

# MINERAL RESOURCES TASMANIA

## Quarry & Laboratory Report

LJN2024-029

**MRT Sand Project,**

**Lot 1 Tasman Peninsula area:**

**Sand Testing: PSD, XRD, C&S and  
Physical Properties**

An unpublished Mineral  
Resources Report for:  
Travis Holmes & Mineral  
Resources Tasmania

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## CONTENTS

SUMMARY.....	2
1. INTRODUCTION .....	4
2. SAMPLE PREPARATION.....	4
3. SAMPLE DESCRIPTIONS .....	4
4. DRY SIEVING RESULTS .....	11
5. CLAY & FINE SILT SETTLING ANALYSIS.....	12
6. CARBON SULPHUR TESTING .....	13
7. X-RAY DIFFRACTION TESTING RESULTS .....	13
8. DISCUSSION AND CONCLUSIONS .....	14
REFERENCES .....	15
DISCLAIMERS: .....	15
LABORATORY DETAILS .....	15
APPENDIX 1: PARTICLE SIZE DISTRIBUTION DATA.....	16
APPENDIX 2: C&S TESTING ANALYSIS.....	27
APPENDIX 3: LABORATORY REPORT: XRD ANALYSES.....	28

## SUMMARY

*Eleven sand samples, predominantly visually medium to fine grained, siliceous sands, with some fine gravel and trace organic matter present, were submitted for testing by Travis Holmes as part of the Mineral Resources Tasmania Sand Sampling Program. A range of testing was ordered including dry sieving of all samples and clay and fine silt settling analysis along with geochemical/organic matter and mineralogical testing by Carbon Sulphur testing, plus X-Ray Diffraction on selected samples.*

*The results obtained largely reflected the visual assessment in particle size distribution and organic matter content. The sands tested were predominantly medium to fine grained, with all excluding two samples (C113808 & C113816) having <5% silt and clay content as determined by particle size distribution by dry sieving. The clay and fine silt settling method (AS 1141.33) showed results at variance with the dry sieving results, with testing showing a ratio by volume of clay and fine silt to sand ranging from ~1% (C113810) to ~43% (C113802). As per the standard, it should be noted that there is no consistent relationship between these test results and the result of the mass passing the 75 µm sieve in the dry sieve analysis. However, the magnitude of the results of this test for all samples were equal to or greater than the result passing the 75 µm sieve, in compliance with the AS 1141.33 predictions.*

*Geochemistry and mineralogy testing showed relative consistency across all the samples tested. Total Organic Carbon and Soil Organic matter were also only detectable in trace levels, not exceeding 0.2% organic matter in any of the samples tested. Mineralogy of the samples was overwhelmingly quartz rich and ranged from 100% quartz (C113810) to 73% quartz (C113805), with variable amorphous clay, kaolinite, feldspar and mica constituting most of the remainder of the samples.*

## 1. INTRODUCTION

Eleven samples of predominantly fine to medium grained, silica rich sands were submitted for analysis by Travis Holmes as part of the MRT Sands Resource Program. While being reasonably visually consistent, there were variations across the samples. These variations were predominantly in colour (indicative of clay and/or iron oxides), grain angularity and organic content, while some samples exhibited gap-graded gravel and cobbles. Testing for all samples included PSD testing and a subset was tested for geochemistry/organic matter by C&S analysis and mineralogical testing by XRD (see below). Clay and fine silt assessment was also undertaken by a hydraulic settling method (AS 1141.33:2015) to assess the clay and silt content of the sands.

## 2. SAMPLE PREPARATION

Samples were dried to a constant mass, riffle split, photographed and broken into sub-samples for the testing required. Material was subsampled for XRD and C&S testing and sample sizes for sieving were calibrated based on an approximate assessment of mean grain size. Due to the predominantly fine-grained nature of the sands, this necessitated small sample sizes for sieving (~50-200g) to reduce the degree of sieve overloading on the finer sieve sizes. As per AS 1289.1.1-2001, this also involved removing some of the largest gravel and cobble particles (particularly sample C113818) so as not to significantly affect the PSD results.

