁰⁶ Pb cps/ ²⁰⁴ Pb cps	%Pb*	²⁰⁷ Pb/ ²³⁵ U	2σ	²⁰⁶ Pb/ ²³⁸ U	2σ	err. corr.	²⁰⁷ Pb/ ²⁰⁶ Pb	2σ	²⁰⁷ Pb/ ²⁰⁶ Pb	2σ	²⁰⁷ Pb/ ²³⁵ U	2σ	²⁰⁶ Pb/ ²³⁸ U	2σ	
Eagle																					
23-JR-020-UpMid-1	4570	300	6700	310	5	479.22	94.0	3	4.52	0.15	0.288	0.005	0.82	0.115	0.005	1885	1738	26	1631	26	
23-JR-020-UpMid-2	10210	14840	10560	200	2	157.97	92.6	3	11.82	0.53	0.496	0.011	0.86	0.170	0.019	2559	2591	40	2600	47	
23-JR-020-UpMid-3	2675	3228	11660	190	2	477.89	98.0	3	8.41	0.33	0.424	0.009	0.94	0.142	0.008	2255	2273	36	2275	39	
23-JR-020-UpMid-4	11550	3816	5640	120	2	169.08	100.0	3	19.11	1.00	0.701	0.012	0.84	0.198	0.022	2812	3051	51	3421	47	
23-JR-020-UpMid-3-1	1151	1751	3180	140	4	690.66	99.2	3	6.59	0.27	0.375	0.004	0.71	0.129	0.010	2086	2057	36	2051	20	
23-JR-025-1	377	67.8	81	35	43	8932.55	100.0	3	12.13	0.52	0.503	0.007	0.70	0.174	0.009	2593	2614	40	2625	29	
23-JR-025-2	1173	54.3	26	29	112	38966.50	99.9	1	11.80	0.41	0.470	0.005	0.88	0.179	0.008	2644	77	2592.8	34	2481	23
23-JR-025-3	1844	95.8	107	32	30	8836.70	99.9	3	12.25	0.45	0.491	0.005	0.63	0.177	0.010	2626	2623	2623.4	34	2575	19
23-JR-025-4	1671	81.3	67	27	40	4076.32	100.0	1	12.64	0.49	0.501	0.008	0.86	0.182	0.008	2672	78	2656	36	2617	33
23-JR-025-5	495	32.74	0	38		911524.46	99.9	1	10.07	0.37	0.412	0.006	0.86	0.174	0.008	2594	78	2441	34	2223	29
23-JR-025-6	1772	111.2	15	24	160	125973.63	100.0	1	11.10	0.39	0.450	0.003	0.41	0.178	0.008	2630	77	2531.2	33	2395	13
23-JR-025-7	3860	209.8	18	28	156	97207.25	100.0	1	11.24	0.40	0.458	0.004	0.59	0.179	0.008	2641	76	2543.9	34	2432	15
23-JR-025-8	3499	190	51	28	55	40273.04	100.0	1	12.69	0.48	0.508	0.008	0.93	0.179	0.008	2642	77	2658	37	2648	36
23-JR-025-9	3660	190.1	311	60	19	7736.76	100.0	3	12.39	0.47	0.539	0.009	0.83	0.179	0.008	2641	2633	2633	36	2779	38
CM24-15-1	115550	24490	13070	410	3	882.67	96.5	3	0.46	0.03	0.052	0.003	0.99	0.064	0.001	745	28	385	19	328	19
CM24-15-10	4	4	870	67	8	58.64	100.0	3	32496.97	4500.00	36.200	2.100	0.90	6.050	0.620	NAN	10510	130	23310	380	
CM24-15-11	359	16	19	22	116	17948.79	100.0	1	12.42	0.46	0.498	0.018	0.63	0.181	0.002	2658	20	2637	35	2605	78
CM24-15-12	339	15	23	21	91	13666.02	100.0	1	12.12	0.44	0.487	0.018	0.51	0.181	0.002	2662	20	2615	34	2559	76
CM24-15-13	336	16	11	24	218	27287.35	100.0	1	12.54	0.46	0.505	0.019	0.69	0.180	0.002	2650	22	2646	35	2633	80
CM24-15-14	649	32	31	37	119	20668.76	100.0	1	14.67	0.55	0.571	0.021	0.61	0.185	0.002	2700	22	2794	35	2911	85
CM24-15-15	401	33	25	29	116	14841.69	100.0	1	13.16	0.49	0.527	0.020	0.65	0.180	0.002	2652	21	2691	36	2729	83
CM24-15-16	273	59	19	22	116	14186.10	100.0	1	13.04	0.48	0.523	0.019	0.64	0.179	0.002	2646	20	2683	35	2710	81
CM24-15-17	4780	960	7230	320	4	3602.20	100.0	3	113.30	5.70	2.965	0.150	0.99	0.273	0.004	3323	22	4799	53	8840	240
CM24-15-18	3840	575	1421	84	6	995.39	92.8	3	3.15	0.17	0.188	0.007	0.73	0.121	0.002	1975	31	1446	43	1110	38
CM24-15-19	15600	3519	32678	1500	5	111.14	75.5	3	2.03	0.09	0.106	0.005	0.91	0.141	0.004	2243	45	1126	32	651	31
CM24-15-2	209132	54790	45858	1000	2	600.63	94.5	3	0.72	0.03	0.069	0.003	0.97	0.076	0.001	1091	25	549	18	429	16
CM24-15-20	7220	1100	12101	3200	26	142.16	81.3	3	2.26	0.19	0.117	0.008	0.96	0.144	0.003	2253	35	1186	48	709	45
CM24-15-21	11690	4050	2803	96	3	725.88	81.1	3	2.56	0.22	0.097	0.006	0.99	0.191	0.005	2743	46	1279	62	594	36
CM24-15-22	5	28	13	22	169	344.62	95.5	1	14.62	0.79	0.512	0.024	0.34	0.205	0.009	2864	68	2781	52	2656	100
CM24-15-23	372	84	450	40	9	185.30	84.0	3	1.72	0.20	0.110	0.005	0.63	0.117	0.009	1880	140	1017	75	672	28
CM24-15-24	1080	151	2160	89	4	54.68	60.2	3	0.71	0.11	0.046	0.003	0.53	0.124	0.020	2100	230	535	69	291	16
CM24-15-3	2253	362	1410	190	13	226.28	79.4	3	1.58	0.05	0.070	0.002	0.67	0.162	0.003	2478	28	960	18	440	12
CM24-15-4	1602	362	223	91	41	1274.96	85.3	3	2.15	0.10	0.094	0.005	0.96	0.169	0.002	2544	21	1157	31	575	31
CM24-15-5	42	10	44	20	45	899.55	99.5	1	12.51	0.50	0.488	0.018	0.40	0.187	0.003	2710	30	2641	38	2560	79
CM24-15-6	131	24	305	34	11	184.13	84.0	3	4.25	0.50	0.210	0.009	0.76	0.150	0.011	2320	140	1697	99	1228	49
CM24-15-7	99	30	1597	68	4	73.75	78.0	3	11.73	2.70	0.519	0.029	0.75	0.165	0.016	2501	170	2565	240	2693	120
CM24-15-8	46	9	4360	760	17	30.61	100.0	3	430.00	150.00	2.260	0.420	0.92	0.900	0.180	4330	180	5430	320	7020	750
CM24-15-9	20	6	4020	460	11	52.47	100.0	3	7086.83	2000.00	13.800	2.600	0.95	2.460	0.490	4540	140	8040	410	15574	1300

CM24-16-1	512	28	23	26	113	20111.45	100.0	1	12.87	0.47	0.517	0.019	0.52	0.179	0.002	2641	21	2670	34	2685	80
CM24-16-10	76	10	50	33	66	1664.20	100.0	1	15.51	0.63	0.650	0.025	0.52	0.172	0.003	2579	35	2846	39	3226	99
CM24-16-11	363	16	27	18	67	11878.40	100.0	1	11.90	0.44	0.482	0.017	0.54	0.182	0.002	2668	20	2596	34	2537	76
CM24-16-12	332	14	0	27		330373.50	100.0	1	12.39	0.46	0.505	0.020	0.43	0.180	0.002	2654	22	2634	35	2636	78
CM24-16-13	419	60	21	22	105	20048.82	100.0	1	13.25	0.49	0.543	0.020	0.68	0.180	0.002	2651	20	2698	34	2795	83
CM24-16-14	227	12	220	36	16	899.10	98.2	3	11.16	0.69	0.492	0.022	0.76	0.165	0.004	2506	39	2542	56	2576	93
CM24-16-15	512	33	25	18	72	20891.31	100.0	1	13.49	0.50	0.556	0.020	0.84	0.178	0.002	2631	20	2714	35	2851	85
CM24-16-16	415	20	56	20	36	6898.20	100.0	1	12.44	0.45	0.504	0.018	0.52	0.181	0.002	2664	20	2639	35	2633	78
CM24-16-17	288	13	14	20	143	19525.26	100.0	1	12.83	0.47	0.522	0.019	0.81	0.181	0.002	2665	21	2667	35	2709	83
CM24-16-18	361	13	49	22	45	6199.39	99.8	1	11.23	0.42	0.467	0.017	0.67	0.176	0.002	2615	21	2542	34	2469	75
CM24-16-19	707	37	37	23	62	24682.84	100.0	1	16.85	0.62	0.696	0.025	0.61	0.178	0.002	2630	20	2926	35	3406	96
CM24-16-2	439	21	23	25	109	18823.71	100.0	1	12.82	0.48	0.514	0.019	0.80	0.180	0.002	2654	20	2666	35	2675	82
CM24-16-20	380	19	-2	25	-1250	375480.44	100.0	1	12.99	0.48	0.530	0.020	0.85	0.179	0.002	2641	20	2679	35	2740	83
CM24-16-21	4119	786	1877	92	5	1538.49	99.6	3	7.46	0.30	0.399	0.015	0.89	0.137	0.002	2186	28	2167	36	2162	69
CM24-16-22	440	28	17	19	112	24034.84	100.0	1	12.85	0.48	0.519	0.019	0.56	0.180	0.002	2650	20	2668	35	2696	80
CM24-16-23	467	29	17	37	218	26487.02	100.0	1	12.16	0.46	0.495	0.019	0.74	0.179	0.003	2639	23	2618	37	2590	80
CM24-16-24	224	17	67	26	39	2763.73	100.0	1	11.33	0.43	0.456	0.017	0.67	0.181	0.002	2659	22	2551	34	2422	75
CM24-16-25	220	10	85	26	31	2263.85	100.0	3	12.16	0.92	0.496	0.021	0.66	0.176	0.004	2616	36	2617	69	2598	89
CM24-16-26	396	17	44	20	45	8550.11	100.0	1	13.78	0.51	0.550	0.020	0.63	0.180	0.002	2651	19	2734	35	2824	83
CM24-16-27	351	16	91	32	35	3645.67	100.0	3	13.01	0.77	0.519	0.019	0.53	0.180	0.003	2651	32	2680	55	2696	82
CM24-16-28	421	21	15	22	147	24392.09	100.0	1	13.07	0.48	0.517	0.019	0.83	0.182	0.002	2666	20	2686	36	2687	79
CM24-16-29	378	26	177	28	16	1167.20	92.3	3	7.47	0.36	0.311	0.013	0.83	0.172	0.004	2570	38	2172	45	1742	61
CM24-16-3	32	30	47	23	49	621.91	98.9	1	11.82	0.49	0.474	0.018	0.33	0.179	0.004	2642	36	2588	38	2499	80
CM24-16-30	332	15	-12	33	-275	314411.79	100.0	1	12.26	0.47	0.490	0.018	0.76	0.179	0.003	2641	26	2624	36	2571	79
CM24-16-31	236	11	140	29	21	1396.29	99.6	3	11.60	0.51	0.477	0.017	0.65	0.176	0.003	2612	32	2573	40	2514	73
CM24-16-32	48	4	38	22	58	1178.55	100.0	1	12.88	0.50	0.533	0.020	0.54	0.172	0.003	2578	28	2669	37	2751	86
CM24-16-33	82	6	2160	180	8	86.22	100.0	3	33.30	3.70	1.190	0.079	0.97	0.212	0.011	2904	85	3585	110	5050	220
CM24-16-34	392	17	7	27	386	43960.58	100.0	1	11.80	0.44	0.482	0.018	0.71	0.178	0.002	2631	22	2590	34	2536	77
CM24-16-35	210	6	-4	21	-525	178598.48	100.0	1	12.16	0.45	0.490	0.018	0.58	0.180	0.002	2647	21	2617	34	2571	77
CM24-16-36	338	12	5	34	680	50806.04	99.9	1	9.61	0.39	0.392	0.015	0.81	0.179	0.003	2640	25	2396	38	2130	71
CM24-16-37	305397	61320	24900	580	2	6341.37	99.8	3	5.25	0.20	0.319	0.012	0.93	0.119	0.001	1946	19	1860	33	1787	58
CM24-16-38	300	15	39	28	72	5522.90	99.8	1	10.75	0.40	0.433	0.016	0.49	0.180	0.003	2649	23	2501	35	2317	71
CM24-16-39	234	12	13	21	162	16641.63	100.0	1	13.06	0.48	0.530	0.020	0.59	0.180	0.002	2649	21	2685	35	2742	84
CM24-16-4	330	17	16	33	206	18005.18	100.0	1	13.35	0.51	0.525	0.019	0.37	0.183	0.003	2686	25	2704	36	2718	81
CM24-16-40	406	22	46	20	43	8467.42	100.0	1	13.42	0.51	0.544	0.021	0.91	0.181	0.002	2658	20	2710	36	2801	84
CM24-16-41	256	13	61	32	52	3350.50	99.8	1	10.72	0.40	0.434	0.016	0.61	0.181	0.002	2660	21	2499	34	2322	71
CM24-16-42	238	11	51	33	65	3773.88	99.9	1	10.29	0.46	0.420	0.018	0.92	0.179	0.003	2639	24	2464	40	2259	83
CM24-16-43	250	9	-2	25	-1250	200975.70	100.0	1	12.23	0.46	0.494	0.018	0.53	0.181	0.003	2657	24	2623	36	2588	78
CM24-16-44	220	7	22	20	91	8148.65	100.0	1	11.88	0.44	0.483	0.018	0.47	0.181	0.002	2661	21	2595	35	2543	76
CM24-16-45	752	45	7	20	286	85455.37	100.0	1	11.21	0.41	0.459	0.017	0.83	0.179	0.002	2638	19	2541	34	2437	74
CM24-16-46	636	39	38	23	61	14881.13	100.0	1	12.45	0.45	0.510	0.018	0.60	0.179	0.002	2639	19	2639	34	2657	79
CM24-16-47	300	15	25	18	72	10226.33	100.0	1	12.25	0.46	0.502	0.019	0.84	0.178	0.002	2632	20	2623	36	2620	81
CM24-16-48	351	14	17	20	118	18872.43	100.0	1	12.87	0.46	0.526	0.019	0.63	0.178	0.002	2634	20	2671	35	2725	81
CM24-16-49	267998	69410	1562	65	4	34577.53	95.0	3	1.67	0.06	0.117	0.004	0.87	0.103	0.001	1682	21	995	24	713	25
CM24-16-5	253	11	90	33	37	2699.31	100.0	3	12.89	0.52	0.522	0.019	0.58	0.180	0.002	2647	22	2673	37	2707	80

