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# Appendix A. Sample Descriptions and Cross-Reference to the University of Tasmania Rock Catalog



| Catalog# | Field# | Rock Name | Rock Description | AMG Northing | AMG Easting | Position | Area | Lithostratigraphy | Group | Preps | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 143174 | B1000 | mag bx | mag bx | 5331373.5 | 383620.2 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,R,RC | Grab samples |
| 143175 | B1001 | mineralised bx | Semi-massive chalcopyrite in chlorite-tourmaline breccia | 5331173.5 | 383612.2 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,R | Grab samples |
| 143176 | B1002 | fspr phyric dac | mag qtz py vein | 5331073.5 | 383652.2 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,R | Grab samples |
| 143177 | B1003 | mineralised bx | cpy and cl | 5331073.5 | 383652.2 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | Grab samples |
| 143178 | B1004 | mineralised bx | cpy and cl | 5331373.5 | 383620.2 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | Grab samples |
| 143179 | B1005 | fspr phyric dac | K alt vein margins | 5331173.5 | 383612.2 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | Grab samples |
| 143180 | B1006 | to vein | Chlorite-tourmaline breccia | 5331273.5 | 383615.2 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | LPS,R,MS,GM | Grab samples |
| 143181 | B1007 | fspr phyric dac | Groundmass k-feldsparsreplaced by sericite + chlorite and magnetite | 5331373.5 | 383620.2 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | LPS | Grab samples |
| 143182 | B1008 | to vein | Chlorite-tourmaline vein | 5331030.5 | 383712.2 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,R | Grab samples |
| 143183 | B1009 | to vein | Euhedral and subhedral tourmaline in magnetite-tourmaline breccia matrix | 5331073.5 | 383812.2 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | Grab samples |
| 143184 | B1010 | fspr phyric dac | K-feldspar altered FPV with Cl replaced Feld. phenocrysts | 5331073.5 | 383652.2 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R,MS,GM | Grab samples |
| 143185 | B1011 | mineralised bx | Semi-massive chalcopyrite in chlorite-tourmaline breccia | 5331173.5 | 383612.2 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | Grab samples |
| 143186 | B1035 | lamprophyre dyke | qtz carb vein (Devonian) | 5442000.0 | 382800.0 | Prince Lyell | Mt. Lyell | Mt. Read Volcanics | Central Volcanic Complex | PS,R | DDH 94WLD0743 134.6m |
| 143187 | B1036 | qz ser chl schist | mag qtz carb veins | 5442000.0 | 382800.0 | Prince Lyell | Mt. Lyell | Mt. Read Volcanics | Central Volcanic Complex | PS,R | DDH 94WLD0743 211.0m |
| 143188 | B1037 | qz ser chl schist | mag qtz carb veins | 5442000.0 | 382800.0 | Prince Lyell | Mt. Lyell | Mt. Read Volcanics | Central Volcanic Complex | PS,R | DDH 94WLD0743 213.1m |
| 143189 | B1038 | qz ser chl schist | mag cpy py mineralisation | 5442000.0 | 382800.0 | Prince Lyell | Mt. Lyell | Mt. Read Volcanics | Central Volcanic Complex | R | DDH 94WLD0743 337m |
| 143190 | B1039 | qz ser chl schist | py qz carb veins | 5442000.0 | 382800.0 | Prince Lyell | Mt. Lyell | Mt. Read Volcanics | Central Volcanic Complex | R | DDH 94WLD0743 348.3m |
| 143191 | B1040 | qz ser chl schist | py qz carb veins | 5442000.0 | 382800.0 | Prince Lyell | Mt. Lyell | Mt. Read Volcanics | Central Volcanic Complex | LPS,R | DDH 94WLD0743 349.0m |
| 143192 | B1041 | qz ser chl schist | massive apatite in mag py cpy veins | 5442000.0 | 382800.0 | Prince Lyell | Mt. Lyell | Mt. Read Volcanics | Central Volcanic Complex | LPS,R | DDH 94WLD0743 360.2m |
| 143193 | B1042 | qz ser chl schist | mag py apatite | 5442000.0 | 382800.0 | Prince Lyell | Mt. Lyell | Mt. Read Volcanics | Central Volcanic Complex | 2PS,R | DDH 94WLD0743 367.1m |
| 143194 | B1043 | qz ser chl schist | mag py apatite | 5442000.0 | 382800.0 | Prince Lyell | Mt. Lyell | Mt. Read Volcanics | Central Volcanic Complex | PS,R | DDH 94WLD0743 456m |
| 143195 | B1044 | qz ser chl schist | mag py apatite | 5442000.0 | 382800.0 | Prince Lyell | Mt. Lyell | Mt. Read Volcanics | Central Volcanic Complex | R | DDH 94WLD0743 460m |
| 143196 | B1045 | hbl andt | Apatite and magnetite | 5324550.0 | 379940.0 | Garfield Prospect | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | LPS,R.MS | DDH G001 197m |
| 143197 | B1046 | hbl andt | Feldspar pheno replaced by masses of carbonate +/- sericite +/- chlorite | 5324550.0 | 379940.0 | Garfield Prospect | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,R | DDH G002 94m |
| 143198 | B1048 | hbl andt | Chlorite altered with scattered relict sericite domains | 5324550.0 | 379940.0 | Garfield Prospect | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,R | DDH G002 134m |
| 143199 | B1052 | hbl andt | Feldspar hornblende-phyric andesite without quartz | 5324550.0 | 379940.0 | Garfield Prospect | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | LPS | DDH G002 196m |
| 143200 | B1053 | hbl andt | Feldspar hornblende-phyric andesite without quartz | 5324550.0 | 379940.0 | Garfield Prospect | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,R | DDH G002 196m |
| 143201 | B1054 | hbl andt | Feldspar hornblende-phyric andesite without quartz | 5324550.0 | 379940.0 | Garfield Prospect | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | LPS | DDH G002 196m |
| 143202 | B1059 | hbl andt | hbl andt | 5324550.0 | 379940.0 | Garfield Prospect | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PD | DDH G003 126m |
| 143203 | B1060 | hbl andt | hbl andt | 5324550.0 | 379940.0 | Garfield Prospect | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | LPS,PD | DDH G003 31m |
| 143204 | B1061 | hbl andt | Apatite and magnetite | 5324550.0 | 379940.0 | Garfield Prospect | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,R,RC | DDH G003 152m |
| 143205 | B1062 | hbl andt | hbl andt | 5324550.0 | 379940.0 | Garfield Prospect | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | LPS,PD | DDH G003 151m |
| 143206 | B1063 | qz phyric rhy | qz phyric rhy | 5324550.0 | 379940.0 | Garfield Prospect | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD | DDH G004 100.5m |
| 143207 | B1064 | qz phyric rhy | Stretched apatite crystal dismembered by shearing parallel to cleavage | 5324550.0 | 379940.0 | Garfield Prospect | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD, R | DDH G004 255m |
| 143208 | B1065 | qz phyric rhy | se alt | 5324550.0 | 379940.0 | Garfield Prospect | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD | DDH G006 135m |
| 143209 | B1066 | qz phyric rhy | se alt | 5324550.0 | 379940.0 | Garfield Prospect | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | LPS,RC | DDH G006 135m |
| 143210 | B1067 | hbl andt | Feldspars were replaced by sericite and hornblende's by chlorite | 5324550.0 | 379940.0 | Garfield Prospect | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS, PD,R | DDH G006 259m |
| 143211 | B1068 | hbl andt | Feldspars were replaced by sericite and hornblende's by chlorite | 5324550.0 | 379940.0 | Garfield Prospect | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD | DDH G012 75.8m |
| 143212 | B1069 | Dac dyke | feld phyric py, chl | 5324550.0 | 379940.0 | Garfield Prospect | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD | DDH G012 126.5m |
| 143213 | B1070 | qz phyric rhy | se alt | 5324550.0 | 379940.0 | Garfield Prospect | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD | DDH G012 131.5m |
| 143214 | B1071 | Dac dyke | chl alt | 5324550.0 | 379940.0 | Garfield Prospect | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD | DDH G012 170m |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 143215 | B1072 | qz phyric rhy | se alt | 5324550.0 | 379940.0 | Garfield Prospect | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD | DDH G012 312m |
| 143216 | B1073 | qz phyric rhy | se alt | 5324550.0 | 379940.0 | Garfield Prospect | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD | DDH G012 380m |
| 143217 | B1074 | hbl andt | apatite in cl alt | 5324550.0 | 379940.0 | Garfield Prospect | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | LPS,PD | DDH G012 412m |
| 143218 | B1075 | hbl andt | apatite in cl alt? hbl? py | 5324550.0 | 379940.0 | Garfield Prospect | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD | DDH G012 429m |
| 143219 | B1076 | qz phyric rhy | se alt | 5324550.0 | 379940.0 | Garfield Prospect | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD | DDH G012 433m |
| 143220 | B1077 | qz phyric rhy | QF Phyric Volc., light green feldspar | 5320385.0 | 381256.0 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD,R | |
| 143221 | B1078 | qz fspr phyric v'clastic | Medium green groundmass, lithic clasts to 2 cm | 5320440.0 | 380690.0 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS | |
| 143222 | B1079 | qz fspr phyric v'clastic | Medium green groundmass, lithic clasts to 2 cm | 5320440.0 | 380690.0 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD,R | |
| 143223 | B1080 | sst | Massive sandstone, scattered hematite. | 5320815.0 | 381300.0 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD,R | |
| 143224 | B1081 | qz phyric rhy | Fine-grained white quartz-phyric volc. | 5318844.0 | 381501.3 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS | |
| 143225 | B1083 | qz phyric rhy | Medium-grained quartz-feldspar-phyric volcaniclastic | 5318851.0 | 381737.4 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,R | |
| 143226 | B1084 | qz phyric rhy | Medium-grained quartz-feldspar-phyric volcaniclastic | 5318851.0 | 381737.4 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,R | |
| 143227 | B1085 | qz phyric rhy | Fine-grained white quartz-phyric volc. | 5318844.0 | 381501.3 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD,R | |
| 143228 | B1086 | qz phyric rhy | Medium-grained quartz-feldspar-phyric volcaniclastic | 5318851.0 | 381737.4 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD,R | |
| 143229 | B1087 | qz phyric rhy | Fine-grained white quartz-phyric volc. | 5318851.0 | 381737.4 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD,R | |
| 143230 | B1088 | hornfels | hornfels | 5318851.0 | 381737.4 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD | |
| 143231 | B1089 | fspr phyric dac | Fine-grained white feldspar-phyric volc. +/- quartz | 5318855.0 | 382054.7 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,R,RC | |
| 143232 | B1090 | fspr phyric dac | Fine-grained white feldspar-phyric volc. +/- quartz | 5318855.0 | 382054.7 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD | |
| 143233 | B1091 | fspr phyric dac | CVC feld. phyric volc. very hard | 5318853.0 | 382327.4 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | LPS,PD | |
| 143234 | B1092 | fspr phyric dac | CVC feld. phyric volc. chlorite, iron stain. | 5318904.0 | 382545.7 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD,R | |
| 143235 | B1093 | fspr phyric dac | CVC feld. phyric volc. pink alt. | 5319043.5 | 382123.8 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD,R | |
| 143236 | B1094 | qz phyric rhy | Stretched pumice clasts, replaced by sericite | 5319046.5 | 381542.9 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD,R | |
| 143237 | B1095 | qz phyric rhy | Q Phyric Volc., light green feldspar | 5319046.5 | 381542.9 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD,R | |
| 143238 | B1096 | fspr phyric dac | Sparse coarse-grained feldspar phenos. in fine-grained groundmass | 5319050.0 | 382536.0 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD,R | |
| 143239 | B1097 | qz phyric rhy | Q Phyric Volc., light green feldspar, iron stain | 5319422.5 | 381330.7 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD | |
| 143240 | B1098 | qz phyric rhy | Q Phyric Volc., light green feldspar, iron stain | 5319422.5 | 381330.7 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD,R | |
| 143241 | B1099 | qz phyric rhy | Q Phyric Volc., light green feldspar | 5319426.0 | 381659.3 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD,R | |
| 143242 | B2000 | fspr phyric dac | CVC feld. phyric volc. chlorite, iron stain. | 5319422.5 | 382120.0 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD | |
| 143243 | B2001 | fspr phyric dac | CVC feld. phyric volc. chlorite, iron stain. | 5319422.5 | 382120.0 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD,R | |
| 143244 | B2002 | fspr phyric dac | CVC feld. phyric volc. chlorite, iron stain. | 5319396.5 | 382251.0 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD,R | |
| 143245 | B2003 | fspr phyric dac | CVC feld. phyric volc. chlorite, iron stain. | 5319830.5 | 381670.1 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD,R | |
| 143246 | B2004 | qz phyric rhy | Perlite showing cuspate fractures, forms a fine-grained crystalline matrix | 5319830.5 | 381670.1 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD,R | |
| 143247 | B2005 | qz phyric rhy | Q Phyric Volc., light green feldspar, iron stain | 5319848.5 | 382088.0 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD,R | |
| 143248 | B2006 | qz phyric rhy | fine to medium-grained quartz-feldspar-phyric lava | 5319830.5 | 381670.1 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD,R | |

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er ablation sample. Numbers indicate the number of a specific preparation type.

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 143249 | B2007 | qz phyric rhy | fine to medium-grained quartz-feldspar-phyric lava | 5319830.5 | 381670.1 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD,R | |
| 143250 | B2008 | qz phyric rhy | fine to medium-grained quartz-feldspar-phyric lava | 5319830.5 | 381670.1 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD,R | |
| 143251 | B2009 | qz phyric rhy | fine to medium-grained quartz-feldspar-phyric lava | 5319830.5 | 381670.1 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,R | |
| 143252 | B2010 | qz phyric rhy | Blocky vesicular pumice replaced with chlorite and magnetite | 5319830.5 | 381670.1 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD,R | |
| 143253 | B2011 | qz phyric rhy | Q Phyric Volc., light green feldspar | 5320572.5 | 381421.8 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PD | |
| 143254 | B2012 | qz phyric rhy | Q Phyric Volc., light green feldspar | 5320572.5 | 381421.8 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD,R | |
| 143255 | B2013 | qz phyric rhy | Q Phyric Volc., light green feldspar | 5320572.5 | 381421.8 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD,R | |
| 143256 | B2014 | fspr phyric dac | CVC feld. phyric volc. pink alt. | 5320572.0 | 381564.4 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD,R | |
| 143257 | B2015 | qz phyric rhy | Q Phyric Volc., light green feldspar | 5320572.0 | 381564.4 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PS,PD | |
| 143258 | B2016 | fspr phyric dac | CVC feld. phyric volc. pink alt. | 5320572.0 | 381564.4 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD,R | |
| 143259 | B2017 | qz phyric rhy | Q Phyric Volc., light green feldspar, iron stain | 5320579.5 | 381021.2 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | PD | |
| 143260 | B2018 | qz phyric rhy | Q Phyric Volc., light green feldspar, iron stain | 5320579.5 | 381021.2 | Slate Spur | Jukes-Darwin | Mt. Read Volcanics | Yolande River Sequence | TS,R | |
| 143261 | B2019 | Mylonite | stretched and broken quartz, K-Feld. rounded and broken, coarse micas. | 5319800.0 | 383818.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Darwin Granite | LPS,PD,R | |
| 143262 | B2020 | to bx | 1% pyrite | 5320278.0 | 383952.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Darwin Granite | PS,PD,R,LA | |
| 143263 | B2022 | Mylonite | Se in gouge zone?, | 5318245.0 | 384058.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Darwin Granite | PS,PD,R | |
| 143264 | B2023 | bx | Granite Fragments in qtz-phyric volcaniclastic bx. | 5318245.0 | 384058.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Tyndall Group | LPS,R | |
| 143265 | B2024 | bar | Barite vein | 5318245.0 | 384058.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Darwin Granite | 2PS,R | |
| 143266 | B2025 | to bx | Near DWG/DPG contact | 5318735.0 | 383620.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Darwin Granite | LPS,PD,R | |
| 143267 | B2026 | mag vein | Mag. vein in CVC | 5320150.0 | 383232.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | LPS | |
| 143268 | B2027 | qz fspr phyric v'clastic | Pink feld. in groundmass, fiamme altered by chlorite. | 5320828.0 | 383203.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | LPS,PD,R | |
| 143269 | B2028 | Microgranite | Dyke or Sill, fine-grained equigranular, dissem. pyrite, trace chlorite | 5320780.0 | 383105.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Darwin Granite | LPS,PD,R,LA | |
| 143270 | B2029 | Specular HemVein | To 20 cm wide, vein in a breccia zone | 5320620.0 | 383115.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | LPS,PD,R | |
| 143271 | B2030 | to vein | Width to 20 cm, Massive center but brecciated edges | 5320038.0 | 383236.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD,R | |
| 143272 | B2031 | qz phyric rhy | Blotchy Chlorite and K-Feldspar | 5319656.0 | 383245.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD,R | |
| 143273 | B2032 | fspr phyric dac | Chlorite alt. feld. pheno., Lt. green sericite | 5319503.0 | 383206.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD,R | |
| 143274 | B2033 | Microgranite | Fine-grained equigranular qtz, K-Feld, Plag. , Micas, 1 mm grain size. | 5318390.0 | 383295.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Darwin Granite | PS,PD,R | |
| 143275 | B2035 | fspr phyric dac | Chl alt CVC, sulfides, Cpy, py | 5319158.0 | 383635.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD,R,LA | |
| 143276 | B2036 | fspr phyric dac | Chl alt CVC, sulfides, Cpy, py | 5319158.0 | 383635.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS | |
| 143277 | B2037 | qz phyric rhy | Textures destroyed, qtx eyes. | 5319860.0 | 383915.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | TS,PD,R | |
| 143278 | B2038 | fspr phyric dac | Mag. and Cl alt. of feld. | 5319860.0 | 383915.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD,R | |
| 143279 | B2040 | granite, Pink Granite | Equigranular coarse-grained, pink K-feld., muscovite to 1 mm. scattered. | 5319860.0 | 383915.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Darwin Granite | PD,R | |
| 143280 | B2043 | g'diorite, White Granite | Equigranular coarse-grained, white feldspar, mafics <2%. | 5319608.0 | 383722.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Darwin Granite | LPS,PD,R | |
| 143281 | B2044 | fspr phyric dac | Fractured, mag veins, breccia, sulfides, tourm. veins, contact with DPG. | 5319655.0 | 383500.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD,R | |
| 143282 | B2045 | granite, Pink Granite | Fine to medium-grained, contact with CVC, mag veins, K-Feld. alt. | 5319640.0 | 383515.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Darwin Granite | LPS,PD,R | |
| 143283 | B2046 | 'diorite, white granite aplit | Very fine-grained in Med grained DWG. Assoc. with Qtz. Porphyry. | 5319698.0 | 383755.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Darwin Granite | PS,PD,R | |

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| Catalog# | Field# | Rock Name | Rock Description | AMG Northing | AMG Easting | Position | Area | Lithostratigraphy | Group | Preps | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 143284 | B2047 | fspr phyric dac | Pyrite parallel to "bedding". 30-40 m from DPG contact. | 5319104.0 | 383272.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD,R,LA | |
| 143285 | B2048 | qz phyric rhy | Well foliated lava. Textural destruction mod. | 5319312.0 | 383222.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD,R | |
| 143286 | B2049 | fspr phyric dac | 50 m from contact with DPG, textures destroyed | 5319195.0 | 383250.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | TS,PD,R | |
| 143287 | B2050 | fspr phyric dac | Weathered CVC near small DPG plug. | 5318402.0 | 383235.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD,R | |
| 143288 | B2051 | fspr phyric dac | 1-2% disseminated pyrite 20-30 m above the DPG contact. | 5318380.0 | 383168.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD,R,LA | |
| 143289 | B2052 | to qz vein | K-feld. alt. DPG clasts and minor specular hematite. | 5319068.0 | 383283.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Darwin Granite | PD,R | |
| 143290 | B2053 | granite, Pink Granite | Equigranular coarse-grained, pink K-feld., muscovite to 1 mm. scattered. | 5319565.0 | 383590.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Darwin Granite | LPS,PD,R,MS | |
| 143291 | B2054 | granite, Pink Granite | Equagranular coarse-grained, pink K-feld., muscovite to 1 mm. scattered. | 5319565.0 | 383590.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Darwin Granite | LPS,PD,R | |
| 143292 | B2055 | granite, Pink Granite | Equagranular coarse-grained, pink K-feld., muscovite to 1 mm. scattered. | 5319565.0 | 383590.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Darwin Granite | 2PD,R | |
| 143293 | B2056 | fspr phyric dac | K-feld and Cl alt | 5319344.0 | 383188.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,R | |
| 143294 | B2057 | fspr phyric dac | Fine-grain groundmassand small (1 to 5 mm) feldspar phenocrysts | 5319344.0 | 383188.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Darwin Granite | PS,PD,R | |
| 143295 | B2058 | qz phyric dyke | se alt | 5331373.5 | 383620.2 | Jukes Prospect | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD | |
| 143296 | B2059 | fspr phyric dac | K-feld alt | 5331373.5 | 383620.2 | Jukes Prospect | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD,R | |
| 143297 | B2060 | qz vein | Massive Quartz Vein | 5319344.0 | 383188.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | LPS,PD,R | |
| 143298 | B2061 | g'diorite, White Granite | Coarse-grained quartz porphyry, white feldspar, mafics <2%. | 5319250.0 | 383565.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Darwin Granite | LPS,R,PD | |
| 143299 | B2066 | g'diorite, White Granite | Coarse-grained quartz porphyry, white feldspar, mafics <2%. | 5319250.0 | 383565.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Darwin Granite | LPS,R,MS,RC | |
| 143300 | B2067 | g'diorite, White Granite | Coarse-grained quartz porphyry, white feldspar, mafics <2%. | 5319250.0 | 383565.0 | Mt. Darwin | Jukes-Darwin | Mt. Read Volcanics | Darwin Granite | LPS,R | |
| 143301 | 8100 | qz fspr phyric v'clastic | Feld. quartz bearing, Pale blue-cream, Some Cl Veining | 5330210.0 | 384720.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | PD,R | Collected by Nathan Duhig and Andrew Jones |
| 143302 | 8600 | qz fspr phyric v'clastic | Quartz feld. Phyric, pale gray blue | 5330120.0 | 384320.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | PS,PD,R | Collected by Nathan Duhig and Andrew Jones |
| 143303 | 9500 | qz fspr phyric v'clastic | Weathered gray blue feldspathic | 5330444.0 | 383923.2 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | PD,R | Collected by Nathan Duhig and Andrew Jones |
| 143304 | 9550 | qz fspr phyric v'clastic | Weathered coarse clear quartz crystals | 5330485.0 | 383894.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | PS,R | Collected by Nathan Duhig and Andrew Jones |
| 143305 | 9600 | qz fspr phyric v'clastic | Felds. Quartz Xls. not abundant | 5330524.0 | 383863.1 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | R | Collected by Nathan Duhig and Andrew Jones |
| 143306 | 9650 | qz fspr phyric v'clastic | Feld. and Qtz. crystals, Cl altered lithics | 5330574.0 | 383843.9 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | R | Collected by Nathan Duhig and Andrew Jones |
| 143307 | 9700 | qz fspr phyric v'clastic | Feld. Quartz xls. Coarse grained. | 5330624.0 | 383831.6 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | PS,R | Collected by Nathan Duhig and Andrew Jones |
| 143308 | 9750 | qz fspr phyric v'clastic | Feld. Quartz xls. Coarse grained. | 5330624.0 | 383831.6 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | R | Collected by Nathan Duhig and Andrew Jones |
| 143309 | 9760 | qz fspr phyric v'clastic | Feld. Quartz Xls. Pink weathered. | 5330673.0 | 383821.7 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | PD,R | Collected by Nathan Duhig and Andrew Jones |
| 143310 | 9770 | qz fspr phyric v'clastic | Feld. and Qtz. crystals, coarse grained | 5330683.0 | 383820.5 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | R | Collected by Nathan Duhig and Andrew Jones |
| 143311 | 9780 | qz fspr phyric v'clastic | Feld. Quartz Xls. | 5330693.0 | 383818.3 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | R | Collected by Nathan Duhig and Andrew Jones |
| 143312 | 9790 | qz fspr phyric v'clastic | Feld. and Qtz. crystals, pink weathering | 5330702.0 | 383815.8 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | LPS,R | Collected by Nathan Duhig and Andrew Jones |
| 143313 | 9800 | qz fspr phyric v'clastic | Feld. Quartz Xls,Lots more Felds. | 5330713.0 | 383813.9 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | PD,R | Collected by Nathan Duhig and Andrew Jones |
| 143314 | 9805 | qz fspr phyric v'clastic | Feld. Quartz Xls,Much sericite | 5330722.0 | 383812.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | PD,R | Collected by Nathan Duhig and Andrew Jones |
| 143315 | 9810 | qz fspr phyric v'clastic | Feld. Quartz Xls,Much sericite | 5330722.0 | 383812.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | R | Collected by Nathan Duhig and Andrew Jones |
| 143316 | 9820 | qz fspr phyric v'clastic | Feld. Quartz Xls. | 5330726.0 | 383811.4 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | R | Collected by Nathan Duhig and Andrew Jones |
| 143317 | 9830 | qz fspr phyric v'clastic | Feld. Quartz Xls. | 5330726.0 | 383811.4 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | PD,R | Collected by Nathan Duhig and Andrew Jones |
| 143318 | 9840 | qz fspr phyric v'clastic | Se 50%, Cl 50%, Coarse Felds.+ Qtz.Se. alt of feld. Cl alt Zones | 5330740.0 | 383808.8 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | R | Collected by Nathan Duhig and Andrew Jones |
| 143319 | 9850 | qz fspr phyric v'clastic | Se 50%, Cl 50%, Coarse Felds.+ Qtz.Se. alt of feld. Cl alt Zones | 5330740.0 | 383808.8 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | R | Collected by Nathan Duhig and Andrew Jones |

ied thin section, TS = standard thin section, R = hand sample, RC = rock chips,
er ablation sample. Numbers indicate the number of a specific preparation type.

# Appendix A. Sample Descriptions and Cross-Reference to the University of Tasmania Rock Catalog



| Catalog# | Field# | Rock Name | Rock Description | AMG Northing | AMG Easting | Position | Area | Lithostratigraphy | Group | Preps | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 143320 | 9860 | qz fspr phyric lava | Coarse Feld. | 5330756.0 | 383800.7 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | PS | Collected by Nathan Duhig and Andrew Jones |
| 143321 | 9870 | qz fspr phyric lava | Coarse Feld. | 5330756.0 | 383800.7 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | R | Collected by Nathan Duhig and Andrew Jones |
| 143322 | 9880 | qz fspr phyric lava | Coarse Feld. Mostly Chlorite | 5330771.0 | 383791.5 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | PS,R,RC | Collected by Nathan Duhig and Andrew Jones |
| 143323 | 9900 | qz fspr phyric lava | Coarse feld. Qtz. Pink Feld rimmed by Cl. Se. + Pink feld. dominant | 5330786.0 | 383778.6 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | R | Collected by Nathan Duhig and Andrew Jones |
| 143324 | 9910 | qz fspr phyric lava | Coarse feld. Qtz. Pink Feld rimmed by Cl. Se. + Pink feld. dominant | 5330786.0 | 383778.6 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | R | Collected by Nathan Duhig and Andrew Jones |
| 143325 | 9920 | qz fspr phyric lava | Coarse Feld. + lesser Qtz. | 5330801.0 | 383764.9 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | PS,R,RC | Collected by Nathan Duhig and Andrew Jones |
| 143326 | 9930 | qz fspr phyric lava | Coarse Feld. + lesser Qtz. | 5330801.0 | 383764.9 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | R | Collected by Nathan Duhig and Andrew Jones |
| 143327 | 9940 | qz fspr phyric lava | Felds. Qtz. Xls. Minor lithics(2cm), Cl alt.? | 5330816.0 | 383751.4 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | R | Collected by Nathan Duhig and Andrew Jones |
| 143328 | 9950 | qz fspr phyric lava | Felds. Qtz. Xls. Minor lithics(2cm), Cl alt.? | 5330816.0 | 383751.4 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | R | Collected by Nathan Duhig and Andrew Jones |
| 143329 | 9960 | qz fspr phyric lava | Feld. Phyric | 5330831.0 | 383737.6 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | R | Collected by Nathan Duhig and Andrew Jones |
| 143330 | 9970 | qz fspr phyric lava | Feld. Phyric | 5330831.0 | 383737.6 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | R | Collected by Nathan Duhig and Andrew Jones |
| 143331 | 9980 | bx | Cl>Se, Cl overprint??, Fe staining | 5330847.0 | 383725.3 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | PS,R | Collected by Nathan Duhig and Andrew Jones |
| 143332 | 9990 | bx | Cl>Se, Cl overprint??, Fe staining | 5330847.0 | 383725.3 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | | Collected by Nathan Duhig and Andrew Jones |
| 143333 | 10000 | fault gouge? | Quartz xls | 5330867.0 | 383715.2 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | R | Collected by Nathan Duhig and Andrew Jones |
| 143334 | 10010 | fault gouge? | Quartz xls | 5330867.0 | 383715.2 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | R | Collected by Nathan Duhig and Andrew Jones |
| 143335 | 10020 | qz fspr phyric lava | Feld. Phyric, chlorite in Felds. | 5330887.0 | 383708.5 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | PD,R | Collected by Nathan Duhig and Andrew Jones |
| 143336 | 10030 | qz fspr phyric lava | Feld. Phyric, chlorite in Felds. | 5330887.0 | 383708.5 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | R | Collected by Nathan Duhig and Andrew Jones |
| 143337 | 10040 | qz fspr phyric lava | Feld.-Qtz. phyric, weathered sericite Alt. | 5330906.0 | 383704.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | PS,R | Collected by Nathan Duhig and Andrew Jones |
| 143338 | 10050 | qz fspr phyric lava | Feld.-Qtz. phyric, weathered sericite Alt. | 5330906.0 | 383704.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | R | Collected by Nathan Duhig and Andrew Jones |
| 143339 | 10060 | qz fspr phyric lava | Feld. Phyric, White-Light Green | 5330925.0 | 383696.7 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | R | Collected by Nathan Duhig and Andrew Jones |
| 143340 | 10080 | qz fspr phyric lava | Feld. Phyric, White-Light Green | 5330944.0 | 383691.4 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | R | Collected by Nathan Duhig and Andrew Jones |
| 143341 | 10090 | qz fspr phyric lava | Feld. Phyric, Cream-Lt. green | 5330962.0 | 383683.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | LPS,R | Collected by Nathan Duhig and Andrew Jones |
| 143342 | 10100 | qz fspr phyric v'clastic | Feld. Phyric, no Quartz, finer grained | 5330971.0 | 383678.9 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | PD,R | Collected by Nathan Duhig and Andrew Jones |
| 143343 | 10120 | qz fspr phyric v'clastic | Feld-Qtz. Phyric, chlorite over K-spar, minor Pyrite | 5330980.0 | 383674.5 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | R,RC | Collected by Nathan Duhig and Andrew Jones |
| 143344 | 10130 | qz fspr phyric v'clastic | Feld-Qtz. Phyric, chlorite over K-spar, minor Pyrite | 5330980.0 | 383674.5 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Eastern Quartz-Phyric Sequence | R,RC | Collected by Nathan Duhig and Andrew Jones |
| 143345 | 10140 | qz fspr phyric v'clastic | Cl 90%, Pyrite veinlets, Minor Chalcopyrite visible and minor K-spar | 5330997.0 | 383664.1 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD,R,LA | Collected by Nathan Duhig and Andrew Jones |
| 143346 | 10150 | qz fspr phyric v'clastic | Cl 90%, Pyrite veinlets, Minor Chalcopyrite visible and minor K-spar | 5330997.0 | 383664.1 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | Collected by Nathan Duhig and Andrew Jones |
| 143347 | 10160 | qz fspr phyric v'clastic | Visible pyrite, reminant sulfides, Malachite in float | 5331017.0 | 383658.9 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R,LA | Collected by Nathan Duhig and Andrew Jones |
| 143348 | 10170 | qz fspr phyric v'clastic | Feld. porphyritic (up to 5mm), minor pyrite veinlets | 5331017.0 | 383658.9 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | LPS,R | Collected by Nathan Duhig and Andrew Jones |
| 143349 | 10180 | qz fspr phyric v'clastic | Felds. still preserved | 5331049.0 | 383641.3 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R,LA | Collected by Nathan Duhig and Andrew Jones |
| 143350 | 10190 | qz fspr phyric dyke | K-spar 75%, Cl 25% Lots of large feldspars, minor pyrite | 5331049.0 | 383641.3 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | Collected by Nathan Duhig and Andrew Jones |
| 143351 | 10200 | qz fspr phyric dyke | K-spar 75%, Cl 25% Lots of large feldspars, minor pyrite | 5331062.0 | 383626.7 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD,R,LA | Collected by Nathan Duhig and Andrew Jones |
| 143352 | 10210 | fspr phyric dac lava | breccia, K-Feld 70%, Cl, Mag. 30%, Dark green matrix | 5331068.0 | 383619.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD,R,LA,RC | Collected by Nathan Duhig and Andrew Jones |
| 143353 | 10220 | fspr phyric dac lava | breccia, Lots of pyrite, K-Feld 65-75%, Cl, Mag. 25-35% | 5331074.0 | 383612.2 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD,R | Collected by Nathan Duhig and Andrew Jones |
| 143354 | 10230 | fspr phyric dac lava | breccia, K-Feld 70%, Cl, Mag. 30%, Dark green matrix | 5331068.0 | 383619.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R,LA,RC | Collected by Nathan Duhig and Andrew Jones |
| 143355 | 10240 | fspr phyric dac lava | K-feld 85%, Crosscut by mag-pyr. and tour. chlorite veins | 5331086.0 | 383598.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | Collected by Nathan Duhig and Andrew Jones |

ied thin section, TS = standard thin section, R = hand sample, RC = rock chips,
er ablation sample. Numbers indicate the number of a specific preparation type.

# Appendix A. Sample Descriptions and Cross-Reference to the University of Tasmania Rock Catalog



| Catalog# | Field# | Rock Name | Rock Description | AMG Northing | AMG Easting | Position | Area | Lithostratigraphy | Group | Preps | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 143356 | 10250 | fspr phyric dac lava | K-spar alt., Mag. Py. veins cut massive k-feld. | 5331090.0 | 383589.7 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,R,MS | Collected by Nathan Duhig and Andrew Jones |
| 143357 | 10260 | fspr phyric dac lava | Feld. phyric, Crosscut by pyrite-chlorite veins | 5331094.0 | 383580.1 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | Collected by Nathan Duhig and Andrew Jones |
| 143358 | 10270 | fspr phyric dac lava | Massive Pink-Red K-spar alt. unit, chlorite veins | 5331097.0 | 383571.7 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | LPS,PD,R,MS,GM | Collected by Nathan Duhig and Andrew Jones |
| 143359 | 10280 | fspr phyric dac lava | K-feld 95%, Minor Chlorite veins and mag. | 5331101.0 | 383561.7 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R,RC | Collected by Nathan Duhig and Andrew Jones |
| 143360 | 10290 | fspr phyric dac lava | Veins of Mag., Tourm, Cl, and lots of pyrite and malachite | 5331103.0 | 383551.8 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,R,LA,MS | Collected by Nathan Duhig and Andrew Jones |
| 143361 | 10300 | fspr phyric dac lava | Dark veins 5%, Tourmaline-Chlorite fault here, Malachite, Cl alt. feld. | 5331106.0 | 383542.1 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,R,MS,RC | Collected by Nathan Duhig and Andrew Jones |
| 143362 | 10310 | fspr phyric dac lava | K-spar and Mag with small Cl. veins | 5331108.0 | 383532.2 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | LPS,PD,R | Collected by Nathan Duhig and Andrew Jones |
| 143363 | 10320 | fspr phyric dac lava | K-spar and Mag with small Cl. veins | 5331111.0 | 383521.5 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R,RC | Collected by Nathan Duhig and Andrew Jones |
| 143364 | 10330 | fspr phyric dac lava | More Cl, Se west ot fault, v. little k-spar Minor K-feld.(<10%),Se-Cl | 5331116.0 | 383513.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,R | Collected by Nathan Duhig and Andrew Jones |
| 143365 | 10340 | fspr phyric dac lava | Groundmass, Cl alt. feld, no sulf. | 5331121.0 | 383504.2 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD,R | Collected by Nathan Duhig and Andrew Jones |
| 143366 | 10350 | fspr phyric dac lava | cl alt | 5331126.0 | 383495.6 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | LPS,R.LA,MS,GM | Collected by Nathan Duhig and Andrew Jones |
| 143367 | 10360 | fspr phyric dac lava | K-Feld. 70% | 5331131.0 | 383486.8 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R,RC | Collected by Nathan Duhig and Andrew Jones |
| 143368 | 10370 | fspr phyric dac lava | fine grained mag forms veins, and pseudobx. Cl alt. feld. | 5331135.0 | 383478.7 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | LPS,PD,R | Collected by Nathan Duhig and Andrew Jones |
| 143369 | 10380 | fspr phyric dac lava | Cl.-Tourmaline?? veins, Small Mag. veins, Minor Malac. | 5331140.0 | 383468.3 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R,LA,RC | Collected by Nathan Duhig and Andrew Jones |
| 143370 | 10400 | fspr phyric dac lava | K-Feld 80%, Chlorite veins +/- mag. Minor cubic pyrite | 5331150.0 | 383450.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R,RC | Collected by Nathan Duhig and Andrew Jones |
| 143371 | 10410 | fspr phyric dac lava | K-Feld 80%, Chlorite veins +/- mag. Minor cubic pyrite | 5331150.0 | 383450.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | Collected by Nathan Duhig and Andrew Jones |
| 143372 | 10420 | fspr phyric dac lava | Cl. in places, some feld. altered by sericite, K-feld. 80%, Cl+Se 20% | 5331163.0 | 383432.1 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD,R,MS,GM | Collected by Nathan Duhig and Andrew Jones |
| 143373 | 10430 | fspr phyric dac lava | Cl. in places, some feld. altered by sericite, K-feld. 80%, Cl+Se 20% | 5331163.0 | 383432.1 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | Collected by Nathan Duhig and Andrew Jones |
| 143374 | 10440 | fspr phyric dac lava | K-feld. 65%, Network of chlorite alt and Cl. alt. feld. | 5331178.0 | 383418.3 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R,RC | Collected by Nathan Duhig and Andrew Jones |
| 143375 | 10450 | fspr phyric dac lava | K-feld. 65%, Network of chlorite alt and Cl. alt. feld. | 5331178.0 | 383418.3 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | Collected by Nathan Duhig and Andrew Jones |
| 143376 | 10460 | fspr phyric dac lava | K-spar. 85%, Cl altering phenocrysts 15%. | 5331192.0 | 383403.7 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | Collected by Nathan Duhig and Andrew Jones |
| 143377 | 10470 | fspr phyric dac lava | K-spar. 85%, Cl altering phenocrysts 15%. | 5331192.0 | 383403.7 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | Collected by Nathan Duhig and Andrew Jones |
| 143378 | 10480 | fspr phyric dac lava | K-spar 70%, Some pyrite, Zones of intense Cl-Mag to 1/2 m wide | 5331205.0 | 383389.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R,RC | Collected by Nathan Duhig and Andrew Jones |
| 143379 | 10490 | fspr phyric dac lava | K-spar 70%, Some pyrite, Zones of intense Cl-Mag to 1/2 m wide | 5331205.0 | 383389.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | Collected by Nathan Duhig and Andrew Jones |
| 143380 | 10500 | qz fspr phyric dyke | Qtz. Feld. Porphyry?? Euhedral Qtz. to 4mm. Zones of Cl. Alt. K-Cl Alt. | 5331215.0 | 383377.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | LPS | Collected by Nathan Duhig and Andrew Jones |
| 143381 | 10510 | fspr phyric dac lava | K-Feld altered FPV cut by numerous quartz veins | 5331215.0 | 383377.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,R,MS,GM,RC | Collected by Nathan Duhig and Andrew Jones |
| 143382 | 10520 | qz fspr phyric dyke | Feld. Qtz. porphyry, Qtz. to 5mm, Feld. 6mm, Minor K-spar alt. | 5331220.0 | 383360.9 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,R,LA | Collected by Nathan Duhig and Andrew Jones |
| 143383 | 10530 | qz fspr phyric dyke | Feld. Qtz. porphyry, Qtz. to 5mm, Feld. 6mm, Minor K-spar alt. | 5331220.0 | 383360.9 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R,RC | Collected by Nathan Duhig and Andrew Jones |
| 143384 | 10540 | fspr phyric dac lava | Coarse Feld. Phyric unit, K-spar visible in places | 5331222.0 | 383344.2 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD,R | Collected by Nathan Duhig and Andrew Jones |
| 143385 | 10550 | qz fspr phyric dyke | No Qtz. or Feld. Minor Py-Chalco.?? | 5331221.0 | 383335.1 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD,R,LA | Collected by Nathan Duhig and Andrew Jones |

ıed thin section, TS = standard thin section, R = hand sample, RC = rock chips,
er ablation sample. Numbers indicate the number of a specific preparation type.

# Appendix A. Sample Descriptions and Cross-Reference to the University of Tasmania Rock Catalog



| Catalog# | Field# | Rock Name | Rock Description | AMG Northing | AMG Easting | Position | Area | Lithostratigraphy | Group | Preps | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 143386 | 10560 | fspr phyric dac lava | Minor Pyrite | 5331220.0 | 383326.1 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | Collected by Nathan Duhig and Andrew Jones |
| 143387 | 10570 | qz fspr phyric dyke | Coarse Feld. Porphyry | 5331220.0 | 383326.1 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | Collected by Nathan Duhig and Andrew Jones |
| 143388 | 10580 | qz fspr phyric dyke | Coarse Feld. Porphyry | 5331218.0 | 383307.1 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,R,LA,RC | Collected by Nathan Duhig and Andrew Jones |
| 143389 | 10590 | qz fspr phyric dyke | Coarse Feld. Porphyry | 5331218.0 | 383307.1 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | Collected by Nathan Duhig and Andrew Jones |
| 143390 | 10600 | fspr phyric dac lava | Feld. Phyric, Sericite 80% Perhaps minor K-spar. | 5331215.0 | 383287.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | Collected by Nathan Duhig and Andrew Jones |
| 143391 | 10610 | fspr phyric dac lava | Feld. Phyric, Sericite 80% Perhaps minor K-spar. | 5331215.0 | 383287.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | Collected by Nathan Duhig and Andrew Jones |
| 143392 | 10620 | fspr phyric dac lava | Apparent Granular Terxture, Totally sericitic alt. | 5331211.0 | 383266.8 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD,R | Collected by Nathan Duhig and Andrew Jones |
| 143393 | 10630 | fspr phyric dac lava | Apparent Granular Terxture, Totally sericitic alt. | 5331211.0 | 383266.8 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | Collected by Nathan Duhig and Andrew Jones |
| 143394 | 10640 | fspr phyric dac lava | Sericite 90%, lime green, Minor Chlorite | 5331208.0 | 383247.3 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | Collected by Nathan Duhig and Andrew Jones |
| 143395 | 10650 | fspr phyric dac lava | Sericite 90%, lime green, Minor Chlorite | 5331208.0 | 383247.3 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R,LA | Collected by Nathan Duhig and Andrew Jones |
| 143396 | 10660 | fspr phyric dac lava | Lt. green overprinting k-spar., 60% sericite, 40% k-spar. | 5331207.0 | 383227.6 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | Collected by Nathan Duhig and Andrew Jones |
| 143397 | 10670 | fspr phyric dac lava | Lt. green overprinting k-spar., 60% sericite, 40% k-spar. | 5331207.0 | 383227.6 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | Collected by Nathan Duhig and Andrew Jones |
| 143398 | 10680 | fspr phyric dac lava | Lime green, granular green and white | 5331202.0 | 383208.6 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | Collected by Nathan Duhig and Andrew Jones |
| 143399 | 10690 | fspr phyric dac lava | Lime green, granular green and white | 5331202.0 | 383208.6 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD,R | Collected by Nathan Duhig and Andrew Jones |
| 143400 | 10700 | fspr phyric dac lava | Feldspathic, weak sericite, lt. tan color | 5331198.0 | 383188.5 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | LPS,R | Collected by Nathan Duhig and Andrew Jones |
| 143401 | 10750 | fspr phyric dac lava | Feld. phyric coherent, columinar joints | 5331194.0 | 383137.3 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,R | Collected by Nathan Duhig and Andrew Jones |
| 143402 | 10800 | fspr phyric dac lava | Feldspathic, lime green color | 5331208.0 | 383079.9 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,R,RC | Collected by Nathan Duhig and Andrew Jones |
| 143403 | 10850 | fspr phyric dac lava | green to pink K-spar alt. cl alt clots, weak pink color | 5331239.0 | 383039.6 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,R | Collected by Nathan Duhig and Andrew Jones |
| 143404 | 10900 | fspr phyric dac lava | Feldspathic unit, Minor sericite veinlets, and later chlorite | 5331280.0 | 383008.5 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD,R | Collected by Nathan Duhig and Andrew Jones |
| 143405 | 11400 | v'clastic sst | Feldspathic + lithic sandstone, Chloritized lithic matrix | 5331380.0 | 382510.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | LPS,PD,R | Collected by Nathan Duhig and Andrew Jones |
| 143406 | 11900 | v'clastic sst | feldspathic(minor)unit looks like a sandstone | 5331510.0 | 382010.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD,R | Collected by Nathan Duhig and Andrew Jones |
| 143407 | 12450 | qz phyric v'clastic | Coarse feld. phyric unit, cl overprinted by se and K-feld alt. | 5331680.0 | 381510.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | LPS,R | Collected by Nathan Duhig and Andrew Jones |
| 143408 | 12600 | qz phyric v'clastic | Coarse feld. phyric unit, cl overprinted by se and K-feld alt. | 5331680.0 | 381510.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | Collected by Nathan Duhig and Andrew Jones |
| 143409 | 12800 | qz phyric v'clastic | Feldspathic | 5331500.0 | 381100.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD,R | Collected by Nathan Duhig and Andrew Jones |
| 143410 | 13300 | v'clastic sst | Feldspathic sandstone, some large feld.(2cm), cl stringers | 5331320.0 | 380620.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD,R | Collected by Nathan Duhig and Andrew Jones |
| 143411 | 13800 | qz phyric v'clastic | Feld. Phyric, Cubic pyrite, Silicified+hematite altered zones, Cl dominant | 5330860.0 | 380480.0 | Jukes Road | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,R | Collected by Nathan Duhig and Andrew Jones |
| 143412 | 400501(880329) | qz phyric rhy | weak Chlorite and Se Altered Qtz. phyric rhy. | 5331052.7 | 383700.8 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD | 880329 |
| 143413 | 400503(880331) | qz phyric rhy | Intense K-spar altered QPR, with Q and Q-chl vns. | 5331054.1 | 383690.9 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,R,LA | 880331 |
| 143414 | 400504(880332) | qz fspr phyric v'clastic | Pervasive K-spar alt. rhy., chl. replacement of feld. | 5331054.8 | 383685.9 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,R | 880332 |
| 143415 | 400505(880333) | rhy | mod. chl. altered rhy. , 1% py | 5331055.6 | 383681.0 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,R | 880333 |
| 143416 | 400506(880334) | qz phyric rhy | "jig saw fit" defined by siderite veins | 5331056.3 | 383676.0 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R | 880334 |
| 143417 | 400507(880335) | qz phyric rhy | weak Chl. alt. | 5331057.0 | 383671.1 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS | 880335 |
| 143418 | 400508(880336) | qz fspr phyric v'clastic | | 5331057.8 | 383666.1 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS | 880336 |

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er ablation sample. Numbers indicate the number of a specific preparation type.

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| Catalog# | Field# | Rock Name | Rock Description | AMG Northing | AMG Easting | Position | Area | Lithostratigraphy | Group | Preps | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 143419 | 400509(880337) | qz phyric rhy | Hyaloclastite??. cpy. in K-spar altered clasts | 5331058.5 | 383661.2 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,2PD | 880337 |
| 143420 | 400510(880338) | qz fspr phyric v'clastic | Q, Py, calc.,chl. vn rimmed by k-spar | 5331059.2 | 383656.2 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,2PD | 880338 |
| 143421 | 400511(880339) | qz fspr phyric v'clastic | vns 2%, pyrite in Chl. Hyaloclastite?? | 5331059.9 | 383651.3 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | 2PD | 880339 |
| 143422 | 400512(880340) | qz phyric rhy | Q vnz parallel, Dilational | 5331060.7 | 383646.3 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,LA | 880340 |
| 143423 | 400514(880342) | qz fspr phyric v'clastic | | 5331062.9 | 383631.5 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD | 880342 |
| 143424 | 400515(880343) | qz fspr phyric v'clastic | intense K-Spar alt. | 5331062.9 | 383631.5 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,R | 880343 |
| 143425 | 400518(880346) | qz phyric rhy | Intense K-Spar alt. massive mag vns | 5331065.0 | 383616.7 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD | 880346 |
| 143426 | 400520(880348) | qz phyric rhy | Weak k-spar | 5331066.5 | 383606.8 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,LA | 880348 |
| 143427 | 400522(880349) | qz phyric rhy | mod. silicification | 5331068.0 | 383596.9 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS | 880349 |
| 143428 | 400523(880350) | rhy | K-spar | 5331068.7 | 383591.9 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS | 880350 |
| 143429 | 400524(880351) | qz phyric rhy | | 5331069.4 | 383587.0 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD | 880351 |
| 143430 | 400525(880352) | qz phyric rhy | dissem mag | 5331070.1 | 383582.0 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS | 880352 |
| 143431 | 400527880354) | qz phyric rhy | dissem mag and vn mag, Intense k-spar | 5331071.6 | 383572.1 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS | 880354 |
| 143432 | 400531(880358) | qz phyric rhy | mag/py vns contain 60% py: assay 25ppm Mo | 5331074.5 | 383552.4 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS | 880358 |
| 143433 | 400532(880359) | qz phyric rhy | intense k-spar brecciated by mag vns | 5331075.2 | 383547.4 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | 3PD,R,LA | 880359 |
| 143434 | 400533(880360) | qz phyric rhy | replacement of dilstional q vns by k-spar | 5331076.0 | 383542.5 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD | 880360 |
| 143435 | 400535(880362) | qz phyric rhy | | 5331077.4 | 383532.6 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD | 880362 |
| 143436 | 400536(880363) | qz phyric rhy | | 5331078.2 | 383527.6 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD | 880363 |
| 143437 | 400537(880364) | qz phyric rhy | K-spar alt. Rhy. | 5331078.9 | 383522.7 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | 2PD | 880364 |
| 143438 | 400538(880365) | qz phyric rhy | | 5331079.6 | 383517.7 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,2PD | 880365 |
| 143439 | 400539(880366) | qz phyric rhy | mod. Chloritisation | 5331080.3 | 383512.8 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD | 880366 |
| 143440 | 400540(880367) | qz phyric rhy | Weak alt. | 5331081.1 | 383507.8 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD | 880367 |
| 143441 | 400541(880368) | qz phyric rhy | Chloritised fractures | 5331081.8 | 383502.9 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD | 880368 |
| 143442 | 400542(880369) | qz phyric rhy | K8 clasts in K6 matrix, Hyaloclastite?? | 5331082.5 | 383498.0 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD | 880369 |
| 143443 | 400543(880370) | qz phyric rhy | Py restricted to chlorite alteration | 5331083.3 | 383493.0 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD,R,LA | 880370 |
| 143444 | 400544(880371) | qz phyric rhy | | 5331084.0 | 383488.1 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD | 880371 |
| 143445 | 400545(880372) | rhy | foliation defined by mag and chlorite vns | 5331084.7 | 383483.1 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD,R | 880372 |
| 143446 | 400546(880373) | rhy | K-spar alt | 5331085.4 | 383478.2 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD | 880373 |
| 143447 | 400547(880374) | rhy | | 5331086.2 | 383473.2 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD | 880374 |
| 143448 | 400548(880375) | qz phyric rhy | K-spar alt | 5331086.9 | 383468.3 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,2PD | 880375 |
| 143449 | 400549(880376) | qz phyric rhy | | 5331087.6 | 383463.3 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD | 880376 |
| 143450 | 400550(880377) | qz phyric rhy | K-spar alt | 5331088.4 | 383458.4 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD | 880377 |
| 143451 | 400551(880378) | qz phyric rhy | Chl replaces feld | 5331089.1 | 383453.4 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD | 880378 |
| 143452 | 400552(880379) | fspr phyric dac | Chloritic Alt | 5331089.8 | 383448.5 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,2PD,LA | 880379 |
| 143453 | 400553(880380) | fspr phyric dac | Chl replaces feld | 5331090.5 | 383443.5 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD | 880380 |
| 143454 | 400554(880381) | fspr phyric dac | q-chl vns | 5331091.3 | 383438.6 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD,R | 880381 |
| 143455 | 400556(880383) | fspr phyric dac | Chl replaces feld | 5331092.7 | 383428.7 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,LA | 880383 |
| 143456 | 400557(880384) | fspr phyric dac | Chl replaces feld | 5331093.5 | 383423.8 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS | 880384 |
| 143457 | 400558(880385) | fspr phyric dac | | 5331094.2 | 383418.8 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD | 880385 |
| 143458 | 400559(880386) | fspr phyric dac | | 5331094.9 | 383413.9 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD | 880386 |
| 143459 | 400562(880389) | qz phyric rhy | 5% diss. py, 5% diss mag, k-spar rims | 5331097.1 | 383399.0 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD | 880389 |
| 143460 | 400563(880390) | qz phyric rhy | to mag/py vns | 5331097.8 | 383394.1 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | R,LA | 880390 |
| 143461 | 400565(880392) | qz phyric rhy | Intense k-spar | 5331099.3 | 383384.2 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD | 880392 |
| 143462 | 400566(880393) | fspr phyric dac | Intense k-spar | 5331100.0 | 383379.2 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD | 880393 |
| 143463 | 400567(880394) | fspr phyric dac | | 5331100.7 | 383374.3 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD | 880394 |
| 143464 | 400569(880396) | fspr phyric dac | | 5331102.2 | 383364.4 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD | 880396 |
| 143465 | 400570(880397) | fspr phyric dac | | 5331102.9 | 383359.4 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD | 880397 |
| 143466 | 400575(880402) | rhy | weak Chl and K-spar alt | 5331106.6 | 383334.7 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | LA | 880402 |

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| Catalog# | Field# | Rock Name | Rock Description | AMG Northing | AMG Easting | Position | Area | Lithostratigraphy | Group | Preps | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 143467 | 400576(880403) | qz phyric rhy | weak Chl and K-spar alt | 5331107.3 | 383329.8 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD | 880403 |
| 143468 | 400577(880404) | qz phyric rhy | weak Chl and K-spar alt | 5331108.0 | 383324.8 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,PD,LA | 880404 |
| 143469 | 400578(880405) | rhy | weak Chl and K-spar alt | 5331108.8 | 383319.9 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS | 880405 |
| 143470 | 400581(880408) | qz phyric rhy | weak Chl and K-spar alt | 5331110.9 | 383305.0 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD | 880408 |
| 143471 | 400584(880411) | fspr phyric dac | weak Chl and K-spar alt | 5331113.1 | 383290.2 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD | 880411 |
| 143472 | 400587(880414) | fspr phyric dac | weak Chl and K-spar alt | 5331115.3 | 383275.4 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD | 880414 |
| 143473 | 400589(880416) | fspr phyric dac | weak Chl and K-spar alt | 5331116.8 | 383265.5 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS | 880416 |
| 143474 | 400590(880417) | fspr phyric dac | weak Chl and K-spar alt | 5331117.5 | 383260.5 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PS,R | 880417 |
| 143475 | 400591(880418) | fspr phyric dac | weak Chl and K-spar alt | 5331118.2 | 383255.6 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD,R,LA | 880418 |
| 143476 | 400592(880419) | fspr phyric dac | weak Chl and K-spar alt | 5331119.0 | 383250.6 | King River Tunnel | Jukes-Darwin | Mt. Read Volcanics | Central Volcanic Complex | PD | 880419 |

ıed thin section, TS = standard thin section, R = hand sample, RC = rock chips,
er ablation sample. Numbers indicate the number of a specific preparation type.

# Appendix B

# OTHER CAMBRIAN GRANITE-RELATED Cu-Au PROSPECTS IN THE MRV

## Murchison Gorge

The Murchison Gorge exposes the contact between the Murchison Granite (Figure 1.1) and the EQPS volcanics that closely resemble the volcanic rocks below the ore horizon at Red Hills (Polya et al., 1986; Corbett and Lees, 1987; Corbett, 1992). The volcanic rocks are overlain by the steeply dipping Farrell Slates (Polya, 1981; Corbett and Lees, 1987), similar to the ore horizons at Rosebery and Hercules. Ore styles include disseminated, vein and replacement style pyrite and chalcopyrite associated with chlorite and K-feldspar altered zones near the granite contact.

Polya (1981) and Polya et al. (1986) described four hydrothermal alteration zones related to the intrusion of the Murchison Granite. With increasing distance from the granite, they are: 1) a potassic zone containing K-feldspar + chlorite + epidote + calcite + magnetite + pyrite. 2) an epidote zone of epidote + chlorite + calcite + magnetite ± allanite. 3) a chlorite zone of chlorite + sericite + albite. 4) two sericite zones: a) sericite + quartz + calcite + K-feldspar + chalcopyrite + pyrite + chlorite + hematite. b) sericite + quartz. The alteration zones occur parallel to the strike of the contact between the volcanics and the granite with zones 1 and 2 close to the granite boundary. Hydrothermal alteration assemblages within the granite are extensively developed. Intense potassic, chlorite and sericite altered zones and late veins occur throughout the granite (Polya, 1981; Polya et al., 1986; Corbett and Lees, 1987; Abbott, 1992; Davidson, 1998).

At and near the contact with the granite, massive pyrite and/or magnetite have replaced the volcanics, but replacement becomes less intense with increasing distance from the granite. Apart from some disseminated pyrite, little sulfide exists higher in the section, except for chalcopyrite in some K-feldspar veinlets. Decreasing MgO and increasing FeO in chlorites, away from the granite, are consistent with a decrease in temperature (Polya et al., 1986).

Mineralogical zoning and sulfur isotope values are consistent mineralisation bein associated with the intrusion of the Murchison Granite and its interaction with Cambrian seawater (Polya et al., 1986; Eastoe et al., 1987; Solomon et al., 1988; Abbott, 1992). Arguments by Polya et al. (1986) suggest that the Murchison Gorge, Lake Selina, and Red Hills sections are all part of a continuum through a Cambrian massive sulfide system and that the Murchison Granite acted as the heat engine and also provided some of the metal budget.

## Lake Selina

Volcanic rocks in the Lake Selina area (Figure 1.1) were intruded by Cambrian granites similar to the Murchison Granite. Lake Selina ore styles consist of disseminated and cross-cutting veins of magnetite, pyrite, chalcopyrite and sphalerite. At the contacts with the granite, replacement zones contain magnetite, pyrite, chlorite and minor galena (Eastoe et al., 1987). The major hydrothermal alteration styles; K-feldspar, chlorite and sericite/quartz/carbonate occur in discrete overlapping zones (Hunns, 1987). K-feldspar varies from total replacement of the volcanics to cross-cutting veins with diffuse edges. K-feldspar has been replaced by later cryptocrystalline

chlorite ± magnetite ± pyrite. Chlorite alteration styles vary from total replacement of the rocks to passive diffuse replacement with increasing distance from the centre of the system. Intensely chlorite altered rocks commonly occur as breccias with chlorite matrices (Hunns, 1987). Two zones of sericite altered rocks occur. The first forms an outer zone around the K-feldspar zone and decreases in intensity with increasing distance from the K-feldspar zone. The second zone occurs within the K-feldspar and chlorite zone and overprinting relationships were observed (Hunns, 1987). Carbonate veins cross-cut all three major hydrothermal alteration styles. Magnetite, pyrite and chalcopyrite occur in veins and disseminations in close association with chlorite alteration styles, although pyrite occurs in the sericite/quartz zone.

It has been proposed that Lake Selina is a small-scale massive sulfide system (Solomon et al., 1987b) or a stockwork feeder system to a larger (yet undiscovered) massive sulfide system (Cartwright, 1984). However, the shape of the hydrothermal alteration zones closely follows the shape of the underlying Murchison Granite, and the alteration zones have closer affinities to porphyry-copper or granite-related hydrothermal alteration systems than to VHMS systems (Large, 1988; Hunns, 1997). In addition, sulfur isotope values suggest hydrothermal fluids that formed the sulfides at Lake Selina were derived from the Murchison Granite (Eastoe, 1980; Eastoe et al., 1987; Hunns, 1987; Solomon et al., 1988). This conclusion is supported by lead isotope signatures that suggest a Precambrian source for the lead, similar to the lead at Rosebery (Gulson and Porritt, 1987).

## Red Hills

The Red Hills Prospect is located approximately 22 km north of Mt. Lyell (Figure 1.1). Two ore styles occur; a narrow (3 metre thick) massive sulfide lens containing banded sphalerite, galena and minor chalcopyrite (44% combined lead-zinc) and stockwork veins of pyrite, chalcopyrite and magnetite. The sulfides occur within a sequence of interbedded black shales and clastic and coherent felsic volcanics of the CVC (Eastoe et al., 1987; Jenkins, 1991). The massive sulfide lens is similar to Rosebery in metal contents, host rock associations, isotopic signatures, Zn-ratio and hydrothermal alteration assemblages. Stockwork veins occur within and outside a crude brecciated pipe-like alteration zone that contains and underlies the massive sulfide lens. Hydrothermal alteration assemblages are not conformable to lithological facies and occur in discrete zones (Eastoe et al., 1987). The uppermost zone (A) contains quartz + albite + chlorite + calcite. Zone B is transitional into a middle Zone C of quartz + sericite + chlorite. In Zone C, quartz occurs as silicification and accompanies the massive sulfide lens. Zone D underlies Zone C and contains quartz + K-feldspar + chlorite + magnetite + pyrite. Sericite alteration is intensly developed in sheared zones, however shearing is interpreted to have occurred after the hydrothermal alteration. Chlorite typically occurs as intense chlorite replacements around the margins of veins that cross-cut K-feldspar alteration assemblages and is confined to the pipe-like zone. The pipe widens with depth and the K-feldspar content increases. The chlorite and K-feldspar alteration assemblages have been overprinted by late carbonate veins.

Ore styles at Red Hills have been interpreted to be of two genetic origins: 1) syngenetic gold-rich massive sulfide pods and, 2) stockwork veins similar to other granite-related mineral occurrances in the MRV (Large, 1988; Jenkins, 1991). Evidence for a syngenetic origin for the massive sulfide lens is restricted to the coincident occurrence with black shales and the sulfide banding. Based

on geophysical interpretations, the Red Hills Prospect is believed to directly overlie a buried Cambrian granite (Payne, 1991; Large et al., 1996). Secondary K-feldspar abundances increases with depth, consistant with a granite-related model. Lead isotope data for the massive and disseminated sulfides is similar to the lead isotopes from Rosebery, Lake Selina and Elliott Bay and suggests a Precambrian source, and lead isotopes for the black shales give a Cambrian age (Gulson and Porritt, 1987).

## Lake Dora

At Lake Dora (Figure 1.1), disseminations and veinlets of pyrite, chalcopyrite, galena and sphalerite are associated with magnetite and hematite veins. The sulfides occur within a single prominent chloritised quartz "grit" horizon stretching for over 3 km in a northerly direction (Solomon et al., 1988). The "grit" occurs within a sequence of quartz-feldspar-phyric volcanics and associated volcaniclastic conglomerates similar to Tyndall Group rocks (Corbett, 1981; Solomon et al., 1988; Corbett, 1992). $\delta^{34}S$ values (+10-14‰) from the magnetite-pyrite veins and disseminated sulfides are similar to values from the Jukes-Darwin area (Solomon et al., 1988).

## Beatrice

A section similar to the Red Hills section occurs at the Beatrice Prospect northeast of Mt. Lyell (Figure 1.1). Ore styles include veinlets and small (<3 cm) lens-like replacements of pyrite, sphalerite, galena and minor chalcopyrite within the volcaniclastic and shale sequence (Hope, 1999). Hydrothermal alteration assemblages recognised by Hope (1999) are: 1) pervasive sericite + quartz + carbonate, 2) pervasive chlorite, 3) chlorite replacement of pumice clasts and volcaniclastics, 4) chlorite in veins and replacements in previously K-feldspar altered rocks, 5) K-feldspar/adularia altered rhyolite clasts and pumice fragments, 6) K-feldspar + chlorite + magnetite replacement of volcanic textures, 7) K-feldspar + quartz ± carbonate ± chlorite ± sulfide veins. Chlorite alteration (4) occurred between K-feldspar events 6 and 7. Pyrite increases with chlorite content in the rocks. Magnetite and hematite occur at depth beneath the prospects in association with K-feldspar alteration assemblages.

Within the volcaniclastic units, sulfides are typically concentrated at the upper contacts between fine and coarse graded units and occur in fine anastomosing veinlets parallel to the contact in association with an increase in hydrothermal chlorite alteration intensities. Deeper in the system, chalcopyrite is intergrown with pyrite in veins within K-feldspar-chlorite-magnetite altered volcanics. In the shale unit, pyrite + sphalerite + galena occur with arsenopyrite, marcasite and pyrrhotite. Sulfides occur in bedding parallel and discordant veinlets, and as selective replacements that rim carbonate and evaporite laminae (Hope, 1999).

Carbon and oxygen isotope data from vein carbonates (mean -4.3‰ and +10.4‰ respectively) are consistent with Cambrian hydrothermal fluids as defined by Khin Zaw (1991). Sulfur isotopes support an interpretation of seawater and rock sulfur as the source. Lead isotope data support a Precambrian source for lead (Hope, 1999).

The two genetic interpretations for the Beatrice Prospect are (1) epigenetic veins and selective replacements (Wilde and Kerr, 1990; Hope, 1999), and (2) bedded syn-sedimentary sulfides (Boyd, 1994). Limestone clasts and evaporite laminae suggest that the depositional environment was shallow water. As a result, fluids may have boiled resulting in footwall brecciation and

stockwork ore styles rather than massive sulfide accumulation. The occurrence of hydrothermal K-feldspar + magnetite suggest a relationship to the Cambrian granites, however the nearest granite is at least 2 km to the east. Isotopic evidence does not conclusively support either an epigenetic or syngenetic model.

## Lake Burbury Prospect

A small (100-200 metres long by <100 metres wide) zone of hydrothermal sericite-chlorite-K-feldspar alteration assemblages occurs in association with a series of magnetite ± tourmaline ± pyrite veins in Tyndall Group volcaniclastic rocks 4 km east of Mt. Lyell (Jaeger, 1996). Ore styles include magnetite, magnetite-tourmaline, quartz-hematite, pyrite and quartz-pyrite-chalcopyrite veins. In addition magnetite-chlorite ± tourmaline and magnetite-hematite breccias occur, although their genesis is unknown. Overall, the ore and hydrothermal alteration styles are identical to those observed along Jukes Road in the current study and were concluded to be related to buried Cambrian granite (Jaeger, 1996). Although small, this occurrence of granite-related alteration and ore styles suggests that processes similar to those at the Darwin and Murchison Granites continued at least until lower Tyndall Group time in the eastern Mt. Lyell area. Large et al. (1996) extended the interpreted the granite ridge from the Jukes Prospect northward at depth below to the east Mt. Lyell area.

## Garfield Prospect

The Garfield andesites (Sections 4.3.1.6 and 4.4.5. Figure 5.2) are comprised of two hornblende-phyric phases that intruded rhyolitic volcanics of the YRS and are texturally and compositionally similar to Suite II Crown Hill and Anthony Road andesites (Crawford et al., 1992; Halley et al., 1996). Their contacts with the enclosing rocks are sharp, consistent with intrusive emplacement. In the overlying sequence, a feldspar-phyric lava occurs that is interpreted to be the highest occurrance of CVC rocks in the local stratigraphy (this study). The CVC lavas were intruded by andesitic dykes of similar composition to the main Garfield andesites constraining the timing of the andesite intrusion to post-CVC emplacement. One of the Garfield andesites has geochemical similarities to the granodiorite phase of the Murchison Granite. Two of the Garfield andesites, however have REE patterns similar to the Lyell-Comstock andesites and are typical Suite II rocks (Crawford et al., 1992).

Pyrite and chalcopyrite are principally hosted in the main Garfield andesites (Halley et al., 1996; Duncan, 1997). They occur in veins and as disseminations. Magnetite and apatite (Plate 5.11C) occur in veins with alteration halos around fractures, and as disseminated grains. Pervasive chlorite-sericite alteration is associated with the ore minerals. Disseminated sulfides are confined to a zone within 20 metres of the andesite contacts. The copper to gold ratio of 3(%) Cu to 1 (ppm) Au is consistent throughout the prospect. Zinc and lead values are low. Sulfur and oxygen isotope values from pyrite and magnetite respectively, apatite REE patterns and apatite $\varepsilon Nd_{(500My)}$ values, support the conclusion that the ores formed from magmatic fluids with little or no local rock input (Halley et al., 1996; Duncan, 1997). Sulfide precipitation occurred as a result of pH increase or cooling (Duncan, 1997).