## 3. SAMPLE DESCRIPTIONS

The samples tested were visually predominantly fine to medium grained, silica rich sands, with some variability across the samples. The variations were predominantly in colour (indicative of clay or oxidised mineral content), grain angularity, and organic content, while some samples exhibited gap-graded gravel and cobbles. See Table 1 and Figs. 1-11 for full sample details.

MINERAL RESOURCES TASMANIA

**Table 1. Tasman Peninsula MRT Sand Project Sample Lot 1**

Sample Registration No.	Site	Description	mE, gda94	mN, gda94	Process
C113801	Lauderdale	Brown, polyolithic well sorted fine grained unconsolidated dry dune sand with abundant bracken fern root fragments.	541198	5248005	Dry Sieve, Clay/Silt settling
C113802	Lauderdale	Light brown to light orange well sorted fine grained unconsolidated dune sand with small clay fraction. Damp.	540693	5247948	Dry Sieve, Clay/Silt settling
C113803	Penna	Processed sharp sand stockpile. Brown polyolithic quartz rich fine to medium grained well sorted angular fine to medium grained unconsolidated sand.	537952	5263212	Dry Sieve, C&S, XRD, Clay/Silt settling
C113804	Penna	"Brickies Sand" stockpile, processed product mix of fat & sharp sand. Brown fine grained angular quartz rich sand with a minor clay fraction.	537952	5263212	Dry Sieve
C113805	Penna	Raw "Bedding Sand" stockpile. Brown fine grained angular quartz rich sand with abundant (10-20%) clay causing clumping but otherwise clean of organics / roots and shells.	537952	5263212	Dry Sieve, C&S, XRD, Clay/Silt settling
C113806	Penna	Screened (<1.4mm) bedding sand stockpile. Brown fine grained angular quartz rich sand with 10-20% clay.	537952	5263212	Dry Sieve
C113807	Penna	Raw "Sharp Sand" stockpile @ Allsands, Penna. Fine to medium grained polyolithic angular quartz rich sand with very low visible clay or other impurities.	537952	5263212	Dry Sieve, C&S, XRD, Clay/Silt settling
C113808	Penna	Raw "Fat Sand" stockpile.	537952	5263212	Dry Sieve, C&S, XRD, Clay/Silt settling
C113810	Lazenbys Sand	Lazenbys sand. Outcropping sand layer 1m below soil layer. White very fine grained subangular to subrounded quartz rich sand with minor bracken fern roots fragments. Pit face sample.	540202	5240850	Dry Sieve, C&S, XRD, Clay/Silt settling
C113816	South Arm	Males washed coarse white sand. Medium to coarse grained brown-grey subrounded to subangular quartz rich sand.	540200	5236700	Dry Sieve, Clay/Silt settling
C113818	Forcett	Very fine to fine grained light brown / tan sand with roots and other organic impurities. Undifferentiated sand.	556926	5260091	Dry Sieve, C&S, XRD, Clay/Silt settling



**Figure 1.** C113801. Brown, well sorted, fine grained, unconsolidated, siliceous, dry, dune sand with bracken fern root fragments present.



**Figure 2.** C113802. Light brown to light orange, well sorted, fine grained, unconsolidated siliceous, dune sand with a small clay fraction.



**Figure 3.** C113803. Light brown to light orange well sorted fine grained unconsolidated quartz rich dune sand with a small clay fraction.



**Figure 4.** C113804. "Brickies Sand" stockpile, processed product mix of fat & sharp sand. Brown fine grained angular quartz rich sand with a minor clay fraction.



**Figure 5.** C113805. Raw "Bedding Sand" stockpile. Brown fine grained angular quartz rich sand with abundant (10-20%) clay causing clumping but otherwise clean of organics / roots and shells.