CM24-16-50	235987	58540	1636	84	5	26295.96	94.7	3	1.51	0.06	0.107	0.004	0.77	0.103	0.001	1674	22	935	22	654	23
CM24-16-51	218927	56340	5270	350	7	8737.65	94.2	3	1.85	0.07	0.124	0.005	0.80	0.109	0.001	1776	21	1065	24	751	26
CM24-16-52	233	6	32	27	84	5750.58	100.0	1	12.21	0.46	0.489	0.018	0.70	0.181	0.002	2659	21	2622	34	2564	77
CM24-16-53	225	8	6	21	350	30353.33	100.0	1	12.39	0.46	0.498	0.018	0.45	0.180	0.002	2654	22	2635	36	2604	78
CM24-16-54	248	8	17	20	118	12475.57	100.0	1	12.70	0.46	0.509	0.018	0.31	0.180	0.002	2653	20	2657	34	2651	79
CM24-16-55	513	25	1	23	2300	423192.59	100.0	1	13.10	0.49	0.528	0.019	0.64	0.179	0.002	2638	22	2686	35	2731	82
CM24-16-56	958	94	55	29	53	16246.65	100.0	1	12.72	0.47	0.516	0.019	0.82	0.178	0.002	2635	20	2659	35	2681	81
CM24-16-57	1367	16	83	29	35	3999.97	87.5	3	3.40	0.18	0.147	0.006	0.87	0.165	0.004	2512	38	1501	42	886	35
CM24-16-58	200	6	11	23	209	13934.71	100.0	1	12.16	0.45	0.492	0.018	0.37	0.178	0.003	2635	24	2617	35	2580	77
CM24-16-59	1032	128	69	21	30	6844.90	91.1	1	6.71	0.31	0.286	0.013	0.98	0.169	0.002	2547	21	2074	41	1617	65
CM24-16-6	233	7	22	18	82	9849.07	100.0	1	12.61	0.46	0.509	0.019	0.59	0.180	0.002	2654	21	2650	35	2652	79
CM24-16-60	1877	324	419	51	12	2154.73	96.0	3	5.47	0.25	0.284	0.014	0.97	0.138	0.002	2203	30	1893	40	1611	68
CM24-16-61	776	145	175	31	18	2777.58	100.8	3	9.26	0.44	0.398	0.015	0.83	0.168	0.003	2535	31	2362	44	2162	72
CM24-16-62	115	4	203	24	12	637.09	100.0	3	17.99	1.40	0.677	0.026	0.46	0.194	0.005	2773	42	2989	73	3331	100
CM24-16-63	382	21	-1	20	-2000	318258.84	100.0	1	12.54	0.46	0.509	0.019	0.83	0.178	0.002	2629	20	2645	35	2653	80
CM24-16-64	224	9	4	21	525	42482.44	100.0	1	11.85	0.45	0.470	0.018	0.80	0.181	0.002	2663	21	2591	35	2486	76
CM24-16-65	314	23	16	22	138	16141.83	100.0	1	12.81	0.47	0.510	0.019	0.63	0.180	0.002	2655	21	2665	35	2656	79
CM24-16-66	372	20	8	21	263	38132.23	100.0	1	12.80	0.48	0.510	0.019	0.82	0.180	0.002	2653	20	2665	36	2660	83
CM24-16-67	261	11	-2	18	-900	211590.00	100.0	1	12.52	0.46	0.505	0.018	0.50	0.178	0.002	2638	22	2645	34	2633	78
CM24-16-68	372	19	17	20	118	17782.38	100.0	1	12.62	0.46	0.504	0.018	0.58	0.181	0.002	2663	19	2652	34	2630	78
CM24-16-69	384	19	1	26	2600	289694.47	100.0	1	12.64	0.47	0.503	0.018	0.64	0.180	0.002	2651	21	2653	35	2624	79
CM24-16-7	233	15	18	28	156	10855.55	100.0	1	12.29	0.46	0.499	0.018	0.66	0.180	0.003	2647	23	2627	35	2607	79
CM24-16-70	472	24	21	23	110	17556.86	100.0	1	12.19	0.45	0.489	0.018	0.73	0.180	0.002	2654	20	2619	34	2564	77
CM24-16-71	499	27	3	25	833	132213.41	100.0	1	12.68	0.47	0.507	0.019	0.56	0.180	0.002	2651	21	2656	34	2642	79
CM24-16-72	280	9	267	37	14	951.19	99.3	3	12.22	0.60	0.505	0.019	0.53	0.177	0.004	2622	38	2620	47	2634	82
CM24-16-73	287	7	49	22	45	3833.25	99.4	1	10.19	0.38	0.408	0.015	0.57	0.180	0.002	2651	21	2453	35	2207	68
CM24-16-74	894	28	46	25	54	25265.94	100.0	1	21.01	0.79	0.855	0.032	0.85	0.178	0.002	2631	20	3139	36	3983	110
CM24-16-75	662	27	30	20	67	28466.37	100.0	1	20.08	0.75	0.816	0.031	0.91	0.177	0.002	2627	20	3094	37	3845	110
CM24-16-76	642	59	10	17	170	82611.23	100.0	1	20.22	0.73	0.813	0.029	0.62	0.179	0.002	2646	19	3102	35	3833	100
CM24-16-77	233	7	-11	19	-173	173072.58	100.0	1	12.33	0.46	0.493	0.018	0.42	0.182	0.003	2671	24	2629	35	2582	78
CM24-16-78	276	19	-3	17	-567	166540.00	100.4	1	9.45	0.35	0.382	0.014	0.59	0.180	0.002	2646	21	2383	33	2083	65
CM24-16-79	232	7	3	27	900	57391.65	100.0	1	12.49	0.47	0.501	0.018	0.73	0.181	0.003	2661	23	2641	35	2618	79
CM24-16-8	411	23	9	29	322	38128.22	100.0	1	11.88	0.44	0.486	0.018	0.39	0.178	0.002	2636	21	2597	35	2555	77
CM24-16-80	30540	27660	9630	300	3	730.42	93.4	3	2.02	0.11	0.144	0.008	0.99	0.103	0.002	1683	28	1116	37	865	45
CM24-16-81	7290	4940	9090	320	4	466.14	96.0	3	6.96	0.33	0.397	0.016	0.81	0.129	0.003	2091	40	2106	42	2156	74
CM24-16-82	872	60	166	26	16	5233.81	100.0	3	15.21	0.62	0.638	0.023	0.67	0.173	0.002	2590	23	2828	39	3182	93
CM24-16-83	317	15	6	20	333	39652.71	100.0	1	12.26	0.45	0.494	0.018	0.66	0.181	0.002	2659	21	2624	35	2586	78
CM24-16-84	367	16	27	27	100	9888.47	100.0	1	12.16	0.46	0.485	0.018	0.73	0.182	0.002	2670	21	2617	35	2549	77
CM24-16-85	824	80	60	19	32	15239.95	100.0	1	17.61	0.65	0.714	0.026	0.87	0.179	0.002	2641	19	2968	35	3474	99
CM24-16-86	838	37	84	23	27	11731.03	100.0	3	18.46	0.63	0.754	0.027	0.80	0.177	0.002	2628	19	3015	34	3623	100
CM24-16-87	7415	1690	519	53	10	6862.67	97.9	3	6.37	0.33	0.313	0.013	0.95	0.147	0.003	2309	36	2021	45	1755	66
CM24-16-88	376	19	8	19	238	34948.33	100.0	1	11.89	0.45	0.477	0.018	0.84	0.182	0.002	2666	20	2594	35	2511	77
CM24-16-89	319	14	-8	25	-313	218426.01	100.0	1	11.98	0.46	0.481	0.018	0.60	0.180	0.003	2658	23	2605	34	2534	80
CM24-16-9	441	45	181	27	15	2690.18	100.0	3	13.54	0.53	0.596	0.021	0.47	0.168	0.003	2539	28	2718	37	3015	87
CM24-16-90	209	7	75	26	35	2215.68	100.0	3	12.57	0.89	0.509	0.021	0.52	0.180	0.004	2648	35	2646	67	2654	88

CM24-16-91	208	7	11	20	182	14494.94	100.0	1	12.72	0.47	0.508	0.019	0.42	0.181	0.003	2663	22	2659	35	2648	79
CM24-16-92	193	7	93	26	28	1684.54	100.0	3	13.02	0.81	0.524	0.021	0.71	0.182	0.004	2666	35	2678	59	2715	88
F. D. no. 5																					
23-JR-031-BottomLeft-1	27100	4314	12	22	183	9710.57	100.0	1	12.17	0.43	0.502	0.004	0.66	0.175	0.008	2605	76	2618	34	2623	19
23-JR-031-BottomLeft-2	213.8	11.28	0	22		47006.78	100.0	1	11.92	0.44	0.488	0.005	0.58	0.179	0.009	2641	77	2599	35	2562	23
23-JR-031-BottomLeft-3	88.73	17	49	30	61	597.35	100.3	1	11.68	0.48	0.485	0.008	0.70	0.176	0.009	2608	81	2576	38	2547	35
23-JR-031-BottomLeft-4	59.6	37.24	19	23	121	1902.11	100.3	1	12.56	0.52	0.514	0.011	0.81	0.179	0.009	2641	82	2646	40	2678	47
23-JR-031-BottomLeft-5	68.2	40.1	38	24	63	396.84	99.3	1	10.90	0.43	0.448	0.007	0.48	0.176	0.009	2627	87	2514	37	2389	29
23-JR-031-BottomLeft-6	31.35	38.61	-3	22	-733	33400.00	100.1	1	12.79	0.52	0.502	0.008	0.57	0.178	0.009	2629	83	2664	39	2623	33
23-JR-031-BottomLeft-7	58.7	32.08	31	24	77	1152.90	100.0	1	13.74	0.56	0.564	0.010	0.69	0.177	0.009	2625	81	2732	39	2886	39
23-JR-031-MidRight-1	59.4	34.5	7420	140	2	747.80	98.6	3	12.18	0.47	0.498	0.008	0.89	0.175	0.009	2608	2617	2617	37	2603	32
23-JR-031-MidRight-2	9930	2260	214	30	14	652.05	100.0	3	10.80	0.56	0.513	0.012	0.70	0.156	0.013	2397	2504	2504	48	2669	50
23-JR-031-MidRight-3	246	36.6	351	35	10	453.78	100.0	3	20.62	1.10	0.923	0.026	0.86	0.163	0.021	2491	3121	3121	49	4213	85
23-JR-031-MidRight-4	161.3	22.51	426	38	9	605.36	100.0	3	15.37	0.70	0.665	0.014	0.80	0.169	0.014	2543	2840	2840	45	3284	55
23-JR-033-Bottom-1	463	22.6	14970	220	1	604.73	99.4	3	4.51	0.18	0.302	0.004	0.70	0.109	0.007	1787	1732	1732	33	1700	19
23-JR-033-Bottom-2	29550	7104	11890	270	2	862.23	99.8	3	4.47	0.20	0.300	0.003	0.29	0.110	0.006	1795	1725	1724.6	37	1693	16
23-JR-033-Bottom-3	34060	8367	12710	210	2	644.30	98.3	3	4.46	0.18	0.288	0.005	0.75	0.113	0.007	1843	1722	1722	33	1634	22
23-JR-033-Bottom-4	27470	9170	14660	230	2	619.08	98.4	3	4.36	0.16	0.285	0.003	0.58	0.112	0.007	1833	1706	1706	31	1617	17
23-JR-033-Top-1	30800	10294	10610	320	3	1213.53	98.5	3	5.44	0.22	0.316	0.003	0.79	0.123	0.005	2007	1891	1890.7	36	1772	14
23-JR-033-Top-2	39590	5495	6300	180	3	872.66	99.4	3	8.17	0.32	0.419	0.004	0.52	0.142	0.007	2248	2249	2249.3	36	2257	19
23-JR-033-Top-3	13000	4126	2620	79	3	845.46	100.0	3	16.23	0.64	0.646	0.011	0.80	0.181	0.010	2662	2892	2892	37	3216	42
23-JR-033-Top-4	3181	3582	5270	170	3	480.14	100.0	3	15.99	0.72	0.626	0.012	0.94	0.180	0.011	2654	2874	2874	43	3134	48
23-JR-033-Top-5	3275	4786	4690	460	10	1220.55	99.2	3	7.38	0.25	0.392	0.009	0.89	0.137	0.004	2185	2157	2157	30	2129	40
23-JR-033-Top-6	14550	4169	13110	600	5	692.95	98.2	3	5.73	0.19	0.332	0.004	0.69	0.126	0.005	2041	1937	1937.4	30	1846	21
CM24-10-1	821	32	11	24	218	47582.95	100.0	1	12.41	0.44	0.496	0.016	0.87	0.180	0.001	2653	10	2634	39	2595	74
CM24-10-10	1426	77	134	28	21	7978.93	100.0	3	12.72	0.23	0.524	0.011	0.85	0.177	0.001	2621	8	2658	17	2717	45
CM24-10-11	192	11	154	33	21	967.09	100.0	3	13.43	0.73	0.557	0.012	0.57	0.177	0.003	2618	29	2709	51	2852	51
CM24-10-12	220	6	170	24	14	4676.19	100.0	3	82.50	6.60	2.590	0.190	1.00	0.229	0.002	3046	16	4465	84	8230	330
CM24-10-13	585	24	6	20	333	82763.89	100.0	1	16.84	0.57	0.654	0.023	0.97	0.188	0.001	2720	9	2921	33	3245	92
CM24-10-14	6316	202	154	27	18	30726.76	100.0	3	13.11	0.26	0.546	0.011	0.72	0.175	0.001	2602	6	2687	19	2806	45
CM24-10-15	9760	537	8130	440	5	1065.20	100.0	3	14.59	0.57	0.659	0.023	0.99	0.161	0.001	2467	11	2783	36	3264	92
CM24-10-16	4055	142	337	34	10	9258.87	100.0	3	13.73	0.29	0.559	0.012	0.86	0.178	0.001	2635	5	2731	20	2863	48
CM24-10-17	284	16	11	19	173	16352.60	100.0	1	12.19	0.34	0.497	0.011	0.36	0.177	0.002	2624	17	2620	22	2604	46
CM24-10-18	279	12	144	24	17	1078.49	98.2	3	8.41	0.29	0.397	0.009	0.69	0.155	0.002	2400	25	2273	31	2154	42
CM24-10-19	777	241	957	53	6	464.22	97.1	3	8.09	0.23	0.402	0.008	0.67	0.149	0.002	2338	19	2241	26	2176	37
CM24-10-2	106	8	91	25	27	1057.45	100.0	3	14.48	0.48	0.658	0.012	0.64	0.161	0.004	2467	39	2779	32	3259	45
CM24-10-20	211	8	135	35	26	1187.77	100.0	3	13.01	0.43	0.547	0.012	0.70	0.174	0.003	2601	23	2682	30	2816	50
CM24-10-21	1291	80	28	21	75	29517.91	100.0	1	11.57	0.23	0.467	0.010	0.81	0.181	0.001	2663	8	2571	18	2469	42
CM24-10-22	1744	111	81	23	28	14367.89	100.0	3	12.19	0.25	0.490	0.010	0.77	0.181	0.001	2660	6	2618	19	2570	42
CM24-10-23	162	7	17	27	159	6397.86	100.0	1	12.80	0.28	0.511	0.011	0.50	0.182	0.001	2669	13	2664	21	2658	47
CM24-10-24	456	28	1388	87	6	271.74	100.0	3	15.74	0.86	0.634	0.027	0.67	0.183	0.003	2676	26	2863	44	3164	98
CM24-10-25	2523	71	64	22	34	25954.16	100.0	1	11.97	0.24	0.482	0.010	0.88	0.180	0.001	2654	6	2603	19	2537	43
CM24-10-26	1302	44	2300	150	7	404.29	100.0	3	10.35	0.27	0.510	0.011	0.76	0.150	0.002	2344	17	2469	23	2657	47
CM24-10-27	246	70	10	19	190	18983.88	100.0	1	14.03	0.30	0.575	0.012	0.79	0.178	0.001	2629	13	2751	20	2926	51
CM24-10-28	878	193	294	28	10	1709.47	100.1	3	6.98	0.27	0.415	0.012	0.93	0.123	0.002	1997	28	2100	36	2239	55

CM24-10-29	7600	367	529	46	9	10092.34	100.0	3	12.42	0.31	0.524	0.014	0.95	0.173	0.001	2583	7	2642	23	2712	58
CM24-10-3	770	35	878	58	7	606.94	98.8	3	11.35	0.39	0.495	0.014	0.92	0.169	0.002	2550	15	2549	32	2590	62
CM24-10-30	777	28	102	30	29	4443.65	99.6	3	10.65	0.35	0.440	0.014	0.97	0.176	0.001	2613	10	2490	31	2352	62
CM24-10-31	9200	559	1872	58	3	1958.27	98.9	3	4.41	0.09	0.293	0.006	0.76	0.110	0.000	1801	8	1714	17	1658	30
CM24-10-32	587	80	24	19	79	9706.27	93.8	1	7.35	0.32	0.311	0.013	0.97	0.172	0.002	2576	14	2155	39	1742	62
CM24-10-33	404	25	144	22	15	2215.22	100.0	3	16.16	0.60	0.596	0.021	0.86	0.196	0.002	2794	15	2891	35	3004	84
CM24-10-34	2303	257	509	41	8	4928.25	100.0	3	17.17	0.65	0.784	0.030	0.97	0.160	0.001	2458	8	2935	36	3718	110
CM24-10-35	338	15	15	21	140	14825.85	100.0	1	12.65	0.26	0.504	0.010	0.66	0.182	0.001	2668	10	2655	19	2628	43
CM24-10-36	231	11	75	32	43	2811.85	100.0	3	14.17	0.37	0.591	0.021	0.55	0.176	0.002	2609	21	2759	23	2991	80
CM24-10-37	143	4	44	24	55	2327.44	100.0	1	14.21	0.45	0.539	0.013	0.83	0.192	0.003	2751	23	2758	30	2776	56
CM24-10-38	244	22	2610	460	18	116.63	100.0	3	19.20	1.50	0.830	0.051	0.96	0.176	0.004	2607	39	3052	72	3900	180
CM24-10-39	258	9	13	20	154	13397.15	100.0	1	12.57	0.26	0.509	0.010	0.58	0.180	0.001	2651	13	2647	20	2652	44
CM24-10-4	3852	667	201	35	17	2338.00	93.9	3	1.20	0.04	0.087	0.004	0.90	0.101	0.002	1638	34	798	19	539	23
CM24-10-40	217	6	11	20	182	15285.76	100.0	1	14.43	0.30	0.575	0.011	0.67	0.182	0.001	2667	11	2777	20	2930	47
CM24-10-41	545	28	1794	72	4	347.72	100.0	3	17.85	0.42	0.826	0.019	0.71	0.161	0.002	2461	16	2983	23	3883	68
CM24-10-42	741	16	30	27	90	19726.28	100.0	1	14.49	0.34	0.580	0.014	0.86	0.182	0.001	2668	9	2782	23	2946	57
CM24-10-43	29594	1235	1480	250	17	11225.86	99.9	3	8.30	0.22	0.413	0.011	0.94	0.146	0.001	2299	14	2265	25	2232	52
CM24-10-44	3120	141	28	20	71	84105.01	100.0	1	13.89	0.30	0.576	0.012	0.92	0.177	0.001	2620	6	2742	20	2933	51
CM24-10-45	2502	95	147	21	14	14719.14	100.0	3	15.79	0.46	0.636	0.019	0.98	0.180	0.001	2655	5	2862	28	3169	75
CM24-10-46	483	16	48	19	40	8113.20	100.0	1	14.86	0.35	0.594	0.014	0.89	0.182	0.001	2673	9	2805	22	3006	56
CM24-10-47	414	16	-5	17	-340	296080.91	100.0	1	13.56	0.26	0.543	0.011	0.34	0.182	0.001	2670	10	2719	18	2797	44
CM24-10-48	309	18	1290	120	9	186.17	97.1	3	12.07	0.41	0.547	0.013	0.59	0.164	0.003	2498	33	2603	32	2812	53
CM24-10-49	1614	65	115	29	25	10737.10	100.0	3	13.97	0.36	0.575	0.013	0.94	0.177	0.001	2626	10	2747	24	2929	52
CM24-10-5	1906	262	1250	180	14	891.20	99.9	3	9.33	0.42	0.415	0.018	0.99	0.163	0.002	2484	15	2375	43	2233	79
CM24-10-50	1030	38	93	25	27	6185.39	99.7	3	10.07	0.27	0.420	0.009	0.58	0.175	0.002	2607	20	2442	24	2265	41
CM24-10-51	919	139	7	17	243	96308.63	100.0	1	13.66	0.38	0.554	0.015	0.96	0.180	0.001	2653	9	2725	27	2844	61
CM24-10-52	5610	631	-9	18	-200	3827629.58	100.0	1	15.60	2.80	0.584	0.075	1.00	0.187	0.006	2705	48	2720	110	2870	240
CM24-10-53	749	37	75	25	33	6696.86	100.0	3	12.15	0.30	0.505	0.013	0.82	0.177	0.001	2628	14	2620	23	2634	54
CM24-10-54	1710	247	32	21	66	41923.74	100.0	1	14.61	0.93	0.558	0.029	1.00	0.192	0.003	2752	26	2776	62	2840	120
CM24-10-55	1835	725	1460	210	14	532.23	96.8	3	4.61	0.14	0.314	0.010	0.90	0.107	0.001	1755	19	1750	25	1762	47
CM24-10-56	16690	1623	902	69	8	6629.65	99.8	3	3.64	0.07	0.270	0.006	0.92	0.099	0.000	1598	7	1559	16	1540	28
CM24-10-57	1459	850	3560	430	12	233.56	94.6	3	7.16	0.16	0.407	0.009	0.59	0.132	0.002	2115	25	2128	20	2198	39
CM24-10-58	4888	478	270	46	17	4585.17	97.7	3	2.49	0.08	0.183	0.006	0.95	0.100	0.001	1616	13	1270	24	1081	30
CM24-10-59	5770	743	670	110	16	4090.87	95.8	3	7.94	0.44	0.343	0.019	0.96	0.168	0.002	2543	24	2219	51	1892	90
CM24-10-6	1612	62	337	56	17	3664.36	100.0	3	13.50	0.25	0.548	0.011	0.58	0.179	0.001	2645	8	2715	18	2820	44
CM24-10-60	1290	162	23	18	78	27432.49	100.1	1	8.29	0.33	0.366	0.012	0.97	0.164	0.001	2498	15	2261	36	2009	55
CM24-10-7	125	2	15	22	147	8290.20	100.0	1	17.03	0.78	0.673	0.026	0.58	0.184	0.003	2689	25	2936	52	3317	110
CM24-10-8	240	27	41	21	51	4911.32	100.0	1	15.03	0.30	0.612	0.012	0.65	0.178	0.001	2638	9	2818	18	3079	50
CM24-10-9	1394	46	6	21	350	166078.15	100.0	1	12.38	0.25	0.505	0.010	0.93	0.178	0.001	2635	7	2633	19	2635	44
CM24-11-1	583	73	9	24	267	48272.17	100.0	1	12.63	0.29	0.526	0.012	0.70	0.174	0.001	2598	8	2652	21	2723	51
CM24-11-10	172	13	6	19	317	23867.19	100.0	1	12.68	0.31	0.551	0.013	0.84	0.168	0.001	2535	12	2657	23	2829	54
CM24-11-11	745	32	188	28	15	2588.10	99.4	3	9.01	0.23	0.430	0.010	0.70	0.152	0.001	2366	13	2337	23	2307	43
CM24-11-12	236	9	73	24	33	2968.83	100.0	1	15.30	0.32	0.602	0.012	0.77	0.184	0.001	2691	9	2834	19	3039	50
CM24-11-13	290	11	31	18	58	7688.24	100.0	1	13.68	0.27	0.544	0.011	0.46	0.183	0.001	2681	9	2728	19	2800	44
CM24-11-14	841	9	588	34	6	1447.19	100.0	3	11.72	0.32	0.677	0.015	0.86	0.126	0.001	2046	14	2582	25	3336	60