## Elliott Bay

In the Elliott Bay region (Figure 1.1), CVC volcanics were intruded by the Cambrian Elliott Bay Granite (Chapters 3, Sections 3.2.2.3 and 3.3). The Elliott Bay Granite was interpreted to be a subvolcanic intrusion and the volcanics are composed of a mixture of quartz-clastics, porphyritic felsic lavas and intrusions, and minor intercalated conglomerates and shales (Large et al., 1987).

Ore styles include several small (3-6 metres wide and 10-20 metres long) but high-grade (up to 36 % combined lead-zinc) stratiform massive sulfide lenses, disseminated domains of galena, sphalerite and pyrite and disseminated and quartz vein gold. The massive sulfide lenses lack footwall stringer alteration styles suggesting that they were deposited distal to the hydrothermal vents (Large et al., 1987). In addition, veins and disseminations of galena-sphalerite-carbonate occur associated with porphyries and volcaniclastics and lead-isotope studies suggest that they are younger than, and possibly unrelated to the massive sulfides (Gulson and Porritt, 1987). Several breccia styles occur including volcaniclastics, hematite breccias with chlorite altered clasts, and tourmaline breccias and breccia veins (Garrett, 1989).

South of the massive sulfide lenses, a laterally extensive zone of hydrothermal chlorite and sericite alteration assemblages occurs that is underlain by extensive disseminations and stockworks of magnetite. The chlorite-sericite alteration assemblages and associated magnetite veins were reported to be similar to hydrothermal alteration assemblages at Mt. Darwin and the Murchison Granite (Large et al., 1987). The chlorite magnetite zone occurs at a lower stratigraphic level than the massive sulfides and was interpreted to be related to deep hydrothermal circulation associated with intrusion of the granitic porphyries (Large et al., 1987).

The genetic model for the Elliott Bay massive sulfides and associated Cu-Au ores involves three stages (Gulson et al., 1987; Large et al., 1987): 1) extension, thinning and rifting of the Tyennan basement, 2) eruption of pyroclastics into a partially submarine, partially subaerial environment, penetration of seawater along the rift margins and initiation of the hydrothermal circulation system to form the stratiform massive sulfides, 3) Intrusion of high-level granites and quartz porphyries and formation of the hydrothermal chlorite-magnetite alteration styles and associated gold. Lead isotope values suggest the source of metals was the Precambrian basement.

# Appendix C. Whole Rock and Trace Element Geochemical Data for the Cambrian Granites of Western Tasmania.



## Darwin Granite

| Sample Number | 41174 | 41372 | 41373 | 41374 | 41375 | 840200 | GS1 | GS2 | GS3 | GS4 | GS5 | GS6 | GS7 | B2028 | B2033 | B2040 | B2043 | B2045 | B2046 | B2053 | B2054 | B2061 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REFERENCE | White, 1975 | White, 1975 | White, 1975 | White, 1975 | White, 1975 | Crawford et. al., 1992 | Jones, 1993 | Jones, 1993 | Jones, 1993 | Jones, 1993 | Jones, 1993 | Jones, 1993 | Jones, 1993 | Wyman, 1996 | Wyman, 1996 | Wyman, 1996 | Wyman, 1996 | Wyman, 1996 | Wyman, 1996 | Wyman, 1996 | Wyman, 1996 | Wyman, 1996. |
| SiO2 | 75.41 | 77.81 | 79.67 | 79.26 | 72.61 | 76.58 | 78.07 | 77.70 | 78.35 | 80.74 | 79.76 | 75.80 | 76.42 | 69.87 | 78.00 | 75.83 | 78.95 | 74.59 | 77.96 | 76.78 | 77.58 | 78.37 |
| TiO2 | 0.18 | 0.06 | 0.12 | 0.19 | 0.21 | 0.22 | 0.23 | 0.19 | 0.20 | 0.21 | 0.27 | 0.19 | 0.21 | 0.61 | 0.09 | 0.19 | 0.16 | 0.21 | 0.28 | 0.16 | 0.16 | 0.17 |
| Al2O3 | 13.86 | 12.84 | 13.41 | 14.07 | 9.73 | 14.52 | 13.43 | 12.57 | 13.07 | 14.73 | 14.17 | 13.78 | 13.74 | 14.35 | 12.72 | 13.13 | 13.95 | 13.25 | 13.58 | 13.46 | 12.91 | 13.73 |
| Fe2O3 | 1.65 | 0.75 | 0.70 | 0.61 | 13.48 | 1.74 | 1.80 | 2.74 | 1.93 | 0.41 | 2.46 | 1.98 | 1.55 | 6.74 | 0.62 | 1.90 | 0.33 | 1.06 | 1.32 | 0.79 | 0.72 | 0.53 |
| MnO | 0.00 | 0.00 | 0.00 | 0.00 | 0.24 | 0.02 | 0.01 | 0.01 | 0.00 | 0.01 | 0.10 | 0.00 | 0.00 | 0.03 | 0.01 | 0.01 | 0.01 | 0.01 | 0.05 | 0.01 | 0.01 | 0.02 |
| MgO | 0.35 | 0.08 | 0.27 | 0.09 | 1.27 | 0.38 | 0.58 | 0.35 | 0.33 | 0.22 | 0.31 | 0.41 | 0.33 | 1.16 | 0.12 | 0.34 | 0.23 | 0.27 | 0.29 | 0.19 | 0.16 | 0.14 |
| CaO | 0.17 | 0.17 | 0.08 | 0.56 | 0.15 | 0.28 | 0.04 | 0.05 | 0.02 | 0.30 | 0.19 | 0.09 | 0.10 | 0.01 | 0.24 | 0.07 | 0.39 | 0.01 | 0.57 | 0.03 | 0.03 | 1.00 |
| Na2O | 2.73 | 2.98 | 3.01 | 4.09 | 0.06 | 3.15 | 1.19 | 0.19 | 1.04 | 3.82 | 3.09 | 2.23 | 2.45 | 0.13 | 3.00 | 1.90 | 4.19 | 0.33 | 4.62 | 2.30 | 2.06 | 4.70 |
| K2O | 5.47 | 5.27 | 2.66 | 1.10 | 2.06 | 4.66 | 6.68 | 7.92 | 7.23 | 1.97 | 2.33 | 6.86 | 6.63 | 6.82 | 5.22 | 6.46 | 1.78 | 9.92 | 1.31 | 6.03 | 6.17 | 1.31 |
| P2O5 | 0.06 | 0.02 | 0.00 | 0.00 | 0.13 | 0.03 | 0.03 | 0.05 | 0.04 | 0.00 | 0.00 | 0.05 | 0.04 | 0.07 | 0.01 | 0.04 | 0.01 | 0.04 | 0.02 | 0.03 | 0.02 | 0.01 |
| Total (Vol. Free) | 99.90 | 99.98 | 99.92 | 99.99 | 99.95 | 101.58 | 102.06 | 101.78 | 102.21 | 102.42 | 102.69 | 101.38 | 101.48 | 99.80 | 100.02 | 99.87 | 100.00 | 99.70 | 99.99 | 99.79 | 99.82 | 99.99 |
| FeO | 1.49 | 0.67 | 0.63 | 0.55 | 12.13 | 1.56 | 1.62 | 2.46 | 1.74 | 0.37 | 2.21 | 1.78 | 1.40 | 6.06 | 0.56 | 1.71 | 0.30 | 0.96 | 1.19 | 0.71 | 0.65 | 0.47 |
| A | 0.136 | 0.126 | 0.132 | 0.138 | 0.095 | 0.142 | 0.132 | 0.123 | 0.128 | 0.144 | 0.139 | 0.135 | 0.135 | 0.141 | 0.125 | 0.129 | 0.137 | 0.130 | 0.133 | 0.132 | 0.127 | 0.135 |
| C | 0.003 | 0.003 | 0.001 | 0.010 | 0.003 | 0.005 | 0.001 | 0.001 | 0.000 | 0.005 | 0.003 | 0.002 | 0.002 | 0.000 | 0.004 | 0.001 | 0.007 | 0.000 | 0.010 | 0.001 | 0.001 | 0.018 |
| N | 0.044 | 0.048 | 0.049 | 0.066 | 0.001 | 0.051 | 0.019 | 0.003 | 0.017 | 0.062 | 0.050 | 0.036 | 0.040 | 0.002 | 0.048 | 0.031 | 0.068 | 0.005 | 0.074 | 0.037 | 0.033 | 0.076 |
| K | 0.058 | 0.056 | 0.028 | 0.012 | 0.022 | 0.049 | 0.071 | 0.084 | 0.077 | 0.021 | 0.025 | 0.073 | 0.070 | 0.072 | 0.055 | 0.069 | 0.019 | 0.105 | 0.014 | 0.064 | 0.066 | 0.014 |
| A/CNK | 1.29 | 1.18 | 1.68 | 1.57 | 3.73 | 1.35 | 1.45 | 1.40 | 1.36 | 1.64 | 1.78 | 1.22 | 1.21 | 1.88 | 1.15 | 1.28 | 1.46 | 1.17 | 1.35 | 1.30 | 1.27 | 1.25 |
| A/NK | 1.33 | 1.21 | 1.71 | 1.77 | 4.17 | 1.42 | 1.46 | 1.42 | 1.37 | 1.75 | 1.86 | 1.24 | 1.23 | 1.89 | 1.20 | 1.30 | 1.58 | 1.17 | 1.51 | 1.30 | 1.28 | 1.50 |
| S | | | | | NA | | | | | | | | | 0.26 | <0.01 | <0.01 | <0.01 | 0.01 | 0.01 | 0.01 | 0.01 | <0.01 |
| Sc | 1 | 2 | | | 8 | 3 | 3 | 4 | 3 | | | 2 | 3 | 14 | <2 | 3 | <2 | 5 | 3 | 4 | 2 | 1 |
| Tl | | | | | NA | | | | | | | | | | | | | | | | | |
| V | 27 | 26 | 17 | 24 | 156 | 21 | 19 | 20 | 18 | 2 | 4 | 16 | 17 | 53 | 2 | 16 | <1.5 | 14 | 26 | 8 | 7 | 2 |
| Cr | 20 | 30 | 22 | 23 | 0 | 1 | 3 | 2 | 2 | 3 | 4 | 2 | 3 | 4 | 2 | 2 | 2 | 4 | 2 | 2 | 2 | 2 |
| Co | | | | | | | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | | | | | | | | | |
| Ni | 1 | 2 | | | 0 | 1 | 2 | 3 | 2 | 2 | 3 | 5 | 5 | 2 | 1 | <1 | <1 | 2 | <1 | 1 | 1 | <1 |
| Cu | | | | | NA | | 7 | 97 | 28 | 6 | 11 | 14 | 8 | 29 | 7 | 7 | 2 | 4 | 3 | 7 | 6 | 3 |
| Zn | | | | | NA | | 42 | 316 | 42 | 19 | 48 | 17 | 18 | 41 | 24 | 32 | 11 | 11 | 42 | 13 | 12 | 21 |
| As | | | | | NA | | <3 | <3 | <3 | <3 | <3 | <3 | <3 | 13 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 |
| Br | | | | | | | 1.2 | 1.5 | <1 | <1 | <1 | 1.9 | 1 | | | | | | | | | |
| Rb | 185 | 215 | 115 | 47 | 105 | 135 | 196 | 211 | 190 | 74 | 116 | 200 | 195 | 249 | 213 | 182 | 61 | 227 | 53 | 146 | 148 | 43 |
| Sr | 130 | 56 | 96 | 183 | 4 | 138 | 48 | 59 | 52 | 115 | 75 | 67 | 58 | 51 | 26 | 68 | 241 | 103 | 135 | 51 | 61 | 205 |
| Zr | 138 | 65 | 90 | 156 | 46 | 132 | 134 | 124 | 134 | 134 | 190 | 128 | 137 | 239 | 65 | 115 | 133 | 162 | 216 | 121 | 110 | 123 |
| Nb | 12 | 20 | 17 | 19 | 16 | 14 | 13 | 11 | 12 | 14 | 20 | 12 | 13 | 8.6 | 16.7 | 13.4 | 17.2 | 12.4 | 21.8 | 15 | 15.2 | 14.8 |
| Mo | | | | | NA | | | | | | | | | | | | | | | | | |
| Ag | | | | | | | | | | | | | | | | | | | | | | |
| Cd | | | | | | | | | | | | | | | | | | | | | | |
| Sn | | | | | NA | | 1.8 | 4.5 | 2.7 | 1.1 | 3.8 | 2.4 | 1.4 | 5.7 | 1.1(<1.5) | 2.8 | 1.8 | 2.8 | 1.3(<1.5) | 2.1 | 2.3 | 2.0 |
| Sb | | | | | | | | | | | | | | | | | | | | | | |
| Cs | | | | | | | | | | | | | | | | | | | | | | |
| Ba | 896 | 234 | 748 | 100 | 468 | 1385 | 1240 | 3152 | 1941 | 416 | 444 | 1348 | 1151 | 2105 | 88 | 1127 | 185 | 2502 | 114 | 1759 | 1736 | 211 |
| La | 103 | 43 | 37 | 33 | NA | 44.7 | 69.8 | 80.2 | 55.8 | 3.9 | 4.7 | 57.9 | 65.2 | 42 | 19 | 72 | 2 | 74 | 36 | 50 | 30 | 5 |
| Ce | | | | | NA | 89.5 | 115.1 | 132.9 | 99.9 | 6.4 | 8.5 | 96.4 | 106.3 | 95 | 33 | 134 | 4 | 139 | 56 | 110 | 65 | 9 |
| Nd | | | | | | 26.5 | | | | | | | | 44 | 9 | 41 | 3 | 55 | 19 | 37 | 20 | 3 |
| Y | 25 | 10 | 10 | 3 | 15 | 18 | 18 | 22 | 18 | 2 | 7 | 12 | 14 | 41 | 8 | 18 | 4 | 25 | 12 | 10 | 9 | 3 |
| W | | | | | | | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | | | | | | | | | |
| Tl | | | | | | | | | | | | | | | | | | | | | | |
| Pb | 23 | 8 | 25 | 43 | 5 | | 50 | 327 | 196 | 14 | 19 | 6 | 6 | 14 | 10 | 8 | 3 | 8 | 5 | <1.5 | 2 | 9 |
| Bi | | | | | NA | | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | 5.9 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| Th | | | | | NA | | 32 | 37 | 35 | 41 | 45 | 39 | 44 | 13 | 33 | 32 | 44 | 19 | 41 | 42 | 40 | 36 |
| U | | | | | NA | | 4.8 | 11.6 | 4.8 | 0.9 | 1.7 | 7.4 | 8.6 | 3.3 | 7.7 | 4.5 | 1.5 | 4.1 | 4.8 | 3.5 | 5.2 | 1.5 |
| CuO | | | | | NA | | | | | | | | | | | | | | | | | |
| Ti/Zr | 7.98 | 5.61 | 8.20 | 7.46 | 27.64 | 10.15 | 10.31 | 9.28 | 8.84 | 9.44 | 8.58 | 9.01 | 9.27 | 15.26 | 8.36 | 10.05 | 7.27 | 7.88 | 7.67 | 7.96 | 8.73 | 8.39 |
| Zr/Nb | 11.50 | 3.25 | 5.29 | 8.21 | 2.88 | 9.43 | 10.31 | 11.27 | 11.17 | 9.57 | 9.50 | 10.67 | 10.54 | 27.78 | 3.86 | 8.60 | 7.72 | 13.04 | 9.89 | 8.07 | 7.22 | 8.32 |
| Nb/Y | 0.48 | 2.00 | 1.70 | 6.33 | 1.07 | 0.78 | 0.72 | 0.50 | 0.67 | 7.00 | 2.86 | 1.00 | 0.93 | 0.21 | 2.23 | 0.74 | 4.20 | 0.49 | 1.88 | 1.52 | 1.75 | 5.92 |
| P2O5/TiO2 | 0.33 | 0.33 | 0.00 | 0.00 | 0.62 | 0.14 | 0.14 | 0.26 | 0.21 | 0.00 | 0.00 | 0.26 | 0.19 | 0.12 | 0.11 | 0.21 | 0.06 | 0.19 | 0.07 | 0.19 | 0.13 | 0.06 |

# Appendix C. Whole Rock and Trace Element Geochemical Data for the Cambrian Granites of Western Tasmania.

## Murchison Granite

| Sample Number | LJ29 | LJ26 | LJ47 | LJ48 | LJ50 | LJ43 | CH340 | LJ30 | LJ28 | B208 | A773 | A530 | A774 | LS12/A | 61610 | 61611 | 30028 | T04135 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reference | Polya et al., (1986) | Polya et al., (1986) | Polya et al., (1986) | Polya et al., (1986) | Polya et al., (1986) | Polya et al., (1986) | Polya et al., (1986) | Polya et al., (1986) | Polya et al., (1986) | Polya et al., (1986) | McNeill and Corbett (1992) | McNeill and Corbett (1992) | McNeill and Corbett (unpubl.) | Stoltz and Large (1988) | Polya (1981) | Polya (1981) | Brooks (1962) | Hunns, 1998 (unpubl.) |
| SiO2 | 62.80 | 60.46 | 64.29 | 62.76 | 61.56 | 64.15 | 80.81 | 75.79 | 74.24 | 63.37 | 63.86 | 64.66 | 73.12 | 67.93 | 61.56 | 61.38 | 63.84 | 72.91 |
| TiO2 | 0.78 | 0.84 | 0.65 | 0.74 | 0.81 | 0.84 | 0.12 | 0.20 | 0.22 | 1.04 | 0.83 | 0.81 | 0.37 | 0.44 | 0.80 | 0.93 | 0.79 | 0.49 |
| Al2O3 | 14.80 | 15.43 | 15.08 | 15.26 | 15.54 | 15.60 | 9.98 | 11.98 | 11.98 | 21.76 | 16.02 | 16.39 | 14.29 | 16.09 | 15.76 | 17.04 | 15.80 | 13.74 |
| Fe2O3 | 6.96 | 7.68 | 6.09 | 6.16 | 6.86 | 4.11 | 0.41 | 1.55 | 1.11 | 4.94 | 2.75 | 2.71 | 0.68 | 5.31 | 6.69 | 7.68 | 2.97 | 4.39 |
| MnO | 0.25 | 0.18 | 0.17 | 0.15 | 0.13 | 0.32 | 0.05 | 0.04 | 0.07 | 0.04 | 0.29 | 0.29 | 0.08 | 0.09 | 0.29 | 0.18 | 0.11 | 0.07 |
| MgO | 1.92 | 3.64 | 2.63 | 2.69 | 3.14 | 3.53 | -0.01 | 0.35 | 0.40 | 0.93 | 3.70 | 3.24 | 1.00 | 1.82 | 2.70 | 3.17 | 3.53 | 0.95 |
| CaO | 4.62 | 3.99 | 3.95 | 4.44 | 5.08 | 6.09 | 1.51 | 0.88 | 2.16 | 0.00 | 5.07 | 4.46 | 2.77 | 0.88 | 5.05 | 2.68 | 4.20 | 0.52 |
| Na2O | 2.73 | 2.50 | 2.30 | 4.58 | 2.73 | 2.84 | 0.64 | 0.52 | 1.45 | -0.02 | 2.90 | 2.49 | 5.12 | 6.66 | 3.01 | 2.54 | 3.39 | 0.61 |
| K2O | 4.98 | 5.11 | 4.64 | 3.06 | 4.00 | 2.37 | 6.49 | 8.70 | 8.37 | 7.93 | 4.38 | 4.81 | 2.53 | 0.67 | 3.93 | 4.20 | 5.18 | 6.20 |
| P2O5 | 0.16 | 0.18 | 0.18 | 0.16 | 0.16 | 0.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.21 | 0.14 | 0.05 | 0.11 | 0.22 | 0.20 | 0.19 | 0.10 |
| Total (Vol. Free) | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| FeO | 6.26 | 6.91 | 5.48 | 5.55 | 6.17 | 3.70 | 0.37 | 1.40 | 1.00 | 4.45 | 2.47 | 2.44 | 0.61 | 4.78 | 6.02 | 6.91 | 2.67 | 3.95 |
| A | 0.145 | 0.151 | 0.148 | 0.150 | 0.152 | 0.153 | 0.098 | 0.117 | 0.118 | 0.213 | 0.157 | 0.161 | 0.140 | 0.158 | 0.155 | 0.167 | 0.155 | 0.135 |
| C | 0.082 | 0.071 | 0.070 | 0.079 | 0.091 | 0.109 | 0.027 | 0.016 | 0.039 | 0.000 | 0.090 | 0.079 | 0.049 | 0.016 | 0.090 | 0.048 | 0.075 | 0.009 |
| N | 0.044 | 0.040 | 0.037 | 0.074 | 0.044 | 0.046 | 0.010 | 0.008 | 0.023 | 0.000 | 0.047 | 0.040 | 0.083 | 0.108 | 0.049 | 0.041 | 0.055 | 0.010 |
| K | 0.053 | 0.054 | 0.049 | 0.033 | 0.042 | 0.025 | 0.069 | 0.092 | 0.089 | 0.084 | 0.046 | 0.051 | 0.027 | 0.007 | 0.042 | 0.045 | 0.055 | 0.066 |
| A/CNK | 0.81 | 0.91 | 0.94 | 0.81 | 0.86 | 0.85 | 0.92 | 1.01 | 0.78 | 2.55 | 0.86 | 0.94 | 0.88 | 1.21 | 0.86 | 1.25 | 0.84 | 1.59 |
| A/NK | 1.50 | 1.60 | 1.71 | 1.41 | 1.76 | 2.16 | 1.24 | 1.17 | 1.05 | 2.54 | 1.69 | 1.76 | 1.28 | 1.38 | 1.71 | 1.95 | 1.41 | 1.78 |
| S | | | | | | | | | | | | | | | | | | |
| Sc | | | | | | | | | | | 20 | 21 | 10 | | | | | 17 |
| Tl | | | | | | | | | | | 11 | 10 | 5 | | | | | 2 |
| V | | | | | | | | | | | 170 | 160 | 39 | | | | | 42 |
| Cr | | | | | | | | | | | 105 | 89 | 110 | | | | | 1 |
| Co | | | | | | | | | | | | | | | | | | |
| Nl | | | | | | | | | | | | | | | | | | |
| Cu | | | | | | | | | | | 36 | 34 | 14 | 2 | 11 | 12 | | 1 |
| Zn | | | | | | | | | | | 240 | 430 | 90 | 220 | 258 | 269 | | 121 |
| As | | | | | | | | | | | | 26 | | | | | | 10 |
| Br | | | | | | | | | | | | | | | | | | |
| Rb | 178 | 229 | 222 | 118 | 159 | 142 | 156 | 241 | 229 | 390 | 160 | 200 | 105 | 153 | 155 | 159 | | 290 |
| Sr | 198 | 273 | 344 | 300 | 374 | 364 | 175 | 120 | 90 | 14 | 390 | 340 | 230 | 330 | 300 | 242 | | 57 |
| Zr | 206 | 167 | 153 | 155 | 158 | 190 | 100 | 95 | 122 | 242 | 190 | 185 | 175 | 183 | 187 | 263 | | 377 |
| Nb | 14 | 15 | 18 | 16 | 17 | 15 | 10 | 14 | 11 | 23 | 12 | 12 | 14 | 11 | 12 | 13 | | 17 |
| Mo | | | | | | | | | | | | | | <1 | | | | |
| Ag | | | | | | | | | | | | <5 | | | | | | |
| Cd | | | | | | | | | | | | | | | | | | |
| Sn | | | | | | | | | | | | | | | | | | 1 |
| Sb | | | | | | | | | | | | | | | | | | 8 |
| Cs | | | | | | | | | | | | | | | | | | |
| Ba | | | | | | | | | | | 1250 | 1300 | 580 | | 1124 | 1701 | | 1105 |
| La | | | | | | | | | | | | | | | | | | |
| Ce | | | | | | | | | | | | | | | | | | |
| Nd | | | | | | | | | | | | | | | | | | |
| Y | 25 | 25 | 23 | 29 | 24 | 27 | 16 | 21 | 18 | 11 | 26 | 29 | 28 | 30 | 22 | 29 | | 31 |
| W | | | | | | | | | | | | | | | | | | |
| Tl | | | | | | | | | | | | | | | | | | |
| Pb | | | | | | | | | | | 83 | 92 | 7 | 28 | | | | 10 |
| Bi | | | | | | | | | | | | | | | | | | |
| Th | | | | | | | | | | | | | | | | | | |
| U | | | | | | | | | | | | | | | | | | |
| CuO | | | | | | | | | | | | | | | | | | |
| Tl/Zr | 22.80 | 30.20 | 25.66 | 28.44 | 30.56 | 26.64 | 7.35 | 12.88 | 11.02 | 25.88 | 26.26 | 26.23 | 12.68 | 14.35 | 25.57 | 21.18 | | 7.82 |
| Zr/Nb | 14.71 | 11.13 | 8.50 | 9.69 | 9.29 | 12.67 | 10.00 | 6.79 | 11.09 | 10.52 | 15.83 | 15.42 | 12.50 | 16.64 | 15.08 | 20.87 | | 22.16 |
| Nb/Y | 0.56 | 0.60 | 0.78 | 0.55 | 0.71 | 0.56 | 0.63 | 0.67 | 0.61 | 2.09 | 0.46 | 0.41 | 0.50 | 0.37 | 0.56 | 0.43 | | 0.56 |
| P2O5/TiO2 | 0.20 | 0.21 | 0.28 | 0.22 | 0.20 | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.25 | 0.17 | 0.14 | 0.26 | 0.28 | 0.21 | 0.24 | 0.21 |

# Appendix C. Whole Rock and Trace Element Geochemical Data for the Cambrian Granites of Western Tasmania.

## Murchison Granite

| Sample Number | T04135 DP | T04136 | T04137 | T04137 DP | AT013 | AT016 | AT017 | AT020 | AT025 | AT027 | AT028 | AT047 | AT050 | AT052 | AT053 | AT064 | DH12311.5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reference | Hunns, 1998 (unpubl.) | Hunns, 1998 (unpubl.) | Hunns, 1998 (unpubl.) | Hunns, 1998 (unpubl.) | Abbott, 1992 | Abbott, 1992 | Abbott, 1992 | Abbott, 1992 | Abbott, 1992 | Abbott, 1992 | Abbott, 1992 | Abbott, 1992 | Abbott, 1992 | Abbott, 1992 | Abbott, 1992 | Abbott, 1992 | Crawford et. al., 1992 |
| SiO2 | 73.02 | 66.23 | 68.91 | 69.08 | 70.01 | 76.21 | 76.70 | 67.96 | 69.60 | 65.55 | 63.51 | 67.54 | 58.62 | 77.56 | 76.64 | 76.30 | 70.37 |
| TiO2 | 0.49 | 0.63 | 0.54 | 0.55 | 0.46 | 0.13 | 0.16 | 0.57 | 0.52 | 0.64 | 0.72 | 0.54 | 0.88 | 0.27 | 0.27 | 0.25 | 0.55 |
| Al2O3 | 13.83 | 14.71 | 14.31 | 14.30 | 14.40 | 10.38 | 11.67 | 14.44 | 13.39 | 14.36 | 14.86 | 14.43 | 15.79 | 12.98 | 12.34 | 12.14 | 14.66 |
| Fe2O3 | 4.35 | 5.96 | 4.67 | 4.69 | 3.57 | 0.91 | 0.85 | 5.00 | 4.01 | 5.36 | 6.28 | 4.48 | 8.25 | 0.73 | 1.50 | 1.17 | 4.33 |
| MnO | 0.08 | 0.24 | 0.24 | 0.25 | 0.09 | 0.27 | 0.08 | 0.25 | 0.19 | 0.25 | 0.25 | 0.22 | 0.21 | 0.02 | 0.07 | 0.03 | 0.24 |
| MgO | 0.98 | 2.48 | 1.96 | 1.94 | 1.32 | 0.36 | 0.33 | 2.01 | 1.26 | 2.74 | 3.69 | 2.06 | 3.79 | 0.42 | 0.48 | 0.36 | 2.00 |
| CaO | 0.54 | 4.42 | 3.52 | 3.54 | 1.20 | 3.94 | 1.33 | 2.70 | 2.92 | 2.76 | 3.25 | 2.60 | 5.23 | 1.17 | 0.95 | 0.30 | 3.59 |
| Na2O | 0.47 | 2.72 | 3.15 | 2.99 | 0.92 | 1.62 | 1.00 | 0.70 | 2.08 | 3.38 | 3.07 | 2.63 | 3.38 | 4.96 | 3.01 | 1.87 | 3.22 |
| K2O | 6.15 | 2.48 | 2.57 | 2.54 | 7.92 | 6.16 | 7.86 | 6.22 | 5.89 | 4.80 | 4.18 | 5.39 | 3.60 | 1.83 | 4.71 | 7.53 | 2.62 |
| P2O5 | 0.10 | 0.13 | 0.13 | 0.12 | 0.11 | 0.03 | 0.03 | 0.14 | 0.15 | 0.17 | 0.19 | 0.13 | 0.23 | 0.05 | 0.03 | 0.04 | 0.13 |
| Total (Vol. Free) | 100.00 | 100.00 | 100.00 | 100.00 | 99.99 | 100.00 | 100.00 | 100.00 | 100.01 | 100.00 | 100.01 | 100.02 | 99.99 | 100.00 | 100.01 | 100.00 | 101.71 |
| FeO | 3.91 | 5.37 | 4.20 | 4.22 | 3.21 | 0.82 | 0.76 | 4.50 | 3.61 | 4.83 | 5.65 | 4.03 | 7.42 | 0.66 | 1.35 | 1.05 | 3.89 |
| A | 0.136 | 0.144 | 0.140 | 0.140 | 0.141 | 0.102 | 0.114 | 0.142 | 0.131 | 0.141 | 0.146 | 0.142 | 0.155 | 0.127 | 0.121 | 0.119 | 0.144 |
| C | 0.010 | 0.079 | 0.063 | 0.063 | 0.021 | 0.070 | 0.024 | 0.048 | 0.052 | 0.049 | 0.058 | 0.046 | 0.093 | 0.021 | 0.017 | 0.005 | 0.064 |
| N | 0.008 | 0.044 | 0.051 | 0.048 | 0.015 | 0.026 | 0.016 | 0.011 | 0.034 | 0.055 | 0.050 | 0.042 | 0.054 | 0.080 | 0.049 | 0.030 | 0.052 |
| K | 0.065 | 0.026 | 0.027 | 0.027 | 0.084 | 0.065 | 0.083 | 0.066 | 0.063 | 0.051 | 0.044 | 0.057 | 0.038 | 0.019 | 0.050 | 0.080 | 0.028 |
| A/CNK | 1.65 | 0.97 | 1.00 | 1.01 | 1.18 | 0.63 | 0.93 | 1.13 | 0.89 | 0.91 | 0.96 | 0.97 | 0.83 | 1.06 | 1.05 | 1.03 | 1.00 |
| A/NK | 1.86 | 2.05 | 1.80 | 1.86 | 1.43 | 1.11 | 1.15 | 1.83 | 1.37 | 1.33 | 1.55 | 1.42 | 1.67 | 1.28 | 1.23 | 1.08 | 1.80 |
| S | | | | | | | | | | | | | | | | | |
| Sc | 17 | 21 | 18 | | | | | | | | | | | | | | |
| Tl | 2 | 4 | 3 | 3 | 2698 | 719 | 959 | 3297 | 2998 | 3657 | 4137 | 3177 | 5216 | 1619 | 1619 | 1499 | |
| V | 50 | 135 | 104 | 95 | 81 | 6 | 6 | 78 | 87 | 120 | 144 | 96 | 188 | 10 | 11 | 13 | 104 |
| Cr | 2 | 21 | 16 | 15 | 18 | 2 | | 22 | 18 | 29 | 32 | 21 | 40 | 3 | | | 16 |
| Co | | | | | | | | | | | | | | | | | |
| Ni | | | | | 5 | 2 | 1 | 6 | 5 | 9 | 9 | 6 | 9 | 2 | 1 | 2 | 3 |
| Cu | 2 | 2 | 3 | 1 | 21 | 152 | 4 | 5 | 15 | 4 | 11 | 5 | 26 | 11 | 3 | 4 | |
| Zn | 129 | 221 | 198 | 190 | 121 | 119 | 25 | 184 | 70 | 304 | 337 | 189 | 203 | 18 | 42 | 28 | |
| As | 11 | 9 | 6 | 6 | | | | | | | | | | | | | |
| Br | | | | | | | | | | | | | | | | | |
| Rb | 287 | 153 | 148 | 143 | 336 | 162 | 210 | 300 | 254 | 163 | 178 | 225 | 145 | 93 | 139 | 287 | 148 |
| Sr | 56 | 352 | 345 | 336 | 98 | 177 | 148 | 179 | 207 | 240 | 276 | 211 | 421 | 212 | 183 | 116 | 345 |
| Zr | 373 | 131 | 218 | 209 | 179 | 99 | 133 | 240 | 218 | 189 | 190 | 184 | 166 | 199 | 258 | 188 | 218 |
| Nb | 16 | 14 | 13 | 12 | 21 | 10 | 19 | 16 | 15 | 16 | 15 | 18 | 13 | 21 | 11 | 20 | 13 |
| Mo | | | | | | | | | | | | | | | | | |
| Ag | | | | | | | | | | | | | | | | | |
| Cd | | | | | | | | | | | | | | | | | |
| Sn | | | | 1 | | | | | | | | | | | | | |
| Sb | 9 | 4 | <3 | <3 | | | | | | | | | | | | | |
| Cs | | | | | | | | | | | | | | | | | |
| Ba | 1110 | 434 | 604 | | 3191 | 1647 | 1982 | 1662 | 2299 | 1516 | 1015 | 914 | 1087 | 311 | 1578 | 739 | 604 |
| La | | | | | | | | | | | | | | | | | |
| Ce | | | | | | | | | | | | | | | | | |
| Nd | | | | | | | | | | | | | | | | | |
| Y | 32 | 40 | 36 | 36 | 31 | 23 | 20 | 44 | 28 | 37 | 31 | 40 | 29 | 38 | 18 | 31 | 36 |
| W | | | | | | | | | | | | | | | | | |
| Tl | | | | | | | | | | | | | | | | | |
| Pb | 10 | 31 | 32 | 35 | 87 | 156 | 23 | 103 | 183 | 293 | 137 | 7 | 51 | 12 | 3 | 6 | |
| Bi | | | | | | | | | | | | | | | | | |
| Th | | | | | | | | | | | | | | | | | |
| U | | | | | | | | | | | | | | | | | |
| CuO | | | | | | | | | | | | | | | | | |
| Tl/Zr | 7.85 | 28.74 | 14.81 | 15.73 | 15.53 | 7.60 | 7.36 | 14.34 | 14.37 | 20.15 | 22.76 | 17.58 | 31.95 | 8.24 | 6.37 | 8.05 | 15.12 |
| Zr/Nb | 23.30 | 9.33 | 16.75 | 17.40 | 8.52 | 9.90 | 7.00 | 15.00 | 14.53 | 11.81 | 12.67 | 10.22 | 12.77 | 9.48 | 23.45 | 9.40 | 16.77 |
| Nb/Y | 0.50 | 0.35 | 0.36 | 0.34 | 0.68 | 0.43 | 0.95 | 0.36 | 0.54 | 0.43 | 0.48 | 0.45 | 0.45 | 0.55 | 0.61 | 0.65 | 0.36 |
| P2O5/TiO2 | 0.21 | 0.21 | 0.25 | 0.23 | 0.24 | 0.25 | 0.19 | 0.24 | 0.28 | 0.26 | 0.26 | 0.25 | 0.26 | 0.19 | 0.11 | 0.16 | 0.24 |

# Appendix C. Whole Rock and Trace Element Geochemical Data for the Cambrian Granites of Western Tasmania.

## Elliot Bay Granite

| Sample Number | Mo203 | Mo214 | Mo218 | Mo221 | 61560 | 61561 | 61562 | J700 | 41468 | 41469 | 41471 | 41472 | 41473 | LRP-1 | LRP-2 | LRP-3 | LRP-4 | LRP-5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reference | Brown (1994) | Brown (1994) | Brown (1994) | Brown (1994) | Alexander (1981) | Alexander (1981) | Alexander (1981) | Pemberton and Vicary (1994) | White (1975) | White (1975) | White (1975) | White (1975) | White (1975) | Pemberton and Vicary (1994) | Pemberton and Vicary (1994) | Pemberton and Vicary (1994) | Pemberton and Vicary (1994) | Pemberton and Vicary (1994) |
| SiO2 | 71.13 | 76.25 | 75.96 | 75.69 | 74.67 | 75.36 | 72.77 | 76.25 | 77.86 | 76.62 | 73.37 | 75.82 | 73.09 | 76.99 | 76.79 | 74.33 | 74.90 | 77.65 |
| TiO2 | 0.55 | 0.24 | 0.24 | 0.24 | 0.24 | 0.21 | 0.46 | 0.41 | 0.11 | 0.16 | 0.42 | 0.20 | 0.43 | 0.24 | 0.21 | 0.39 | 0.51 | 0.18 |
| Al2O3 | 13.84 | 12.90 | 12.83 | 12.77 | 13.07 | 13.04 | 13.43 | 13.09 | 12.07 | 12.50 | 13.44 | 12.84 | 13.65 | 13.22 | 13.21 | 13.63 | 13.68 | 12.70 |
| Fe2O3 | 3.43 | 1.05 | 1.33 | 1.05 | 2.34 | 2.25 | 5.65 | 0.06 | 1.01 | 1.76 | 3.13 | 1.90 | 4.58 | 0.33 | 0.73 | 1.86 | 0.60 | 0.23 |
| MnO | 0.02 | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.05 | 0.07 | 0.04 | 0.05 | 0.05 | 0.04 | 0.05 | 0.02 | 0.01 | 0.02 | 0.05 | 0.02 |
| MgO | 1.11 | 0.27 | 0.33 | 0.33 | 0.42 | 0.15 | 1.20 | 0.73 | 0.06 | 0.13 | 0.65 | 0.24 | 1.12 | 0.61 | 0.41 | 1.07 | 0.85 | 0.29 |
| CaO | 2.36 | 1.77 | 1.03 | 1.45 | 1.31 | 1.29 | 1.95 | 1.52 | 0.20 | 0.11 | 1.31 | 1.27 | 1.65 | 0.26 | 0.76 | 2.38 | 1.68 | 0.81 |
| Na2O | 2.98 | 4.64 | 3.39 | 3.67 | 2.88 | 2.82 | 1.20 | 2.59 | 2.79 | 2.49 | 2.41 | 3.03 | 1.59 | 3.17 | 3.17 | 2.60 | 2.34 | 2.48 |
| K2O | 4.51 | 2.87 | 4.89 | 4.60 | 5.00 | 4.83 | 3.22 | 5.17 | 5.86 | 6.14 | 5.15 | 4.62 | 3.77 | 5.13 | 4.68 | 3.65 | 5.29 | 5.61 |
| P2O5 | 0.07 | 0.01 | 0.01 | 0.17 | 0.04 | 0.04 | 0.07 | 0.08 | 0.01 | 0.04 | 0.06 | 0.04 | 0.06 | 0.04 | 0.03 | 0.07 | 0.09 | 0.03 |
| Total (Vol. Free) | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| FeO | 3.09 | 0.94 | 1.19 | 0.94 | 2.11 | 2.03 | 5.09 | 0.06 | 0.91 | 1.58 | 2.82 | 1.71 | 4.12 | 0.30 | 0.66 | 1.67 | 0.54 | 0.20 |
| A | 0.136 | 0.127 | 0.126 | 0.125 | 0.128 | 0.128 | 0.132 | 0.128 | 0.118 | 0.123 | 0.132 | 0.126 | 0.134 | 0.130 | 0.130 | 0.134 | 0.134 | 0.125 |
| C | 0.042 | 0.032 | 0.018 | 0.026 | 0.023 | 0.023 | 0.035 | 0.027 | 0.004 | 0.002 | 0.023 | 0.023 | 0.029 | 0.005 | 0.014 | 0.042 | 0.030 | 0.014 |
| N | 0.048 | 0.075 | 0.055 | 0.059 | 0.046 | 0.045 | 0.019 | 0.042 | 0.045 | 0.040 | 0.039 | 0.049 | 0.026 | 0.051 | 0.051 | 0.042 | 0.038 | 0.040 |
| K | 0.048 | 0.030 | 0.052 | 0.049 | 0.053 | 0.051 | 0.034 | 0.055 | 0.062 | 0.065 | 0.055 | 0.049 | 0.040 | 0.054 | 0.050 | 0.039 | 0.056 | 0.060 |
| A/CNK | 0.98 | 0.92 | 1.01 | 0.94 | 1.04 | 1.07 | 1.49 | 1.04 | 1.07 | 1.14 | 1.13 | 1.04 | 1.41 | 1.18 | 1.13 | 1.08 | 1.08 | 1.09 |
| A/NK | 1.41 | 1.20 | 1.18 | 1.16 | 1.29 | 1.32 | 2.46 | 1.33 | 1.10 | 1.16 | 1.41 | 1.29 | 2.04 | 1.23 | 1.28 | 1.65 | 1.43 | 1.25 |
| S | <300 | <300 | <300 | <300 | | | | 360 | 600 | 800 | 600 | 500 | 800 | 299 | 120 | 300 | 2220 | 299 |
| Sc | <10 | <10 | <10 | <10 | 4 | 3 | 8 | <9 | 3 | 5 | 7 | 4 | 8 | <9 | <9 | <9 | <9 | <9 |
| Tl | | | | | | | | | | | | | | | | | | |
| V | 55 | 16 | 16 | 27 | | | | 18 | 46 | 47 | 57 | 32 | 65 | 12 | 11 | 37 | 29 | 8 |
| Cr | 80 | 81 | 81 | 99 | | | | 72 | 21 | 29 | 40 | 38 | 42 | 44 | 70 | 57 | 63 | 47 |
| Co | 10 | <4 | <4 | <4 | | | | <8 | | | | | | <8 | <8 | <8 | <8 | <8 |
| Ni | 16 | 7 | 4 | 7 | | | | 10 | 9 | 14 | 10 | 5 | 14 | 9 | 7 | 14 | 10 | 9 |
| Cu | 24 | 19 | 18 | 21 | 6 | 17 | 6 | <5 | 0 | 0 | 0 | 10 | 0 | 14 | <5 | <5 | <5 | 5 |
| Zn | 23 | 21 | 15 | 12 | 17 | 18 | 24 | 48 | 0 | 0 | 0 | 0 | 0 | 11 | 8 | 6 | 22 | 12 |
| As | | | | | | | | | | | | | | | | | | |
| Br | | | | | | | | | | | | | | | | | | |
| Rb | 130 | 97 | 145 | 135 | 136 | 135 | 125 | 210 | 368 | 380 | 213 | 161 | 204 | 145 | 140 | 105 | 250 | 270 |
| Sr | 185 | 155 | 99 | 105 | 123 | 112 | 131 | 110 | 56 | 75 | 141 | 158 | 151 | 82 | 105 | 160 | 105 | 42 |
| Zr | 280 | 175 | 165 | 165 | 140 | 152 | 218 | 310 | 90 | 168 | 303 | 176 | 198 | 165 | 160 | 210 | 320 | 150 |
| Nb | 14 | 18 | 15 | 18 | 12 | 14 | 12 | 20 | 19 | 15 | 9 | 8 | 5 | 16 | 16 | 13 | 21 | 29 |
| Mo | | | | | 0 | 0 | 0 | | | | | | | | | | | |
| Ag | | | | | | | | | | | | | | | | | | |
| Cd | | | | | | | | | | | | | | | | | | |
| Sn | 9 | 4 | <4 | <4 | 0 | 0 | 0 | | | | | | | | | | | |
| Sb | | | | | | | | | | | | | | | | | | |
| Cs | | | | | | | | | | | | | | | | | | |
| Ba | 1200 | 690 | 1050 | 950 | 999 | 1086 | 800 | 840 | 104 | 176 | 1075 | 870 | 716 | 1380 | 1110 | 950 | 1090 | 185 |
| La | 48 | 46 | 53 | 70 | | | | 150 | 70 | 30 | 33 | 56 | 60 | 65 | 115 | 45 | 105 | 50 |
| Ce | 140 | 105 | 110 | 120 | | | | 290 | 120 | 30 | 20 | 90 | 70 | 125 | 220 | 105 | 195 | 115 |
| Nd | 30 | 23 | 31 | 36 | | | | 69 | | | | | | 38 | 62 | 32 | 55 | 26 |
| Y | 35 | 43 | 38 | 44 | 31 | 39 | 18 | 39 | 111 | 77 | 39 | 59 | 19 | 36 | 43 | 25 | 50 | 42 |
| W | 16 | 390 | 11 | 22 | 5 | 3 | 8 | | | | | | | | | | | |
| Tl | | | | | | | | | | | | | | | | | | |
| Pb | 9 | 13 | 11 | 6 | | | | 16 | 20 | 43 | 20 | 14 | 16 | <10 | <10 | <10 | <10 | 13 |
| Bi | | | | | | | | | | | | | | | | | | |
| Th | 16 | 32 | 22 | 25 | | | | 35 | 75 | 77 | 41 | 45 | 32 | 23 | 23 | 17 | 22 | 61 |
| U | 11 | 5 | 16 | 27 | | | | 11 | | | | | | <10 | <10 | <10 | <10 | 27 |
| CuO | | | | | | | | | | | | | | | | | | |
| Ti/Zr | 11.70 | 8.28 | 8.90 | 8.88 | 10.46 | 8.12 | 12.73 | 7.98 | 7.30 | 5.75 | 8.37 | 6.85 | 13.04 | 8.57 | 7.82 | 11.26 | 9.49 | 7.38 |
| Zr/Nb | 20.00 | 9.72 | 11.00 | 9.17 | 11.67 | 10.86 | 18.17 | 15.50 | 4.74 | 11.20 | 33.67 | 22.00 | 39.60 | 10.31 | 10.00 | 16.15 | 15.24 | 5.17 |
| Nb/Y | 0.40 | 0.42 | 0.39 | 0.41 | 0.39 | 0.36 | 0.67 | 0.51 | 0.17 | 0.19 | 0.23 | 0.14 | 0.26 | 0.44 | 0.37 | 0.52 | 0.42 | 0.69 |
| P2O5/TiO2 | 0.13 | 0.04 | 0.04 | 0.71 | 0.17 | 0.20 | 0.15 | 0.21 | 0.09 | 0.25 | 0.14 | 0.20 | 0.14 | 0.17 | 0.15 | 0.18 | 0.19 | 0.17 |

# Appendix C. Whole Rock and Trace Element Geochemical Data for the Cambrian Granites of Western Tasmania.

## Elliot Bay Granite

| Sample Number | LRP-6 | EB-1 | EB-2 | 41470 | 41475 | J722 | J798 |
|---|---|---|---|---|---|---|---|
| Reference | Pemberton and Vicary (1994) | Stolz and Large (1988) | Stolz and Large (1988) | White (1975) | White (1975) | Pemberton and Vicary (1994) | Pemberton and Vicary (1994) |
| SiO2 | 74.19 | 75.25 | 73.21 | 69.25 | 71.05 | 72.88 | 71.67 |
| TiO2 | 0.55 | 0.27 | 0.40 | 0.48 | 0.43 | 0.40 | 0.42 |
| Al2O3 | 13.91 | 12.71 | 13.20 | 13.45 | 13.51 | 14.02 | 13.88 |
| Fe2O3 | 0.85 | 2.64 | 3.73 | 7.04 | 3.83 | 0.71 | 1.96 |
| MnO | 0.06 | 0.04 | 0.06 | 0.75 | 0.11 | 0.13 | 0.10 |
| MgO | 1.18 | 0.32 | 0.57 | 2.70 | 2.11 | 2.27 | 2.38 |
| CaO | 1.72 | 1.22 | 0.95 | 0.81 | 0.91 | 2.30 | 2.27 |
| Na2O | 2.18 | 2.55 | 2.70 | 1.05 | 2.51 | 2.48 | 2.62 |
| K2O | 5.23 | 4.96 | 5.12 | 4.34 | 5.43 | 4.69 | 4.57 |
| P2O5 | 0.13 | 0.04 | 0.06 | 0.13 | 0.10 | 0.12 | 0.13 |
| Total (Vol. Free) | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| FeO | 0.77 | 2.38 | 3.36 | 6.34 | 3.45 | 0.64 | 1.77 |
| A | 0.136 | 0.125 | 0.129 | 0.132 | 0.132 | 0.137 | 0.136 |
| C | 0.031 | 0.022 | 0.017 | 0.014 | 0.016 | 0.041 | 0.040 |
| N | 0.035 | 0.041 | 0.044 | 0.017 | 0.040 | 0.040 | 0.042 |
| K | 0.056 | 0.053 | 0.054 | 0.046 | 0.058 | 0.050 | 0.049 |
| A/CNK | 1.12 | 1.08 | 1.13 | 1.70 | 1.16 | 1.05 | 1.04 |
| A/NK | 1.51 | 1.33 | 1.32 | 2.09 | 1.35 | 1.53 | 1.50 |
| S | 480 | 100 | <100 | 600 | 4100 | 840 | 600 |
| Sc | <9 | | | 12 | 15 | 9 | <9 |
| Tl | | | | | | | |
| V | 39 | | | 82 | 112 | 47 | 48 |
| Cr | 105 | | | 106 | 117 | 9 | 13 |
| Co | <8 | | | | | 9 | 13 |
| Ni | 13 | | | 33 | 67 | 28 | 30 |
| Cu | 6 | 18 | 10 | 22 | 180 | 12 | 10 |
| Zn | 30 | 120 | 42 | 92 | 284 | 100 | 51 |
| As | | | | | | | |
| Br | | | | | | | |
| Rb | 190 | 232 | 195 | 236 | 177 | 165 | 170 |
| Sr | 115 | 85 | 109 | 126 | 70 | 200 | 240 |
| Zr | 310 | 187 | 298 | 182 | 200 | 185 | 200 |
| Nb | 19 | 19 | 17 | 6 | 3 | 14 | 16 |
| Mo | | 3 | 2.5 | | | | |
| Ag | | | | | | | |
| Cd | | | | | | | |
| Sn | | | | | | | |
| Sb | | | | | | | |
| Cs | | | | | | | |
| Ba | 1180 | | | 1160 | 1430 | 1180 | 1210 |
| La | 91 | | | 60 | 80 | 125 | 145 |
| Ce | 175 | | | 62 | 35 | 45 | 64 |
| Nd | 48 | | | | | 37 | 42 |
| Y | 38 | 40 | 36 | 44 | 50 | 30 | 31 |
| W | | | | | | | |
| Tl | | | | | | | |
| Pb | <10 | 12 | 18 | 48 | 435 | 43 | <10 |
| Bi | | | | | | | |
| Th | 20 | | | | | | |
| U | <10 | | | | | | |
| CuO | | | | | | | |
| Tl/Zr | 10.57 | 8.66 | 8.05 | 15.84 | 13.03 | 13.11 | 12.72 |
| Zr/Nb | 16.32 | 9.84 | 17.53 | 30.33 | 66.67 | 13.21 | 12.50 |
| Nb/Y | 0.50 | 0.48 | 0.47 | 0.14 | 0.06 | 0.47 | 0.52 |
| P2O5/TiO2 | 0.23 | 0.15 | 0.15 | 0.28 | 0.23 | 0.29 | 0.30 |

# Appendix D. Normative Granite Mineralogy

## Darwin Granite

| Sample Number | Qz | Or | Ab | An | Ne | Cpx | Di | Hd | Opx | En | Fs | Ol | Fo | Fa | Mt | Il | Cm | Ap | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 41174 | 35.12 | 32.40 | 23.19 | 9.43 | 0.00 | -7.63 | -2.55 | -5.08 | 6.73 | 2.05 | 4.68 | 0.00 | 0.00 | 0.00 | 0.27 | 0.35 | 0.00 | 0.11 | 99.97 |
| 41372 | 38.34 | 31.16 | 25.23 | 6.10 | 0.00 | -4.66 | -0.93 | -3.73 | 3.55 | 0.63 | 2.92 | 0.00 | 0.00 | 0.00 | 0.12 | 0.12 | 0.00 | 0.04 | 99.99 |
| 41373 | 47.95 | 15.73 | 25.48 | 15.27 | 0.00 | -12.35 | -6.20 | -6.16 | 7.57 | 3.54 | 4.03 | 0.00 | 0.00 | 0.00 | 0.11 | 0.23 | 0.00 | 0.00 | 100.00 |
| 41374 | 46.66 | 6.52 | 34.67 | 16.77 | 0.00 | -11.89 | -3.97 | -7.92 | 6.80 | 2.07 | 4.73 | 0.00 | 0.00 | 0.00 | 0.10 | 0.37 | 0.00 | 0.00 | 100.00 |
| 41375 | 50.27 | 12.33 | 0.52 | 20.44 | 0.00 | -17.89 | -2.92 | -14.98 | 31.43 | 4.56 | 26.87 | 0.00 | 0.00 | 0.00 | 2.20 | 0.41 | 0.00 | 0.24 | 99.93 |
| 840200 | 35.62 | 27.16 | 26.27 | 11.56 | 0.00 | -8.81 | -3.02 | -5.79 | 7.43 | 2.32 | 5.11 | 0.00 | 0.00 | 0.00 | 0.28 | 0.42 | 0.00 | 0.05 | 99.98 |
| GS1 | 40.47 | 38.74 | 9.91 | 11.35 | 0.00 | -9.51 | -4.16 | -5.36 | 8.26 | 3.34 | 4.93 | 0.00 | 0.00 | 0.00 | 0.28 | 0.43 | 0.00 | 0.06 | 99.98 |
| GS2 | 41.38 | 46.09 | 1.60 | 9.91 | 0.00 | -8.62 | -1.94 | -6.68 | 8.74 | 1.77 | 6.97 | 0.00 | 0.00 | 0.00 | 0.43 | 0.36 | 0.00 | 0.09 | 99.97 |
| GS3 | 40.20 | 41.89 | 8.62 | 9.43 | 0.00 | -8.21 | -2.37 | -5.83 | 7.30 | 1.91 | 5.39 | 0.00 | 0.00 | 0.00 | 0.31 | 0.37 | 0.00 | 0.07 | 99.98 |
| GS4 | 45.41 | 11.39 | 31.57 | 16.82 | 0.00 | -12.41 | -9.02 | -3.39 | 6.76 | 4.72 | 2.03 | 0.00 | 0.00 | 0.00 | 0.06 | 0.39 | 0.00 | 0.00 | 100.00 |
| GS5 | 45.78 | 13.46 | 25.49 | 17.48 | 0.00 | -14.31 | -3.19 | -11.12 | 11.21 | 2.24 | 8.97 | 0.00 | 0.00 | 0.00 | 0.39 | 0.50 | 0.00 | 0.00 | 100.00 |
| GS6 | 32.89 | 40.04 | 18.63 | 7.25 | 0.00 | -6.07 | -1.97 | -4.09 | 6.46 | 1.91 | 4.55 | 0.00 | 0.00 | 0.00 | 0.31 | 0.36 | 0.00 | 0.09 | 99.97 |
| GS7 | 33.47 | 38.69 | 20.46 | 6.81 | 0.00 | -5.59 | -1.94 | -3.65 | 5.42 | 1.72 | 3.70 | 0.00 | 0.00 | 0.00 | 0.25 | 0.40 | 0.00 | 0.07 | 99.98 |
| B2028 | 33.84 | 40.64 | 1.13 | 18.55 | 0.00 | -16.24 | -4.63 | -11.61 | 19.65 | 5.07 | 14.57 | 0.00 | 0.00 | 0.00 | 1.09 | 1.16 | 0.00 | 0.13 | 99.96 |
| B2033 | 38.60 | 30.83 | 25.36 | 5.85 | 0.00 | -4.02 | -1.29 | -2.73 | 3.07 | 0.90 | 2.17 | 0.00 | 0.00 | 0.00 | 0.10 | 0.17 | 0.00 | 0.02 | 99.99 |
| B2040 | 36.81 | 38.31 | 16.10 | 8.24 | 0.00 | -6.97 | -2.04 | -4.93 | 6.73 | 1.78 | 4.95 | 0.00 | 0.00 | 0.00 | 0.31 | 0.37 | 0.00 | 0.07 | 99.98 |
| B2043 | 43.91 | 10.53 | 35.46 | 13.99 | 0.00 | -9.75 | -7.40 | -2.35 | 5.47 | 4.01 | 1.46 | 0.00 | 0.00 | 0.00 | 0.05 | 0.31 | 0.00 | 0.02 | 99.99 |
| B2045 | 32.78 | 58.87 | 2.82 | 5.38 | 0.00 | -4.71 | -1.92 | -2.79 | 4.19 | 1.58 | 2.62 | 0.00 | 0.00 | 0.00 | 0.17 | 0.41 | 0.00 | 0.07 | 99.98 |
| B2046 | 41.80 | 7.74 | 39.11 | 12.50 | 0.00 | -8.31 | -2.99 | -5.32 | 6.39 | 2.10 | 4.29 | 0.00 | 0.00 | 0.00 | 0.21 | 0.52 | 0.00 | 0.04 | 99.99 |
| B2053 | 37.91 | 35.72 | 19.55 | 8.60 | 0.00 | -7.29 | -2.86 | -4.43 | 5.01 | 1.80 | 3.21 | 0.00 | 0.00 | 0.00 | 0.13 | 0.31 | 0.00 | 0.05 | 99.98 |
| B2054 | 39.81 | 36.56 | 17.49 | 7.76 | 0.00 | -6.54 | -2.49 | -4.06 | 4.46 | 1.55 | 2.90 | 0.00 | 0.00 | 0.00 | 0.12 | 0.30 | 0.00 | 0.04 | 99.99 |
| B2061 | 41.87 | 7.74 | 39.76 | 12.54 | 0.00 | -6.37 | -2.92 | -3.45 | 4.02 | 1.71 | 2.31 | 0.00 | 0.00 | 0.00 | 0.09 | 0.33 | 0.00 | 0.02 | 99.99 |

## Murchison Granite

| Sample Number | Qz | Or | Ab | An | Ne | Cpx | Di | Hd | Opx | En | Fs | Ol | Fo | Fa | Mt | Il | Cm | Ap | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LJ29 | 13.47 | 29.63 | 23.22 | 13.52 | 0.00 | 7.18 | 2.77 | 4.41 | 10.00 | 3.53 | 6.46 | 0.00 | 0.00 | 0.00 | 1.13 | 1.50 | 0.00 | 0.28 | 99.92 |
| LJ26 | 9.22 | 30.41 | 21.33 | 15.89 | 0.00 | 2.38 | 1.24 | 1.14 | 17.51 | 8.54 | 8.97 | 0.00 | 0.00 | 0.00 | 1.25 | 1.61 | 0.00 | 0.32 | 99.91 |
| LJ47 | 18.17 | 27.60 | 19.59 | 17.19 | 0.00 | 1.08 | 0.54 | 0.54 | 13.71 | 6.34 | 7.38 | 0.00 | 0.00 | 0.00 | 0.99 | 1.25 | 0.00 | 0.33 | 99.90 |
| LJ48 | 9.86 | 18.19 | 38.99 | 12.09 | 0.00 | 7.49 | 3.77 | 3.71 | 10.61 | 4.98 | 5.62 | 0.00 | 0.00 | 0.00 | 1.00 | 1.40 | 0.00 | 0.29 | 99.92 |
| LJ50 | 12.80 | 23.76 | 23.23 | 18.47 | 0.00 | 4.85 | 2.51 | 2.34 | 13.87 | 6.71 | 7.16 | 0.00 | 0.00 | 0.00 | 1.11 | 1.54 | 0.00 | 0.29 | 99.92 |
| LJ43 | 19.92 | 14.05 | 24.14 | 22.90 | 0.00 | 5.19 | 3.50 | 1.69 | 11.18 | 7.20 | 3.98 | 0.00 | 0.00 | 0.00 | 0.66 | 1.61 | 0.00 | 0.28 | 99.92 |
| CH340 | 49.33 | 38.34 | 5.45 | 5.19 | 0.00 | 2.10 | -0.14 | 2.25 | -0.70 | 0.04 | -0.74 | 0.00 | 0.00 | 0.00 | 0.07 | 0.23 | 0.00 | -0.01 | 100.00 |
| LJ30 | 36.19 | 51.49 | 4.41 | 4.65 | 0.00 | -0.23 | -0.08 | -0.15 | 2.86 | 0.90 | 1.96 | 0.00 | 0.00 | 0.00 | 0.25 | 0.39 | 0.00 | -0.01 | 100.00 |
| LJ28 | 30.02 | 49.49 | 12.26 | 1.50 | 0.00 | 7.72 | 3.61 | 4.11 | -1.58 | -0.68 | -0.89 | 0.00 | 0.00 | 0.00 | 0.18 | 0.43 | 0.00 | -0.01 | 100.00 |
| B208 | 21.70 | 47.09 | -0.18 | 36.20 | 0.00 | -30.75 | -10.46 | -20.29 | 23.15 | 7.18 | 15.97 | 0.00 | 0.00 | 0.00 | 0.80 | 1.99 | 0.00 | -0.01 | 100.00 |
| A773 | 14.46 | 25.93 | 24.57 | 17.82 | 0.00 | 4.84 | 3.78 | 1.06 | 9.87 | 7.48 | 2.39 | 0.00 | 0.00 | 0.00 | 0.44 | 1.58 | 0.00 | 0.37 | 99.90 |
| A530 | 16.87 | 28.51 | 21.14 | 19.37 | 0.00 | 1.51 | 1.14 | 0.36 | 10.30 | 7.55 | 2.75 | 0.00 | 0.00 | 0.00 | 0.44 | 1.54 | 0.00 | 0.25 | 99.93 |
| A774 | 27.24 | 14.95 | 43.35 | 8.55 | 0.00 | 3.84 | 3.29 | 0.55 | 1.14 | 0.96 | 0.18 | 0.00 | 0.00 | 0.00 | 0.11 | 0.70 | 0.00 | 0.09 | 99.97 |
| LS12/A | 17.51 | 3.99 | 56.65 | 12.06 | 0.00 | -7.07 | -3.08 | -3.99 | 14.90 | 5.99 | 8.91 | 0.00 | 0.00 | 0.00 | 0.86 | 0.84 | 0.00 | 0.20 | 99.94 |
| 61610 | 12.29 | 23.35 | 25.59 | 18.01 | 0.00 | 4.77 | 2.28 | 2.49 | 12.86 | 5.71 | 7.15 | 0.00 | 0.00 | 0.00 | 1.08 | 1.52 | 0.00 | 0.41 | 99.88 |
| 61611 | 14.13 | 25.01 | 21.64 | 22.83 | 0.00 | -8.91 | -4.38 | -4.53 | 21.83 | 9.98 | 11.85 | 0.00 | 0.00 | 0.00 | 1.25 | 1.78 | 0.00 | 0.35 | 99.90 |
| 30028 | 10.79 | 30.68 | 28.74 | 12.65 | 0.00 | 5.60 | 4.32 | 1.28 | 9.11 | 6.80 | 2.31 | 0.00 | 0.00 | 0.00 | 0.48 | 1.51 | 0.00 | 0.35 | 99.90 |
| T04135 | 37.95 | 36.76 | 5.22 | 16.51 | 0.00 | -12.39 | -4.17 | -8.23 | 14.08 | 4.31 | 9.77 | 0.00 | 0.00 | 0.00 | 0.71 | 0.94 | 0.00 | 0.18 | 99.95 |
| T04135 DP | 38.84 | 36.46 | 3.98 | 17.55 | 0.00 | -13.19 | -4.53 | -8.65 | 14.49 | 4.54 | 9.95 | 0.00 | 0.00 | 0.00 | 0.70 | 0.93 | 0.00 | 0.18 | 99.95 |
| T04136 | 24.87 | 14.75 | 23.14 | 20.70 | 0.00 | 0.41 | 0.20 | 0.21 | 13.67 | 6.13 | 7.54 | 0.00 | 0.00 | 0.00 | 0.97 | 1.20 | 0.00 | 0.24 | 99.93 |
| T04137 | 27.88 | 15.23 | 26.81 | 17.39 | 0.00 | -0.60 | -0.29 | -0.31 | 11.21 | 5.03 | 6.18 | 0.00 | 0.00 | 0.00 | 0.75 | 1.03 | 0.00 | 0.24 | 99.93 |
| T04137 DP | 28.94 | 15.09 | 25.38 | 18.16 | 0.00 | -1.14 | -0.55 | -0.59 | 11.47 | 5.11 | 6.36 | 0.00 | 0.00 | 0.00 | 0.76 | 1.04 | 0.00 | 0.22 | 99.94 |
| AT013 | 26.87 | 46.93 | 7.79 | 11.83 | 0.00 | -5.53 | -2.58 | -2.95 | 10.39 | 4.49 | 5.90 | 0.00 | 0.00 | 0.00 | 0.58 | 0.88 | 0.00 | 0.20 | 99.94 |
| AT016 | 37.22 | 36.42 | 13.72 | 2.87 | 0.00 | 13.91 | 5.50 | 8.40 | -4.58 | -1.67 | -2.92 | 0.00 | 0.00 | 0.00 | 0.15 | 0.24 | 0.00 | 0.06 | 99.99 |
| AT017 | 37.60 | 46.46 | 8.47 | 4.16 | 0.00 | 1.86 | 0.87 | 0.98 | 0.94 | 0.41 | 0.53 | 0.00 | 0.00 | 0.00 | 0.14 | 0.31 | 0.00 | 0.05 | 99.98 |
| AT020 | 27.73 | 36.92 | 5.94 | 17.98 | 0.00 | -4.51 | -2.13 | -2.37 | 13.72 | 6.03 | 7.69 | 0.00 | 0.00 | 0.00 | 0.81 | 1.09 | 0.00 | 0.24 | 99.93 |
| AT025 | 25.85 | 34.95 | 17.66 | 9.82 | 0.00 | 3.14 | 1.32 | 1.83 | 6.61 | 2.55 | 4.06 | 0.00 | 0.00 | 0.00 | 0.65 | 1.00 | 0.00 | 0.26 | 99.93 |
| AT027 | 15.55 | 28.50 | 28.77 | 9.86 | 0.00 | 2.32 | 1.24 | 1.08 | 12.54 | 6.28 | 6.26 | 0.00 | 0.00 | 0.00 | 0.87 | 1.21 | 0.00 | 0.30 | 99.92 |
| AT028 | 14.27 | 24.84 | 26.15 | 14.49 | 0.00 | 0.40 | 0.23 | 0.17 | 17.01 | 9.13 | 7.88 | 0.00 | 0.00 | 0.00 | 1.02 | 1.38 | 0.00 | 0.34 | 99.90 |
| AT047 | 20.93 | 32.00 | 22.30 | 11.71 | 0.00 | 0.29 | 0.15 | 0.14 | 10.71 | 5.07 | 5.64 | 0.00 | 0.00 | 0.00 | 0.72 | 1.03 | 0.00 | 0.24 | 99.93 |
| AT050 | 5.91 | 21.43 | 28.78 | 17.43 | 0.00 | 5.93 | 3.04 | 2.89 | 16.94 | 8.11 | 8.83 | 0.00 | 0.00 | 0.00 | 1.34 | 1.69 | 0.00 | 0.42 | 99.88 |
| AT052 | 37.97 | 10.84 | 42.01 | 7.74 | 0.00 | -1.82 | -1.22 | -0.60 | 2.51 | 1.60 | 0.91 | 0.00 | 0.00 | 0.00 | 0.12 | 0.52 | 0.00 | 0.09 | 99.97 |
| AT053 | 37.29 | 27.86 | 25.54 | 6.24 | 0.00 | -1.43 | -0.63 | -0.80 | 3.66 | 1.48 | 2.18 | 0.00 | 0.00 | 0.00 | 0.24 | 0.52 | 0.00 | 0.05 | 99.98 |
| AT064 | 34.71 | 44.57 | 15.83 | 2.49 | 0.00 | -1.04 | -0.47 | -0.57 | 2.68 | 1.13 | 1.56 | 0.00 | 0.00 | 0.00 | 0.19 | 0.48 | 0.00 | 0.07 | 99.98 |
| DH12311.5 | 28.26 | 15.26 | 26.87 | 17.60 | 0.00 | -0.71 | -0.36 | -0.35 | 10.69 | 5.07 | 5.62 | 0.00 | 0.00 | 0.00 | 0.69 | 1.03 | 0.00 | 0.23 | 99.93 |