**Figure 6.** C113806. Screened (<1.4mm) bedding sand from stockpile. Brown fine grained angular quartz rich sand with 10-20% clay.



**Figure 7.** C113807. Raw "Sharp Sand" stockpile @ Allsands, Penna. Fine to medium grained, polyolithic, angular quartz rich sand with very low visible clay or other impurities.



**Figure 8.** C113808. Raw "Fat Sand" from stockpile.



**Figure 9.** C113810. Lazenbys sand. Outcropping sand layer 1m below soil layer. White very fine grained subangular to subrounded quartz rich sand with minor bracken fern roots fragments. Pit face sample.



**Figure 10.** C113816. Males washed coarse white sand. Medium to coarse grained, brown-grey subrounded to subangular lithic-rich, quartz rich sand.



**Figure 11.** C113818. very fine to fine grained light brown / tan sand with roots and other organic impurities - undifferentiated sediments.

#### 4. DRY SIEVING RESULTS

The samples were riffle-split down to manageable, representative sub-sample sizes and dry sieving was undertaken by N. Delany in accordance with AS 1289.3.6.1, with any overloaded sieves re-sieved in portions. To reduce sieve overloading, weights of sample used were based on estimating average sample PSD and minimum mass of sub-sample required as per the AS 1289.1.1.

The majority of sands sampled were medium to fine-grained, silica rich sands with minimal organic content and gravel to cobble-sized clasts present. Clay/silt fractions determined by PSD were less than 10% for all samples. See Appendix 1 for cumulative histograms and weights retained on sieves PSD data.

## 5. CLAY & FINE SILT SETTLING ANALYSIS

Clay and fine silt settling analysis was undertaken in accordance with AS 1141.33:2015 with results summarised below. The standard specifies where the separation of sediments is unclear, results should be specified “indeterminate”, however, where possible, estimated C (Ratio by volume of Clay & Fine silt to Sand) has been indicated.

As per the standard, there is no consistent relationship between the test result and the silt and clay fraction obtained by sieving. In general, however, the magnitude of the result of this test will be greater than the result passing the 75 µm sieve. This was verified in testing, with one of the samples approximately equivalent to the result by sieving (C113810) and the remainder giving a higher proportion of clay and fine silt to sand than the clay and fine silt results obtained by sieving.

**Table 2.** Sand and Fine Silt & Clay Settling Data

Sample Registration Number	Sand Volume - S (mL)	Clay & Fine Silt Volume - F (mL)	Ratio by volume of Clay & Fine silt to Sand - C (%)	Comments
C113801	87	7	8	
C113802	80	34	43	
C113803	90	14	16	
C113805	90	19	21	
C113807	92	14	15	
C113808	84	23*	27*	Separation of sediments unclear
C113810	92	2	2	
C113816	90	8*	9*	Separation of sediments unclear
C113818	105	2	2	

\* Estimated clay and fine silt volumes, and ratios of clay and fine silt to sand

## 6. CARBON SULPHUR TESTING

C&S contents were determined by Non-Dispersive Infrared (NDIR) analysis using a Bruker G4 Icarus analyser, in the MRT laboratories, Mornington, with added acid leach tests to determine the Total Organic Carbon (TOC) and C as carbonate. Soil Organic Matter (SOM = TOC plus estimates of H, N, O and other elements that are normal components of organic compounds in soil) was also calculated by multiplying by the standard value of 1.72 (Pribyl, 2010).

Variable TOC and SOM was found in these samples. TOC ranged from ~0.01% (C113810) to ~0.1% (C113818) and SOM ranged from ~0.03% (C113810) to ~0.2% for C113818, making the latter the most organic rich sample tested.

## 7. X-RAY DIFFRACTION TESTING RESULTS

Representative subsamples were analysed in the MRT laboratories, Mornington, Tasmania and run on a Rigaku Miniflex 600 X-Ray Diffractometer system. The mineralogy of the samples was overwhelmingly silica (quartz) rich, ranging from 100% quartz (C113810) to 73% quartz (C113805), with variable amorphous clay, kaolinite, feldspar and mica constituting most of the remainder of the samples (Fig. 3).