CM24-11-15	276	7	22	18	82	9729.16	100.0	1	12.85	0.25	0.515	0.010	0.23	0.182	0.001	2671	10	2668	19	2677	44
CM24-11-16	299	30	6	23	383	39106.40	100.0	1	12.09	0.25	0.492	0.010	0.53	0.179	0.001	2641	10	2613	20	2578	43
CM24-11-17	447	64	550	40	7	1177.17	100.0	3	19.82	0.46	0.952	0.020	0.52	0.153	0.002	2384	17	3082	22	4314	67
CM24-11-18	306	11	16	24	150	13624.59	100.0	1	11.91	0.28	0.505	0.012	0.70	0.171	0.001	2568	12	2598	21	2635	50
CM24-11-19	160	5	-8	15	-188	122005.88	100.0	1	12.84	0.27	0.513	0.010	0.57	0.182	0.002	2667	13	2668	20	2667	45
CM24-11-2	187	15	8	21	263	16819.63	100.0	1	12.01	0.34	0.498	0.015	0.83	0.175	0.001	2607	13	2603	25	2604	62
CM24-11-20	192	8	89	23	26	2108.35	100.0	3	14.43	0.47	0.656	0.015	0.60	0.159	0.002	2444	21	2778	31	3249	56
CM24-11-21	388	12	-10	23	-230	304365.72	100.0	1	14.37	0.34	0.566	0.015	0.72	0.184	0.001	2689	10	2776	22	2888	59
CM24-11-22	241	11	41	20	49	4242.72	100.0	1	11.92	0.25	0.497	0.011	0.74	0.174	0.001	2592	11	2597	20	2601	46
CM24-11-23	203	11	37	21	57	4158.34	100.0	1	12.24	0.28	0.510	0.012	0.71	0.174	0.001	2596	14	2625	21	2658	50
CM24-11-24	364	36	346	39	11	1340.13	100.0	3	19.09	0.55	0.852	0.026	0.91	0.164	0.001	2491	14	3047	28	3966	91
CM24-11-25	507	68	458	44	10	1446.95	100.0	3	19.96	0.42	0.880	0.020	0.77	0.165	0.001	2511	10	3090	20	4066	67
CM24-11-26	136	3	47	17	36	2326.38	100.0	1	13.73	0.28	0.546	0.011	0.41	0.183	0.002	2675	14	2731	19	2807	47
CM24-11-27	149	4	9	19	211	12045.17	100.0	1	12.36	0.27	0.498	0.010	0.65	0.181	0.001	2660	12	2631	21	2604	44
CM24-11-28	155	6	23	18	78	5767.57	100.0	1	14.07	0.38	0.584	0.016	0.92	0.175	0.001	2599	13	2751	26	2960	65
CM24-11-29	319	6	113	24	21	2431.87	100.0	3	11.35	0.42	0.610	0.026	0.90	0.137	0.002	2185	26	2546	36	3057	100
CM24-11-3	86	67	32	18	56	1893.13	100.3	1	11.12	0.26	0.462	0.010	0.68	0.176	0.002	2607	18	2533	22	2446	45
CM24-11-30	771	3	9	18	200	19298.07	92.6	1	2.84	0.06	0.157	0.003	0.79	0.131	0.001	2110	13	1366	16	942	18
CM24-11-31	885	114	130	26	20	1735.28	88.5	3	3.88	0.15	0.177	0.007	0.91	0.161	0.002	2461	19	1605	31	1051	38
CM24-11-32	1547	148	526	78	15	946.47	90.6	3	4.63	0.27	0.223	0.012	1.00	0.152	0.002	2366	18	1730	38	1294	61
CM24-11-33	98	16	19	18	95	3771.12	100.0	1	12.35	0.31	0.498	0.012	0.81	0.181	0.002	2667	16	2629	24	2602	51
CM24-11-34	113	22	144	25	17	652.29	100.0	3	12.37	0.65	0.560	0.013	0.68	0.163	0.004	2483	43	2639	52	2866	55
CM24-11-35	345	13	6	18	300	41246.62	100.0	1	12.41	0.25	0.500	0.010	0.38	0.180	0.001	2652	10	2636	19	2611	42
CM24-11-36	612	55	56	20	36	5142.78	95.9	1	7.56	0.25	0.331	0.011	0.96	0.166	0.001	2517	11	2177	28	1840	51
CM24-11-37	33220	2007	15780	260	2	952.05	99.0	3	4.22	0.09	0.307	0.006	0.79	0.101	0.000	1635	6	1678	17	1723	30
CM24-11-38	819	27	768	46	6	1218.25	100.0	3	13.80	0.36	0.779	0.017	0.82	0.129	0.001	2090	12	2734	25	3712	63
CM24-11-39	244	20	10	15	150	16599.02	100.0	1	11.50	0.23	0.469	0.009	0.58	0.178	0.001	2631	10	2565	19	2480	40
CM24-11-4	96	7	5	19	380	12189.61	99.9	1	9.64	0.24	0.413	0.010	0.69	0.171	0.002	2570	21	2401	24	2227	43
CM24-11-40	674	19	3520	120	3	686.21	100.0	3	53.95	1.20	2.421	0.052	0.91	0.163	0.001	2482	6	4067	22	7925	97
CM24-11-41	332	30	89	29	33	3127.39	100.0	3	12.19	0.50	0.543	0.022	0.73	0.166	0.001	2515	15	2621	33	2799	88
CM24-11-42	468	26	162	43	27	2509.70	100.0	3	13.94	0.33	0.599	0.013	0.62	0.169	0.001	2543	12	2745	22	3027	53
CM24-11-43	841	20	185	49	26	2959.24	100.0	3	10.56	0.46	0.496	0.017	0.70	0.153	0.002	2380	17	2484	35	2595	72
CM24-11-44	364	9	199	26	13	1097.41	98.6	3	8.42	0.30	0.419	0.010	0.80	0.145	0.002	2292	21	2278	32	2256	45
CM24-11-45	274	11	105	25	24	1794.51	100.0	3	9.89	0.31	0.483	0.012	0.77	0.149	0.002	2329	22	2424	29	2537	54
CM24-11-46	2570	15	893	60	7	1773.78	100.0	3	8.14	0.43	0.468	0.024	0.99	0.127	0.001	2050	9	2234	45	2468	100
CM24-11-47	779	41	481	38	8	2258.88	100.0	3	18.26	0.41	0.987	0.027	0.90	0.135	0.001	2163	15	3007	21	4421	87
CM24-11-48	300	9	8	18	225	27167.43	100.0	1	12.78	0.26	0.513	0.011	0.74	0.182	0.001	2675	11	2663	19	2667	47
CM24-11-49	1006	14	1536	97	6	820.87	100.0	3	14.00	0.53	0.899	0.033	0.96	0.117	0.001	1911	20	2746	36	4121	110
CM24-11-5	143	10	13	19	146	7920.86	100.0	1	11.41	0.24	0.467	0.009	0.56	0.178	0.002	2636	13	2558	20	2471	41
CM24-11-50	5370	26	5680	240	4	637.16	100.0	3	8.55	0.22	0.481	0.012	0.91	0.131	0.001	2110	10	2291	24	2534	53
CM24-11-51	307	15	12	20	167	19168.30	100.0	1	12.97	0.25	0.531	0.010	0.49	0.178	0.001	2630	9	2678	18	2745	43
CM24-11-52	430	57	2	26	1300	161359.94	100.0	1	11.93	0.27	0.506	0.012	0.75	0.172	0.001	2576	9	2601	22	2639	52
CM24-11-6	1401	58	1208	47	4	617.21	95.9	3	6.20	0.18	0.338	0.008	0.83	0.136	0.001	2182	13	2003	25	1874	39
CM24-11-7	2386	90	3590	140	4	564.96	100.0	3	9.82	0.34	0.543	0.016	0.97	0.134	0.001	2147	13	2411	32	2794	66
CM24-11-8	222	11	48	28	58	6927.44	100.0	1	16.89	2.10	0.907	0.140	0.95	0.135	0.002	2161	29	2926	79	4154	360

1 No ^{204}Pb correction
3 ^{204}Pb based correction

LA ICP-MS Data for U-Pb Geochronology on Monazite

Sample	Concentrations		common-Pb regimes						Final isotope ratios						Final ages (Ma)							
	U (ppm)	Th (ppm)	²⁰⁴ Pb	2σ int	%	²⁰⁶ Pbcps/	%Pb*	²⁰⁷ Pb/	2σ	²⁰⁶ Pb/	2σ	err.	²⁰⁷ Pb/	2σ	²⁰⁷ Pb/	2σ	²⁰⁷ Pb/	2σ	²⁰⁶ Pb/	2σ	%conc	
F.D. no. 5			Cps			²⁰⁴ PbCps		²³⁵ U		²³⁸ U		corr.	²⁰⁶ Pb		²⁰⁶ Pb		²³⁵ U		²³⁸ U			
HS_CM24-10-G1 - 1	15	46300	24	25	104.2	258.3	97.9	1	9.44	0.40	0.426	0.011	0.33	0.1593	0.0065	2446	69	2371	39	2285	50	93.3
HS_CM24-10-G1 - 2	9	29450	7	19	271.4	514.3	97.1	1	8.10	0.45	0.397	0.012	0.42	0.1488	0.0069	2310	88	2256	50	2159	53	92.8
HS_CM24-10-G1 - 3	62	73382	41	37	90.2	425.9	95.6	1	5.15	0.23	0.279	0.010	0.77	0.1334	0.0038	2143	48	1843	40	1584	51	71.0
HS_CM24-10-G10 - 1	46	45370	40	20	50.0	463.0	98.9	1	13.18	0.32	0.509	0.008	0.30	0.1875	0.0037	2721	33	2695	23	2654	35	97.0
HS_CM24-10-G10 - 2	70	29120	33	27	81.8	517.6	99.1	1	12.63	0.42	0.503	0.011	0.41	0.1814	0.0051	2668	50	2648	31	2638	49	98.4
HS_CM24-10-G10 - 3	119	43800	32	21	65.6	625.0	98.9	1	12.64	0.31	0.505	0.008	0.22	0.1813	0.0036	2662	33	2652	22	2636	35	99.1
HS_CM24-10-G2 - 1	33	56600	38	20	52.6	366.6	95.5	1	7.77	0.25	0.352	0.007	0.51	0.1593	0.0042	2456	43	2209	29	1945	34	75.9
HS_CM24-10-G2 - 2	27	34480	31	31	100.0	501.0	97.3	1	9.66	0.31	0.420	0.008	0.56	0.1671	0.0040	2531	39	2404	29	2258	38	87.1
HS_CM24-10-G2 - 3	18	20560	12	21	175.0	1060.0	98.6	1	11.51	0.46	0.489	0.014	0.68	0.1707	0.0047	2562	47	2567	37	2560	60	99.6
HS_CM24-10-G3 - 1	108	43917	85	23	27.1	400.9	90.7	3	3.84	0.54	0.205	0.016	0.96	0.1290	0.0110	2190	120	1490	110	1168	73	50.2
HS_CM24-10-G3 - 2	91	66981	23	19	82.6	995.2	93.6	1	2.72	0.07	0.160	0.003	0.46	0.1227	0.0025	1992	36	1336	20	957	16	71.6
HS_CM24-10-G3 - 3	44	45020	14	26	185.7	1014.3	95.1	1	3.70	0.17	0.215	0.007	0.66	0.1225	0.0039	2001	58	1567	35	1253	35	59.9
HS_CM24-10-G4 - 1	74	87895	60	22	36.7	732.6	95.8	3	8.50	1.10	0.435	0.051	0.92	0.1394	0.0100	2272	100	2130	140	2230	230	101.6
HS_CM24-10-G4 - 2	104	129057	801	67	8.4	681.1	100.0	3	81.20	4.50	3.600	0.150	0.98	0.1646	0.0040	2502	41	4486	53	9780	210	755.2
HS_CM24-10-G4 - 3	318	145229	56	21	37.5	589.1	94.0	3	0.87	0.13	0.074	0.002	0.66	0.0851	0.0110	1660	150	598	77	458	13	76.6
HS_CM24-10-G5 - 1	114	66414	69	24	34.8	451.8	92.9	3	2.44	0.37	0.172	0.011	0.70	0.1050	0.0120	1970	140	1240	110	1014	60	41.0
HS_CM24-10-G5 - 2	2146	120504	68	21	30.9	1330.6	92.6	3	0.43	0.03	0.032	0.001	0.54	0.0976	0.0047	1580	85	359	18	201	4	56.1
HS_CM24-10-G5 - 3	1660	98326	300	44	14.7	670.4	90.0	3	1.80	0.18	0.108	0.010	0.97	0.1240	0.0033	2011	47	1004	66	653	57	65.0
HS_CM24-10-G6 - 1	19	37740	34	19	55.9	419.7	98.6	1	13.32	0.36	0.507	0.009	0.42	0.1886	0.0042	2733	36	2703	25	2643	39	96.8
HS_CM24-10-G6 - 2	19	41080	19	27	142.1	987.9	100.0	1	18.77	0.55	0.663	0.011	0.39	0.2057	0.0052	2878	40	3026	29	3279	44	117.2
HS_CM24-10-G6 - 3	12	28420	9	17	188.9	1133.3	99.5	1	16.25	0.48	0.584	0.010	0.47	0.2038	0.0047	2856	38	2894	29	2963	42	103.8
HS_CM24-10-G7 - 1	54	50641	25	19	76.0	690.4	94.3	1	4.50	0.20	0.242	0.009	0.82	0.1361	0.0033	2179	43	1727	37	1392	47	59.6
HS_CM24-10-G7 - 2	31	49360	9	29	322.2	1828.9	97.2	1	7.38	0.21	0.362	0.008	0.32	0.1470	0.0038	2332	41	2156	25	1989	38	82.5
HS_CM24-10-G7 - 3	33	45490	40	39	97.5	484.8	96.4	1	8.47	0.40	0.386	0.013	0.71	0.1620	0.0056	2475	55	2283	42	2102	62	81.1
HS_CM24-10-G8 - 1	374	126685	40	20	50.0	661.7	92.3	1	1.60	0.23	0.084	0.008	0.98	0.1221	0.0059	1931	87	908	84	529	50	58.3
HS_CM24-10-G8 - 2	238	46921	28	22	78.6	659.3	90.9	1	1.50	0.17	0.080	0.007	0.96	0.1298	0.0042	2092	58	879	66	497	44	56.5
HS_CM24-10-G8 - 3	1310	50890	41	21	51.2	923.4	95.3	1	0.50	0.12	0.034	0.005	0.99	0.0897	0.0047	1352	93	359	57	216	31	60.2
HS_CM24-10-G9 - 1	32	26260	26	21	80.8	728.8	99.3	1	12.70	0.33	0.509	0.009	0.22	0.1795	0.0042	2648	39	2655	25	2653	40	99.0