## Elliot Bay Granite

| Sample Number | Qz | Or | Ab | An | Ne | Cpx | Di | Hd | Opx | En | Fs | Ol | Fo | Fa | Mt | Il | Cm | Ap | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mo203 | 28.40 | 26.71 | 25.29 | 11.11 | 0.00 | 0.14 | 0.06 | 0.08 | 6.59 | 2.75 | 3.83 | 0.00 | 0.00 | 0.00 | 0.55 | 1.04 | 0.00 | 0.13 | 99.96 |
| Mo214 | 34.23 | 16.98 | 39.32 | 5.89 | 0.00 | 2.50 | 1.06 | 1.44 | 0.48 | 0.19 | 0.29 | 0.00 | 0.00 | 0.00 | 0.17 | 0.46 | 0.00 | -0.02 | 100.01 |
| Mo218 | 34.17 | 28.91 | 28.69 | 5.39 | 0.00 | -0.17 | -0.07 | -0.11 | 2.36 | 0.85 | 1.52 | 0.00 | 0.00 | 0.00 | 0.21 | 0.47 | 0.00 | -0.02 | 100.01 |
| Mo221 | 33.44 | 27.21 | 31.12 | 4.78 | 0.00 | 1.06 | 0.49 | 0.57 | 1.36 | 0.58 | 0.78 | 0.00 | 0.00 | 0.00 | 0.17 | 0.46 | 0.00 | 0.31 | 99.91 |
| 61560 | 33.87 | 29.60 | 24.43 | 7.99 | 0.00 | -1.48 | -0.43 | -1.04 | 4.66 | 1.24 | 3.42 | 0.00 | 0.00 | 0.00 | 0.38 | 0.46 | 0.00 | 0.07 | 99.98 |
| 61561 | 35.86 | 28.58 | 23.91 | 8.68 | 0.00 | -2.24 | -0.30 | -1.93 | 4.36 | 0.53 | 3.83 | 0.00 | 0.00 | 0.00 | 0.36 | 0.39 | 0.00 | 0.07 | 99.98 |
| 61562 | 41.98 | 19.12 | 10.18 | 21.87 | 0.00 | -10.73 | -3.48 | -7.25 | 15.62 | 4.61 | 11.00 | 0.00 | 0.00 | 0.00 | 0.92 | 0.88 | 0.00 | 0.13 | 99.96 |
| J700 | 37.09 | 30.57 | 21.93 | 8.82 | 0.00 | -1.37 | -1.75 | 0.38 | 1.97 | 2.63 | -0.66 | 0.00 | 0.00 | 0.00 | 0.01 | 0.78 | 0.00 | 0.15 | 99.96 |
| 41468 | 37.70 | 34.66 | 23.63 | 3.10 | 0.00 | -1.91 | -0.22 | -1.68 | 2.43 | 0.25 | 2.18 | 0.00 | 0.00 | 0.00 | 0.16 | 0.21 | 0.00 | 0.02 | 100.00 |
| 41469 | 36.40 | 36.34 | 21.07 | 4.82 | 0.00 | -3.96 | -0.56 | -3.40 | 4.65 | 0.59 | 4.06 | 0.00 | 0.00 | 0.00 | 0.28 | 0.31 | 0.00 | 0.07 | 99.98 |
| 41471 | 33.46 | 30.51 | 20.44 | 10.69 | 0.00 | -3.88 | -1.30 | -2.58 | 7.33 | 2.24 | 5.09 | 0.00 | 0.00 | 0.00 | 0.51 | 0.81 | 0.00 | 0.11 | 99.97 |
| 41472 | 36.18 | 27.33 | 25.67 | 7.81 | 0.00 | -1.53 | -0.35 | -1.18 | 3.76 | 0.76 | 2.99 | 0.00 | 0.00 | 0.00 | 0.31 | 0.38 | 0.00 | 0.07 | 99.98 |
| 41473 | 39.52 | 22.39 | 13.51 | 19.04 | 0.00 | -9.51 | -3.42 | -6.09 | 13.34 | 4.38 | 8.96 | 0.00 | 0.00 | 0.00 | 0.74 | 0.82 | 0.00 | 0.11 | 99.97 |
| LRP-1 | 36.33 | 30.32 | 26.83 | 6.70 | 0.00 | -4.47 | -4.22 | -0.25 | 3.70 | 3.47 | 0.23 | 0.00 | 0.00 | 0.00 | 0.05 | 0.45 | 0.00 | 0.07 | 99.98 |
| LRP-2 | 37.03 | 27.66 | 26.88 | 7.98 | 0.00 | -3.60 | -2.27 | -1.33 | 3.45 | 2.07 | 1.39 | 0.00 | 0.00 | 0.00 | 0.12 | 0.40 | 0.00 | 0.06 | 99.98 |
| LRP-3 | 37.16 | 21.62 | 22.08 | 14.72 | 0.00 | -2.77 | -1.70 | -1.08 | 5.98 | 3.45 | 2.52 | 0.00 | 0.00 | 0.00 | 0.30 | 0.75 | 0.00 | 0.13 | 99.96 |
| LRP-4 | 35.67 | 31.25 | 19.83 | 11.22 | 0.00 | -2.75 | -2.65 | -0.10 | 3.50 | 3.36 | 0.14 | 0.00 | 0.00 | 0.00 | 0.10 | 0.96 | 0.00 | 0.17 | 99.95 |
| LRP-5 | 38.99 | 33.15 | 21.00 | 6.96 | 0.00 | -2.46 | -2.34 | -0.13 | 1.91 | 1.80 | 0.11 | 0.00 | 0.00 | 0.00 | 0.04 | 0.35 | 0.00 | 0.06 | 99.98 |
| LRP-6 | 35.19 | 30.95 | 18.42 | 12.75 | 0.00 | -3.96 | -3.55 | -0.41 | 5.18 | 4.58 | 0.60 | 0.00 | 0.00 | 0.00 | 0.14 | 1.04 | 0.00 | 0.23 | 99.93 |
| EB-1 | 36.45 | 29.38 | 21.63 | 8.61 | 0.00 | -2.42 | -0.53 | -1.89 | 5.32 | 1.04 | 4.28 | 0.00 | 0.00 | 0.00 | 0.43 | 0.51 | 0.00 | 0.07 | 99.98 |
| EB-2 | 32.24 | 30.36 | 22.93 | 8.81 | 0.00 | -3.84 | -1.01 | -2.83 | 8.00 | 1.89 | 6.11 | 0.00 | 0.00 | 0.00 | 0.60 | 0.76 | 0.00 | 0.11 | 99.97 |
| 41470 | 33.19 | 25.80 | 8.98 | 19.27 | 0.00 | -13.52 | -5.79 | -7.72 | 23.92 | 9.46 | 14.46 | 0.00 | 0.00 | 0.00 | 1.14 | 0.92 | 0.00 | 0.24 | 99.94 |
| 41475 | 27.56 | 32.20 | 21.29 | 9.60 | 0.00 | -4.73 | -2.64 | -2.09 | 12.40 | 6.51 | 5.89 | 0.00 | 0.00 | 0.00 | 0.62 | 0.83 | 0.00 | 0.18 | 99.95 |
| J722 | 31.71 | 27.76 | 21.00 | 13.26 | 0.00 | -2.06 | -1.89 | -0.16 | 7.17 | 6.53 | 0.64 | 0.00 | 0.00 | 0.00 | 0.11 | 0.77 | 0.00 | 0.21 | 99.94 |
| J798 | 29.46 | 27.07 | 22.22 | 12.62 | 0.00 | -1.74 | -1.32 | -0.42 | 8.95 | 6.54 | 2.41 | 0.00 | 0.00 | 0.00 | 0.32 | 0.81 | 0.00 | 0.23 | 99.93 |

# Appendix E. Summary of REE Data for Cambrian Granites.

| Location | | Murchison Granite | Murchison Granite | Murchison Granite | Murchison Granite | Elliott Bay Granite | Darwin Granite | Darwin Granite | Darwin Granite | Darwin Granite | Darwin Granite |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample No. | | TO4137 | AT 050 | AT 013 | AT 053 | 61560 | JD13 | B2033 | B2053 | B2043 | B2061 |
| Granite type | Chondrite Nornalisation Values | Granodiorite | Diorite | Granodiorite | Granite | Granite | Granite | Darwin microgranite | Darwin pink granite | Darwin white granite | Darwin quartz-feldspar porphyry |
| Reference | Boynton, 1984 | Crawford et. al. 1992 | Samples from Abbott, 1992, analyses from Large, 1998 pers. comm. | Samples from Abbott, 1992, analyses from Large, 1998 pers. comm. | Samples from Abbott, 1992, analyses from Large, 1998 pers. comm. | Wyman, 1998 (this study) | Crawford et. al. 1992 | Wyman, 1998 (this study) | Wyman, 1998 (this study) | Wyman, 1998 (this study) | Wyman, 1998 (this study) |
| La | 0.31 | 32.8 | 82.5 | 42.2 | 51.8 | 12.19 | 44.7 | 22.64 | 60.87 | 3.91 | 6.15 |
| Ce | 0.808 | 73.7 | 152.7 | 81.1 | 107.6 | 26.97 | 89.5 | 32.66 | 114.62 | 5.43 | 9.82 |
| Pr | 0.122 | 8.31 | 15.94 | 9.95 | 12.64 | | 8.21 | | | | |
| Nd | 0.6 | 32 | 55.6 | 39.1 | 48.1 | 14.5 | 26.5 | 8.9 | 36.3 | 2.1 | 3 |
| Pm | | | | | | | | | | | |
| Sm | 0.195 | 5.51 | 8.06 | 7.64 | 8.91 | 3.9 | 4.15 | 1 | 5.1 | 0.4 | 0.4 |
| Eu | 0.0735 | 0.83 | 2.92 | 2.06 | 1.5 | 1.41 | 1.23 | 0.25 | 1.55 | 0.31 | 0.49 |
| Gd | 0.259 | 4.87 | 4.3 | 6.31 | 6.81 | 4.6 | 2.68 | 0.8 | 3.1 | 0.4 | 0.4 |
| Tb | 0.0474 | | | | | 0.76 | | 0.1 | 0.29 | 0.06 | 0.06 |
| Dy | 0.322 | 5.36 | 3.48 | 5.23 | 5.38 | | 2.38 | | | | |
| Ho | 0.0718 | | | | | | | | | | |
| Er | 0.21 | 3.73 | 2.4 | 3.57 | 3.54 | 3.2 | 1.85 | 0.7 | 0.5 | 0.3 | 0.3 |
| Tm | 0.0324 | | | | | | | | | | |
| Yb | 0.209 | 3.48 | 2.12 | 2.96 | 3.54 | 3 | 1.85 | 1.2 | 0.7 | 0.4 | 0.4 |
| Lu | 0.0322 | | | | | 0.5 | | 0.2 | 0.1 | <0.1 | 0.05 |
| **Chondrite Normalised Values** | | | | | | | | | | | |
| La | | 105.81 | 266.13 | 136.13 | 167.10 | 39.32 | 144.19 | 73.03 | 196.35 | 12.61 | 19.84 |
| Ce | | 91.21 | 188.99 | 100.37 | 133.17 | 33.38 | 110.77 | 40.42 | 141.86 | 6.72 | 12.15 |
| Pr | | 68.11 | 130.66 | 81.56 | 103.61 | | 67.30 | | | | |
| Nd | | 53.33 | 92.67 | 65.17 | 80.17 | 24.17 | 44.17 | 14.83 | 60.50 | 3.50 | 5.00 |
| Pm | | | | | | | | | | | |
| Sm | | 28.26 | 41.33 | 39.18 | 45.69 | 20.00 | 21.28 | 5.13 | 26.15 | 2.05 | 2.05 |
| Eu | | 11.29 | 39.73 | 28.03 | 20.41 | 19.18 | 16.73 | 3.40 | 21.09 | 4.22 | 6.67 |
| Gd | | 18.80 | 16.60 | 24.36 | 26.29 | 17.76 | 10.35 | 3.09 | 11.97 | 1.54 | 1.54 |
| Tb | | | | | | 16.03 | | 2.11 | 6.12 | 1.27 | 1.27 |
| Dy | | 16.65 | 10.81 | 16.24 | 16.71 | | 7.39 | | | | |
| Ho | | | | | | | | | | | |
| Er | | 17.76 | 11.43 | 17.00 | 16.86 | 15.24 | 8.81 | 3.33 | 2.38 | 1.43 | 1.43 |
| Tm | | | | | | | | | | | |
| Yb | | 16.65 | 10.14 | 14.16 | 16.94 | 14.35 | 8.85 | 5.74 | 3.35 | 1.91 | 1.91 |
| Lu | | | | | | 15.53 | | 6.21 | 3.11 | 1.55 | 1.55 |
| (La/Yb)N | | 6.35 | 26.24 | 9.61 | 9.87 | 2.74 | 16.29 | 12.72 | 58.63 | 6.59 | 10.37 |
| (La/Sm)N | | 3.74 | 6.44 | 3.47 | 3.66 | 1.97 | 6.78 | 14.24 | 7.51 | 6.15 | 9.67 |
| (Gd/Yb)N | | 1.13 | 1.64 | 1.72 | 1.55 | 1.24 | 1.17 | 0.54 | 3.57 | 0.81 | 0.81 |

## Appendix E-1. Granite REE, Continued.

| Granite type | | Murchison diorite | Murchison granodiorite | Murchison granodiorite | Murchison granite | Elliott Bay granite | Darwin microgranite | Darwin pink granite | Darwin pink granite | Darwin quartz-feldspar porphyry | Darwin white granite |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample number | Chondrite Normalisation Values | AT 050 | TO4137 | AT 013 | AT 053 | 61560 | B2033 | B2053 | 840200 | B2061 | B2043 |
| | Boynton, 1984 | Samples from Abbott, 1992, analyses from Large, 1998 pers. comm. | Crawford et. al. 1992 | Samples from Abbott, 1992, analyses from Large, 1998 pers. comm. | Samples from Abbott, 1992, analyses from Large, 1998 pers. comm. | Wyman, 1998 (this study) | Wyman, 1998 (this study) | Wyman, 1998 (this study) | Crawford et. al. 1992 | Wyman, 1998 (this study) | Wyman, 1998 (this study) |
| La | 0.31 | 82.50 | 32.80 | 42.20 | 51.80 | 12.19 | 22.64 | 60.87 | 44.70 | 6.15 | 3.91 |
| Ce | 0.808 | 152.70 | 73.70 | 81.10 | 107.60 | 26.97 | 32.66 | 114.62 | 89.50 | 9.82 | 5.43 |
| Pr | 0.122 | 15.94 | 8.31 | 9.95 | 12.64 | 4.07 | 4.93 | 17.31 | 8.21 | 1.48 | 0.82 |
| Nd | 0.6 | 55.60 | 32.00 | 39.10 | 48.10 | 14.50 | 8.90 | 36.30 | 26.50 | 3.00 | 2.10 |
| Pm | | | | | | | | | | | |
| Sm | 0.195 | 8.06 | 5.51 | 7.64 | 8.91 | 3.90 | 1.00 | 5.10 | 4.15 | 0.40 | 0.40 |
| Eu | 0.0735 | 2.92 | 0.83 | 2.06 | 1.50 | 1.41 | 0.25 | 1.55 | 1.23 | 0.49 | 0.31 |
| Gd | 0.259 | 4.30 | 4.87 | 6.31 | 6.81 | 4.60 | 0.80 | 3.10 | 2.68 | 0.40 | 0.40 |
| Tb | 0.0474 | 0.79 | 0.89 | 1.15 | 1.25 | 0.76 | 0.10 | 0.29 | 0.49 | 0.06 | 0.06 |
| Dy | 0.322 | 3.48 | 5.36 | 5.23 | 5.38 | 5.16 | 0.68 | 1.97 | 2.38 | 0.41 | 0.41 |
| Ho | 0.0718 | 0.78 | 1.20 | 1.17 | 1.20 | 1.15 | 0.15 | 0.44 | 0.53 | 0.09 | 0.09 |
| Er | 0.21 | 2.40 | 3.73 | 3.57 | 3.54 | 3.20 | 0.70 | 0.50 | 1.65 | 0.30 | 0.30 |
| Tm | 0.0324 | 0.37 | 0.57 | 0.55 | 0.55 | 0.49 | 0.11 | 0.08 | 0.26 | 0.05 | 0.05 |
| Yb | 0.209 | 2.12 | 3.48 | 2.96 | 3.54 | 3.00 | 1.20 | 0.70 | 1.65 | 0.40 | 0.40 |
| Lu | 0.0322 | 0.33 | 0.54 | 0.46 | 0.55 | 0.50 | 0.20 | 0.10 | 0.26 | 0.05 | <0.1 |
| Total Calculated REE | | 332 | 174 | 203 | 253 | 82 | 74 | 243 | 185 | 23 | 15 |

REE values in shade are calculated using the ratio of the element to the value of the element preceeding it on the list as determined from the values for the chondrite.
Example: The calculated value for Tb is 0.183 x (the value for Gd).
0.183 = 0.0474 / 0.259 (the values for the two elements in the chondrite)

# Appendix E-2. Microprobe Analytical Results for Minerals in the Darwin Granite.



| Mineral | Ox%(O ) | Ox%(Si) | Ox%(P ) | Ox%(Ca) | Ox%(Ti) | Ox%(Y ) | Ox%(Zr) | Ox%(La) | Ox%(Ce) | Ox%(Pr) | Ox%(Nd) | Ox%(Sm) | Ox%(Gd) | Ox%(Dy) | Ox%(Er) | Ox%(Yb) | Ox%(Hf) | Ox%(Pb) | Ox%(Th) | Ox%(U ) | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Monazite** | | | | | | | | | | | | | | | | | | | | | |
| 2053 am1 | 0 | 0.214 | 29.0346 | 0.1038 | 0.0702 | 0.635 | 0.0002 | 17.8521 | 35.2087 | 4.2164 | 10.2093 | 1.3264 | 1.0864 | 0.3177 | 0.0222 | 0.056 | 0 | 0.0003 | 0.0109 | 0.0001 | 100.3643 |
| 2053 am10 | 0 | 0.0995 | 28.8793 | 0.1461 | 0.0045 | 0.453 | 0.0002 | 15.3676 | 37.3942 | 4.5892 | 10.7703 | 1.4091 | 0.8962 | 0.196 | 0 | 0.0502 | 0 | 0.0073 | 0.1916 | 0 | 100.4543 |
| 2053 am11 | 0 | 0.2333 | 28.5839 | 0.5156 | 0.0211 | 0.1913 | 0.0002 | 15.895 | 38.9167 | 4.2494 | 9.6483 | 0.8029 | 0.3678 | 0.006 | 0 | 0.0333 | 0 | 0.0492 | 0.9336 | 0.0194 | 100.467 |
| 2053 am12 | 0 | 0.1496 | 29.1232 | 0.0957 | 0.0332 | 0.3618 | 0.0002 | 15.6656 | 37.6848 | 4.5107 | 10.7045 | 1.5989 | 0.8476 | 0.1793 | 0.0045 | 0.0231 | 0 | 0.0003 | 0.0974 | 0.0042 | 101.0846 |
| 2053 am13 | 0 | 0.0586 | 28.686 | 0.0257 | 0.0002 | 0.3798 | 0.0002 | 16.6623 | 36.5803 | 4.4897 | 10.7845 | 1.425 | 1.0158 | 0.1681 | 0.0261 | 0.0288 | 0 | 0.0003 | 0.0247 | 0.0115 | 100.5676 |
| 2053 am2 | 0 | 0.1328 | 29.0079 | 0.0711 | 0.0312 | 0.8413 | 0.0002 | 16.761 | 35.2848 | 4.3328 | 10.8699 | 1.6423 | 1.2849 | 0.5538 | 0.0021 | 0 | 0 | 0.0061 | 0.0209 | 0.0213 | 100.8644 |
| 2053 am3 | 0 | 1.0147 | 27.4635 | 0.077 | 0.0002 | 0.5401 | 0.0002 | 16.4167 | 34.7815 | 4.2826 | 9.8643 | 1.2811 | 1.0939 | 0.2808 | 0 | 0 | 0 | 0.0003 | 0.0438 | 0 | 97.1407 |
| 2053 am4 | 0 | 0.1076 | 29.0101 | 0.1115 | 0.0017 | 0.54 | 0.0002 | 16.7418 | 35.878 | 4.2019 | 11.1688 | 1.6339 | 1.0952 | 0.2292 | 0 | 0 | 0 | 0.0061 | 0.1071 | 0.0054 | 100.8385 |
| 2053 am5 | 0 | 0.2084 | 28.5156 | 0.1787 | 0.0231 | 0.1872 | 0.0002 | 16.6356 | 37.6788 | 4.2758 | 10.1088 | 0.5948 | 0.3796 | 0.0127 | 0 | 0.0501 | 0 | 0.0405 | 0.8054 | 0.0482 | 99.7435 |
| 2053 am6 | 0 | 3.8075 | 26.9518 | 0.1749 | 0.0002 | 0.1931 | 0.0002 | 13.2323 | 38.6439 | 4.8209 | 10.4766 | 1.1966 | 0.5206 | 0.1566 | 0 | 0.0078 | 0 | 0.0034 | 0.5158 | 0.0321 | 100.7343 |
| 2053 am7 | 0 | 0.2567 | 28.4524 | 0.262 | 0.0178 | 0.1964 | 0.0002 | 13.3597 | 39.0516 | 4.9282 | 11.256 | 1.0687 | 0.4419 | 0.1276 | 0 | 0 | 0 | 0.0431 | 0.9042 | 0.0126 | 100.3801 |
| 2053 am8 | 0 | 0.0856 | 28.6815 | 0.2861 | 0.0351 | 0.1232 | 0.0002 | 16.5533 | 40.0055 | 4.5258 | 9.1913 | 0.8169 | 0.2865 | 0.0002 | 0 | 0.0264 | 0 | 0.0212 | 0.0002 | 0.0001 | 100.6391 |
| 2053 am9 | 0 | 0.0868 | 28.9164 | 0.0625 | 0.0193 | 0.4379 | 0.0002 | 16.2091 | 37.1269 | 4.3252 | 10.8213 | 1.2776 | 0.9443 | 0.2434 | 0.0174 | 0.0092 | 0 | 0.0186 | 0.0002 | 0.0041 | 100.5204 |
| **Average** | **0** | **0.4965** | **28.5774** | **0.1624** | **0.0198** | **0.3908** | **0.0002** | **15.9502** | **37.2489** | **4.4423** | **10.4518** | **1.2365** | **0.7893** | **0.1901** | **0.0056** | **0.0219** | **0.0000** | **0.0151** | **0.2812** | **0.0122** | **100.2922** |
| **Rutile** | | | | | | | | | | | | | | | | | | | | | |
| 2033 cR5 | 0 | 0 | 0.0003 | 0.0054 | 91.3763 | 0.0668 | 0.013 | 0.029 | 0.0003 | 0.07 | 0.0626 | 0.0003 | 0.0003 | 0.0793 | 0.0001 | 0.0063 | 0.8399 | 0.0049 | 0.0002 | 0.012 | 92.567 |
| B2043_A1_R1 | 0 | 0.2757 | 0.0003 | 0.0187 | 93.5237 | 0.0692 | 0.0967 | 0.0155 | 0.0003 | 0.0005 | 0.0118 | 0.0003 | 0.0003 | 0.0483 | 0.0285 | 0 | 0.8628 | 0.0233 | 0.0002 | 0.0001 | 94.9762 |
| B2043_A1_R2 | 0 | 0 | 0.0003 | 0.0061 | 92.3472 | 0.0629 | 0.2742 | 0.0001 | 0.0003 | 0.0005 | 0.0232 | 0.0317 | 0.0003 | 0.0466 | 0.0091 | 0.0193 | 0.8391 | 0.0179 | 0.0002 | 0.0057 | 93.6847 |
| B2043_A2_R3 | 0 | 0.0034 | 0.0003 | 0.0076 | 95.4077 | 0.0632 | 0.0791 | 0.0003 | 0.0003 | 0.0005 | 0.0003 | 0.0003 | 0.0433 | 0.0003 | 0.0225 | 0.0449 | 0.9111 | 0.0003 | 0.0002 | 0.0001 | 96.5857 |
| B2043_A2_R4 | 0 | 0.0268 | 0.0003 | 0.0106 | 94.95 | 0.076 | 0.0782 | 0 | 0.0003 | 0.0083 | 0.1331 | 0.0003 | 0.05 | 0.0003 | 0.0035 | 0.0016 | 0.9156 | 0.0003 | 0.0279 | 0 | 96.2831 |
| B2043_A2_R5 | 0 | 0.0047 | 0.0003 | 0.0104 | 95.3596 | 0.0659 | 0.1162 | 0.0001 | 0.0003 | 0.0647 | 0.0352 | 0.0003 | 0.0003 | 0.0003 | 0.0001 | 0.0054 | 0.8885 | 0.0166 | 0.0002 | 0.0329 | 96.602 |
| B2043_A2_R6 | 0 | 0 | 0.0003 | 0.0318 | 90.5661 | 0.0587 | 0.2889 | 0.0003 | 0.0003 | 0.0897 | 0.0003 | 0.0152 | 0.0003 | 0.0003 | 0.0001 | 0.0129 | 0.8204 | 0.0003 | 0.0048 | 0.0005 | 91.8912 |
| B2043_B1_R8 | 0 | 0 | 0.0003 | 0.0148 | 95.9014 | 0.0725 | 0.1142 | 0 | 0.0003 | 0.093 | 0.0379 | 0.0644 | 0.0003 | 0.0018 | 0.0001 | 0.007 | 0.8195 | 0.0188 | 0.0002 | 0.0013 | 97.1478 |
| B2043_C1_R11 | 0 | 0 | 0.0003 | 0.0034 | 95.6194 | 0.0525 | 0.0888 | 0.0001 | 0.0003 | 0.005 | 0.0324 | 0.018 | 0.0328 | 0.0003 | 0 | 0.0043 | 0.8581 | 0.0003 | 0.0046 | 0.0001 | 96.7207 |
| **Average** | **0** | **0.0388** | **0.0003** | **0.0129** | **94.2094** | **0.0651** | **0.1420** | **0.0021** | **0.0003** | **0.0328** | **0.0343** | **0.0163** | **0.0160** | **0.0123** | **0.0080** | **0.0119** | **0.8644** | **0.0097** | **0.0048** | **0.0051** | **95.4864** |
| 2053 ar1 | 0 | 0.0994 | 0.0003 | 0.0215 | 90.6211 | 0.0858 | 0.0475 | 0.0001 | 0.0003 | 0.0947 | 0.0306 | 0.0159 | 0.0071 | 0.0003 | 0 | 0.0002 | 0.8914 | 0.008 | 0.0146 | 0.0386 | 91.9774 |
| 2053 ar2 | 0 | 0.2165 | 0.0003 | 0.0359 | 95.4292 | 0.0705 | 0.0107 | 0.0001 | 0.0003 | 0.0005 | 0.0303 | 0.0003 | 0.0003 | 0.0003 | 0.0001 | 0.0002 | 0.9183 | 0.0215 | 0.0002 | 0.0001 | 96.7356 |
| 2053 ar3 | 0 | 0.313 | 0.0003 | 0.0162 | 95.7574 | 0.0608 | 0.0563 | 0.0068 | 0.0003 | 0.0649 | 0.0878 | 0.0538 | 0.036 | 0.0003 | 0 | 0.0158 | 0.9129 | 0.0003 | 0.0002 | 0.0063 | 97.3894 |
| 2053 ar4 | 0 | 0.0787 | 0.0003 | 0.0205 | 95.9171 | 0.0515 | 0.0264 | 0.0001 | 0.0003 | 0.0005 | 0.0267 | 0.0003 | 0.0003 | 0.093 | 0.0035 | 0.0156 | 0.8989 | 0.0168 | 0.0002 | 0.0001 | 97.1508 |
| 2053 ar5 | 0 | 0.177 | 0.0003 | 0.0384 | 95.5299 | 0.0599 | 0.0002 | 0 | 0.0003 | 0.04 | 0.0483 | 0.0003 | 0.0003 | 0.0568 | 0.0088 | 0.0376 | 0.8836 | 0.0435 | 0.0002 | 0.0091 | 96.9345 |
| 2053 ar6 | 0 | 0.1365 | 0.0003 | 0.0314 | 93.1097 | 0.0681 | 0.0239 | 0.0001 | 0.0003 | 0.1016 | 0.0276 | 0.0133 | 0.0003 | 0.0732 | 0.0148 | 0 | 0.8676 | 0.0108 | 0.0002 | 0.0089 | 94.4886 |
| 2053 ar7 | 0 | 0.0121 | 0.0003 | 0.0152 | 96.221 | 0.0516 | 0.0256 | 0.009 | 0.0003 | 0.0783 | 0.0335 | 0.0003 | 0.0003 | 0.0198 | 0.0001 | 0 | 0.9084 | 0.0277 | 0.0002 | 0.0171 | 97.4208 |
| 2053 cr1 | 0 | 0 | 0.0003 | 0.0001 | 92.2769 | 0.0796 | 0.0002 | 0 | 0.0003 | 0.19 | 0.0362 | 0.0011 | 0.0407 | 0.0003 | 0 | 0.0024 | 0.8815 | 0.0013 | 0.0002 | 0.0127 | 93.5238 |
| **Average** | **0** | **0.1292** | **0.0003** | **0.0224** | **94.3578** | **0.0660** | **0.0239** | **0.0020** | **0.0003** | **0.0713** | **0.0401** | **0.0107** | **0.0107** | **0.0305** | **0.0034** | **0.0090** | **0.8953** | **0.0162** | **0.0020** | **0.0116** | **95.7026** |
| B2061_B1_R1 | 0 | 0.0206 | 0.0003 | 0.0629 | 95.3248 | 0.0694 | 0.0957 | 0.0003 | 0.0003 | 0.0548 | 0.0003 | 0.014 | 0.0314 | 0.0003 | 0.0171 | 0.0002 | 0.8443 | 0.0239 | 0.0002 | 0.0157 | 96.5765 |
| B2061_B1_R2 | 0 | 0.0138 | 0.0003 | 0.0314 | 95.0562 | 0.0518 | 0.0891 | 0 | 0.0003 | 0.0648 | 0.0639 | 0.0589 | 0.0073 | 0.0045 | 0 | 0.0386 | 0.901 | 0.0105 | 0.0048 | 0.0122 | 96.4094 |
| B2061_B1_R4 | 0 | 0.0136 | 0.0003 | 0.043 | 94.412 | 0.0366 | 0.1166 | 0 | 0.0003 | 0.1413 | 0.1066 | 0.0376 | 0.0121 | 0.0003 | 0 | 0.0205 | 0.8616 | 0.0003 | 0.0002 | 0.0335 | 95.8364 |
| B2061_D1_R6 | 0 | 0.0282 | 0.0003 | 0.0252 | 95.7653 | 0.0521 | 0.0472 | 0.0001 | 0.0003 | 0.1163 | 0.0204 | 0.0068 | 0.0003 | 0.0003 | 0.0144 | 0.0002 | 0.8842 | 0.0185 | 0.0002 | 0.0234 | 97.0037 |
| B2061_D1_R7 | 0 | 0.0078 | 0.0003 | 0.0001 | 94.8547 | 0.0628 | 0.0953 | 0 | 0.0003 | 0.0598 | 0.0365 | 0.0213 | 0.0003 | 0.0003 | 0.0001 | 0.0551 | 0.9127 | 0.0013 | 0.0002 | 0.0001 | 96.109 |
| B2061_D1_R8 | 0 | 0.16 | 0.0003 | 0.034 | 93.2273 | 0.0616 | 0.1111 | 0.0001 | 0.0003 | 0.0005 | 0.0217 | 0.0496 | 0.0003 | 0.0003 | 0.0001 | 0.0064 | 0.9082 | 0.0145 | 0.0002 | 0.0018 | 94.5983 |
| B2061_D1_R9 | 0 | 0.6222 | 0.0003 | 0.1556 | 93.1725 | 0.0597 | 0.0203 | 0 | 0.0003 | 0.0005 | 0.0529 | 0.0003 | 0.0021 | 0.0079 | 0.0001 | 0.0312 | 0.8563 | 0.0521 | 0.0486 | 0.0575 | 95.1404 |
| B2061_D1_R10 | 0 | 0.0854 | 0.0003 | 0.0938 | 93.8922 | 0.0693 | 0.0777 | 0.0026 | 0.0003 | 0.0333 | 0.0314 | 0.011 | 0.0003 | 0.0003 | 0.0337 | 0.0002 | 0.8809 | 0.0275 | 0.0076 | 0 | 95.2478 |
| **Average** | **0** | **0.1190** | **0.0003** | **0.0558** | **94.4631** | **0.0579** | **0.0816** | **0.0004** | **0.0003** | **0.0589** | **0.0417** | **0.0249** | **0.0068** | **0.0018** | **0.0082** | **0.0191** | **0.8812** | **0.0186** | **0.0078** | **0.0180** | **95.8652** |

# Appendix E-2. Microprobe Analytical Results for Minerals in the Darwin Granite.



| Mineral | Ox%(O ) | Ox%(Si) | Ox%(P ) | Ox%(Ca) | Ox%(Ti) | Ox%(Y ) | Ox%(Zr) | Ox%(La) | Ox%(Ce) | Ox%(Pr) | Ox%(Nd) | Ox%(Sm) | Ox%(Gd) | Ox%(Dy) | Ox%(Er) | Ox%(Yb) | Ox%(Hf) | Ox%(Pb) | Ox%(Th) | Ox%(U ) | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Zircon** | | | | | | | | | | | | | | | | | | | | | |
| 2033 bZ1 | 0 | 29.8772 | 0.1225 | 0.0762 | 0.0526 | 0.4165 | 64.2695 | 0 | 0.056 | 0.0005 | 0.0846 | 0.0003 | 0.0003 | 0.0003 | 0.0267 | 0.1742 | 2.2768 | 0.0208 | 0.1812 | 0.4287 | 98.0649 |
| 2033 cZ4 | 0 | 27.9685 | 0.1202 | 0.8384 | 0.0002 | 0.678 | 59.083 | 0 | 0.1195 | 0.0505 | 0.0359 | 0.0003 | 0.0718 | 0.0003 | 0.0756 | 0.2682 | 1.9246 | 0.0783 | 1.1808 | 1.8588 | 94.3529 |
| 2033 cZ5 | 0 | 30.5669 | 0.0859 | 0.0002 | 0.0002 | 0.1242 | 66.4937 | 0 | 0.001 | 0.0005 | 0.16 | 0.0003 | 0.0266 | 0.068 | 0.0183 | 0.0022 | 2.6925 | 0.0107 | 0.0398 | 0.1442 | 100.4332 |
| 2033 cZ6 | 0 | 30.1053 | 0.0991 | 0.2643 | 0.008 | 0.2844 | 65.3036 | 0.0077 | 0.0003 | 0.0005 | 0.0985 | 0.0011 | 0.0003 | 0.0408 | 0.0867 | 0.1565 | 1.7408 | 0.0523 | 0.0184 | 0.7709 | 99.0393 |
| **Average** | **0** | **29.6295** | **0.1069** | **0.2948** | **0.0153** | **0.3758** | **63.7875** | **0.0019** | **0.0442** | **0.0130** | **0.0948** | **0.0005** | **0.0248** | **0.0273** | **0.0513** | **0.1503** | **2.1587** | **0.0405** | **0.3551** | **0.8007** | **97.9726** |
| B2043_A2_Z1 | 0 | 30.5607 | 0.1528 | 0.0277 | 0.0297 | 0.2938 | 66.0957 | 0.0241 | 0.0452 | 0.0005 | 0.1351 | 0.0003 | 0.0003 | 0.0509 | 0.0248 | 0.1325 | 1.4596 | 0.0279 | 0.2003 | 0.2828 | 99.5447 |
| B2043_A2_Z2 | 0 | 30.6697 | 0.1384 | 0.0098 | 0.0002 | 0.2565 | 65.1408 | 0 | 0.0003 | 0.0005 | 0.0448 | 0.0187 | 0.0032 | 0.067 | 0.0314 | 0.0561 | 2.0319 | 0.0433 | 0.8812 | 0.3225 | 99.7163 |
| B2043_A2_Z3 | 0 | 30.3751 | 0.0814 | 0.0091 | 0.0002 | 0.2366 | 65.8674 | 0.0086 | 0.0003 | 0.0005 | 0.1006 | 0.0082 | 0.0343 | 0.0374 | 0 | 0.0622 | 1.5391 | 0.0268 | 0.0539 | 0.0741 | 98.5158 |
| B2043_B1_Z4 | 0 | 30.4193 | 0.1021 | 0.0608 | 0.0255 | 0.3584 | 64.7068 | 0.0083 | 0.0003 | 0.0474 | 0.0054 | 0.1217 | 0.0569 | 0.0402 | 0.0683 | 0.1777 | 1.6529 | 0.0445 | 0.3778 | 0.489 | 98.7633 |
| B2043_C3_Z5 | 0 | 30.352 | 0.1436 | 0.0359 | 0.1438 | 0.6831 | 64.4304 | 0 | 0.0491 | 0.0005 | 0.0427 | 0.0003 | 0.0535 | 0.0223 | 0.1428 | 0.2435 | 1.5611 | 0.0537 | 0.5482 | 0.5226 | 99.0291 |
| B2043_C3_Z6 | 0 | 28.9741 | 0.2406 | 0.5526 | 0.3206 | 1.418 | 58.4578 | 0.029 | 0.1768 | 0.0005 | 0.0979 | 0.0003 | 0.0584 | 0.1863 | 0.1077 | 0.3554 | 1.7783 | 0.0525 | 0.7571 | 1.5811 | 95.145 |
| B2043_C3_Z7 | 0 | 28.9696 | 0.2481 | 0.5248 | 0.1698 | 0.736 | 60.0399 | 0.0002 | 0.0144 | 0.0214 | 0.0102 | 0.0411 | 0.0003 | 0.0151 | 0.1262 | 0.3514 | 1.8074 | 0.047 | 0.459 | 1.2298 | 94.8117 |
| B2043_D1_Z8 | 0 | 30.4985 | 0.1509 | 0.0289 | 0.002 | 0.2441 | 65.8186 | 0.0294 | 0.0058 | 0.0337 | 0.0555 | 0.0004 | 0.0003 | 0.1288 | 0.0447 | 0.0388 | 1.5809 | 0.0433 | 0.5697 | 0.1338 | 99.4081 |
| B2043_D1_Z9 | 0 | 30.5844 | 0.0985 | 0.0275 | 0.0305 | 0.5804 | 65.8602 | 0.0182 | 0.0221 | 0.0459 | 0.0563 | 0.0003 | 0.1109 | 0.0509 | 0.0748 | 0.1115 | 1.4093 | 0.0311 | 0.2476 | 0.2563 | 99.6167 |
| B2043_D1_Z10 | 0 | 30.9584 | 0.1554 | 0.0133 | 0.0092 | 0.4403 | 66.5165 | 0.0002 | 0.0003 | 0.0337 | 0.0109 | 0.0379 | 0.0053 | 0.0349 | 0.0719 | 0.109 | 1.3697 | 0.0434 | 0.1606 | 0.1544 | 100.1253 |
| B2043_C1_Z11 | 0 | 29.2313 | 0.1246 | 0.8958 | 0.0148 | 1.1872 | 54.6507 | 0.0235 | 0.1144 | 0.0183 | 0.0937 | 0.0488 | 0.0408 | 0.0765 | 0.1931 | 0.5015 | 1.5814 | 0.2282 | 2.1619 | 4.1603 | 95.3468 |
| B2043_C1_Z12 | 0 | 31.3454 | 0.1421 | 0.0058 | 0.0002 | 0.1714 | 66.9738 | 0.0089 | 0.0003 | 0.0614 | 0.0657 | 0.0782 | 0.0003 | 0.0542 | 0.0363 | 0.0125 | 1.9535 | 0.008 | 0.0224 | 0.0452 | 100.9856 |
| **Average** | **0** | **30.2449** | **0.1482** | **0.1827** | **0.0622** | **0.5505** | **63.7132** | **0.0125** | **0.0358** | **0.0220** | **0.0599** | **0.0297** | **0.0304** | **0.0637** | **0.0768** | **0.1793** | **1.6438** | **0.0541** | **0.5366** | **0.7710** | **98.4174** |
| B2061_B1_Z1 | 0 | 21.9341 | 0.0592 | 0.3793 | 0.054 | 0.2146 | 42.006 | 0 | 0.0116 | 0.0005 | 0.0403 | 0.082 | 0.0085 | 0.1187 | 0.0159 | 0.085 | 0.9961 | 0.0003 | 0.2532 | 0.1381 | 66.3974 |
| B2061_D1_Z2 | 0 | 30.9367 | 0.3544 | 0.0002 | 0.0244 | 0.5895 | 66.5558 | 0 | 0.028 | 0.0353 | 0.0504 | 0.0003 | 0.0476 | 0.1058 | 0.1116 | 0.126 | 1.1544 | 0.0088 | 0.1971 | 0.2185 | 100.5448 |
| B2061_D1_Z4 | 0 | 31.1213 | 0.1016 | 0.0294 | 0.0137 | 0.1717 | 66.9316 | 0.0239 | 0.0003 | 0.0005 | 0.0485 | 0.0003 | 0.0354 | 0.0003 | 0.0619 | 0.0857 | 1.4768 | 0.0273 | 0.0731 | 0.0816 | 100.2849 |
| B2061_D1_Z5 | 0 | 31.1893 | 0.0938 | 0.0234 | 0.0002 | 0.1121 | 67.373 | 0.0401 | 0.0299 | 0.0005 | 0.0003 | 0.0088 | 0.0003 | 0.0308 | 0.0001 | 0 | 1.4807 | 0.0063 | 0.0143 | 0.0237 | 100.4276 |
| B2061_D1_Z6 | 0 | 30.9859 | 0.1235 | 0.0269 | 0.0182 | 0.2756 | 66.8377 | 0 | 0.0003 | 0.0005 | 0.0481 | 0.0085 | 0.0394 | 0.0787 | 0.0691 | 0.0716 | 1.4583 | 0.0399 | 0.0232 | 0.0734 | 100.1788 |
| B2061_D1_Z7 | 0 | 31.3696 | 0.1314 | 0.0245 | 0.0073 | 0.2134 | 67.7165 | 0 | 0.0145 | 0.0005 | 0.0797 | 0.0854 | 0.0189 | 0.0003 | 0.0571 | 0.0574 | 1.1169 | 0.0003 | 0.0177 | 0.0025 | 100.9139 |
| B2061_D1_Z8 | 0 | 31.28 | 0.164 | 0.007 | 0.0241 | 0.1858 | 67.2591 | 0.0136 | 0.0003 | 0.0005 | 0.0519 | 0.029 | 0.0003 | 0.041 | 0.0615 | 0.0366 | 1.386 | 0.0122 | 0.0243 | 0.0731 | 100.6503 |
| B2061_D1_Z9 | 0 | 30.9914 | 0.117 | 0.0075 | 0.0002 | 0.2531 | 66.6529 | 0.0219 | 0.054 | 0.0005 | 0.0706 | 0.0003 | 0.0003 | 0.1139 | 0.0557 | 0.1351 | 1.5735 | 0.0003 | 0.0834 | 0.1574 | 100.289 |
| B2061_D1_Z10 | 0 | 30.8745 | 0.135 | 0.0002 | 0.0002 | 0.1455 | 67.1015 | 0 | 0.0003 | 0.0005 | 0.0562 | 0.0035 | 0.0332 | 0.0003 | 0.0283 | 0.0164 | 1.2705 | 0.0491 | 0.0002 | 0.0493 | 99.7647 |
| **Average** | **0** | **30.1254** | **0.1412** | **0.1319** | **0.0183** | **0.3392** | **63.6477** | **0.0120** | **0.0241** | **0.0118** | **0.0554** | **0.0312** | **0.0213** | **0.0570** | **0.0640** | **0.1089** | **1.4243** | **0.0362** | **0.2840** | **0.4828** | **97.0168** |
| 2053 CZ1 | 0 | 30.3912 | 0.158 | 0.0263 | 0.0177 | 0.3844 | 65.8442 | 0 | 0.0003 | 0.0005 | 0.0425 | 0.0003 | 0.0791 | 0.123 | 0.0983 | 0.0881 | 1.5959 | 0.0285 | 0.4701 | 0.3709 | 99.7193 |
| 2053 CZ10 | 0 | 31.0349 | 0.1339 | 0.0002 | 0.0002 | 0.1742 | 67.431 | 0.004 | 0.0058 | 0.0877 | 0.0953 | 0.0136 | 0.0693 | 0.025 | 0 | 0 | 1.3472 | 0.0289 | 0.0759 | 0.0783 | 100.6054 |
| 2053 CZ2 | 0 | 30.8124 | 0.0873 | 0.0198 | 0.0277 | 0.2095 | 65.8954 | 0 | 0.0003 | 0.0005 | 0.051 | 0.0003 | 0.0003 | 0.0277 | 0.0543 | 0.1224 | 2.368 | 0.0259 | 0.0944 | 0.4554 | 100.2526 |
| 2053 CZ3 | 0 | 31.1748 | 0.1281 | 0.0061 | 0.0002 | 0.2019 | 66.9928 | 0.0002 | 0.0242 | 0.0005 | 0.0124 | 0.0426 | 0.0482 | 0.011 | 0.0343 | 0.0803 | 1.5716 | 0.0249 | 0.0622 | 0.1918 | 100.6081 |
| 2053 CZ4 | 0 | 31.25 | 0.1434 | 0.0002 | 0.0009 | 0.1742 | 67.8793 | 0 | 0.0003 | 0.0005 | 0.1272 | 0.0003 | 0.0003 | 0.0259 | 0.0335 | 0.0414 | 1.1099 | 0.0122 | 0.0527 | 0.0513 | 100.9035 |
| 2053 CZ5 | 0 | 31.0787 | 0.1116 | 0.0164 | 0.0074 | 0.1741 | 67.7822 | 0.006 | 0.0003 | 0.0005 | 0.0753 | 0.0637 | 0.0115 | 0.0003 | 0 | 0.0001 | 1.2844 | 0.0008 | 0.0192 | 0.0179 | 100.6504 |
| 2053 CZ6 | 0 | 31.3229 | 0.1241 | 0.0083 | 0.01 | 0.1786 | 67.1341 | 0.0094 | 0.0003 | 0.0185 | 0.1145 | 0.1007 | 0.0003 | 0.1046 | 0.0818 | 0.0328 | 1.6107 | 0.0491 | 0.0431 | 0.1892 | 101.133 |
| 2053 CZ7 | 0 | 30.8811 | 0.1772 | 0.0121 | 0.0002 | 0.3366 | 67.2679 | 0 | 0.0619 | 0.0292 | 0.0732 | 0.0003 | 0.0085 | 0.0477 | 0.0218 | 0.0188 | 1.1316 | 0.0041 | 0.2503 | 0.1754 | 100.4979 |
| 2053 CZ8 | 0 | 30.7046 | 0.1183 | 0.018 | 0.0002 | 0.1588 | 67.5013 | 0 | 0.0222 | 0.0154 | 0.0497 | 0.0003 | 0.0697 | 0.0003 | 0.0214 | 0.0001 | 1.2316 | 0.0553 | 0.0365 | 0.0718 | 100.0755 |
| 2053 CZ9 | 0 | 30.9461 | 0.1037 | 0.0119 | 0.0009 | 0.1005 | 67.9191 | 0 | 0.0003 | 0.0005 | 0.0885 | 0.0003 | 0.0003 | 0.0485 | 0.0024 | 0 | 1.3176 | 0.0285 | 0.0391 | 0.0119 | 100.6201 |
| **Average** | **0** | **30.9597** | **0.1286** | **0.0119** | **0.0065** | **0.2093** | **67.1647** | **0.0020** | **0.0116** | **0.0154** | **0.0730** | **0.0222** | **0.0288** | **0.0414** | **0.0348** | **0.0384** | **1.4569** | **0.0258** | **0.1144** | **0.1614** | **100.5066** |
| **Feldspars** | | | | | | | | | | | | | | | | | | | | | |
| B2043_A1_feld1 | 0 | 47.9573 | 0.2633 | 18.3909 | 0.3033 | 0.0463 | 0.0002 | 0.0071 | 0.0003 | 0.0502 | 0.0166 | 0.0003 | 0.0003 | 0.0273 | 0.0001 | 0 | 0.0481 | 0.0003 | 0.0003 | 0.0013 | 67.1135 |
| B2043_A2_feld2 | 0 | 60.8478 | 0.0004 | 1.0485 | 0.0499 | 0.0544 | 0.0002 | 0 | 0.0003 | 0.0781 | 0.0895 | 0.0003 | 0.0003 | 0.0003 | 0.0018 | 0.0002 | 0 | 0.0137 | 0.0139 | 0.0316 | 62.231 |
| B2043_C3_feld3 | 0 | 54.4961 | 0.0004 | 1.237 | 0.2526 | 0.0531 | 0.0002 | 0 | 0.0097 | 0.0451 | 0.0671 | 0.019 | 0.0003 | 0.0662 | 0.0001 | 0.0066 | 0.0368 | 0.0003 | 0.0077 | 0.0767 | 56.375 |
| **Average** | **0** | **54.4337** | **0.0880** | **6.8921** | **0.2019** | **0.0513** | **0.0002** | **0.0024** | **0.0034** | **0.0578** | **0.0577** | **0.0065** | **0.0003** | **0.0313** | **0.0006** | **0.0023** | **0.0283** | **0.0048** | **0.0073** | **0.0365** | **61.9065** |
| B2043_C1_Kfeld1 | 0 | 62.3027 | 0.0004 | 0.0686 | 0.0602 | 0.0411 | 0.0002 | 0.0059 | 0.0003 | 0.007 | 0.0503 | 0.004 | 0.0003 | 0.0205 | 0.0256 | 0 | 0.0111 | 0.0064 | 0.0051 | 0.1111 | 62.7208 |
| **Thorite** | | | | | | | | | | | | | | | | | | | | | |
| 2033 cT1 | 0 | 9.7561 | 5.7673 | 0.1275 | 2.0356 | 0.2154 | 0.0002 | 0.0875 | 0.0815 | 0.1255 | 0.1021 | 0.0429 | 0.0144 | 0.0393 | 0 | 0 | 0.0689 | 0.0924 | 64.5444 | 1.8065 | 84.9075 |
| 2033 cT2 | 0 | 9.9337 | 4.8364 | 0.1083 | 3.3355 | 0.1383 | 0.0002 | 0 | 0.1342 | 0.0289 | 0.1948 | 0.0996 | 0.0002 | 0.1653 | 0.0001 | 0.0589 | 0.0558 | 0.0637 | 70.135 | 1.3638 | 90.6525 |
| **Average** | | **9.8449** | **5.3019** | **0.1179** | **2.6856** | **0.1769** | **0.0002** | **0.0438** | **0.1079** | **0.0772** | **0.1485** | **0.0713** | **0.0073** | **0.1023** | **0.0001** | **0.0295** | **0.0623** | **0.0781** | **67.3397** | **1.5852** | **87.7800** |

# Appendix E-2. Microprobe Analytical Results for Minerals in the Darwin Granite.

| Mineral | Ox%(O ) | Ox%(Sl) | Ox%(P ) | Ox%(Ca) | Ox%(Tl) | Ox%(Y ) | Ox%(Zr) | Ox%(La) | Ox%(Ce) | Ox%(Pr) | Ox%(Nd) | Ox%(Sm) | Ox%(Gd) | Ox%(Dy) | Ox%(Er) | Ox%(Yb) | Ox%(Hf) | Ox%(Pb) | Ox%(Th) | Ox%(U ) | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Chalcopyrite** | | | | | | | | | | | | | | | | | | | | | |
| B2061_A1_chalco1 | 0 | 0.103 | 0.0522 | 0.0703 | 0.0002 | 0.0528 | 0.0001 | 0.0219 | 0.0554 | 0.0751 | 0.005 | 0.0452 | 0.0002 | 0.0002 | 0.0224 | 0.0167 | 0.0238 | 2.5326 | 0.015 | 0.0419 | 3.134 |
| **Pyrite** | | | | | | | | | | | | | | | | | | | | | |
| 2053 CP1 | 0 | 0.0056 | 0.0003 | 0.0047 | 0.0002 | 0.0504 | 0.0002 | 0 | 0.0002 | 0.0645 | 0.0867 | 0.0052 | 0.009 | 0.0563 | 0 | 0 | 0.0218 | 0.5324 | 0.0002 | 0.02 | 0.8577 |
| 2053 CP2 | 0 | 0.011 | 0.0002 | 0.0099 | 0.0002 | 0.0502 | 0.0001 | 0 | 0.0228 | 0.0004 | 0.0328 | 0.0002 | 0.0109 | 0.0002 | 0 | 0 | 0.0144 | 0.5246 | 0.0288 | 0 | 0.7067 |
| 2053 CP3 | 0 | 0.015 | 0.0002 | 0.0103 | 0.0223 | 0.0679 | 0.0002 | 0 | 0.0156 | 0.0004 | 0.0578 | 0.0002 | 0.0226 | 0.0002 | 0 | 0.0004 | 0.0296 | 0.4956 | 0.0187 | 0.0056 | 0.7628 |
| **Average** | **0** | **0.0105** | **0.0002** | **0.0083** | **0.0076** | **0.0562** | **0.0002** | **0.0000** | **0.0129** | **0.0218** | **0.0591** | **0.0019** | **0.0142** | **0.0189** | **0.0000** | **0.0001** | **0.0219** | **0.5175** | **0.0159** | **0.0085** | **0.7757** |
| **Magnetite** | | | | | | | | | | | | | | | | | | | | | |
| 2033 am1 | 0 | 0.0983 | 0.0003 | 0.0052 | 0.1969 | 0.047 | 0.0002 | 0 | 0.0236 | 0.0005 | 0.0264 | 0.0003 | 0.042 | 0.0003 | 0 | 0 | 0.0049 | 0.0183 | 0.0144 | 0 | 0.4786 |
| 2033 am2 | 0 | 0.213 | 0.0003 | 0.0118 | 0.2226 | 0.0518 | 0.0002 | 0 | 0.0029 | 0.0005 | 0.0418 | 0.0003 | 0.0539 | 0.0064 | 0 | 0 | 0 | 0.0254 | 0.0788 | 0 | 0.7097 |
| 2033 am3 | 0 | 0.1246 | 0.0003 | 0.0074 | 0.4422 | 0.0403 | 0.0002 | 0.0246 | 0.0065 | 0.0486 | 0.029 | 0.0539 | 0.0003 | 0.0003 | 0 | 0 | 0.0329 | 0.0003 | 0.0647 | 0 | 0.8761 |
| 2033 bm4 | 0 | 0.4105 | 0.0003 | 0.0174 | 0.0549 | 0.0582 | 0.0002 | 0.0003 | 0.0003 | 0.0065 | 0.0003 | 0.0003 | 0.0248 | 0.0226 | 0 | 0 | 0.0248 | 0.0003 | 0.0002 | 0 | 0.6219 |
| **Average** | **0** | **0.2116** | **0.0003** | **0.0105** | **0.2292** | **0.0493** | **0.0002** | **0.0062** | **0.0083** | **0.0140** | **0.0244** | **0.0137** | **0.0303** | **0.0074** | **0.0000** | **0.0000** | **0.0157** | **0.0111** | **0.0395** | **0.0000** | **0.6716** |
| B2043_A1_MG1 | 0 | 2.6145 | 0.0004 | 0.031 | 0.082 | 0.0704 | 0.0002 | 0 | 0.0003 | 0.0005 | 0.0401 | 0.0003 | 0.0003 | 0.0304 | 0 | 0 | 0.025 | 0.0003 | 0.0213 | 0.0278 | 2.9448 |
| B2043_A2_MG2 | 0 | 0.1628 | 0.0003 | 0.014 | 0.1936 | 0.0347 | 0.0002 | 0 | 0.0489 | 0.0732 | 0.0849 | 0.0003 | 0.0003 | 0.0003 | 0 | 0 | 0 | 0.0129 | 0.0042 | 0 | 0.6306 |
| **Average** | | **1.3887** | **0.0004** | **0.0225** | **0.1378** | **0.0526** | **0.0002** | **0.0000** | **0.0246** | **0.0369** | **0.0625** | **0.0003** | **0.0003** | **0.0154** | **0.0000** | **0.0000** | **0.0125** | **0.0066** | **0.0128** | **0.0139** | **1.7877** |
| **Yttrocrasite (?) (Y,Th,U,Ca)$Ti_2$(O,OH)** | | | | | | | | | | | | | | | | | | | | | |
| B2043_A2_U2 | 0 | 0 | 0.2902 | 0.2602 | 23.9602 | 18.9789 | 0.0002 | 0 | 0.2107 | 0.1752 | 1.3762 | 0.8362 | 2.6676 | 3.106 | 2.3255 | 2.4814 | 0.2635 | 0.1301 | 5.1841 | 2.6245 | 64.8707 |

Appendix E-2 Continued.

**Feldspar**

| | B2033-misc-09799-A-Feld1 | B2033-misc-09799-A-Feld4 | B2033-misc-09799-B-Feld1 | B2033-misc-09799-B-Feld2 | B2033-misc-09799-B-Feld3 | B2033-misc-09799-B-Feld4 | B2033-misc-09799-D-Feld1 | B2055-misc-09799-B-K-feld1 | B2055-misc-09799-C-Feld1 | B2055-misc-09799-C-K-feld1 | B2055-misc-09799-E-Feld1 | B2055-misc-09799-G-Feld1 | B2055-misc-09799-H-Feld1 | B2055-misc-09799-H-Feld2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $SiO_2$ | 63.83 | 63.64 | 68.17 | 68.05 | 68.01 | 64.22 | 68.43 | 63.24 | 63.12 | 62.94 | 63.36 | 62.66 | 62.75 | 67.13 |
| $TiO_2$ | 0 | 0.01 | 0 | 0 | 0 | 0.01 | 0 | 0.01 | 0.01 | 0 | 0.01 | 0.02 | 0.02 | 0 |
| $Al_2O_3$ | 18.38 | 18.57 | 19.92 | 20.03 | 19.89 | 18.5 | 19.97 | 18.65 | 19.09 | 18.45 | 18.58 | 19.02 | 18.9 | 20.52 |
| $Fe_2O_3$ | 0.06 | 0.08 | 0.03 | 0.05 | 0.03 | 0.09 | 0 | 0.01 | 0.5 | 0.14 | 0.03 | 0.03 | 0.28 | 0.22 |
| MnO | 0 | 0 | 0.01 | 0.03 | 0 | 0 | 0 | 0 | 0.02 | 0 | 0 | 0.01 | 0 | 0 |
| MgO | 0 | 0 | 0.01 | 0 | 0.01 | 0.02 | 0 | 0 | 0.02 | 0 | 0.01 | 0.01 | 0.01 | 0.02 |
| CaO | 0.03 | 0.02 | 0.06 | 0.09 | 0.04 | 0 | 0.11 | 0 | 0 | 0 | 0 | 0 | 0 | 0.08 |
| SrO | 0.07 | 0.01 | 0.01 | 0.06 | 0 | 0.02 | 0.02 | 0.01 | 0.08 | 0.01 | 0.01 | 0.04 | 0.02 | 0.03 |
| BaO | 0 | 0.05 | 0 | 0 | 0.01 | 0.01 | 0 | 0.36 | 0.37 | 0.34 | 0.28 | 0.53 | 0.75 | 0.06 |
| $Na_2O$ | 0.39 | 0.27 | 11.41 | 11.34 | 11.47 | 0.54 | 11.46 | 0.27 | 0.81 | 0.25 | 0.45 | 0.24 | 0.25 | 10.98 |
| $K_2O$ | 16.58 | 16.65 | 0.06 | 0.11 | 0.07 | 16.43 | 0.07 | 16.49 | 15.22 | 16.63 | 16.29 | 16.39 | 16.25 | 0.44 |
| $Rb_2O$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.01 |
| Sum Ox% | 99.35 | 99.3 | 99.68 | 99.76 | 99.55 | 99.83 | 100.06 | 99.05 | 99.24 | 98.77 | 99.02 | 98.94 | 99.23 | 99.49 |
| Si | 2.982 | 2.975 | 2.984 | 2.978 | 2.982 | 2.982 | 2.984 | 2.969 | 2.948 | 2.968 | 2.972 | 2.95 | 2.95 | 2.953 |
| Ti | 0 | 0.001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.001 | 0.001 | 0 |
| Al/Al IV | 1.012 | 1.023 | 1.028 | 1.033 | 1.028 | 1.013 | 1.026 | 1.032 | 1.051 | 1.026 | 1.027 | 1.055 | 1.047 | 1.064 |
| Al VI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Fe3+ | 0.002 | 0.003 | 0.001 | 0.001 | 0.001 | 0.003 | 0 | 0 | 0.017 | 0.005 | 0.001 | 0.001 | 0.01 | 0.007 |
| Mn2+ | 0 | 0 | 0 | 0.001 | 0 | 0 | 0 | 0 | 0.001 | 0 | 0 | 0 | 0 | 0 |
| Mg | 0 | 0 | 0.001 | 0 | 0 | 0.001 | 0 | 0 | 0.002 | 0 | 0.001 | 0.001 | 0.001 | 0.001 |
| Ca | 0.001 | 0.001 | 0.003 | 0.004 | 0.002 | 0 | 0.005 | 0 | 0 | 0 | 0 | 0 | 0 | 0.004 |
| Sr | 0.002 | 0 | 0 | 0.001 | 0 | 0 | 0 | 0 | 0.002 | 0 | 0 | 0.001 | 0 | 0.001 |
| Ba | 0 | 0.001 | 0 | 0 | 0 | 0 | 0 | 0.007 | 0.007 | 0.006 | 0.005 | 0.01 | 0.014 | 0.001 |
| Na | 0.035 | 0.024 | 0.968 | 0.962 | 0.975 | 0.049 | 0.969 | 0.025 | 0.073 | 0.023 | 0.041 | 0.022 | 0.022 | 0.936 |
| K | 0.988 | 0.993 | 0.003 | 0.006 | 0.004 | 0.973 | 0.004 | 0.988 | 0.907 | 1 | 0.975 | 0.984 | 0.975 | 0.025 |
| Rb | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sum Cat# | 5.023 | 5.02 | 4.988 | 4.988 | 4.993 | 5.021 | 4.989 | 5.021 | 5.008 | 5.028 | 5.022 | 5.025 | 5.02 | 4.992 |
| Ab | 3.41 | 2.356 | 99.328 | 98.803 | 99.364 | 4.746 | 99.004 | 2.436 | 7.385 | 2.218 | 4.022 | 2.168 | 2.218 | 96.819 |
| An | 0.14 | 0.097 | 0.298 | 0.429 | 0.214 | 0.001 | 0.542 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.412 |
| Or | 96.259 | 97.425 | 0.346 | 0.623 | 0.377 | 95.187 | 0.413 | 96.895 | 91.711 | 97.135 | 95.438 | 96.771 | 96.361 | 2.555 |
| Celsian | 0 | 0.085 | 0 | 0 | 0.021 | 0.024 | 0 | 0.643 | 0.69 | 0.615 | 0.502 | 0.956 | 1.373 | 0.107 |
| Rb-Feld | 0 | 0 | 0 | 0 | 0.012 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.019 |
| Sr-Feld | 0.191 | 0.037 | 0.029 | 0.145 | 0.011 | 0.042 | 0.042 | 0.025 | 0.213 | 0.031 | 0.038 | 0.104 | 0.046 | 0.087 |

Appendix E-2 Continued.