**Table 3. XRD Summary wt% ( $\pm$ error)**

Mineral	Formula	C113803	C113805	C113807	C113808	C113810	C113818
		Penna sand	Penna sand	Penna sand	Penna sand	Lazenbys Sand	Forcett Sediment
Amorphous Clay	Variable	-	5 ( $\pm$ 3)	-	6 ( $\pm$ 3)	-	-
Kaolinite group	$Al_2(Si_2O_5)(OH)_4$	<1	4 ( $\pm$ 2)	4 ( $\pm$ 2)	6 ( $\pm$ 3)	-	-
K-Feldspar	$KAlSi_3O_8$	7 ( $\pm$ 3)	8 ( $\pm$ 4)	7 ( $\pm$ 3)	5 ( $\pm$ 3)	-	4 ( $\pm$ 2)
Mica (illite)	$K_{0.7}Al_2[Al_{0.7}Si_{3.3}O_{10}](OH)_2$	3 ( $\pm$ 2)	1 ( $\pm$ 2)	-	-	-	-
Plagioclase	$(Na,Ca)(Al,Si)_4O_8$	8 ( $\pm$ 3)	9 ( $\pm$ 4)	5 ( $\pm$ 3)	4 ( $\pm$ 2)	-	-
Quartz	$SiO_2$	81 ( $\pm$ 10)	73 ( $\pm$ 10)	85 ( $\pm$ 10)	80 ( $\pm$ 10)	100 ( $\pm$ 10)	96 ( $\pm$ 10)

## 8. DISCUSSION AND CONCLUSIONS

The results obtained by physical testing of these siliceous sands largely reflected the visual assessment in particle size distribution and organic matter content. The sands tested were found to be predominantly medium to fine grained, with all excluding two samples (C113806 & C113818) having <5% silt and clay content as determined by particle size distribution by dry sieving.

The clay and fine silt settling method showed results at variance with the dry sieving results, with testing showing a ratio by volume of clay and fine silt to sand ranging from ~1% (C113810) to ~43% (C113802). As per the standard, it should be noted that there is no consistent relationship between these test results and the result of the mass passing the 75 µm sieve in the dry sieve analysis. However, the magnitude of the results of this test for all samples were equal to or greater than the result passing the 75 µm sieve, in compliance with the AS 1141.33 predictions.

Geochemistry and mineralogical analyses showed relative consistency across all the samples tested. Total Organic Carbon and Soil Organic matter were also only detectable in trace levels, not exceeding 0.2% organic matter in any of the samples tested. Mineralogy of the samples was overwhelmingly silica (quartz) rich and ranged from 100% quartz (C113810) to 73% quartz (C113805), with variable amorphous clay, kaolinite, feldspar and mica constituting most of the remainder of the samples.

## REFERENCES

Pribyl, Douglas W., 2010, A critical review of the conventional SOC to SOM conversion factor, *Geoderma*, Volume 156, Issues 3–4, Pages 75-83,