HS_CM24-10-G9 - 2	30	29640	22	24	109.1	739.1	98.9	1	12.63	0.34	0.507	0.009	0.28	0.1810	0.0042	2659	39	2652	25	2641	38	99.3
HS_CM24-10-G9 - 3	34	26210	17	18	105.9	936.5	98.6	1	12.69	0.33	0.503	0.008	0.21	0.1826	0.0044	2681	40	2655	24	2626	36	97.5
PC_CM24-10 - 1	no value	no value	5420	150	2.8	1297.7	100.0	3	8.59	0.19	0.458	0.007	0.83	0.1376	0.0019	2196	23	2295	19	2429	29	111.6
PC_CM24-10 - 2	no value	no value	7520	320	4.3	995.1	100.0	3	10.33	0.25	0.504	0.010	0.94	0.1490	0.0018	2334	20	2464	23	2633	40	115.3
PC_CM24-10 - 3	no value	no value	4330	150	3.5	1317.5	97.6	3	7.92	0.18	0.393	0.007	0.92	0.1458	0.0018	2297	21	2221	20	2142	31	92.0
PC_CM24-10 - 4	no value	no value	3790	130	3.4	5840.5	100.0	3	12.18	0.33	0.547	0.011	0.97	0.1609	0.0018	2465	19	2617	25	2815	47	117.9
PC_CM24-10 - 5	177588	50746	512	30	5.9	398.8	92.9	3	5.33	0.21	0.297	0.008	0.83	0.1326	0.0035	2135	47	1875	33	1672	38	74.2
HS_CM24-11-G1 - 1	4262	147189	24	19	79.2	23970.1	100.0	1	12.61	0.25	0.509	0.007	0.54	0.1793	0.0022	2645	20	2650	18	2653	28	100.6
HS_CM24-11-G1 - 2	1976	137196	29	18	62.1	20145.2	100.0	1	12.66	0.25	0.514	0.006	0.56	0.1787	0.0022	2640	20	2654	18	2676	28	101.6
HS_CM24-11-G1 - 3	1677	122549	100	35	35.0	5951.7	100.0	3	12.82	0.33	0.516	0.007	0.59	0.1802	0.0024	2654	22	2666	24	2682	31	101.3
HS_CM24-11-G2 - 1	1132	98948	194	34	17.5	2670.4	100.0	3	12.52	0.19	0.511	0.007	0.65	0.1780	0.0020	2634	19	2645	15	2659	28	101.1
HS_CM24-11-G2 - 2	387	30460	22	18	81.8	9078.3	99.8	1	12.46	0.25	0.504	0.007	0.64	0.1794	0.0022	2646	21	2639	19	2631	29	99.3
HS_CM24-11-G2 - 3	708	101155	26	19	73.1	17926.3	100.0	1	12.63	0.25	0.510	0.007	0.60	0.1795	0.0022	2647	20	2652	19	2658	28	100.5
HS_CM24-11-G3 - 1	785	112793	38	20	52.6	13890.3	100.0	1	12.61	0.25	0.508	0.007	0.71	0.1802	0.0021	2653	19	2651	18	2649	28	99.8
HS_CM24-11-G3 - 2	818	120633	55	20	36.4	9989.3	100.0	3	12.14	0.24	0.496	0.006	0.68	0.1774	0.0024	2631	22	2615	19	2596	27	98.4
HS_CM24-11-G3 - 3	942	122508	29	20	69.0	21128.6	100.0	1	12.36	0.24	0.502	0.007	0.63	0.1789	0.0021	2641	20	2632	18	2620	28	99.0
HS_CM24-11-G4 - 1	929	117928	39	20	51.3	15555.3	100.0	1	12.57	0.24	0.509	0.006	0.62	0.1796	0.0021	2648	19	2648	18	2653	28	100.1
HS_CM24-11-G4 - 2	990	120524	19	20	105.3	32773.4	100.0	1	12.43	0.24	0.504	0.006	0.70	0.1791	0.0021	2643	19	2638	19	2631	27	99.3
HS_CM24-11-G5 - 1	790	116386	1830	280	15.3	305.6	98.8	3	13.31	0.30	0.535	0.011	0.79	0.1818	0.0023	2671	20	2705	22	2759	44	103.3
HS_CM24-11-G5 - 2	598	111576	1320	130	9.8	332.5	99.8	3	16.09	0.43	0.614	0.012	0.83	0.1943	0.0026	2776	22	2881	25	3084	50	111.8
HS_CM24-11-G5 - 3	919	107003	202	29	14.4	2843.9	100.0	3	12.60	0.29	0.515	0.007	0.69	0.1785	0.0021	2639	19	2650	21	2677	28	101.2
HS_CM24-11-G6 - 1	782	90254	110	25	22.7	4474.2	100.0	3	12.65	0.33	0.517	0.007	0.65	0.1781	0.0026	2634	24	2654	25	2684	30	102.1
HS_CM24-11-G6 - 2	795	103690	19	20	105.3	26882.7	100.0	1	12.50	0.25	0.508	0.007	0.65	0.1793	0.0021	2645	20	2642	19	2647	28	100.2
HS_CM24-11-G6 - 3	872	108256	12	17	141.7	47943.1	100.0	1	12.55	0.25	0.509	0.007	0.63	0.1788	0.0021	2640	20	2647	19	2651	29	100.7
HS_CM24-11-G7 - 1	857	102884	84	24	28.6	6854.9	100.0	3	12.65	0.28	0.514	0.007	0.53	0.1791	0.0026	2645	25	2654	21	2671	28	101.0
HS_CM24-11-G7 - 2	716	86541	32	18	56.3	15388.2	99.9	1	12.39	0.24	0.503	0.006	0.61	0.1789	0.0022	2642	20	2634	18	2628	27	99.2
HS_CM24-11-G7 - 3	768	99290	100	21	21.0	5397.8	100.0	3	12.54	0.30	0.512	0.007	0.63	0.1785	0.0027	2640	25	2646	23	2664	28	100.6
PC_CM24-11 - 1	no value	no value	530	38	7.2	1090.0	100.0	3	9.08	0.25	0.506	0.011	0.87	0.1324	0.0020	2130	26	2345	24	2649	46	127.0
PC_CM24-11 - 2	no value	no value	799	43	5.4	111.0	94.7	3	11.16	0.99	0.531	0.012	0.69	0.1629	0.0130	2472	140	2543	87	2740	50	107.2
PC_CM24-11 - 3	no value	no value	4170	120	2.9	953.8	99.5	3	4.34	0.11	0.318	0.006	0.96	0.0993	0.0012	1611	22	1700	22	1780	28	111.7
PC_CM24-11 - 4	no value	no value	982	47	4.8	161.4	98.0	3	11.20	0.56	0.533	0.011	0.61	0.1568	0.0073	2408	80	2526	48	2755	46	115.3
PC_CM24-11 - 5	no value	no value	203	21	10.3	285.2	98.8	3	9.09	0.65	0.505	0.019	0.68	0.1315	0.0085	2130	120	2327	64	2621	79	127.2
PC_CM24-11 - 6	no value	no value	596	40	6.7	471.2	100.0	3	11.33	0.44	0.561	0.016	0.89	0.1484	0.0038	2327	44	2559	36	2865	64	127.4

PC_CM24-11 - 7	no value	no value	465	34	7.3	911.6	100.0	3	12.01	0.39	0.565	0.016	0.92	0.1555	0.0034	2408	36	2597	30	2892	67	123.6
PC_CM24-11 - 8	no value	no value	1058	48	4.5	62.9	100.0	3	36.40	2.20	1.055	0.023	0.76	0.2628	0.0150	3249	88	3678	60	4641	71	154.7
Eagle																						
HS_CM24-15-G1 - 1	759	114153	48	15	31.3	11311.2	100.0	1	12.71	0.25	0.519	0.007	0.69	0.1778	0.0021	2631	20	2659	19	2696	29	103.0
HS_CM24-15-G2 - 1	422	72139	30	20	66.7	10628.9	100.0	1	12.89	0.25	0.523	0.007	0.61	0.1792	0.0021	2645	20	2671	18	2710	28	102.9
HS_CM24-15-G2 - 2	348	61995	26	19	73.1	9918.6	99.9	1	12.57	0.25	0.510	0.007	0.52	0.1789	0.0022	2641	21	2648	19	2658	28	100.7
PC_CM24-15 - 1	no value	no value	3112	71	2.3	3630.9	97.9	3	1.99	0.06	0.169	0.004	0.98	0.0858	0.0010	1332	24	1112	19	1004	22	73.4
PC_CM24-15 - 2	no value	no value	795	45	5.7	10429.8	99.5	3	2.20	0.06	0.196	0.005	0.97	0.0810	0.0010	1220	24	1179	20	1155	24	94.7
PC_CM24-15 - 3	no value	no value	4620	140	3.0	2985.8	97.8	3	2.06	0.06	0.174	0.004	0.91	0.0867	0.0013	1355	28	1135	19	1033	20	73.8
PC_CM24-15 - 4	no value	no value	1226	56	4.6	1760.8	100.0	3	32.02	1.10	1.208	0.034	0.98	0.1913	0.0025	2754	21	3544	32	5098	100	227.7
PC_CM24-15 - 5	8587407	589382	3690	220	6.0	2534.5	97.4	3	2.04	0.10	0.169	0.008	0.99	0.0892	0.0016	1402	32	1119	29	993	33	88.7
PC_CM24-15 - 6	no value	no value	2382	68	2.9	3968.4	97.6	3	1.23	0.03	0.114	0.002	0.96	0.0788	0.0010	1167	24	814	13	695	11	85.4
PC_CM24-15-G1 - 1	no value	no value	2310	80	3.5	4889.7	98.5	3	2.15	0.08	0.184	0.007	0.99	0.0853	0.0010	1323	24	1157	27	1084	36	80.2
PC_CM24-15-G1 - 2	no value	no value	1698	55	3.2	6476.8	99.0	3	2.33	0.06	0.198	0.005	0.97	0.0852	0.0010	1319	23	1220	19	1164	25	87.2
PC_CM24-15-G1 - 3	no value	no value	1820	74	4.1	5355.1	97.6	3	1.65	0.08	0.142	0.006	0.99	0.0846	0.0011	1305	24	982	31	855	35	87.1
PC_CM24-15-G2 - 1	no value	no value	2186	64	2.9	4499.9	98.1	3	2.07	0.06	0.173	0.004	0.98	0.0865	0.0011	1350	25	1137	19	1030	20	74.4
PC_CM24-15-G2 - 2	no value	no value	8900	420	4.7	2051.4	97.7	3	2.72	0.09	0.210	0.006	0.97	0.0947	0.0012	1521	24	1330	25	1228	31	78.4
HS_CM24-16-G1 - 1	13160	96538	26	19	73.1	67998.7	99.7	1	12.05	0.24	0.491	0.006	0.75	0.1771	0.0021	2626	19	2608	18	2574	27	98.1
HS_CM24-16-G1 - 2	12300	147571	11	18	163.6	116194.9	99.9	1	12.40	0.24	0.499	0.006	0.68	0.1795	0.0021	2648	20	2635	18	2611	27	98.7
HS_CM24-16-G1 - 3	24810	144768	43	24	55.8	51146.2	99.9	1	12.38	0.24	0.500	0.007	0.66	0.1797	0.0021	2649	20	2633	18	2615	28	98.3
HS_CM24-16-G2 - 1	21910	104575	49	23	46.9	36394.9	100.0	1	12.59	0.25	0.508	0.007	0.70	0.1802	0.0021	2653	19	2649	18	2646	28	99.6
HS_CM24-16-G2 - 2	23040	104395	8	19	237.5	262552.8	100.0	1	12.44	0.24	0.503	0.007	0.62	0.1790	0.0022	2642	20	2638	18	2626	28	99.6
HS_CM24-16-G2 - 3	22890	122053	40	23	57.5	65193.0	100.0	1	12.53	0.25	0.507	0.007	0.70	0.1791	0.0021	2643	20	2645	18	2646	27	100.2
PC_CM24-16 - 1	no value	no value	6530	270	4.1	2783.6	100.0	3	23.34	0.51	0.868	0.014	0.95	0.1954	0.0024	2788	20	3239	21	4028	47	160.2
PC_CM24-16 - 2	no value	no value	1614	65	4.0	5046.1	100.0	3	6.10	0.16	0.398	0.007	0.95	0.1113	0.0013	1820	21	1989	23	2160	34	121.9
PC_CM24-16 - 3	no value	no value	2062	77	3.7	4125.2	99.9	3	4.46	0.11	0.319	0.006	0.97	0.1015	0.0012	1652	23	1722	20	1784	31	109.2
PC_CM24-16 - 4	no value	no value	677	42	6.2	377.3	99.2	3	5.74	0.24	0.404	0.010	0.71	0.1069	0.0042	1746	71	1935	37	2183	47	125.3
PC_CM24-16 - 5	no value	no value	854	72	8.4	7339.4	99.9	3	3.78	0.13	0.309	0.010	0.99	0.0896	0.0012	1417	25	1584	30	1740	46	124.5
PC_CM24-16 - 6	no value	no value	2386	99	4.1	2215.4	99.5	3	3.78	0.10	0.283	0.005	0.95	0.0974	0.0012	1576	24	1588	20	1603	27	101.6
PC_CM24-16 - 7	no value	no value	1060	190	17.9	7353.8	99.6	3	3.44	0.08	0.268	0.005	0.95	0.0931	0.0007	1489	15	1514	19	1532	28	103.2
PC_CM24-16 - 8	no value	no value	1279	61	4.8	3132.8	99.7	3	4.45	0.12	0.314	0.007	0.97	0.1033	0.0013	1683	23	1718	22	1756	32	104.8
PC_CM24-16-G1 - 1	no value	no value	6720	130	1.9	2895.4	100.0	3	17.31	0.42	0.671	0.013	0.97	0.1869	0.0022	2715	20	2949	23	3312	50	128.3
PC_CM24-16-G1 - 2	no value	no value	5820	230	4.0	2643.0	100.0	3	19.54	0.42	0.721	0.011	0.91	0.1972	0.0023	2803	19	3069	21	3500	40	132.0

PC_CM24-16-G2 - 1	no value	no value	3770	170	4.5	1335.0	99.9	3	10.84	0.36	0.526	0.017	0.96	0.1513	0.0019	2362	22	2502	32	2714	71	117.3
PC_CM24-16-G2 - 2	no value	no value	9270	250	2.7	561.4	100.0	3	43.26	1.30	1.387	0.035	0.96	0.2259	0.0028	3024	20	3843	30	5594	93	231.9
Eagle Metasomatic																						
LT21-09-65.8 - 1	1775	37670	6	15	250.0	88184.8	99.8	1	12.25	0.13	0.496	0.004	0.70	0.1796	0.0013	2648	12	2624	10	2597	16	97.4
LT21-09-65.8 - 10	1314	20970	11	18	163.6	52167.6	99.9	1	12.57	0.13	0.505	0.004	0.76	0.1809	0.0013	2661	12	2648	10	2636	17	98.6
LT21-09-65.8 - 11	1381	25820	26	21	80.8	18954.6	94.9	1	11.77	0.13	0.476	0.004	0.77	0.1797	0.0014	2650	13	2587	10	2507	19	93.5
LT21-09-65.8 - 12	1427	27810	8	16	200.0	64153.4	99.9	1	12.29	0.13	0.496	0.004	0.61	0.1803	0.0013	2655	13	2627	10	2596	17	97.1
LT21-09-65.8 - 13	896	13460	-4	19	-475.0	444366.0	99.9	1	12.27	0.13	0.495	0.004	0.55	0.1792	0.0015	2646	14	2625	10	2593	17	97.8
LT21-09-65.8 - 14	829	17130	18	18	100.0	22830.6	99.1	1	11.72	0.17	0.479	0.006	0.92	0.1773	0.0014	2627	13	2582	13	2521	26	95.4
LT21-09-65.8 - 15	1011	26530	18	19	105.6	28434.5	98.7	1	11.82	0.15	0.476	0.005	0.82	0.1800	0.0014	2652	13	2591	12	2511	21	93.6
LT21-09-65.8 - 16	633	40590	-8	29	-362.5	331522.7	100.0	1	12.62	0.17	0.508	0.005	0.69	0.1802	0.0018	2653	17	2652	13	2646	23	99.9
LT21-09-65.8 - 17	1218	32160	4	15	375.0	122700.3	99.9	1	12.44	0.14	0.501	0.004	0.72	0.1801	0.0014	2653	13	2639	10	2619	18	98.5
LT21-09-65.8 - 18	1134	37810	19	15	78.9	25144.7	99.3	1	12.17	0.14	0.490	0.004	0.79	0.1802	0.0013	2654	12	2617	11	2569	19	96.2
LT21-09-65.8 - 19	958	17610	12	23	191.7	38272.6	100.0	1	12.49	0.14	0.506	0.004	0.53	0.1788	0.0015	2640	14	2642	10	2638	19	99.9
LT21-09-65.8 - 2	1511	59650	13	15	115.4	35860.5	100.0	1	12.45	0.13	0.502	0.004	0.46	0.1799	0.0014	2652	12	2639	10	2623	16	98.6
LT21-09-65.8 - 21	1559	32340	10	17	170.0	47072.1	99.7	1	12.04	0.13	0.487	0.004	0.77	0.1796	0.0014	2648	13	2607	10	2556	17	95.8
LT21-09-65.8 - 22	2209	32290	16	17	106.3	31824.0	99.8	1	12.31	0.14	0.496	0.004	0.75	0.1801	0.0014	2653	13	2628	11	2598	18	97.5
LT21-09-65.8 - 23	4659	29430	12	16	133.3	39434.9	99.8	1	12.58	0.14	0.505	0.004	0.72	0.1804	0.0014	2656	13	2648	10	2634	18	99.1
LT21-09-65.8 - 24	6914	33310	4	14	350.0	123350.9	99.7	1	12.38	0.14	0.499	0.004	0.67	0.1799	0.0014	2652	13	2633	10	2607	18	98.1
LT21-09-65.8 - 25	2052	32880	0	16		436052.0	99.9	1	12.69	0.14	0.507	0.004	0.63	0.1816	0.0015	2667	14	2657	11	2646	17	98.9
LT21-09-65.8 - 26	1669	32430	5	22	440.0	94317.8	100.0	1	12.59	0.16	0.506	0.005	0.61	0.1806	0.0017	2657	16	2649	12	2641	20	99.2
LT21-09-65.8 - 27	1065	17660	23	18	78.3	19437.0	100.0	1	12.61	0.13	0.508	0.004	0.64	0.1794	0.0014	2646	13	2651	10	2650	17	99.5
LT21-09-65.8 - 28	1157	22080	-3	13	-433.3	527202.6	99.8	1	12.30	0.13	0.494	0.004	0.66	0.1806	0.0014	2657	12	2628	9	2587	17	96.9
LT21-09-65.8 - 29	886	13100	22	17	77.3	18855.2	99.9	1	12.62	0.13	0.504	0.004	0.54	0.1806	0.0014	2659	13	2651	10	2632	17	99.2
LT21-09-65.8 - 3_1	1514	34070	3	14	466.7	171305.5	99.9	1	12.54	0.13	0.504	0.004	0.67	0.1803	0.0014	2655	13	2646	10	2632	17	99.1
LT21-09-65.8 - 30	1128	16790	7	16	228.6	69292.4	99.8	1	12.31	0.14	0.495	0.004	0.80	0.1801	0.0013	2654	13	2628	11	2591	17	97.3
LT21-09-65.8 - 4	1233	25470	0	26		399454.3	98.4	1	11.51	0.19	0.471	0.006	0.83	0.1779	0.0017	2632	16	2564	15	2488	27	93.1
LT21-09-65.8 - 5	1318	19470	2	12	600.0	275853.6	100.0	1	12.35	0.13	0.497	0.004	0.63	0.1801	0.0014	2653	12	2631	10	2603	16	97.8
LT21-09-65.8 - 6	1138	38220	-1	15	-1500.0	494474.0	99.2	1	11.90	0.14	0.483	0.005	0.84	0.1793	0.0014	2646	12	2597	11	2538	19	94.9
LT21-09-65.8 - 7	1017	25290	17	15	88.2	29606.3	99.7	1	12.29	0.14	0.494	0.004	0.77	0.1803	0.0014	2655	13	2627	10	2587	17	97.0
LT21-09-65.8 - 8	939	35750	-12	14	-116.7	508077.3	99.7	1	12.43	0.13	0.499	0.004	0.61	0.1813	0.0014	2664	13	2637	10	2611	17	97.3
LT21-09-65.8 - 9	949	36380	41	25	61.0	9971.6	97.9	1	10.67	0.21	0.446	0.008	0.91	0.1744	0.0018	2599	17	2497	19	2378	34	89.4
LT21-09-65.8 - 1	1186	36450	26	22	84.6	63925.9	100.0	1	12.71	0.15	0.514	0.006	0.89	0.1787	0.0010	2640	10	2658	11	2674	26	102.0