**Altered Feldspar**

| | B2055-misc-09799-I-Feld1 | B2033-misc-09799-B-Feld5 | B2033-misc-09799-C-Feld1 | B2033-misc-09799-E-Feld2 | B2033-misc-09799-G-Feld1 | B2033-misc-09799-G-Feld2 | B2033-misc-09799-H-Feld2 | B2033-misc-09799-A-Feld2 | B2033-misc-09799-E-Feld1 | B2033-misc-09799-A-Feld3 |
|---|---|---|---|---|---|---|---|---|---|---|
| $SiO_2$ | 66.54 | 65.89 | 65.68 | 65.14 | 64.24 | 63.99 | 65.42 | 66.76 | 66.75 | 67.64 |
| $TiO_2$ | 0 | 0 | 0.01 | 0 | 0.03 | 0 | 0.02 | 0 | 0 | 0 |
| $Al_2O_3$ | 19.33 | 19.29 | 19.02 | 21.7 | 18.75 | 18.66 | 19.08 | 20.73 | 20.84 | 20.58 |
| $Fe_2O_3$ | 0.08 | 0.16 | 0.12 | 0.1 | 0.48 | 0.04 | 0.29 | 0.17 | 0.1 | 0.14 |
| MnO | 0 | 0 | 0.01 | 0.01 | 0 | 0.02 | 0 | 0.01 | 0 | 0.01 |
| MgO | 0 | 0 | 0 | 0.01 | 0 | 0 | 0 | 0 | 0 | 0.02 |
| CaO | 0.04 | 0.09 | 0.01 | 2.34 | 0.02 | 0 | 0.07 | 1.05 | 1.11 | 0.52 |
| SrO | 0.04 | 0.01 | 0.02 | 0.01 | 0.02 | 0.02 | 0.03 | 0.04 | 0.01 | 0.03 |
| BaO | 0.11 | 0.03 | 0.06 | 0.01 | 0.03 | 0 | 0 | 0.03 | 0.01 | 0.01 |
| $Na_2O$ | 6.74 | 5.55 | 4.61 | 10.06 | 1.25 | 0.72 | 4.24 | 10.83 | 10.76 | 11.07 |
| $K_2O$ | 7.15 | 9.04 | 9.78 | 0.3 | 15.44 | 16.22 | 10.66 | 0.23 | 0.23 | 0.32 |
| $Rb_2O$ | 0 | 0 | 0 | 0.02 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sum Ox% | 100.05 | 100.06 | 99.32 | 99.69 | 100.25 | 99.67 | 99.84 | 99.86 | 99.82 | 100.32 |
| Si | 2.981 | 2.973 | 2.987 | 2.875 | 2.965 | 2.975 | 2.974 | 2.932 | 2.93 | 2.951 |
| Ti | 0 | 0 | 0 | 0 | 0.001 | 0 | 0.001 | 0 | 0 | 0 |
| Al/Al IV | 1.021 | 1.026 | 1.02 | 1.129 | 1.02 | 1.022 | 1.023 | 1.073 | 1.078 | 1.058 |
| Al VI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Fe3+ | 0.003 | 0.005 | 0.004 | 0.003 | 0.017 | 0.001 | 0.01 | 0.006 | 0.003 | 0.004 |
| Mn2+ | 0 | 0 | 0 | 0 | 0 | 0.001 | 0 | 0 | 0 | 0 |
| Mg | 0 | 0 | 0 | 0.001 | 0 | 0 | 0 | 0 | 0 | 0.001 |
| Ca | 0.002 | 0.004 | 0.001 | 0.111 | 0.001 | 0 | 0.004 | 0.049 | 0.052 | 0.024 |
| Sr | 0.001 | 0 | 0.001 | 0 | 0.001 | 0.001 | 0.001 | 0.001 | 0 | 0.001 |
| Ba | 0.002 | 0 | 0.001 | 0 | 0.001 | 0 | 0 | 0 | 0 | 0 |
| Na | 0.585 | 0.485 | 0.407 | 0.861 | 0.112 | 0.065 | 0.374 | 0.922 | 0.916 | 0.937 |
| K | 0.409 | 0.52 | 0.567 | 0.017 | 0.909 | 0.962 | 0.618 | 0.013 | 0.013 | 0.018 |
| Rb | 0 | 0 | 0 | 0.001 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sum Cat# | 5.004 | 5.014 | 4.988 | 4.998 | 5.026 | 5.026 | 5.005 | 4.997 | 4.993 | 4.995 |
| Ab | 58.582 | 48.018 | 41.665 | 87.007 | 10.918 | 6.29 | 37.53 | 93.49 | 93.317 | 95.639 |
| An | 0.216 | 0.445 | 0.063 | 11.192 | 0.092 | 0.001 | 0.363 | 5.016 | 5.34 | 2.472 |
| Or | 40.902 | 51.464 | 58.115 | 1.697 | 88.882 | 93.653 | 62.025 | 1.333 | 1.29 | 1.807 |
| Celsian | 0.198 | 0.044 | 0.103 | 0.019 | 0.054 | 0 | 0 | 0.046 | 0.013 | 0.015 |
| Rb-Feld | 0 | 0 | 0 | 0.071 | 0 | 0 | 0 | 0.014 | 0.004 | 0 |
| Sr-Feld | 0.103 | 0.029 | 0.053 | 0.014 | 0.053 | 0.056 | 0.082 | 0.101 | 0.037 | 0.067 |

# Appendix F. Sr and Nd Data.



| Sample Number | Unit/Location | Rock Type | Age (T in million years) | Nd ppm | Sm ppm | 143Nd/144 Nd measured | Sm/Nd | 147Sm/144Nd calculated | epsilon Nd (0) | 143Nd/144 Nd initial | 143Nd/144 Nd (T)CHUR | epsilon Nd (init)CHUR | Nd age mod: CHUR (Ma) | Nd age mod: DEPLETED (Ma) | TDM 2-stage | 87Sr/86Sr (T=initial) | Reference |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GS-1 | Darwin Granite | Granite | 500 | 32.69 | 4.38 | 0.512089 | 0.1339859 | 0.08101183 | -10.71 | 0.511774 | 0.511994 | **-4.29** | 833 | 1392 | 1600 | 0.693240 | Stolz, 1997 pers. comm. |
| GS-7 | Darwin Granite | Granite | 500 | 26.61 | 4.71 | 0.512089 | 0.1770011 | 0.10702008 | -10.71 | 0.511738 | 0.511994 | **-4.99** | 934 | 1534 | 1658 | 0.700846 | Stolz, 1997 pers. comm. |
| JD13 | Darwin Granite | Granite | 500 | 27.17 | 3.842 | 0.512132 | 0.141406 | 0.085536 | -9.87 | 0.511852 | 0.511994 | **-2.8** | 694 | 1226 | 1474 | 0.7092824 | Crawford, 1997 pers. comm. |
| TO4137 | Murchison Granite | Granite | 500 | 34.68 | 6.755 | 0.512139 | 0.194781 | 0.117823 | -9.73 | 0.511753 | 0.511994 | **-4.7** | 964 | 1626.11 | 1634 | 0.7097828 | Crawford, 1997 pers. comm. |
| AR1 | Tyndall Group | ? | 500 | 60.42 | 11.75 | 0.51214 | 0.194472 | 0.117636 | -9.71 | 0.511755 | 0.511994 | **-4.7** | 960 | 1621 | 1632 | 0.7098299 | Crawford, 1997 pers. comm. |
| AR4 | Tyndall Group | ? | 500 | 30.73 | 6.037 | 0.512128 | 0.196453 | 0.118834 | -9.95 | 0.511739 | 0.511994 | **-5.0** | 998 | 1661 | 1658 | 0.7103866 | Crawford, 1997 pers. comm. |
| W93 | Queenstown Reservoir | Andesite | 500 | 60.16 | 10.32 | 0.512332 | 0.171543 | 0.103766 | -5.97 | 0.511992 | 0.511994 | **0.0** | 503 | 1153 | 1245 | 0.7085363 | Crawford, 1997 pers. comm. |
| M189 | Crown Hill | Andesite | 500 | 55.67 | 11.25 | 0.512283 | 0.202084 | 0.122240 | -6.92 | 0.511883 | 0.511994 | **-2.2** | 727 | 1466 | 1423 | 0.7087077 | Crawford, 1997 pers. comm. |
| Z632 | Crown Hill | Hnbl. Andesite | 500 | 63.32 | 10.08 | 0.512299 | 0.159191 | 0.096295 | -6.61 | 0.511984 | 0.511994 | **-0.2** | 515 | 1122 | 1259 | 0.7082729 | Crawford, 1997 pers. comm. |
| HR23 | Halls Rivulet | Andesite | 500 | 27.4 | 5.523 | 0.512095 | 0.201569 | 0.121929 | -10.59 | 0.511696 | 0.511994 | **-5.8** | 1106 | 1771 | 1728 | 0.7153367 | Crawford, 1997 pers. comm. |
| 39233 | Mt.Lyell | Andesite | 500 | 41.96 | 7.528 | 0.512266 | 0.179409 | 0.108524 | -7.26 | 0.511911 | 0.511994 | **-1.6** | 644 | 1300 | 1378 | 0.7093558 | Crawford, 1997 pers. comm. |
| AR6 | ? | Hnbl. Andesite | 500 | 49.88 | 8.362 | 0.512288 | 0.167642 | 0.101407 | -6.83 | 0.511956 | 0.511994 | **-0.7** | 561 | 1188 | 1304 | 0.7087971 | Crawford, 1997 pers. comm. |
| Y75 | Yolande River | Felsic porph. | 500 | 35.03 | 6.764 | 0.511983 | 0.193092 | 0.116801 | -12.78 | 0.511600 | 0.511994 | **-7.7** | 1248 | 1853 | 1883 | 0.6997197 | Stolz, 1997 pers. comm. |
| Z488 | Western Volc. Seq. | Rhyolite porph. | 500 | 52.88 | 10.08 | 0.511938 | 0.190620 | 0.115306 | -13.65 | 0.511560 | 0.511994 | **-8.5** | 1309 | 1894 | 1948 | 0.7230618 | Stolz, 1997 pers. comm. |
| 109452 | Prince Lyell Apatite-Magnetite veins | Apatite | 500 | 3970 | 731 | 0.512177 | 0.184131 | 0.11133331 | | 0.511812 | 0.511994 | **-3.54** | | | | 0.708979 | Stolz, 1997 pers. comm. |
| 109454 | Prince Lyell Apatite-Magnetite veins | Apatite | 500 | 4310 | 788 | 0.512144 | 0.1828306 | 0.1105462 | | 0.511782 | 0.511994 | **-4.14** | | | | 0.70901 | Stolz, 1997 pers. comm. |
| Garfield | Garfield Apatite-Magnetite veins | Apatite | 500 | | | | | | | | | **-1.2** | | | | | Halley, 1996 pers. comm. |
| Garfield | Garfield Apatite-Magnetite veins | Apatite | 500 | | | | | | | | | **-1.3** | | | | | Halley, 1996 pers. comm. |

# Appendix F. Sr and Nd Data.



| Sample Number | Unit/Location | | Age (T in million years) | Nd ppm | Sm ppm | 143Nd/144Nd measured | Sm/Nd | 147Sm/144Nd calculated | epsilon Nd (0) | 143Nd/144Nd initial | 143Nd/144Nd (T)CHUR | epsilon Nd (init)CHUR | Nd age mod:CHUR (Ma) | Nd age mod:DEPLETED (Ma) | TDM 2-stage | 87Sr/86Sr (T=initial) | Reference |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TO4137 | Murchison Gr. | Granite | 500 | 34.68 | 6.755 | 0.512139 | 0.194781 | 0.117823 | -9.7 | 0.511753 | 0.511994 | **-4.7** | 964 | 1626.11 | 1634 | 0.7097828 | Crawford, 1997 pers. comm. |
| JD13 | Darwin Gr. | Granite | 500 | 27.17 | 3.842 | 0.512132 | 0.141406 | 0.085536 | -9.9 | 0.511852 | 0.511994 | **-2.8** | 694 | 1226 | 1474 | 0.7092824 | Crawford, 1997 pers. comm. |
| AR1 | Tyndall Group | Rhyolite | 500 | 60.42 | 11.75 | 0.51214 | 0.194472 | 0.117636 | -9.7 | 0.511755 | 0.511994 | **-4.7** | 960 | 1621 | 1632 | 0.7098299 | Crawford, 1997 pers. comm. |
| AR4 | Tyndall Group | Rhyolite | 500 | 30.73 | 6.037 | 0.512128 | 0.196453 | 0.118834 | -9.9 | 0.511739 | 0.511994 | **-5.0** | 998 | 1661 | 1658 | 0.7103866 | Crawford, 1997 pers. comm. |
| Z7250 | CPX in Hellyer | Basalts | 500 | 3.5 | 1.03 | 0.512677 | 0.294286 | 0.178013 | 0.8 | 0.512094 | 0.511994 | **2.0** | -319 | 2074 | 1079 | 0.7081234 | Crawford, 1997 pers. comm. |
| 72504 | CPX in Hellyer | Basalts | 500 | 66.2 | 12.87 | 0.512281 | 0.194411 | 0.117599 | -7.0 | 0.511896 | 0.511994 | **-1.9** | 689 | 1398 | 1402 | 0.7079598 | Crawford, 1997 pers. comm. |
| 72564 | CPX in Hellyer | Basalts | 500 | 8.08 | 2.26 | 0.512592 | 0.279703 | 0.169192 | -0.9 | 0.512038 | 0.511994 | **0.9** | 255 | 1954 | 1171 | 0.7064964 | Crawford, 1997 pers. comm. |
| 72567 | CPX in Hellyer | Basalts | 500 | 7.96 | 2.23 | 0.512605 | 0.280151 | 0.169463 | -0.6 | 0.512050 | 0.511994 | **1.1** | 185 | 1921 | 1151 | 0.7064643 | Crawford, 1997 pers. comm. |
| 72568 | CPX in Hellyer | Basalts | 500 | 7.86 | 2.22 | 0.51261 | 0.282443 | 0.170850 | -0.5 | 0.512050 | 0.511994 | **1.1** | 166 | 1965 | 1150 | 0.7063386 | Crawford, 1997 pers. comm. |
| W93 | Hnbl. andesite | CVC | 500 | 60.16 | 10.32 | 0.512332 | 0.171543 | 0.103766 | -6.0 | 0.511992 | 0.511994 | **0.0** | 503 | 1153 | 1245 | 0.7085363 | Crawford, 1997 pers. comm. |
| M189 | Hnbl. andesite | CVC | 500 | 55.67 | 11.25 | 0.512283 | 0.202084 | 0.122240 | -6.9 | 0.511883 | 0.511994 | **-2.2** | 727 | 1466 | 1423 | 0.7087077 | Crawford, 1997 pers. comm. |
| Z632 | Hnbl. andesite | CVC | 500 | 63.32 | 10.08 | 0.512299 | 0.159191 | 0.096295 | -6.6 | 0.511984 | 0.511994 | **-0.2** | 515 | 1122 | 1259 | 0.7082729 | Crawford, 1997 pers. comm. |
| HR23 | Andesite-Henty | CVC | 500 | 27.4 | 5.523 | 0.512095 | 0.201569 | 0.121929 | -10.6 | 0.511696 | 0.511994 | **-5.8** | 1106 | 1771 | 1728 | 0.7153367 | Crawford, 1997 pers. comm. |
| HCL | rhyolite | CVC | 500 | 49.61 | 8.966 | 0.512182 | 0.180730 | 0.109323 | -8.9 | 0.511824 | 0.511994 | **-3.3** | 796 | 1432 | 1519 | 0.7090896 | Crawford, 1997 pers. comm. |
| 39233 | Hnbl. andesite | CVC | 500 | 41.96 | 7.528 | 0.512266 | 0.179409 | 0.108524 | -7.3 | 0.511911 | 0.511994 | **-1.6** | 644 | 1300 | 1378 | 0.7093558 | Crawford, 1997 pers. comm. |
| AR6 | Hnbl. andesite | CVC | 500 | 49.88 | 8.362 | 0.512288 | 0.167642 | 0.101407 | -6.8 | 0.511956 | 0.511994 | **-0.7** | 561 | 1188 | 1304 | 0.7087971 | Crawford, 1997 pers. comm. |
| 30039A | Hnbl. andesite | CVC | 500 | 31.78 | 6.312 | 0.512177 | 0.198615 | 0.120143 | -9.0 | 0.511783 | 0.511994 | **-4.1** | 918 | 1605 | 1585 | 0.7088277 | Crawford, 1997 pers. comm. |
| JD6 | rhyolite | CVC | 500 | 41.26 | 7.9 | 0.512081 | 0.191469 | 0.115819 | -10.9 | 0.511702 | 0.511994 | **-5.7** | 1049 | 1683 | 1718 | 0.6914487 | Crawford, 1997 pers. comm. |
| Y408 | basalt | WVC | 500 | 101 | 17.25 | 0.512325 | 0.170792 | 0.103312 | -6.1 | 0.511987 | 0.511994 | **-0.1** | 512 | 1157 | 1254 | 0.7123654 | Crawford, 1997 pers. comm. |
| Y75 | felsic porph. | WVC | 500 | 35.03 | 6.764 | 0.511983 | 0.193092 | 0.116801 | -12.8 | 0.511600 | 0.511994 | **-7.7** | 1248 | 1853 | 1883 | 0.6997197 | Crawford, 1997 pers. comm. |
| C9 | basalt | WVC | 500 | 31.61 | 5.622 | 0.512399 | 0.177855 | 0.107585 | -4.7 | 0.512047 | 0.511994 | **1.0** | 410 | 1098 | 1156 | 0.7065443 | Crawford, 1997 pers. comm. |
| Z102 | basalt | WVC | 500 | 44.93 | 7.729 | 0.512347 | 0.172023 | 0.104057 | -5.7 | 0.512006 | 0.511994 | **0.2** | 480 | 1135 | 1222 | 0.7077121 | Crawford, 1997 pers. comm. |
| Z488 | rhyolite porph | WVC | 500 | 52.88 | 10.08 | 0.511938 | 0.190620 | 0.115306 | -13.7 | 0.511560 | 0.511994 | **-8.5** | 1309 | 1894 | 1948 | 0.7230618 | Crawford, 1997 pers. comm. |

# Appendix G. Results of XRD Analyses.



| Sample Number | >80% | 60-80% | >60% | 40-60% | 25-40% | 15-25% | 10-15% | 5-10% | <5% |
|---|---|---|---|---|---|---|---|---|---|
| B1077 | | Quartz | | | | | Plagioclase, K-Feldspar | Mica | Chlorite |
| B1090 | | Quartz | | | | Plagioclase | | Mica | Chlorite |
| B2011 | | Quartz | | | | | | Mica, K-Feldspar, Plagioclase | ?Smectite |
| B2030 | Tourmaline | | | | | | Quartz | | Hematite, ?Chlorite |
| B2033 | | | | Quartz | | Plagioclase, K-Feldspar | | | Mica, ?Hematite |
| B2043 | | Quartz | | | Plagioclase | | | Mica | |
| B2049 | | | | Tourmaline, Quartz | | | | | Mica, ?Hematite |
| B2052 | | | | Quartz | | | | | |
| B2054 | | | | Quartz | | K-Feldspar | Plagioclase | Mica | |
| 74293 | | | | | | Mica | Plagioclase | K-Feldspar, Ankerite | Chlorite |
| B1006 | Chlorite (94) | | | | | | | Quartz (6) | |
| B1010 | Chlorite (95) | | | | | | | Quartz (3) | Mica (2) |
| 10350 | Chlorite (84) | | | | | | | Goethite (6) | Mica (4), Quartz (4), Rutile (2) |
| 8600 | | | | Quartz | | Mica | Kaolinite | | Chlorite, K-Feldspar |
| 10140 | | | Quartz | | | Chlorite | Mica | K-Feldspar | Hematite, Goethite |
| 10330 | | | Quartz | | | Mica | Chlorite | K-Feldspar | |
| 10520 | | | | Quartz | | Chlorite | Mica, K-Feldspar | | |
| 10550 | | | | Quartz | Mica | Chlorite | | | K-Feldspar, Hematite |

All XRD analyses were conducted at the laboratory at Mineral Resources Tasmania, Rosny Park, Tasmania.

| Sample Number | Chlorite | Siderite | Quartz | K-Feldspar | Mica | Goethite | Rutile | Tour-maline | Jarosite | Hematite | Pyrite | Plagioclase | Magnetite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10250 | | | 5 | | | | 9 | | | 4 | | | 82 |
| 10270 (non-Magnetic) | 35 | | 19 | 4 | 15 | 20 | 4 | | 3 | | | | |
| 10290 | 2 | | 57 | 40 | 1 | | | | | | | | |
| 10300 | 5 | | 40 | | 14 | 35 | 6 | | | | | | |
| 10300 (+2.88 SG, heavies) | 17 | 2 | 8 | 1 | 12 | 58 | 2 | | | ? | | | |
| 10300A | 4 | | 80 | 9 | 7 | | | | | | | | |
| 10350 | 89 | | 3 | | 2 | 5 | 1 | | | | | | |
| 10350A (non-magnetic | 42 | | 14 | 3 | 15 | 14 | 4 | 7 | | | 1 | | |
| 10350B (+3.1SG, Heavy) | 53 | | 8 | | 4 | 20 | 1 | | | 13 | | | |
| 10420 | 37 | | 7 | | 10 | 43 | 3 | | | | | | |
| 10420A | 1 | | 82 | 16 | 1 | | | | | | | | |
| 10510 (Heavies) | 3 | | 15 | 14 | 24 | | 28 | | | | 4 | 11 | |
| B1006 | 47 | 43 | 10 | 1 | | | | | | | | | |
| B1010 | 33 | 51 | 13 | 1 | 2 | | | | | | | | |

All XRD analyses were conducted at the laboratory at Mineral Resources Tasmania, Rosny Park, Tasmania.
Numbers are in Percent.

# Appendix H. Volcanic Rock Geochemical Data from the Jukes Road and Jukes Prospect.



**Central Volcanic Complex**

Data from: **Wyman (1996)**

| Sample Number | 10140 | 10160 | 10180 | 10200 | 10212 | 10220 | 10240 | 10250 | 10260 | 10270 | 10280 | 10290 | 10300 | 10330 | 10340 | 10350 | 10360 | 10370 | 10375.1 | 10380 | 10390 | 10400 | 10420 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SiO2 | 68.32 | 68.59 | 67.40 | 71.40 | 58.58 | 70.86 | 68.36 | 73.37 | 71.43 | 72.15 | 72.75 | 68.98 | 69.42 | 72.95 | 72.84 | 74.57 | 72.56 | 72.09 | 54.87 | 64.39 | 74.07 | 71.69 | 72.71 |
| TiO2 | 0.14 | 0.25 | 0.36 | 0.37 | 0.26 | 0.29 | 0.29 | 0.29 | 0.31 | 0.30 | 0.30 | 0.30 | 0.32 | 0.31 | 0.31 | 0.31 | 0.30 | 0.31 | 0.32 | 0.30 | 0.31 | 0.29 | 0.32 |
| Al2O3 | 11.43 | 11.01 | 11.58 | 12.63 | 11.27 | 12.31 | 12.05 | 12.61 | 13.57 | 12.61 | 12.83 | 13.10 | 13.52 | 13.57 | 13.32 | 12.97 | 13.22 | 13.63 | 16.41 | 13.92 | 12.81 | 12.32 | 13.03 |
| Fe2O3 | 14.23 | 15.79 | 14.75 | 9.32 | 26.71 | 8.29 | 10.49 | 4.98 | 5.50 | 6.08 | 5.95 | 9.95 | 9.09 | 5.70 | 5.82 | 5.82 | 6.41 | 4.95 | 23.25 | 14.46 | 4.32 | 8.29 | 5.29 |
| MnO | 0.12 | 0.05 | 0.05 | 0.06 | 0.10 | 0.06 | 0.04 | 0.02 | 0.02 | 0.06 | 0.03 | 0.04 | 0.03 | 0.03 | 0.04 | 0.03 | 0.06 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 |
| MgO | 0.81 | 0.79 | 1.46 | 0.70 | 1.36 | 0.66 | 0.61 | 0.46 | 0.68 | 0.62 | 0.62 | 0.73 | 0.78 | 1.07 | 1.02 | 1.00 | 0.79 | 0.55 | 2.13 | 1.18 | 0.60 | 0.69 | 0.57 |
| CaO | 0.01 | 0.02 | 0.01 | 0.02 | 0.01 | 0.02 | 0.04 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.03 | 0.02 | 0.02 | 0.17 | 0.07 | 0.01 | 0.01 | 0.01 |
| Na2O | 0.08 | 0.02 | 0.10 | 0.06 | 0.04 | 0.10 | 0.18 | 0.19 | 0.17 | 0.14 | 0.13 | 0.11 | 0.04 | 0.11 | 0.18 | 0.14 | 0.27 | 0.19 | 0.87 | 0.36 | 0.19 | 0.11 | 0.09 |
| K2O | 4.47 | 2.97 | 3.95 | 5.15 | 1.56 | 6.97 | 7.54 | 7.98 | 7.88 | 7.93 | 7.03 | 6.53 | 6.18 | 6.15 | 6.05 | 5.04 | 5.95 | 8.11 | 1.56 | 4.72 | 7.60 | 6.05 | 7.53 |
| P2O5 | 0.04 | 0.04 | 0.06 | 0.06 | 0.03 | 0.04 | 0.05 | 0.04 | 0.03 | 0.05 | 0.03 | 0.06 | 0.10 | 0.03 | 0.04 | 0.03 | 0.05 | 0.05 | 0.05 | 0.04 | 0.04 | 0.10 | 0.06 |
| Total Volatile | | | | | | | | | | | | | | | | | | | | | | | |
| Free | 99.66 | 99.54 | 99.73 | 99.77 | 99.91 | 99.60 | 99.66 | 99.95 | 99.60 | 99.95 | 99.68 | 99.81 | 99.49 | 99.94 | 99.64 | 99.94 | 99.63 | 99.94 | 99.68 | 99.48 | 99.99 | 99.59 | 99.63 |
| FeO | 12.88 | 14.29 | 13.35 | 8.43 | 24.17 | 7.50 | 9.49 | 4.51 | 4.98 | 5.50 | 5.38 | 9.00 | 8.23 | 5.16 | 5.27 | 5.27 | 5.80 | 4.48 | 21.04 | 13.09 | 3.91 | 7.50 | 4.79 |
| S | 0.16 | 0.16 | 0.1 | 0.18 | 4.42 | 4.42 | 0.67 | 0.75 | 0.14 | 0.09 | <0.01 | <0.01 | 0.26 | <0.01 | <0.01 | 0.18 | 0.02 | <0.01 | 0.04 | 0.03 | 0.03 | 0.03 | 0.02 |
| Sc | | | | | | | | | | | | | | | | | | | | | | | |
| Tl | 867 | 1504 | 2181 | 2220 | 1543 | 1724 | 1767 | 1760 | 1832 | 1776 | 1777 | 1791 | 1919 | 2016 | 1854 | 1850 | 1789 | 1879 | 1936 | 1810 | 1833 | 1732 | 1906 |
| V | | | | | | | | | | | | | | | | | | | | | | | |
| Cr | | | | | | | | | | | | | | | | | | | | | | | |
| Co | | | | | | | | | 6 | | 6 | | 28 | | 4 | | 2 | | 6 | | 7 | | |
| Ni | | | | | | | | | | | | | | | | | | | | | | | |
| Cu | 1500 | 3040 | 254 | 156 | 491 | 491 | 1200 | 305 | 430 | 834 | 387 | 365 | 1400 | 2640 | 469 | 1200 | 493 | 1195 | 454 | 2480 | 104 | 1550 | 523 |
| Zn | 156 | 158 | 169 | 74 | 307 | 307 | 98 | 75 | 56 | 86 | 82 | 62 | 78 | 111 | 94 | 84 | 93 | 84 | 33 | 83 | 66 | 88 | 72 |
| As | | | | | | | | | <3 | | <3 | | 10 | | <3 | | <3 | | <3 | | <3 | | |
| Br | | | | | | | | | 1 | | <1 | | <1 | | <1 | | <1 | | <1 | | <1 | | |
| Rb | 100 | 109 | 84 | 134 | 59 | 59 | 158 | 156 | 172 | 176 | 165 | 160 | 162 | 178 | 176 | 181 | 166 | 179 | 183 | 109 | 196 | 157 | 179 |
| Sr | 27 | 9 | 43 | 41 | 6 | 6 | 44 | 51 | 55 | 58 | 53 | 43 | 32 | 27 | 30 | 28 | 21 | 34 | 47 | 45 | 45 | 31 | 47 |
| Zr | 129 | 211 | 197 | 294 | 197 | 197 | 245 | 244 | 260 | 269 | 253 | 269 | 259 | 277 | 276 | 269 | 271 | 266 | 286 | 256 | 270 | 242 | 268 |
| Nb | | | | | | | | | 12.7 | | 12 | | 14.6 | | 12.4 | | 13.5 | | 15.4 | | 12.8 | | |
| Mo | 5.3 | 3.8 | | 1.3 | 2.2 | 14.4 | 9.6 | 13.2 | 7.5 | 3.2 | 6.4 | 4.2 | 9.8 | 3 | 1.4 | 1.4 | 1.9 | 2.6 | 2.9 | 30.1 | 1.4 | 4 | 1.8 |
| Ag | | | | | | | | | | | | | | | | | | | | | | | |
| Cd | | | | | | | | | | | | | | | | | | | | | | | |
| Sn | | | | | | | | | 4.8 | | 3.6 | | 18.3 | | 4.5 | | 9.4 | | 4.3 | | 7.2 | | |
| Sb | | | | | | | | | | | | | | | | | | | | | | | |
| Cs | | | | | | | | | | | | | | | | | | | | | | | |
| Ba | 1161 | 536 | 2065 | 1812 | 190 | 190 | 2088 | 2611 | 2689 | 2526 | 2818 | 2359 | 2101 | 1447 | 1961 | 1805 | 1323 | 1912 | 2698 | 1692 | 2750 | 1754 | 2625 |
| La | | | | | | | | | | | | | | | | | | | | | | | |
| Ce | | | | | | | | | | | | | | | | | | | | | | | |
| Nd | | | | | | | | | 50 | | 52 | | 58 | | 42 | | 38 | | 30 | | 51 | | |
| Y | | | | | | | | | 36 | | 34 | | 96 | | 36 | | 31 | | 223 | | 43 | | |
| W | | | | | | | | | 22 | | 19 | | 33 | | 17 | | 21 | | 38 | | 18 | | |
| Tl | | | | | | | | | | | | | | | | | | | | | | | |
| Pb | 13 | 19 | 42 | 12 | 137 | 137 | 44 | 16 | 11 | 14 | 28 | 16 | 71 | 67 | 11 | 14 | 11 | 20 | 17 | 24 | 19 | 46 | 9 |
| Bi | 7 | 3 | 2 | 3 | 2 | 21 | 11 | 3 | 3 | 2 | 3 | <1.5 | 14 | 3 | 4 | <1.5 | <1.5 | <1.5 | <1.5 | 25 | <1.5 | 6 | <1.5 |
| Th | 22 | 18.1 | 18.3 | 13.1 | 17.9 | 17.9 | 17 | 17.3 | 17 | 20.9 | 19 | 19.5 | 19 | 21.3 | 19 | 19.8 | 20 | 20.3 | 20 | 18.4 | 20 | 19.2 | 19 |
| U | 11.6 | 10 | 6.2 | 5.2 | 10.2 | 10.2 | 8.9 | 22.6 | 11.8 | 12.6 | 13 | 10.4 | 15.9 | 20.7 | 6.4 | 7.5 | 7 | 9.1 | 10.7 | 32.8 | 5.1 | 19.2 | 7.1 |
| Al* | 98 | 99 | 98 | 99 | 98 | 98 | 97 | 98 | 98 | 98 | 98 | 98 | 99 | 97 | 97 | 97 | 96 | 98 | 78 | 93 | 98 | 98 | 99 |
| CCPI** | 75 | 83 | 79 | 64 | 94 | 54 | 57 | 38 | 41 | 43 | 46 | 59 | 59 | 40 | 50 | 55 | 51 | 38 | 90 | 74 | 37 | 57 | 41 |
| Tl/Zr | 6.7 | 7.1 | 11.1 | 7.5 | 7.8 | 8.8 | 7.2 | 7.2 | 7.0 | 6.6 | 7.0 | 6.7 | 7.4 | 7.3 | 6.7 | 6.9 | 6.6 | 7.1 | 6.8 | 7.1 | 6.8 | 7.2 | 7.1 |
| Zr/Nb | | | | | | | | | 20.5 | | 21.1 | | 17.7 | | 22.3 | | 20.1 | | 18.6 | | 21.1 | | |
| Nb/Y | | | | | | | | | 0.4 | | 0.4 | | 0.2 | | 0.3 | | 0.4 | | 0.1 | | 0.3 | | |
| P2O5/TiO2 | 0.3 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 | 0.2 | 0.1 | 0.2 | 0.3 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 | 0.4 | 0.2 |

* Alteration Index = 100(K2O + MgO) / (K2O + MgO + Na2O + CaO), Ishikawa et al. (1976)

** Chlorite-Carbonate-Pyrite Index = 100(MgO + FeO) / (MgO + FeO + Na2O + K2O), Large et al. (in press)

# Appendix H. Volcanic Rock Geochemical Data from the Jukes Road and Jukes Prospect.

**Central Volcanic Complex**

Data from **Wyman (1996)**

| Sample Number | 10440 | 10460 | 10480 | 10500 | 10520 | 10540 | 10550 | 10560 | 10580 | 10600 | 10620 | 10640 | 10660 | 10680 | 10700 | 10750 | 10800 | 10850 | 10900 | 11400 | 11900 | 12450 | 12800 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SiO2 | 73.44 | 74.27 | 73.06 | 69.33 | 64.35 | 66.04 | 66.59 | 73.35 | 69.54 | 76.30 | 72.98 | 75.30 | 75.66 | 74.52 | 74.87 | 76.23 | 75.30 | 75.45 | 74.53 | 71.65 | 75.22 | 73.78 | 79.39 |
| TiO2 | 0.32 | 0.32 | 0.31 | 0.43 | 0.64 | 0.53 | 0.57 | 0.31 | 0.55 | 0.27 | 0.39 | 0.32 | 0.31 | 0.30 | 0.31 | 0.30 | 0.32 | 0.28 | 0.33 | 0.35 | 0.38 | 0.30 | 0.30 |
| Al2O3 | 13.67 | 13.49 | 12.91 | 14.05 | 13.61 | 12.66 | 13.99 | 13.37 | 13.60 | 13.18 | 13.75 | 13.37 | 13.21 | 13.16 | 13.82 | 13.84 | 13.38 | 13.21 | 13.89 | 17.13 | 16.43 | 13.27 | 12.72 |
| Fe2O3 | 4.26 | 4.13 | 4.31 | 7.07 | 13.67 | 13.80 | 11.76 | 5.54 | 8.91 | 3.77 | 6.06 | 3.23 | 3.21 | 3.90 | 4.24 | 3.16 | 3.37 | 3.89 | 2.72 | 4.24 | 3.59 | 3.97 | 2.56 |
| MnO | 0.02 | 0.01 | 0.03 | 0.02 | 0.05 | 0.12 | 0.12 | 0.03 | 0.08 | 0.14 | 0.35 | 0.13 | 0.13 | 0.13 | 0.09 | 0.01 | 0.07 | 0.21 | 0.10 | 0.02 | 0.05 | 0.06 | 0.02 |
| MgO | 0.60 | 0.63 | 0.52 | 0.67 | 1.42 | 1.38 | 1.45 | 0.80 | 1.49 | 0.80 | 1.20 | 0.84 | 0.83 | 1.18 | 0.97 | 0.74 | 0.71 | 0.69 | 0.59 | 1.32 | 0.70 | 1.12 | 0.69 |
| CaO | 0.05 | 0.02 | 0.02 | 0.03 | 0.12 | 0.09 | 0.10 | 0.03 | 0.15 | 0.04 | 0.08 | 0.03 | 0.07 | 0.29 | 0.02 | 0.03 | 0.15 | 0.24 | 0.24 | 0.01 | 0.01 | 0.95 | 0.03 |
| Na2O | 0.30 | 0.15 | 0.35 | 0.16 | 0.08 | 0.10 | 0.17 | 0.33 | 0.34 | 0.07 | 0.17 | 0.54 | 0.81 | 0.56 | 0.37 | 1.48 | 2.08 | 1.24 | 2.10 | 0.46 | 0.95 | 4.01 | 0.16 |
| K2O | 7.03 | 6.71 | 8.12 | 7.81 | 5.31 | 4.69 | 4.95 | 6.02 | 5.10 | 5.27 | 4.81 | 6.00 | 5.56 | 5.74 | 5.11 | 4.17 | 4.44 | 4.74 | 5.28 | 4.67 | 2.52 | 2.49 | 4.04 |
| P2O5 | 0.04 | 0.04 | 0.05 | 0.10 | 0.14 | 0.13 | 0.13 | 0.06 | 0.11 | 0.05 | 0.08 | 0.05 | 0.05 | 0.05 | 0.05 | 0.04 | 0.05 | 0.05 | 0.05 | 0.05 | 0.06 | 0.06 | 0.03 |
| Total Volatile | | | | | | | | | | | | | | | | | | | | | | | |
| Free | 99.73 | 99.77 | 99.66 | 99.68 | 99.39 | 99.56 | 99.84 | 99.83 | 99.88 | 99.90 | 99.89 | 99.82 | 99.84 | 99.84 | 99.87 | 100.00 | 99.87 | 100.00 | 99.83 | 99.92 | 99.93 | 100.00 | 99.94 |
| FeO | 3.85 | 3.74 | 3.90 | 6.40 | 12.37 | 12.49 | 10.64 | 5.01 | 8.07 | 3.41 | 5.48 | 2.92 | 2.90 | 3.53 | 3.84 | 2.86 | 3.05 | 3.52 | 2.46 | 3.84 | 3.25 | 3.59 | 2.31 |
| S | 0.05 | <0.01 | 0.02 | 0.01 | 0.27 | 0.07 | 0.05 | 0.01 | 0.01 | 0.02 | 0.04 | 0.01 | <0.01 | 0.04 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.02 | <0.01 | <0.01 | <0.01 |
| Sc | | | | | | | | | | | | | | | | | | | | | | | |
| Ti | 1906 | 1908 | 1829 | 2585 | 3829 | 3157 | 3394 | 1843 | 3312 | 1598 | 2343 | 1905 | 1842 | 1783 | 1861 | 1786 | 1893 | 1700 | 1955 | 2073 | 2287 | 1774 | 1792 |
| V | | | | | | | | | | | | | | | | | | | | | | | |
| Cr | | | | | | | | | | | | | | | | | | | | | | | |
| Co | | | | | | | | | | | | | | | | 2 | | 3 | | | | 4 | |
| Ni | | | | | | | | | | | | | | | | | | | | | | | |
| Cu | 272 | 187 | 385 | 429 | 3510 | 2240 | 324 | 91 | 74 | 28 | 45 | 40 | 24 | 6 | 13 | 6 | 5 | 7 | 5 | 10 | 86 | 9 | 3 |
| Zn | 64 | 52 | 56 | 99 | 175 | 144 | 107 | 53 | 82 | 80 | 94 | 43 | 38 | 46 | 62 | 57 | 40 | 59 | 42 | 88 | 81 | 93 | 26 |
| As | | | | | | | | | | | | | | | | <3 | | <3 | | | | <3 | |
| Br | | | | | | | | | | | | | | | | <1 | | <1 | | | | <1 | |
| Rb | 21 | 192 | 179 | 193 | 151 | 150 | 178 | 174 | 178 | 188 | 184 | 200 | 188 | 185 | 183 | 145 | 143 | 165 | 159 | 187 | 96 | 100 | 150 |
| Sr | 46 | 39 | 56 | 49 | 34 | 24 | 20 | 30 | 24 | 10 | 13 | 20 | 22 | 21 | 13 | 18 | 29 | 20 | 45 | 11 | 21 | 60 | 5 |
| Zr | 287 | 277 | 267 | 291 | 308 | 300 | 331 | 278 | 312 | 239 | 309 | 278 | 280 | 274 | 284 | 291 | 289 | 274 | 298 | 336 | 340 | 257 | 241 |
| Nb | | | | | | | | | | | | | | | | 13.6 | | 13.1 | | | | 12.1 | |
| Mo | 1.2 | 1.5 | 1.5 | 2.1 | 2 | 4.5 | 2.1 | 1.5 | 1.9 | 1.4 | 1.5 | 1.5 | 1.8 | 1.6 | 1.2 | 1.4 | 1.1 | 2.4 | <1 | 1 | 2.2 | 1.3 | <1 |
| Ag | | | | | | | | | | | | | | | | | | | | | | | |
| Cd | | | | | | | | | | | | | | | | | | | | | | | |
| Sn | | | | | | | | | | | | | | | | 4.7 | | 4 | | | | 2.9 | |
| Sb | | | | | | | | | | | | | | | | | | | | | | | |
| Cs | | | | | | | | | | | | | | | | | | | | | | | |
| Ba | 2058 | 1668 | 2526 | 2285 | 1355 | 1267 | 1085 | 1462 | 996 | 893 | 909 | 1498 | 1433 | 1435 | 1204 | 882 | 1120 | 1141 | 1527 | 688 | 566 | 692 | 506 |
| La | | | | | | | | | | | | | | | | | | | | | | | |
| Ce | | | | | | | | | | | | | | | | | | | | | | | |
| Nd | | | | | | | | | | | | | | | | | | | | | | | |
| Y | | | | | | | | | | | | | | | | 38 | | 41 | | | | 40 | |
| W | | | | | | | | | | | | | | | | 4 | | 6 | | | | 5 | |
| Tl | | | | | | | | | | | | | | | | | | | | | | | |
| Pb | 7 | 5 | 6 | 4 | 11 | 16 | 9 | 5 | 3 | 11 | 28 | 28 | 12 | 15 | 8 | 26 | 8 | 8 | 3 | 55 | 69 | 2 | 5 |
| Bi | <1.5 | <1.5 | 3 | <1.5 | 7 | 16 | 7 | <1.5 | <1.5 | <1.5 | 2 | 3 | <1.5 | <1.5 | <1.5 | <1.5 | 2 | <1.5 | <1.5 | <1.5 | 3 | 2 | <1.5 |
| Th | 20.9 | 20 | 19.6 | 15.5 | 13.1 | 13 | 14.4 | 20 | 15.4 | 22.7 | 19.4 | 19.6 | 20.5 | 20.9 | 20.6 | 22 | 19.8 | 20 | 21.4 | 24.7 | 24 | 18 | 18 |
| U | 6.7 | 5.6 | 6.5 | 7.3 | 7.6 | 16.1 | 6.9 | 6 | 4.8 | 5.4 | 5.9 | 5 | 4.8 | 4.2 | 5.3 | 5.2 | 4.6 | 4.4 | 5.4 | 4.3 | 5.7 | 4.7 | 4.1 |
| AI* | 96 | 98 | 96 | 98 | 97 | 97 | 96 | 95 | 93 | 98 | 96 | 92 | 88 | 89 | 94 | 76 | 70 | 79 | 71 | 93 | 77 | 42 | 96 |
| CCPI** | 38 | 39 | 34 | 47 | 72 | 74 | 70 | 48 | 64 | 44 | 57 | 37 | 37 | 43 | 47 | 39 | 37 | 41 | 29 | 50 | 53 | 42 | 42 |
| Ti/Zr | 6.6 | 6.9 | 6.9 | 8.9 | 12.4 | 10.5 | 10.3 | 6.6 | 10.6 | 6.7 | 7.6 | 6.9 | 6.6 | 6.5 | 6.6 | 6.1 | 6.5 | 6.2 | 6.6 | 6.2 | 6.7 | 6.9 | 7.4 |
| Zr/Nb | | | | | | | | | | | | | | | | 21.4 | | 20.9 | | | | 21.2 | |
| Nb/Y | | | | | | | | | | | | | | | | 0.4 | | 0.3 | | | | 0.3 | |
| P2O5/TiO2 | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 |

* Alteration Index = 100(K2O + MgO) / (K2O + MgO + Na2O + CaO), Ishikawa et al. (1976)

** Chlorite-Carbonate-Pyrite Index = 100(MgO + FeO) / (MgO + FeO + Na2O + K2O), Large et al. (In press)

# Appendix H. Volcanic Rock Geochemical Data from the Jukes Road and Jukes Prospect.

**Central Volcanic Complex**

Data from **Wyman (1996)**

| Sample Number | 13300 | 13800 | *** B10140 | *** B10170 | *** B10200 | *** B10210 | *** B10220 | *** B10250 | *** B10270 | *** B10290 | *** B10300 | *** B10310 | *** B10330 | *** B10350 | *** B10370 | *** B10420 | *** B10520 | *** B10550 | *** B10700 | *** B10750 | *** B10800 | *** B10850 | *** B10900 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SiO2 | 74.22 | 72.42 | 71.12 | 63.15 | 73.16 | 62.97 | 74.07 | 73.71 | 73.90 | 73.74 | 74.29 | 72.39 | 75.37 | 72.77 | 74.48 | 76.26 | 66.71 | 65.13 | 75.23 | 76.17 | 74.89 | 75.48 | 73.38 |
| TiO2 | 0.35 | 0.36 | 0.08 | 0.36 | 0.40 | 0.24 | 0.28 | 0.30 | 0.31 | 0.27 | 0.32 | 0.34 | 0.32 | 0.37 | 0.32 | 0.31 | 0.76 | 0.73 | 0.30 | 0.31 | 0.29 | 0.29 | 0.34 |
| Al2O3 | 14.80 | 17.05 | 11.58 | 12.31 | 13.39 | 10.85 | 13.01 | 13.74 | 13.12 | 12.10 | 13.82 | 14.48 | 13.49 | 13.23 | 13.84 | 13.47 | 14.52 | 13.97 | 13.52 | 13.30 | 13.14 | 13.09 | 15.32 |
| Fe2O3 | 3.06 | 3.29 | 10.60 | 20.04 | 4.74 | 18.58 | 3.38 | 3.79 | 4.53 | 5.51 | 3.78 | 4.98 | 3.98 | 7.11 | 3.14 | 1.71 | 8.52 | 12.89 | 3.67 | 3.35 | 3.87 | 2.96 | 2.09 |
| MnO | 0.03 | 0.02 | 0.04 | 0.08 | 0.02 | 0.04 | 0.02 | 0.01 | 0.03 | 0.03 | 0.02 | 0.02 | 0.02 | 0.04 | 0.02 | 0.01 | 0.04 | 0.05 | 0.02 | 0.10 | 0.07 | 0.13 | 0.01 |
| MgO | 1.25 | 0.85 | 0.88 | 1.39 | 0.56 | 0.61 | 0.47 | 0.58 | 0.71 | 0.53 | 0.79 | 0.79 | 0.99 | 1.15 | 0.84 | 0.43 | 1.13 | 1.82 | 0.99 | 0.67 | 0.96 | 0.68 | 0.58 |
| CaO | 0.02 | 0.05 | 0.02 | 0.02 | 0.07 | 0.03 | 0.02 | 0.05 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.05 | 0.02 | 0.01 | 0.11 | 0.23 | 0.04 | 0.11 | 0.54 | 0.63 | 0.07 |
| Na2O | 0.68 | 1.31 | 0.02 | 0.03 | 0.14 | 0.15 | 0.16 | 0.94 | 0.12 | 0.13 | 0.09 | 0.12 | 0.11 | 0.15 | 0.19 | 0.15 | 0.16 | 0.15 | 0.99 | 2.29 | 1.73 | 2.04 | 2.39 |
| K2O | 5.40 | 4.50 | 4.75 | 2.39 | 7.44 | 6.33 | 8.47 | 6.82 | 7.22 | 7.60 | 6.72 | 6.78 | 5.63 | 5.06 | 7.08 | 7.61 | 7.53 | 4.82 | 5.18 | 3.66 | 4.47 | 4.65 | 5.76 |
| P2O5 | 0.03 | 0.04 | 0.02 | 0.05 | 0.07 | 0.03 | 0.04 | 0.05 | 0.03 | 0.04 | 0.03 | 0.03 | 0.03 | 0.05 | 0.03 | 0.03 | 0.11 | 0.18 | 0.05 | 0.04 | 0.05 | 0.05 | 0.05 |
| Total | | | | | | | | | | | | | | | | | | | | | | | |
| Volatile | | | | | | | | | | | | | | | | | | | | | | | |
| Free | 99.85 | 99.88 | 99.12 | 99.83 | 99.99 | 99.84 | 99.92 | 100.00 | 99.97 | 99.97 | 99.87 | 99.96 | 99.96 | 99.97 | 99.96 | 100.00 | 99.60 | 99.97 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| FeO | 2.77 | 2.97 | 9.59 | 18.13 | 4.29 | 16.81 | 3.06 | 3.43 | 4.10 | 4.99 | 3.42 | 4.51 | 3.60 | 6.43 | 2.84 | 1.55 | 7.71 | 11.67 | 3.32 | 3.03 | 3.50 | 2.68 | 1.89 |
| S | <0.01 | 0.05 | 0.87 | 0.11 | 0.03 | 0.37 | 0.06 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.17 | 0.04 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Sc | | | | | | | | | | | | | | | | | | | | | | | |
| Ti | 2096 | 2139 | 494 | 2175 | 2375 | 1457 | 1699 | 1826 | 1833 | 1644 | 1903 | 2033 | 1911 | 2210 | 1896 | 1884 | 4548 | 4358 | 1781 | 1830 | 1715 | 1709 | 2068 |
| V | | | | | | | | | | | | | | | | | | | | | | | |
| Cr | | | | | | | | | | | | | | | | | | | | | | | |
| Co | | | 38 | | 5 | 44 | 3 | 3 | 2 | 12 | <2 | <2 | 3 | 4 | 3 | <2 | 6 | 2 | <2 | <2 | 4 | <2 | <2 |
| Ni | | | | | | | | | | | | | | | | | | | | | | | |
| Cu | 7 | 32 | 6800 | 1264 | 101 | 1270 | 584 | 23 | 164 | 215 | 954 | 279 | 267 | 234 | 322 | 47 | 3100 | 205 | 4 | 4 | 9 | 3 | 3 |
| Zn | 43 | 56 | 151 | 269 | 55 | 103 | 44 | 51 | 81 | 57 | 79 | 73 | 71 | 114 | 55 | 25 | 118 | 112 | 35 | 39 | 46 | 42 | 35 |
| As | | | 8 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | 4 | <3 | <3 | <3 | <3 | <3 | 4 | 5 | <3 | <3 | <3 | <3 | <3 |
| Br | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Rb | 157 | 151 | 96 | 74 | 157 | 140 | 194 | 175 | 195 | 161 | 193 | 200 | 188 | 167 | 207 | 190 | 198 | 163 | 173 | 129 | 149 | 148 | 179 |
| Sr | 43 | 44 | 20 | 14 | 87 | 41 | 62 | 45 | 41 | 38 | 33 | 43 | 22 | 18 | 35 | 36 | 63 | 21 | 22 | 22 | 21 | 33 | 41 |
| Zr | 331 | 355 | 86 | 271 | 313 | 216 | 271 | 281 | 286 | 257 | 282 | 310 | 279 | 284 | 288 | 289 | 396 | 378 | 278 | 280 | 276 | 268 | 329 |
| Nb | | | 19 | 14.8 | 18.9 | 14.3 | 12.7 | 13 | 12.8 | 11.4 | 13.6 | 14.5 | 13.1 | 12.9 | 13.4 | 14 | 15.9 | 14.4 | 13.2 | 13.1 | 13.3 | 13 | 16.1 |
| Mo | 1 | <1 | 3.4 | 2.3 | 3 | 28.2 | 2.1 | 2.1 | 1.2 | 4 | 1.9 | 1.3 | 1.4 | <1 | 2 | 1.4 | 2.9 | 1.3 | 1.8 | 1.4 | 1.1 | 1.4 | <1 |
| Ag | | | | | | | | | | | | | | | | | | | | | | | |
| Cd | | | | | | | | | | | | | | | | | | | | | | | |
| Sn | | | 4.2 | 7.9 | 3.5 | 10.1 | 4.1 | 7.5 | 5 | 9.2 | 3.2 | 5 | 4.5 | 9.6 | 2.4 | 4.2 | 3.9 | 5.6 | 3.4 | 4.9 | 5.7 | 3.8 | 3.6 |
| Sb | | | | | | | | | | | | | | | | | | | | | | | |
| Cs | | | | | | | | | | | | | | | | | | | | | | | |
| Ba | 1353 | 966 | 1275 | 717 | 2819 | 2224 | 2477 | 2077 | 2285 | 2449 | 1526 | 1954 | 1591 | 1323 | 1898 | 2217 | 2016 | 1053 | 1232 | 822 | 997 | 1103 | 1612 |
| La | | | | | | | | | | | | | | | | | | | | | | | |
| Ce | | | | | | | | | | | | | | | | | | | | | | | |
| Nd | | | 18 | 99 | 48 | 11 | 37 | 54 | 45 | 74 | 45 | 41 | 40 | 40 | 51 | 47 | 32 | 30 | 47 | 37 | 44 | 38 | 60 |
| Y | | | 81 | 55 | 48 | 25 | 49 | 39 | 36 | 40 | 31 | 35 | 40 | 27 | 45 | 37 | 30 | 37 | 41 | 39 | 42 | 36 | 41 |
| W | | | 30 | 38 | 36 | 31 | 20 | 11 | 24 | 21 | 11 | 25 | 21 | 20 | 22 | 18 | 55 | 30 | 5 | 6 | 3 | 4 | 5 |
| Tl | | | | | | | | | | | | | | | | | | | | | | | |
| Pb | 9 | 13 | 11 | 2 | <1.5 | 73 | 12 | 5 | 4 | 17 | 21 | 30 | 22 | 6 | 6 | <1.5 | 26 | <1.5 | 3 | 20 | 2 | 7 | 0 |
| Bi | <1.5 | <1.5 | 5 | 2 | <1.5 | 6 | <1.5 | <1.5 | <1.5 | 2 | <1.5 | <1.5 | 4 | <1.5 | <1.5 | 2 | 4 | 2 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 |
| Th | 20.8 | 24.9 | 28 | 15 | 14 | 13 | 21 | 21 | 19 | 17 | 21 | 22 | 20 | 19 | 22 | 19 | 11 | 9 | 21 | 21 | 20 | 21 | 24 |
| U | 5 | 6.1 | 11.8 | 4.3 | 3.9 | 14.2 | 6.1 | 6.8 | 5.5 | 12.1 | 5.5 | 6.3 | 5.2 | 5.7 | 5.2 | 5 | 3.9 | 4.8 | 4.8 | 4.4 | 4.6 | 4.5 | 6.7 |
| AI* | 90 | 80 | 99 | 99 | 97 | 97 | 98 | 88 | 98 | 98 | 99 | 98 | 98 | 97 | 97 | 98 | 97 | 95 | 86 | 64 | 71 | 67 | 72 |
| CCPI** | 40 | 40 | 69 | 89 | 39 | 73 | 29 | 34 | 40 | 42 | 38 | 43 | 44 | 59 | 34 | 20 | 53 | 73 | 41 | 38 | 42 | 33 | 23 |
| Ti/Zr | 6.3 | 6.0 | 5.7 | 8.0 | 7.6 | 6.7 | 6.3 | 6.5 | 6.4 | 6.4 | 6.7 | 6.6 | 6.8 | 7.8 | 6.6 | 6.5 | 11.5 | 11.5 | 6.4 | 6.5 | 6.2 | 6.4 | 6.3 |
| Zr/Nb | | | 4.5 | 18.3 | 16.6 | 15.1 | 21.3 | 21.6 | 22.3 | 22.5 | 20.7 | 21.4 | 21.3 | 22.0 | 21.5 | 20.6 | 24.9 | 26.3 | 21.1 | 21.4 | 20.8 | 20.6 | 20.4 |
| Nb/Y | | | 0.2 | 0.3 | 0.4 | 0.6 | 0.3 | 0.3 | 0.4 | 0.3 | 0.4 | 0.4 | 0.3 | 0.5 | 0.3 | 0.4 | 0.5 | 0.4 | 0.3 | 0.3 | 0.3 | 0.4 | 0.4 |
| P2O5/TiO2 | 0.1 | 0.1 | 0.3 | 0.1 | 0.2 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.3 | 0.2 | 0.1 | 0.2 | 0.2 | 0.1 |

* Alteration Index = 100(K2O + MgO) / (K2O + MgO + Na2O + CaO), Ishikawa et al. (1976)

** Chlorite-Carbonate-Pyrite Index = 100(MgO + FeO) / (MgO + FeO + Na2O + K2O), Large et al. (in press)

*** B10140 to B13800 are reanalysis of rocks 10140 to 13800 prepared by careful hand selection of the cleanest possible coarse crushed pieces after elimination of weathered, soiled and oxidised bits.

# Appendix H. Volcanic Rock Geochemical Data from the Jukes Road and Jukes Prospect.

**Central Volcanic Complex**

Data from **Wyman (1996)**

| Sample | *** | *** | *** | *** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number | B11900 | B12450 | B12800 | B13800 | MJ96-4 | MJ96-6 | MJ96-8 | MJ96-9 | MJ96-10 | MJ96-11 | MJ96-12 | MJ96-13 | MJ96-14 | MJ96-15 | MJ96-16 | MJ96-17 | MJ96-18 |
| SiO2 | 75.41 | 71.21 | 72.92 | 74.40 | 72.26 | 74.51 | 64.30 | 70.09 | 71.33 | 73.41 | 68.52 | 75.12 | 74.67 | 67.84 | 73.54 | 74.03 | 75.11 |
| TiO2 | 0.32 | 0.35 | 0.38 | 0.28 | 0.35 | 0.34 | 0.79 | 0.89 | 0.30 | 0.34 | 0.40 | 0.31 | 0.30 | 0.38 | 0.31 | 0.30 | 0.28 |
| Al2O3 | 15.43 | 14.78 | 17.26 | 13.66 | 12.41 | 13.67 | 14.49 | 14.85 | 14.36 | 13.06 | 14.56 | 13.28 | 12.99 | 16.06 | 13.11 | 13.88 | 12.90 |
| Fe2O3 | 4.31 | 4.47 | 2.65 | 3.49 | 5.23 | 3.86 | 12.89 | 5.91 | 3.92 | 3.76 | 6.69 | 2.82 | 3.43 | 4.93 | 3.09 | 2.99 | 3.26 |
| MnO | 0.08 | 0.05 | 0.01 | 0.02 | 0.23 | 0.03 | 0.17 | 0.41 | 0.34 | 0.08 | 0.12 | 0.03 | 0.13 | 0.08 | 0.08 | 0.02 | 0.06 |
| MgO | 0.81 | 1.35 | 0.86 | 0.81 | 0.51 | 0.71 | 1.42 | 1.36 | 0.97 | 0.88 | 1.82 | 0.71 | 0.90 | 1.37 | 0.71 | 0.74 | 0.92 |
| CaO | 0.02 | 0.51 | 0.01 | 0.08 | 0.07 | -0.01 | 0.23 | 0.50 | 1.47 | -0.01 | 0.04 | 0.08 | 0.13 | 1.51 | 1.62 | 0.07 | 0.59 |
| Na2O | 1.12 | 4.31 | 0.06 | 3.16 | 0.17 | 0.08 | 0.10 | 1.56 | 0.53 | 0.11 | 0.10 | 5.41 | 4.27 | 2.67 | 4.91 | 3.32 | 1.65 |
| K2O | 2.45 | 2.90 | 5.82 | 4.03 | 8.39 | 6.50 | 5.30 | 4.18 | 6.59 | 8.13 | 7.47 | 2.10 | 3.03 | 4.99 | 2.48 | 4.47 | 5.11 |
| P2O5 | 0.04 | 0.07 | 0.03 | 0.05 | 0.06 | 0.03 | 0.18 | 0.21 | 0.06 | 0.06 | 0.07 | 0.06 | 0.06 | 0.07 | 0.05 | 0.05 | 0.05 |
| Total | | | | | | | | | | | | | | | | | |
| Volatile | | | | | | | | | | | | | | | | | |
| Free | 99.99 | 100.00 | 100.00 | 100.00 | 99.69 | 99.71 | 99.88 | 99.95 | 99.88 | 99.84 | 99.80 | 99.92 | 99.91 | 99.91 | 99.91 | 99.88 | 99.93 |
| FeO | 3.90 | 4.04 | 2.40 | 3.16 | 4.74 | 3.49 | 11.66 | 5.35 | 3.55 | 3.41 | 6.06 | 2.55 | 3.10 | 4.46 | 2.80 | 2.71 | 2.95 |
| S | <0.01 | <0.01 | <0.01 | <0.01 | 0.04 | 0.01 | 0.02 | 0.04 | 0.01 | 0.2 | 0.15 | 0.28 | <0.01 | <0.01 | <0.01 | 0.01 | 0.01 |
| Sc | | | | | 18.4 | 8.1 | 18.6 | 20.7 | 14.2 | 8 | 11 | 10.9 | 10.8 | 14.5 | 13.3 | 10.5 | 9.1 |
| Ti | 1911 | 2084 | 2286 | 1702 | 2092 | 2018 | 4744 | 5318 | 1807 | 2067 | 2392 | 1857 | 1818 | 2286 | 1836 | 1823 | 1654 |
| V | | | | | 18.4 | 10 | 74.7 | 86.5 | 5.7 | 12.3 | 14 | 7.7 | 7.6 | 10.2 | 2.9 | 6.1 | 7.6 |
| Cr | | | | | 3 | 4 | 8.8 | 8.4 | 1.7 | 5 | 4.4 | 1.5 | 2.6 | 2 | 4.5 | 5.4 | 5.5 |
| Co | <2 | 4 | <2 | 3 | | | | | | | | | | | | | |
| Ni | | | | | 2.3 | 1.9 | 4 | 4.6 | 1.6 | 2.1 | 2.5 | 1.2 | 1.7 | 1.3 | 1 | 2.7 | 3.4 |
| Cu | 103 | 3 | 3 | 7 | 48.4 | 163.5 | 73.8 | 26.1 | 6.5 | 38.3 | 101 | 3.3 | 11.6 | 25.6 | 3.6 | 14.4 | 16.7 |
| Zn | 91 | 106 | 26 | 53 | 39 | 66.2 | 134.3 | 187.4 | 142 | 315 | 226.9 | 147.5 | 78.3 | 61.4 | 66.5 | 53.1 | 72.2 |
| As | 6 | <3 | <3 | <3 | 1 | <1 | 3 | 1 | <1 | 4 | 2 | <1 | <1 | <1 | <1 | <1 | <1 |
| Br | 2.9 | <1 | <1 | <1 | | | | | | | | | | | | | |
| Rb | 59 | 131 | 212 | 130 | 157.6 | 195.8 | 203 | 161.6 | 269.3 | 208.5 | 240.4 | 52.5 | 108.7 | 203.8 | 78.8 | 145.1 | 157.1 |
| Sr | 28 | 58 | 5 | 71 | 110.8 | 29.5 | 24.6 | 34.2 | 33.3 | 35.4 | 26.1 | 67.7 | 57.2 | 56.2 | 106.9 | 84 | 65.2 |
| Zr | 308 | 302 | 309 | 298 | 294.8 | 295 | 423.7 | 429.4 | 289.6 | 282.6 | 338.9 | 256.2 | 245.7 | 330.1 | 291.8 | 304.9 | 278.4 |
| Nb | 13.6 | 14.1 | 15 | 12.7 | 17.4 | 13.8 | 16.6 | 18.3 | 14.2 | 12.7 | 15.7 | 11.7 | 11.1 | 15.5 | 11.8 | 14.1 | 13 |
| Mo | 1.8 | <1 | <1 | <1 | 2.5 | 0.3 | 0.4 | 1.6 | 0.7 | 0.3 | 2.7 | 0.2 | 0.2 | 0.2 | 0.1 | 0.3 | 0.1 |
| Ag | | | | | 0.1 | 0.3 | <0.1 | 0.1 | <0.1 | 0.4 | 0.1 | <0.1 | 0.2 | 0.4 | <0.1 | <0.1 | <0.1 |
| Cd | | | | | 0.1 | <0.1 | <0.1 | 0.2 | 0.4 | 0.6 | 0.1 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Sn | 3.1 | 2.8 | 2.2 | 3.2 | | | | | | | | | | | | | |
| Sb | | | | | 1.5 | 1.2 | 2.3 | 1 | 2 | 1.8 | 1.7 | 0.6 | 0.9 | 1.1 | 0.6 | 1 | 0.5 |
| Cs | | | | | 1.17 | 1.62 | 2.73 | 2.37 | 3.25 | 2.84 | 4.7 | 0.6 | 2.22 | 5.28 | 2.42 | 6.06 | 8.34 |
| Ba | 866 | 830 | 714 | 871 | 2986.5 | 2591.6 | 1049 | 772.8 | 1159.9 | 1516.3 | 1479.8 | 1005.5 | 699.5 | 1095.5 | 713.7 | 1215.8 | 731.1 |
| La | | | | | 39.8 | 54.7 | 31.5 | 40.8 | 35.6 | 50.1 | 89.4 | 25.8 | 54.1 | 53.4 | 28.2 | 80.7 | 65.2 |
| Ce | | | | | 80.2 | 114.5 | 68 | 87.8 | 77.7 | 110.3 | 186.9 | 59.1 | 115.5 | 119.2 | 59.4 | 163.7 | 122 |
| Nd | 54 | 56 | 64 | 53 | 33.4 | 48.9 | 31.7 | 41.8 | 35.7 | 46.8 | 77.4 | 27.2 | 51.6 | 52.8 | 26.4 | 71.6 | 53.1 |
| Y | 33 | 50 | 53 | 44 | 35.3 | 43 | 35.3 | 36 | 53.1 | 37.2 | 45.8 | 37.9 | 51.6 | 54.1 | 40.7 | 54 | 55.7 |
| W | 4 | 5 | 3 | 4 | | | | | | | | | | | | | |
| Tl | | | | | 0.9 | 0.9 | 0.7 | 0.9 | 2 | 2 | 1.9 | <0.5 | 0.6 | 0.9 | <0.5 | 0.6 | 0.5 |
| Pb | 116 | <1.5 | 13 | 5 | 11.1 | 25.3 | <1.5 | 7.4 | 22.7 | 49.2 | 8.7 | 2 | 24.9 | 3.5 | <1.5 | 13.8 | 3.8 |
| Bi | 2 | <1.5 | <1.5 | <1.5 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| Th | 22 | 20 | 24 | 20 | 13.6 | 22.5 | 13.5 | 13.3 | 22.6 | 19 | 25.3 | 18.5 | 17.4 | 24.3 | 16.6 | 21 | 19.2 |
| U | 5.2 | 5.3 | 5.3 | 5.5 | 3.57 | 6.5 | 4.33 | 3.46 | 5.53 | 4.8 | 5.71 | 4.21 | 4.43 | 5.33 | 4.18 | 5.53 | 4.41 |
| AI* | 74 | 47 | 99 | 60 | 97 | 99 | 95 | 73 | 79 | 99 | 98 | 34 | 47 | 60 | 33 | 61 | 73 |
| CCPI** | 57 | 43 | 36 | 36 | 38 | 39 | 71 | 54 | 39 | 34 | 51 | 30 | 35 | 43 | 32 | 31 | 36 |
| Ti/Zr | 6.2 | 6.9 | 7.4 | 5.7 | 7.1 | 6.8 | 11.2 | 12.4 | 6.2 | 7.3 | 7.1 | 7.2 | 7.4 | 6.9 | 6.3 | 6.0 | 5.9 |
| Zr/Nb | 22.6 | 21.4 | 20.6 | 23.5 | 16.9 | 21.4 | 25.5 | 23.5 | 20.4 | 22.3 | 21.6 | 21.9 | 22.1 | 21.3 | 24.7 | 21.6 | 21.4 |
| Nb/Y | 0.4 | 0.3 | 0.3 | 0.3 | 0.5 | 0.3 | 0.5 | 0.5 | 0.3 | 0.3 | 0.3 | 0.3 | 0.2 | 0.3 | 0.3 | 0.3 | 0.2 |
| P2O5/TiO2 | 0.1 | 0.2 | 0.1 | 0.2 | 0.2 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |

* Alteration Index = 100(K2O + MgO) / (K2O + MgO + Na2O + CaO), Ishikawa et al. (1976)

** Chlorite-Carbonate-Pyrite Index = 100(MgO + FeO) / (MgO + FeO + Na2O + K2O), Large et al. (in press

*** B10140 to B13800 are reanalysis of rocks 10140 to 13800 prepared by careful hand selection of the cleanest possible coarse crushed pieces after elimination of

# Appendix H. Volcanic Rock Geochemical Data from the Jukes Road and Jukes Prospect.

**Central Volcanic Complex**

Data from **Wyman (1996)**

| Sample Number | 880329 | 880337 | 880342 | 880344 | 880351 | 880362 | 880363 | 880365 | 880368 | 880370 | 880372 | 880374 | 880375 | 880376 | 880379 | 880380 | 880381 | 880386 | 880389 | 880392 | 880397 | 880404 | 880405 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SiO2 | 72.35 | 72.35 | 73.40 | 71.65 | 70.46 | 74.02 | 75.15 | 72.09 | 74.12 | 71.95 | 70.24 | 70.79 | 71.65 | 74.36 | 73.86 | 74.05 | 72.37 | 73.29 | 71.87 | 72.72 | 73.06 | 73.70 | 73.72 |
| TiO2 | 0.38 | 0.18 | 0.28 | 0.29 | 0.29 | 0.30 | 0.34 | 0.29 | 0.30 | 0.28 | 0.27 | 0.29 | 0.29 | 0.30 | 0.30 | 0.30 | 0.32 | 0.29 | 0.29 | 0.31 | 0.30 | 0.30 | 0.32 |
| Al2O3 | 13.70 | 11.60 | 12.12 | 12.91 | 12.60 | 13.09 | 12.94 | 12.91 | 12.84 | 12.47 | 12.37 | 12.41 | 12.40 | 12.64 | 12.83 | 12.11 | 12.56 | 12.97 | 12.55 | 13.10 | 13.15 | 12.99 | 12.98 |
| Fe2O3 | 3.13 | 6.19 | 5.85 | 4.24 | 3.95 | 3.49 | 5.32 | 6.84 | 3.07 | 5.19 | 7.62 | 6.66 | 6.09 | 3.87 | 5.16 | 5.19 | 3.43 | 4.00 | 5.57 | 4.19 | 4.03 | 4.97 | 3.72 |
| MnO | 0.10 | 0.29 | 0.26 | 0.16 | 0.13 | 0.03 | 0.62 | 0.09 | 0.06 | 0.08 | 0.14 | 0.39 | 0.12 | 0.08 | 0.04 | 0.06 | 0.12 | 0.05 | 0.09 | 0.02 | 0.06 | 0.14 | 0.21 |
| MgO | 0.77 | 0.70 | 0.93 | 0.74 | 1.29 | 0.85 | 1.05 | 1.13 | 0.65 | 0.71 | 0.74 | 1.45 | 1.15 | 0.99 | 0.90 | 1.04 | 0.71 | 0.69 | 0.73 | 0.61 | 0.80 | 1.10 | 0.93 |
| CaO | 3.97 | 0.71 | 0.75 | 0.92 | 2.84 | 0.53 | 0.48 | 0.85 | 1.17 | 1.13 | 0.65 | 1.56 | 1.10 | 1.02 | 0.45 | 0.65 | 1.50 | 0.63 | 0.62 | 0.32 | 0.88 | 0.67 | 0.96 |
| Na2O | 1.16 | 0.14 | 0.06 | 1.89 | 2.79 | 1.33 | 0.16 | 0.07 | 1.88 | 1.20 | 0.63 | 0.14 | 0.38 | 0.16 | 0.12 | 1.13 | 0.23 | 1.94 | 1.95 | 1.54 | 1.74 | 0.17 | 5.60 |
| K2O | 4.29 | 7.50 | 6.07 | 7.09 | 5.41 | 6.05 | 4.47 | 5.48 | 5.60 | 6.69 | 7.03 | 6.02 | 6.51 | 6.31 | 6.11 | 5.22 | 8.70 | 5.88 | 6.06 | 6.82 | 5.73 | 5.79 | 2.03 |
| P2O5 | 0.07 | 0.05 | 0.06 | 0.09 | 0.05 | 0.05 | 0.05 | 0.06 | 0.05 | 0.07 | 0.07 | 0.05 | 0.06 | 0.05 | 0.06 | 0.07 | 0.07 | 0.05 | 0.07 | 0.06 | 0.05 | 0.06 | |
| Total | | | | | | | | | | | | | | | | | | | | | | | |
| Volatile Free | 99.92 | 99.73 | 99.77 | 100.00 | 99.81 | 99.74 | 100.00 | 99.82 | 99.75 | 99.77 | 99.77 | 99.77 | 99.76 | 99.79 | 99.83 | 99.82 | 100.00 | 99.79 | 99.80 | 99.69 | 99.80 | 99.90 | 100.00 |
| FeO | 2.83 | 5.60 | 5.29 | 3.84 | 3.58 | 3.15 | 4.81 | 6.19 | 2.78 | 4.69 | 6.90 | 6.03 | 5.51 | 3.50 | 4.67 | 4.69 | 3.10 | 3.62 | 5.04 | 3.79 | 3.65 | 4.50 | 3.37 |
| S | 0.01 | 0.07 | 0.11 | | 0.201 | 0.03 | | 1.39 | 0.04 | 0.3216 | 1.07535 | 0.201 | 0.1809 | 0.04 | 0.05 | 0.04 | | 0.07 | 0.03 | 0.21 | 0.03 | 0.11 | |
| Sc | 10.5 | 6.5 | 8.4 | | 7.8 | 7.6 | | 10.1 | 7.5 | 8.1 | 8 | 8.4 | 8.2 | 8.3 | 8.2 | 8.2 | | 7.7 | 8.1 | 7.8 | 7.2 | 9.4 | |
| Ti | 2294 | 1097 | 1670 | 1739 | 1764 | 1793 | 2038 | 1760 | 1802 | 1675 | 1620 | 1756 | 1736 | 1798 | 1783 | 1779 | 1918 | 1719 | 1712 | 1843 | 1788 | 1811 | 1918 |
| V | 34.1 | 14.8 | 12.4 | | 9.2 | 10.1 | | 9.9 | 8.5 | 13.1 | 13.8 | 13.1 | 15 | 9.7 | 12.2 | 12.3 | | 9.2 | 12.9 | 10.2 | 10.6 | 11.6 | |
| Cr | 99.3 | 10.5 | 9.1 | | 4.4 | 3.4 | | 4.2 | 5 | 12.6 | 13.6 | 8.3 | 10.3 | 4.7 | 8.4 | 9.7 | | 4.9 | 12.4 | 4.5 | 159.3 | 9.2 | |
| Co | | | | | | | | | | | | | | | | | | | | | | | |
| Ni | 2.9 | 4.8 | 4.3 | | 3.6 | 2.9 | | 3.2 | 1.9 | 4.3 | 6.1 | 5.1 | 4.5 | 1.6 | 3.4 | 4.2 | | 2.9 | 5.8 | 3 | 4.2 | 3.3 | |
| Cu | 5.7 | 162.9 | 120.2 | | 29.8 | 8.4 | | 14.2 | 4.6 | 10.9 | 40.6 | 85.1 | 61.6 | 50.1 | 46.3 | 20.1 | | 6.5 | 23.1 | 18.6 | 7.4 | 16.1 | |
| Zn | 49.7 | 60.8 | 78.5 | | 50.1 | 53.3 | | 85.7 | 43 | 61.8 | 67.3 | 108.5 | 98.5 | 88.5 | 79.3 | 100 | | 59.9 | 74.3 | 84 | 106.9 | 188.6 | |
| As | <3 | <3 | <3 | | <3 | <3 | | 4.8 | <3 | <3 | 10.4 | 4.8 | <3 | <3 | <3 | <3 | | <3 | <3 | <3 | <3 | 5.2 | |
| Br | | | | | | | | | | | | | | | | | | | | | | | |
| Rb | 148.8 | 177.9 | 171.3 | 154 | 130.2 | 177.7 | 199 | 193.9 | 151.5 | 180 | 174.8 | 184.8 | 189.7 | 189.3 | 177 | 160.7 | 170 | 170.6 | 153.7 | 173.8 | 168.4 | 171.6 | 175 |
| Sr | 110.6 | 95.8 | 51.2 | 91 | 92.2 | 66 | 19 | 32.4 | 96.8 | 81.5 | 63.8 | 65.6 | 69.2 | 57.9 | 39.1 | 50 | 114 | 80.2 | 88.8 | 115.6 | 88.8 | 35.7 | 62 |
| Zr | 236.2 | 141.3 | 246.8 | 276 | 257.5 | 276.2 | 286 | 261.9 | 263 | 259.4 | 248.5 | 253.4 | 253.8 | 264.5 | 267.2 | 271.8 | 259 | 267.9 | 258.9 | 279.6 | 279.5 | 270.4 | 270 |
| Nb | 15.8 | 16.6 | 11.4 | 14 | 12 | 12.4 | 14 | 13 | 12.8 | 12.5 | 12.2 | 12 | 12.2 | 12.7 | 12.9 | 12.2 | 13 | 12.7 | 11.8 | 13.4 | 13 | 12.5 | 14 |
| Mo | | | | | | | | | | | | | | | | | | | | | | | |
| Ag | | | | | | | | | | | | | | | | | | | | | | | |
| Cd | | | | | | | | | | | | | | | | | | | | | | | |
| Sn | 2.832 | 3.789 | 4.913 | | 1.904 | 3.96 | | 7.452 | 2.835 | 2.589 | 3.141 | 4.074 | 4.242 | 3.502 | 4.456 | 6.642 | | 2.389 | 3.788 | 2.929 | 2.785 | 3.832 | |
| Sb | | | | | | | | | | | | | | | | | | | | | | | |
| Cs | | | | | | | | | | | | | | | | | | | | | | | |
| Ba | 816.8 | 2351 | 1869.4 | | 1639.4 | 2148.7 | | 1429.1 | 2347 | 1787.4 | 1945.2 | 2062.7 | 2139.6 | 1909.6 | 1584.4 | 1611.7 | | 1872.7 | 1921.1 | 2718.4 | 1789.5 | 953.7 | |
| La | 48.4 | 57.5 | 40.2 | | 57.3 | 40.5 | | 37.2 | 40 | 44.6 | 49.2 | 47 | 53.3 | 38 | 41.8 | 47.2 | | 43.7 | 43.5 | 60.5 | 37.2 | 51.8 | |
| Ce | 103.2 | 112.8 | 88.9 | | 119.4 | 92.5 | | 82.6 | 89.3 | 98.2 | 102.5 | 100.7 | 110.1 | 86.5 | 92.5 | 97.5 | | 91 | 100 | 132.6 | 82.9 | 109.9 | |
| Nd | 45.7 | 45.6 | 36.6 | | 50.5 | 37.2 | | 33 | 37.2 | 40.4 | 38.6 | 39.7 | 44.3 | 32.7 | 38.8 | 41.3 | | 34.9 | 40.4 | 53.5 | 33.6 | 44.8 | |
| Y | 35.3 | 37.8 | 38.8 | 32 | 40.3 | 32.4 | 43 | 35.8 | 35.5 | 36.4 | 37.5 | 39 | 42.2 | 31.9 | 35.4 | 33.1 | 29 | 34.9 | 37.5 | 37.8 | 35.7 | 41.6 | 45 |
| W | | | | | | | | | | | | | | | | | | | | | | | |
| Tl | | | | | | | | | | | | | | | | | | | | | | | |
| Pb | 19.9 | 5.1 | 37 | | 7.4 | 4.1 | | 2.7 | 7.9 | 22.6 | 12.1 | 13.4 | 25.6 | 102.1 | 21.1 | 34.9 | | 10.8 | 12.4 | 5 | 28.2 | 242.2 | |
| Bi | <2 | <2 | 2.6 | | <2 | <2 | | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | | <2 | <2 | <2 | <2 | <2 | |
| Th | 17.0 | 24.2 | 18.2 | | 19.3 | 21.6 | | 19.3 | 19.4 | 18.7 | 19.7 | 19.4 | 18.3 | 18.6 | 19.3 | 19.3 | | 20.3 | 21.9 | 20.3 | 19.8 | 20.6 | |
| U | 3.5 | 7.5 | 6.4 | | 6.0 | 5.0 | | 6.4 | 4.9 | 4.8 | 5.7 | 5.6 | 6.8 | 6.5 | 5.4 | 6.8 | | 6.2 | 5.3 | 6.0 | 5.0 | 5.2 | |
| Al* | 50 | 91 | 90 | 74 | 54 | 79 | 90 | 88 | 67 | 76 | 86 | 82 | 84 | 86 | 93 | 78 | 84 | 72 | 73 | 80 | 71 | 89 | 31 |
| CCPI** | 40 | 45 | 50 | 34 | 37 | 35 | 56 | 57 | 31 | 41 | 50 | 55 | 49 | 41 | 47 | 47 | 30 | 36 | 42 | 35 | 37 | 48 | 36 |
| Ti/Zr | 9.7 | 7.8 | 6.8 | 6.3 | 6.9 | 6.5 | 7.1 | 6.7 | 6.9 | 6.5 | 6.5 | 6.9 | 6.8 | 6.8 | 6.7 | 6.5 | 7.4 | 6.4 | 6.6 | 6.6 | 6.4 | 6.7 | 7.1 |
| Zr/Nb | 14.9 | 8.5 | 21.6 | 19.7 | 21.5 | 22.3 | 20.4 | 20.1 | 20.5 | 20.8 | 20.4 | 21.1 | 20.8 | 20.8 | 20.7 | 22.3 | 19.9 | 21.1 | 21.9 | 20.9 | 21.5 | 21.6 | 19.3 |
| Nb/Y | 0.4 | 0.4 | 0.3 | 0.4 | 0.3 | 0.4 | 0.3 | 0.4 | 0.4 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.3 | 0.4 | 0.4 | 0.3 | 0.3 |
| P2O5/TiO2 | 0.2 | 0.3 | 0.2 | 0.3 | 0.2 | 0.2 | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.2 | 0.2 | 0.2 | 0.0 |