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**TECHNICAL OFFICER**

R.S. Bottrill

**MINERALOGIST/PETROLOGIST**

## DISCLAIMERS:

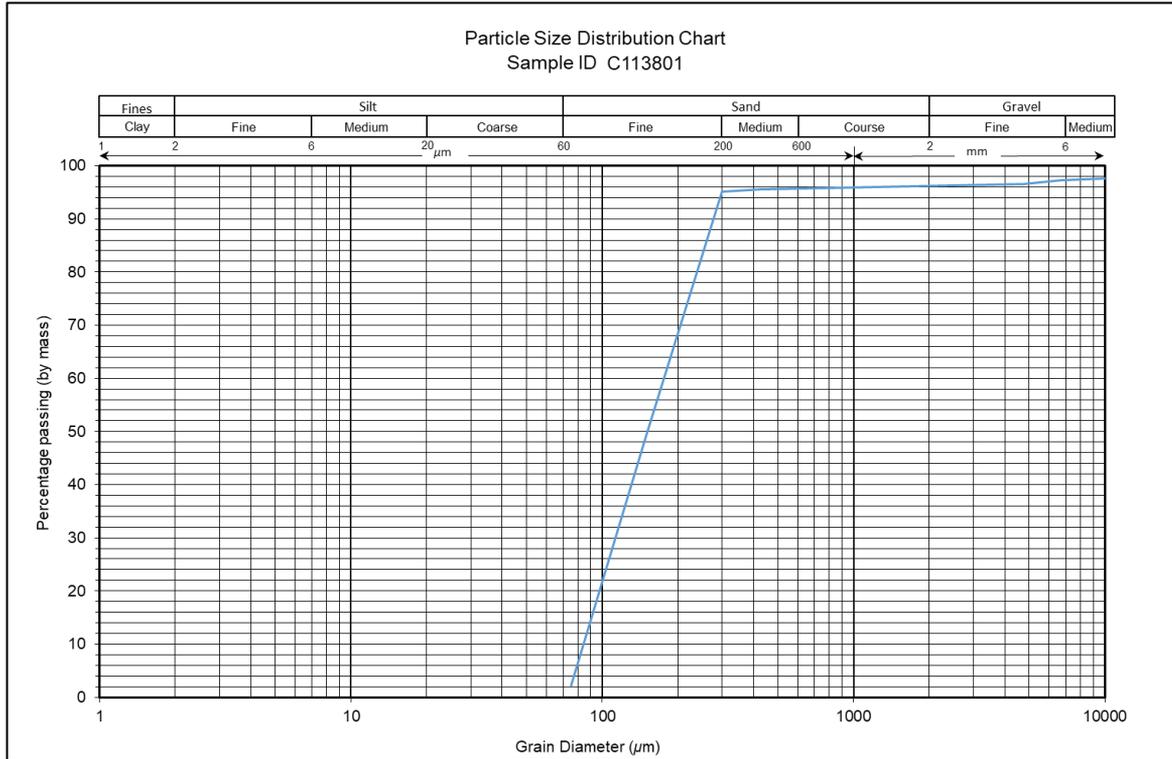
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## LABORATORY DETAILS

*MRT operates a laboratory facility at Mornington, Tasmania. In the interests of full disclosure, these laboratories do not have NATA accreditation. However, all tests are performed according to relevant Australian Standards cited in the report and subject to internal peer review processes. The analytical facilities at MRT are periodically compared against other similar laboratories in other jurisdictions with favourable results.*