LT21-09-65.8 - 10	1119	31720	43	18	41.9	36195.8	100.0	1	12.37	0.13	0.501	0.005	0.77	0.1786	0.0010	2639	9	2633	10	2619	23	99.3
LT21-09-65.8 - 11	1291	37435	21	17	81.0	87136.8	100.0	1	12.52	0.13	0.510	0.005	0.66	0.1785	0.0009	2639	8	2644	9	2656	22	100.6
LT21-09-65.8 - 12	1110	45850	45	16	35.6	34464.5	99.3	1	11.73	0.13	0.477	0.005	0.67	0.1791	0.0010	2644	9	2583	10	2512	22	93.7
LT21-09-65.8 - 13	1025	18500	45	16	35.6	38417.1	100.0	1	12.25	0.13	0.500	0.005	0.71	0.1775	0.0009	2629	9	2624	10	2615	22	99.5
LT21-09-65.8 - 14	669	20630	32	14	43.8	26081.5	96.9	1	8.59	0.35	0.388	0.013	0.98	0.1595	0.0017	2450	18	2281	37	2107	60	84.5
LT21-09-65.8 - 15	1043	31020	38	20	52.6	48305.1	100.0	1	12.60	0.13	0.511	0.005	0.61	0.1793	0.0010	2645	9	2650	10	2660	22	100.6
LT21-09-65.8 - 16	1047	24880	33	16	48.5	49369.8	99.9	1	11.96	0.13	0.486	0.005	0.79	0.1784	0.0009	2638	9	2601	10	2552	23	96.2
LT21-09-65.8 - 17	1069	46000	26	16	61.5	57479.0	100.0	1	12.52	0.13	0.507	0.005	0.66	0.1791	0.0009	2643	9	2644	10	2642	22	99.9
LT21-09-65.8 - 18	1126	31830	59	20	33.9	25367.0	99.7	1	11.88	0.13	0.482	0.005	0.58	0.1787	0.0011	2639	11	2596	10	2534	22	95.4
LT21-09-65.8 - 19	972	24400	26	22	84.6	55243.9	100.0	1	12.47	0.14	0.506	0.006	0.74	0.1793	0.0012	2646	11	2640	11	2638	24	99.4
LT21-09-65.8 - 2	1095	45990	22	20	90.9	59756.9	100.0	1	12.70	0.14	0.510	0.006	0.78	0.1801	0.0011	2653	10	2658	10	2657	25	99.5
LT21-09-65.8 - 21	1365	26470	50	22	44.0	29761.3	95.1	1	11.81	0.15	0.479	0.006	0.92	0.1785	0.0010	2638	9	2591	12	2521	25	95.0
LT21-09-65.8 - 22	1861	24880	43	26	60.5	33972.7	100.0	1	12.57	0.15	0.507	0.006	0.87	0.1792	0.0010	2646	9	2648	11	2645	26	99.7
LT21-09-65.8 - 23	4468	41120	35	15	42.9	47730.0	100.0	1	12.57	0.13	0.507	0.005	0.67	0.1791	0.0009	2643	9	2648	10	2645	22	99.5
~~LT21-09-65.8 - 24~~	~~12635~~	~~48505~~	~~9~~	~~15~~	~~166.7~~	~~11709.6~~	~~87.6~~	~~1~~	~~4.71~~	~~0.49~~	~~0.188~~	~~0.019~~	~~0.99~~	~~0.1821~~	~~0.0021~~	~~2673~~	~~22~~	~~1710~~	~~110~~	~~1090~~	~~110~~	~~36.5~~
LT21-09-65.8 - 25	2627	33510	29	16	55.2	54716.0	100.0	1	12.56	0.13	0.508	0.006	0.85	0.1788	0.0010	2641	9	2647	10	2648	23	100.7
LT21-09-65.8 - 26	2031	31620	39	17	43.6	36759.0	97.0	1	11.94	0.18	0.486	0.007	0.94	0.1785	0.0011	2638	10	2599	14	2552	31	96.0
LT21-09-65.8 - 27	1420	26700	35	19	54.3	43746.3	100.0	1	12.36	0.13	0.502	0.005	0.61	0.1789	0.0010	2642	9	2633	10	2623	22	99.0
LT21-09-65.8 - 28	1387	18480	23	16	69.6	72557.4	100.0	1	12.52	0.13	0.507	0.005	0.73	0.1794	0.0010	2646	9	2644	10	2645	23	100.3
LT21-09-65.8 - 29	1017	14790	41	22	53.7	21339.7	90.8	1	10.41	0.20	0.422	0.008	0.96	0.1793	0.0011	2646	10	2471	18	2268	36	83.0
LT21-09-65.8 - 3	1279	32750	37	24	64.9	37210.1	100.0	1	12.65	0.17	0.509	0.006	0.79	0.1803	0.0013	2655	12	2654	12	2653	25	99.9
LT21-09-65.8 - 30	1127	14450	27	18	66.7	59748.6	100.0	1	12.38	0.13	0.501	0.005	0.62	0.1793	0.0010	2646	10	2633	10	2619	23	98.6
LT21-09-65.8 - 4	1328	16430	10	29	290.0	147000.5	100.0	1	12.47	0.14	0.506	0.006	0.81	0.1786	0.0011	2639	10	2640	11	2641	24	100.2
LT21-09-65.8 - 5	1218	20980	30	17	56.7	55134.3	100.0	1	12.78	0.13	0.517	0.005	0.79	0.1800	0.0009	2653	8	2663	10	2686	23	101.1
LT21-09-65.8 - 6	1030	50343	57	24	42.1	24363.5	99.9	1	11.43	0.13	0.476	0.006	0.84	0.1753	0.0011	2608	10	2559	11	2510	25	94.9
LT21-09-65.8 - 7	990	37500	29	19	65.5	36107.5	95.3	1	8.77	0.17	0.379	0.007	0.97	0.1685	0.0011	2542	11	2313	18	2068	31	78.2
LT21-09-65.8 - 8	1201	33795	21	18	85.7	85353.3	100.0	1	12.49	0.13	0.505	0.005	0.66	0.1793	0.0010	2645	9	2642	10	2636	23	99.6
LT21-09-65.8 - 9	1052	32260	36	17	47.2	44177.7	99.9	1	12.38	0.13	0.499	0.005	0.80	0.1801	0.0010	2653	9	2634	10	2608	23	98.0

1 No ²⁰⁴Pb correction3 ²⁰⁴Pb based correction

LA ICP-MS Data for U-Pb Geochronology on Apatite

Sample	Concentrations		Final Isotope Ratios							Final Ages (Ma)						
	U (ppm)	Th (ppm)	²⁰⁷ Pb/ ²³⁵ U	2σ	²⁰⁶ Pb/ ²³⁸ U	2σ	err. corr.	²⁰⁷ Pb/ ²⁰⁶ Pb	2σ	²⁰⁷ Pb/ ²⁰⁶ Pb	2σ	²⁰⁷ Pb/ ²³⁵ U	2σ	²⁰⁶ Pb/ ²³⁸ U	2σ	%conc
F.D. no. 5			²³⁵ U		²³⁸ U			²⁰⁶ Pb		²⁰⁶ Pb		²³⁵ U		²³⁸ U		
CM24-10-1	15	75	11.240	0.410	0.4842	0.0180	0.84	0.168	0.005	2518	53	2529	36	2545	77	102.7
CM24-10-10	2	4	5.800	2.000	0.4260	0.0310	0.93	0.066	0.036	2830	160	2480	160	2285	140	38.1
CM24-10-11	4	31	7.100	1.400	0.4250	0.0220	0.86	0.117	0.022	2530	150	2350	120	2285	96	64.1
CM24-10-12	7	5	9.340	0.850	0.4669	0.0300	0.92	0.140	0.012	2310	120	2348	82	2470	140	107.0
CM24-10-13	2	37	2.200	2.900	0.3950	0.0440	0.95	-0.131	0.093	2950	150	2640	160	2140	210	12.8
CM24-10-14	5	5	9.500	1.900	0.5040	0.0210	0.73	0.119	0.026	2660	130	2630	120	2610	90	74.6
CM24-10-15	0	22	210.000	110.000	3.3100	0.7400	0.96	0.630	0.210	4410	160	6230	220	9870	840	276.5
CM24-10-16	1	8	-10.200	5.800	0.3390	0.0900	0.96	0.840	1.000	3570	190	3340	190	1900	440	-31.2
CM24-10-17	21	67	11.250	0.310	0.4826	0.0170	0.80	0.169	0.004	2540	40	2535	27	2539	72	100.4
CM24-10-18	33	68	11.330	0.220	0.4832	0.0150	0.73	0.171	0.003	2569	28	2557	18	2541	64	98.1
CM24-10-19	10	139	9.740	0.610	0.4675	0.0260	0.91	0.153	0.008	2366	86	2382	61	2471	110	105.0
CM24-10-2	10	16	10.830	0.540	0.4774	0.0190	0.67	0.163	0.007	2484	73	2483	52	2514	81	102.7
CM24-10-20	6	36	8.690	0.910	0.4596	0.0280	0.91	0.136	0.013	2410	100	2341	86	2438	120	110.7
CM24-10-21	30	92	10.800	2.400	0.5310	0.0220	0.77	0.098	0.041	2744	83	2737	86	2732	92	77.6
CM24-10-22	1	4	-2.400	6.200	0.3900	0.0860	0.96	0.340	0.510	3480	220	3120	240	2090	410	-8.0
CM24-10-23	0	1	1046.275	1400.00	12.7000	7.8000	0.94	0.043	0.039	4450	640	7820	490	14426	6300	1323.6
CM24-10-3	12	58	10.800	0.610	0.4726	0.0220	0.82	0.162	0.008	2457	83	2471	56	2493	96	105.4
CM24-10-4	4	136	7.900	1.700	0.4400	0.0290	0.92	0.119	0.026	2580	160	2540	120	2344	130	67.6
CM24-10-5	3	49	8.100	1.700	0.4320	0.0400	0.94	0.102	0.027	2600	180	2410	140	2308	180	67.8
CM24-10-6	6	77	10.300	1.000	0.4641	0.0250	0.91	0.150	0.014	2560	100	2474	84	2457	110	90.0
CM24-10-7	1	5	2.000	5.300	0.4040	0.0840	0.96	0.060	0.320	3540	150	3320	130	2120	400	6.3
CM24-10-8	1	7	-4.400	5.600	0.3630	0.0830	0.95	0.090	0.390	3560	150	3240	170	1920	420	-13.6
CM24-10-9	1	6	3.300	4.800	0.4320	0.0740	0.95	-0.200	0.190	3470	160	3260	170	2250	330	11.2
Eagle																
CM24-15-1	5	2	7.300	1.300	0.4436	0.0310	0.93	0.113	0.020	2440	140	2360	110	2370	140	127.4
CM24-15-10	5	3	7.400	1.200	0.4502	0.0300	0.93	0.111	0.018	2430	120	2360	100	2395	130	125.6
CM24-15-11	1	1	3.600	6.400	0.5120	0.0460	0.88	-0.058	0.099	3500	180	3370	220	2700	210	11.9
CM24-15-12	3	3	0.530	2.410	0.4080	0.0250	0.92	-0.140	0.110	2620	220	2340	200	2201	110	4.4
CM24-15-13	7	3	6.100	1.000	0.4420	0.0320	0.92	0.095	0.015	2170	150	2080	130	2359	140	118.4
CM24-15-14	7	4	7.400	1.100	0.4464	0.0340	0.92	0.110	0.017	2300	150	2260	110	2377	150	114.3

CM24-15-15	0	1	-118.000	39.000	0.0400	0.3100	0.96	1.050	0.560	4230	160	4930	240	2200	1100	-185.9
CM24-15-16	0	1	-113.000	92.000	1.3300	0.6200	0.96	0.880	0.340	4260	180	5990	230	8590	1000	372.8
CM24-15-2	0	1	80.000	200.000	3.5000	1.4000	0.95	1.120	0.530	4430	150	6810	220	12015	1400	104.6
CM24-15-3	1	2	-16.100	6.400	0.3120	0.0570	0.93	-0.330	0.630	3240	250	3060	200	1710	290	-69.0
CM24-15-4	1	1	-19.500	7.600	0.2730	0.0580	0.14	0.060	0.450	3340	250	3020	280	1540	290	-75.4
CM24-15-5	3	5	2.600	2.200	0.4150	0.0480	0.94	0.011	0.039	2840	170	2490	180	2224	220	16.9
CM24-15-6	3	9	4.600	2.100	0.4520	0.0210	0.94	0.010	0.180	2320	160	2360	130	2389	93	147.8
CM24-15-7	0	1	-37.000	11.000	0.1910	0.1100	0.97	0.440	0.700	3800	270	3670	250	880	670	24.0
CM24-15-9	0	0	-95.000	29.000	0.1200	0.2200	0.95	1.000	0.560	4030	250	4580	270	1820	960	-182.9
CM24-16-1	0	0	-53.000	89.000	0.9800	0.6400	0.95	1.200	0.300	4400	170	5930	180	6805	1200	270.5
CM24-16-2	0	1	-111.000	68.000	0.2200	0.4800	0.97	0.900	0.210	4300	250	5630	240	5458	1200	-163.1
CM24-16-3	0	0	2100.000	520.000	15.4000	3.5000	0.94	0.290	0.083	4510	300	7680	270	17197	1500	2502.4
CM24-16-4	0	1	130.000	100.000	2.6400	0.7200	0.95	0.920	0.240	4230	260	6360	180	9800	1000	204.9

LA ICP-MS Data for U-Pb Geochronology on Zircons

Sample	Concentrations		Common-Pb Regimes						Final Isotope Ratios							Final Ages (Ma)					
	U (ppm)	Th (ppm)	²⁰⁴ PbCps	2σ	int %	²⁰⁶ PbCps/ ²⁰⁴ PbCps	%Pb*		²⁰⁷ Pb/ ²³⁵ U	2σ	²⁰⁶ Pb/ ²³⁸ U	2σ	err.	²⁰⁷ Pb/ ²⁰⁶ Pb	2σ	²⁰⁷ Pb/ ²⁰⁶ Pb	2σ	²⁰⁷ Pb/ ²³⁵ U	2σ	²⁰⁶ Pb/ ²³⁸ U	2σ
	F.D. no. 5												corr.								
Zrc-HS-CM24-10-1	75	54	-14	19	-136	28587	98.8	1	13.43	0.28	0.511	0.010	0.49	0.1898	0.0033	2739	29	2711	20	2659	42
Zrc-HS-CM24-10-10	73	14	11	19	173	2312	98.3	1	12.15	0.26	0.481	0.009	0.34	0.1844	0.0035	2687	32	2621	20	2531	40
Zrc-HS-CM24-10-11	56	25	6	18	300	3488	99.2	1	13.65	0.30	0.517	0.010	0.59	0.1904	0.0034	2743	29	2724	21	2684	44
Zrc-HS-CM24-10-12	35	19	5	19	380	2632	98.9	1	13.40	0.36	0.512	0.010	0.41	0.1885	0.0044	2725	38	2708	25	2662	45
Zrc-HS-CM24-10-13	56	27	17	16	94	1251	99.2	1	13.71	0.30	0.526	0.011	0.51	0.1901	0.0034	2740	30	2729	20	2723	45
Zrc-HS-CM24-10-14	38	17	-10	21	-210	13590	98.7	1	13.55	0.37	0.515	0.011	0.44	0.1893	0.0043	2729	37	2716	25	2676	45
Zrc-HS-CM24-10-15	49	23	15	18	120	1227	99.4	1	13.56	0.30	0.524	0.010	0.43	0.1863	0.0034	2704	30	2719	21	2714	43
Zrc-HS-CM24-10-16	80	33	-8	18	-225	30060	99.6	1	13.85	0.31	0.525	0.010	0.58	0.1909	0.0031	2751	27	2738	21	2721	44
Zrc-HS-CM24-10-17	698	701	8	20	250	17956	95.5	1	10.97	0.41	0.428	0.016	0.98	0.1859	0.0026	2708	22	2507	35	2286	73
Zrc-HS-CM24-10-18	31	19	9	20	222	1259	98.5	1	13.57	0.37	0.510	0.011	0.48	0.1908	0.0044	2750	37	2719	26	2657	45
Zrc-HS-CM24-10-19	35	21	-3	19	-633	13440	99.3	1	13.42	0.36	0.521	0.011	0.44	0.1846	0.0040	2706	36	2711	25	2705	47
Zrc-HS-CM24-10-2	30	17	-8	19	-238	11600	98.7	1	13.88	0.40	0.522	0.012	0.36	0.1919	0.0049	2749	42	2744	27	2706	49
Zrc-HS-CM24-10-20	78	49	12	18	150	2429	99.2	1	13.51	0.29	0.517	0.010	0.53	0.1893	0.0033	2733	29	2715	20	2683	43
Zrc-HS-CM24-10-21	108	48	-17	19	-112	36670	98.4	1	12.32	0.26	0.487	0.010	0.60	0.1838	0.0028	2686	25	2632	20	2557	41
Zrc-HS-CM24-10-22	2534	1044	-2	32	-1600	954078	95.8	1	10.55	0.30	0.424	0.011	0.96	0.1829	0.0024	2680	23	2482	27	2275	50
Zrc-HS-CM24-10-23	1231	177	38	19	50	6553	98.2	1	11.39	0.28	0.466	0.011	0.94	0.1771	0.0023	2626	22	2555	24	2462	50
Zrc-HS-CM24-10-24	5890	1610	119	28	24	3677	89.7	3	3.41	0.11	0.163	0.006	0.96	0.1518	0.0026	2367	1503	1503	25	974	30
Zrc-HS-CM24-10-25	181	97	25	22	88	453	84.1	1	2.23	0.07	0.089	0.002	0.49	0.1852	0.0049	2699	45	1189	22	550	13
Zrc-HS-CM24-10-3	153	43	38	33	87	564	97.1	1	3.02	0.09	0.211	0.004	0.26	0.1038	0.0027	1686	48	1410	21	1235	23
Zrc-HS-CM24-10-4	23	11	-8	18	-225	8530	98.1	1	13.45	0.34	0.507	0.010	0.33	0.1936	0.0045	2767	38	2712	24	2640	44
Zrc-HS-CM24-10-5	36	17	1	18	1800	13700	99.1	1	13.86	0.34	0.528	0.011	0.33	0.1904	0.0043	2746	36	2738	23	2735	47
Zrc-HS-CM24-10-6	45	34	-4	22	-550	16520	99.0	1	13.60	0.34	0.514	0.010	0.61	0.1917	0.0036	2754	30	2721	23	2671	44
Zrc-HS-CM24-10-7	32	17	20	19	95	566	97.5	1	13.31	0.36	0.495	0.010	0.42	0.1951	0.0046	2782	38	2702	25	2589	44
Zrc-HS-CM24-10-8	62	26	6	20	333	4045	99.5	1	13.96	0.30	0.533	0.010	0.65	0.1911	0.0031	2749	27	2750	19	2754	44
Zrc-HS-CM24-10-9	79	37	7	19	271	4224	99.3	1	13.52	0.29	0.514	0.010	0.58	0.1900	0.0031	2747	26	2716	20	2674	42
Zrc-HS-CM24-10-Core-1	173	61	57	25	44	1286	99.6	3	12.67	0.81	0.523	0.012	0.81	0.1807	0.0086	2656	2651	2651	63	2712	51
Zrc-HS-CM24-10-Core-2	146	84	6	26	433	10384	99.9	1	13.61	0.27	0.525	0.010	0.49	0.1887	0.0029	2733	25	2724	19	2721	40
Zrc-HS-CM24-10-Core-3	85	16	29	18	62	1000	98.4	1	11.95	0.25	0.479	0.009	0.42	0.1818	0.0031	2674	28	2599	20	2521	39
Zrc-HS-CM24-10-Core-4	54	24	23	21	91	989	99.6	1	13.95	0.35	0.547	0.011	0.59	0.1868	0.0038	2707	33	2747	24	2809	49
Zrc-HS-CM24-10-Rim-1	3537	232	1553	88	6	773	99.7	3	8.07	0.19	0.435	0.010	0.85	0.1356	0.0030	2171	2238	2238	21	2328	44
Zrc-HS-CM24-10-Rim-2	7440	457	102	21	21	4522	95.6	3	0.88	0.02	0.073	0.001	0.77	0.0880	0.0019	1384	643	643	12	454	8