* Alteration Index = 100(K2O + MgO) / (K2O + MgO + Na2O + CaO), Ishikawa et al. (1976)

** Chlorite-Carbonate-Pyrite Index = 100(MgO + FeO) / (MgO + FeO + Na2O + K2O), Large et al. (in press)

# Appendix H. Volcanic Rock Geochemical Data from the Jukes Road and Jukes Prospect.

**Central Volcanic Complex**
Data from **Wyman (1996)**

| Sample Number | 880408 | 880411 | 880414 | 880416 | 880418 |
|---|---|---|---|---|---|
| SiO2 | 73.64 | 72.59 | 75.37 | 62.79 | 72.98 |
| TiO2 | 0.31 | 0.30 | 0.26 | 0.72 | 0.30 |
| Al2O3 | 12.41 | 12.13 | 11.61 | 15.77 | 13.29 |
| Fe2O3 | 5.13 | 6.95 | 4.40 | 7.89 | 4.56 |
| MnO | 0.06 | 0.06 | 0.14 | 0.17 | 0.12 |
| MgO | 1.17 | 1.11 | 1.35 | 2.62 | 1.21 |
| CaO | 0.24 | 0.25 | 0.93 | 3.07 | 0.69 |
| Na2O | 0.24 | 0.98 | 1.85 | 3.67 | 1.54 |
| K2O | 6.56 | 5.42 | 3.96 | 3.10 | 5.12 |
| P2O5 | 0.06 | 0.06 | 0.05 | 0.20 | 0.05 |
| Total Volatile Free | 99.82 | 99.85 | 99.92 | 100.00 | 99.86 |
| FeO | 4.64 | 6.29 | 3.98 | 7.14 | 4.13 |
| S | 0.03 | 0.1 | 0.02 | | 0.08 |
| Sc | 7.6 | 6.7 | 7.6 | | 7.7 |
| Ti | 1842 | 1772 | 1549 | 4316 | 1785 |
| V | 10.5 | 9 | 6.6 | | 8.9 |
| Cr | 8 | 41.8 | 4 | | 17 |
| Co | | | | | |
| Ni | 3.9 | 149.5 | 1.7 | | 61.1 |
| Cu | 7.2 | 18.3 | 10.4 | | 9.8 |
| Zn | 31.3 | 30.3 | 43.7 | | 38.9 |
| As | <3 | 3.1 | <3 | | <3 |
| Br | | | | | |
| Rb | 194.3 | 171.1 | 125.5 | 127 | 178.3 |
| Sr | 30.7 | 31 | 50.9 | 98 | 47.2 |
| Zr | 264.2 | 298.2 | 225.4 | 302 | 281.7 |
| Nb | 12.9 | 12.2 | 11.3 | | 13.2 |
| Mo | | | | | |
| Ag | | | | | |
| Cd | | | | | |
| Sn | 5.061 | 5.24 | 2.052 | | 3.696 |
| Sb | | | | | |
| Cs | | | | | |
| Ba | 1568.3 | 1311.9 | 939.5 | | 1150 |
| La | 89.6 | 48.6 | 29.4 | | 44.9 |
| Ce | 184.4 | 102.7 | 63.5 | | 99.2 |
| Nd | 79.2 | 43.3 | 27.8 | | 44.3 |
| Y | 32.9 | 32.3 | 34.1 | 31 | 39.8 |
| W | | | | | |
| Tl | | | | | |
| Pb | <1.5 | 2.9 | 4.8 | | 6.1 |
| Bi | <2 | <2 | <2 | | <2 |
| Th | 21.7 | 20.6 | 17.3 | | 20.8 |
| U | 5.3 | 4.6 | 4.4 | | 5.2 |
| AI* | 94 | 84 | 66 | 46 | 74 |
| CCPI** | 46 | 54 | 48 | 59 | 44 |
| Ti/Zr | 7.0 | 5.9 | 6.9 | 14.3 | 6.3 |
| Zr/Nb | 20.5 | 24.4 | 19.9 | | 21.3 |
| Nb/Y | 0.4 | 0.4 | 0.3 | 0.0 | 0.3 |
| P2O5/TiO2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.2 |

**Central Volcanic Complex**
Data fr **Doyle (1990)**

| Sample Number | L11 | L12 | L13 | 12 | M17 | 11 | J12 | L9 | J18 | 34 | JP2 | 10 | L14 | 3 | J17 | L8 | L7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SiO2 | 73.15 | 73.65 | 75.62 | 70.84 | 61.68 | 82.53 | 75.64 | 74.71 | 74.26 | 66.42 | 71.65 | 74.67 | 75.50 | 78.94 | 76.44 | 71.03 | 66.14 |
| TiO2 | 0.40 | 0.86 | 0.37 | 0.93 | 0.42 | 0.15 | 0.31 | 0.34 | 0.33 | 0.75 | 0.48 | 0.33 | 0.32 | 0.31 | 0.08 | 0.76 | 0.64 |
| Al2O3 | 13.57 | 15.74 | 13.59 | 15.20 | 10.11 | 8.79 | 13.32 | 13.67 | 13.69 | 15.29 | 10.65 | 13.21 | 12.96 | 12.93 | 11.24 | 14.52 | 13.48 |
| Fe2O3 | 4.19 | 2.92 | 3.08 | 5.80 | 2.56 | 2.09 | 4.61 | 4.36 | 3.99 | 9.91 | 7.88 | 3.20 | 4.39 | 2.29 | 4.02 | 7.08 | 13.05 |
| MnO | 0.09 | 0.01 | 0.02 | 0.03 | 0.01 | 0.06 | 0.04 | 0.10 | 0.02 | 0.14 | 0.52 | 0.19 | 0.05 | 0.01 | 0.80 | 0.05 | 0.07 |
| MgO | 1.54 | 0.92 | 0.80 | 1.22 | 0.67 | 0.31 | 1.04 | 1.18 | 0.99 | 1.30 | 0.48 | 0.79 | 0.64 | 0.54 | 0.31 | 1.25 | 1.40 |
| CaO | 1.01 | 0.33 | 0.06 | 0.27 | 0.01 | 0.02 | 0.06 | 0.29 | 0.04 | 0.21 | 0.10 | 0.99 | 0.05 | 0.05 | 0.16 | 0.26 | 0.18 |
| Na2O | 1.52 | 0.15 | 2.18 | 0.74 | 0.10 | 0.62 | 0.23 | 0.07 | 0.95 | 0.47 | 0.15 | 1.43 | 1.80 | 0.15 | 0.16 | 0.15 | 0.15 |
| K2O | 4.44 | 5.19 | 4.19 | 4.76 | 4.39 | 5.39 | 4.65 | 5.25 | 5.70 | 5.32 | 8.05 | 5.16 | 4.24 | 4.73 | 6.78 | 4.71 | 4.75 |
| P2O5 | 0.08 | 0.23 | 0.10 | 0.22 | 0.04 | 0.03 | 0.10 | 0.03 | 0.04 | 0.20 | 0.03 | 0.03 | 0.05 | 0.04 | 0.03 | 0.20 | 0.12 |
| Total Volatile Free | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| FeO | 3.79 | 2.64 | 2.79 | 5.25 | 2.32 | 1.89 | 4.17 | 3.95 | 3.61 | 8.97 | 7.13 | 2.90 | 3.97 | 2.07 | 3.64 | 6.41 | 11.81 |
| S | | | | | | | | | | | | | | | | | |
| Sc | | | | | | | | | | | | | | | | | |
| Ti | 2398 | 5156 | 2218 | 5575 | 2518 | 899 | 1858 | 2038 | 1978 | 4498 | 2877 | 1978 | 1818 | 1858 | 480 | 4456 | 3836 |
| V | | | | | | | | | | | | | | | | | |
| Cr | | | | | | | | | | | | | | | | | |
| Co | | | | | | | | | | | | | | | | | |
| Ni | | | | | | | | | | | | | | | | | |
| Cu | | | | | | | | | | | | | | | | | |
| Zn | | | | | | | | | | | | | | | | | |
| As | | | | | | | | | | | | | | | | | |
| Br | | | | | | | | | | | | | | | | | |
| Rb | 172 | 220 | 147 | 174 | 166 | 119 | 184 | 199 | 183 | 193 | 123 | 174 | 149 | 200 | 172 | 191 | 168 |
| Sr | 52 | 8 | 21 | 16 | 25 | 23 | 10 | 13 | 30 | 39 | 128 | 28 | 17 | 6 | 25 | 11 | 23 |
| Zr | 261 | 457 | 292 | 406 | 324 | 153 | 274 | 300 | 273 | 347 | 92 | 281 | 276 | 276 | 77 | 382 | 312 |
| Nb | 14 | 20 | 14 | 17 | 17 | 11 | 13 | 16 | 14 | 18 | 9 | 14 | 15 | 13 | 25 | 16 | 14 |
| Mo | | | | | | | | | | | | | | | | | |
| Ag | | | | | | | | | | | | | | | | | |
| Cd | | | | | | | | | | | | | | | | | |
| Sn | | | | | | | | | | | | | | | | | |
| Sb | | | | | | | | | | | | | | | | | |
| Cs | | | | | | | | | | | | | | | | | |
| Ba | | | | | | | | | | | | | | | | | |
| La | | | | | | | | | | | | | | | | | |
| Ce | | | | | | | | | | | | | | | | | |
| Nd | | | | | | | | | | | | | | | | | |
| Y | 37 | 35 | 43 | 31 | 40 | 32 | 36 | 38 | 56 | 34 | 14 | 39 | 38 | 37 | 34 | 238 | 32 |
| W | | | | | | | | | | | | | | | | | |
| Tl | | | | | | | | | | | | | | | | | |
| Pb | | | | | | | | | | | | | | | | | |
| Bi | | | | | | | | | | | | | | | | | |
| Th | | | | | | | | | | | | | | | | | |
| U | | | | | | | | | | | | | | | | | |
| AI* | 70 | 93 | 69 | 86 | 98 | 90 | 95 | 95 | 87 | 91 | 97 | 71 | 73 | 96 | 96 | 94 | 95 |
| CCPI** | 47 | 40 | 36 | 54 | 40 | 27 | 52 | 49 | 41 | 64 | 48 | 36 | 43 | 35 | 36 | 61 | 73 |
| Ti/Zr | 9.2 | 11.3 | 7.6 | 13.7 | 7.8 | 5.9 | 6.8 | 6.8 | 7.2 | 13.0 | 31.3 | 7.0 | 6.6 | 6.7 | 6.2 | 11.7 | 12.3 |
| Zr/Nb | 18.6 | 22.9 | 20.9 | 23.9 | 19.1 | 13.9 | 21.1 | 18.8 | 19.5 | 19.3 | 10.2 | 20.1 | 18.4 | 21.2 | 3.1 | 23.9 | 22.3 |
| Nb/Y | 0.4 | 0.6 | 0.3 | 0.5 | 0.4 | 0.3 | 0.4 | 0.4 | 0.3 | 0.5 | 0.6 | 0.4 | 0.4 | 0.4 | 0.7 | 0.1 | 0.4 |
| P2O5/TiO2 | 0.2 | 0.3 | 0.3 | 0.2 | 0.1 | 0.2 | 0.3 | 0.1 | 0.1 | 0.3 | 0.1 | 0.1 | 0.2 | 0.1 | 0.4 | 0.3 | 0.2 |

* Alteration Index = 100(K2O + MgO) / (K2O + MgO + Na2O + CaO), Ishikawa et al. (1976)

** Chlorite-Carbonate-Pyrite Index = 100(MgO + FeO) / (MgO + FeO + Na2O + K2O), Large et al. (in press)

# Appendix H. Volcanic Rock Geochemical Data from Mt. Darwin.

**Central Volcanic Complex**
Data from: **Wyman (1996)**

| Sample Number | B2027 | B2031 | B2032 | B2035 | B2037 | B2038 | B2044 | B2047 | B2048 | B2049 | B2050 | B2051 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SiO2 | 76.52 | 78.54 | 67.81 | 56.33 | 75.75 | 71.35 | 65.52 | 76.29 | 68.01 | 72.36 | 64.82 | 63.85 |
| TiO2 | 0.18 | 0.20 | 0.67 | 0.18 | 0.22 | 0.27 | 0.67 | 0.52 | 0.67 | 0.41 | 0.72 | 0.88 |
| Al2O3 | 13.28 | 12.92 | 14.60 | 12.38 | 12.32 | 14.59 | 15.56 | 9.25 | 14.66 | 13.99 | 17.05 | 16.27 |
| Fe2O3 | 1.34 | 3.47 | 8.63 | 27.20 | 1.30 | 2.96 | 6.40 | 7.62 | 6.31 | 0.84 | 8.66 | 5.87 |
| MnO | 0.01 | 0.01 | 0.03 | 0.02 | 0.01 | 0.01 | 0.03 | 0.01 | 0.03 | 0.01 | 0.05 | 0.01 |
| MgO | 0.43 | 0.46 | 1.31 | 2.39 | 0.20 | 0.92 | 1.84 | 1.72 | 1.65 | 0.21 | 2.71 | 1.31 |
| CaO | 0.01 | 0.01 | 0.01 | 0.13 | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 |
| Na2O | 0.16 | 0.09 | 0.12 | 0.97 | 0.24 | 0.30 | 0.22 | 0.15 | 0.17 | 0.29 | 0.06 | 0.33 |
| K2O | 7.81 | 4.23 | 6.48 | 0.36 | 9.63 | 9.27 | 9.35 | 4.31 | 8.07 | 11.49 | 5.80 | 10.96 |
| P2O5 | 0.03 | 0.02 | 0.07 | 0.04 | 0.04 | 0.04 | 0.05 | 0.05 | 0.11 | 0.06 | 0.07 | 0.06 |
| Total Volatile | | | | | | | | | | | | |
| Free | 99.77 | 99.95 | 99.73 | 99.99 | 99.73 | 99.72 | 99.65 | 99.94 | 99.69 | 99.67 | 99.95 | 99.55 |
| FeO | 1.22 | 3.14 | 7.81 | 24.61 | 1.18 | 2.68 | 5.79 | 6.90 | 5.71 | 0.76 | 7.84 | 5.31 |
| S | 0.01 | <0.01 | 0.01 | 0.1 | 0.02 | 0.01 | 0.03 | 0.51 | <0.01 | 0.01 | 0.01 | 0.05 |
| Sc | 5 | 7 | 16 | 18 | 3 | 8 | 20 | 14 | 17 | 2 | 27 | 21 |
| Tl | 1099 | 1227 | 4019 | 1086 | 1329 | 1599 | 4030 | 3088 | 3993 | 2467 | 4315 | 5302 |
| V | 6 | 6 | 56 | 75 | 7 | 13 | 135 | 70 | 50 | 5 | 154 | 122 |
| Cr | 3 | 3 | 4 | 12 | 3 | 3 | 8 | 6 | 2 | 3 | 66 | 2 |
| Co | | | | | | | | | | | | |
| Ni | 1 | 1 | 2 | 16 | 2 | 3 | 9 | 2 | 3 | 2 | 16 | 3 |
| Cu | 33 | 116 | 27 | 8 | 4 | 8 | 22 | 7 | 6 | 5 | 247 | 21 |
| Zn | 11 | 19 | 47 | 25 | 12 | 89 | 55 | 44 | 149 | 10 | 111 | 119 |
| As | 8 | <3 | <3 | <3 | <3 | <3 | <3 | 5 | <3 | <3 | <3 | <3 |
| Br | | | | | | | | | | | | |
| Rb | 222 | 163 | 260 | 15 | 209 | 259 | 241 | 159 | 216 | 227 | 290 | 219 |
| Sr | 66 | 10 | 49 | 76 | 92 | 80 | 90 | 21 | 82 | 85 | 16 | 97 |
| Zr | 161 | 174 | 268 | 71 | 179 | 223 | 213 | 175 | 270 | 318 | 219 | 264 |
| Nb | 13.6 | 15.3 | 10 | 8.2 | 9.5 | 16.4 | 9.9 | 7.8 | 9.7 | 14.2 | 8.7 | 9.9 |
| Mo | | | | | | | | | | | | |
| Ag | | | | | | | | | | | | |
| Cd | | | | | | | | | | | | |
| Sn | 7.2 | 16.0 | 7.5 | 12.2 | 3.4 | 5.2 | 7.6 | 14.3 | 12.8 | 5.0 | 5.3 | 6.0 |
| Sb | | | | | | | | | | | | |
| Cs | | | | | | | | | | | | |
| Ba | 2179 | 550 | 2339 | 139 | 2676 | 2463 | 2939 | 648 | 2728 | 3017 | 812 | 4479 |
| La | 41 | 43 | 41 | 14 | 27 | 40 | 102 | 15 | 67 | 5 | 37 | 41 |
| Ce | 99 | 102 | 94 | 23 | 62 | 88 | 200 | 31 | 124 | 17 | 77 | 88 |
| Nd | 38 | 44 | 45 | 7 | 18 | 35 | 75 | 15 | 46 | 3 | 32 | 44 |
| Y | 33 | 32 | 44 | 266 | 65 | 46 | 33 | 22 | 35 | 94 | 30 | 31 |
| W | | | | | | | | | | | | |
| Tl | | | | | | | | | | | | |
| Pb | 10 | 5 | 4 | 7 | 13 | 31 | 17 | 6 | 7 | 5 | 22 | 22 |
| Bi | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| Th | 21 | 25 | 12 | 16 | 46 | 25 | 11 | 9 | 12 | 9 | 12 | 10 |
| U | 4.7 | 5.1 | 4 | 6.9 | 7.8 | 6.5 | 3.9 | 2.5 | 4.1 | 5.7 | 3.5 | 3.7 |
| AI* | 98 | 98 | 98 | 72 | 98 | 97 | 98 | 97 | 98 | 98 | 99 | 97 |
| CCPI** | 17 | 45 | 58 | 95 | 12 | 27 | 44 | 66 | 47 | 8 | 64 | 37 |
| Ti/Zr | 7 | 7 | 15 | 15 | 7 | 7 | 19 | 18 | 15 | 8 | 20 | 20 |
| Zr/Nb | 11.9 | 11.4 | 26.8 | 8.7 | 18.8 | 13.6 | 21.5 | 22.4 | 27.8 | 22.4 | 25.2 | 26.6 |
| Nb/Y | 0.4 | 0.5 | 0.2 | 0.0 | 0.1 | 0.4 | 0.3 | 0.4 | 0.3 | 0.2 | 0.3 | 0.3 |
| P2O5/TiO2 | 0.0 | 1.8 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 | 0.2 | 0.1 |

* Alteration Index = 100(K2O + MgO) / (K2O + MgO + Na2O + CaO), Ishikawa et al. (1976)

** Chlorite-Carbonate-Pyrite Index = 100(MgO + FeO) / (MgO + FeO + Na2O + K2O), Large et al. (in press)

**Central Volcanic Complex (Near Mt. Darwin)**
Data from: **White (1975)**

| Sample Number | 41092 | 41093 | 41117 | 41134 | 41142 | 41233 | 41263 | 41319 | 41324 | 41376 | 41377 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SiO2 | 76.01 | 52.64 | 64.10 | 73.23 | 74.78 | 79.00 | 76.02 | 72.26 | 74.25 | 69.82 | 68.67 |
| TiO2 | 0.24 | 0.31 | 0.17 | 0.33 | 0.09 | 0.24 | 0.29 | 0.43 | 0.49 | 0.40 | 0.72 |
| Al2O3 | 12.45 | 11.60 | 10.09 | 13.65 | 11.22 | 12.20 | 13.14 | 10.65 | 12.79 | 15.24 | 15.15 |
| Fe2O3 | 2.90 | 25.83 | 17.96 | 2.79 | 2.10 | 2.65 | 2.77 | 12.72 | 6.79 | 3.36 | 7.65 |
| MnO | 0.00 | 0.00 | 0.00 | 0.01 | 0.12 | 0.02 | 0.00 | 0.00 | 0.15 | 0.00 | 0.01 |
| MgO | 0.36 | 1.34 | 0.75 | 0.82 | 0.86 | 0.65 | 0.30 | 0.30 | 0.90 | 1.24 | 0.91 |
| CaO | 0.00 | 0.00 | 0.05 | 0.52 | 1.24 | 0.02 | 0.10 | 0.01 | 0.16 | 0.03 | 0.20 |
| Na2O | 2.62 | 0.15 | 0.18 | 3.23 | 0.33 | 0.42 | 0.11 | 0.07 | 0.04 | 0.22 | 1.04 |
| K2O | 5.25 | 7.73 | 6.33 | 5.19 | 8.95 | 4.54 | 7.14 | 3.48 | 4.16 | 9.42 | 5.43 |
| P2O5 | 0.03 | 0.05 | 0.08 | 0.05 | 0.02 | 0.02 | 0.02 | 0.01 | 0.10 | 0.05 | 0.10 |
| Total Volatile | | | | | | | | | | | |
| Free | 99.86 | 99.67 | 99.71 | 99.81 | 99.71 | 99.75 | 99.90 | 99.93 | 99.84 | 99.76 | 99.87 |
| FeO | 2.63 | 23.38 | 16.25 | 2.53 | 1.90 | 2.40 | 2.50 | 11.51 | 6.15 | 3.04 | 6.92 |
| S | 0.15 | 0.18 | 2.3 | 0.01 | 0.13 | 0 | 0 | 6.99 | 1.27 | 0.14 | 2.75 |
| Sc | 10 | 7 | 1 | 7 | 3 | 10 | 7 | 7 | 10 | 13 | 15 |
| Tl | 1455 | 1869 | 1038 | 2000 | 553 | 1409 | 1761 | 2559 | 2954 | 2407 | 4315 |
| V | 20 | 63 | 25 | 20 | 18 | 16 | 20 | 49 | 42 | 15 | 72 |
| Cr | 16 | 0 | 0 | 20 | 28 | 25 | 23 | 14 | 8 | 20 | 16 |
| Co | | | | | | | | | | | |
| Ni | 1 | 4 | 14 | 10 | 12 | 10 | 6 | 9 | 11 | 9 | 25 |
| Cu | 2 | 62 | 143 | 0 | 6 | 12 | 0 | 45 | 33 | 0 | 566 |
| Zn | 56 | 118 | 115 | 59 | 22 | 14 | 0 | 14 | 84 | 47 | 39 |
| As | | | | | | | | | | | |
| Br | | | | | | | | | | | |
| Rb | 162 | 195 | 125 | 144 | 214 | 223 | 238 | 150 | 176 | 475 | 202 |
| Sr | 50 | 45 | 44 | 76 | 113 | 21 | 84 | 12 | 14 | 50 | 82 |
| Zr | 253 | 200 | 74 | 298 | 110 | 334 | 272 | 102 | 177 | 320 | 215 |
| Nb | 27 | 18 | 31 | 15 | 24 | 5 | 17 | 0 | 7 | 21 | 16 |
| Mo | | | | | | | | | | | |
| Ag | | | | | | | | | | | |
| Cd | | | | | | | | | | | |
| Sn | | | | | | | | | | | |
| Sb | | | | | | | | | | | |
| Cs | | | | | | | | | | | |
| Ba | 1250 | 2960 | 2510 | 1700 | 2500 | 2150 | 900 | 580 | 1340 | 2060 | 1070 |
| La | 82 | 104 | 162 | 36 | 47 | 50 | 21 | 18 | 54 | 66 | 25 |
| Ce | 100 | 350 | 400 | 50 | 140 | 90 | 60 | 80 | 80 | 70 | 20 |
| Nd | | | | | | | | | | | |
| Y | 46 | 33 | 196 | 33 | 50 | 43 | 42 | 38 | 45 | 58 | 37 |
| W | | | | | | | | | | | |
| Tl | | | | | | | | | | | |
| Pb | 10 | 15 | 8 | 20 | 1 | 0 | 13 | 7 | 4 | 10 | 47 |
| Bi | | | | | | | | | | | |
| Th | 19 | 30 | 25 | 20 | 31 | 35 | 33 | 13 | 18 | 26 | 5 |
| U | | | | | | | | | | | |
| AI* | 68 | 98 | 97 | 62 | 86 | 92 | 97 | 98 | 96 | 98 | 84 |
| CCPI** | 28 | 76 | 72 | 28 | 23 | 38 | 28 | 77 | 63 | 31 | 55 |
| Tl/Zr | 6 | 9 | 14 | 7 | 5 | 4 | 6 | 25 | 17 | 8 | 20 |
| Zr/Nb | 9.4 | 11.1 | 2.4 | 19.9 | 4.6 | 66.8 | 16.0 | | 25.3 | 15.2 | 13.4 |
| Nb/Y | 0.6 | 0.5 | 0.2 | 0.5 | 0.5 | 0.1 | 0.4 | 0.0 | 0.2 | 0.4 | 0.4 |
| P2O5/TiO2 | 0.1 | 0.2 | 0.5 | 0.2 | 0.2 | 0.1 | 0.1 | 0.0 | 0.2 | 0.1 | 0.1 |

# Appendix H. Volcanic Rock Geochemical Data from Mt. Darwin.

## Central Volcanic Complex (Near Mt. Darwin)

Data from: **White (1975)**

| Sample Number | 41378 | 41381 | 41382 | 41383 | 41384 | 41385 | 41388 | 41389 | 41390 | 41391 |
|---|---|---|---|---|---|---|---|---|---|---|
| SiO2 | 75.29 | 72.73 | 60.21 | 73.94 | 78.39 | 73.49 | 73.97 | 57.65 | 56.63 | 71.63 |
| TiO2 | 0.16 | 0.19 | 0.21 | 0.27 | 0.25 | 0.31 | 0.22 | 0.53 | 0.24 | 0.30 |
| Al2O3 | 14.34 | 14.92 | 10.65 | 12.59 | 12.54 | 13.46 | 12.97 | 12.13 | 9.48 | 12.80 |
| Fe2O3 | 3.01 | 8.14 | 23.78 | 3.02 | 2.78 | 4.70 | 5.64 | 25.45 | 26.97 | 6.26 |
| MnO | 0.00 | 0.14 | 0.32 | 0.00 | 0.00 | 0.03 | 0.01 | 0.13 | 0.14 | 0.11 |
| MgO | 0.38 | 0.58 | 0.98 | 0.44 | 0.57 | 0.69 | 0.83 | 2.43 | 2.14 | 0.42 |
| CaO | 0.00 | 0.05 | 0.05 | 0.00 | 0.00 | 0.00 | 0.05 | 0.21 | 0.12 | 0.04 |
| Na2O | 1.09 | 0.07 | 0.29 | 0.44 | 0.04 | 0.28 | 0.55 | 0.24 | 0.01 | 0.34 |
| K2O | 5.64 | 3.10 | 0.23 | 7.20 | 5.04 | 6.72 | 5.59 | 0.79 | 0.23 | 7.76 |
| P2O5 | 0.04 | 0.02 | 0.05 | 0.02 | 0.01 | 0.03 | 0.02 | 0.10 | 0.06 | 0.06 |
| Total Volatile Free | 99.95 | 99.95 | 96.77 | 97.92 | 99.63 | 99.73 | 99.85 | 99.67 | 96.03 | 99.72 |
| FeO | 2.72 | 7.37 | 21.52 | 2.73 | 2.52 | 4.26 | 5.10 | 23.03 | 24.41 | 5.66 |
| S | 0.12 | 0.03 | 0.98 | 0.43 | 0.18 | 0.08 | 0 | 0.7 | 3.1 | 0.17 |
| Sc | 1 | 6 | 5 | 9 | 9 | 8 | 6 | 16 | 6 | 6 |
| Ti | 977 | 1155 | 1235 | 1597 | 1527 | 1888 | 1330 | 3197 | 1449 | 1769 |
| V | 20 | 23 | 26 | 7 | 14 | 12 | 15 | 93 | 45 | 38 |
| Cr | 16 | 6 | 0 | 24 | 18 | 22 | 8 | 0 | 0 | 32 |
| Co | | | | | | | | | | |
| Ni | 3 | 1 | 0 | 11 | 6 | 14 | 11 | 13 | 5 | 1 |
| Cu | 0 | 15 | 17175 | 8 | 0 | 6 | 80 | 2114 | 30120 | 122 |
| Zn | 3 | 87 | 248 | 15 | 22 | 48 | 34 | 225 | 205 | 73 |
| As | | | | | | | | | | |
| Br | | | | | | | | | | |
| Rb | 166 | 133 | 7 | 216 | 230 | 242 | 205 | 22 | 10 | 172 |
| Sr | 10 | 11 | 6 | 397 | 20 | 40 | 32 | 7 | 8 | 69 |
| Zr | 197 | 220 | 160 | 264 | 280 | 300 | 278 | 267 | 96 | 233 |
| Nb | 21 | 16 | 13 | 12 | 9 | 6 | 10 | 20 | 3 | 8 |
| Mo | | | | | | | | | | |
| Ag | | | | | | | | | | |
| Cd | | | | | | | | | | |
| Sn | | | | | | | | | | |
| Sb | | | | | | | | | | |
| Cs | | | | | | | | | | |
| Ba | 516 | 462 | 82 | 18180 | 3220 | 2420 | 1340 | 283 | 80 | 2530 |
| La | 87 | 30 | 0 | 23 | 20 | 27 | 44 | 0 | 0 | 38 |
| Ce | 140 | 70 | 100 | 500 | 100 | 80 | 50 | 100 | 100 | 100 |
| Nd | | | | | | | | | | |
| Y | 35 | 42 | 46 | 43 | 41 | 49 | 44 | 173 | 40 | 38 |
| W | | | | | | | | | | |
| Tl | | | | | | | | | | |
| Pb | 0 | 0 | 26 | 0 | 8 | 0 | 26 | 2 | 38 | 15 |
| Bi | | | | | | | | | | |
| Th | 41 | 16 | 9 | 25 | 20 | 23 | 19 | 15 | 21 | 28 |
| U | | | | | | | | | | |
| AI* | 85 | 97 | 78 | 95 | 99 | 96 | 91 | 88 | 95 | 96 |
| CCPI** | 32 | 71 | 98 | 29 | 38 | 41 | 49 | 96 | 99 | 43 |
| Ti/Zr | 5 | 5 | 8 | 6 | 5 | 6 | 5 | 12 | 15 | 8 |
| Zr/Nb | 9.4 | 13.8 | 12.3 | 22.0 | 31.1 | 50.0 | 27.8 | 13.4 | 32.0 | 29.1 |
| Nb/Y | 0.6 | 0.4 | 0.3 | 0.3 | 0.2 | 0.1 | 0.2 | 0.1 | 0.1 | 0.2 |
| P2O5/TIO2 | 0.3 | 0.1 | 0.3 | 0.1 | 0.0 | 0.1 | 0.1 | 0.2 | 0.3 | 0.2 |

* Alteration Index = 100(K2O + MgO) / (K2O + MgO + Na2O + CaO), Ishikawa et al. (1976)

** Chlorite-Carbonate-Pyrite Index = 100(MgO + FeO) / (MgO + FeO + Na2O + K2O), Large et al. (in press)

## Central Volcanic Complex (Prince Lyell)

Data from: **Raymond (1992)**

| Sample Number | PL1 | PL2 | PL3 | PL4 | PL5 | PL6 | PL7 | PL8 | PL10 | PL11 | PL15 | PL16 | PL17 | PL18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SiO2 | 71.93 | 61.47 | 56.54 | 64.80 | 59.64 | 70.13 | 60.46 | 72.84 | 69.58 | 65.94 | 57.23 | 63.22 | 60.00 | 59.84 |
| TiO2 | 0.28 | 0.27 | 0.45 | 0.30 | 0.48 | 0.27 | 0.39 | 0.24 | 0.27 | 0.44 | 0.50 | 0.34 | 0.37 | 0.52 |
| Al2O3 | 11.79 | 11.13 | 13.35 | 11.85 | 13.12 | 11.91 | 11.79 | 11.13 | 11.54 | 13.66 | 14.02 | 9.46 | 12.29 | 14.80 |
| Fe2O3 | 8.38 | 17.49 | 19.89 | 11.87 | 16.11 | 8.29 | 20.61 | 7.81 | 12.67 | 13.64 | 17.84 | 18.19 | 17.12 | 14.32 |
| MnO | 0.07 | 0.41 | 0.06 | 0.26 | 0.13 | 0.12 | 0.45 | 0.07 | 0.08 | 0.22 | 0.18 | 0.23 | 0.05 | 0.21 |
| MgO | 1.24 | 2.16 | 2.30 | 1.98 | 2.34 | 1.64 | 3.28 | 1.46 | 0.88 | 1.40 | 2.53 | 1.65 | 2.15 | 2.78 |
| CaO | 0.40 | 0.91 | 0.61 | 1.86 | 0.97 | 0.84 | 0.16 | 0.78 | 0.05 | 0.16 | 0.87 | 0.59 | 0.28 | 1.59 |
| Na2O | 0.06 | 0.14 | 0.22 | 0.27 | 0.06 | 0.08 | 0.05 | 0.07 | 0.16 | 0.14 | 0.05 | 0.08 | 0.05 | 0.04 |
| K2O | 3.46 | 3.57 | 3.78 | 3.85 | 3.81 | 4.14 | 1.57 | 3.83 | 3.88 | 4.17 | 4.01 | 2.74 | 4.03 | 5.01 |
| P2O5 | 0.16 | 0.54 | 0.37 | 0.37 | 0.69 | 0.22 | 0.18 | 0.17 | 0.08 | 0.10 | 0.48 | 0.35 | 0.31 | 0.22 |
| Total Volatile Free | 97.77 | 98.08 | 97.57 | 97.42 | 97.34 | 97.64 | 98.94 | 98.42 | 99.20 | 99.86 | 97.72 | 96.85 | 96.67 | 99.33 |
| FeO | 7.58 | 15.83 | 18.00 | 10.75 | 14.58 | 7.50 | 18.65 | 7.07 | 11.47 | 12.34 | 16.15 | 16.46 | 15.49 | 12.96 |
| S | | | | | | | | | | | | | | |
| Sc | | | | | | | | | | | | | | |
| Ti | 1700 | 1641 | 2724 | 1817 | 2866 | 1636 | 2362 | 1452 | 1591 | 2609 | 3013 | 2032 | 2236 | 3110 |
| V | | | | | | | | | | | | | | |
| Cr | | | | | | | | | | | | | | |
| Co | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill |
| Ni | | | | | | | | | | | | | | |
| Cu | 16700 | 14000 | 18000 | 19040 | 20000 | 18000 | 8700 | 12000 | 6000 | 1040 | 17040 | 25200 | 25040 | 5040 |
| Zn | 146 | 439 | 370 | 131 | 336 | 150 | 511 | 136 | 76 | 81 | 563 | 373 | 1027 | 204 |
| As | 6 | <3 | 30 | 4 | 9 | <3 | 13 | <3 | 8 | <3 | <3 | <3 | 24 | <3 |
| Br | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Rb | 91 | 69 | 84 | 116 | 96 | 100 | 36 | 94 | 110 | 137 | 94 | 63 | 65 | 114 |
| Sr | 144 | 52 | 24 | 69 | 32 | 112 | 8 | 452 | 12 | 14 | 167 | 21 | 30 | 98 |
| Zr | 219 | 175 | 168 | 183 | 167 | 223 | 177 | 200 | 205 | 214 | 148 | 144 | 172 | 186 |
| Nb | 21 | 10 | 22 | 31 | 17 | 20 | 14 | 18 | 11 | 9 | 20 | 16 | 18 | 11 |
| Mo | 41 | 23 | 157 | 340 | 7 | 29 | 22 | 37 | 26 | 5 | 33 | 42 | 282 | 20 |
| Ag | | | | | | | | | | | | | | |
| Cd | | | | | | | | | | | | | | |
| Sn | 11 | 21 | 7 | 18 | 25 | 35 | 10 | 31 | 75 | 18 | 14 | 12 | 13 | 35 |
| Sb | | | | | | | | | | | | | | |
| Cs | | | | | | | | | | | | | | |
| Ba | 9146 | 6384 | 3575 | 3297 | 4762 | 5764 | 2158 | 15685 | 2581 | 2308 | 10531 | 2079 | 4917 | 6852 |
| La | | | | | | | | | | | | | | |
| Ce | | | | | | | | | | | | | | |
| Nd | 134 | 38 | 160 | 96 | 50 | 76 | 97 | 75 | 105 | 36 | 157 | 184 | 132 | 68 |
| Y | 30 | 17 | 23 | 31 | 18 | 21 | 27 | 28 | 61 | 39 | 35 | 29 | 25 | 32 |
| W | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill |
| Tl | | | | | | | | | | | | | | |
| Pb | 9 | 22 | 26 | 11 | 16 | 9 | 14 | 10 | 9 | 3 | 126 | 22 | 28 | 8 |
| Bi | 1 | 2 | 2 | 3 | 3 | 2 | <1.5 | <1.5 | 3 | 2 | 4 | 3 | 2 | <1.5 |
| Th | 13 | 9 | 24 | 18 | 27 | 13 | 14 | 15 | 16 | 12 | 15 | 14 | 12 | 23 |
| U | 10.2 | 4.9 | 9.1 | 9.4 | 8.2 | 6.5 | 6.3 | 16.7 | 36.9 | 4.9 | 10.9 | 11.5 | 64.2 | 15.3 |
| AI* | 91 | 84 | 88 | 73 | 86 | 86 | 96 | 86 | 96 | 95 | 88 | 87 | 95 | 83 |
| CCPI** | 71 | 83 | 84 | 76 | 81 | 68 | 93 | 69 | 75 | 76 | 82 | 87 | 81 | 76 |
| Ti/Zr | 8 | 9 | 16 | 10 | 17 | 7 | 13 | 7 | 8 | 12 | 20 | 14 | 13 | 17 |
| Zr/Nb | 10.4 | 17.5 | 7.6 | 5.9 | 9.8 | 11.2 | 12.6 | 11.1 | 18.6 | 23.8 | 7.4 | 9.0 | 9.6 | 16.9 |
| Nb/Y | 0.7 | 0.6 | 1.0 | 1.0 | 0.9 | 1.0 | 0.5 | 0.6 | 0.2 | 0.2 | 0.6 | 0.6 | 0.7 | 0.3 |
| P2O5/TIO2 | 0.6 | 2.0 | 0.8 | 1.2 | 1.4 | 0.8 | 0.5 | 0.7 | 0.3 | 0.2 | 1.0 | 1.0 | 0.8 | 0.4 |

# Appendix H. Volcanic Rock Geochemical Data from Mt. Darwin.

**Central Volcanic Complex (Prince Lyell)**
Data from: **Raymond (1992)**

| Sample Number | PL22 | PL23 | PL24 | PL27 | PL28 | PL29 | PL30 | PL31 |
|---|---|---|---|---|---|---|---|---|
| SiO2 | 63.04 | 65.41 | 70.40 | 55.10 | 60.11 | 64.97 | 66.31 | 64.64 |
| TiO2 | 0.48 | 0.29 | 0.26 | 0.34 | 0.59 | 0.25 | 0.24 | 0.22 |
| Al2O3 | 14.75 | 12.41 | 11.50 | 11.79 | 14.36 | 11.06 | 11.10 | 10.25 |
| Fe2O3 | 11.65 | 11.16 | 12.22 | 24.87 | 16.50 | 13.64 | 14.57 | 17.59 |
| MnO | 0.12 | 0.08 | 0.14 | 0.15 | 0.20 | 0.19 | 0.14 | 0.25 |
| MgO | 2.19 | 1.34 | 1.18 | 2.39 | 3.12 | 1.55 | 1.86 | 2.00 |
| CaO | 1.00 | 0.65 | 0.06 | 0.51 | 0.96 | 0.75 | 0.68 | 0.26 |
| Na2O | 0.33 | 0.96 | 0.12 | 0.02 | 0.11 | 0.08 | 0.02 | 0.04 |
| K2O | 5.05 | 5.44 | 3.83 | 2.20 | 3.14 | 3.64 | 3.02 | 1.78 |
| P2O5 | 0.21 | 0.31 | 0.07 | 0.45 | 0.51 | 0.38 | 0.34 | 0.30 |
| Total Volatile | | | | | | | | |
| Free | 98.82 | 98.04 | 99.79 | 97.82 | 99.59 | 96.51 | 98.28 | 97.34 |
| FeO | 10.54 | 10.10 | 11.06 | 22.50 | 14.94 | 12.35 | 13.18 | 15.92 |
| S | | | | | | | | |
| Sc | | | | | | | | |
| Ti | 2883 | 1752 | 1578 | 2027 | 3518 | 1478 | 1452 | 1342 |
| V | | | | | | | | |
| Cr | | | | | | | | |
| Co | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill |
| Ni | | | | | | | | |
| Cu | 9040 | 15040 | 1600 | 16000 | 3040 | 26080 | 13040 | 20000 |
| Zn | 132 | 310 | 84 | 3753 | 162 | 270 | 265 | 630 |
| As | <3 | 12 | <3 | 96 | 17 | 7 | 12 | 36 |
| Br | <1 | <1 | <1 | <1 | <1 | <1 | <1 | |
| Rb | 123 | 65 | 113 | 39 | 86 | 84 | 48 | |
| Sr | 61 | 79 | 11 | 17 | 20 | 42 | 32 | |
| Zr | 205 | 215 | 214 | 152 | 164 | 198 | 199 | 166 |
| Nb | 12 | 22 | 9 | 16 | 11 | 14 | 14 | |
| Mo | 22 | 65 | 25 | 17 | 34 | 93 | 6 | |
| Ag | | | | | | | | |
| Cd | | | | | | | | |
| Sn | 41 | 9 | 40 | 17 | 16 | 13 | 13 | 5 |
| Sb | | | | | | | | |
| Cs | | | | | | | | |
| Ba | 5233 | 10917 | 1378 | 2817 | 1183 | 4569 | 4917 | |
| La | | | | | | | | |
| Ce | | | | | | | | |
| Nd | 86 | 85 | 67 | 45 | 32 | 33 | 59 | |
| Y | 32 | 17 | 65 | 17 | 20 | 16 | 17 | |
| W | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill |
| Tl | | | | | | | | |
| Pb | 5 | 14 | 8 | 108 | 12 | 8 | 71 | 179 |
| Bi | <1.5 | <1.5 | 2 | 2 | 3 | 3 | 2 | |
| Th | 26 | 13 | 13 | 10 | 24 | 17 | 15 | |
| U | 11.0 | 10.2 | 13.5 | 14.1 | 5.6 | 5.6 | 16.9 | |
| AI* | 84 | 81 | 97 | 90 | 85 | 86 | 87 | 93 |
| CCPI** | 70 | 64 | 76 | 92 | 85 | 79 | 83 | 91 |
| Ti/Zr | 14 | 8 | 7 | 13 | 21 | 7 | 7 | 8 |
| Zr/Nb | 17.1 | 9.8 | 23.8 | 9.5 | 14.9 | 14.1 | 14.2 | |
| Nb/Y | 0.4 | 1.3 | 0.1 | 0.9 | 0.6 | 0.9 | 0.8 | |
| P2O5/TiO2 | 0.4 | 1.1 | 0.3 | 1.3 | 0.9 | 1.5 | 1.4 | 1.3 |

**Central Volcanic Complex (Intercolonial spur)**
Data from: **Gadaloff (1996)**

| Sample Number | 28/4/3 | 16/5/6 | 16/5/7 | 4/4/3 | 4/4/7 | 7/4/1 | 7/4/2 | 7/4/4 | 7/4/6 | 8/4/2 | 14/4/1 | 28/4/1 | 28/4/2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SiO2 | 69.33 | 52.97 | 63.85 | 74.47 | 76.60 | 74.62 | 75.03 | 73.52 | 74.33 | 73.86 | 73.86 | 74.52 | 72.69 |
| TiO2 | 0.34 | 0.31 | 0.29 | 0.31 | 0.30 | 0.32 | 0.33 | 0.29 | 0.30 | 0.31 | 0.30 | 0.33 | 0.29 |
| Al2O3 | 14.70 | 14.49 | 13.80 | 13.56 | 13.52 | 13.52 | 13.88 | 12.33 | 13.02 | 13.30 | 13.38 | 13.79 | 12.92 |
| Fe2O3 | 10.62 | 26.88 | 15.60 | 3.18 | 2.36 | 2.83 | 2.47 | 6.29 | 3.32 | 3.31 | 2.66 | 3.19 | 10.54 |
| MnO | 0.10 | 0.25 | 0.11 | 0.02 | 0.01 | 0.01 | 0.01 | 0.05 | 0.01 | 0.02 | 0.01 | 0.01 | 0.10 |
| MgO | 0.87 | 4.40 | 3.23 | 0.63 | 0.63 | 0.32 | 0.42 | 0.81 | 0.54 | 0.50 | 0.49 | 0.40 | 0.54 |
| CaO | 0.01 | 0.06 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.08 | 0.01 | 0.01 | 0.01 |
| Na2O | 0.04 | 0.01 | 0.03 | 0.14 | 0.08 | 0.11 | 0.11 | 0.06 | 0.15 | 2.73 | 0.19 | 0.13 | 0.05 |
| K2O | 3.96 | 0.56 | 3.03 | 7.65 | 6.50 | 8.26 | 7.72 | 6.60 | 8.29 | 5.83 | 9.07 | 7.60 | 2.82 |
| P2O5 | 0.03 | 0.05 | 0.04 | 0.04 | 0.02 | 0.03 | 0.03 | 0.04 | 0.04 | 0.05 | 0.04 | 0.03 | 0.03 |
| Total Volatile | | | | | | | | | | | | | |
| Free | 100.01 | 100.00 | 100.00 | 100.01 | 100.02 | 100.02 | 100.01 | 100.01 | 100.01 | 100.00 | 100.02 | 100.02 | 100.01 |
| FeO | 9.61 | 24.33 | 14.12 | 2.88 | 2.13 | 2.56 | 2.23 | 5.69 | 3.00 | 2.99 | 2.40 | 2.89 | 9.54 |
| S | 0.01 | 0.16 | <0.01 | 0.01 | <0.01 | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 | 0.01 | <0.01 | 0.02 |
| Sc | 10 | 12 | 11 | 9 | 9 | 8 | 9 | 8 | 7 | 7 | 9 | 9 | 9 |
| Ti | 2050 | 1844 | 1744 | 1887 | 1783 | 1889 | 1957 | 1725 | 1769 | 1886 | 1823 | 1950 | 1758 |
| V | 9 | 16 | 7 | 7 | 9 | 7 | 8 | 8 | 7 | 8 | 9 | 7 | 11 |
| Cr | 5 | 4 | 5 | 3 | 3 | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 |
| Co | | | | | | | | | | | | | |
| Ni | 4 | 22 | 11 | 3 | 4 | 3 | 3 | 3 | 2 | 2 | 3 | 4 | 4 |
| Cu | 40 | 1160 | 121 | 11 | 6 | 6 | 7 | 110 | 60 | 20 | 8 | 8 | 22 |
| Zn | 188 | 178 | 191 | 47 | 58 | 19 | 36 | 51 | 31 | 53 | 29 | 25 | 154 |
| As | | <1 | <1 | | | | <1 | | 1 | <1 | 3 | 2 | |
| Br | | | | | | | | | | | | | |
| Rb | 198 | 25 | 120 | 212 | 201 | 221 | 219 | 174 | 207 | 143 | 215 | 228 | 141 |
| Sr | 6 | 1 | 6 | 36 | 14 | 35 | 33 | 13 | 46 | 55 | 59 | 24 | 6 |
| Zr | 314 | 229 | 272 | 287 | 279 | 290 | 296 | 252 | 274 | 282 | 281 | 288 | 273 |
| Nb | 14 | 10 | 11 | 14 | 13 | 13 | 14 | 11 | 13 | 13 | 13 | 13 | 12 |
| Mo | | 0.3 | 0.1 | | | | 0.2 | | 0.4 | 0.5 | 0.6 | 0.1 | |
| Ag | | 0.3 | <0.1 | | | | 0.2 | | <0.1 | <0.1 | 0.2 | <0.1 | |
| Cd | | 0.1 | <0.1 | | | | <0.1 | | <0.1 | <0.1 | <0.1 | <0.1 | |
| Sn | | | | | | | | | | | | | |
| Sb | | 0.3 | 0.5 | | | | 0.8 | | 0.8 | 0.8 | 0.7 | 1.1 | |
| Cs | | 0.33 | 0.99 | | | | 1.66 | | 1.66 | 0.6 | 0.76 | 1.24 | |
| Ba | 388 | 49 | 515 | 2019 | 941 | 1517 | 1688 | 1571 | 2421 | 1608 | 2663 | 1278 | 332 |
| La | 43 | 40 | 59 | 64 | 48 | 40 | 49 | 35 | 55 | 39 | 55 | 49 | 9 |
| Ce | 91 | 78 | 129 | 127 | 101 | 83 | 113 | 78 | 117 | 92 | 114 | 103 | 20 |
| Nd | 41 | 32 | 57 | 52 | 42 | 32 | 51 | 34 | 46 | 39 | 47 | 45 | 10 |
| Y | 40 | 48 | 42 | 54 | 35 | 32 | 39 | 73 | 38 | 29 | 28 | 44 | 75 |
| W | | | | | | | | | | | | | |
| Tl | | <0.5 | <0.5 | | | | 0.9 | | 1 | 0.6 | 0.9 | 0.7 | |
| Pb | 4 | 2 | 4 | <1.5 | 5 | 5 | 3 | 2 | 2 | 7 | 3 | 6 | 209 |
| Bi | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| Th | 26 | 22 | 23 | 23 | 22 | 21 | 23 | 19 | 21 | 24 | 22 | 22 | 21 |
| U | | 3 | 3 | | | | 5 | | 5 | 5 | 6 | 4 | |
| AI* | 99 | 99 | 99 | 98 | 99 | 99 | 99 | 99 | 98 | 69 | 98 | 98 | 98 |
| CCPI** | 72 | 98 | 85 | 31 | 30 | 26 | 25 | 49 | 30 | 29 | 24 | 30 | 78 |
| Ti/Zr | 7 | 8 | 6 | 7 | 6 | 7 | 7 | 7 | 6 | 7 | 6 | 7 | 6 |
| Zr/Nb | 22.4 | 22.9 | 24.7 | 20.5 | 21.5 | 22.3 | 21.1 | 22.9 | 21.1 | 21.7 | 21.6 | 22.2 | 22.8 |
| Nb/Y | 0.4 | 0.2 | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 | 0.2 | 0.3 | 0.4 | 0.5 | 0.3 | 0.2 |
| P2O5/TiO2 | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 |

* Alteration Index = 100(K2O + MgO) / (K2O + MgO + Na2O + CaO), Ishikawa et al. (1976)

** Chlorite-Carbonate-Pyrite Index = 100(MgO + FeO) / (MgO + FeO + Na2O + K2O), Large et al. (in press)

# Appendix H. Volcanic Rock Geochemical Data from Mt. Darwin.

**Central Volcanic Complex (Intercolonial spur)**
Data from: **Gadaloff (1996)**

| Sample Number | 28/4/4 | 28/4/5 | 15/5/1 | 15/5/2 | 5/4/4 |
|---|---|---|---|---|---|
| SiO2 | 74.81 | 73.06 | 72.77 | 74.60 | 77.17 |
| TiO2 | 0.29 | 0.29 | 0.28 | 0.29 | 0.18 |
| Al2O3 | 12.48 | 12.57 | 12.47 | 13.21 | 12.65 |
| Fe2O3 | 3.11 | 10.30 | 4.49 | 3.68 | 2.97 |
| MnO | 0.02 | 0.05 | 0.02 | 0.03 | 0.02 |
| MgO | 0.52 | 0.72 | 0.84 | 0.64 | 0.38 |
| CaO | 0.01 | 0.01 | 0.01 | 0.12 | 0.01 |
| Na2O | 0.18 | 0.03 | 0.24 | 1.89 | 0.53 |
| K2O | 8.54 | 2.96 | 8.86 | 5.48 | 6.06 |
| P2O5 | 0.04 | 0.02 | 0.02 | 0.05 | 0.03 |
| Total Volatile Free | 100.01 | 100.01 | 100.01 | 100.00 | 100.00 |
| FeO | 2.82 | 9.32 | 4.06 | 3.33 | 2.69 |
| S | 0.01 | 0.01 | <0.01 | <0.01 | <0.01 |
| Sc | 8 | 9 | 7 | 9 | 3 |
| Tl | 1768 | 1745 | 1706 | 1768 | 1090 |
| V | 7 | 7 | 8 | 8 | 5 |
| Cr | 4 | 3 | 3 | 3 | 2 |
| Co | | | | | |
| Ni | 3 | 2 | 3 | 2 | 2 |
| Cu | 28 | 135 | 205 | 29 | 5 |
| Zn | 29 | 280 | 61 | 91 | 79 |
| As | <1 | | <1 | <1 | |
| Br | | | | | |
| Rb | 179 | 147 | 186 | 165 | 197 |
| Sr | 51 | 3 | 54 | 99 | 31 |
| Zr | 262 | 264 | 269 | 276 | 161 |
| Nb | 12 | 12 | 11 | 13 | 18 |
| Mo | 0.6 | | 0.6 | 0.4 | |
| Ag | <0.1 | | 0.2 | <0.1 | |
| Cd | <0.1 | | 0.1 | <0.1 | |
| Sn | | | | | |
| Sb | 0.4 | | 0.5 | 0.7 | |
| Cs | 0.49 | | 0.54 | 1.2 | |
| Ba | 3248 | 224 | 2105 | 1631 | 1199 |
| La | 52 | 51 | 31 | 54 | 53 |
| Ce | 111 | 102 | 68 | 103 | 107 |
| Nd | 45 | 45 | 29 | 48 | 43 |
| Y | 37 | 29 | 35 | 43 | 33 |
| W | | | | | |
| Tl | 0.8 | | 0.6 | 0.8 | |
| Pb | 2 | 149 | 3 | 12 | 4 |
| Bl | <2 | <2 | <2 | <2 | <2 |
| Th | 19 | 23 | 19 | 22 | 29 |
| U | 5 | | 6 | 6 | |
| AI* | 98 | 99 | 97 | 75 | 92 |
| CCPI** | 28 | 77 | 35 | 35 | 32 |
| Tl/Zr | 7 | 7 | 6 | 6 | 7 |
| Zr/Nb | 21.8 | 22.0 | 24.5 | 21.2 | 8.9 |
| Nb/Y | 0.3 | 0.4 | 0.3 | 0.3 | 0.5 |
| P2O5/TiO2 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 |

* Alteration Index = 100(K2O + MgO) / (K2O + MgO + Na2O + CaO), Ishikawa et al. (1976)

** Chlorite-Carbonate-Pyrite Index = 100(MgO + FeO) / (MgO + FeO + Na2O + K2O), Large et al. (in press)

# Appendix H. Volcanic Rock Geochemical Data from the Eastern Quartz-Phyric Sequence and Tyndall Group.

**Eastern Quartz Phyric Sequence (Jukes Road)**

Data from: **Wyman (1996)**

| Sample Number | 8100 | 8600 | 9500 | 9550 | 9600 | 9650 | 9700 | 9760 | 9770 | 9780 | 9790 | 9800 | 9805 | 9820 | 9840 | 9860 | 9880 | 9900 | 9920 | 9940 | 9960 | 9980 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SiO2 | 70.63 | 72.31 | 71.19 | 71.29 | 71.89 | 67.03 | 73.81 | 71.46 | 71.83 | 72.02 | 71.40 | 70.90 | 71.11 | 71.79 | 71.95 | 76.12 | 77.56 | 70.32 | 66.72 | 73.13 | 65.26 | 65.42 |
| TiO2 | 0.53 | 0.62 | 0.64 | 0.56 | 0.58 | 0.92 | 0.43 | 0.43 | 0.48 | 0.50 | 0.50 | 0.53 | 0.46 | 0.40 | 0.42 | 0.27 | 0.23 | 0.55 | 0.87 | 0.43 | 0.84 | 0.88 |
| Al2O3 | 18.60 | 18.88 | 18.91 | 17.21 | 16.73 | 17.31 | 15.77 | 15.85 | 17.01 | 16.60 | 16.87 | 16.87 | 16.54 | 14.71 | 15.86 | 13.95 | 12.48 | 14.46 | 16.23 | 14.79 | 18.10 | 16.93 |
| Fe2O3 | 3.49 | 3.05 | 3.84 | 4.95 | 4.83 | 7.82 | 3.98 | 6.49 | 5.72 | 5.06 | 5.78 | 5.60 | 5.99 | 7.84 | 6.22 | 4.11 | 3.82 | 7.60 | 9.44 | 4.68 | 9.80 | 10.55 |
| MnO | 0.03 | 0.04 | 0.04 | 0.11 | 0.08 | 0.11 | 0.22 | 0.00 | 0.15 | 0.09 | 0.16 | 0.17 | 0.09 | 0.09 | 0.13 | 0.04 | 0.07 | 0.08 | 0.10 | 0.03 | 0.07 | 0.05 |
| MgO | 1.09 | 0.93 | 0.94 | 1.21 | 0.81 | 1.33 | 0.96 | 0.00 | 0.81 | 0.90 | 0.87 | 1.01 | 0.92 | 0.82 | 0.71 | 0.55 | 0.61 | 1.03 | 1.35 | 0.68 | 1.13 | 1.10 |
| CaO | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.04 | 0.06 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.06 | 0.07 | 0.01 | 0.01 | 0.01 |
| Na2O | 0.03 | 0.03 | 0.03 | 0.29 | 0.41 | 0.62 | 0.29 | 0.00 | 0.06 | 0.03 | 0.06 | 0.09 | 0.05 | 0.06 | 0.15 | 0.27 | 0.62 | 0.47 | 0.04 | 0.13 | 0.04 | 0.04 |
| K2O | 5.49 | 4.02 | 4.21 | 4.28 | 4.46 | 4.69 | 4.26 | 0.00 | 3.86 | 4.57 | 4.27 | 4.56 | 4.58 | 4.04 | 4.33 | 4.52 | 4.46 | 5.16 | 4.95 | 5.88 | 4.51 | 4.76 |
| P2O5 | 0.04 | 0.05 | 0.07 | 0.08 | 0.08 | 0.12 | 0.05 | 0.00 | 0.07 | 0.06 | 0.08 | 0.08 | 0.09 | 0.10 | 0.07 | 0.04 | 0.03 | 0.09 | 0.15 | 0.06 | 0.14 | 0.17 |
| Total Volatile | | | | | | | | | | | | | | | | | | | | | | |
| Free | 99.95 | 99.95 | 99.88 | 100.00 | 99.88 | 100.00 | 99.84 | 94.24 | 100.00 | 99.85 | 100.00 | 99.82 | 99.85 | 99.87 | 99.85 | 99.89 | 99.89 | 99.84 | 99.92 | 99.83 | 99.91 | 99.91 |
| FeO | 3.16 | 2.76 | 3.48 | 4.48 | 4.37 | 7.08 | 3.61 | 5.87 | 5.18 | 4.58 | 5.23 | 5.06 | 5.42 | 7.10 | 5.63 | 3.72 | 3.45 | 6.88 | 8.54 | 4.24 | 8.87 | 9.55 |
| S | <0.01 | 0.01 | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 0.01 | <0.01 | 0.01 | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 0.01 |
| Sc | | | | | | | | | | | | | | | | | | | | | | |
| Tl | 3193 | 3695 | 3830 | 3367 | 3452 | 5513 | 2584 | 2585 | 2848 | 3020 | 3024 | 3153 | 2776 | 2389 | 2504 | 1613 | 1353 | 3273 | 5233 | 2598 | 5051 | 5250 |
| V | | | | | | | | | | | | | | | | | | | | | | |
| Cr | | | | | | | | | | | | | | | | | | | | | | |
| Co | | | | 5 | | 4 | | | 5 | | 3 | | | | | | | | | | | |
| Ni | | | | | | | | | | | | | | | | | | | | | | |
| Cu | 10 | 11 | 8 | 13 | 7 | 16 | 6 | 8 | 10 | 13 | 16 | 18 | 18 | 30 | 9 | 8 | 55 | 16 | 8 | 6 | 18 | 20 |
| Zn | 78 | 100 | 203 | 329 | 144 | 136 | 393 | 260 | 169 | 123 | 134 | 150 | 121 | 164 | 213 | 68 | 85 | 122 | 107 | 58 | 88 | 90 |
| As | | | | <3 | | <3 | | | <3 | | <3 | | | | | | | | | | | |
| Br | | | | <1 | | 5.4 | | | <1 | | <1 | | | | | | | | | | | |
| Rb | 346 | 174 | 157 | 152 | 155 | 185 | 165 | 153 | 142 | 164 | 154 | 170 | 174 | 168 | 173 | 178 | 167 | 170 | 198 | 195 | 200 | 195 |
| Sr | 13 | 19 | 5 | 13 | 10 | 37 | 42 | 10 | 8 | 8 | 9 | 7 | 11 | 7 | 9 | 19 | 28 | 49 | 14 | 33 | 9 | 11 |
| Zr | 279 | 338 | 341 | 311 | 300 | 425 | 263 | 259 | 277 | 290 | 303 | 316 | 292 | 236 | 255 | 199 | 174 | 270 | 383 | 253 | 351 | 399 |
| Nb | | | | 17.8 | | 18.9 | | | 18.8 | | 18.2 | | | | | | | | | | | |
| Mo | 1.2 | 1.1 | 2.3 | 1.7 | 1.9 | 1.6 | 1.1 | 1.6 | <1 | 1 | 1.4 | 1.5 | 2.4 | 2.7 | 1.6 | 1.7 | 2 | <1 | 1.5 | 1.2 | 1.9 | 2.7 |
| Ag | | | | | | | | | | | | | | | | | | | | | | |
| Cd | | | | | | | | | | | | | | | | | | | | | | |
| Sn | | | | 3.2 | | 4.2 | | | 4.1 | | 4.4 | | | | | | | | | | | |
| Sb | | | | | | | | | | | | | | | | | | | | | | |
| Cs | | | | | | | | | | | | | | | | | | | | | | |
| Ba | 708 | 734 | 1025 | 1069 | 952 | 1064 | 1300 | 1389 | 1331 | 1251 | 1278 | 1535 | 1242 | 1044 | 1286 | 1012 | 940 | 1434 | 721 | 1398 | 711 | 762 |
| La | | | | | | | | | | | | | | | | | | | | | | |
| Ce | | | | | | | | | | | | | | | | | | | | | | |
| Nd | | | | 46 | | 32 | | | 13 | | 13 | | | | | | | | | | | |
| Y | | | | 28 | | 33 | | | 11 | | 17 | | | | | | | | | | | |
| W | | | | 4 | | 8 | | | 3 | | 2 | | | | | | | | | | | |
| Tl | | | | | | | | | | | | | | | | | | | | | | |
| Pb | 18 | 92 | 179 | 137 | 52 | 29 | 41 | 109 | 34 | 31 | 59 | 74 | 173 | 55 | 21 | 19 | 17 | 30 | 16 | 21 | 32 | 39 |
| Bi | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | 2 | <1.5 | <1.5 | 4 | 2 | 2 | <1.5 | 4 | 2 | 2 | 2 | 3 | 3 | 3 | <1.5 | 2 | <1.5 |
| Th | 20.2 | 19.9 | 20.8 | 19 | 17 | 16 | 19.7 | 18.1 | 20 | 19 | 21 | 21.5 | 22.5 | 19.6 | 21 | 23.2 | 21 | 18.4 | 12 | 19.2 | 15.1 | 16.9 |
| U | 4.5 | 4 | 7.4 | 5 | 4.6 | 3.3 | 5.8 | 4.7 | 6.4 | 4.7 | 5.1 | 6.8 | 5.8 | 5.4 | 4.8 | 4.1 | 5.7 | 3 | 4.4 | 4.5 | 4.4 | 6.1 |
| AI* | 99 | 99 | 99 | 95 | 92 | 90 | 94 | | 98 | 99 | 99 | 98 | 99 | 99 | 97 | 95 | 89 | 92 | 98 | 98 | 99 | 99 |
| CCPI** | 43 | 48 | 51 | 55 | 52 | 61 | 50 | 100 | 60 | 54 | 58 | 57 | 58 | 66 | 59 | 47 | 44 | 58 | 66 | 45 | 69 | 69 |
| Tl/Zr | 11.4 | 10.9 | 11.2 | 10.8 | 11.5 | 13.0 | 9.8 | 10.0 | 10.3 | 10.4 | 10.0 | 10.0 | 9.5 | 10.1 | 9.8 | 8.1 | 7.8 | 12.1 | 13.7 | 10.3 | 14.4 | 13.2 |
| Zr/Nb | | | | 17.5 | | 22.5 | | | 14.7 | | 16.6 | | | | | | | | | | | |
| Nb/Y | | | | 0.6 | | 0.6 | | | 1.7 | | 1.1 | | | | | | | | | | | |
| P2O5/TiO2 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 | 0.0 | 0.2 | 0.1 | 0.2 | 0.2 | 0.2 | 0.3 | 0.2 | 0.2 | 0.1 | 0.2 | 0.2 | 0.1 | 0.2 | 0.2 |