**APPENDIX 1: PARTICLE SIZE DISTRIBUTION DATA**

**C113801 Cumulative Histogram & PSD Data**



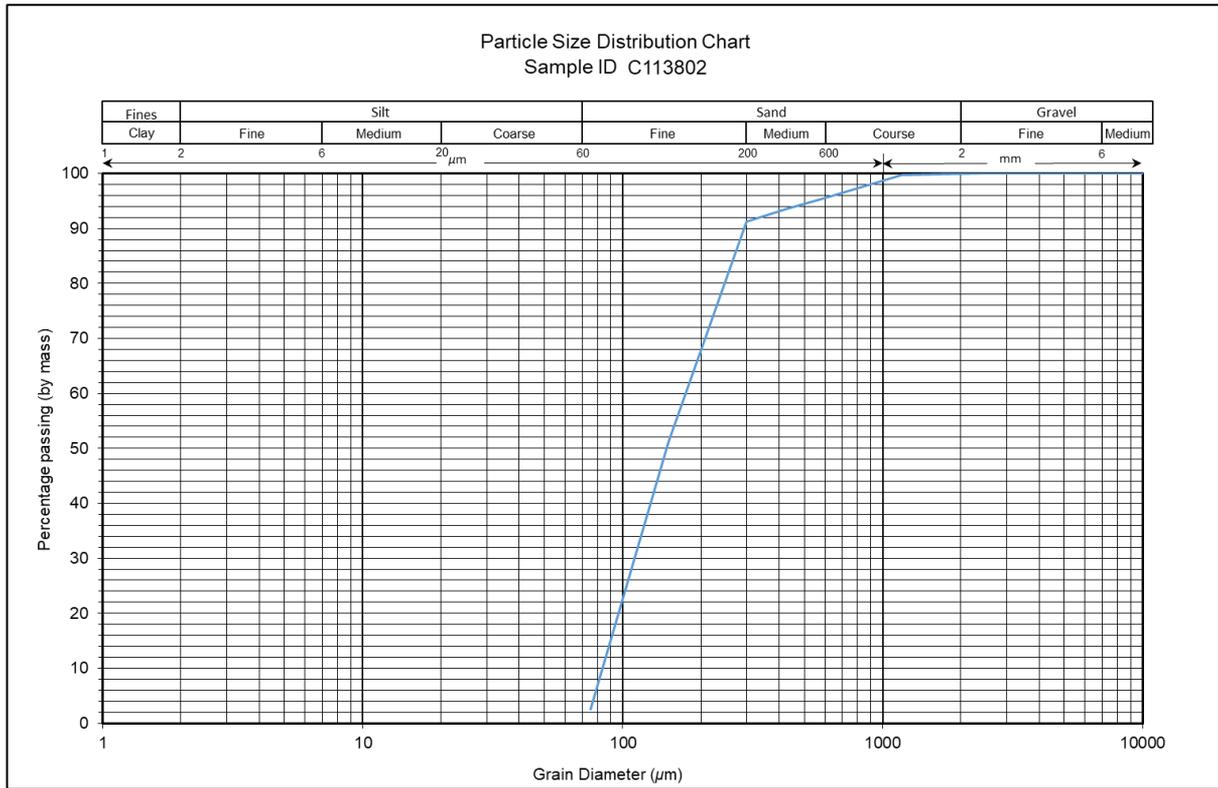
Sample ID:	C113801
Date:	22/04/2024

Weight of sample used (g)	296.1
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Retained on Sieve size (microns)	wt. (g)	wt. %
>13200	5.9	2.00
13200-9500	1.30	0.44
9500-6700	0.80	0.27
6700-4750	2.00	0.68
4750-2360	1.00	0.34
2360-1180	0.70	0.24
1180-600	1.00	0.34
600-425	0.40	0.14
425-300	1.40	0.48
300-150	134.50	45.64
150-75	139.00	47.17
<75	6.70	2.27
<b>Total</b>	<b>294.70</b>	<b>100.00</b>

cum. % passing	Sieve size (microns)
100.00	<b>19000</b>
98.00	13200
97.56	9500
97.29	6700
96.61	4750
96.27	2360
96.03	1180
95.69	600
95.55	425
95.08	300
49.44	150
2.27	75
	0