Zrc-HS-CM24-10-Rim-3	5615	324	89	26	29	7202	96.0	3	2.01	0.07	0.146	0.004	0.96	0.0998	0.0016	1620	1120	1120	21	877	21
Zrc-HS-CM24-10-Rim-4	9420	615	545	60	11	878	94.1	3	0.86	0.07	0.071	0.004	0.99	0.0880	0.0021	1369	621	621	36	445	26
Zrc-PC-CM24-10-1	92	31	15	21	140	2190	99.6	1	13.70	0.34	0.526	0.014	0.60	0.1905	0.0018	2745	15	2729	23	2725	57
Zrc-PC-CM24-10-2	81	37	25	22	88	1202	99.7	1	15.95	0.43	0.560	0.015	0.63	0.2063	0.0025	2874	19	2872	26	2867	60
Zrc-PC-CM24-10-3	181	103	22	20	91	2841	99.2	1	13.53	0.32	0.511	0.013	0.60	0.1929	0.0014	2770	12	2716	23	2661	54
Zrc-PC-CM24-10-4	247	268	46	23	50	1578	98.6	1	13.85	0.34	0.514	0.013	0.72	0.1974	0.0013	2803	11	2740	23	2673	56
Zrc-PC-CM24-10-5	309	121	33	22	67	3476	100.0	1	14.21	0.34	0.544	0.013	0.57	0.1916	0.0013	2754	11	2763	22	2800	56
Zrc-PC-CM24-10-6	259	179	24	25	104	3796	100.0	1	14.96	0.36	0.548	0.014	0.58	0.1979	0.0014	2807	12	2813	23	2818	56
Zrc-HS-CM24-11-1	1733	5010	844	64	8	841	100.0	3	13.68	0.36	0.569	0.012	0.86	0.1763	0.0027	2618	2727	2727	25	2902	50
Zrc-HS-CM24-11-10	5300332	23349045	51	19	37	50417	100.0	3	16.35	0.34	0.660	0.013	0.96	0.1795	0.0024	2648	2896	2896	20	3266	50
Zrc-HS-CM24-11-11	6068098	25409121	105	22	21	25641	99.4	3	13.86	0.55	0.567	0.021	1.00	0.1765	0.0023	2620	2723	2723	40	2883	87
Zrc-HS-CM24-11-12	6753911	24783159	129	24	19	19676	100.0	3	16.95	0.34	0.676	0.013	0.95	0.1817	0.0023	2668	2931	2931	19	3326	49
Zrc-HS-CM24-11-13	12540	1047	117	28	24	22878	99.5	3	6.46	0.13	0.366	0.007	0.90	0.1289	0.0018	2082	2040	2040	18	2008	34
Zrc-HS-CM24-11-14	13320	1692	117	24	21	22591	99.4	3	6.26	0.12	0.360	0.007	0.86	0.1264	0.0017	2049	2012	2012	17	1983	34
Zrc-HS-CM24-11-15	16090	1967	149	28	19	20120	99.7	3	6.22	0.15	0.362	0.008	0.96	0.1251	0.0017	2030	2007	2007	21	1989	40
Zrc-HS-CM24-11-16	23150	2647	214	32	15	19927	99.3	3	5.20	0.15	0.325	0.009	0.97	0.1163	0.0015	1901	1850	1850	25	1810	43
Zrc-HS-CM24-11-17	23770	3600	229	30	13	18805	97.6	3	4.19	0.11	0.266	0.006	0.97	0.1135	0.0016	1856	1667	1667	22	1520	30
Zrc-HS-CM24-11-18	18170	1890	97	23	24	8144	94.8	3	0.93	0.05	0.072	0.003	0.87	0.0946	0.0031	1512	663	663	26	449	16
Zrc-HS-CM24-11-19	10165	1380	35	19	54	43057	95.1	1	6.90	0.46	0.322	0.019	0.99	0.1541	0.0027	2391	30	2060	64	1781	95
Zrc-HS-CM24-11-2	725	7180	47	27	57	4778	100.0	1	13.80	0.31	0.572	0.012	0.89	0.1777	0.0024	2630	23	2738	20	2913	50
Zrc-HS-CM24-11-20	10770	623	28	18	64	46968	91.3	1	3.11	0.24	0.159	0.011	1.00	0.1446	0.0028	2276	34	1403	50	934	54
Zrc-HS-CM24-11-21	17140	1429	40	21	53	20960	94.7	1	1.04	0.11	0.071	0.005	0.99	0.0974	0.0042	1525	84	681	55	440	31
Zrc-HS-CM24-11-22	1765	3653	74	26	35	7512	100.0	3	12.75	0.29	0.522	0.009	0.78	0.1775	0.0037	2629	2661	2661	22	2705	39
Zrc-HS-CM24-11-23	811	2778	12	20	167	22095	100.0	1	13.00	0.23	0.523	0.009	0.72	0.1795	0.0023	2647	21	2679	17	2713	39
Zrc-HS-CM24-11-24	1128	2025	68	24	35	4764	100.0	3	13.58	0.31	0.547	0.009	0.55	0.1794	0.0039	2647	2721	2721	22	2814	39
Zrc-HS-CM24-11-25	378	3599	17	20	118	6946	100.0	1	12.70	0.24	0.511	0.009	0.67	0.1804	0.0025	2656	22	2657	17	2662	39
Zrc-HS-CM24-11-26	489	2217	64	21	33	1820	100.0	3	13.24	0.49	0.540	0.011	0.76	0.1786	0.0054	2635	2694	2694	34	2781	47
Zrc-HS-CM24-11-27	445	5140	7	19	271	20096	100.0	1	13.28	0.26	0.530	0.010	0.74	0.1819	0.0024	2668	22	2701	18	2742	41
Zrc-HS-CM24-11-3	8890	6530	1297	89	7	1080	96.6	3	4.15	0.10	0.268	0.006	0.94	0.1124	0.0023	1839	1664	1664	19	1531	31
Zrc-HS-CM24-11-4	4529	1284	45	19	42	17742	96.5	1	7.32	0.21	0.352	0.010	0.96	0.1504	0.0020	2349	22	2149	27	1941	49
Zrc-HS-CM24-11-5	1600	253	34	17	50	10326	99.6	1	11.32	0.23	0.484	0.010	0.77	0.1672	0.0024	2531	24	2549	19	2545	44
Zrc-HS-CM24-11-6	3099	133	37	19	51	24755	100.0	1	11.27	0.24	0.503	0.010	0.89	0.1632	0.0021	2488	22	2547	20	2624	42
Zrc-HS-CM24-11-7	3381	485	28	23	82	26680	100.0	1	9.77	0.20	0.466	0.009	0.92	0.1527	0.0020	2376	22	2412	19	2464	40
Zrc-HS-CM24-11-8	10991080	39441757	187	23	12	13725	95.9	3	9.15	0.31	0.389	0.012	0.99	0.1693	0.0022	2551	2345	2345	30	2112	53
Zrc-HS-CM24-11-9	13361794	43464844	163	23	14	20003	97.6	3	10.19	0.33	0.434	0.013	0.99	0.1698	0.0022	2556	2446	2446	30	2320	56
Zrc-HS-CM24-12-1	84	38	12	17	142	2526	99.3	1	13.49	0.29	0.518	0.011	0.63	0.1878	0.0030	2722	26	2714	20	2693	46
Zrc-HS-CM24-12-10	61	25	3	17	567	7934	99.7	1	14.35	0.30	0.545	0.011	0.52	0.1917	0.0033	2754	28	2771	20	2805	45

Zrc-HS-CM24-12-11	149	78	2	18	900	24365	99.4	1	13.42	0.27	0.517	0.010	0.58	0.1877	0.0028	2721	25	2709	19	2684	40
Zrc-HS-CM24-12-12	97	47	21	26	124	1692	99.4	1	13.28	0.30	0.518	0.012	0.57	0.1888	0.0034	2729	30	2703	22	2690	50
Zrc-HS-CM24-12-13	131	82	10	18	180	3791	96.7	1	11.60	0.23	0.451	0.009	0.54	0.1867	0.0028	2713	25	2573	19	2398	38
Zrc-HS-CM24-12-14	120	91	4	19	475	11363	99.9	1	13.86	0.28	0.531	0.010	0.59	0.1895	0.0029	2735	25	2740	19	2746	41
Zrc-HS-CM24-12-15	97	63	-6	16	-267	34860	99.5	1	13.40	0.29	0.517	0.010	0.66	0.1882	0.0030	2725	26	2709	20	2684	41
Zrc-HS-CM24-12-16	130	81	-7	20	-286	46900	99.5	1	13.73	0.28	0.521	0.010	0.66	0.1910	0.0028	2750	24	2730	19	2701	42
Zrc-HS-CM24-12-17	72	26	3	16	533	8537	99.8	1	14.01	0.31	0.539	0.011	0.61	0.1883	0.0031	2726	27	2748	21	2779	45
Zrc-HS-CM24-12-18	69	31	18	17	94	1326	99.0	1	13.52	0.30	0.515	0.010	0.48	0.1904	0.0034	2743	29	2716	21	2677	43
Zrc-HS-CM24-12-19	48	18	20	19	95	851	99.4	1	13.88	0.32	0.527	0.010	0.50	0.1918	0.0036	2754	31	2740	22	2727	43
Zrc-HS-CM24-12-2	100	50	1	17	1700	36969	99.4	1	13.64	0.29	0.523	0.010	0.57	0.1906	0.0031	2747	27	2725	20	2709	43
Zrc-HS-CM24-12-20	85	38	8	18	225	3725	99.3	1	13.46	0.29	0.517	0.010	0.60	0.1887	0.0031	2729	27	2713	21	2683	42
Zrc-HS-CM24-12-21	48	20	11	17	155	1548	99.1	1	13.77	0.34	0.524	0.011	0.52	0.1907	0.0037	2745	31	2736	23	2718	47
Zrc-HS-CM24-12-22	47	22	6	17	283	2730	99.2	1	13.76	0.34	0.528	0.011	0.40	0.1893	0.0038	2733	32	2733	23	2730	46
Zrc-HS-CM24-12-3	205	114	8	16	200	9202	99.7	1	13.85	0.28	0.526	0.009	0.72	0.1903	0.0026	2743	23	2740	19	2722	40
Zrc-HS-CM24-12-4	74	33	8	18	225	3408	99.4	1	13.79	0.31	0.528	0.010	0.58	0.1903	0.0032	2741	27	2736	20	2730	44
Zrc-HS-CM24-12-5	186	120	0	20		62656	99.6	1	13.63	0.28	0.519	0.009	0.50	0.1894	0.0029	2737	26	2725	19	2695	39
Zrc-HS-CM24-12-6	183	118	2	15	750	29268	98.1	1	12.65	0.32	0.492	0.012	0.89	0.1882	0.0028	2726	24	2655	24	2575	52
Zrc-HS-CM24-12-7	83	34	12	19	158	2601	99.4	1	13.88	0.32	0.528	0.010	0.57	0.1906	0.0031	2744	27	2738	22	2730	44
Zrc-HS-CM24-12-8	52	24	10	17	170	1886	99.4	1	13.79	0.32	0.523	0.010	0.48	0.1906	0.0034	2750	30	2738	22	2709	43
Zrc-HS-CM24-12-9	23	11	-8	17	-213	8220	98.8	1	13.79	0.43	0.516	0.011	0.51	0.1896	0.0046	2745	40	2738	31	2689	48
Zrc-HS-CM24-12-Core-1	608	452	5	19	380	43361	99.3	1	13.42	0.30	0.517	0.011	0.94	0.1886	0.0025	2729	22	2710	21	2683	47
Zrc-HS-CM24-12-Core-10	93	49	-8	19	-238	33260	99.3	1	13.30	0.27	0.515	0.010	0.51	0.1877	0.0031	2718	27	2700	19	2678	42
Zrc-HS-CM24-12-Core-2	2228	1628	20	20	100	41709	100.0	1	13.88	0.25	0.532	0.009	0.87	0.1889	0.0024	2731	21	2741	17	2749	40
Zrc-HS-CM24-12-Core-3	74	41	31	16	52	862	97.9	1	12.58	0.33	0.489	0.013	0.78	0.1874	0.0033	2720	29	2650	25	2562	55
Zrc-HS-CM24-12-Core-4	731	423	5	19	380	42949	99.5	1	14.54	0.38	0.556	0.013	0.97	0.1892	0.0025	2735	22	2781	26	2846	57
Zrc-HS-CM24-12-Core-5	158	105	-6	19	-317	59563	99.7	1	13.77	0.27	0.526	0.010	0.57	0.1901	0.0028	2742	23	2733	18	2725	41
Zrc-HS-CM24-12-Core-6	146	65	15	18	120	3383	98.3	1	13.04	0.27	0.493	0.010	0.71	0.1903	0.0027	2745	24	2681	19	2583	42
Zrc-HS-CM24-12-Core-7	107	59	1	15	1500	40423	99.4	1	13.82	0.28	0.527	0.010	0.52	0.1905	0.0030	2747	25	2738	19	2727	42
Zrc-HS-CM24-12-Core-8	109	76	-1	20	-2000	40945	99.4	1	13.76	0.27	0.525	0.010	0.46	0.1900	0.0030	2740	26	2732	19	2718	42
Zrc-HS-CM24-12-Core-9	135	73	-8	21	-263	50020	99.7	1	13.77	0.26	0.526	0.010	0.49	0.1894	0.0028	2735	24	2734	19	2723	41
Zrc-HS-CM24-12-Rim-1	175	88	-39	20	-51	62992	99.2	1	13.32	0.27	0.511	0.009	0.55	0.1893	0.0028	2736	25	2701	19	2661	40
Zrc-HS-CM24-12-Rim-10	155	78	13	17	131	4543	100.0	1	13.87	0.27	0.537	0.010	0.47	0.1881	0.0029	2729	25	2741	19	2769	40
Zrc-HS-CM24-12-Rim-2	133	58	-11	19	-173	39570	95.9	1	12.08	0.28	0.453	0.010	0.78	0.1939	0.0029	2774	25	2609	21	2410	44
Zrc-HS-CM24-12-Rim-3	232	129	-22	20	-91	83072	99.7	1	13.66	0.26	0.519	0.009	0.52	0.1912	0.0027	2751	23	2728	18	2694	39
Zrc-HS-CM24-12-Rim-4	83	34	8	17	213	3708	99.5	1	13.47	0.29	0.518	0.010	0.61	0.1883	0.0030	2726	26	2714	20	2691	42
Zrc-HS-CM24-12-Rim-5	179	116	-10	18	-180	64386	99.3	1	13.49	0.27	0.514	0.009	0.60	0.1901	0.0028	2740	24	2714	18	2672	40
Zrc-HS-CM24-12-Rim-6	44	15	-19	20	-105	16460	99.2	1	13.82	0.28	0.530	0.010	0.52	0.1868	0.0038	2710	33	2719	24	2721	47