* Alteration Index = 100(K2O + MgO) / (K2O + MgO + Na2O + CaO), Ishikawa et al. (1976)

** Chlorite-Carbonate-Pyrite Index = 100(MgO + FeO) / (MgO + FeO + Na2O + K2O), Large et al. (in press)

# Appendix H. Volcanic Rock Geochemical Data from the Eastern Quartz-Phyric Sequence and Tyndall Group.

**Eastern Quartz Phyric Sequence (Jukes Road)**

Data from: **Wyman (1996)**

| Sample Number | 10000 | 10020 | 10040 | 10060 | 10080 | 10090 | 10100 | 10120 | ***B8600 | ***B9550 | ***B9700 | ***B9780 | ***B9790 | ***B10090 | MJ96-1 | MJ96-2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SiO2 | 75.97 | 73.12 | 71.67 | 75.44 | 72.71 | 69.56 | 78.91 | 72.40 | 68.56 | 72.31 | 73.70 | 73.80 | 71.29 | 73.95 | 70.53 | 73.84 |
| TiO2 | 0.49 | 0.46 | 0.48 | 0.48 | 0.45 | 0.57 | 0.30 | 0.28 | 0.57 | 0.53 | 0.41 | 0.48 | 0.50 | 0.49 | 0.52 | 0.39 |
| Al2O3 | 15.52 | 16.53 | 16.53 | 15.92 | 17.36 | 18.67 | 12.63 | 12.82 | 23.45 | 15.22 | 14.61 | 16.82 | 17.86 | 16.66 | 14.57 | 13.81 |
| Fe2O3 | 2.34 | 4.18 | 6.06 | 2.76 | 3.92 | 4.20 | 2.54 | 8.00 | 3.00 | 4.64 | 3.90 | 4.25 | 5.01 | 2.68 | 3.28 | 3.15 |
| MnO | 0.01 | 0.02 | 0.02 | 0.01 | 0.02 | 0.02 | 0.01 | 0.02 | 0.03 | 0.12 | 0.25 | 0.10 | 0.09 | 0.01 | 0.25 | 0.26 |
| MgO | 0.61 | 0.62 | 0.60 | 0.60 | 0.68 | 0.93 | 0.68 | 0.51 | 0.82 | 1.25 | 1.07 | 0.77 | 0.87 | 0.72 | 0.80 | 0.82 |
| CaO | 0.01 | 0.01 | 0.03 | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 | 0.05 | 0.21 | 0.01 | 0.01 | 0.02 | 3.49 | 0.57 |
| Na2O | 0.08 | 0.36 | 0.68 | 0.05 | 0.14 | 0.16 | 0.11 | 0.04 | 0.08 | 1.86 | 2.18 | 0.06 | 0.05 | 0.19 | 2.64 | 2.71 |
| K2O | 4.87 | 4.54 | 3.77 | 4.62 | 4.53 | 5.82 | 4.67 | 5.63 | 3.41 | 3.92 | 3.61 | 3.65 | 4.25 | 5.25 | 3.75 | 4.19 |
| P2O5 | 0.02 | 0.03 | 0.09 | 0.02 | 0.04 | 0.05 | 0.03 | 0.07 | 0.07 | 0.09 | 0.07 | 0.05 | 0.06 | 0.03 | 0.09 | 0.07 |
| Total Volatile | | | | | | | | | | | | | | | | |
| Free | 99.92 | 99.88 | 99.93 | 99.91 | 99.87 | 100.00 | 99.91 | 99.79 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 99.91 | 99.81 |
| FeO | 2.12 | 3.79 | 5.48 | 2.50 | 3.55 | 3.81 | 2.30 | 7.24 | 2.70 | 4.18 | 3.51 | 3.82 | 4.51 | 2.41 | 2.96 | 2.85 |
| S | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.02 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 0.01 |
| Sc | | | | | | | | | | | | | | | 14.7 | 10 |
| Ti | 2944 | 2779 | 2881 | 2886 | 2711 | 3411 | 1787 | 1675 | 3405 | 3160 | 2465 | 2893 | 3011 | 2963 | 3137 | 2337 |
| V | | | | | | | | | | | | | | | 63.4 | 36.3 |
| Cr | | | | | | | | | | | | | | | 12 | 5.1 |
| Co | | | | | | <2 | | | 5 | 6 | 4 | 3 | <2 | <2 | | |
| Ni | | | | | | | | | | | | | | | 3.8 | 2.6 |
| Cu | 3 | 8 | 7 | 6 | 6 | 21 | 16 | 321 | 14 | 5 | 4 | 7 | 10 | 8 | 10.5 | 5.3 |
| Zn | 27 | 46 | 43 | 28 | 54 | 85 | 35 | 63 | 166 | 355 | 428 | 165 | 146 | 23 | 151.9 | 312.9 |
| As | | | | | | 7 | | | <3 | <3 | <3 | <3 | <3 | <3 | 1 | <1 |
| Br | | | | | | 3.3 | | | 1.7 | <1 | <1 | <1 | <1 | 1.6 | | |
| Rb | 174 | 146 | 145 | 166 | 155 | 201 | 168 | 146 | 145 | 134 | 139 | 132 | 155 | 221 | 143.6 | 142.3 |
| Sr | 13 | 18 | 21 | 12 | 18 | 23 | 21 | 31 | 12 | 50 | 106 | 6 | 8 | 9 | 75.1 | 135.9 |
| Zr | 299 | 295 | 289 | 288 | 294 | 277 | 234 | 190 | 310 | 290 | 258 | 283 | 300 | 286 | 289.8 | 242.8 |
| Nb | | | | | | 20.5 | | | 19.4 | 16.6 | 17.2 | 18.4 | 18.4 | 17.3 | 17.1 | 15.6 |
| Mo | 1 | <1 | <1 | 1.6 | 1.5 | 2.3 | 1 | 4.2 | 1.1 | 1.4 | 1.6 | 1.1 | 1.6 | <1 | 0.8 | 0.9 |
| Ag | | | | | | | | | | | | | | | 0.1 | 0.2 |
| Cd | | | | | | | | | | | | | | | 0.4 | 0.2 |
| Sn | | | | | | 3.2 | | | 2.9 | 2.8 | 2.7 | 3.8 | 3.1 | 4.1 | | |
| Sb | | | | | | | | | | | | | | | 1.1 | 0.6 |
| Cs | | | | | | | | | | | | | | | 6.07 | 4.7 |
| Ba | 731 | 1014 | 590 | 808 | 1090 | 1190 | 808 | 1448 | 387 | 1128 | 1220 | 1117 | 1298 | 684 | 630.6 | 1587.7 |
| La | | | | | | | | | | | | | | | 49 | 65.5 |
| Ce | | | | | | | | | | | | | | | 95.7 | 135 |
| Nd | | | | | | 42 | | | 50 | 42 | 44 | 19 | 11 | 77 | 46.1 | 55.2 |
| Y | | | | | | 35 | | | 31 | 26 | 30 | 13 | 11 | 35 | 46.5 | 55.9 |
| W | | | | | | 5 | | | 3 | 5 | <2 | <2 | 3 | 14 | | |
| Tl | | | | | | | | | | | | | | | 1.2 | 1.1 |
| Pb | 5 | 10 | 12 | 7 | 18 | 31 | 21 | 45 | 111 | 119 | 10 | 59 | 59 | 6 | 154.3 | 72.9 |
| Bi | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | 6 | 2 | <1.5 | <1.5 | <1.5 | 3 | 2 | <1.5 | <2 | <2 |
| Th | 10.4 | 16.5 | 16 | 12.9 | 16.2 | 22 | 15.8 | 19.6 | 19 | 17 | 18 | 20 | 19 | 14 | 15.9 | 19 |
| U | 3.4 | 3.4 | 4.5 | 2.5 | 2.9 | 3.7 | 3 | 8.4 | 4.4 | 4 | 4 | 4.8 | 5.4 | 2.3 | 3.53 | 4.69 |
| AI* | 98 | 93 | 86 | 99 | 97 | 97 | 98 | 99 | 98 | 73 | 66 | 98 | 99 | 97 | 43 | 60 |
| CCPI** | 35 | 47 | 58 | 40 | 48 | 44 | 38 | 58 | 50 | 48 | 44 | 55 | 56 | 37 | 37 | 35 |
| Ti/Zr | 9.8 | 9.4 | 10.0 | 10.0 | 9.2 | 12.3 | 7.6 | 8.8 | 11.0 | 10.9 | 9.6 | 10.2 | 10.0 | 10.4 | 10.8 | 9.6 |
| Zr/Nb | | | | | | 13.5 | | | 16.0 | 17.5 | 15.0 | 15.4 | 16.3 | 16.5 | 16.9 | 15.6 |
| Nb/Y | | | | | | 0.6 | | | 0.6 | 0.6 | 0.6 | 1.4 | 1.7 | 0.5 | 0.4 | 0.3 |
| P2O5/TiO2 | 0.0 | 0.1 | 0.2 | 0.0 | 0.1 | 0.1 | 0.1 | 0.3 | 0.1 | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 |

**Eastern Quartz Phyric Sequence (Intercolonial Spur)**

Data from: **Gadaloff (1996)**

| Sample Number | 30/3/1 | 13/4/1 | 13/4/2 |
|---|---|---|---|
| SiO2 | 74.20 | 69.46 | 78.63 |
| TiO2 | 0.49 | 0.30 | 0.50 |
| Al2O3 | 12.38 | 7.30 | 12.51 |
| Fe2O3 | 7.68 | 19.75 | 3.06 |
| MnO | 0.07 | 0.01 | 0.01 |
| MgO | 1.98 | 0.55 | 0.73 |
| CaO | 0.05 | 0.01 | 0.01 |
| Na2O | 0.04 | 0.07 | 0.02 |
| K2O | 3.02 | 2.53 | 4.50 |
| P2O5 | 0.09 | 0.03 | 0.04 |
| Total Volatile | | | |
| Free | 100.00 | 100.02 | 100.01 |
| FeO | 6.95 | 17.88 | 2.77 |
| S | 0.86 | 14.19 | 1.02 |
| Sc | 14 | 7 | 13 |
| Ti | 2914 | 1787 | 3005 |
| V | 44 | 14 | 41 |
| Cr | 6 | 6 | 3 |
| Co | | | |
| Ni | 3 | 3 | 2 |
| Cu | 9 | 34 | 46 |
| Zn | 120 | 704 | 69 |
| As | 8 | 119 | |
| Br | | | |
| Rb | 122 | 92 | 183 |
| Sr | 2 | 4 | 5 |
| Zr | 221 | 104 | 194 |
| Nb | 9 | 5 | 8 |
| Mo | 0.4 | 0.8 | |
| Ag | 0.1 | 2.9 | |
| Cd | 0.1 | 2.9 | |
| Sn | | | |
| Sb | 0.5 | 5.3 | |
| Cs | 0.96 | 0.88 | |
| Ba | 551 | 273 | 1421 |
| La | 34 | 22 | 27 |
| Ce | 82 | 42 | 63 |
| Nd | 41 | 17 | 27 |
| Y | 63 | 11 | 30 |
| W | | | |
| Tl | 1 | 3.5 | |
| Pb | 10 | 345 | 17 |
| Bi | 0.9 | 7.1 | <2 |
| Th | 14.2 | 7.24 | 15 |
| U | 3.28 | 2.45 | |
| AI* | 98 | 97 | 99 |
| CCPI** | 74 | 88 | 44 |
| Ti/Zr | 13.2 | 17.2 | 15.5 |
| Zr/Nb | 24.6 | 20.8 | 24.3 |
| Nb/Y | 0.1 | 0.5 | 0.3 |
| P2O5/TiO2 | 0.2 | 0.1 | 0.1 |

* Alteration Index = 100(K2O + MgO) / (K2O + MgO + Na2O + CaO), Ishikawa et al. (1976)

*** B8600 to B10090 are reanalysis of rocks 8600 to 10090 prepared by careful hand selection of the cleanest possible

** Chlorite-Carbonate-Pyrite Index = 100(MgO + FeO) / (MgO + FeO + Na2O + K2O), Large et al. (in press) coarse crushed pieces after elimination of weathered, soiled and oxidised bits.

# Appendix H. Volcanic Rock Geochemical Data from the Eastern Quartz-Phyric Sequence and Tyndall Group.

**Eastern Quartz Phyric Sequence (Southern Mt. Read Volcanics)**

Data from: **White (1975)**

| Sample Number | 41151 | 41379 | 41380 | 41239 | 41386 | 41387 | 41392 | 41247 | AR315 | AR316 | AR318 | CT82 | CT83 | CML1 | CML2 | AR306 | AR75 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SiO2 | 72.34 | 71.82 | 72.70 | 71.20 | 73.33 | 70.64 | 72.15 | 76.04 | 78.24 | 75.86 | 74.67 | 76.73 | 77.00 | 72.91 | 73.08 | 84.31 | 79.69 |
| TiO2 | 0.40 | 0.42 | 0.48 | 0.49 | 0.44 | 0.52 | 0.47 | 0.39 | 0.16 | 0.23 | 0.15 | 0.24 | 0.13 | 0.42 | 0.43 | 0.14 | 0.17 |
| Al2O3 | 14.92 | 15.80 | 16.74 | 16.62 | 16.61 | 15.81 | 15.26 | 14.76 | 11.66 | 13.83 | 13.17 | 12.01 | 11.89 | 14.58 | 14.54 | 8.96 | 11.15 |
| Fe2O3 | 6.90 | 3.70 | 3.08 | 3.16 | 3.03 | 3.23 | 4.46 | 3.17 | 1.78 | 0.10 | 2.38 | 2.42 | 1.93 | 2.31 | 2.25 | 0.77 | 0.95 |
| MnO | 0.01 | 0.00 | 0.00 | 0.00 | 0.02 | 0.14 | 0.09 | 0.00 | 0.01 | 0.00 | 0.04 | 0.04 | 0.02 | 0.02 | 0.01 | 0.00 | 0.01 |
| MgO | 0.46 | 0.84 | 0.82 | 0.47 | 0.86 | 1.56 | 1.05 | 0.56 | 0.47 | 0.08 | 0.50 | 0.63 | 0.45 | 0.64 | 0.58 | 0.27 | 0.25 |
| CaO | 2.68 | 0.02 | 0.09 | 0.00 | 0.00 | 0.00 | 0.15 | 0.02 | 0.13 | 0.01 | 0.08 | 0.24 | 0.13 | 0.14 | 0.10 | 0.03 | 0.36 |
| Na2O | 0.22 | 1.94 | 0.82 | 1.62 | 0.65 | 0.93 | 1.81 | 0.56 | 2.58 | 4.30 | 3.74 | 3.92 | 2.87 | 5.06 | 5.49 | 4.19 | 4.27 |
| K2O | 1.78 | 5.23 | 5.04 | 6.22 | 4.82 | 6.90 | 4.34 | 4.29 | 4.97 | 5.56 | 5.25 | 3.71 | 5.57 | 3.85 | 3.47 | 1.31 | 3.12 |
| P2O5 | 0.17 | 0.06 | 0.03 | 0.08 | 0.07 | 0.09 | 0.09 | 0.07 | 0.02 | 0.02 | 0.02 | 0.04 | 0.02 | 0.07 | 0.07 | 0.01 | 0.02 |
| Total Volatile | | | | | | | | | | | | | | | | | |
| Free | 99.88 | 99.84 | 99.81 | 99.88 | 99.84 | 99.83 | 99.88 | 99.86 | 100.01 | 100.00 | 100.01 | 99.99 | 100.02 | 100.00 | 100.01 | 99.99 | 100.00 |
| FeO | 6.25 | 3.35 | 2.78 | 2.86 | 2.75 | 2.92 | 4.04 | 2.87 | 1.61 | 0.09 | 2.16 | 2.19 | 1.74 | 2.09 | 2.03 | 0.70 | 0.86 |
| S | 0.23 | 0 | 0.02 | 0.1 | 0.13 | 0.18 | 0.17 | 0.14 | | | | | | | | | |
| Sc | 8 | 10 | 13 | 11 | 8 | 11 | 10 | 10 | 5.5 | 12.1 | 5.8 | 7.6 | 4 | 9.2 | 9.3 | 4.5 | 4 |
| Ti | 2402 | 2498 | 2900 | 2956 | 2617 | 3133 | 2803 | 2336 | 973 | 1398 | 908 | 1450 | 786 | 2491 | 2548 | 841 | 1027 |
| V | 36 | 58 | 53 | 48 | 48 | 68 | 54 | 43 | 4 | 2 | 4 | 13 | 6 | 38 | 36 | 4 | 5 |
| Cr | 20 | 28 | 28 | 22 | 15 | 34 | 16 | 15 | 3 | 2.7 | 1.9 | 2.6 | 2.7 | 4.4 | 4.6 | 2.4 | 2.2 |
| Co | | | | | | | | | | | | | | | | | |
| Ni | 3 | 5 | 2 | 11 | 10 | 11 | 1 | 2 | 2 | 2.2 | 2.2 | 1.9 | 2.1 | 1.6 | 2.1 | 1.2 | 2 |
| Cu | 6 | 15 | 0 | 0 | 27 | 30 | 0 | 0 | 3 | 2 | 1 | 2 | 2 | 2 | 3 | 12 | 19 |
| Zn | 220 | 33 | 24 | 31 | 43 | 285 | 290 | 34 | 44.2 | 2 | 43 | 52 | 32.3 | 28 | 23 | 7 | 12 |
| As | | | | | | | | | | | | | | | | | |
| Br | | | | | | | | | | | | | | | | | |
| Rb | 270 | 230 | 203 | 262 | 209 | 253 | 202 | 158 | 102 | 102 | 114 | 47 | 78 | 80 | 70 | 21 | 63 |
| Sr | 14 | 75 | 39 | 12 | 35 | 52 | 95 | 21 | 71 | 33 | 97 | 90 | 66 | 179 | 159 | 70 | 152 |
| Zr | 285 | 264 | 302 | 334 | 267 | 286 | 298 | 282 | 171 | 253 | 183 | 239 | 168 | 261 | 264 | 171 | 194 |
| Nb | 21 | 19 | 18 | 9 | 12 | 12 | 20 | 18 | 14.3 | 17.8 | 19.8 | 17.2 | 18.3 | 14.3 | 14.4 | 10.3 | 11.3 |
| Mo | | | | | | | | | | | | | | | | | |
| Ag | | | | | | | | | | | | | | | | | |
| Cd | | | | | | | | | | | | | | | | | |
| Sn | | | | | | | | | | | | | | | | | |
| Sb | | | | | | | | | | | | | | | | | |
| Cs | | | | | | | | | | | | | | | | | |
| Ba | 1070 | 1430 | 1600 | 1075 | 1340 | 1520 | 1075 | 1250 | 2204 | 1114 | 1186 | 831 | 1411 | 1477 | 1430 | 567 | 2512 |
| La | 36 | 32 | 20 | 23 | 28 | 55 | 24 | 25 | 52 | 46 | 80 | 48 | 43 | 40 | 44 | 13 | 17 |
| Ce | 70 | 60 | 70 | 40 | 80 | 30 | 50 | 70 | 107 | 96 | 161 | 99 | 97 | 88 | 96 | 33 | 46 |
| Nd | | | | | | | | | 44 | 44 | 72 | 44 | 41 | 39 | 42 | 15 | 22 |
| Y | 44 | 41 | 26 | 50 | 43 | 43 | 43 | 34 | 27 | 46 | 57 | 50 | 37 | 33 | 31 | 19 | 29 |
| W | | | | | | | | | | | | | | | | | |
| Tl | | | | | | | | | | | | | | | | | |
| Pb | 70 | 0 | 0 | 0 | 51 | 126 | 35 | 3 | 8.4 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 |
| Bl | | | | | | | | | | | | | | | | | |
| Th | | | | | | | | | 22 | 22.8 | 25.4 | 17 | 22 | 13.2 | 14.5 | 13.4 | 13.9 |
| U | 19 | 20 | 25 | 17 | 31 | 19 | 25 | 27 | 4 | 5.1 | 5.6 | 6 | 4.8 | 3.2 | 3.3 | 2.7 | 2.5 |
| AI* | 44 | 76 | 86 | 80 | 90 | 90 | 73 | 89 | 67 | 57 | 60 | 51 | 67 | 46 | 42 | 27 | 42 |
| CCPI** | 77 | 37 | 38 | 30 | 40 | 36 | 45 | 41 | 22 | 2 | 23 | 27 | 21 | 23 | 23 | 15 | 13 |
| Ti/Zr | 8.4 | 9.5 | 9.6 | 8.8 | 9.8 | 11.0 | 9.4 | 8.3 | 5.7 | 5.5 | 5.0 | 6.1 | 4.7 | 9.5 | 9.7 | 4.9 | 5.3 |
| Zr/Nb | 13.6 | 13.9 | 16.8 | 37.1 | 22.3 | 23.8 | 14.9 | 15.7 | 12.0 | 14.2 | 9.2 | 13.9 | 9.2 | 18.3 | 18.3 | 16.6 | 17.2 |
| Nb/Y | 0.5 | 0.5 | 0.7 | 0.2 | 0.3 | 0.3 | 0.5 | 0.5 | 0.5 | 0.4 | 0.3 | 0.3 | 0.5 | 0.4 | 0.5 | 0.5 | 0.4 |
| P2O5/TiO2 | 0.4 | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 |

**Eastern Quartz Phyric and Tyndall Group Sequences**

Data from: **Crawford et al. (1992)**

| Sample Number | A478 | AR1 | AR4 | 1984/6 | 1984/7 | J79/1 | J79/2 |
|---|---|---|---|---|---|---|---|
| SiO2 | 70.3 | 75.80 | 66.40 | 77.20 | 75.40 | 73.20 | 71.60 |
| TiO2 | 0.52 | 0.18 | 0.50 | 0.19 | 0.17 | 0.30 | 0.44 |
| Al2O3 | 13.7 | 12.90 | 16.50 | 11.60 | 13.00 | 13.10 | 14.10 |
| Fe2O3 | 4.65 | 3.00 | 5.09 | 2.09 | 1.70 | 2.00 | 3.78 |
| MnO | 0.08 | 0.02 | 0.11 | 0.08 | 0.02 | 0.18 | 0.12 |
| MgO | 2.21 | 0.81 | 1.73 | 0.32 | 0.30 | 0.34 | 0.80 |
| CaO | 1.65 | 0.03 | 0.88 | 1.23 | 0.19 | 3.39 | 2.29 |
| Na2O | 3.37 | 4.47 | 7.67 | 3.69 | 3.61 | 0.34 | 3.22 |
| K2O | 3.51 | 3.08 | 1.50 | 3.79 | 5.72 | 7.21 | 3.95 |
| P2O5 | 0.04 | 0.03 | 0.19 | 0.03 | 0.02 | 0.07 | 0.07 |
| Total Volatile | | | | | | | |
| Free | 100.03 | 100.32 | 100.57 | 100.22 | 100.13 | 100.13 | 100.37 |
| FeO | 4.18 | 2.71 | 4.58 | 1.90 | 1.54 | 1.80 | 3.40 |
| S | | | | | | | |
| Sc | | | | | | | |
| Ti | 3117 | 1079 | 2997 | 1139 | 1019 | 1798 | 2638 |
| V | | 5 | 63 | <10 | <10 | 21 | 29 |
| Cr | | <2 | 6 | 50 | 18 | <10 | <10 |
| Co | | | | | | | |
| Ni | 23 | <1 | 3 | 9 | 28 | 22 | 20 |
| Cu | | | | | | | |
| Zn | | | | | | | |
| As | | | | | | | |
| Br | | | | | | | |
| Rb | 160 | 62 | 27 | 83 | 128 | 235 | 155 |
| Sr | 125 | 107 | 253 | 100 | 109 | 123 | 207 |
| Zr | 240 | 200 | 314 | 186 | 189 | 280 | 197 |
| Nb | 11 | 19 | 13 | | | 17 | 14 |
| Mo | | | | | | | |
| Ag | | | | | | | |
| Cd | | | | | | | |
| Sn | 69 | | | | | | |
| Sb | | | | | | | |
| Cs | | | | | | | |
| Ba | 840 | 1560 | 574 | 1750 | 1750 | 3530 | 1190 |
| La | | | | | | | |
| Ce | | | | | | | |
| Nd | | | | | | | |
| Y | 30 | 46 | 35 | 41 | 54 | 34 | 32 |
| W | | | | | | | |
| Tl | | | | | | | |
| Pb | | | | | | | |
| Bl | | | | | | | |
| Th | | | | | | | |
| U | | | | | | | |
| AI* | 53 | 46 | 27 | 46 | 61 | 67 | 46 |
| CCPI** | 48 | 32 | 41 | 23 | 16 | 22 | 37 |
| Ti/Zr | 13.0 | 5.4 | 9.5 | 6.1 | 5.4 | 6.4 | 13.4 |
| Zr/Nb | 21.8 | 10.5 | 24.2 | | | 16.5 | 14.1 |
| Nb/Y | 0.4 | 0.4 | 0.4 | 0.0 | 0.0 | 0.5 | 0.4 |
| P2O5/TiO2 | 0.1 | 0.2 | 0.4 | 0.2 | 0.1 | 0.2 | 0.2 |

* Alteration Index = 100(K2O + MgO) / (K2O + MgO + Na2O + CaO), Ishikawa et al. (1976)

** Chlorite-Carbonate-Pyrite Index = 100(MgO + FeO) / (MgO + FeO + Na2O + K2O), Large et al. (In press)

Appendix H. Volcanic Rock Geochemical Data from the Eastern Quartz-Phyric Sequence and Tyndall Group.

**Eastern Quartz Phyric Sequence (Mt. Read Volcanics, Lake Selina)**

Data from **Hunns (1987)**

| Sample Number | T04069 | T04082 | T04087 | T04130 |
|---|---|---|---|---|
| SiO2 | 66.77 | 68.24 | 70.83 | 76.52 |
| TiO2 | 0.72 | 0.42 | 0.44 | 0.15 |
| Al2O3 | 16.15 | 14.21 | 15.32 | 12.34 |
| Fe2O3 | 7.71 | 6.38 | 6.34 | 2.52 |
| MnO | 0.09 | 0.38 | 0.20 | 0.03 |
| MgO | 2.15 | 2.39 | 0.98 | 0.33 |
| CaO | 0.01 | 3.21 | 0.24 | 0.05 |
| Na2O | 0.10 | 0.11 | 0.21 | 0.25 |
| K2O | 6.28 | 4.61 | 5.55 | 7.79 |
| P2O5 | 0.11 | 0.16 | 0.09 | 0.02 |
| Volatile | | | | |
| Free | 100.10 | 100.11 | 100.21 | 100.00 |
| FeO | 6.93 | 5.74 | 5.71 | 2.27 |
| S | | | | |
| Sc | 28 | 9 | 14 | 4.4 |
| Tl | 4302 | 2536 | 2631 | 913 |
| V | 168.5 | 89.8 | 51.9 | 14.1 |
| Cr | 15.2 | 7.2 | 4.6 | 1 |
| Co | 52 | 14 | 9 | 9 |
| Ni | 8.2 | 13.8 | 1.1 | 0.9 |
| Cu | 23.9 | 6.8 | 56.4 | 0.8 |
| Zn | 311 | 624 | 867 | 66 |
| As | 29 | 6 | 9 | 12 |
| Br | | | | |
| Rb | 290 | 300 | 278 | 233 |
| Sr | 80.4 | 34.9 | 22.8 | 148.3 |
| Zr | 194.8 | 183.3 | 272.9 | 139.9 |
| Nb | 10 | 11 | 16 | 13 |
| Mo | | | | |
| Ag | | | | |
| Cd | | | | |
| Sn | 4 | | | |
| Sb | | | <3.00 | <3.00 |
| Cs | | | | |
| Ba | 1758 | 387 | 1062 | 2637 |
| La | | | | |
| Ce | | | | |
| Nd | | | | |
| Y | 25.3 | 24.3 | 34.2 | 16.3 |
| W | | | | |
| Tl | | | | |
| Pb | 36 | 145 | 116 | 18.9 |
| Bi | | | | |
| Th | | | | |
| U | | | | |
| AI* | 99 | 68 | 94 | 96 |
| CCPI** | 59 | 63 | 54 | 24 |
| Ti/Zr | 22.1 | 13.8 | 9.6 | 6.5 |
| Zr/Nb | 19.5 | 16.7 | 17.1 | 10.8 |
| Nb/Y | 0.4 | 0.5 | 0.5 | 0.8 |
| P2O5/TiO2 | 0.2 | 0.4 | 0.2 | 0.1 |

* Alteration Index = 100(K2O + MgO) / (K2O + MgO + Na2O + CaO), Ishikawa et al. (1976)

** Chlorite-Carbonate-Pyrite Index = 100(MgO + FeO) / (MgO + FeO + Na2O + K2O), Large et al. (in press)

# Appendix H. Volcanic Rock Geochemical Data from the Yolande River Sequence and Suite 1 and Suite 2 Andesites.

Data from: **Wyman (1996)**

**Slate Spur and the Clark Valley**

| Sample Number | B1077 | B1079 | B1080 | B1085 | B1087 | B1089 | B1091 | B1092 | B1093 | B1095 | B1096 | B1098 | B1099 | B2001 | B2002 | B2003 | B2005 | B2013 | B2014 | B2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SiO2 | 76.80 | 70.00 | 74.46 | 76.64 | 82.64 | 82.68 | 76.42 | 68.11 | 75.79 | 81.77 | 71.33 | 77.78 | 80.71 | 75.53 | 76.23 | 75.77 | 75.09 | 84.33 | 74.18 | 77.35 |
| TiO2 | 0.21 | 0.65 | 0.35 | 0.38 | 0.16 | 0.28 | 0.25 | 0.63 | 0.25 | 0.17 | 0.43 | 0.21 | 0.25 | 0.26 | 0.24 | 0.32 | 0.22 | 0.17 | 0.28 | 0.20 |
| Al2O3 | 12.68 | 16.11 | 13.41 | 13.28 | 10.89 | 9.97 | 12.26 | 14.99 | 13.59 | 10.23 | 14.55 | 13.01 | 12.50 | 12.80 | 12.83 | 13.56 | 14.37 | 10.35 | 13.04 | 12.33 |
| Fe2O3 | 1.54 | 3.41 | 3.87 | 2.76 | 1.55 | 1.77 | 2.94 | 8.47 | 1.52 | 1.37 | 5.34 | 1.29 | 1.44 | 3.62 | 2.74 | 2.79 | 2.00 | 1.09 | 3.64 | 1.29 |
| MnO | 0.01 | 0.10 | 0.03 | 0.01 | 0.01 | 0.01 | 0.01 | 0.03 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.06 | 0.01 |
| MgO | 0.35 | 1.65 | 0.69 | 1.26 | 0.60 | 0.76 | 0.37 | 1.73 | 0.38 | 0.29 | 0.98 | 0.31 | 0.44 | 0.49 | 0.51 | 0.76 | 0.59 | 0.38 | 0.48 | 0.27 |
| CaO | 0.02 | 0.12 | 0.04 | 0.01 | 0.01 | 0.01 | 0.01 | 0.19 | 0.02 | 0.01 | 0.02 | 0.01 | 0.01 | 0.02 | 0.03 | 0.02 | 0.01 | 0.01 | 0.17 | 0.01 |
| Na2O | 2.46 | 5.08 | 3.73 | 0.06 | 0.05 | 1.16 | 0.10 | 2.21 | 2.29 | 1.54 | 2.23 | 1.23 | 0.15 | 2.41 | 2.55 | 2.24 | 1.57 | 0.06 | 3.63 | 0.27 |
| K2O | 5.77 | 2.72 | 3.27 | 5.40 | 4.09 | 3.32 | 7.49 | 3.40 | 5.98 | 4.51 | 4.95 | 5.99 | 4.44 | 4.68 | 4.71 | 4.40 | 6.04 | 3.57 | 4.32 | 8.01 |
| P2O5 | 0.03 | 0.07 | 0.06 | 0.02 | 0.02 | 0.03 | 0.03 | 0.16 | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 | 0.03 | 0.03 | 0.05 | 0.02 | 0.02 | 0.05 | 0.04 |
| Total Volatile | | | | | | | | | | | | | | | | | | | | |
| Free | 99.87 | 99.92 | 99.91 | 99.82 | 100.03 | 99.99 | 99.88 | 99.93 | 99.86 | 99.92 | 99.88 | 99.87 | 99.96 | 99.86 | 99.87 | 99.91 | 99.92 | 100.00 | 99.86 | 99.79 |
| FeO | 1.39 | 3.07 | 3.48 | 2.48 | 1.40 | 1.59 | 2.65 | 7.62 | 1.37 | 1.23 | 4.81 | 1.16 | 1.29 | 3.26 | 2.47 | 2.51 | 1.80 | 0.98 | 3.28 | 1.16 |
| S | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 0.01 | <0.01 | 0.01 | <0.01 | <0.01 | 0.01 | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 |
| Sc | 6 | 18 | 11 | 7 | 4 | 9 | 9 | 16 | 9 | 4 | 11 | 6 | 8 | 9 | 8 | 11 | 7 | 4 | 10 | 6 |
| Tl | 1278 | 3891 | 2087 | 2292 | 980 | 1668 | 1476 | 3806 | 1469 | 1032 | 2602 | 1232 | 1476 | 1533 | 1409 | 1904 | 1290 | 1039 | 1708 | 1218 |
| V | 7 | 101 | 8 | 41 | 11 | 2 | <1.5 | 44 | 2 | 10 | 18 | 7 | 3 | 2 | <1.5 | 5 | 10 | 7 | 5 | 10 |
| Cr | 2 | 70 | 2 | 23 | 3 | 2 | 2 | 3 | 2 | 3 | 6 | 2 | 1 | 1 | 1 | 2 | 3 | 3 | 1 | 2 |
| Co | | | | | | | | | | | | | | | | | | | | |
| Ni | 2 | 12 | 1 | 9 | 1 | 1 | 2 | 2 | 1 | 1 | 3 | 1 | <1 | 1 | 1 | 2 | 2 | 2 | 2 | 1 |
| Cu | 3 | 2 | 3 | 6 | 1 | 1 | 21 | 27 | 4 | 3 | 4 | 4 | 2 | 3 | 52 | 2 | 3 | 1 | 3 | 5 |
| Zn | 81 | 99 | 40 | 27 | 26 | 13 | 17 | 88 | 14 | 22 | 37 | 32 | 21 | 21 | 20 | 21 | 20 | 17 | 50 | 80 |
| As | <3 | <3 | <3 | <3 | <3 | <3 | 4 | <3 | <3 | 3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 |
| Br | | | | | | | | | | | | | | | | | | | | |
| Rb | 190 | 102 | 116 | 249 | 188 | 140 | 189 | 151 | 151 | 145 | 184 | 198 | 177 | 145 | 141 | 146 | 223 | 163 | 131 | 246 |
| Sr | 93 | 137 | 78 | 4 | 3 | 20 | 16 | 45 | 57 | 35 | 33 | 34 | 3 | 54 | 49 | 34 | 27 | 3 | 142 | 36 |
| Zr | 173 | 366 | 273 | 226 | 117 | 285 | 274 | 280 | 267 | 142 | 306 | 167 | 253 | 273 | 263 | 274 | 178 | 131 | 267 | 155 |
| Nb | 15.7 | 15 | 12.6 | 14.7 | 11.8 | 13.9 | 11.7 | 9.7 | 13.7 | 11 | 11.7 | 15.6 | 13.4 | 13.1 | 12 | 13.1 | 15.5 | 13.2 | 13.1 | 13.2 |
| Mo | | | | | | | | | | | | | | | | | | | | |
| Ag | | | | | | | | | | | | | | | | | | | | |
| Cd | | | | | | | | | | | | | | | | | | | | |
| Sn | 3.1 | 3.2 | 2.0 | 3.1 | 2.2 | 3.4 | 3.3 | 6.8 | 2.2 | 2.8 | 3.5 | 1.6 | 2.2 | 1.1(<1.5) | 5.9 | 3.5 | 3.5 | 3.2 | 3.2 | 2.0 |
| Sb | | | | | | | | | | | | | | | | | | | | |
| Cs | | | | | | | | | | | | | | | | | | | | |
| Ba | 1179 | 754 | 794 | 1689 | 390 | 401 | 1303 | 801 | 1349 | 889 | 949 | 1194 | 392 | 1189 | 1135 | 1001 | 820 | 334 | 1199 | 1799 |
| La | 36 | 55 | 79 | 47 | 45 | 55 | 45 | 44 | 53 | 46 | 45 | 43 | 57 | 25 | 49 | 54 | 41 | 46 | 117 | 51 |
| Ce | 73 | 107 | 158 | 112 | 102 | 127 | 99 | 95 | 123 | 100 | 91 | 110 | 123 | 64 | 111 | 114 | 93 | 98 | 114 | 119 |
| Nd | 37 | 53 | 75 | 47 | 41 | 57 | 44 | 45 | 52 | 41 | 40 | 42 | 48 | 29 | 49 | 54 | 36 | 40 | 107 | 47 |
| Y | 29 | 44 | 58 | 24 | 25 | 47 | 40 | 42 | 43 | 33 | 31 | 33 | 35 | 38 | 40 | 44 | 32 | 27 | 83 | 30 |
| W | | | | | | | | | | | | | | | | | | | | |
| Tl | | | | | | | | | | | | | | | | | | | | |
| Pb | 6 | 8 | 2 | 4 | 13 | 3 | 16 | 2 | 4 | 16 | 4 | 35 | 4 | 3 | 3 | <1.5 | 5 | <1.5 | 4 | 4 |
| Bi | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| Th | 25 | 16 | 19 | 22 | 16 | 21 | 18 | 14 | 21 | 19 | 15 | 23 | 19 | 20 | 21 | 20 | 27 | 16 | 19 | 22 |
| U | 4.4 | 4.4 | 4 | 4.4 | 2.9 | 6.4 | 5.2 | 4.5 | 4.4 | 5.3 | 2.9 | 3.9 | 5 | 3.8 | 4.6 | 5.1 | 6 | 2.4 | 3.8 | 4 |
| Al* | 71 | 46 | 51 | 99 | 99 | 78 | 99 | 68 | 73 | 76 | 73 | 83 | 97 | 68 | 67 | 70 | 81 | 98 | 56 | 97 |
| CCPI** | 17 | 38 | 37 | 41 | 33 | 35 | 28 | 62 | 17 | 20 | 45 | 17 | 27 | 35 | 29 | 33 | 24 | 27 | 32 | 15 |
| Tl/Zr | 7.4 | 10.6 | 7.6 | 10.1 | 8.4 | 5.8 | 5.4 | 13.6 | 5.5 | 7.3 | 8.5 | 7.4 | 5.8 | 5.6 | 5.4 | 6.9 | 7.2 | 7.9 | 6.4 | 7.9 |
| Zr/Nb | 11.0 | 24.4 | 21.7 | 15.4 | 9.9 | 20.5 | 23.5 | 28.9 | 19.5 | 12.9 | 26.1 | 10.7 | 18.9 | 20.8 | 22.0 | 20.9 | 11.5 | 9.9 | 20.4 | 11.7 |
| Nb/Y | 0.5 | 0.3 | 0.2 | 0.6 | 0.5 | 0.3 | 0.3 | 0.2 | 0.3 | 0.3 | 0.4 | 0.5 | 0.4 | 0.3 | 0.3 | 0.3 | 0.5 | 0.5 | 0.2 | 0.4 |
| P2O5/TiO2 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0.2 | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 | 0.2 | 0.2 |

* Alteration Index = 100(K2O + MgO) / (K2O + MgO + Na2O + CaO), Ishikawa et al. (1976)

** Chlorite-Carbonate-Pyrite Index = 100(MgO + FeO) / (MgO + FeO + Na2O + K2O), Large et al. (in press)

# Appendix H. Volcanic Rock Geochemical Data from the Yolande River Sequence and Suite 1 and Suite 2 Andesites.

Data from: **Duncan (1997)**

**Garfield Andesite**

| Sample Number | 1021201 | 1021209 | 1021212 | 1021213 | 1021214 | 1021219 | 1021227 | 1021234 | 1021235 | 1021242 | 1021243 | 1021244 | 1021253 | 1021267 | 1021268 | 1021269 | W255602 | W255603 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SiO2 | 61.75 | 61.78 | 59.62 | 61.05 | 60.53 | 65.31 | 62.19 | 61.20 | 60.91 | 60.93 | 61.78 | 63.68 | 62.16 | 61.08 | 57.92 | 61.64 | 59.72 | 59.89 |
| TiO2 | 0.43 | 0.43 | 0.37 | 0.43 | 0.42 | 0.45 | 0.39 | 0.53 | 0.47 | 0.38 | 0.47 | 0.47 | 0.54 | 0.44 | 0.49 | 0.41 | 0.58 | 0.65 |
| Al2O3 | 17.14 | 17.18 | 16.26 | 16.39 | 16.96 | 15.97 | 16.58 | 17.19 | 17.56 | 15.28 | 17.27 | 16.64 | 17.55 | 17.38 | 15.88 | 16.58 | 19.80 | 21.37 |
| Fe2O3 | 7.67 | 11.55 | 15.80 | 14.22 | 11.03 | 6.18 | 8.32 | 9.88 | 12.81 | 15.59 | 8.20 | 6.22 | 9.92 | 11.95 | 12.62 | 9.95 | 9.69 | 6.60 |
| MnO | 0.13 | 0.04 | 0.04 | 0.05 | 0.07 | 0.07 | 0.03 | 0.05 | 0.02 | 0.22 | 0.14 | 0.13 | 0.04 | 0.09 | 0.14 | 0.17 | 0.13 | 0.07 |
| MgO | 2.64 | 2.94 | 3.87 | 4.06 | 3.12 | 2.18 | 2.67 | 1.72 | 1.70 | 2.96 | 2.65 | 2.32 | 2.70 | 2.27 | 4.27 | 2.72 | 2.10 | 1.50 |
| CaO | 3.94 | 1.43 | 0.37 | 0.45 | 2.75 | 3.86 | 4.31 | 3.76 | 0.91 | 0.91 | 2.61 | 3.36 | 0.58 | 1.96 | 4.17 | 2.87 | 0.82 | 0.95 |
| Na2O | 3.65 | 0.19 | 0.15 | 0.10 | 1.56 | 3.62 | 2.90 | 0.32 | 0.56 | 0.09 | 3.51 | 4.42 | 1.75 | 0.18 | 0.89 | 1.47 | 1.66 | 2.58 |
| K2O | 2.39 | 4.18 | 3.27 | 2.97 | 3.27 | 2.13 | 2.30 | 5.01 | 4.73 | 3.39 | 3.12 | 2.52 | 4.44 | 4.37 | 3.27 | 3.90 | 5.07 | 5.89 |
| P2O5 | 0.26 | 0.28 | 0.25 | 0.28 | 0.28 | 0.23 | 0.30 | 0.34 | 0.34 | 0.25 | 0.25 | 0.24 | 0.32 | 0.30 | 0.33 | 0.29 | 0.44 | 0.49 |
| Total Volatile Free | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| FeO | 6.90 | 10.39 | 14.21 | 12.80 | 9.92 | 5.56 | 7.49 | 8.89 | 11.53 | 14.03 | 7.38 | 5.60 | 8.93 | 10.76 | 11.36 | 8.96 | 8.72 | 5.94 |
| S | 0 | 0.14 | 0.65 | 0.25 | 0.09 | 0.35 | 0.2 | 0 | 0.23 | 1.49 | 0.18 | 0 | 0.49 | 0.33 | 0.39 | 0.04 | 0.09 | 0.02 |
| Sc | 18 | 16 | 13 | 18 | 18 | 15 | 17 | 23 | 20 | 15 | 15 | 14 | 20 | 16 | 25 | 14 | 22 | 21 |
| Ti | 2458 | 2458 | 2158 | 2458 | 2398 | 2578 | 2218 | 2997 | 2698 | 2158 | 2698 | 2698 | 3117 | 2458 | 2698 | 2338 | 3357 | 3777 |
| V | 172 | 126 | 135 | 174 | 165 | 116 | 117 | 180 | 187 | 147 | 122 | 120 | 190 | 158 | 199 | 148 | 207 | 229 |
| Cr | 10 | 10 | 9 | 28 | 16 | 10 | 9 | 33 | 11 | 9 | 12 | 17 | 19 | 8 | 146 | 7 | 53 | 51 |
| Co | | | | | | | | | | | | | | | | | | |
| Ni | | | | | | | | | | | | | | | | | | |
| Cu | 30 | 716 | 86 | 351 | 15 | 12 | 204 | 38 | 94 | 20 | 220 | 37 | 283 | 95 | 337 | 46 | 49 | 112 |
| Zn | 79 | 55 | 48 | 52 | 45 | 154 | 80 | 73 | 128 | 210 | 152 | 141 | 131 | 156 | 159 | 89 | 269 | 173 |
| As | | | | | | | | | | | | | | | | | | |
| Br | | | | | | | | | | | | | | | | | | |
| Rb | 80 | 133 | 103 | 94 | 108 | 62 | 73 | 162 | 166 | 115 | 113 | 86 | 154 | 130 | 98 | 124 | 170 | 197 |
| Sr | 107 | 35 | 18 | 19 | 57 | 123 | 120 | 54 | 31 | 29 | 140 | 152 | 56 | 34 | 138 | 64 | 58 | 51 |
| Zr | 139 | 152 | 142 | 144 | 153 | 215 | 150 | 186 | 159 | 132 | 223 | 215 | 211 | 155 | 153 | 154 | 188 | 207 |
| Nb | 9 | 13 | 6 | 8 | 8 | 13 | 9 | 10 | 9 | 8 | 12 | 13 | 10 | 8 | 9 | 9 | 11 | 13 |
| Mo | | | | | | | | | | | | | | | | | | |
| Ag | | | | | | | | | | | | | | | | | | |
| Cd | | | | | | | | | | | | | | | | | | |
| Sn | | | | | | | | | | | | | | | | | | |
| Sb | | | | | | | | | | | | | | | | | | |
| Cs | | | | | | | | | | | | | | | | | | |
| Ba | 548 | 1058 | 672 | 601 | 764 | 755 | 1114 | 1173 | 1324 | 1039 | 1031 | 860 | 1337 | 1216 | 1291 | 1357 | 1284 | 1552 |
| La | 65 | 58 | 52 | 90 | 76 | 110 | 88 | 72 | 57 | 78 | 104 | 100 | 94 | 88 | 78 | 77 | 99 | 101 |
| Ce | 123 | 103 | 93 | 161 | 144 | 204 | 157 | 140 | 106 | 147 | 199 | 195 | 174 | 157 | 152 | 146 | 186 | 190 |
| Nd | 44 | 35 | 36 | 59 | 53 | 72 | 56 | 52 | 40 | 53 | 76 | 76 | 65 | 56 | 60 | 54 | 74 | 74 |
| Y | 18 | 18 | 16 | 21 | 21 | 26 | 18 | 24 | 29 | 16 | 25 | 27 | 28 | 21 | 20 | 20 | 28 | 34 |
| W | | | | | | | | | | | | | | | | | | |
| Tl | | | | | | | | | | | | | | | | | | |
| Pb | 5 | 5 | 4 | 4 | 5 | 9 | 7 | 4 | 7 | 11 | 9 | 6 | 7 | 6 | 12 | 6 | 11 | 8 |
| Bi | | | | | | | | | | | | | | | | | | |
| Th | | | | | | | | | | | | | | | | | | |
| U | | | | | | | | | | | | | | | | | | |
| AI* | 40 | 81 | 93 | 93 | 60 | 37 | 41 | 62 | 81 | 86 | 49 | 38 | 75 | 76 | 60 | 60 | 74 | 68 |
| CCPI** | 61 | 75 | 84 | 85 | 73 | 57 | 66 | 67 | 71 | 83 | 60 | 53 | 65 | 74 | 79 | 69 | 62 | 47 |
| Ti/Zr | 17.7 | 16.2 | 15.2 | 17.1 | 15.7 | 12.0 | 14.8 | 16.1 | 17.0 | 16.3 | 12.1 | 12.5 | 14.8 | 15.9 | 17.6 | 15.2 | 17.9 | 18.2 |
| Zr/Nb | 15.4 | 11.7 | 23.7 | 18.0 | 19.1 | 16.5 | 16.7 | 18.6 | 17.7 | 16.5 | 18.6 | 16.5 | 21.1 | 19.4 | 17.0 | 17.1 | 17.1 | 15.9 |
| Nb/Y | 0.5 | 0.7 | 0.4 | 0.4 | 0.4 | 0.5 | 0.5 | 0.4 | 0.3 | 0.5 | 0.5 | 0.5 | 0.4 | 0.4 | 0.5 | 0.5 | 0.4 | 0.4 |
| P2O5/TiO2 | 0.6 | 0.7 | 0.7 | 0.7 | 0.7 | 0.5 | 0.8 | 0.6 | 0.7 | 0.7 | 0.5 | 0.5 | 0.6 | 0.7 | 0.7 | 0.7 | 0.8 | 0.7 |

* Alteration Index = 100(K2O + MgO) / (K2O + MgO + Na2O + CaO), Ishikawa et al. (1976)

** Chlorite-Carbonate-Pyrite Index = 100(MgO + FeO) / (MgO + FeO + Na2O + K2O), Large et al. (in press)

# Appendix H. Volcanic Rock Geochemical Data from the Yolande River Sequence and Suite 1 and Suite 2 Andesites.

Data from: **Crawford et al. (1992)**

**Andesites**

| | Anthony Road Area | | | Crown Hill Area | | | Queenstown Reservoir | | South of Queenstown | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sample Number** | **AR6** | **HR65** | **HR70** | **Z632** | **M235** | **M189** | **39232** | **39233** | **LE135** | **LE29** |
| **SiO2** | 58.5 | 66.6 | 67.6 | 60.9 | 63.3 | 58.8 | 58.8 | 58.5 | 60.6 | 66.5 |
| **TiO2** | 0.46 | 0.36 | 0.44 | 0.49 | 0.42 | 0.48 | 0.57 | 0.56 | 0.45 | 0.42 |
| **Al2O3** | 16 | 14.6 | 16.9 | 14.3 | 14.7 | 15.9 | 14.4 | 14.2 | 16.1 | 15.3 |
| **Fe2O3** | 7.41 | 4.89 | 6.76 | 7.29 | 7.42 | 7.65 | 7.83 | 8.11 | 7.76 | 4.42 |
| **MnO** | 0.11 | 0.11 | 0.02 | 0.13 | 0.16 | 0.21 | 0.12 | 0.13 | 0.14 | 0.1 |
| **MgO** | 4.37 | 2.66 | 3.43 | 4.84 | 3.45 | 4.37 | 5.24 | 6.75 | 3.68 | 2.81 |
| **CaO** | 6.26 | 2.3 | 0.1 | 6.29 | 4.51 | 6.35 | 5.62 | 5.18 | 5.88 | 4.05 |
| **Na2O** | 6.75 | 5.53 | 1.44 | 4.07 | 4.05 | 4.4 | 4.24 | 4.76 | 3.62 | 4.88 |
| **K2O** | 0.37 | 2.74 | 3.02 | 1.39 | 1.77 | 1.59 | 2.97 | 1.61 | 1.52 | 1.36 |
| **P2O5** | 0.33 | 0.19 | 0.23 | 0.32 | 0.19 | 0.21 | 0.22 | 0.2 | 0.23 | 0.2 |
| **Total vol. Free** | 100.56 | 99.98 | 99.94 | 100.02 | 99.97 | 99.96 | 100.01 | 100 | 99.98 | 100.04 |
| **FeO** | 6.67 | 4.40 | 6.08 | 6.56 | 6.68 | 6.88 | 7.05 | 7.30 | 6.98 | 3.98 |
| **S** | | | | | | | | | | |
| **Sc** | | | | | | | | | | |
| **Ti** | 2758 | 2158 | 2638 | 2938 | 2518 | 2878 | 3417 | 3357 | 2698 | 2518 |
| **V** | 206 | 140 | 177 | 175 | 172 | 181 | 201 | 196 | 250 | 155 |
| **Cr** | 142 | 52 | 64 | 130 | 40 | 68 | 160 | 224 | 250 | 220 |
| **Co** | | | | | | | | | | |
| **Ni** | 40 | 17 | 24 | 39 | 24 | 15 | 49 | 53 | 29 | 20 |
| **Cu** | | | | | | | | | | |
| **Zn** | | | | | | | | | | |
| **As** | | | | | | | | | | |
| **Br** | | | | | | | | | | |
| **Rb** | 14 | 116 | 105 | 42 | 52 | 49 | 85 | 53 | 53 | 53 |
| **Sr** | 516 | 1004 | 94 | 683 | 418 | 716 | 262 | 363 | 840 | 590 |
| **Zr** | 160 | 132 | 155 | 169 | 150 | 144 | 167 | 159 | 150 | 165 |
| **Nb** | 8 | 7 | 7 | 8 | 8 | 8 | 9 | 8 | 6 | 6 |
| **Mo** | | | | | | | | | | |
| **Ag** | | | | | | | | | | |
| **Cd** | | | | | | | | | | |
| **Sn** | | | | | | | | | | |
| **Sb** | | | | | | | | | | |
| **Cs** | | | | | | | | | | |
| **Ba** | 188 | | 747 | 1184 | 2720 | 1403 | 1068 | 572 | 1500 | 2200 |
| **La** | 71.7 | 51.7 | 68.4 | 63.7 | | 88.8 | 44.1 | 40.7 | | |
| **Ce** | 149 | 97.7 | 124 | 131 | | 162 | 93.9 | 87 | | |
| **Nd** | 55 | 35.8 | 42.5 | 52.5 | | 57.2 | 40.1 | 41.1 | | |
| **Y** | 23 | 23 | 27 | 24 | 26 | 25 | 35 | 27 | 18 | 18 |
| **W** | | | | | | | | | | |
| **Tl** | | | | | | | | | | |
| **Pb** | | | | | | | | | | |
| **Bi** | | | | | | | | | | |
| **Th** | | | | | | | | | | |
| **U** | | | | | | | | | | |
| **Al*** | 27 | 41 | 81 | 38 | 38 | 36 | 45 | 46 | 35 | 32 |
| **CCPI**** | 61 | 46 | 68 | 68 | 64 | 65 | 63 | 69 | 67 | 52 |
| **Ti/Zr** | 17.2 | 16.3 | 17.0 | 17.4 | 16.8 | 20.0 | 20.5 | 21.1 | 18.0 | 15.3 |
| **Zr/Nb** | 20.0 | 18.9 | 22.1 | 21.1 | 18.8 | 18.0 | 18.6 | 19.9 | 25.0 | 27.5 |
| **Nb/Y** | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| **P2O5/TiO2** | 0.7 | 0.5 | 0.5 | 0.7 | 0.5 | 0.4 | 0.4 | 0.4 | 0.5 | 0.5 |

Data from: **Raymond (1992)**

**Andesites from Mt. Lyell**

| **Sample Number** | **PL9** | **PL12** | **PL13** | **PL14** | **PL19** | **PL21** | **PL32** |
|---|---|---|---|---|---|---|---|
| **SiO2** | 49.27 | 42.52 | 49.48 | 48.53 | 48.63 | 48.61 | 52.87 |
| **TiO2** | 0.65 | 0.61 | 0.56 | 0.65 | 0.65 | 0.69 | 0.73 |
| **Al2O3** | 16.20 | 16.77 | 11.10 | 17.85 | 18.74 | 15.72 | 17.89 |
| **Fe2O3** | 22.04 | 30.05 | 26.49 | 24.92 | 21.37 | 25.86 | 18.08 |
| **MnO** | 0.32 | 0.39 | 0.21 | 0.30 | 0.15 | 0.26 | 0.14 |
| **MgO** | 4.06 | 4.89 | 2.46 | 4.30 | 3.33 | 4.53 | 2.98 |
| **CaO** | 1.45 | 0.60 | 1.07 | 0.20 | 0.70 | 0.86 | 0.97 |
| **Na2O** | 0.10 | 0.12 | 0.11 | 0.03 | 0.05 | 0.02 | 0.63 |
| **K2O** | 3.38 | 2.65 | 3.01 | 2.58 | 5.34 | 2.57 | 5.12 |
| **P2O5** | 0.50 | 0.44 | 0.86 | 0.19 | 0.24 | 0.34 | 0.21 |
| **Total vol. Free** | 97.97 | 99.04 | 95.35 | 99.57 | 99.20 | 99.46 | 99.60 |
| **FeO** | 19.95 | 27.19 | 23.98 | 22.55 | 19.34 | 23.41 | 16.36 |
| **S** | | | | | | | |
| **Sc** | | | | | | | |
| **Ti** | 3885 | 3665 | 3337 | 3905 | 3914 | 4122 | 4381 |
| **V** | | | | | | | |
| **Cr** | | | | | | | |
| **Co** | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill |
| **Ni** | | | | | | | |
| **Cu** | 15040 | 7040 | 34080 | 3200 | 6000 | 4000 | 3040 |
| **Zn** | 1107 | 1234 | 9169 | 500 | 476 | 682 | 252 |
| **As** | 37 | 126 | 65 | 19 | 20 | 14 | 9 |
| **Br** | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| **Rb** | 81 | 54 | 49 | 60 | 110 | 59 | 136 |
| **Sr** | 42 | 20 | 23 | 12 | 46 | 28 | 49 |
| **Zr** | 106 | 82 | 132 | 107 | 105 | 109 | 132 |
| **Nb** | 27 | 18 | 42 | 6 | 19 | 11 | 7 |
| **Mo** | 20 | 20 | 87 | 10 | 10 | 8 | |
| **Ag** | | | | | | | |
| **Cd** | | | | | | | |
| **Sn** | 10 | 18 | 14 | 18 | 18 | 9 | 10 |
| **Sb** | | | | | | | |
| **Cs** | | | | | | | |
| **Ba** | 3188 | 3841 | 3236 | 2374 | 8593 | 3754 | 5613 |
| **La** | | | | | | | |
| **Ce** | | | | | | | |
| **Nd** | 46 | 47 | 92 | 29 | 52 | 34 | 25 |
| **Y** | 16 | 18 | 23 | 19 | 16 | 16 | 24 |
| **W** | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill | WC Mill |
| **Tl** | | | | | | | |
| **Pb** | 694 | 63 | 1094 | 6 | 52 | 34 | 7 |
| **Bi** | <1.5 | 2 | 3 | <1.5 | <1.5 | 2 | 2 |
| **Th** | 14 | 9 | 19 | 8 | 7 | 8 | 8 |
| **U** | 5.1 | 7 | 52.4 | 3.8 | 3.2 | 5.2 | 3 |
| **Al*** | 83 | 91 | 82 | 97 | 92 | 89 | 84 |
| **CCPI**** | 87 | 92 | 89 | 91 | 81 | 92 | 77 |
| **Ti/Zr** | 36.6 | 44.7 | 25.3 | 36.5 | 37.3 | 37.8 | 33.2 |
| **Zr/Nb** | 3.9 | 4.6 | 3.1 | 17.8 | 5.5 | 9.9 | 18.9 |
| **Nb/Y** | 1.7 | 1.0 | 1.8 | 0.3 | 1.2 | 0.7 | 0.3 |
| **P2O5/TiO2** | 0.8 | 0.7 | 1.5 | 0.3 | 0.4 | 0.5 | 0.3 |

* Alteration Index = 100(K2O + MgO) / (K2O + MgO + Na2O + CaO), Ishikawa et al. (1976)

** Chlorite-Carbonate-Pyrite Index = 100(MgO + FeO) / (MgO + FeO + Na2O + K2O), Large et al. (in press)

# Appendix H. REE Data from Suite 1 and Suite 2 Andesites.

Data from: **Halley (1996), written comm.**
**From Various Locations as given:**

| | Crown Hill | Garfield | | | Lyell-Comstock | | | | W.S Basalt | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 22240 | 22454 | 22708 | 36816 | 22144 | 22119 | 22122 | 22220 | 22135 | 22136 | 22232 | 22267 |
| La | 82.3 | 53.5 | 143.0 | 70.5 | 98.0 | 90.3 | 55.6 | 54.6 | 266.0 | 243.0 | 158.0 | 152.0 |
| Ce | 144.0 | 115.0 | 286.0 | 128.0 | 175.0 | 158.0 | 103.0 | 93.3 | 368.0 | 324.0 | 226.0 | 253.0 |
| Pr | | | | | | | | | | | | |
| Nd | | | | | | | | | | | | |
| Pm | | | | | | | | | | | | |
| Sm | 8.5 | 9.4 | 16.1 | 6.7 | 10.2 | 10.4 | 6.3 | 6.8 | 30.0 | 24.3 | 16.0 | 22.3 |
| Eu | 1.9 | 1.6 | 3.3 | 1.4 | 2.7 | 2.2 | 1.3 | 1.4 | 8.0 | 6.8 | 4.6 | 6.0 |
| Gd | | | | | | | | | | | | |
| Tb | | | | | | | | | | | | |
| Dy | | | | | | | | | | | | |
| Ho | | | | | | | | | | | | |
| Er | | | | | | | | | | | | |
| Tm | | | | | | | | | | | | |
| Yb | 2.0 | 4.7 | 3.3 | 2.2 | 2.1 | 2.6 | 1.5 | 2.7 | 3.3 | 2.3 | 1.9 | 4.3 |
| Lu | 0.4 | 0.8 | 0.5 | 0.4 | 0.3 | 0.4 | 0.2 | 0.4 | 0.5 | 0.4 | 0.4 | 0.7 |
| **Chondrite Normalised values** | | | | | | | | | | | | |
| La | 265.5 | 172.6 | 461.3 | 227.4 | 316.1 | 291.3 | 179.4 | 176.1 | 858.1 | 783.9 | 509.7 | 490.3 |
| Ce | 178.2 | 142.3 | 354.0 | 158.4 | 216.6 | 195.5 | 127.5 | 115.5 | 455.4 | 401.0 | 279.7 | 313.1 |
| Pr | | | | | | | | | | | | |
| Nd | | | | | | | | | | | | |
| Pm | | | | | | | | | | | | |
| Sm | 43.8 | 48.1 | 82.6 | 34.6 | 52.3 | 53.3 | 32.3 | 34.9 | 153.8 | 124.6 | 82.1 | 114.4 |
| Eu | 25.3 | 22.3 | 45.2 | 18.9 | 37.0 | 29.8 | 17.4 | 19.2 | 108.2 | 92.5 | 62.3 | 81.6 |
| Gd | | | | | | | | | | | | |
| Tb | | | | | | | | | | | | |
| Dy | | | | | | | | | | | | |
| Ho | | | | | | | | | | | | |
| Er | | | | | | | | | | | | |
| Tm | | | | | | | | | | | | |
| Yb | 9.7 | 22.6 | 15.6 | 10.6 | 9.9 | 12.3 | 7.2 | 12.8 | 15.6 | 11.0 | 9.2 | 20.7 |
| Lu | 10.9 | 23.9 | 16.1 | 11.5 | 10.2 | 12.1 | 6.8 | 11.5 | 16.8 | 13.0 | 11.2 | 22.0 |
| (La/Yb)N | 27.5 | 7.6 | 29.5 | 21.4 | 31.9 | 23.7 | 25.0 | 13.7 | 55.2 | 71.2 | 55.2 | 23.7 |
| (La/Sm)N | 6.1 | 3.6 | 5.6 | 6.6 | 6.0 | 5.5 | 5.6 | 5.1 | 5.6 | 6.3 | 6.2 | 4.3 |

Chondrite normalised REE values were calculated using the data from Boynton (1984), as given in Appendix D.