**C113802 Cumulative Histogram & PSD Data**



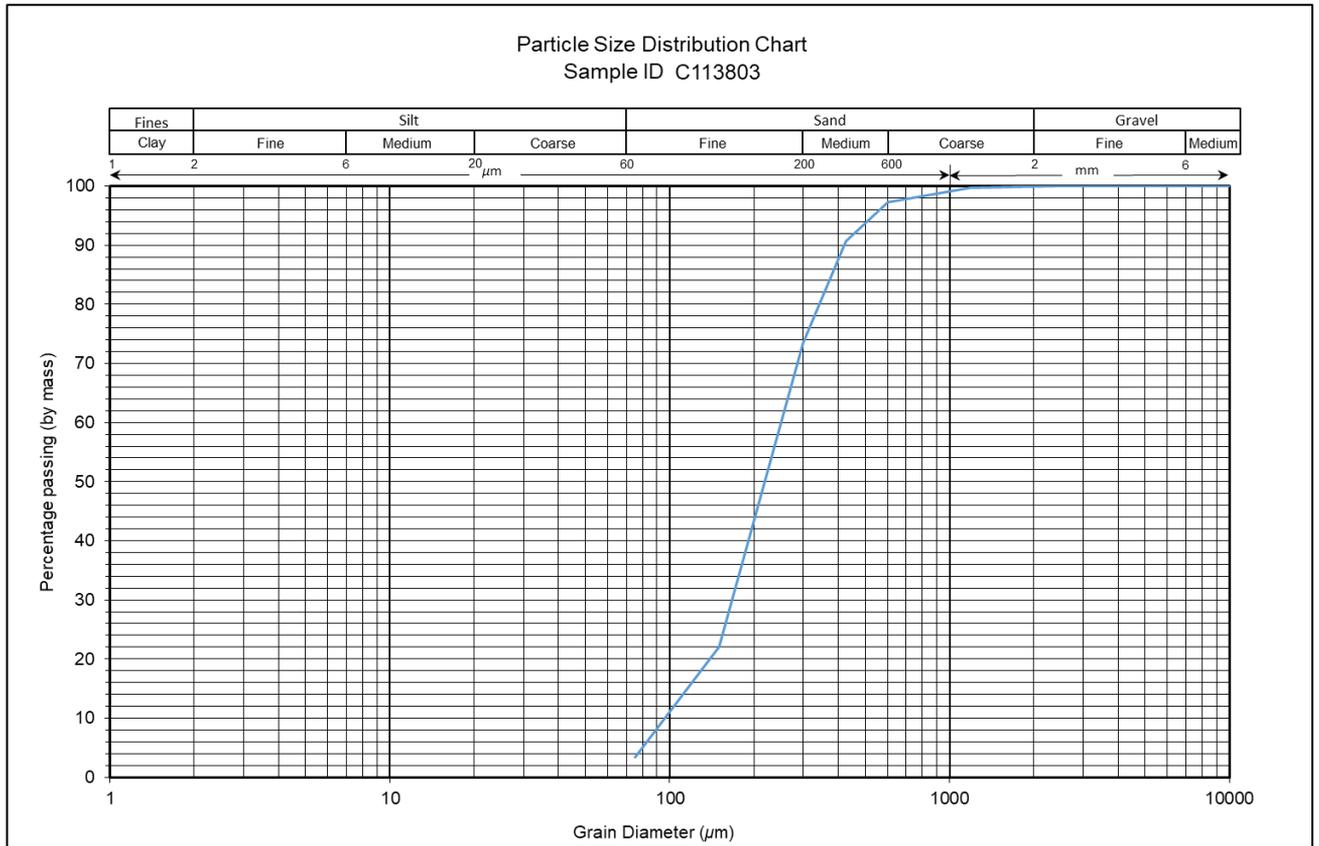
Sample ID:	C113802
Date:	22/04/2024

Weight of sample used (g)	176.2
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Retained on Sieve size (microns)	wt. (g)	wt. %
>13200	0	0.00
13200-9500	0.00	0.00
9500-6700	0.00	0.00
6700-4750	0.00	0.00
4750-2360	0.00	0.00
2360-1180	0.50	0.29
1180-600	7.30	4.17
600-425	3.40	1.94
425-300	4.20	2.40
300-150	69.90	39.94
150-75	85.30	48.74
<75	4.40	2.51
Total	175.00	100.00

cum.% passing	Sieve size (microns)
100.00	19000
100.00	13200
100.00	9500
100.00	6700
100.00	4750
100.00	2360
99.71	1180
95.54	600
93.60	425
91.20	300
51.26	150
2.51	75
	0