Zrc-HS-CM24-12-Rim-7	77	33	11	17	155	2613	99.5	1	13.77	0.30	0.524	0.010	0.49	0.1891	0.0030	2733	26	2732	20	2717	41
Zrc-HS-CM24-12-Rim-8	64	28	9	16	178	2532	99.3	1	13.47	0.30	0.514	0.010	0.53	0.1885	0.0032	2729	27	2714	21	2673	43
Zrc-HS-CM24-12-Rim-9	83	33	-1	17	-1700	31340	99.7	1	13.82	0.29	0.531	0.010	0.49	0.1881	0.0031	2724	28	2738	21	2748	42
Zrc-PC-CM24-12-1	316	237	12	18	150	8518	99.6	1	13.65	0.33	0.519	0.013	0.76	0.1897	0.0011	2741	10	2727	22	2697	55
Zrc-PC-CM24-12-2	279	174	-9	17	-189	99777	100.0	1	13.85	0.34	0.529	0.013	0.76	0.1899	0.0014	2739	12	2741	23	2738	56
Zrc-PC-CM24-12-3	129	100	5	22	440	8704	99.7	1	14.00	0.34	0.530	0.013	0.53	0.1906	0.0018	2747	16	2749	23	2742	56
Zrc-PC-CM24-12-4	129	80	5	21	420	8159	99.4	1	13.56	0.34	0.514	0.013	0.64	0.1899	0.0018	2740	15	2719	23	2673	55
Zrc-PC-CM24-12-5	223	142	7	23	329	10393	99.8	1	13.82	0.34	0.530	0.013	0.65	0.1889	0.0015	2732	14	2739	23	2739	56
Zrc-PC-CM24-12-Thin-1	680	243	14	22	157	18088	100.0	1	14.20	0.35	0.541	0.014	0.85	0.1905	0.0011	2746	10	2764	24	2785	58
Zrc-PC-CM24-12-Thin-2	143	91	17	22	129	2958	100.0	1	14.14	0.34	0.541	0.013	0.41	0.1897	0.0018	2740	16	2759	23	2787	56
Zrc-PC-CM24-12-Thin-3	77	38	1	21	2100	27480	99.8	1	14.22	0.36	0.536	0.014	0.47	0.1912	0.0020	2751	17	2764	24	2765	57
Zrc-PC-CM24-12-Thin-4	1368	1490	-7	33	-471	297405	100.0	1	14.18	0.37	0.546	0.014	0.78	0.1882	0.0016	2727	13	2763	24	2809	59
Zrc-HS-CM24-13-1	133	84	9	17	189	5312	99.6	1	13.64	0.27	0.525	0.010	0.51	0.1883	0.0028	2725	24	2724	19	2717	40
Zrc-HS-CM24-13-10	4283	182	62	32	52	10095	94.9	3	2.40	0.08	0.156	0.004	0.93	0.1115	0.0016	1822	1240	1240	22	939	22
Zrc-HS-CM24-13-11	4270	194	130	41	32	4392	94.0	3	2.84	0.09	0.173	0.004	0.90	0.1197	0.0027	1954	1366	1366	23	1031	21
Zrc-HS-CM24-13-12	3306	141	71	21	30	10451	95.3	3	5.88	0.34	0.294	0.011	0.99	0.1426	0.0033	2249	1948	1948	49	1667	55
Zrc-HS-CM24-13-13	3964	239	860	130	15	596	90.6	3	3.20	0.19	0.180	0.006	0.97	0.1293	0.0033	2088	1443	1443	47	1065	35
Zrc-HS-CM24-13-14	72	29	-18	17	-94	25170	99.3	1	13.49	0.30	0.521	0.010	0.52	0.1886	0.0033	2725	29	2716	20	2700	44
Zrc-HS-CM24-13-15	72	30	4	16	400	6470	99.7	1	13.93	0.29	0.530	0.010	0.51	0.1908	0.0031	2746	26	2748	20	2742	42
Zrc-HS-CM24-13-16	127	71	-7	19	-271	40761	98.3	1	12.87	0.28	0.491	0.010	0.68	0.1892	0.0029	2737	26	2671	21	2572	41
Zrc-HS-CM24-13-17	97	42	2	17	850	16924	99.4	1	13.78	0.29	0.527	0.011	0.61	0.1902	0.0031	2740	27	2738	20	2727	44
Zrc-HS-CM24-13-18	107	86	-16	17	-106	35960	98.9	1	13.27	0.28	0.506	0.009	0.58	0.1901	0.0029	2742	25	2699	20	2641	40
Zrc-HS-CM24-13-19	47	23	-2	18	-900	16160	99.4	1	13.72	0.32	0.524	0.011	0.43	0.1900	0.0037	2738	32	2732	22	2716	45
Zrc-HS-CM24-13-2	114	71	21	17	81	1946	99.5	1	13.81	0.29	0.525	0.010	0.59	0.1906	0.0029	2746	26	2735	20	2719	42
Zrc-HS-CM24-13-20	2492	1061	34	16	47	21372	100.0	1	13.98	0.29	0.551	0.011	0.94	0.1851	0.0023	2698	21	2747	20	2827	46
Zrc-HS-CM24-13-21	70	24	-25	15	-60	25257	99.9	1	13.64	0.30	0.530	0.010	0.58	0.1871	0.0031	2717	28	2729	21	2744	42
Zrc-HS-CM24-13-22	25	10	10	16	160	873	99.3	1	14.14	0.44	0.538	0.012	0.47	0.1910	0.0051	2758	43	2757	29	2775	49
Zrc-HS-CM24-13-23	161	77	6	18	300	8678	98.6	1	12.90	0.25	0.493	0.009	0.43	0.1898	0.0028	2738	24	2672	18	2586	37
Zrc-HS-CM24-13-24	425	459	88	18	20	982	93.4	3	10.59	0.41	0.414	0.009	0.61	0.1863	0.0055	2707	2485	2485	37	2233	39
Zrc-HS-CM24-13-25	1293	2204	331	30	9	421	85.6	3	5.50	0.22	0.240	0.007	0.80	0.1713	0.0038	2576	1895	1895	34	1383	36
Zrc-HS-CM24-13-26	114	428	48	20	42	795	98.7	1	14.47	0.35	0.525	0.011	0.80	0.1993	0.0032	2821	28	2777	23	2720	48
Zrc-HS-CM24-13-27	369	219	26	20	77	5111	100.0	1	14.19	0.31	0.545	0.011	0.85	0.1894	0.0027	2739	22	2761	21	2801	45
Zrc-HS-CM24-13-28	154	81	16	18	113	3191	99.1	1	13.01	0.26	0.505	0.009	0.49	0.1883	0.0028	2725	25	2679	19	2633	38
Zrc-HS-CM24-13-29	60	27	11	12	109	1965	99.9	1	14.28	0.30	0.554	0.011	0.45	0.1885	0.0032	2725	28	2770	20	2839	44
Zrc-HS-CM24-13-3	98	58	8	19	238	4047	99.1	1	13.57	0.28	0.516	0.010	0.49	0.1906	0.0031	2748	27	2720	19	2682	43
Zrc-HS-CM24-13-4	63	19	8	16	200	2951	99.7	1	13.90	0.32	0.537	0.011	0.60	0.1882	0.0033	2727	28	2746	22	2771	47
Zrc-HS-CM24-13-5	80	37	0	18		28358	99.5	1	13.58	0.29	0.523	0.010	0.49	0.1896	0.0031	2737	27	2722	20	2710	42

Zrc-HS-CM24-13-6	122	66	12	16	133	3362	97.9	1	12.54	0.25	0.484	0.009	0.41	0.1888	0.0029	2730	25	2647	18	2543	38
Zrc-HS-CM24-13-7	153	79	-11	15	-136	54223	99.7	1	13.64	0.27	0.525	0.009	0.49	0.1887	0.0028	2728	24	2725	19	2719	40
Zrc-HS-CM24-13-8	4641	200	46	20	43	10016	95.4	1	1.67	0.04	0.121	0.003	0.95	0.1012	0.0013	1645	24	996	14	733	14
Zrc-HS-CM24-13-9	4189	160	61	19	31	9356	94.7	3	2.79	0.07	0.176	0.003	0.78	0.1154	0.0020	1888	1352	1352	17	1043	18
Zrc-HS-CM24-13-Core-1	307	377	161	21	13	592	99.9	3	12.52	0.59	0.536	0.011	0.56	0.1730	0.0055	2583	2642	2642	45	2764	47
Zrc-HS-CM24-13-Core-2	2580	1338	5	17	340	172069	100.0	1	15.68	0.31	0.599	0.011	0.93	0.1906	0.0024	2747	20	2858	18	3023	45
Zrc-HS-CM24-13-Core-3	283	225	-6	16	-267	81914	98.0	1	12.34	0.23	0.480	0.008	0.59	0.1865	0.0025	2712	24	2631	18	2528	37
Zrc-HS-CM24-13-Core-4	92	55	23	26	113	1554	99.1	1	13.84	0.36	0.526	0.014	0.70	0.1932	0.0039	2769	33	2739	26	2722	58
Zrc-HS-CM24-13-Core-5	243	183	6	21	350	14635	99.4	1	13.25	0.30	0.517	0.011	0.76	0.1898	0.0028	2739	24	2696	21	2684	46
Zrc-HS-CM24-13-Core-6	1016	659	35	23	66	8923	99.1	1	13.99	0.37	0.533	0.014	0.96	0.1912	0.0025	2751	22	2748	25	2750	58
Zrc-HS-CM24-13-Core-7	2116	944	14	19	136	51543	100.0	1	14.02	0.25	0.538	0.009	0.84	0.1895	0.0024	2737	20	2751	17	2776	39
Zrc-HS-CM24-13-Core-8	135	73	9	17	189	5400	99.7	1	13.52	0.27	0.523	0.010	0.66	0.1885	0.0027	2727	23	2718	19	2711	42
Zrc-HS-CM24-13-Core-9	2225	1407	13	40	308	62346	100.0	1	13.35	0.30	0.527	0.011	0.87	0.1855	0.0025	2702	22	2704	21	2729	47
Zrc-HS-CM24-13-Rim-1	463	112	198	26	13	633	96.3	3	9.11	0.53	0.428	0.018	0.81	0.1597	0.0055	2454	2328	2328	52	2284	81
Zrc-HS-CM24-13-Rim-2	187	185	13	21	162	3654	93.8	1	9.93	0.21	0.388	0.008	0.62	0.1844	0.0030	2690	27	2427	20	2113	36
Zrc-HS-CM24-13-Rim-3	119	63	-2	19	-950	38391	97.4	1	12.67	0.26	0.480	0.009	0.63	0.1923	0.0030	2761	26	2654	19	2526	41
Zrc-HS-CM24-13-Rim-4	4676	198	105	23	22	6281	95.8	3	2.82	0.07	0.187	0.004	0.94	0.1096	0.0024	1793	1360	1360	19	1103	22
Zrc-HS-CM24-13-Rim-5	90	60	5	19	380	6124	98.7	1	13.35	0.29	0.508	0.011	0.67	0.1898	0.0030	2740	26	2704	21	2646	48
Zrc-HS-CM24-13-Rim-6	148	72	4	23	575	13292	98.5	1	12.76	0.30	0.494	0.010	0.78	0.1888	0.0029	2730	25	2662	21	2587	44
Zrc-HS-CM24-13-Rim-7	80	36	10	27	270	2117	98.5	1	12.90	0.43	0.495	0.013	0.77	0.1896	0.0046	2734	40	2674	33	2593	56
Zrc-HS-CM24-13-Rim-8	54	26	-29	19	-66	18340	98.9	1	13.71	0.31	0.516	0.010	0.46	0.1919	0.0036	2757	31	2729	22	2684	45
Zrc-HS-CM24-13-Rim-9	361	186	-4	22	-550	116958	99.4	1	13.51	0.40	0.522	0.014	0.95	0.1883	0.0026	2726	23	2721	28	2705	60
Zrc-PC-CM24-13-1	220	108	-17	24	-141	81460	100.0	1	14.17	0.34	0.538	0.013	0.46	0.1908	0.0016	2747	14	2761	23	2773	56
Zrc-PC-CM24-13-10	200	117	1	16	1600	74211	100.0	1	14.00	0.34	0.532	0.013	0.65	0.1903	0.0013	2745	11	2749	23	2750	56
Zrc-PC-CM24-13-11	125	63	1	20	2000	45554	99.9	1	14.07	0.35	0.538	0.013	0.42	0.1880	0.0018	2726	15	2753	24	2773	56
Zrc-PC-CM24-13-12	92	34	16	17	106	2079	99.5	1	13.84	0.36	0.528	0.014	0.64	0.1899	0.0020	2739	17	2740	24	2735	59
Zrc-PC-CM24-13-13	249	392	-4	19	-475	80790	98.9	1	13.00	0.32	0.503	0.013	0.78	0.1884	0.0012	2728	10	2680	23	2624	55
Zrc-PC-CM24-13-14	86	46	30	17	57	978	97.8	1	12.99	0.34	0.492	0.013	0.55	0.1916	0.0021	2754	18	2677	25	2576	55
Zrc-PC-CM24-13-15	167	558	7	17	243	7096	97.4	1	12.23	0.31	0.472	0.012	0.64	0.1874	0.0015	2717	13	2622	24	2490	53
Zrc-PC-CM24-13-2	300	183	17	18	106	5861	100.0	1	13.76	0.34	0.528	0.013	0.73	0.1895	0.0011	2737	10	2732	23	2733	55
Zrc-PC-CM24-13-3	332	216	-4	20	-500	118235	99.8	1	13.83	0.33	0.525	0.013	0.61	0.1908	0.0011	2749	10	2738	22	2721	54
Zrc-PC-CM24-13-4	137	104	-14	17	-121	46813	99.5	1	13.70	0.34	0.524	0.013	0.70	0.1898	0.0016	2739	14	2728	23	2714	57
Zrc-PC-CM24-13-5	158	97	5	24	480	11277	99.9	1	13.79	0.37	0.536	0.014	0.62	0.1871	0.0022	2716	19	2733	26	2764	59
Zrc-PC-CM24-13-6	69	33	-10	22	-220	24230	99.5	1	14.10	0.36	0.528	0.013	0.58	0.1934	0.0020	2768	17	2757	24	2734	57
Zrc-PC-CM24-13-7	60	27	-9	19	-211	21120	99.2	1	13.99	0.38	0.526	0.013	0.42	0.1926	0.0028	2761	24	2750	26	2722	57
Zrc-PC-CM24-13-8	484	531	12	27	225	14879	99.4	1	13.06	0.31	0.504	0.013	0.74	0.1890	0.0013	2732	12	2683	23	2631	55
Zrc-PC-CM24-13-9	329	187	-16	22	-138	117768	99.9	1	13.90	0.33	0.531	0.013	0.68	0.1907	0.0013	2747	11	2743	22	2744	55

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Zrc-HS-CM24-15-1	95	45	-21	17	-81	31810	99.2	1	13.59	0.28	0.513	0.010	0.61	0.1912	0.0031	2752	26	2724	20	2669	42
Zrc-HS-CM24-15-10	149	59	-13	15	-115	48770	99.3	1	13.64	0.27	0.520	0.010	0.54	0.1912	0.0029	2750	25	2725	19	2698	41
Zrc-HS-CM24-15-11	112	56	8	16	200	4952	100.0	1	14.33	0.30	0.541	0.010	0.56	0.1905	0.0029	2743	26	2770	20	2790	43
Zrc-HS-CM24-15-12	313	183	9	18	200	11124	99.8	1	13.61	0.25	0.521	0.009	0.56	0.1888	0.0026	2730	22	2723	17	2708	39
Zrc-HS-CM24-15-13	201	163	-22	24	-109	70129	100.0	1	13.56	0.27	0.524	0.010	0.66	0.1889	0.0028	2731	24	2719	18	2716	41
Zrc-HS-CM24-15-14	63	35	-5	18	-360	22169	99.4	1	13.97	0.30	0.535	0.010	0.33	0.1892	0.0035	2732	31	2747	21	2761	44
Zrc-HS-CM24-15-15	60	23	3	18	600	6513	99.5	1	13.69	0.32	0.527	0.010	0.52	0.1886	0.0035	2729	30	2729	22	2728	43
Zrc-HS-CM24-15-16	90	38	13	14	108	2351	99.7	1	13.77	0.29	0.530	0.010	0.44	0.1882	0.0032	2724	27	2732	20	2741	43
Zrc-HS-CM24-15-17	112	66	14	17	121	2590	99.9	1	14.03	0.30	0.535	0.010	0.64	0.1885	0.0030	2726	26	2751	20	2766	41
Zrc-HS-CM24-15-18	188	109	9	17	189	6438	99.6	1	13.85	0.28	0.528	0.010	0.37	0.1905	0.0030	2747	26	2738	19	2730	40
Zrc-HS-CM24-15-19	114	91	-7	15	-214	39724	99.3	1	13.62	0.28	0.517	0.010	0.55	0.1907	0.0030	2745	26	2725	19	2686	41
Zrc-HS-CM24-15-2	59	30	-11	20	-182	20080	99.4	1	13.81	0.32	0.525	0.010	0.52	0.1906	0.0033	2747	30	2737	21	2721	43
Zrc-HS-CM24-15-20	142	107	4	15	375	9805	96.0	1	11.72	0.26	0.450	0.009	0.79	0.1893	0.0029	2736	25	2584	21	2392	41
Zrc-HS-CM24-15-21	124	70	3	18	600	7587	89.2	1	6.92	0.18	0.273	0.006	0.67	0.1859	0.0037	2708	33	2098	23	1553	32
Zrc-HS-CM24-15-22	117	80	-3	18	-600	39510	99.5	1	13.73	0.28	0.523	0.010	0.54	0.1901	0.0029	2742	25	2731	19	2710	41
Zrc-HS-CM24-15-23	345	173	5	18	360	17424	94.7	1	10.82	0.37	0.414	0.013	0.96	0.1891	0.0026	2732	23	2498	31	2228	60
Zrc-HS-CM24-15-24	265	133	-6	18	-300	90852	100.0	1	13.82	0.27	0.529	0.010	0.68	0.1895	0.0026	2738	23	2737	18	2736	40
Zrc-HS-CM24-15-25	119	56	2	16	800	19560	99.3	1	13.30	0.28	0.515	0.010	0.53	0.1886	0.0031	2726	27	2702	20	2675	41
Zrc-HS-CM24-15-26	55	32	-18	15	-83	18520	99.4	1	13.92	0.33	0.538	0.011	0.48	0.1879	0.0035	2718	31	2745	22	2777	46
Zrc-HS-CM24-15-27	207	53	21	18	86	2496	97.2	1	11.34	0.23	0.453	0.009	0.54	0.1808	0.0029	2663	27	2551	19	2407	42
Zrc-HS-CM24-15-28	146	65	28	23	82	1796	99.7	1	13.62	0.35	0.527	0.012	0.87	0.1882	0.0031	2724	27	2721	24	2731	53
Zrc-HS-CM24-15-29	68	28	-9	15	-167	22710	99.6	1	13.77	0.31	0.529	0.010	0.48	0.1890	0.0035	2735	30	2734	22	2735	43
Zrc-HS-CM24-15-3	54	36	-5	16	-320	18140	99.7	1	13.90	0.33	0.528	0.010	0.62	0.1889	0.0033	2730	29	2743	22	2731	44
Zrc-HS-CM24-15-4	110	67	3	16	533	11500	98.3	1	13.30	0.34	0.501	0.012	0.79	0.1913	0.0031	2753	28	2701	23	2617	50
Zrc-HS-CM24-15-5	40	16	3	17	567	4593	99.7	1	13.91	0.35	0.544	0.011	0.51	0.1851	0.0038	2701	33	2742	24	2797	47
Zrc-HS-CM24-15-6	160	69	-17	17	-100	54400	99.6	1	13.35	0.27	0.515	0.010	0.68	0.1866	0.0027	2712	24	2705	20	2679	41
Zrc-HS-CM24-15-7	76	30	8	17	213	3304	99.6	1	13.90	0.30	0.530	0.010	0.58	0.1888	0.0031	2732	28	2741	20	2740	44
Zrc-HS-CM24-15-8	36	15	2	19	950	6025	98.6	1	13.77	0.35	0.522	0.011	0.41	0.1900	0.0041	2746	36	2734	23	2703	48
Zrc-HS-CM24-15-9	194	98	-2	16	-800	67608	100.0	1	13.72	0.27	0.527	0.010	0.56	0.1882	0.0027	2726	24	2732	19	2729	40
Zrc-HS-CM24-15-Core-1	1024	1456	30	24	80	11603	98.2	1	13.00	0.39	0.504	0.016	0.95	0.1895	0.0027	2736	23	2679	29	2626	68
Zrc-HS-CM24-15-Core-2	5070	3890	3	17	567	335006	97.3	1	9.66	0.57	0.425	0.021	0.98	0.1641	0.0030	2495	31	2406	51	2268	94
Zrc-HS-CM24-15-Core-3	90	58	4	15	375	7520	99.5	1	13.67	0.28	0.522	0.010	0.52	0.1882	0.0031	2728	26	2725	20	2708	44
Zrc-HS-CM24-15-Core-4	101	66	18	16	89	1861	99.5	1	13.50	0.28	0.521	0.010	0.48	0.1881	0.0031	2722	27	2715	19	2704	41
Zrc-HS-CM24-15-Core-5	7380	3270	700	120	17	1006	92.2	3	4.24	0.26	0.229	0.014	0.91	0.1375	0.0049	2195	1654	1654	52	1319	74
Zrc-HS-CM24-15-Core-6	1948	952	2	18	900	305280	100.0	1	13.82	0.25	0.530	0.009	0.74	0.1885	0.0024	2728	21	2738	17	2739	39
Zrc-HS-CM24-15-Core-7	156	102	6	18	300	8799	99.6	1	13.70	0.29	0.527	0.010	0.71	0.1891	0.0027	2734	23	2728	20	2731	42