Data from: **Crawford et al. (1992)**
**From Various Locations as given:**

| | Anthony Road Area | | Crown Hill Area | | | Queenstown Reservoir | |
|---|---|---|---|---|---|---|---|
| | AR6 | HR65 | HR70 | Z632 | M189 | 39232 | 39233 |
| La | 71.7 | 51.7 | 68.4 | 63.7 | 88.8 | 44.1 | 40.7 |
| Ce | 149.0 | 97.7 | 124.0 | 131.0 | 162.0 | 93.9 | 87.0 |
| Pr | 15.0 | 10.0 | 12.1 | 14.1 | 16.5 | 10.5 | 10.9 |
| Nd | 55.0 | 35.8 | 42.5 | 52.5 | 57.2 | 40.1 | 41.1 |
| Pm | | | | | | | |
| Sm | 8.8 | 6.1 | 7.0 | 8.9 | 9.1 | 6.9 | 8.3 |
| Eu | 1.4 | 1.4 | 1.6 | 2.3 | 2.1 | 1.5 | 2.0 |
| Gd | 6.1 | 4.2 | 5.4 | 6.7 | 6.1 | 5.8 | 6.3 |
| Tb | | | | | | | |
| Dy | 4.1 | 3.2 | 4.2 | 4.3 | 4.2 | 4.6 | 4.5 |
| Ho | | | | | | | |
| Er | 2.3 | 2.1 | 2.5 | 2.3 | 2.2 | 2.6 | 3.0 |
| Tm | | | | | | | |
| Yb | 1.9 | 2.2 | 2.7 | 2.1 | 2.6 | 2.5 | 2.7 |
| Lu | | | | | | | |
| **Chondrite Normalised values** | | | | | | | |
| La | 231.3 | 166.8 | 220.6 | 205.5 | 286.5 | 142.3 | 131.3 |
| Ce | 184.4 | 120.9 | 153.5 | 162.1 | 200.5 | 116.2 | 107.7 |
| Pr | 123.0 | 82.0 | 99.2 | 115.6 | 135.2 | 86.1 | 89.3 |
| Nd | 91.7 | 59.7 | 70.8 | 87.5 | 95.3 | 66.8 | 68.5 |
| Pm | | | | | | | |
| Sm | 45.1 | 31.1 | 35.7 | 45.5 | 46.5 | 35.5 | 42.4 |
| Eu | 19.2 | 18.8 | 22.2 | 31.8 | 28.3 | 19.7 | 26.8 |
| Gd | 23.6 | 16.1 | 20.8 | 25.8 | 23.4 | 22.3 | 24.4 |
| Tb | | | | | | | |
| Dy | 12.6 | 10.0 | 13.0 | 13.4 | 13.0 | 14.3 | 13.9 |
| Ho | | | | | | | |
| Er | 10.9 | 9.8 | 11.9 | 10.7 | 10.3 | 12.5 | 14.2 |
| Tm | | | | | | | |
| Yb | 8.9 | 10.5 | 13.1 | 10.2 | 12.2 | 12.1 | 13.1 |
| Lu | | | | | | | |
| (La/Yb)N | 26.1 | 15.9 | 16.9 | 20.2 | 23.4 | 11.8 | 10.1 |
| (La/Sm)N | 5.1 | 5.4 | 6.2 | 4.5 | 6.2 | 4.0 | 3.1 |

# Appendix H. Volcanic Rock REE Data from the Southern Mt. Read Volcanics.

Data from: **This Study**
**Jukes Road**

| | Feldspar phyric rhyolite | Qtz. Feld. Porphyry |
|---|---|---|
| | **10620** | **MJ-96-9** |
| La | 55.38 | 42.75 |
| Ce | 109.84 | 84.95 |
| Pr | | |
| Nd | 48.30 | 38.50 |
| Pm | | |
| Sm | 8.60 | 7.00 |
| Eu | 1.56 | 1.65 |
| Gd | 7.00 | 6.00 |
| Tb | 0.92 | 0.82 |
| Dy | | |
| Ho | | |
| Er | 3.50 | 3.00 |
| Tm | | |
| Yb | 3.70 | 3.00 |
| Lu | 0.50 | 0.40 |
| **Chondrite Normalised values** | | |
| La | 178.65 | 137.90 |
| Ce | 135.94 | 105.14 |
| Pr | | |
| Nd | 80.50 | 64.17 |
| Pm | | |
| Sm | 44.10 | 35.90 |
| Eu | 21.22 | 22.45 |
| Gd | 27.03 | 23.17 |
| Tb | 19.41 | 17.30 |
| Dy | | |
| Ho | | |
| Er | 16.67 | 14.29 |
| Tm | | |
| Yb | 17.70 | 14.35 |
| Lu | 15.53 | 12.42 |
| **(La/Yb)N** | 10.1 | 9.6 |
| **(La/Sm)N** | 4.1 | 3.8 |
| **(Gd/Yb)N** | 1.5 | 1.6 |

Analyses by Analabs, Perth, Australia

Data from: **This Study**
**Jukes Road, Eastern Quartz-Phyric Sequence**

| | Qtz. Feld-Phyric Volclast. | Qtz. Feld-Phyric Volclast. | Qtz. Feld-Phyric Volclast. | Qtz. Feld-Phyric Volclast. | Qtz. Feld-Phyric Volclast. | Qtz. Feld-Phyric Volclast. | Qtz. Feld-Phyric Volclast. | Qtz. Feld-Phyric Volclast. | Qtz. Feld-Phyric Volclast. | Qtz. Feld-Phyric Volclast. | Qtz. Feld-Phyric Volclast. | Qtz. Feld-Phyric Volclast. | Coherent Qtz. Feld-Phyric dacite | Coherent Qtz. Feld-Phyric dacite | Coherent Qtz. Feld-Phyric dacite | Qtz. Feld-Phyric Volclast. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **9550** | **9600** | **9650** | **9700** | **9760** | **9770** | **9780** | **9790** | **9800** | **9805** | **9820** | **9840** | **9860** | **9880** | **9900** | **9920** |
| La | 44.90 | 43.10 | 35.90 | 54.00 | 42.90 | 22.00 | 22.40 | 21.80 | 19.30 | 48.80 | 30.20 | 34.30 | 51.60 | 68.40 | 58.20 | 30.20 |
| Ce | 94.30 | 90.30 | 71.70 | 99.40 | 103.00 | 102.00 | 81.70 | 87.00 | 40.60 | 102.00 | 63.40 | 76.00 | 104.00 | 134.00 | 112.00 | 64.90 |
| Pr | | | | | | | | | | | | | | | | |
| Nd | | | | | | | | | | | | | | | | |
| Pm | | | | | | | | | | | | | | | | |
| Sm | 7.98 | 7.57 | 6.28 | 8.37 | 6.33 | 2.56 | 3.75 | 2.97 | 2.64 | 6.77 | 4.72 | 5.66 | 6.85 | 9.17 | 8.70 | 5.65 |
| Eu | 1.51 | 1.37 | 1.12 | 1.59 | 1.11 | -0.50 | 0.61 | 0.61 | -0.50 | 1.19 | 0.84 | 1.15 | 0.91 | 1.70 | 1.58 | 1.15 |
| Gd | | | | | | | | | | | | | | | | |
| Tb | | | | | | | | | | | | | | | | |
| Dy | | | | | | | | | | | | | | | | |
| Ho | | | | | | | | | | | | | | | | |
| Er | | | | | | | | | | | | | | | | |
| Tm | | | | | | | | | | | | | | | | |
| Yb | 3.40 | 3.56 | 3.73 | 3.81 | 2.90 | 2.20 | 2.84 | 2.67 | 2.89 | 3.18 | 3.06 | 3.41 | 3.34 | 4.21 | 3.46 | 3.75 |
| Lu | 0.51 | 0.51 | 0.56 | 0.56 | 0.40 | 0.34 | 0.42 | 0.38 | 0.42 | 0.46 | 0.45 | 0.48 | 0.48 | 0.64 | 0.52 | 0.52 |
| **Chondrite Normalised values** | | | | | | | | | | | | | | | | |
| La | 144.84 | 139.03 | 115.81 | 174.19 | 138.39 | 70.97 | 72.26 | 70.32 | 62.26 | 157.42 | 97.42 | 110.65 | 166.45 | 220.65 | 187.74 | 97.42 |
| Ce | 116.71 | 111.76 | 88.74 | 123.02 | 127.48 | 126.24 | 101.11 | 107.67 | 50.25 | 126.24 | 78.47 | 94.06 | 128.71 | 165.84 | 138.61 | 80.32 |
| Pr | | | | | | | | | | | | | | | | |
| Nd | | | | | | | | | | | | | | | | |
| Pm | | | | | | | | | | | | | | | | |
| Sm | 40.92 | 38.82 | 32.21 | 42.92 | 32.46 | 13.13 | 19.23 | 15.23 | 13.54 | 34.72 | 24.21 | 29.03 | 35.13 | 47.03 | 44.62 | 28.97 |
| Eu | 20.54 | 18.64 | 15.24 | 21.63 | 15.10 | -6.80 | 8.30 | 8.30 | -6.80 | 16.19 | 11.43 | 15.65 | 12.38 | 23.13 | 21.50 | 15.65 |
| Gd | | | | | | | | | | | | | | | | |
| Tb | | | | | | | | | | | | | | | | |
| Dy | | | | | | | | | | | | | | | | |
| Ho | | | | | | | | | | | | | | | | |
| Er | | | | | | | | | | | | | | | | |
| Tm | | | | | | | | | | | | | | | | |
| Yb | 16.27 | 17.03 | 17.85 | 18.23 | 13.88 | 10.53 | 13.59 | 12.78 | 13.83 | 15.22 | 14.64 | 16.32 | 15.98 | 20.14 | 16.56 | 17.94 |
| Lu | 15.84 | 15.84 | 17.39 | 17.39 | 12.42 | 10.56 | 13.04 | 11.80 | 13.04 | 14.29 | 13.98 | 14.91 | 14.91 | 19.88 | 16.15 | 16.15 |
| **(La/Yb)N** | 8.9 | 8.2 | 6.5 | 9.6 | 10.0 | 6.7 | 5.3 | 5.5 | 4.5 | 10.3 | 6.7 | 6.8 | 10.4 | 11.0 | 11.3 | 5.4 |
| **(La/Sm)N** | 3.5 | 3.6 | 3.6 | 4.1 | 4.3 | 5.4 | 3.8 | 4.6 | 4.6 | 4.5 | 4.0 | 3.8 | 4.7 | 4.7 | 4.2 | 3.4 |
| **(Gd/Yb)N** | | | | | | | | | | | | | | | | |

Chondrite normalised REE values were calculated using the data from Boynton (1984), as given in Appendix D

Analyses by INAA at Becquerel Labratories, Lucas Heights, NSW, Australia

# Appendix H. Volcanic Rock REE Data from the Southern Mt. Read Volcanics.

Data from: **This Study**

**Jukes Road, Eastern Quartz-Phyric Sequence**

| | Fault gouge | Coherent Qtz. Feld-Phyric dacite | Coherent Qtz. Feld-Phyric dacite | Coherent Qtz. Feld-Phyric dacite | Qtz. Feld-Phyric Volclast. | Qtz. Feld-Phyric Volclast. | Coherent Qtz. Feld-Phyric dacite | Coherent Qtz. Feld-Phyric dacite | Coherent Qtz. Feld-Phyric dacite | Qtz. Feld-Phyric Volclast. | Qtz. Feld-Phyric Volclast. | Qtz. Feld-Phyric Volclast. | Qtz. Feld-Phyric Volclast. | Qtz. Feld-Phyric Volclast. | Feld- Phyric Col. Jointed Dacite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **9940** | **9960** | **9980** | **10000** | **10020** | **10040** | **10060** | **10080** | **10090** | **B8600** | **B9550** | **B9700** | **B9780** | **B9790** | **B10090** |
| **La** | 48.70 | 34.60 | 44.60 | 38.80 | 18.00 | 24.80 | 40.20 | 34.70 | 48.60 | 54.90 | 47.40 | 48.60 | 22.40 | 32.60 | 80.20 |
| **Ce** | 98.90 | 79.50 | 89.70 | 78.80 | 26.70 | 58.60 | 51.30 | 75.90 | 96.10 | 115.00 | 97.40 | 93.90 | 99.10 | 50.20 | 175.00 |
| **Pr** | | | | | | | | | | | | | | | |
| **Nd** | | | | | | | | | | | | | | | |
| **Pm** | | | | | | | | | | | | | | | |
| **Sm** | 7.20 | 6.20 | 7.62 | 5.22 | 3.35 | 4.75 | 6.22 | 5.99 | 8.27 | 8.37 | 7.73 | 8.03 | 3.62 | 2.10 | 13.80 |
| **Eu** | 1.06 | 1.17 | 1.85 | 0.99 | 0.66 | 1.12 | 0.93 | 1.10 | 1.27 | 1.65 | 1.38 | 1.46 | 0.85 | 0.50 | 2.05 |
| **Gd** | | | | | | | | | | | | | | | |
| **Tb** | | | | | | | | | | | | | | | |
| **Dy** | | | | | | | | | | | | | | | |
| **Ho** | | | | | | | | | | | | | | | |
| **Er** | | | | | | | | | | | | | | | |
| **Tm** | | | | | | | | | | | | | | | |
| **Yb** | 3.60 | 3.22 | 3.44 | 3.11 | 3.11 | 3.08 | 3.24 | 3.65 | 3.99 | 3.27 | 3.40 | 3.37 | 2.40 | 2.04 | 3.12 |
| **Lu** | 0.51 | 0.46 | 0.49 | 0.46 | 0.50 | 0.47 | 0.47 | 0.52 | 0.57 | 0.49 | 0.52 | 0.50 | 0.37 | 0.34 | 0.44 |
| **Chondrite Normalised values** | | | | | | | | | | | | | | | |
| **La** | 157.10 | 111.61 | 143.87 | 125.16 | 58.06 | 80.00 | 129.68 | 111.94 | 156.77 | 177.10 | 152.90 | 156.77 | 72.26 | 105.16 | 258.71 |
| **Ce** | 122.40 | 98.39 | 111.01 | 97.52 | 33.04 | 72.52 | 63.49 | 93.94 | 118.94 | 142.33 | 120.54 | 116.21 | 122.65 | 62.13 | 216.58 |
| **Pr** | | | | | | | | | | | | | | | |
| **Nd** | | | | | | | | | | | | | | | |
| **Pm** | | | | | | | | | | | | | | | |
| **Sm** | 36.92 | 31.79 | 39.08 | 26.77 | 17.18 | 24.36 | 31.90 | 30.72 | 42.41 | 42.92 | 39.64 | 41.18 | 18.56 | 10.77 | 70.77 |
| **Eu** | 14.42 | 15.92 | 25.17 | 13.47 | 8.98 | 15.24 | 12.65 | 14.97 | 17.28 | 22.45 | 18.78 | 19.86 | 11.56 | -6.80 | 27.89 |
| **Gd** | | | | | | | | | | | | | | | |
| **Tb** | | | | | | | | | | | | | | | |
| **Dy** | | | | | | | | | | | | | | | |
| **Ho** | | | | | | | | | | | | | | | |
| **Er** | | | | | | | | | | | | | | | |
| **Tm** | | | | | | | | | | | | | | | |
| **Yb** | 17.22 | 15.41 | 16.46 | 14.88 | 14.88 | 14.74 | 15.50 | 17.46 | 19.09 | 15.65 | 16.27 | 16.12 | 11.48 | 9.76 | 14.93 |
| **Lu** | 15.84 | 14.29 | 15.22 | 14.29 | 15.53 | 14.60 | 14.60 | 16.15 | 17.70 | 15.22 | 16.15 | 15.53 | 11.49 | 10.56 | 13.66 |
| **(La/Yb)N** | 9.1 | 7.2 | 8.7 | 8.4 | 3.9 | 5.4 | 8.4 | 6.4 | 8.2 | 11.3 | 9.4 | 9.7 | 6.3 | 10.8 | 17.3 |
| **(La/Sm)N** | 4.3 | 3.5 | 3.7 | 4.7 | 3.4 | 3.3 | 4.1 | 3.6 | 3.7 | 4.1 | 3.9 | 3.8 | 3.9 | 9.8 | 3.7 |
| **(Gd/Yb)N** | | | | | | | | | | | | | | | |

Chondrite normalised REE values were calculated using the data from Boynton (1984), as given in Appendix D

Analyses by INAA at Becquerel Labratories, Lucas Heights, NSW, Australia

# Appendix H. Volcanic Rock REE Data from the Southern Mt. Read Volcanics.

Data from: **This Study**

**Jukes Road, Central Volcanic Sequence**

| | Qtz. Feld-Phyric Volclast. / gouge | Qtz. Feld-Phyric Volclast. / gouge | Qtz. Feld-Phyric Volclast. / gouge | Qtz. Feld-Phyric Volclast. / gouge | Qtz. Feld-Phyric Volclast. / gouge | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **10100** | **10120** | **10140** | **10160** | **10180** | **10200** | **10210** | **10220** | **10240** | **10250** | **10260** | **10270** | **10280** | **10290** | **10300** | **10310** |
| **La** | 47.70 | 42.80 | 34.30 | 35.60 | 67.20 | 50.10 | 41.80 | 38.80 | 55.70 | 66.50 | 63.80 | 70.20 | 71.50 | 78.30 | 63.60 | 56.50 |
| **Ce** | 90.00 | 84.10 | 69.60 | 74.10 | 137.00 | 106.00 | 94.40 | 81.30 | 117.00 | 130.00 | 128.00 | 144.00 | 142.00 | 151.00 | 127.00 | 112.00 |
| **Pr** | | | | | | | | | | | | | | | | |
| **Nd** | | | | | | | | | | | | | | | | |
| **Pm** | | | | | | | | | | | | | | | | |
| **Sm** | 8.06 | 7.06 | 6.61 | 6.77 | 10.70 | 10.20 | 8.82 | 6.75 | 9.65 | 10.50 | 10.20 | 11.30 | 11.70 | 12.80 | 10.70 | 9.41 |
| **Eu** | 1.22 | 1.21 | 1.62 | 1.48 | 2.59 | 2.47 | 1.51 | 1.01 | 0.82 | 1.49 | 1.56 | 1.53 | 1.69 | 2.40 | 1.88 | 1.51 |
| **Gd** | | | | | | | | | | | | | | | | |
| **Tb** | | | | | | | | | | | | | | | | |
| **Dy** | | | | | | | | | | | | | | | | |
| **Ho** | | | | | | | | | | | | | | | | |
| **Er** | | | | | | | | | | | | | | | | |
| **Tm** | | | | | | | | | | | | | | | | |
| **Yb** | 3.34 | 3.70 | 6.55 | 7.01 | 5.56 | 3.86 | 6.20 | 4.66 | 4.75 | 4.39 | 4.46 | 4.21 | 4.46 | 10.40 | 4.94 | 4.26 |
| **Lu** | 0.48 | 0.56 | 0.96 | 1.09 | 0.83 | 0.54 | 0.83 | 0.67 | 0.72 | 0.65 | 0.68 | 0.63 | 0.70 | 1.52 | 0.76 | 0.64 |
| **Chondrite Normalised values** | | | | | | | | | | | | | | | | |
| **La** | 153.87 | 138.06 | 110.65 | 114.84 | 216.77 | 161.61 | 134.84 | 125.16 | 179.68 | 214.52 | 205.81 | 226.45 | 230.65 | 252.58 | 205.16 | 182.26 |
| **Ce** | 111.39 | 104.08 | 86.14 | 91.71 | 169.55 | 131.19 | 116.83 | 100.62 | 144.80 | 160.89 | 158.42 | 178.22 | 175.74 | 186.88 | 157.18 | 138.61 |
| **Pr** | | | | | | | | | | | | | | | | |
| **Nd** | | | | | | | | | | | | | | | | |
| **Pm** | | | | | | | | | | | | | | | | |
| **Sm** | 41.33 | 36.21 | 33.90 | 34.72 | 54.87 | 52.31 | 45.23 | 34.62 | 49.49 | 53.85 | 52.31 | 57.95 | 60.00 | 65.64 | 54.87 | 48.26 |
| **Eu** | 16.60 | 16.46 | 22.04 | 20.14 | 35.24 | 33.61 | 20.54 | 13.74 | 11.16 | 20.27 | 21.22 | 20.82 | 22.99 | 32.65 | 25.58 | 20.54 |
| **Gd** | | | | | | | | | | | | | | | | |
| **Tb** | | | | | | | | | | | | | | | | |
| **Dy** | | | | | | | | | | | | | | | | |
| **Ho** | | | | | | | | | | | | | | | | |
| **Er** | | | | | | | | | | | | | | | | |
| **Tm** | | | | | | | | | | | | | | | | |
| **Yb** | 15.98 | 17.70 | 31.34 | 33.54 | 26.60 | 18.47 | 29.67 | 22.30 | 22.73 | 21.00 | 21.34 | 20.14 | 21.34 | 49.76 | 23.64 | 20.38 |
| **Lu** | 14.91 | 17.39 | 29.81 | 33.85 | 25.78 | 16.77 | 25.78 | 20.81 | 22.36 | 20.19 | 21.12 | 19.57 | 21.74 | 47.20 | 23.60 | 19.88 |
| **(La/Yb)N** | 9.6 | 7.8 | 3.5 | 3.4 | 8.1 | 8.8 | 4.5 | 5.6 | 7.9 | 10.2 | 9.6 | 11.2 | 10.8 | 5.1 | 8.7 | 8.9 |
| **(La/Sm)N** | 3.7 | 3.8 | 3.3 | 3.3 | 4.0 | 3.1 | 3.0 | 3.6 | 3.6 | 4.0 | 3.9 | 3.9 | 3.8 | 3.8 | 3.7 | 3.8 |
| **(Gd/Yb)N** | | | | | | | | | | | | | | | | |

Chondrite normalised REE values were calculated using the data from Boynton (1984), as given in Appendix D

Analyses by INAA at Becquerel Labratories, Lucas Heights, NSW, Australia

# Appendix H. Volcanic Rock REE Data from the Southern Mt. Read Volcanics.

Data from: **This Study**

**Jukes Road, Central Volcanic Sequence**

| | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Qtz. Feld. Porphyry | Qtz. Feld. Porphyry | Feld- Phyric Col. Jointed Dacite | Qtz. Feld. Porphyry |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **10330** | **10340** | **10350** | **10360** | **10370** | **10375** | **10380** | **10390** | **10400** | **10420** | **10440** | **10460** | **10480** | **10500** | **10520** | **10540** | **10550** |
| **La** | 50.00 | 56.20 | 45.70 | 47.00 | 32.00 | 7.45 | 24.80 | 76.40 | 55.70 | 57.70 | 50.60 | 57.20 | 61.00 | 42.30 | 48.40 | 32.90 | 38.30 |
| **Ce** | 102.00 | 113.00 | 95.40 | 95.70 | 72.10 | 15.20 | 54.10 | 158.00 | 113.00 | 123.00 | 107.00 | 118.00 | 130.00 | 88.90 | 105.00 | 60.30 | 84.60 |
| **Pr** | | | | | | | | | | | | | | | | | |
| **Nd** | | | | | | | | | | | | | | | | | |
| **Pm** | | | | | | | | | | | | | | | | | |
| **Sm** | 8.50 | 9.30 | 7.55 | 8.24 | 6.36 | 2.14 | 5.10 | 12.00 | 9.22 | 9.88 | 8.53 | 9.43 | 10.00 | 7.32 | 9.04 | 6.44 | 7.28 |
| **Eu** | 1.50 | 1.58 | 1.20 | 1.33 | 1.46 | 0.73 | 1.05 | 2.19 | 1.40 | 2.08 | 1.56 | 1.51 | 1.70 | 1.13 | 1.74 | 0.97 | 1.13 |
| **Gd** | | | | | | | | | | | | | | | | | |
| **Tb** | | | | | | | | | | | | | | | | | |
| **Dy** | | | | | | | | | | | | | | | | | |
| **Ho** | | | | | | | | | | | | | | | | | |
| **Er** | | | | | | | | | | | | | | | | | |
| **Tm** | | | | | | | | | | | | | | | | | |
| **Yb** | 4.20 | 4.24 | 3.92 | 4.02 | 20.30 | 5.55 | 7.02 | 5.51 | 5.87 | 4.83 | 4.07 | 4.18 | 4.59 | 4.62 | 5.28 | 4.84 | 4.69 |
| **Lu** | 0.63 | 0.62 | 0.57 | 0.62 | 2.80 | 0.98 | 1.13 | 0.88 | 0.87 | 0.73 | 0.63 | 0.63 | 0.69 | 0.67 | 0.78 | 0.78 | 0.71 |
| **Chondrite Normalised values** | | | | | | | | | | | | | | | | | |
| **La** | 161.29 | 181.29 | 147.42 | 151.61 | 103.23 | 24.03 | 80.00 | 246.45 | 179.68 | 186.13 | 163.23 | 184.52 | 196.77 | 136.45 | 156.13 | 106.13 | 123.55 |
| **Ce** | 126.24 | 139.85 | 118.07 | 118.44 | 89.23 | 18.81 | 66.96 | 195.54 | 139.85 | 152.23 | 132.43 | 146.04 | 160.89 | 110.02 | 129.95 | 74.63 | 104.70 |
| **Pr** | | | | | | | | | | | | | | | | | |
| **Nd** | | | | | | | | | | | | | | | | | |
| **Pm** | | | | | | | | | | | | | | | | | |
| **Sm** | 43.59 | 47.69 | 38.72 | 42.26 | 32.62 | 10.97 | 26.15 | 61.54 | 47.28 | 50.67 | 43.74 | 48.36 | 51.28 | 37.54 | 46.36 | 33.03 | 37.33 |
| **Eu** | 20.41 | 21.50 | 16.33 | 18.10 | 19.86 | 9.93 | 14.29 | 29.80 | 19.05 | 28.30 | 21.22 | 20.54 | 23.13 | 15.37 | 23.67 | 13.20 | 15.37 |
| **Gd** | | | | | | | | | | | | | | | | | |
| **Tb** | | | | | | | | | | | | | | | | | |
| **Dy** | | | | | | | | | | | | | | | | | |
| **Ho** | | | | | | | | | | | | | | | | | |
| **Er** | | | | | | | | | | | | | | | | | |
| **Tm** | | | | | | | | | | | | | | | | | |
| **Yb** | 20.10 | 20.29 | 18.76 | 19.23 | 97.13 | 26.56 | 33.59 | 26.36 | 28.09 | 23.11 | 19.47 | 20.00 | 21.96 | 22.11 | 25.26 | 23.16 | 22.44 |
| **Lu** | 19.57 | 19.25 | 17.70 | 19.25 | 86.96 | 30.43 | 35.09 | 27.33 | 27.02 | 22.67 | 19.57 | 19.57 | 21.43 | 20.81 | 24.22 | 24.22 | 22.05 |
| **(La/Yb)N** | 8.0 | 8.9 | 7.9 | 7.9 | 1.1 | 0.9 | 2.4 | 9.3 | 6.4 | 8.1 | 8.4 | 9.2 | 9.0 | 6.2 | 6.2 | 4.6 | 5.5 |
| **(La/Sm)N** | 3.7 | 3.8 | 3.8 | 3.6 | 3.2 | 2.2 | 3.1 | 4.0 | 3.8 | 3.7 | 3.7 | 3.8 | 3.8 | 3.6 | 3.4 | 3.2 | 3.3 |
| **(Gd/Yb)N** | | | | | | | | | | | | | | | | | |

Chondrite normalised REE values were calculated using the data from Boynton (1984), as given in Appendix D

Analyses by INAA at Becquerel Labratories, Lucas Heights, NSW, Australia

# Appendix H. Volcanic Rock REE Data from the Southern Mt. Read Volcanics.

Data from: **This Study**

**Jukes Road, Central Volcanic Sequence**

| | Feld- Phyric Col. Jointed Dacite | Qtz. Feld. Porphyry | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Qtz. Feld- Phyric Volclast. / gouge | Qtz. Feld- Phyric Volclast. / gouge | Feld- Phyric Col. Jointed Dacite | Qtz. Feld. Porphyry | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **10560** | **10580** | **10600** | **10620** | **10640** | **10660** | **10680** | **10700** | **10750** | **B10140** | **B10170** | **B10200** | **B10210** | **B10220** | **B10250** | **B10270** | **B10290** |
| **La** | 47.40 | 37.70 | 53.90 | 57.60 | 56.00 | 56.20 | 49.80 | 51.60 | 54.10 | 21.50 | 110.00 | 57.90 | 16.80 | 41.60 | 65.70 | 54.60 | 103.00 |
| **Ce** | 104.00 | 83.40 | 116.00 | 125.00 | 120.00 | 121.00 | 108.00 | 110.00 | 116.00 | 49.10 | 226.00 | 120.00 | 33.70 | 95.10 | 138.00 | 118.00 | 191.00 |
| **Pr** | | | | | | | | | | | | | | | | | |
| **Nd** | | | | | | | | | | | | | | | | | |
| **Pm** | | | | | | | | | | | | | | | | | |
| **Sm** | 8.19 | 7.03 | 9.14 | 9.92 | 9.32 | 9.34 | 8.23 | 8.63 | 9.15 | 4.83 | 19.50 | 11.30 | 3.07 | 7.34 | 11.20 | 9.30 | 14.90 |
| **Eu** | 1.21 | 0.93 | 1.43 | 1.65 | 1.07 | 1.66 | 1.02 | 1.30 | 1.18 | 1.33 | 4.46 | 2.92 | 0.55 | 0.73 | 2.13 | 1.08 | 2.17 |
| **Gd** | | | | | | | | | | | | | | | | | |
| **Tb** | | | | | | | | | | | | | | | | | |
| **Dy** | | | | | | | | | | | | | | | | | |
| **Ho** | | | | | | | | | | | | | | | | | |
| **Er** | | | | | | | | | | | | | | | | | |
| **Tm** | | | | | | | | | | | | | | | | | |
| **Yb** | 4.23 | 3.81 | 4.31 | 4.11 | 4.14 | 3.95 | 3.83 | 3.99 | 3.85 | 10.10 | 4.31 | 3.54 | 4.02 | 4.86 | 4.23 | 4.38 | 4.65 |
| **Lu** | 0.70 | 0.62 | 0.64 | 0.62 | 0.61 | 0.60 | 0.56 | 0.61 | 0.60 | 1.40 | 0.69 | 0.53 | 0.59 | 0.70 | 0.72 | 0.70 | 0.78 |
| **Chondrite Normalised values** | | | | | | | | | | | | | | | | | |
| **La** | 152.90 | 121.61 | 173.87 | 185.81 | 180.65 | 181.29 | 160.65 | 166.45 | 174.52 | 69.35 | 354.84 | 186.77 | 54.19 | 134.19 | 211.94 | 176.13 | 332.26 |
| **Ce** | 128.71 | 103.22 | 143.56 | 154.70 | 148.51 | 149.75 | 133.66 | 136.14 | 143.56 | 60.77 | 279.70 | 148.51 | 41.71 | 117.70 | 170.79 | 146.04 | 236.39 |
| **Pr** | | | | | | | | | | | | | | | | | |
| **Nd** | | | | | | | | | | | | | | | | | |
| **Pm** | | | | | | | | | | | | | | | | | |
| **Sm** | 42.00 | 36.05 | 46.87 | 50.87 | 47.79 | 47.90 | 42.21 | 44.26 | 46.92 | 24.77 | 100.00 | 57.95 | 15.74 | 37.64 | 57.44 | 47.69 | 76.41 |
| **Eu** | 16.46 | 12.65 | 19.46 | 22.45 | 14.56 | 22.59 | 13.88 | 17.69 | 16.05 | 18.10 | 60.68 | 39.73 | 7.48 | 9.93 | 28.98 | 14.69 | 29.52 |
| **Gd** | | | | | | | | | | | | | | | | | |
| **Tb** | | | | | | | | | | | | | | | | | |
| **Dy** | | | | | | | | | | | | | | | | | |
| **Ho** | | | | | | | | | | | | | | | | | |
| **Er** | | | | | | | | | | | | | | | | | |
| **Tm** | | | | | | | | | | | | | | | | | |
| **Yb** | 20.24 | 18.23 | 20.62 | 19.67 | 19.81 | 18.90 | 18.33 | 19.09 | 18.42 | 48.33 | 20.62 | 16.94 | 19.23 | 23.25 | 20.24 | 20.96 | 22.25 |
| **Lu** | 21.74 | 19.25 | 19.88 | 19.25 | 18.94 | 18.63 | 17.39 | 18.94 | 18.63 | 43.48 | 21.43 | 16.46 | 18.32 | 21.74 | 22.36 | 21.74 | 24.22 |
| **(La/Yb)N** | 7.6 | 6.7 | 8.4 | 9.4 | 9.1 | 9.6 | 8.8 | 8.7 | 9.5 | 1.4 | 17.2 | 11.0 | 2.8 | 5.8 | 10.5 | 8.4 | 14.9 |
| **(La/Sm)N** | 3.6 | 3.4 | 3.7 | 3.7 | 3.8 | 3.8 | 3.8 | 3.8 | 3.7 | 2.8 | 3.5 | 3.2 | 3.4 | 3.6 | 3.7 | 3.7 | 4.3 |
| **(Gd/Yb)N** | | | | | | | | | | | | | | | | | |

Chondrite normalised REE values were calculated using the data from Boynton (1984), as given in Appendix D

Analyses by INAA at Becquerel Labratories, Lucas Heights, NSW, Australia

# Appendix H. Volcanic Rock REE Data from the Southern Mt. Read Volcanics.

Data from: **This Study**

**Jukes Road, Central Volcanic Sequence**

| | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Qtz. Feld. Porphyry | Qtz. Feld. Porphyry | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Feld- Phyric Col. Jointed Dacite | Volc. Sandstone | Qtz.-Phyric Volclast. | Qtz.-Phyric Volclast. | Qtz.-Phyric Volclast. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **B10300** | **B10310** | **B10330** | **B10350** | **B10370** | **B10420** | **B10520** | **B10550** | **B10700** | **B10750** | **B10800** | **B10850** | **B10900** | **B11900** | **B12450** | **B12800** | **B13800** |
| **La** | 57.10 | 48.40 | 49.60 | 48.10 | 56.80 | 55.40 | 39.80 | 38.60 | 59.50 | 43.10 | 56.70 | 47.80 | 78.40 | 56.60 | 56.90 | 69.40 | 66.90 |
| **Ce** | 121.00 | 102.00 | 106.00 | 105.00 | 106.00 | 115.00 | 88.70 | 84.90 | 124.00 | 94.00 | 121.00 | 101.00 | 150.00 | 123.00 | 129.00 | 162.00 | 133.00 |
| **Pr** | | | | | | | | | | | | | | | | | |
| **Nd** | | | | | | | | | | | | | | | | | |
| **Pm** | | | | | | | | | | | | | | | | | |
| **Sm** | 8.98 | 8.06 | 8.67 | 7.82 | 9.88 | 9.08 | 7.49 | 7.23 | 9.63 | 7.79 | 9.61 | 8.06 | 12.20 | 9.55 | 10.70 | 13.00 | 11.60 |
| **Eu** | 1.41 | 1.22 | 1.46 | 1.08 | 1.51 | 1.57 | 1.45 | 1.11 | 1.25 | 1.18 | 1.54 | 1.19 | 1.55 | 1.47 | 1.52 | 2.26 | 1.99 |
| **Gd** | | | | | | | | | | | | | | | | | |
| **Tb** | | | | | | | | | | | | | | | | | |
| **Dy** | | | | | | | | | | | | | | | | | |
| **Ho** | | | | | | | | | | | | | | | | | |
| **Er** | | | | | | | | | | | | | | | | | |
| **Tm** | | | | | | | | | | | | | | | | | |
| **Yb** | 3.98 | 4.04 | 4.65 | 3.61 | 4.95 | 3.98 | 3.45 | 4.15 | 4.16 | 3.86 | 4.10 | 3.87 | 4.48 | 3.89 | 4.78 | 4.98 | 4.54 |
| **Lu** | 0.61 | 0.63 | 0.71 | 0.55 | 0.78 | 0.61 | 0.54 | 0.61 | 0.60 | 0.59 | 0.62 | 0.59 | 0.69 | 0.57 | 0.71 | 0.72 | 0.68 |
| **Chondrite Normalised values** | | | | | | | | | | | | | | | | | |
| **La** | 184.19 | 156.13 | 160.00 | 155.16 | 183.23 | 178.71 | 128.39 | 124.52 | 191.94 | 139.03 | 182.90 | 154.19 | 252.90 | 182.58 | 183.55 | 223.87 | 215.81 |
| **Ce** | 149.75 | 126.24 | 131.19 | 129.95 | 131.19 | 142.33 | 109.78 | 105.07 | 153.47 | 116.34 | 149.75 | 125.00 | 185.64 | 152.23 | 159.65 | 200.50 | 164.60 |
| **Pr** | | | | | | | | | | | | | | | | | |
| **Nd** | | | | | | | | | | | | | | | | | |
| **Pm** | | | | | | | | | | | | | | | | | |
| **Sm** | 46.05 | 41.33 | 44.46 | 40.10 | 50.67 | 46.56 | 38.41 | 37.08 | 49.38 | 39.95 | 49.28 | 41.33 | 62.56 | 48.97 | 54.87 | 66.67 | 59.49 |
| **Eu** | 19.18 | 16.60 | 19.86 | 14.69 | 20.54 | 21.36 | 19.73 | 15.10 | 17.01 | 16.05 | 20.95 | 16.19 | 21.09 | 20.00 | 20.68 | 30.75 | 27.07 |
| **Gd** | | | | | | | | | | | | | | | | | |
| **Tb** | | | | | | | | | | | | | | | | | |
| **Dy** | | | | | | | | | | | | | | | | | |
| **Ho** | | | | | | | | | | | | | | | | | |
| **Er** | | | | | | | | | | | | | | | | | |
| **Tm** | | | | | | | | | | | | | | | | | |
| **Yb** | 19.04 | 19.33 | 22.25 | 17.27 | 23.68 | 19.04 | 16.51 | 19.86 | 19.90 | 18.47 | 19.62 | 18.52 | 21.44 | 18.61 | 22.87 | 23.83 | 21.72 |
| **Lu** | 18.94 | 19.57 | 22.05 | 17.08 | 24.22 | 18.94 | 16.77 | 18.94 | 18.63 | 18.32 | 19.25 | 18.32 | 21.43 | 17.70 | 22.05 | 22.36 | 21.12 |
| **(La/Yb)N** | 9.7 | 8.1 | 7.2 | 9.0 | 7.7 | 9.4 | 7.8 | 6.3 | 9.6 | 7.5 | 9.3 | 8.3 | 11.8 | 9.8 | 8.0 | 9.4 | 9.9 |
| **(La/Sm)N** | 4.0 | 3.8 | 3.6 | 3.9 | 3.6 | 3.8 | 3.3 | 3.4 | 3.9 | 3.5 | 3.7 | 3.7 | 4.0 | 3.7 | 3.3 | 3.4 | 3.6 |
| **(Gd/Yb)N** | | | | | | | | | | | | | | | | | |

Chondrite normalised REE values were calculated using the data from Boynton (1984), as given in Appendix D

Analyses by INAA at Becquerel Labratories, Lucas Heights, NSW, Australia

# Appendix H. Volcanic Rock REE Data from the Southern Mt. Read Volcanics.

| | Data from **This Study** **Mt. Darwin, CVC** | Data from **This Study** **Clark Valley, YRS** | | |
|---|---|---|---|---|
| | Feld- Phyric dacite | Coherent Qtz. Feld-Phyric Rhyolite | Coherent Qtz. Feld-Phyric Rhyolite | Coherent Qtz. Feld-Phyric Rhyolite |
| | **B2051** | **B1077** | **B1098** | **B2007** |
| La | 52.60 | 43.20 | 54.10 | 46.10 |
| Ce | 91.70 | 78.00 | 122.00 | 154.00 |
| Pr | | | | |
| Nd | 47.00 | 38.70 | 45.30 | 34.60 |
| Pm | | | | |
| Sm | 7.80 | 6.80 | 7.90 | 6.00 |
| Eu | 1.35 | 1.07 | 1.24 | 0.96 |
| Gd | 5.80 | 5.10 | 6.20 | 4.90 |
| Tb | 0.73 | 0.74 | 0.86 | 0.77 |
| Dy | | | | |
| Ho | | | | |
| Er | 2.70 | 3.00 | 2.70 | 3.40 |
| Tm | | | | |
| Yb | 3.30 | 3.20 | 2.50 | 3.60 |
| Lu | 0.60 | 0.50 | 0.40 | 0.60 |
| **Chondrite Normalised values** | | | | |
| La | 169.68 | 139.35 | 174.52 | 148.71 |
| Ce | 113.49 | 96.53 | 150.99 | 190.59 |
| Pr | | | | |
| Nd | 78.33 | 64.50 | 75.50 | 57.67 |
| Pm | | | | |
| Sm | 40.00 | 34.87 | 40.51 | 30.77 |
| Eu | 18.37 | 14.56 | 16.87 | 13.06 |
| Gd | 22.39 | 19.69 | 23.94 | 18.92 |
| Tb | 15.40 | 15.61 | 18.14 | 16.24 |
| Dy | | | | |
| Ho | | | | |
| Er | 12.86 | 14.29 | 12.86 | 16.19 |
| Tm | | | | |
| Yb | 15.79 | 15.31 | 11.96 | 17.22 |
| Lu | 18.63 | 15.53 | 12.42 | 18.63 |
| **(La/Yb)N** | 10.7 | 9.1 | 14.6 | 8.6 |
| **(La/Sm)N** | 4.2 | 4.0 | 4.3 | 4.8 |
| **(Gd/Yb)N** | 1.4 | 1.3 | 2.0 | 1.1 |

Chondrite normalised REE values were calculated using the data from Boynton (1984), as given in Appendix D

Analyses by Analabs, Perth, Australia

# Appendix I. Feldspar Microprobe Data from the Jukes Road.



| Sample Number | SiO2 | TiO2 | Al2O3 | Fe2O3 | MgO | CaO | SrO | BaO | Na2O | K2O | Rb2O | Sum Ox% | Si | Ti | Al/Al IV | Al VI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10190-MJ-96-4a-feld | 63.74 | 0 | 19.12 | 0.42 | 0 | 0 | 0 | 1.2 | 0.39 | 16.07 | 0 | 100.94 | 2.95 | 0 | 1.043 | 1.043 |
| 10190-MJ-96-4b-feld-1 | 63.1 | 0.09 | 18.78 | 1.37 | 0.18 | 0 | 0 | 0.5 | 0.31 | 15.09 | 0 | 99.44 | 2.944 | 0.003 | 1.033 | 1.033 |
| 10190-MJ-96-4b-feld-2 | 64.42 | 0 | 18.92 | 0.09 | 0.01 | 0 | 0 | 0.53 | 0.28 | 16.53 | 0 | 100.79 | 2.971 | 0 | 1.029 | 1.029 |
| 10190-MJ-96-4b-feld-5 | 63.18 | 0.04 | 18.95 | 0.83 | 0.06 | 0 | 0 | 0.91 | 0.29 | 15.49 | 0 | 99.75 | 2.948 | 0.001 | 1.042 | 1.042 |
| 10190-MJ-96-4e-feld-1 | 63.67 | 0 | 19.22 | 0.03 | 0.02 | 0 | 0 | 1.11 | 0.42 | 16.03 | 0 | 100.49 | 2.954 | 0 | 1.051 | 1.051 |
| 10190-MJ-96-4e-feld-2 | 64.04 | 0.02 | 19.01 | 0.16 | 0 | 0 | 0 | 0.67 | 0.35 | 15.92 | 0 | 100.17 | 2.967 | 0.001 | 1.038 | 1.038 |
| 10190-MJ-96-4f-feld-1 | 64.67 | 0 | 19.03 | 0.01 | 0 | 0 | 0 | 0.58 | 0.31 | 16.25 | 0 | 100.85 | 2.975 | 0 | 1.032 | 1.032 |
| 10190-MJ-96-4f-feld-2 | 57.76 | 0.08 | 21.62 | 2.57 | 0.53 | 0 | 0 | 0.46 | 0.18 | 14 | 0 | 97.2 | 2.77 | 0.003 | 1.222 | 1.222 |
| 10210b-feld | 65.77 | 0 | 19.15 | 0.89 | 0.04 | 0 | 0 | 0.74 | 0.33 | 14.94 | 0 | 101.87 | 2.979 | 0 | 1.023 | 1.023 |
| 10220a-feld-pheno-1 | 64.15 | 0 | 19.36 | 0.12 | 0 | 0 | 0 | 0.65 | 0.28 | 16.57 | 0 | 101.15 | 2.953 | 0 | 1.05 | 1.05 |
| 10220a-feld-pheno-2 | 61.11 | 0.06 | 19.02 | 4.04 | 0.52 | 0 | 0 | 0.27 | 0.32 | 14.92 | 0 | 100.27 | 2.856 | 0.002 | 1.047 | 1.047 |
| 10250-feld-1 | 64.65 | 0 | 19.31 | 0.13 | 0.01 | 0 | 0 | 0.79 | 0.44 | 16.36 | 0 | 101.69 | 2.959 | 0 | 1.042 | 1.042 |
| 10250-feld-2 | 62.86 | 3.82 | 19.59 | 0.75 | 0.08 | 0 | 0 | 0.18 | 5.29 | 7.9 | 0 | 100.46 | 2.836 | 0.13 | 1.042 | 1.042 |
| 10250b-feld-1 | 64.09 | 0.05 | 19.21 | 0.2 | 0.03 | 0.02 | 0 | 0.87 | 0.4 | 16.46 | 0 | 101.34 | 2.951 | 0.002 | 1.043 | 1.043 |
| 10250b-feld-2 | 61.53 | 0 | 20.73 | 1.53 | 0.28 | 0 | 0 | 0.62 | 0.28 | 15.66 | 0 | 100.64 | 2.856 | 0 | 1.134 | 1.134 |
| 10290b-feld | 61.91 | 0 | 18.63 | 1.25 | 0 | 0 | 0 | 0.56 | 0.24 | 15.68 | 0 | 98.28 | 2.937 | 0 | 1.042 | 1.042 |
| 10290b-feld | 61.2 | 0 | 17.56 | 5.45 | 0.22 | 0.02 | 0 | 0.49 | 0.3 | 13.26 | 0 | 98.53 | 2.899 | 0 | 0.98 | 0.98 |
| 10750a-feld | 69.01 | 0.03 | 20.25 | 0.25 | 0.01 | 0.07 | 0 | 0.01 | 11.47 | 0.16 | 0 | 101.26 | 2.977 | 0.001 | 1.029 | 1.029 |
| 10750c-feld | 66.95 | 0 | 21.02 | 0.08 | 0 | 0.07 | 0 | 0.06 | 11.07 | 0.1 | 0 | 99.36 | 2.942 | 0 | 1.089 | 1.089 |
| 10750c-feld | 61.96 | 0.07 | 26.89 | 0.1 | 0.05 | 0.04 | 0 | 0 | 10.27 | 0.2 | 0.01 | 99.6 | 2.725 | 0.002 | 1.394 | 1.394 |

| | Fe3+ | Mg | Ca | Sr | Ba | Na | K | Rb | Sum Cat# | Ab | An | Or | Celsian | Rb-Feld | Sr-Feld |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10190-MJ-96-4a-feld | 0.014 | 0 | 0 | 0 | 0.022 | 0.035 | 0.949 | 0 | 5.013 | 3.49 | 0.008 | 94.34 | 2.157 | 0 | 0.004 |
| 10190-MJ-96-4b-feld-1 | 0.048 | 0.013 | 0 | 0 | 0.009 | 0.028 | 0.898 | 0 | 4.976 | 3.037 | 0.009 | 95.97 | 0.979 | 0 | 0.005 |
| 10190-MJ-96-4b-feld-2 | 0.003 | 0.001 | 0 | 0 | 0.01 | 0.025 | 0.972 | 0 | 5.011 | 2.455 | 0.008 | 96.575 | 0.957 | 0 | 0.004 |
| 10190-MJ-96-4b-feld-5 | 0.029 | 0.004 | 0 | 0 | 0.017 | 0.026 | 0.922 | 0 | 4.989 | 2.702 | 0.008 | 95.57 | 1.715 | 0 | 0.005 |
| 10190-MJ-96-4e-feld-1 | 0.001 | 0.001 | 0 | 0 | 0.02 | 0.037 | 0.949 | 0 | 5.013 | 3.724 | 0.008 | 94.264 | 1.999 | 0 | 0.004 |
| 10190-MJ-96-4e-feld-2 | 0.006 | 0 | 0 | 0 | 0.012 | 0.032 | 0.941 | 0 | 4.997 | 3.227 | 0.008 | 95.528 | 1.232 | 0 | 0.004 |
| 10190-MJ-96-4f-feld-1 | 0 | 0 | 0 | 0 | 0.01 | 0.028 | 0.954 | 0 | 4.999 | 2.781 | 0.008 | 96.16 | 1.046 | 0 | 0.004 |
| 10190-MJ-96-4f-feld-2 | 0.093 | 0.038 | 0 | 0 | 0.009 | 0.017 | 0.856 | 0 | 5.007 | 1.946 | 0.009 | 97.068 | 0.971 | 0 | 0.005 |
| 10210b-feld | 0.03 | 0.003 | 0 | 0 | 0.013 | 0.029 | 0.863 | 0 | 4.94 | 3.206 | 0.009 | 95.32 | 1.46 | 0 | 0.005 |
| 10220a-feld-pheno-1 | 0.004 | 0 | 0 | 0 | 0.012 | 0.025 | 0.973 | 0 | 5.019 | 2.514 | 0.008 | 96.305 | 1.169 | 0 | 0.004 |
| 10220a-feld-pheno-2 | 0.142 | 0.036 | 0 | 0 | 0.005 | 0.029 | 0.89 | 0 | 5.007 | 3.14 | 0.009 | 96.308 | 0.538 | 0 | 0.005 |
| 10250-feld-1 | 0.004 | 0.001 | 0 | 0 | 0.014 | 0.039 | 0.955 | 0 | 5.014 | 3.875 | 0.008 | 94.716 | 1.397 | 0 | 0.004 |
| 10250-feld-2 | 0.025 | 0.005 | 0 | 0 | 0.003 | 0.463 | 0.455 | 0 | 4.959 | 50.28 | 0.008 | 49.367 | 0.34 | 0 | 0.005 |
| 10250b-feld-1 | 0.007 | 0.002 | 0.001 | 0 | 0.016 | 0.036 | 0.967 | 0 | 5.024 | 3.544 | 0.091 | 94.822 | 1.539 | 0 | 0.004 |
| 10250b-feld-2 | 0.054 | 0.02 | 0 | 0 | 0.011 | 0.026 | 0.927 | 0 | 5.027 | 2.655 | 0.008 | 96.17 | 1.162 | 0 | 0.005 |
| 10290b-feld | 0.045 | 0 | 0 | 0 | 0.01 | 0.022 | 0.949 | 0 | 5.005 | 2.262 | 0.008 | 96.671 | 1.054 | 0 | 0.005 |
| 10290b-feld | 0.194 | 0.016 | 0.001 | 0 | 0.009 | 0.028 | 0.801 | 0 | 4.928 | 3.333 | 0.132 | 95.436 | 1.093 | 0 | 0.005 |
| 10750a-feld | 0.008 | 0.001 | 0.003 | 0 | 0 | 0.96 | 0.009 | 0 | 4.988 | 98.729 | 0.317 | 0.924 | 0.026 | 0 | 0.004 |
| 10750c-feld | 0.003 | 0 | 0.003 | 0 | 0.001 | 0.943 | 0.006 | 0 | 4.987 | 98.965 | 0.324 | 0.591 | 0.115 | 0 | 0.005 |
| 10750c-feld | 0.003 | 0.003 | 0.002 | 0 | 0 | 0.876 | 0.011 | 0 | 5.017 | 98.508 | 0.196 | 1.245 | 0 | 0.045 | 0.005 |

# Appendix J. Microprobe Analytical Results for Micas from the Jukes Road.



| Sample Number | Habit | Ox%(Si) | Ox%(Ti) | Ox%(Al) | Ox%(Fe) | Ox%(Mn) | Ox%(Mg) | Ox%(Ca) | Ox%(Na) | Ox%(K ) | Ox%(P ) | Ox%(Cl) | Ox%(Cr) | Ox%(Ni) | Ox%(Zn) | Ox%(Rb) | Ox%(Sr) | Ox%(Ba) | Total | FeO+MgO | 100*MgO/ (FeO+MgO) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Phengites** | | | | | | | | | | | | | | | | | | | | | |
| 10750a-mica-lath-1 | Feld. Pheno. Repl. | 51.54 | 0.21 | 28.66 | 4.77 | 0.00 | 2.05 | 0.03 | 0.04 | 7.55 | 0.03 | 0.00 | 0.00 | 0.04 | 0.06 | 0.00 | 0.00 | 0.09 | 95.07 | 6.83 | 30.08 |
| 10750a-mica-interstitial-2 | Interstitial | 51.02 | 0.19 | 27.67 | 4.20 | 0.00 | 2.16 | 0.02 | 0.13 | 10.72 | 0.04 | 0.05 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 96.23 | 6.37 | 33.99 |
| 10750c-mica-lath-2 | Feld. Pheno. Repl. | 50.55 | 0.13 | 27.84 | 3.78 | 0.00 | 1.76 | 0.08 | 0.14 | 10.09 | 0.00 | 0.03 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 94.51 | 5.54 | 31.82 |
| 10750a-mica-interstitial-3 | Interstitial | 50.41 | 0.11 | 28.87 | 4.09 | 0.00 | 1.93 | 0.06 | 0.07 | 10.65 | 0.03 | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 | 0.17 | 96.49 | 6.02 | 31.99 |
| 10750c-mica-2 | Feld. Pheno. Repl. | 50.27 | 0.13 | 29.55 | 3.62 | 0.00 | 1.82 | 0.00 | 0.10 | 10.32 | 0.00 | 0.02 | 0.03 | 0.00 | 0.00 | 0.01 | 0.00 | 0.05 | 95.95 | 5.45 | 33.46 |
| 10750c-mica-lath-5 | Feld. Pheno. Repl. | 50.22 | 0.17 | 30.87 | 3.54 | 0.00 | 1.66 | 0.08 | 0.30 | 10.25 | 0.07 | 0.06 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 0.15 | 97.42 | 5.19 | 31.92 |
| 10750a-mica-4 | Interstitial | 49.78 | 0.20 | 27.59 | 4.67 | 0.06 | 1.98 | 0.02 | 0.06 | 10.53 | 0.01 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.09 | 95.01 | 6.65 | 29.83 |
| 10750c-mica-lath-7 | Feld. Pheno. Repl. | 49.65 | 0.26 | 29.35 | 4.90 | 0.00 | 1.86 | 0.02 | 0.08 | 10.31 | 0.01 | 0.02 | 0.00 | 0.03 | 0.08 | 0.00 | 0.00 | 0.15 | 96.72 | 6.76 | 27.58 |
| 10750c-mica-3 | Feld. Pheno. Repl. | 49.53 | 0.16 | 29.10 | 4.21 | 0.02 | 1.82 | 0.03 | 0.15 | 11.06 | 0.03 | 0.01 | 0.00 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 96.15 | 6.03 | 30.19 |
| 10750a-mica-1 | Interstitial | 49.50 | 0.27 | 31.02 | 4.00 | 0.02 | 1.54 | 0.06 | 0.12 | 10.73 | 0.01 | 0.01 | 0.01 | 0.00 | 0.10 | 0.00 | 0.00 | 0.08 | 97.45 | 5.53 | 27.76 |
| 10750a-mica-2 | Interstitial | 49.01 | 0.24 | 29.99 | 4.57 | 0.07 | 1.67 | 0.03 | 0.07 | 10.28 | 0.00 | 0.01 | 0.00 | 0.03 | 0.00 | 0.00 | 0.00 | 0.23 | 96.20 | 6.24 | 26.81 |
| 10750c-mica-4 | Feld. Pheno. Repl. | 48.61 | 0.20 | 30.44 | 4.18 | 0.00 | 1.54 | 0.06 | 0.08 | 10.56 | 0.00 | 0.02 | 0.01 | 0.00 | 0.09 | 0.00 | 0.00 | 0.06 | 95.86 | 5.73 | 26.93 |
| 10420a-mica-2 | Quartz chlorite vein | 49.85 | 0.05 | 29.32 | 4.91 | 0.00 | 1.57 | 0.00 | 0.10 | 10.45 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.02 | 96.29 | 6.48 | 24.25 |
| 10420a-mica-9 | Quartz chlorite vein | 49.82 | 0.18 | 30.15 | 3.66 | 0.05 | 1.61 | 0.02 | 0.09 | 10.30 | 0.00 | 0.02 | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 | 0.16 | 96.14 | 5.27 | 30.49 |
| 10420a-mica-1 | Quartz chlorite vein | 48.71 | 0.07 | 30.27 | 5.07 | 0.02 | 1.52 | 0.02 | 0.07 | 10.65 | 0.03 | 0.02 | 0.02 | 0.00 | 0.10 | 0.00 | 0.00 | 0.17 | 96.75 | 6.59 | 23.07 |
| 10330a-mica-2 | Intergranular | 48.95 | 0.27 | 29.16 | 5.15 | 0.05 | 1.58 | 0.03 | 0.12 | 10.83 | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.22 | 96.40 | 6.73 | 23.43 |
| 10330d-mica-1 | Intergranular | 48.84 | 0.19 | 30.70 | 4.25 | 0.00 | 1.57 | 0.04 | 0.13 | 10.05 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.12 | 95.94 | 5.82 | 26.98 |
| 10250c-mica-1 | Feld. Pheno. Repl. | 48.45 | 0.36 | 32.45 | 4.28 | 0.02 | 1.36 | 0.02 | 0.13 | 10.42 | 0.00 | 0.02 | 0.00 | 0.03 | 0.00 | 0.00 | 0.00 | 0.18 | 97.73 | 5.64 | 24.12 |
| **Transitional analyses from Chlorite to Phengite** | | | | | | | | | | | | | | | | | | | | | |
| 10140a-chlorite-inter-2 | Breccia, Interstitial | 42.71 | 0.10 | 23.19 | 17.47 | 0.04 | 1.66 | 0.01 | 0.12 | 8.43 | 0.00 | 0.02 | 0.05 | 0.00 | 0.10 | 0.00 | 0.00 | 0.16 | 94.05 | 19.12 | 8.66 |
| 10140a-chlorite-inter-3 | Breccia, Interstitial | 41.15 | 0.07 | 23.01 | 21.41 | 0.11 | 2.14 | 0.01 | 0.09 | 6.57 | 0.04 | 0.00 | 0.00 | 0.00 | 0.13 | 0.00 | 0.00 | 0.19 | 94.94 | 23.55 | 9.10 |
| 10140b-chlorite-matrix-2 | Breccia, Matrix | 38.40 | 0.04 | 19.74 | 25.20 | 0.12 | 2.20 | 0.01 | 0.16 | 5.73 | 0.00 | 0.00 | 0.00 | 0.08 | 0.02 | 0.00 | 0.00 | 0.42 | 92.13 | 27.41 | 8.04 |
| 10190-MJ-96-4e-mica-1 | Feld. Pheno. Repl. | 47.89 | 0.10 | 29.41 | 6.65 | 0.00 | 1.45 | 0.02 | 0.07 | 9.98 | 0.00 | 0.00 | 0.00 | 0.04 | 0.00 | 0.00 | 0.00 | 0.19 | 95.80 | 8.10 | 17.90 |
| 10190-MJ-96-4e-mica-2 | Feld. Pheno. Repl. | 48.79 | 0.11 | 29.17 | 6.68 | 0.02 | 1.65 | 0.03 | 0.11 | 10.34 | 0.00 | 0.08 | 0.02 | 0.02 | 0.12 | 0.00 | 0.00 | 0.09 | 97.24 | 8.33 | 19.78 |
| 10190-MJ-96-4f-mica-1 | Feld. Pheno. Repl. | 48.14 | 0.26 | 27.50 | 6.69 | 0.04 | 1.42 | 0.05 | 0.05 | 10.55 | 0.02 | 0.02 | 0.04 | 0.02 | 0.00 | 0.00 | 0.00 | 0.25 | 95.05 | 8.10 | 17.47 |
| 10190-MJ-96-4f-mica-2 | Feld. Pheno. Repl. | 47.04 | 0.12 | 30.32 | 6.53 | 0.01 | 0.99 | 0.00 | 0.16 | 10.94 | 0.00 | 0.11 | 0.03 | 0.05 | 0.09 | 0.00 | 0.00 | 0.04 | 96.42 | 7.52 | 13.20 |
| 10190-MJ-96-4f-mica-3 | Feld. Pheno. Repl. | 47.32 | 0.16 | 31.05 | 6.68 | 0.00 | 1.09 | 0.00 | 0.15 | 10.82 | 0.07 | 0.14 | 0.00 | 0.05 | 0.10 | 0.00 | 0.00 | 0.08 | 97.72 | 7.78 | 14.06 |
| 10220a-chlorite-pheno-1 | Feld. Pheno. Repl. | 39.45 | 0.12 | 25.43 | 18.29 | 0.16 | 2.20 | 0.00 | 0.16 | 6.77 | 0.01 | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 92.66 | 20.50 | 10.76 |
| 10220a-chlorite-pheno-2 | Feld. Pheno. Repl. | 45.44 | 0.08 | 27.80 | 13.32 | 0.18 | 2.05 | 0.04 | 0.08 | 7.04 | 0.00 | 0.02 | 0.00 | 0.00 | 0.07 | 0.00 | 0.00 | 0.19 | 96.30 | 15.37 | 13.31 |
| 10220a-chlorite-pheno-3 | Feld. Pheno. Repl. | 42.60 | 0.21 | 25.38 | 15.02 | 0.00 | 2.56 | 0.01 | 0.07 | 8.00 | 0.00 | 0.02 | 0.04 | 0.03 | 0.14 | 0.00 | 0.00 | 0.08 | 94.17 | 17.59 | 14.58 |
| 10220a-chlorite-pheno-4 | Feld. Pheno. Repl. | 38.05 | 0.22 | 23.95 | 20.68 | 0.11 | 3.03 | 0.00 | 0.10 | 6.28 | 0.07 | 0.10 | 0.00 | 0.04 | 0.08 | 0.00 | 0.00 | 0.17 | 92.88 | 23.70 | 12.76 |
| 10220f-chlorite-mag-1 | Chlorite in contact with magnetite | 40.63 | 0.27 | 25.26 | 15.49 | 0.10 | 2.67 | 0.04 | 0.08 | 7.07 | 0.05 | 0.04 | 0.00 | 0.00 | 0.12 | 0.00 | 0.00 | 0.06 | 91.87 | 18.16 | 14.71 |
| 10250b-mica-1 | Feld. Pheno. Repl. | 48.84 | 0.26 | 29.89 | 5.94 | 0.04 | 1.59 | 0.01 | 0.12 | 10.50 | 0.00 | 0.03 | 0.02 | 0.03 | 0.01 | 0.00 | 0.00 | 0.14 | 97.42 | 7.53 | 21.10 |
| 10250c-mica-2 | Feld. Pheno. Repl. | 48.02 | 0.29 | 30.27 | 5.46 | 0.05 | 1.57 | 0.02 | 0.11 | 10.28 | 0.00 | 0.03 | 0.00 | 0.00 | 0.15 | 0.00 | 0.00 | 0.21 | 96.47 | 7.03 | 22.29 |
| 10290a-chl-1 | Feld. Pheno. Repl. | 31.66 | 0.00 | 21.90 | 28.40 | 0.17 | 2.42 | 0.03 | 0.12 | 2.84 | 0.02 | 0.07 | 0.01 | 0.00 | 0.14 | 0.00 | 0.00 | 0.16 | 87.95 | 30.82 | 7.86 |
| 10290a-mica-5 | Feld. Pheno. Repl. | 45.60 | 0.01 | 19.67 | 16.37 | 0.09 | 1.36 | 0.07 | 0.23 | 8.75 | 0.01 | 0.07 | 0.03 | 0.03 | 0.00 | 0.00 | 0.00 | 0.31 | 92.60 | 17.73 | 7.69 |
| 10330a-mica-1 | Intergranular | 44.80 | 0.21 | 26.90 | 6.41 | 0.05 | 1.82 | 0.02 | 0.05 | 8.77 | 0.06 | 0.03 | 0.02 | 0.03 | 0.07 | 0.00 | 0.00 | 0.22 | 89.45 | 8.23 | 22.15 |
| 10330a-mica-10 | Intergranular | 45.90 | 0.19 | 28.95 | 8.99 | 0.04 | 1.87 | 0.00 | 0.07 | 9.21 | 0.05 | 0.02 | 0.00 | 0.01 | 0.09 | 0.00 | 0.00 | 0.09 | 95.48 | 10.86 | 17.23 |
| 10330a-mica-6 | Intergranular | 47.85 | 0.22 | 28.70 | 7.10 | 0.06 | 1.96 | 0.00 | 0.10 | 10.33 | 0.00 | 0.02 | 0.03 | 0.01 | 0.09 | 0.00 | 0.00 | 0.11 | 96.58 | 9.06 | 21.61 |
| 10330a-mica-9 | Intergranular | 47.46 | 0.28 | 30.13 | 5.78 | 0.08 | 1.70 | 0.00 | 0.11 | 10.29 | 0.02 | 0.01 | 0.00 | 0.00 | 0.04 | 0.00 | 0.00 | 0.26 | 96.17 | 7.48 | 22.67 |
| 10330b-mica-1 | Biotite Pheno. Repl. | 32.89 | 0.14 | 23.23 | 25.46 | 0.29 | 4.32 | 0.01 | 0.06 | 3.68 | 0.00 | 0.01 | 0.01 | 0.02 | 0.03 | 0.00 | 0.00 | 0.04 | 90.20 | 29.78 | 14.51 |
| 10330b-mica-2 | Biotite Pheno. Repl. | 36.08 | 0.12 | 22.56 | 18.72 | 0.20 | 3.68 | 0.04 | 0.15 | 4.57 | 0.00 | 0.03 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 86.25 | 22.40 | 16.42 |
| 10330d-mica-2 | Intergranular | 46.71 | 0.14 | 29.49 | 7.87 | 0.05 | 2.05 | 0.00 | 0.09 | 7.82 | 0.04 | 0.04 | 0.02 | 0.06 | 0.00 | 0.00 | 0.00 | 0.14 | 94.53 | 9.92 | 20.69 |
| 10420a-mica-10 | Quartz chlorite vein | 47.80 | 0.24 | 29.08 | 5.32 | 0.01 | 1.78 | 0.00 | 0.08 | 10.66 | 0.02 | 0.01 | 0.03 | 0.00 | 0.14 | 0.00 | 0.00 | 0.23 | 95.42 | 7.11 | 25.12 |
| 10420a-mica-5 | Quartz chlorite vein | 48.15 | 0.14 | 29.88 | 6.04 | 0.02 | 1.38 | 0.00 | 0.08 | 11.18 | 0.00 | 0.02 | 0.02 | 0.08 | 0.07 | 0.00 | 0.00 | 0.30 | 97.36 | 7.42 | 18.60 |
| 10750c-mica-1 | Feld. Pheno. Repl. | 47.68 | 0.42 | 28.92 | 6.24 | 0.05 | 1.81 | 0.01 | 0.09 | 11.17 | 0.02 | 0.02 | 0.07 | 0.04 | 0.00 | 0.00 | 0.01 | 0.45 | 97.00 | 8.06 | 22.50 |