Zrc-HS-CM24-15-Rim-1	80	44	11	23	209	2583	99.5	1	13.71	0.32	0.529	0.010	0.43	0.1902	0.0036	2740	31	2728	22	2734	44
Zrc-HS-CM24-15-Rim-2	247	404	119	37	31	191	80.3	3	4.55	0.64	0.190	0.009	0.58	0.1740	0.0180	2580	1700	1700	110	1121	48
Zrc-HS-CM24-15-Rim-3	199	108	2	18	900	32612	99.8	1	13.93	0.27	0.530	0.010	0.51	0.1897	0.0028	2737	24	2744	18	2741	41
Zrc-HS-CM24-15-Rim-4	98	42	-2	16	-800	33160	99.4	1	13.71	0.28	0.521	0.010	0.43	0.1905	0.0030	2747	26	2732	19	2705	41
Zrc-HS-CM24-15-Rim-5	792	461	8	18	225	22051	97.2	1	11.41	0.30	0.454	0.013	0.96	0.1826	0.0024	2675	22	2558	25	2411	56
Zrc-HS-CM24-15-Rim-6	113	53	8	17	213	5090	99.6	1	13.60	0.31	0.526	0.011	0.61	0.1885	0.0033	2730	28	2722	21	2727	45
Zrc-HS-CM24-15-Rim-7	213	125	7	20	286	10045	100.0	1	13.81	0.27	0.529	0.010	0.73	0.1882	0.0025	2727	23	2736	18	2739	41
Zrc-PC-CM24-15-1	230	121	14	25	179	5469	99.2	1	13.70	0.39	0.525	0.016	0.87	0.1893	0.0017	2736	14	2727	27	2720	66
Zrc-PC-CM24-15-10	137	200	27	25	93	1711	99.5	1	13.60	0.35	0.526	0.014	0.49	0.1888	0.0021	2729	18	2723	24	2727	59
Zrc-PC-CM24-15-11	197	98	2	18	900	31325	100.0	1	15.36	0.41	0.587	0.016	0.82	0.1897	0.0015	2739	13	2836	26	2976	64
Zrc-PC-CM24-15-2	127	69	24	19	79	1953	99.9	1	13.72	0.36	0.528	0.014	0.62	0.1885	0.0018	2728	16	2729	25	2731	57
Zrc-PC-CM24-15-3	129	92	4	25	625	12750	99.2	1	13.64	0.41	0.526	0.016	0.88	0.1891	0.0019	2732	17	2726	29	2729	68
Zrc-PC-CM24-15-4	166	66	20	18	90	2836	100.0	1	14.52	0.38	0.562	0.014	0.77	0.1869	0.0015	2712	14	2789	25	2876	59
Zrc-PC-CM24-15-5	103	62	-28	28	-100	38960	99.7	1	13.90	0.38	0.536	0.014	0.69	0.1887	0.0023	2731	19	2745	26	2765	61
Zrc-PC-CM24-15-6	110	32	-2	17	-850	39080	99.2	1	13.32	0.48	0.520	0.019	0.90	0.1844	0.0021	2694	19	2705	33	2694	79
Zrc-PC-CM24-15-7	111	45	-1	18	-1800	38599	100.0	1	13.85	0.35	0.543	0.014	0.44	0.1842	0.0020	2690	18	2742	25	2795	57
Zrc-PC-CM24-15-8	123	74	3	17	567	15258	100.0	1	14.70	0.39	0.563	0.015	0.62	0.1896	0.0019	2739	17	2794	25	2879	60
Zrc-PC-CM24-15-9	195	131	28	16	57	2136	99.2	1	12.98	0.32	0.504	0.012	0.61	0.1873	0.0015	2718	13	2677	23	2630	53
Zrc-HS-CM24-16-1	9960	1101	191	25	13	2138	93.0	3	1.45	0.05	0.096	0.003	0.93	0.1092	0.0023	1784	907	907	19	593	16
Zrc-HS-CM24-16-2	8900	594	194	22	11	2797	91.7	3	1.86	0.10	0.108	0.004	0.99	0.1239	0.0024	2009	1055	1055	30	660	24
Zrc-HS-CM24-16-3	10840	620	47	19	40	6005	98.2	1	0.40	0.01	0.044	0.001	0.81	0.0659	0.0009	802	29	343	6	277	5
Zrc-HS-CM24-16-4	3403	223	38	21	55	19430	99.6	1	10.24	0.26	0.474	0.013	0.97	0.1570	0.0020	2422	22	2453	24	2497	58
Zrc-HS-CM24-16-5	4560	254	79	25	32	15932	100.0	3	10.87	0.23	0.511	0.011	0.94	0.1541	0.0022	2392	2512	2512	19	2657	49
Zrc-HS-CM24-16-6	5220	301	635	66	10	969	92.5	3	2.91	0.11	0.175	0.004	0.84	0.1225	0.0024	1990	1382	1382	28	1037	23
Zrc-HS-CM24-16-7	6010	276	241	29	12	1709	94.6	3	1.33	0.04	0.102	0.002	0.72	0.0948	0.0022	1519	858	858	19	627	12
Zrc-HS-CM24-16-8	13922	1150	12	16	133	14640	92.7	1	0.54	0.04	0.036	0.002	0.98	0.1077	0.0017	1758	28	434	24	228	13
Zrc-HS-CM24-16-9	11200	412	33	28	85	4088	96.2	1	0.19	0.01	0.018	0.001	0.87	0.0785	0.0017	1154	43	177	4	115	4
Zrc-PC-CM24-16-1	1733	52	18	24	133	25090	100.0	1	12.08	0.42	0.524	0.015	0.96	0.1683	0.0017	2539	17	2607	34	2714	66
Zrc-PC-CM24-16-2	3737	185	39	37	95	18057	99.7	1	7.89	0.26	0.410	0.014	0.97	0.1398	0.0009	2223	11	2217	30	2213	64
Zrc-PC-CM24-16-3	10810	724	30	22	73	42466	97.7	1	2.97	0.10	0.212	0.006	0.89	0.1006	0.0012	1631	22	1399	27	1237	32
Zrc-PC-CM24-16-4	6220	509	115	23	20	3686	93.3	3	2.06	0.10	0.129	0.005	0.97	0.1159	0.0021	1888	1127	1127	34	780	28
Zrc-PC-CM24-16-5	10240	826	318	30	9	2984	93.9	3	1.77	0.11	0.119	0.007	0.99	0.1083	0.0008	1771	1028	1028	42	725	41
Zrc-PC-CM24-16-6	3770	1023	102	30	29	12440	100.0	3	22.05	0.59	0.907	0.023	0.92	0.1759	0.0007	2615	3185	3185	26	4162	78
Zrc-PC-CM24-16-7	8760	652	976	92	9	549	90.9	3	1.59	0.09	0.105	0.005	0.98	0.1092	0.0016	1782	957	957	37	644	29
Zrc-PC-CM24-16-8	12660	1797	145	28	19	4146	93.3	3	1.49	0.12	0.096	0.006	0.99	0.1091	0.0022	1771	900	900	45	590	34
Zrc-HS-CM24-17-1	53	42	-10	22	-220	16730	98.5	1	13.38	0.38	0.511	0.012	0.52	0.1910	0.0044	2753	37	2706	26	2657	51
Zrc-HS-CM24-17-10	58	30	4	19	475	4783	99.4	1	14.29	0.32	0.534	0.011	0.51	0.1932	0.0035	2767	29	2767	21	2760	46

Zrc-HS-CM24-17-11	63	30	3	16	533	6715	99.6	1	13.80	0.29	0.530	0.010	0.51	0.1880	0.0031	2728	27	2735	20	2741	41
Zrc-HS-CM24-17-2	45	22	14	16	114	1050	99.2	1	13.98	0.34	0.530	0.011	0.48	0.1926	0.0038	2764	31	2748	23	2741	46
Zrc-HS-CM24-17-3	34	17	-2	16	-800	11190	99.6	1	14.19	0.38	0.544	0.011	0.36	0.1873	0.0044	2719	39	2762	26	2806	46
Zrc-HS-CM24-17-4	75	30	11	17	155	2216	99.5	1	13.65	0.30	0.524	0.010	0.47	0.1888	0.0033	2729	29	2723	21	2714	43
Zrc-HS-CM24-17-5	126	60	9	16	178	4633	99.8	1	14.10	0.28	0.534	0.010	0.47	0.1909	0.0030	2754	26	2757	19	2762	42
Zrc-HS-CM24-17-6	77	29	-12	17	-142	25630	99.7	1	13.80	0.29	0.529	0.011	0.60	0.1884	0.0031	2729	27	2734	20	2735	44
Zrc-HS-CM24-17-7	120	77	-13	15	-115	39010	99.5	1	13.76	0.29	0.527	0.010	0.58	0.1891	0.0031	2735	27	2733	20	2728	43
Zrc-HS-CM24-17-8	71	41	-18	17	-94	18180	97.4	1	12.14	0.46	0.470	0.015	0.89	0.1861	0.0038	2705	33	2615	35	2480	66
Zrc-HS-CM24-17-9	88	59	0	18		27650	99.6	1	13.77	0.29	0.526	0.010	0.50	0.1901	0.0032	2741	28	2735	20	2726	42
Zrc-HS-CM24-17-Core-1	129	92	-13	16	-123	43150	99.7	1	13.71	0.28	0.526	0.010	0.48	0.1891	0.0030	2733	26	2730	19	2726	42
Zrc-HS-CM24-17-Core-10	3268	2131	-4	17	-425	1035675	100.0	1	14.21	0.27	0.544	0.010	0.89	0.1892	0.0024	2735	20	2763	18	2800	41
Zrc-HS-CM24-17-Core-11	1432	662	-8	16	-200	503601	100.0	1	13.89	0.26	0.537	0.010	0.79	0.1882	0.0024	2726	21	2743	18	2769	40
Zrc-HS-CM24-17-Core-12	95	52	21	19	90	1510	99.7	1	13.83	0.31	0.531	0.010	0.59	0.1888	0.0030	2729	26	2736	21	2746	44
Zrc-HS-CM24-17-Core-2	153	111	-35	15	-43	49570	99.4	1	13.72	0.28	0.522	0.010	0.55	0.1910	0.0030	2749	25	2730	19	2709	40
Zrc-HS-CM24-17-Core-3	1641	923	-10	26	-260	568087	100.0	1	15.01	0.32	0.579	0.012	0.78	0.1887	0.0027	2729	24	2815	20	2945	47
Zrc-HS-CM24-17-Core-4	1809	1123	-19	14	-74	447187	100.0	1	14.92	0.34	0.575	0.013	0.95	0.1878	0.0024	2723	21	2812	22	2932	51
Zrc-HS-CM24-17-Core-5	96	46	16	17	106	1884	98.9	1	13.30	0.29	0.505	0.009	0.50	0.1904	0.0031	2742	27	2703	20	2636	39
Zrc-HS-CM24-17-Core-6	128	85	-2	17	-850	42059	99.7	1	14.06	0.29	0.533	0.010	0.54	0.1910	0.0030	2749	26	2753	20	2754	43
Zrc-HS-CM24-17-Core-7	155	96	-3	18	-600	50813	99.9	1	13.72	0.28	0.531	0.010	0.61	0.1877	0.0028	2719	24	2729	19	2743	42
Zrc-HS-CM24-17-Core-8	116	56	-14	17	-121	38759	99.8	1	14.19	0.29	0.540	0.010	0.60	0.1905	0.0029	2744	25	2764	19	2781	42
Zrc-HS-CM24-17-Core-9	79	58	0	16		26567	99.4	1	13.76	0.30	0.526	0.010	0.59	0.1895	0.0030	2736	27	2734	20	2727	43
Zrc-HS-CM24-17-Rim-1	47	18	-1	15	-1500	15370	99.3	1	13.35	0.33	0.524	0.011	0.45	0.1864	0.0038	2703	34	2707	23	2719	44
Zrc-HS-CM24-17-Rim-10	191	99	8	18	225	7835	99.7	1	13.73	0.27	0.525	0.010	0.67	0.1901	0.0027	2742	23	2731	18	2718	42
Zrc-HS-CM24-17-Rim-11	106	50	7	16	229	4906	99.3	1	13.76	0.28	0.524	0.010	0.61	0.1909	0.0030	2750	26	2734	20	2713	43
Zrc-HS-CM24-17-Rim-12	172	83	8	17	213	7508	99.8	1	13.76	0.28	0.528	0.010	0.50	0.1894	0.0030	2735	26	2733	20	2734	43
Zrc-HS-CM24-17-Rim-2	130	34	3	16	533	12300	99.7	1	11.80	0.28	0.493	0.010	0.70	0.1743	0.0030	2601	29	2589	23	2585	41
Zrc-HS-CM24-17-Rim-3	122	50	-4	16	-400	42180	99.4	1	13.87	0.28	0.525	0.010	0.71	0.1915	0.0028	2753	24	2740	19	2721	43
Zrc-HS-CM24-17-Rim-4	1108	753	3	17	567	94168	100.0	1	15.15	0.32	0.584	0.012	0.89	0.1883	0.0025	2727	22	2828	21	2968	49
Zrc-HS-CM24-17-Rim-5	120	46	8	17	213	4295	96.1	1	11.97	0.24	0.452	0.009	0.48	0.1908	0.0031	2748	27	2602	19	2403	38
Zrc-HS-CM24-17-Rim-6	94	43	-9	19	-211	32620	99.7	1	14.05	0.30	0.537	0.011	0.48	0.1894	0.0031	2737	28	2754	19	2770	44
Zrc-HS-CM24-17-Rim-7	49	22	15	17	113	1056	99.2	1	13.71	0.34	0.523	0.011	0.54	0.1891	0.0036	2728	32	2730	23	2711	46
Zrc-HS-CM24-17-Rim-8	50	22	6	18	300	2842	99.4	1	14.13	0.32	0.536	0.011	0.46	0.1911	0.0037	2756	30	2758	21	2764	44
Zrc-HS-CM24-17-Rim-9	101	41	3	16	533	11140	99.7	1	13.41	0.27	0.525	0.010	0.50	0.1874	0.0030	2718	25	2709	19	2718	41
Zrc-PC-CM24-17Core-1	97	65	-3	19	-633	32840	99.4	1	13.60	0.34	0.521	0.013	0.51	0.1896	0.0019	2738	16	2722	24	2703	56
Zrc-PC-CM24-17Core-2	132	75	11	20	182	4036	99.8	1	13.85	0.34	0.528	0.013	0.65	0.1901	0.0013	2741	12	2739	23	2732	56
Zrc-PC-CM24-17Core-3	135	72	14	20	143	3216	99.3	1	13.78	0.36	0.519	0.013	0.62	0.1892	0.0019	2736	17	2735	25	2693	57
Zrc-PC-CM24-17Core-4	927	421	-1	19	-1900	335486	100.0	1	14.26	0.33	0.544	0.013	0.79	0.1884	0.0008	2728	7	2767	22	2800	55

Zrc-PC-CM24-17Core-5	1111	613	24	30	125	15401	100.0	1	14.83	0.39	0.573	0.016	0.88	0.1876	0.0012	2720	11	2804	25	2924	63
Zrc-PC-CM24-17Core-6	92	64	-4	19	-475	30237	98.8	1	13.49	0.36	0.509	0.013	0.44	0.1895	0.0024	2741	21	2714	26	2654	57
Zrc-PC-CM24-17Core-7	90	57	-12	28	-233	33890	99.7	1	14.03	0.35	0.531	0.014	0.50	0.1913	0.0022	2750	19	2751	24	2747	59
Zrc-PC-CM24-17Core-8	121	79	-9	20	-222	41669	99.9	1	13.90	0.34	0.531	0.013	0.57	0.1885	0.0017	2728	15	2743	24	2746	55
Zrc-PC-CM24-17Rim-1	162	71	-15	16	-107	58331	100.0	1	13.91	0.33	0.535	0.013	0.60	0.1879	0.0014	2723	12	2744	23	2763	56
Zrc-PC-CM24-17Rim-2	121	61	-3	19	-633	43360	99.8	1	14.26	0.35	0.541	0.014	0.55	0.1922	0.0017	2760	15	2767	24	2786	57
Zrc-PC-CM24-17Rim-3	145	81	5	19	380	10202	100.0	1	13.86	0.34	0.536	0.014	0.54	0.1886	0.0016	2729	14	2740	23	2767	57
Zrc-PC-CM24-17Rim-4	196	218	16	23	144	4298	99.2	1	12.83	0.34	0.501	0.013	0.74	0.1878	0.0018	2723	16	2666	25	2619	57
Zrc-PC-CM24-17Rim-5	300	162	-8	17	-213	100058	99.3	1	13.17	0.33	0.509	0.013	0.83	0.1888	0.0011	2730	10	2691	24	2651	55
Zrc-PC-CM24-17Rim-6	99	45	-10	19	-190	35930	100.0	1	14.20	0.37	0.543	0.014	0.63	0.1897	0.0019	2736	16	2761	24	2797	58
Zrc-PC-CM24-17Rim-7	91	43	-13	18	-138	33046	99.6	1	13.60	0.34	0.526	0.013	0.42	0.1891	0.0020	2731	17	2722	24	2723	56
Zrc-PC-CM24-17Rim-8	83	34	-10	17	-170	29720	99.9	1	13.64	0.35	0.528	0.013	0.59	0.1873	0.0017	2717	15	2723	24	2732	57

1 No ²⁰⁴Pb correction

3 ²⁰⁴Pb based correction

Curriculum Vitae

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Education:

University of New Brunswick, Fredericton, 2023 - 2025

M.Sc. Earth Sciences

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B.Sc. Earth and Environmental Sciences

- Concentration in Earth Sciences

Minor in Anthropological Archaeology

Undergraduate Research: Does Iron Source Matter for Iron Oxide Copper Gold Systems? Isotopic Evidence for a Sedimentary Ironstone Protolith at the Osborne Deposit, Queensland, Australia (Currently unpublished)

Publications:

Roush, J., Martins, T., McFarlane, C.R.M., Rinne, M.L. and Groat, L. 2023. Preliminary examination of the Tappy, Eagle and F.D. no. 5 pegmatites in the Cat Lake–Winnipeg River pegmatite field, southeastern Manitoba (parts of NTS 52L5, 11); in Report of Activities 2023, Manitoba Economic Development, Investment, Trade and Natural Resources, Manitoba Geological Survey, p. 20–26.

Conference Presentations:

Roush, J., Martins, T., McFarlane, C.R.M., Rinne, M.L. and Groat, L. 2023. A first look at the Tappy, Eagle and F.D. no.5 Pegmatites, Winnipeg River-Cat Lake pegmatite field, southeastern Manitoba. Poster. Central Canada Mineral Exploration Convention, Winnipeg, MB

Roush, J., Martins, T., McFarlane, C.R.M. 2024. Preliminary Results from the Tappy, Eagle and F.D. no.5 Pegmatites, Cat Lake-Winnipeg River pegmatite field, southeastern Manitoba. Presentation. Atlantic Geoscience Society, Moncton NB

Roush, J., Martins, T., McFarlane, C.R.M., Rinne, M.L. and Groat, L. 2024. The Eagle, F.D. no. 5 and Tappy Pegmatites from the Cat Lake-Winnipeg River pegmatite field, southeastern Manitoba. Poster. Geological Association of Canada - Mineralogical Association of Canada Conference, Brandon, MB

Roush, J., Martins, T., McFarlane, C.R.M. and Groat, L. 2025. As Within, So Without: Pegmatitic and Host Rock Monazite. Poster. Geological Association of Canada - Mineralogical Association of Canada Conference, Ottawa, ON