# Appendix J. Microprobe Analytical Results for Micas from the Jukes Road.



| Sample Number | Habit | Ox%(Si) | Ox%(Ti) | Ox%(Al) | Ox%(Fe) | Ox%(Mn) | Ox%(Mg) | Ox%(Ca) | Ox%(Na) | Ox%(K) | Ox%(P) | Ox%(Cl) | Ox%(Cr) | Ox%(Ni) | Ox%(Zn) | Ox%(Rb) | Ox%(Sr) | Ox%(Ba) | Total | FeO+MgO | 100*MgO (FeO+MgO) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Chlorites** | | | | | | | | | | | | | | | | | | | | | |
| 10140b-chlorite-matrix-1 | Breccia, Matrix | 23.88 | 0.05 | 19.90 | 39.81 | 0.21 | 3.63 | 0.05 | 0.02 | 0.10 | 0.01 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 87.69 | 43.43 | 8.35 |
| 10140b-chlorite-matrix-3 | Breccia, Matrix | 24.75 | 0.02 | 20.22 | 39.32 | 0.19 | 3.65 | 0.03 | 0.04 | 0.36 | 0.00 | 0.04 | 0.00 | 0.04 | 0.03 | 0.00 | 0.00 | 0.00 | 88.68 | 42.97 | 8.50 |
| 10190-MJ-96-4b-chlorite- | Feld. Pheno. Repl. | 23.78 | 0.02 | 18.91 | 38.79 | 0.14 | 5.93 | 0.01 | 0.03 | 0.23 | 0.00 | 0.01 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.08 | 87.99 | 44.72 | 13.26 |
| 10200a-chlorite-vein-1 | Chlotite vein | 24.41 | 0.02 | 19.77 | 40.09 | 0.28 | 3.78 | 0.07 | 0.03 | 0.09 | 0.00 | 0.00 | 0.00 | 0.05 | 0.05 | 0.00 | 0.00 | 0.00 | 88.64 | 43.87 | 8.62 |
| 10200a-chlorite-vein-2 | Chlotite vein | 26.89 | 0.01 | 20.89 | 37.06 | 0.27 | 3.15 | 0.07 | 0.02 | 0.84 | 0.00 | 0.00 | 0.02 | 0.02 | 0.06 | 0.00 | 0.00 | 0.00 | 89.31 | 40.21 | 7.84 |
| 10200a-chlorite-vein-3 | Chlotite vein | 28.88 | 0.03 | 21.77 | 32.75 | 0.26 | 2.81 | 0.06 | 0.03 | 1.67 | 0.00 | 0.00 | 0.00 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 88.28 | 35.56 | 7.89 |
| 10210a-chlorite-breccia- | Breccia, Matrix | 23.53 | 0.05 | 20.60 | 38.36 | 0.52 | 5.59 | 0.04 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.11 | 0.00 | 0.00 | 0.00 | 88.82 | 43.95 | 12.71 |
| 10210a-chlorite-breccia- | Breccia, Matrix | 23.30 | 0.06 | 20.87 | 39.22 | 0.43 | 5.14 | 0.06 | 0.05 | 0.02 | 0.00 | 0.02 | 0.00 | 0.00 | 0.07 | 0.06 | 0.00 | 0.02 | 89.32 | 44.36 | 11.59 |
| 10210a-chlorite-breccia- | Breccia, Matrix | 23.03 | 0.03 | 20.16 | 41.10 | 0.43 | 3.85 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.19 | 0.00 | 0.00 | 0.06 | 88.88 | 44.95 | 8.56 |
| 10210a-chlorite-unknown- | Breccia, Matrix | 23.39 | 0.04 | 20.61 | 39.61 | 0.49 | 5.21 | 0.00 | 0.06 | 0.03 | 0.00 | 0.02 | 0.00 | 0.00 | 0.14 | 0.01 | 0.00 | 0.00 | 89.62 | 44.81 | 11.62 |
| 10210b-chlorite-1 | Breccia, Matrix | 32.44 | 0.38 | 21.31 | 35.09 | 0.00 | 1.16 | 0.03 | 0.07 | 7.81 | 0.00 | 0.00 | 0.00 | 0.01 | 0.16 | 0.00 | 0.00 | 0.16 | 98.63 | 36.25 | 3.20 |
| 10220b-chlorite-pheno-2 | Feld. Pheno. Repl. | 24.99 | 0.08 | 19.28 | 40.04 | 0.38 | 4.22 | 0.03 | 0.07 | 0.29 | 0.13 | 0.01 | 0.01 | 0.00 | 0.17 | 0.03 | 0.00 | 0.05 | 89.79 | 44.26 | 9.54 |
| 10220c-chlorite-1 | Interstitial | 22.96 | 0.06 | 21.15 | 39.45 | 0.31 | 4.73 | 0.03 | 0.04 | 0.19 | 0.04 | 0.02 | 0.00 | 0.00 | 0.13 | 0.00 | 0.00 | 0.00 | 89.11 | 44.18 | 10.71 |
| 10220c-chlorite-2 | Interstitial | 23.05 | 0.08 | 19.98 | 39.52 | 0.24 | 4.90 | 0.03 | 0.01 | 0.12 | 0.00 | 0.01 | 0.02 | 0.00 | 0.10 | 0.00 | 0.00 | 0.06 | 88.12 | 44.42 | 11.03 |
| 10220d-chlorite-1 | Interstitial | 23.10 | 0.02 | 19.43 | 39.14 | 0.29 | 4.68 | 0.00 | 0.03 | 0.19 | 0.01 | 0.00 | 0.00 | 0.03 | 0.14 | 0.00 | 0.00 | 0.05 | 87.10 | 43.82 | 10.67 |
| 10220e-chlorite-vein-2 | Chlotite vein | 28.15 | 0.06 | 20.68 | 33.60 | 0.24 | 3.68 | 0.02 | 0.08 | 1.87 | 0.06 | 0.01 | 0.00 | 0.00 | 0.16 | 0.06 | 0.01 | 0.02 | 88.70 | 37.28 | 9.87 |
| 10220f-chlorite-mag-2 | Chlorite in contact with magnetite | 25.54 | 0.08 | 19.56 | 38.54 | 0.31 | 5.87 | 0.02 | 0.00 | 0.51 | 0.00 | 0.07 | 0.02 | 0.01 | 0.15 | 0.00 | 0.00 | 0.00 | 90.68 | 44.42 | 13.22 |
| 10220f-chlorite-mag-3 | Chlorite in contact with magnetite | 28.77 | 0.12 | 20.75 | 33.88 | 0.22 | 5.47 | 0.04 | 0.03 | 1.58 | 0.03 | 0.07 | 0.00 | 0.03 | 0.09 | 0.00 | 0.00 | 0.07 | 91.16 | 39.35 | 13.90 |
| 10250c-chlorite-2 | Interstitial | 24.66 | 4.37 | 17.69 | 33.99 | 0.01 | 6.81 | 0.03 | 0.04 | 0.73 | 0.03 | 0.21 | 0.00 | 0.00 | 0.10 | 0.12 | 0.00 | 0.00 | 88.80 | 40.80 | 16.68 |
| 10290a-chl-2 | Feld. Pheno. Repl. | 29.47 | 0.01 | 18.39 | 31.17 | 0.20 | 2.36 | 0.04 | 0.25 | 2.51 | 0.02 | 0.12 | 0.00 | 0.03 | 0.02 | 0.00 | 0.00 | 0.09 | 84.67 | 33.54 | 7.05 |
| 10290a-mica-2 | Feld. Pheno. Repl. | 31.03 | 0.02 | 20.68 | 30.11 | 0.21 | 2.77 | 0.05 | 0.14 | 2.44 | 0.02 | 0.03 | 0.03 | 0.00 | 0.01 | 0.00 | 0.00 | 0.03 | 87.55 | 32.88 | 8.42 |
| 10290a-mica-3 | Feld. Pheno. Repl. | 24.34 | 0.01 | 19.04 | 38.47 | 0.26 | 3.17 | 0.06 | 0.18 | 0.31 | 0.00 | 0.05 | 0.01 | 0.02 | 0.14 | 0.08 | 0.00 | 0.00 | 86.13 | 41.63 | 7.61 |
| 10330a-chlorite-3 | Biotite Pheno. Repl. | 25.88 | 0.05 | 18.66 | 35.94 | 0.36 | 7.06 | 0.00 | 0.04 | 0.21 | 0.05 | 0.04 | 0.00 | 0.00 | 0.28 | 0.00 | 0.00 | 0.00 | 88.59 | 43.01 | 16.43 |
| 10330a-chlorite-4 | Biotite Pheno. Repl. | 25.47 | 0.06 | 20.02 | 36.38 | 0.35 | 6.47 | 0.01 | 0.04 | 0.18 | 0.03 | 0.03 | 0.01 | 0.01 | 0.21 | 0.00 | 0.00 | 0.15 | 89.42 | 42.85 | 15.10 |
| 10330a-chlorite-5 | Biotite Pheno. Repl. | 24.63 | 0.03 | 19.81 | 37.48 | 0.37 | 6.21 | 0.01 | 0.03 | 0.10 | 0.04 | 0.03 | 0.00 | 0.00 | 0.21 | 0.00 | 0.00 | 0.02 | 88.95 | 43.68 | 14.21 |
| 10330b-mica-7 | Biotite Pheno. Repl. | 25.12 | 0.05 | 19.72 | 36.86 | 0.35 | 5.93 | 0.00 | 0.04 | 0.39 | 0.00 | 0.00 | 0.06 | 0.00 | 0.05 | 0.00 | 0.00 | 0.06 | 88.62 | 42.78 | 13.85 |
| 10580-a-chl1 | Chlotite vein | 23.26 | 0.05 | 20.73 | 37.99 | 0.24 | 6.19 | 0.03 | 0.01 | 0.01 | 0.00 | 0.06 | 0.00 | 0.02 | 0.17 | 0.00 | 0.00 | 0.00 | 88.76 | 44.17 | 14.01 |
| 10580-a-chl11 | Chlotite vein | 23.56 | 0.00 | 19.71 | 37.62 | 0.30 | 6.62 | 0.07 | 0.02 | 0.05 | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 | 0.05 | 0.00 | 0.00 | 88.03 | 44.23 | 14.96 |
| 10580-a-chl3 | Chlotite vein | 23.43 | 0.03 | 20.06 | 37.27 | 0.27 | 6.36 | 0.03 | 0.02 | 0.03 | 0.00 | 0.01 | 0.05 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 87.59 | 43.63 | 14.58 |
| 10580-a-chl4 | Chlotite vein | 23.46 | 0.01 | 19.67 | 38.71 | 0.27 | 6.16 | 0.04 | 0.03 | 0.00 | 0.03 | 0.09 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.03 | 88.57 | 44.87 | 13.72 |
| 10580-a-chl5 | Chlotite vein | 23.46 | 0.07 | 19.38 | 37.67 | 0.23 | 6.69 | 0.06 | 0.04 | 0.03 | 0.02 | 0.03 | 0.03 | 0.04 | 0.12 | 0.04 | 0.00 | 0.00 | 87.91 | 44.36 | 15.08 |
| 10580-a-chl6 | Chlotite vein | 29.42 | 0.06 | 21.81 | 30.23 | 0.19 | 5.14 | 0.08 | 0.10 | 2.53 | 0.05 | 0.04 | 0.01 | 0.00 | 0.09 | 0.06 | 0.00 | 0.01 | 89.82 | 35.38 | 14.53 |
| 10580-a-chl7 | Chlotite vein | 23.06 | 0.06 | 19.86 | 36.79 | 0.15 | 5.63 | 0.10 | 0.05 | 0.24 | 0.07 | 0.04 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.13 | 86.21 | 42.42 | 13.27 |
| 10580-a-chl8 | Chlotite vein | 24.26 | 0.05 | 19.62 | 37.14 | 0.23 | 6.88 | 0.07 | 0.03 | 0.03 | 0.04 | 0.01 | 0.00 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 88.40 | 44.02 | 15.62 |
| 10580-a-chl9 | Chlotite vein | 24.00 | 0.03 | 20.01 | 37.48 | 0.21 | 6.96 | 0.08 | 0.01 | 0.09 | 0.00 | 0.02 | 0.00 | 0.00 | 0.10 | 0.03 | 0.00 | 0.00 | 89.01 | 44.44 | 15.66 |
| 10580-b-chl1 | Biotite Pheno. Repl. | 24.30 | 0.06 | 19.57 | 38.09 | 0.17 | 6.63 | 0.07 | 0.01 | 0.03 | 0.00 | 0.04 | 0.03 | 0.02 | 0.04 | 0.07 | 0.00 | 0.04 | 89.16 | 44.71 | 14.82 |
| 10580-b-chl2 | Biotite Pheno. Repl. | 23.43 | 0.06 | 19.92 | 37.81 | 0.23 | 6.51 | 0.05 | 0.00 | 0.00 | 0.00 | 0.03 | 0.01 | 0.00 | 0.00 | 0.08 | 0.00 | 0.02 | 88.16 | 44.31 | 14.68 |
| 10580-b-chl3 | Biotite Pheno. Repl. | 23.33 | 0.05 | 20.48 | 37.56 | 0.27 | 6.71 | 0.07 | 0.00 | 0.02 | 0.00 | 0.01 | 0.07 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 88.60 | 44.27 | 15.16 |
| 10580-b-chl4 | Biotite Pheno. Repl. | 23.13 | 0.12 | 20.41 | 35.71 | 0.27 | 6.87 | 0.07 | 0.02 | 0.02 | 0.03 | 0.03 | 0.00 | 0.08 | 0.05 | 0.00 | 0.00 | 0.07 | 86.89 | 42.58 | 16.13 |
| 10580-b-chl5 | Biotite Pheno. Repl. | 23.30 | 0.17 | 20.78 | 37.39 | 0.24 | 6.46 | 0.06 | 0.01 | 0.02 | 0.00 | 0.04 | 0.03 | 0.02 | 0.16 | 0.03 | 0.00 | 0.09 | 88.79 | 43.85 | 14.73 |
| 10580-b-chl6 | Biotite Pheno. Repl. | 23.51 | 0.03 | 20.20 | 37.28 | 0.15 | 6.33 | 0.03 | 0.01 | 0.03 | 0.00 | 0.01 | 0.00 | 0.03 | 0.18 | 0.08 | 0.00 | 0.12 | 88.00 | 43.61 | 14.51 |
| 10580-b-chl8 | Biotite Pheno. Repl. | 23.32 | 0.05 | 20.97 | 36.68 | 0.28 | 6.74 | 0.01 | 0.00 | 0.01 | 0.01 | 0.06 | 0.00 | 0.00 | 0.00 | 0.07 | 0.00 | 0.00 | 88.20 | 43.42 | 15.52 |
| 10580-c-chl1 | Biotite Pheno. Repl. | 26.01 | 0.41 | 19.02 | 36.18 | 0.25 | 6.38 | 0.08 | 0.11 | 0.13 | 0.07 | 0.07 | 0.01 | 0.03 | 0.10 | 0.05 | 0.00 | 0.00 | 88.91 | 42.57 | 15.00 |
| 10580-c-chl2 | Biotite Pheno. Repl. | 24.48 | 0.08 | 20.18 | 37.08 | 0.26 | 6.42 | 0.07 | 0.04 | 0.23 | 0.00 | 0.03 | 0.00 | 0.00 | 0.17 | 0.00 | 0.00 | 0.00 | 89.04 | 43.50 | 14.77 |
| 10580-c-chl3 | Biotite Pheno. Repl. | 24.05 | 0.06 | 19.55 | 37.46 | 0.15 | 6.39 | 0.03 | 0.03 | 0.04 | 0.02 | 0.03 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 87.82 | 43.85 | 14.57 |
| 10580-c-chl4 | Biotite Pheno. Repl. | 24.50 | 0.04 | 19.31 | 37.67 | 0.23 | 6.77 | 0.03 | 0.02 | 0.04 | 0.02 | 0.01 | 0.03 | 0.00 | 0.05 | 0.04 | 0.00 | 0.05 | 88.84 | 44.45 | 15.24 |
| 10580-e-chl1 | Biotite Pheno. Repl. | 23.82 | 0.04 | 19.68 | 38.04 | 0.25 | 6.52 | 0.09 | 0.02 | 0.02 | 0.07 | 0.02 | 0.02 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 88.64 | 44.56 | 14.63 |
| 10580-e-chl2 | Biotite Pheno. Repl. | 23.39 | 0.01 | 20.27 | 37.26 | 0.18 | 6.69 | 0.02 | 0.02 | 0.03 | 0.01 | 0.01 | 0.00 | 0.01 | 0.12 | 0.02 | 0.00 | 0.00 | 88.04 | 43.94 | 15.21 |
| 10580-e-chl3 | Biotite Pheno. Repl. | 24.03 | 0.06 | 20.74 | 32.43 | 0.46 | 9.51 | 0.04 | 0.04 | 0.01 | 0.02 | 0.05 | 0.02 | 0.01 | 0.05 | 0.07 | 0.00 | 0.00 | 87.54 | 41.94 | 22.68 |

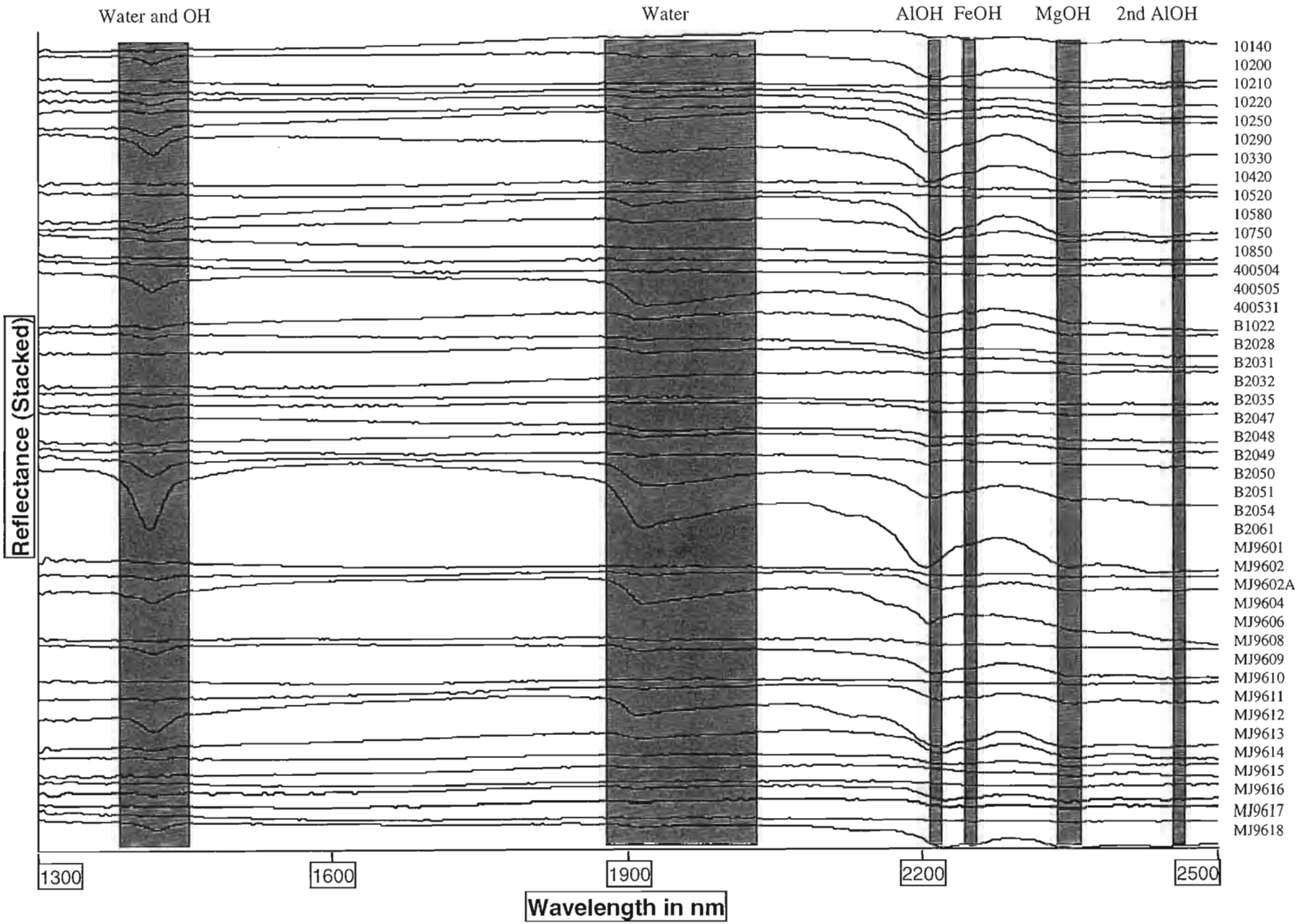
# Appendix J. Microprobe Analytical Results for Micas from the Jukes Road.

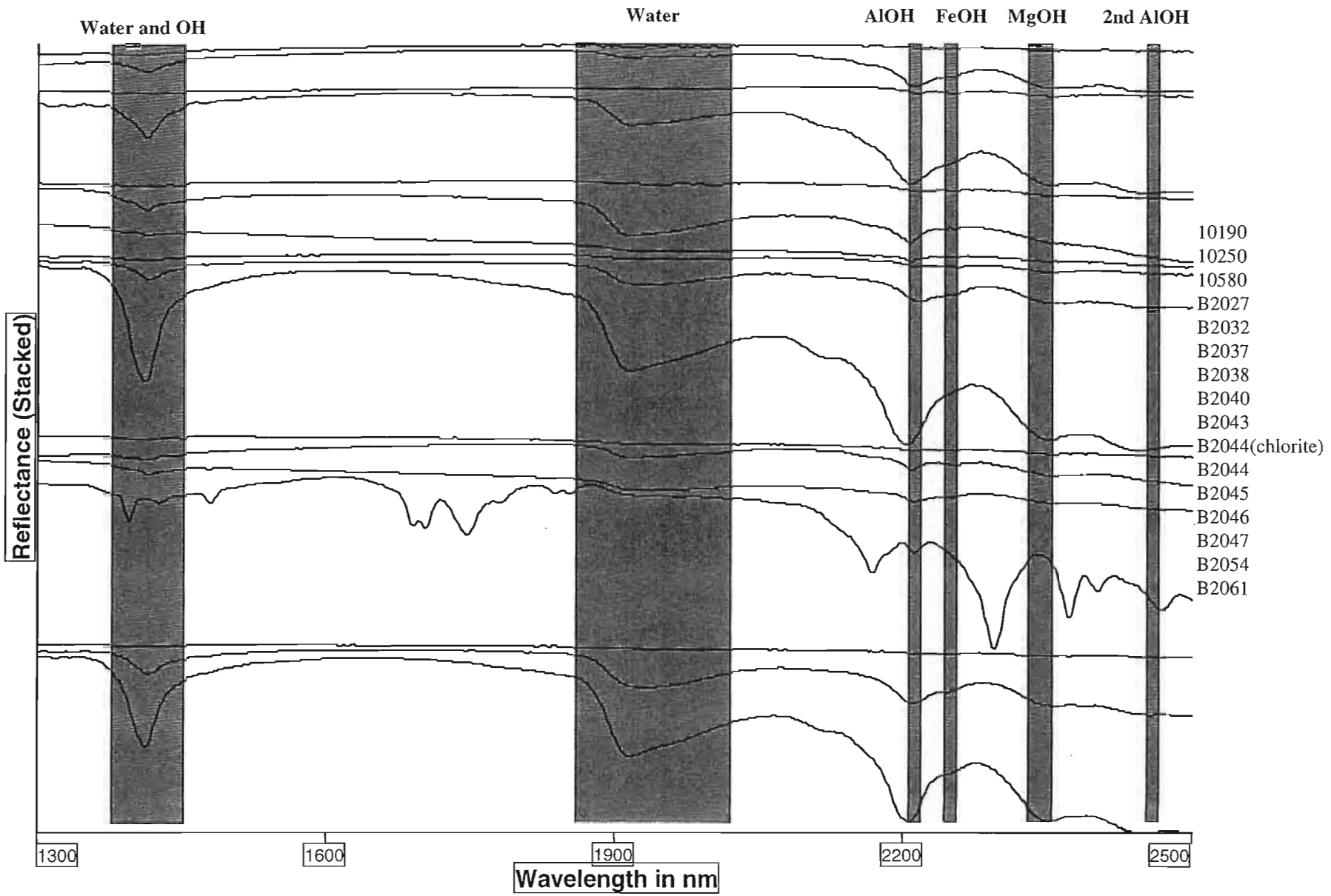
## Chlorite

| Label | Habit | Cations | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | H2O(c) | Si | Ti | Cr | Fe2+ | Mn2+ | Mg | Ca | Na | K | Zn | Ni | OH | Sum Cat# | XMg | XFe | Al VI | Uncorrected Al IV | Corrected Al IV | Chlorite Temp °C | Na+K+2Ca | Fe/(Fe+Mg) | Si/Al |
| 10140b-chlorite-matrix-3 | Breccia Matrix | 10.63 | 5.584 | 0.003 | 0 | 7.418 | 0.036 | 1.228 | 0.006 | 0.019 | 0.103 | 0.004 | 0.007 | 16 | 35.785 | 0.142 | 0.86 | 2.96 | 2.416 | 3.017 | 338 | 0.46 | 0.858 | 1.22 |
| 10190-MJ-96-4b-chlorite-1 | Feldspar Pheno. Repl. | 10.51 | 5.429 | 0.004 | 0 | 7.406 | 0.027 | 2.019 | 0.003 | 0.012 | 0.066 | 0.009 | 0 | 16 | 36.062 | 0.214 | 0.79 | 2.516 | 2.571 | 3.121 | 349 | 0.28 | 0.786 | 1.26 |
| 10190-MJ-96-4b-chlorite-2 | Feldspar Pheno. Repl. | 10.45 | 5.324 | 0.006 | 0 | 8.175 | 0.036 | 1.208 | 0.011 | 0.002 | 0.004 | 0.006 | 0 | 16 | 36.039 | 0.129 | 0.87 | 2.591 | 2.676 | 3.286 | 366 | 0.11 | 0.871 | 1.19 |
| 10200a-chlorite-vein-1 | Chlotite veins | 10.57 | 5.537 | 0.003 | 0 | 7.605 | 0.055 | 1.279 | 0.017 | 0.011 | 0.027 | 0.009 | 0.009 | 16 | 35.837 | 0.144 | 0.86 | 2.822 | 2.463 | 3.062 | 343 | 0.26 | 0.856 | 1.23 |
| 10210a-chlorite-3 | Breccia Matrix | 10.67 | 5.29 | 0.008 | 0 | 7.213 | 0.1 | 1.872 | 0.01 | 0.003 | 0.001 | 0.019 | 0 | 16 | 35.975 | 0.206 | 0.79 | 2.748 | 2.71 | 3.266 | 364 | 0.09 | 0.794 | 1.14 |
| 10210a-chlorite-4 | Breccia Matrix | 10.67 | 5.236 | 0.01 | 0 | 7.372 | 0.082 | 1.722 | 0.014 | 0.02 | 0.005 | 0.012 | 0 | 16 | 36.002 | 0.189 | 0.81 | 2.765 | 2.764 | 3.331 | 371 | 0.19 | 0.811 | 1.12 |
| 10210a-chlorite-5 | Breccia Matrix | 10.48 | 5.269 | 0.005 | 0.001 | 7.865 | 0.083 | 1.311 | 0.001 | 0.005 | 0 | 0.033 | 0 | 16 | 36.01 | 0.143 | 0.86 | 2.706 | 2.731 | 3.331 | 371 | 0.01 | 0.857 | 1.14 |
| 10210a-chlorite-chl-4 | Breccia Matrix | 10.69 | 5.249 | 0.007 | 0 | 7.433 | 0.094 | 1.742 | 0 | 0.028 | 0.008 | 0.023 | 0 | 16 | 36.035 | 0.19 | 0.81 | 2.701 | 2.751 | 3.318 | 370 | 0.09 | 0.810 | 1.13 |
| 10220b-chlorite-pheno-2 | Feldspar Pheno. Repl. | 10.68 | 5.611 | 0.013 | 0.002 | 7.517 | 0.072 | 1.412 | 0.008 | 0.032 | 0.083 | 0.029 | 0 | 16 | 35.882 | 0.158 | 0.84 | 2.713 | 2.389 | 2.978 | 334 | 0.42 | 0.842 | 1.30 |
| 10220c-chlorite-1 | Diffuse Chlorite | 10.62 | 5.185 | 0.01 | 0 | 7.449 | 0.059 | 1.593 | 0.008 | 0.017 | 0.053 | 0.022 | 0 | 16 | 36.026 | 0.176 | 0.82 | 2.814 | 2.815 | 3.392 | 378 | 0.29 | 0.824 | 1.09 |
| 10220c-chlorite-2 | Diffuse Chlorite | 10.48 | 5.275 | 0.014 | 0.003 | 7.566 | 0.047 | 1.672 | 0.006 | 0.006 | 0.035 | 0.017 | 0 | 16 | 36.033 | 0.181 | 0.82 | 2.666 | 2.725 | 3.298 | 368 | 0.19 | 0.819 | 1.15 |
| 10220d-chlorite-1 | Diffuse Chlorite | 10.35 | 5.354 | 0.004 | 0 | 7.588 | 0.058 | 1.616 | 0 | 0.013 | 0.055 | 0.024 | 0.005 | 16 | 36.023 | 0.176 | 0.82 | 2.661 | 2.646 | 3.223 | 360 | 0.22 | 0.824 | 1.19 |
| 10220f-chlorite-mag-2 | Chlotite veins | 10.92 | 5.608 | 0.013 | 0.004 | 7.078 | 0.057 | 1.922 | 0.004 | 0.002 | 0.142 | 0.025 | 0.002 | 16 | 35.918 | 0.214 | 0.79 | 2.67 | 2.392 | 2.943 | 330 | 0.55 | 0.786 | 1.31 |
| 10250c-chlorite-2 | Diffuse Chlorite | 10.82 | 5.464 | 0.728 | 0 | 6.3 | 0.003 | 2.248 | 0.007 | 0.017 | 0.206 | 0.017 | 0 | 16 | 35.61 | 0.263 | 0.74 | 2.084 | 2.536 | 3.052 | 342 | 0.83 | 0.737 | 1.39 |
| 10290a-chlorite-3 | Feldspar Pheno. Repl. | 10.28 | 5.678 | 0.001 | 0.002 | 7.505 | 0.051 | 1.101 | 0.015 | 0.082 | 0.092 | 0.024 | 0.003 | 16 | 35.79 | 0.128 | 0.87 | 2.913 | 2.322 | 2.932 | 329 | 0.61 | 0.872 | 1.28 |
| 10290c-vein-1-chl-1 | Chlotite veins | 10.51 | 5.232 | 0.004 | 0 | 7.412 | 0.147 | 1.738 | 0.008 | 0.015 | 0.012 | 0.024 | 0.003 | 16 | 36.05 | 0.19 | 0.81 | 2.688 | 2.768 | 3.335 | 372 | 0.13 | 0.810 | 1.13 |
| 10290c-vein-1-chl-3 | Chlotite veins | 11.24 | 5.395 | 0.009 | 0 | 6.804 | 0.115 | 1.876 | 0 | 0.031 | 0.045 | 0 | 0 | 16 | 35.848 | 0.216 | 0.78 | 2.967 | 2.605 | 3.154 | 352 | 0.23 | 0.784 | 1.14 |
| 10290c-vein-1-chl-4 | Chlotite veins | 11.21 | 5.379 | 0.007 | 0.005 | 6.894 | 0.098 | 1.831 | 0.002 | 0.032 | 0.045 | 0.014 | 0.003 | 16 | 35.87 | 0.21 | 0.79 | 2.939 | 2.621 | 3.174 | 354 | 0.26 | 0.790 | 1.14 |
| 10290c-vein-1-chl-5 | Chlotite veins | 10.82 | 5.359 | 0.014 | 0 | 7.132 | 0.12 | 1.824 | 0.007 | 0.013 | 0.024 | 0.028 | 0 | 16 | 35.937 | 0.204 | 0.80 | 2.775 | 2.641 | 3.198 | 357 | 0.18 | 0.796 | 1.17 |
| 10290c-vein-1-chl-6 | Chlotite veins | 10.48 | 5.326 | 0.005 | 0 | 7.258 | 0.091 | 1.964 | 0.005 | 0.026 | 0.016 | 0.038 | 0 | 16 | 36.036 | 0.213 | 0.79 | 2.632 | 2.674 | 3.225 | 360 | 0.15 | 0.787 | 1.18 |
| 10290c-vein-1-chl-9 | Chlotite veins | 9.83 | 5.105 | 0.005 | 0 | 7.669 | 0.125 | 1.623 | 0.018 | 0.034 | 0.022 | 0.025 | 0 | 16 | 36.153 | 0.175 | 0.83 | 2.633 | 2.895 | 3.473 | 386 | 0.28 | 0.825 | 1.09 |
| 10290c-vein-2-chl-1 | Chlotite veins | 10.01 | 5.308 | 0.006 | 0 | 7.856 | 0.046 | 1.539 | 0.015 | 0.013 | 0.015 | 0.036 | 0.005 | 16 | 36.08 | 0.164 | 0.84 | 2.549 | 2.692 | 3.277 | 365 | 0.2 | 0.836 | 1.19 |
| 10330a-chl-3 | Biotite Pheno. Repl. | 10.8 | 5.746 | 0.009 | 0 | 6.674 | 0.068 | 2.338 | 0 | 0.019 | 0.059 | 0.045 | 0 | 16 | 35.842 | 0.259 | 0.74 | 2.629 | 2.254 | 2.772 | 312 | 0.25 | 0.741 | 1.39 |
| 10330a-chl-4 | Biotite Pheno. Repl. | 10.89 | 5.609 | 0.01 | 0.003 | 6.7 | 0.065 | 2.125 | 0.003 | 0.017 | 0.052 | 0.035 | 0.002 | 16 | 35.815 | 0.241 | 0.76 | 2.805 | 2.391 | 2.922 | 328 | 0.24 | 0.759 | 1.27 |
| 10330a-chl-5 | Biotite Pheno. Repl. | 10.75 | 5.496 | 0.004 | 0 | 6.993 | 0.071 | 2.065 | 0.001 | 0.011 | 0.028 | 0.034 | 0 | 16 | 35.914 | 0.228 | 0.77 | 2.705 | 2.504 | 3.044 | 341 | 0.15 | 0.772 | 1.24 |
| 10330b-chl-7 | Biotite Pheno. Repl. | 10.75 | 5.602 | 0.009 | 0.01 | 6.875 | 0.066 | 1.971 | 0 | 0.016 | 0.112 | 0.009 | 0 | 16 | 35.856 | 0.223 | 0.78 | 2.786 | 2.398 | 2.942 | 330 | 0.43 | 0.777 | 1.27 |
| 10580-a-chl1 | Chlotite veins | 10.68 | 5.226 | 0.009 | 0 | 7.137 | 0.047 | 2.072 | 0.007 | 0.003 | 0.004 | 0.028 | 0.004 | 16 | 36.024 | 0.225 | 0.78 | 2.714 | 2.774 | 3.317 | 370 | 0.08 | 0.775 | 1.12 |
| 10580-a-chl11 | Chlotite veins | 10.6 | 5.333 | 0 | 0 | 7.121 | 0.058 | 2.234 | 0.017 | 0.01 | 0.015 | 0 | 0.001 | 16 | 36.049 | 0.239 | 0.76 | 2.592 | 2.667 | 3.200 | 357 | 0.21 | 0.761 | 1.20 |
| 10580-a-chl3 | Chlotite veins | 10.57 | 5.317 | 0.005 | 0.009 | 7.072 | 0.052 | 2.152 | 0.007 | 0.008 | 0.008 | 0.003 | 0 | 16 | 35.999 | 0.233 | 0.77 | 2.683 | 2.683 | 3.220 | 359 | 0.11 | 0.767 | 1.17 |
| 10580-a-chl4 | Chlotite veins | 10.59 | 5.314 | 0.002 | 0 | 7.334 | 0.052 | 2.079 | 0.009 | 0.014 | 0.001 | 0.009 | 0 | 16 | 36.065 | 0.221 | 0.78 | 2.565 | 2.686 | 3.231 | 361 | 0.11 | 0.779 | 1.19 |
| 10580-a-chl5 | Chlotite veins | 10.56 | 5.33 | 0.012 | 0.006 | 7.159 | 0.044 | 2.266 | 0.014 | 0.016 | 0.009 | 0.02 | 0.007 | 16 | 36.073 | 0.24 | 0.76 | 2.521 | 2.67 | 3.202 | 357 | 0.19 | 0.760 | 1.21 |
| 10560-a-chl7 | Chlotite veins | 10.36 | 5.339 | 0.011 | 0 | 7.123 | 0.028 | 1.943 | 0.025 | 0.021 | 0.07 | 0 | 0.009 | 16 | 35.986 | 0.214 | 0.79 | 2.757 | 2.661 | 3.211 | 358 | 0.49 | 0.766 | 1.16 |
| 10580-a-chl8 | Chlotite veins | 10.7 | 5.435 | 0.009 | 0 | 6.961 | 0.043 | 2.297 | 0.018 | 0.015 | 0.009 | 0 | 0.006 | 16 | 35.976 | 0.248 | 0.75 | 2.618 | 2.565 | 3.091 | 346 | 0.2 | 0.752 | 1.24 |
| 10580-a-chl9 | Chlotite veins | 10.75 | 5.353 | 0.004 | 0 | 6.991 | 0.04 | 2.313 | 0.018 | 0.004 | 0.025 | 0.016 | 0 | 16 | 36.026 | 0.249 | 0.75 | 2.614 | 2.647 | 3.173 | 354 | 0.26 | 0.751 | 1.20 |
| 10580-b-chl1 | Biotite Pheno. Repl. | 10.74 | 5.429 | 0.009 | 0.005 | 7.116 | 0.031 | 2.206 | 0.016 | 0.006 | 0.009 | 0.006 | 0.003 | 16 | 35.99 | 0.237 | 0.76 | 2.581 | 2.571 | 3.105 | 347 | 0.18 | 0.763 | 1.24 |
| 10580-b-chl10 | Biotite Pheno. Repl. | 10.39 | 5.21 | 0.005 | 0 | 7.221 | 0.063 | 2.165 | 0.013 | 0.015 | 0.008 | 0 | 0 | 16 | 36.098 | 0.231 | 0.77 | 2.607 | 2.79 | 3.329 | 371 | 0.16 | 0.769 | 1.14 |
| 10580-b-chl2 | Biotite Pheno. Repl. | 10.6 | 5.301 | 0.01 | 0.001 | 7.154 | 0.045 | 2.194 | 0.012 | 0.002 | 0 | 0 | 0 | 16 | 36.033 | 0.235 | 0.77 | 2.613 | 2.699 | 3.235 | 361 | 0.1 | 0.765 | 1.18 |
| 10580-b-chl3 | Biotite Pheno. Repl. | 10.69 | 5.236 | 0.008 | 0.012 | 7.05 | 0.052 | 2.246 | 0.018 | 0.001 | 0.006 | 0 | 0 | 16 | 36.046 | 0.242 | 0.76 | 2.652 | 2.764 | 3.295 | 367 | 0.16 | 0.758 | 1.14 |
| 10580-b-chl4 | Biotite Pheno. Repl. | 10.54 | 5.262 | 0.02 | 0.001 | 6.795 | 0.053 | 2.329 | 0.017 | 0.008 | 0.005 | 0.009 | 0.015 | 16 | 35.987 | 0.255 | 0.74 | 2.736 | 2.738 | 3.259 | 363 | 0.18 | 0.745 | 1.13 |
| 10580-b-chl5 | Biotite Pheno. Repl. | 10.7 | 5.221 | 0.028 | 0.004 | 7.008 | 0.046 | 2.157 | 0.015 | 0.004 | 0.005 | 0.027 | 0.004 | 16 | 36.008 | 0.235 | 0.76 | 2.711 | 2.779 | 3.314 | 369 | 0.15 | 0.765 | 1.12 |
| 10580-b-chl6 | Biotite Pheno. Repl. | 10.6 | 5.32 | 0.005 | 0 | 7.055 | 0.029 | 2.134 | 0.008 | 0.003 | 0.01 | 0.03 | 0.005 | 16 | 35.987 | 0.232 | 0.77 | 2.708 | 2.68 | 3.217 | 359 | 0.1 | 0.768 | 1.16 |
| 10580-b-chl7 | Biotite Pheno. Repl. | 10.55 | 5.145 | 0.002 | 0.003 | 7.389 | 0.059 | 1.856 | 0.004 | 0.014 | 0.005 | 0.006 | 0.003 | 16 | 36.069 | 0.201 | 0.80 | 2.729 | 2.855 | 3.414 | 380 | 0.09 | 0.799 | 1.09 |
| 10580-b-chl8 | Biotite Pheno. Repl. | 10.69 | 5.234 | 0.008 | 0 | 6.885 | 0.053 | 2.254 | 0.002 | 0.001 | 0.003 | 0 | 0 | 16 | 35.987 | 0.247 | 0.75 | 2.78 | 2.766 | 3.293 | 367 | 0.03 | 0.753 | 1.11 |
| 10580-b-chl9 | Biotite Pheno. Repl. | 10.59 | 5.172 | 0.006 | 0.008 | 7.16 | 0.047 | 2.115 | 0.021 | 0.003 | 0.003 | 0 | 0 | 16 | 36.059 | 0.228 | 0.77 | 2.695 | 2.828 | 3.368 | 375 | 0.2 | 0.772 | 1.10 |
| 10580-c-chl1 | Biotite Pheno. Repl. | 10.85 | 5.752 | 0.068 | 0.002 | 6.69 | 0.047 | 2.104 | 0.02 | 0.047 | 0.036 | 0.016 | 0.005 | 16 | 35.743 | 0.239 | 0.76 | 2.707 | 2.248 | 2.781 | 313 | 0.4 | 0.761 | 1.37 |
| 10580-c-chl2 | Biotite Pheno. Repl. | 10.79 | 5.443 | 0.013 | 0 | 6.894 | 0.049 | 2.128 | 0.016 | 0.016 | 0.065 | 0.028 | 0 | 16 | 35.941 | 0.236 | 0.76 | 2.73 | 2.557 | 3.092 | 346 | 0.41 | 0.764 | 1.21 |
| 10580-c-chl3 | Biotite Pheno. Repl. | 10.61 | 5.439 | 0.01 | 0 | 7.084 | 0.029 | 2.153 | 0.007 | 0.013 | 0.01 | 0 | 0.002 | 16 | 35.958 | 0.233 | 0.77 | 2.649 | 2.561 | 3.098 | 346 | 0.13 | 0.767 | 1.23 |
| 10580-c-chl4 | Biotite Pheno. Repl. | 10.72 | 5.481 | 0.007 | 0.006 | 7.048 | 0.043 | 2.258 | 0.008 | 0.009 | 0.012 | 0.009 | 0 | 16 | 35.974 | 0.243 | 0.76 | 2.573 | 2.519 | 3.049 | 341 | 0.12 | 0.757 | 1.27 |
| 10580-e-chl1 | Biotite Pheno. Repl. | 10.66 | 5.361 | 0.006 | 0.004 | 7.16 | 0.047 | 2.187 | 0.022 | 0.01 | 0.006 | 0.009 | 0 | 16 | 36.03 | 0.234 | 0.77 | 2.58 | 2.639 | 3.175 | 355 | 0.22 | 0.766 | 1.21 |
| 10580-e-chl2 | Biotite Pheno. Repl. | 10.63 | 5.278 | 0.002 | 0.001 | 7.032 | 0.035 | 2.249 | 0.005 | 0.01 | 0.008 | 0.02 | 0.001 | 16 | 36.033 | 0.242 | 0.76 | 2.671 | 2.722 | 3.252 | 363 | 0.09 | 0.758 | 1.15 |
| 10580-e-chl3 | Biotite Pheno. Repl. | 10.85 | 5.312 | 0.01 | 0.003 | 5.996 | 0.086 | 3.134 | 0.009 | 0.017 | 0.004 | 0.008 | 0.001 | 16 | 35.985 | 0.343 | 0.66 | 2.716 | 2.688 | 3.148 | 352 | 0.13 | 0.657 | 1.16 |

Appendix K

# PIMA SPECTRA


Water and OH
Water
AlOH
FeOH
MgOH
2nd AlOH
10140
10200
10210
10220
10250
10290
10330
10420
10520
10580
10750
10850
400504
400505
400531
B1022
B2028
B2031
B2032
B2035
B2047
B2048
B2049
B2050
B2051
B2054
B2061
MJ9601
MJ9602
MJ9602A
MJ9604
MJ9606
MJ9608
MJ9609
MJ9610
MJ9611
MJ9612
MJ9613
MJ9614
MJ9615
MJ9616
MJ9617
MJ9618
Reflectance (Stacked)
1300
1600
1900
2200
2500
Wavelength in nm


Water and OH
Water
AlOH
FeOH
MgOH
2nd AlOH
10190
10250
10580
B2027
B2032
B2037
B2038
B2040
B2043
B2044(chlorite)
B2044
B2045
B2046
B2047
B2054
B2061
Reflectance (Stacked)
1300
1600
1900
2200
2500
Wavelength in nm

| Sample Number | TSA Mineral1 | TSA Weight1 | TSA Mineral2 | TSA Weight2 | TSA Error | AlOH | FeOH |
|---|---|---|---|---|---|---|---|
| 10140 | FeChlorite | 0.738 | Phengite | 0.262 | 63.467 | 2210.736 | 2250.392 |
| 10190 | FeChlorite | 0.759 | Phengite | 0.241 | 333.04 | 2212.788 | 2249.404 |
| 10200 | Phengite | 1 | NULL | NULL | 80.966 | 2214.607 | NULL |
| 10210 | NULL | NULL | NULL | NULL | NULL | 2225.757 | 2263.934 |
| 10220 | FeChlorite | 0.505 | Phengite | 0.495 | 76.129 | 2215.496 | NULL |
| 10250 | Phengite | 0.85 | Halloysite | 0.15 | 49.416 | 2209.586 | NULL |
| 10290 | Muscovite | 0.514 | FeChlorite | 0.486 | 90.861 | 2214.055 | 2233.753 |
| 10330 | Phengite | 1 | NULL | NULL | 98.77 | 2212.75 | NULL |
| 10420 | Phengite | 0.807 | Halloysite | 0.193 | 67.764 | 2208.631 | NULL |
| 10520 | FeChlorite | 1 | Phengite | NULL | 90.69 | 2209.628 | 2253.487 |
| 10580 | FeChlorite | 1 | Phengite | NULL | 59.722 | 2218.779 | 2253.341 |
| 10750 | Phengite | 1 | NULL | NULL | 105.697 | 2215.278 | NULL |
| 10850 | Phengite | 1 | NULL | NULL | 96.513 | 2215.307 | NULL |
| 400504 | Phengite | 1 | FeChlorite | NULL | 48.98 | 2215.516 | 2240 |
| 400505 | NULL | NULL | NULL | NULL | NULL | 2226.656 | 2256.925 |
| 400531 | NULL | NULL | NULL | NULL | NULL | NULL | 2260.85 |
| B1022 | Muscovite | 0.819 | Halloysite | 0.181 | 145.871 | 2208.568 | NULL |
| B2027 | Muscovite | 1 | NULL | NULL | 52.997 | 2206.432 | NULL |
| B2028 | Phengite | 1 | NULL | NULL | 106.628 | 2209.713 | NULL |
| B2031 | Muscovite | 1 | NULL | NULL | 56.865 | 2204.315 | NULL |
| B2032 | Phengite | 0.575 | FeChlorite | 0.425 | 252.165 | 2210.836 | NULL |
| B2033 | Muscovite | 0.572 | Halloysite | 0.428 | 140.305 | 2205.396 | NULL |
| B2035 | NULL | NULL | NULL | NULL | NULL | 2206.116 | 2243.284 |
| B2037 | Halloysite | 1 | NULL | NULL | 192.013 | 2206.189 | NULL |
| B2038 | FeChlorite | 0.608 | Phengite | 0.392 | 159.098 | 2211.455 | 2254.549 |
| B2040 | Phengite | 1 | NULL | NULL | 61.625 | 2215.803 | NULL |
| B2043 | Illite | 1 | NULL | NULL | 25.715 | 2201.839 | NULL |
| B2044 | Halloysite | 0.708 | Epidote | 0.292 | 190.645 | 2207.481 | 2248.593 |
| B2045 | Muscovite | 0.744 | Halloysite | 0.256 | 116.253 | 2210.254 | NULL |
| B2047 | Phengite | 1 | FeChlorite | NULL | 87.462 | 2214 | 2254 |
| B2048 | Phengite | 1 | NULL | NULL | 119.328 | 2219.071 | 2246.18 |
| B2049 | Phengite | 1 | NULL | NULL | 180.128 | 2213.224 | 2234.442 |
| B2050 | Phengite | 0.701 | Halloysite | 0.299 | 108.792 | 2210 | NULL |
| B2051 | Halloysite | 1 | NULL | NULL | 170.316 | 2205.316 | 2255.861 |
| B2054 | Muscovite | 1 | NULL | NULL | 83.575 | 2207.643 | NULL |
| B2061 | Illite | 0.565 | Muscovite | 0.435 | 30.126 | 2202.646 | NULL |
| MJ9601 | Phengite | 1 | NULL | NULL | 71.342 | 2217.17 | NULL |
| MJ9602 | Phengite | 1 | NULL | NULL | 74.018 | 2218.795 | NULL |
| MJ9602A | Halloysite | 0.557 | Phengite | 0.443 | 242.252 | 2206.588 | NULL |
| MJ9604 | Phengite | 0.793 | Brucite | 0.207 | 149.551 | 2218.192 | 2235.219 |
| MJ9606 | Phengite | 1 | NULL | NULL | 99.479 | 2212.955 | NULL |
| MJ9608 | FeChlorite | 1 | NULL | NULL | 46.44 | 2218 | 2255.69 |
| MJ9609 | Phengite | 0.577 | FeChlorite | 0.423 | 111.319 | 2216.966 | NULL |
| MJ9610 | Phengite | 1 | NULL | NULL | 63.093 | 2215.424 | NULL |
| MJ9611 | Phengite | 0.581 | FeChlorite | 0.419 | 119.846 | 2216.001 | NULL |
| MJ9612 | Phengite | 1 | NULL | NULL | 76.947 | 2217.576 | NULL |
| MJ9613 | FeChlorite | 1 | NULL | NULL | 123.64 | NULL | 2255.106 |
| MJ9614 | FeChlorite | 0.776 | Zoisite | 0.224 | 39.522 | 2225.414 | 2256.193 |
| MJ9615 | Phengite | 1 | NULL | NULL | 107.94 | 2221.683 | NULL |
| MJ9616 | Phengite | 0.653 | FeChlorite | 0.347 | 70.199 | 2222.562 | 2251.716 |
| MJ9617 | Phengite | 1 | NULL | NULL | 34.457 | 2219.149 | 2250.963 |
| MJ9618 | Phengite | 1 | NULL | NULL | 46.083 | 2221.341 | NULL |

# Appendix M. Summary of Carbonate Microprobe Analyses.



| Sample Number | SiO2 | FeCO3 | MnCO3 | MgCO3 | CaCO3 | BaCO3 | SrCO3 | Na2Ca*2 | K2Ca*2 | PbCO3 | ZnCO3 | NiCO3 | CoCO3 | CdCO3 | Cu2... | Sum Ox% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10190-MJ-96-4c-carb2 | 0.04 | 82.37 | 0.51 | 15.52 | 1.68 | 0.08 | 0.04 | 0.25 | 0.02 | - | 0.12 | 0 | - | - | - | 100.63 |
| 10190-MJ-96-4c-carb3 | 0.02 | 82.78 | 0.5 | 13.75 | 1.15 | 0.09 | 0 | 0.4 | 0.34 | - | 0 | 0 | - | - | - | 99.04 |
| 10190-MJ-96-4d-carb1 | 0.06 | 82.27 | 4.13 | 9.68 | 0.45 | 0 | 0.06 | 0.4 | 0.02 | - | 0.19 | 0 | - | - | - | 97.26 |
| 10190-MJ-96-4d-carb2 | 0.05 | 82.53 | 3.83 | 9.95 | 0.33 | 0 | 0.03 | 0.7 | 0.08 | - | 0.2 | 0.03 | - | - | - | 97.73 |
| 10190-MJ-96-4d-carb3 | 0.05 | 81.53 | 4.59 | 10.82 | 0.63 | 0 | 0 | 0.35 | 0.1 | - | 0 | 0.1 | - | - | - | 98.17 |
| 10190-MJ-96-4e-carb3 | 0.42 | 80.77 | 3.94 | 10.01 | 0.31 | 0 | 0.01 | 0.31 | 2.29 | - | 0.2 | 0 | - | - | - | 98.28 |
| 10190-MJ-96-4f-carb3 | 0.12 | 81.59 | 4.76 | 9.31 | 1.39 | 0 | 0 | 0.4 | 0.74 | - | 0.12 | 0 | - | - | - | 98.43 |
| 10850-b carb | 0 | 19.53 | 5.37 | 20.79 | 50.8 | 0 | 0 | - | - | 0 | 0.04 | - | - | - | 0.01 | 96.56 |
| 10850-b carb4 | 0 | 28.02 | 6.7 | 10.47 | 47.62 | 0 | 0.02 | - | - | 0.08 | 0.31 | - | - | - | 0.01 | 93.23 |
| 10850-b carb6 | 0 | 20.31 | 7.03 | 17.91 | 52.49 | 0 | 0.04 | - | - | 0.06 | 0 | - | - | - | 0.19 | 98.04 |
| 10850-c carb5 | 0 | 17.79 | 5.63 | 17.61 | 51.81 | 0 | 0.03 | - | - | 0 | 1.86 | - | - | - | 0.01 | 94.75 |
| 10850-c carb6 | 0 | 14.38 | 6.08 | 21.04 | 52.98 | 0.09 | 0.02 | - | - | 0.06 | 0 | - | - | - | 0.02 | 94.68 |
| 10850-c carb8 | 0 | 16.71 | 5.89 | 20.87 | 51.2 | 0 | 0.04 | - | - | 0.12 | 0.07 | - | - | - | 0.21 | 95.12 |
| 10850-c carb9 | 0 | 16.75 | 5.8 | 20.55 | 51.24 | 0.1 | 0.05 | - | - | 0 | 0.06 | - | - | - | 0.12 | 94.67 |
| 10850-d carb2 | 0 | 17.13 | 6.5 | 19.33 | 51.96 | 0 | 0.02 | - | - | 0 | 0.12 | - | - | - | 0.38 | 95.45 |
| 10850-d carb3 | 0 | 17.18 | 6.14 | 19.5 | 54.42 | 0 | 0.1 | - | - | 0 | 0.15 | - | - | - | 0.01 | 97.49 |
| 10850-d carb4 | 0 | 22.37 | 6.43 | 15.93 | 50.07 | 0 | 0 | - | - | 0 | 0 | - | - | - | 0.68 | 95.49 |
| 10850-d carb6 | 0 | 22.13 | 7.09 | 15.51 | 49.58 | 0 | 0 | - | - | 0.08 | 0.1 | - | - | - | 0.01 | 94.51 |

| | Si | Fe2+ | Mn2+ | Mg | Ca | Ba | Sr | Na | K | Pb | Zn | Ni | Co | Cd | Cu | Sum Cat# |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10190-MJ-96-4c-carb2 | 0.001 | 0.771 | 0.008 | 0.2 | 0.019 | 0 | 0 | 0.001 | 0 | - | 0.001 | 0 | - | - | - | 1.001 |
| 10190-MJ-96-4c-carb3 | 0 | 0.794 | 0.008 | 0.181 | 0.014 | 0 | 0 | 0.001 | 0.001 | - | 0 | 0 | - | - | - | 1 |
| 10190-MJ-96-4d-carb1 | 0.001 | 0.797 | 0.065 | 0.129 | 0.006 | 0 | 0 | 0.001 | 0 | - | 0.002 | 0 | - | - | - | 1.001 |
| 10190-MJ-96-4d-carb2 | 0.001 | 0.799 | 0.061 | 0.132 | 0.005 | 0 | 0 | 0.002 | 0 | - | 0.002 | 0 | - | - | - | 1.002 |
| 10190-MJ-96-4d-carb3 | 0.001 | 0.777 | 0.071 | 0.142 | 0.008 | 0 | 0 | 0.001 | 0 | - | 0 | 0.001 | - | - | - | 1.001 |
| 10190-MJ-96-4e-carb3 | 0.008 | 0.778 | 0.062 | 0.133 | 0.009 | 0 | 0 | 0.001 | 0.004 | - | 0.002 | 0 | - | - | - | 0.996 |
| 10190-MJ-96-4f-carb3 | 0.002 | 0.78 | 0.074 | 0.122 | 0.018 | 0 | 0 | 0.001 | 0.001 | - | 0.001 | 0 | - | - | - | 1 |
| 10850-b carb | 0 | 0.169 | 0.076 | 0.247 | 0.508 | 0 | 0 | - | - | 0 | 0 | - | - | - | 0 | 1 |
| 10850-b carb4 | 0 | 0.258 | 0.101 | 0.133 | 0.508 | 0 | 0 | - | - | 0 | 0.003 | - | - | - | 0 | 1.003 |
| 10850-b carb6 | 0 | 0.173 | 0.098 | 0.21 | 0.518 | 0 | 0 | - | - | 0 | 0 | - | - | - | 0.001 | 1.001 |
| 10850-c carb5 | 0 | 0.16 | 0.083 | 0.218 | 0.539 | 0 | 0 | - | - | 0 | 0.015 | - | - | - | 0 | 1.015 |
| 10850-c carb6 | 0 | 0.125 | 0.087 | 0.252 | 0.535 | 0 | 0 | - | - | 0 | 0 | - | - | - | 0 | 1 |
| 10850-c carb8 | 0 | 0.146 | 0.084 | 0.251 | 0.518 | 0 | 0 | - | - | 0 | 0.001 | - | - | - | 0.001 | 1.002 |
| 10850-c carb9 | 0 | 0.147 | 0.083 | 0.248 | 0.521 | 0.001 | 0 | - | - | 0 | 0 | - | - | - | 0 | 1.001 |
| 10850-d carb2 | 0 | 0.15 | 0.093 | 0.232 | 0.525 | 0 | 0 | - | - | 0 | 0.001 | - | - | - | 0.001 | 1.002 |
| 10850-d carb3 | 0 | 0.147 | 0.086 | 0.229 | 0.538 | 0 | 0.001 | - | - | 0 | 0.001 | - | - | - | 0 | 1.001 |
| 10850-d carb4 | 0 | 0.198 | 0.093 | 0.194 | 0.514 | 0 | 0 | - | - | 0 | 0 | - | - | - | 0.002 | 1.002 |
| 10850-d carb6 | 0 | 0.197 | 0.103 | 0.19 | 0.51 | 0 | 0 | - | - | 0 | 0.001 | - | - | - | 0 | 1.001 |

| | Cu2... | Malachite | Buetschildite | Eitelite | Otavite | Cobaltocalcite | Gaspeite | Cerusite | Witherite | Smithsonite | Stonianite | Rhodochrosite | Magnesite | Sidérite | Calcite | * |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10190-MJ-96-4c-carb2 | Cu2(OH)2CO3 | 0 | 0.003 | 0.054 | 0 | 0 | 0.002 | 0 | 0.043 | 0.102 | 0.027 | 0.784 | 19.968 | 77.114 | 1.824 | CO3 |
| 10190-MJ-96-4c-carb3 | Cu2(OH)2CO3 | 0 | 0.064 | 0.089 | 0 | 0 | 0.002 | 0 | 0.048 | 0.002 | 0.002 | 0.786 | 18.131 | 79.443 | 1.274 | CO3 |
| 10190-MJ-96-4d-carb1 | Cu2(OH)2CO3 | 0 | 0.003 | 0.091 | 0 | 0 | 0.002 | 0 | 0 | 0.174 | 0.048 | 6.528 | 12.885 | 79.68 | 0.501 | CO3 |
| 10190-MJ-96-4d-carb2 | Cu2(OH)2CO3 | 0 | 0.015 | 0.158 | 0 | 0 | 0.032 | 0 | 0 | 0.181 | 0.02 | 6.061 | 13.231 | 79.887 | 0.372 | CO3 |
| 10190-MJ-96-4d-carb3 | Cu2(OH)2CO3 | 0 | 0.019 | 0.077 | 0 | 0 | 0.096 | 0 | 0 | 0.002 | 0.002 | 7.14 | 14.169 | 77.688 | 0.69 | CO3 |
| 10190-MJ-96-4e-carb3 | Cu2(OH)2CO3 | 0 | 0.431 | 0.069 | 0 | 0 | 0.002 | 0 | 0 | 0.18 | 0.009 | 6.209 | 13.257 | 77.845 | 0.351 | CO3 |
| 10190-MJ-96-4f-carb3 | Cu2(OH)2CO3 | 0 | 0.137 | 0.09 | 0 | 0 | 0.002 | 0 | 0 | 0.103 | 0.002 | 7.427 | 12.236 | 78.027 | 1.533 | CO3 |
| 10850-b carb | Cu2(OH)2CO3 | 0.002 | 0 | 0 | 0 | 0 | 0 | 0.001 | 0.001 | 0.036 | 0.002 | 7.584 | 24.693 | 16.882 | 50.828 | CO3 |
| 10850-b carb4 | Cu2(OH)2CO3 | 0.002 | 0 | 0 | 0 | 0 | 0 | 0.031 | 0.001 | 0.264 | 0.017 | 10.079 | 13.262 | 25.825 | 50.805 | CO3 |
| 10850-b carb6 | Cu2(OH)2CO3 | 0.059 | 0 | 0 | 0 | 0 | 0 | 0.023 | 0.001 | 0.002 | 0.024 | 9.797 | 21.003 | 17.328 | 51.838 | CO3 |
| 10850-c carb5 | Cu2(OH)2CO3 | 0.002 | 0 | 0 | 0 | 0 | 0 | 0.001 | 0.001 | 1.549 | 0.022 | 8.266 | 21.764 | 16.002 | 53.935 | CO3 |
| 10850-c carb6 | Cu2(OH)2CO3 | 0.008 | 0 | 0 | 0 | 0 | 0 | 0.023 | 0.045 | 0.002 | 0.015 | 8.663 | 25.225 | 12.544 | 53.498 | CO3 |
| 10850-c carb8 | Cu2(OH)2CO3 | 0.068 | 0 | 0 | 0 | 0 | 0 | 0.047 | 0.001 | 0.054 | 0.029 | 8.414 | 25.083 | 14.621 | 51.842 | CO3 |
| 10850-c carb9 | Cu2(OH)2CO3 | 0.038 | 0 | 0 | 0 | 0 | 0 | 0.001 | 0.05 | 0.045 | 0.035 | 8.314 | 24.797 | 14.711 | 52.084 | CO3 |
| 10850-d carb2 | Cu2(OH)2CO3 | 0.121 | 0 | 0 | 0 | 0 | 0 | 0.001 | 0.001 | 0.099 | 0.016 | 9.27 | 23.199 | 14.967 | 52.537 | CO3 |
| 10850-d carb3 | Cu2(OH)2CO3 | 0.002 | 0 | 0 | 0 | 0 | 0 | 0.001 | 0.001 | 0.115 | 0.065 | 8.559 | 22.887 | 14.678 | 53.8 | CO3 |
| 10850-d carb4 | Cu2(OH)2CO3 | 0.222 | 0 | 0 | 0 | 0 | 0 | 0.001 | 0.001 | 0.002 | 0.002 | 9.313 | 19.422 | 19.841 | 51.412 | CO3 |
| 10850-d carb6 | Cu2(OH)2CO3 | 0.002 | 0 | 0 | 0 | 0 | 0 | 0.03 | 0.001 | 0.082 | 0.002 | 10.305 | 18.957 | 19.681 | 51.044 | CO3 |

| | Tourmaline Vein | Tourmaline Vein | Magnetite Vein | Magnetite Vein | Tourmaline Vein | Tourmaline-Specular Hematite Vein | Quartz Vein |
|---|---|---|---|---|---|---|---|
| **Sample Number** | **B2020** | **B2025** | **B2026** | **B2029** | **B2030** | **B2052** | **B2060** |
| **SiO2** | 74.71 | 69.58 | 3.65 | 22.31 | 50.61 | 63.96 | 98.42 |
| **TiO2** | 0.24 | 0.23 | 0.09 | 0.05 | 0.19 | 0.14 | 0.01 |
| **Al2O3** | 13.42 | 17.79 | 0.51 | 0.53 | 27.03 | 20.85 | 0.47 |
| **Fe2O3** | 4.15 | 6.17 | 95.47 | 76.85 | 15.59 | 9.83 | 0.77 |
| **MnO** | 0.09 | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 |
| **MgO** | 0.99 | 4.26 | 0.06 | 0.06 | 4.30 | 3.25 | 0.02 |
| **CaO** | 0.83 | 0.54 | 0.02 | 0.01 | 0.33 | 0.22 | 0.01 |
| **Na2O** | 0.09 | 1.26 | 0.05 | 0.05 | 1.85 | 1.58 | 0.05 |
| **K2O** | 5.32 | 0.15 | 0.16 | 0.08 | 0.08 | 0.10 | 0.31 |
| **P2O5** | 0.06 | 0.01 | 0.03 | 0.09 | 0.01 | 0.04 | 0.01 |
| **Total Volatile** | | | | | | | |
| **Free** | 99.91 | 100.01 | 100.05 | 100.03 | 100.00 | 100.00 | 100.09 |
| **FeO** | 3.76 | 5.58 | 86.40 | 69.55 | 14.11 | 8.90 | 0.70 |
| **S** | 0.09 | 0.01 | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| **Sc** | 5 | 20 | <2 | 8 | 46 | 32 | <2 |
| **Ti(PPM Calc)** | 1430 | 1404 | 542 | 302 | 1149 | 860 | 60 |
| **V** | 29 | 136 | 187 | 18 | 103 | 30 | <1.5 |
| **Cr** | 5 | 17 | 11 | 6 | 8 | 2 | 2 |
| **Co** | | | | | | | |
| **Ni** | 2 | 5 | 7 | 5 | 4 | 7 | <1 |
| **Cu** | 48 | 14 | 33 | 33 | 36 | 3 | <1 |
| **Zn** | 48 | 56 | 32 | 6 | 50 | 20 | 2 |
| **As** | <3 | 8 | 4 | 25 | <3 | <3 | <3 |
| **Br** | | | | | | | |
| **Rb** | 199 | 6 | 9 | 3 | 3 | 2 | 8 |
| **Sr** | 26 | 84 | 16 | 15 | 100 | 63 | 2 |
| **Zr** | 145 | 142 | 6 | 10 | 54 | 54 | 7 |
| **Nb** | 14.2 | 6.9 | <2 | 2.6 | 2.6 | 5.1 | 1 |
| **Mo** | | | | | | | |
| **Ag** | | | | | | | |
| **Cd** | | | | | | | |
| **Sn** | 8.8 | 7.3 | 0.4(<3) | 1203.4 | 39.4 | 148.1 | 3.0 |
| **Sb** | | | | | | | |
| **Cs** | | | | | | | |
| **Ba** | 877 | 36 | 63 | 54 | 25 | 28 | 98 |
| **La** | 49 | 19 | 14 | 5 | 9 | <2 | <2 |
| **Ce** | 96 | 37 | 7 | 3 | 10 | <4 | <4 |
| **Nd** | 34 | 12 | 4 | 5 | 3 | <2 | <2 |
| **Y** | 24 | 9 | 60 | 648 | 8 | 373 | 12 |
| **W** | | | | | | | |
| **Tl** | | | | | | | |
| **Pb** | 4 | 224 | 62 | 16 | 45 | 2 | <1.5 |
| **Bi** | <2 | 2.4 | 5.9 | 17.4 | <2 | <2 | <2 |
| **Th** | 31 | 15 | <2 | 3 | 13 | 13 | <1.5 |
| **U** | 5.5 | 2.8 | 15.5 | 11.6 | 2.7 | 4.1 | <1.5 |

# APPENDIX O. ALTERATION AND MINERALISATION PARAGENESIS: NOTES AND REFERENCES

The following observations were used to construct the alteration and mineralisation paragenesis discussed in Chapter 7. The observations are presented here as factual observations made by the author or are appropriately referenced if taken from previous studies. The observations of the author are from the Jukes Prospect and the Mt. Darwin areas and are separated below on that basis.

## THE JUKES PROSPECT OBSERVATIONS

### EARLY

Diffuse weak sericite alteration of least altered feldspar-phyric volcanics (FPV) occurs along Jukes Road. (Field Observation).

Diffuse chlorite replaces sericite in feldspar phenocrysts in moderately altered FPV (Common Petrographic Observation, Figure 5.14E).

Diffuse chlorite replaces groundmass and groundmass feldspar laths in FPV (Rock 10310).

Chlorite veins with diffuse boundaries replace sericite altered FPV (Rock 10310).

Quartz + chlorite ± sericite are cut by quartz only veinlets (Rock 10290).

Quartz veinlets cut the sericite altered FPV. (Field Observation).

### MIDDLE

Disseminated pyrite and magnetite occur in K-feldspar altered FPV with stockwork quartz veins (Rock 10280).

Disseminated magnetite occurs with K-feldspar and chlorite alteration. (Field Observation).

K-feldspar + sericite + chlorite replace groundmass micropoikilitic groundmass quartz in the FPV (Petrographic Observation).

Stockworks of quartz + chlorite + sericite occur throughout the intensely altered K-feldspar altered rocks. (Field Observation).

Diffuse quartz occurs with some K-feldspar alteration assemblages (Petrographic Observation).

Diffuse chlorite replaced both the groundmass and feldspar phenocrysts (chlorite disease) along Jukes Road (Field Observation, Plate 7._). These rocks (with "Chlorite disease") are cut by veins of K-feldspar that have diffuse K-feldspar replacing chlorite along the vein margins (Field Observation).

Diffuse K-feldspar + chlorite replace previously sericite + chlorite altered groundmass in FPV (Rock 10310).

Diffuse chlorite replaces the groundmass in a magnetite-tourmaline breccia (Field Observation).

Vein chlorite ± pyrite ± chalcopyrite fills fractures and replaces both sericite and K-feldspar altered FPV outward from the fracture margins. (Field Observation).

Diffuse sericite altered FPV is locally overprinted by K-feldspar without chlorite (Rock 10310).

Diffuse sericite 70-100% replaces feldspar phenocrysts in FPV. It is then replaced by chlorite. The rock is then cut by chlorite-tourmaline-magnetite, quartz, quartz-sericite and quartz-chlorite-tourmaline veins. (Rock 10370, Plate 7.3).

Quartz + K-feldspar veins are cut by quartz + chlorite veins. (Rock 10290).

Diffuse vein controlled K-feldspar altered the groundmass around fracture margins. K-feldspar replaced previously chlorite altered feldspar phenocrysts. (Petrographic Observation).

Diffuse K-feldspar altered the groundmass after sericite + chlorite altered the feldspar phenocrysts. (Rock 2037).

Stockwork quartz + K-feldspar veins in K-feldspar altered FPV. The veins were reopened by chlorite + chalcopyrite + pyrite veins that also filled new fractures in the same rock. (Rock 10280).

Diffuse K-feldspar replaced earlier chlorite altered FPV vein veinlets. The veinlets were then reopened and filled with chlorite. (Petrographic Observation).

Chlorite-tourmaline and magnetite breccias contain angular clasts of intensely K-feldspar altered FPV. (Rocks B1001 and B1009).

Sericite altered FPV is overprinted by K-feldspar alteration assemblages and they are in-turn cut by chlorite veins. (Petrographic Observation).

Stockwork veins of quartz + pyrite + chalcopyrite occur in the intense K-feldspar altered rocks. Some have been reopened and used by later chlorite. (Field Observation).

K-feldspar altered FPV is overprinted by intense chlorite (Field Observation and (Doyle, 1990).

Magnetite ± pyrite veins cut K-feldspar altered CVC (Field Observation and Doyle, 1990)

Chlorite + quartz + pyrite + chalcopyrite vein intrudes K-feldspar altered FPV in the margins of the breccia (Rock 10210).

Chlorite + chalcopyrite vein cuts K-feldspar altered FPV. (Field Observation).

Pyrite and Chalcopyrite occur in quart veins that cut sericite and chlorite altered FPV (Rock 10220).

Three stages of quartz veins occur in K-feldspar altered FPV (Rock 10220).

Chalcopyrite vein cuts chlorite altered FPV in the core of the Jukes Prospect (Field Observation).

Pyrite and chalcopyrite occur in chlorite along the margin of the quartz-feldspar porphyry dykes (Field Observation).

Chalcopyrite an malachite occurs in post mineral faults (Field Observation).

Galena and sphalerite occur in a chalcopyrite vein and in dolomite veins (Doyle, 1990).

LATE

Sericite vein cuts sericite altered FPV. (Petrographic Observation).

Diffuse sericite halo replaces K-feldspar altered quartz-feldspar porphyry dyke around a sericite-quartz vein. **(Plate 7.6G).**

Dolomite occurs in veins that cut the chlorite-tourmaline and magnetite breccia matrices as well as K-feldspar altered FPV (Doyle, 1990).

Dolomite veins cut K-feldspar and sericite altered FPV in the outer zone of the Jukes system (Field Observation).

Sericite + pyrite veins cut the "Chlorite Zone" (Doyle, 1990).

Quartz-sericite vein cuts tourmaline + chlorite vein (Field Observation).

Magnetite vein is cut by quartz vein (Field Observation).

Tourmaline vein is cut by quartz vein (Field Observation).

# MT. DARWIN AREA OBSERVATIONS

## MIDDLE

Magnetite veins cut altered CVC (Field Observation, and Plate 7.4).

Tourmaline veins cut altered CVC (Field Observation, and Plate 7.2).

Magnetite veins occur in joints and fractures within the pink granite phase of the Darwin Granite (Field Observation, and Plate 7.4, and Large et al. 1996).

Chalcopyrite occurs in chlorite altered CVC at the contact of the Darwin Granite. (Field Observation).

Small (<1 cm) tourmaline veins cut the granite contact zone. (Field Observation).

The contact zone of the Darwin Granite is typically silicified with disseminated pyrite. Localised areas have K-feldspar alteration and magnetite. (Field Observation).

Magnetite + hematite veins cut K-feldspar and chlorite altered CVC near the summit of Mt. Darwin. (Field Observation).

K-feldspar, chlorite and quartz occur as infills to previously existing magnetite veins (Field Observation).

Quartz-specular hematite veins are cut by magnetite veins and these are in-turn cut by tourmaline veins (Field Observation).

Some tourmaline veins have an outer rim of tourmaline and an inner zone of magnetite + hematite. No sharp transition was observed. (Field Observation).

Pyrite and chalcopyrite occur in stockworks of magnetite + hematite and tourmaline veins (White, 1975).

Magnetite + pyrite veins cut the CVC (Jones, 1992).

Disseminated magnetite and pyrite occur in localised domains near the granite contact (Field Observation).

Veins of pyrite occur in the pink granite phase of the Darwin granite (Jones, 1992).

Tourmaline occurs with magnetite and pyrite in the CVC (Jones, 1992).

Chalcopyrite occurs in magnetite + hematite veins at the Prince Darwin Prospect (White 1975).

Chalcopyrite occurs in magnetite + hematite veins at Intercolonial Spur (Gadaloff, 1996).

Chalcopyrite occurs in Chlorite altered zones at Intercolonial Spur (Gadaloff, 1996).

Chalcopyrite is remobilised at Intercolonial Spur (Gadaloff, 1996).

K-feldspar altered clasts of CVC occur in tourmaline-magnetite breccias at Intercolonial Spur (Gadaloff, 1996).

LATE

Chalcopyrite occurs in sheared EQPS at the East Darwin Prospect and Findons but in magnetite + hematite veins in the CVC on the other side of the fault (Gadaloff, 1996).

Chalcopyrite replaces barite at East Darwin (Gadaloff, 1996).

$\delta^{34}S$ values from shears and fractures have Cambrian seawater values (Solomon, 1988; Jones 1992; Gadaloff, 1996, This study).

Magnetite veins are cut by quartz veins (Field Observation).

Quartz veins are cut by tourmaline veins in the CVC (Jones, 1992).