**C113803 Cumulative Histogram & PSD Data**



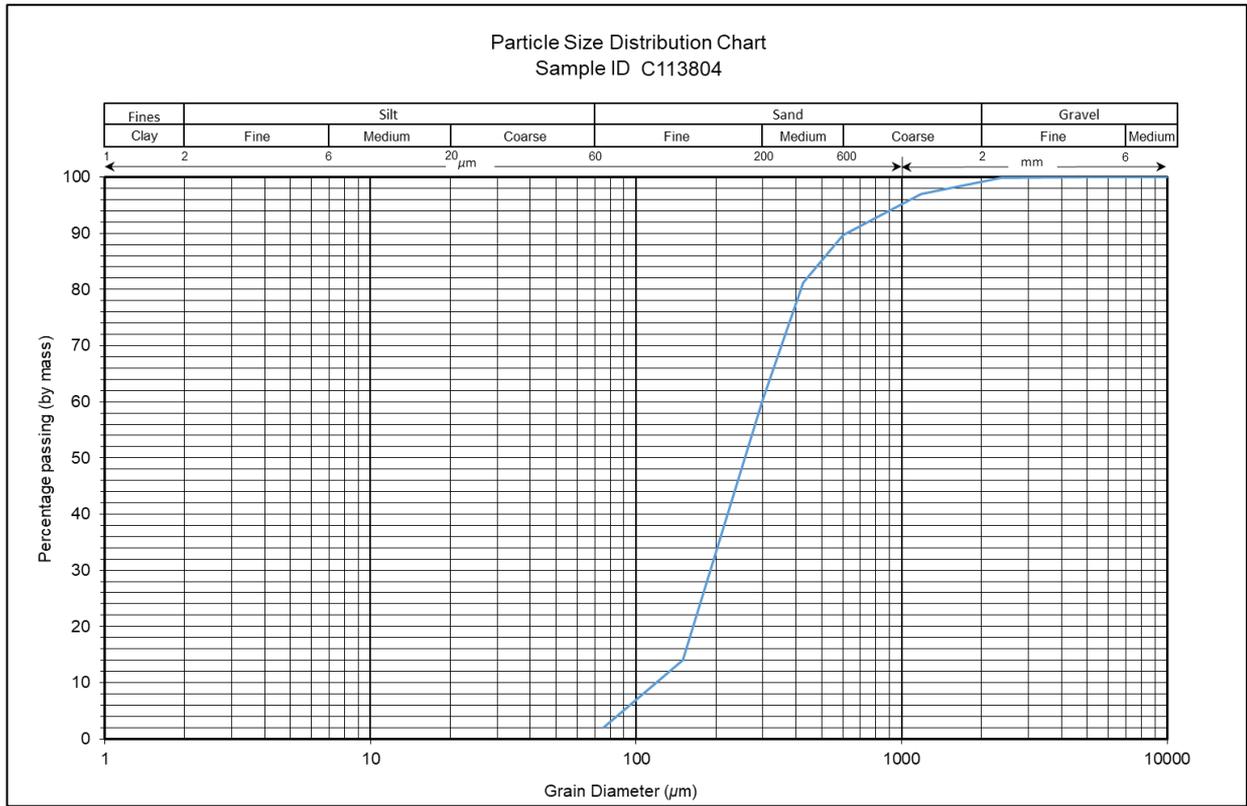
Sample ID:	C113803
Date:	22/04/2024

Weight of sample used (g)	208.5
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Retained on Sieve size (microns)	wt. (g)	wt. %
>13200	0	0.00
13200-9500	0.00	0.00
9500-6700	0.00	0.00
6700-4750	0.00	0.00
4750-2360	0.00	0.00
2360-1180	0.60	0.28
1180-600	5.20	2.45
600-425	14.00	6.59
425-300	36.60	17.24
300-150	109.12	51.39
150-75	39.46	18.58
<75	7.35	3.46
Total	212.33	100.00

cum. % passing	Sieve size (microns)
100.00	19000
100.00	13200
100.00	9500
100.00	6700
100.00	4750
100.00	2360
99.72	1180
97.27	600
90.67	425
73.44	300
22.05	150
3.46	75
	Test

**C113804 Cumulative Histogram & PSD Data**



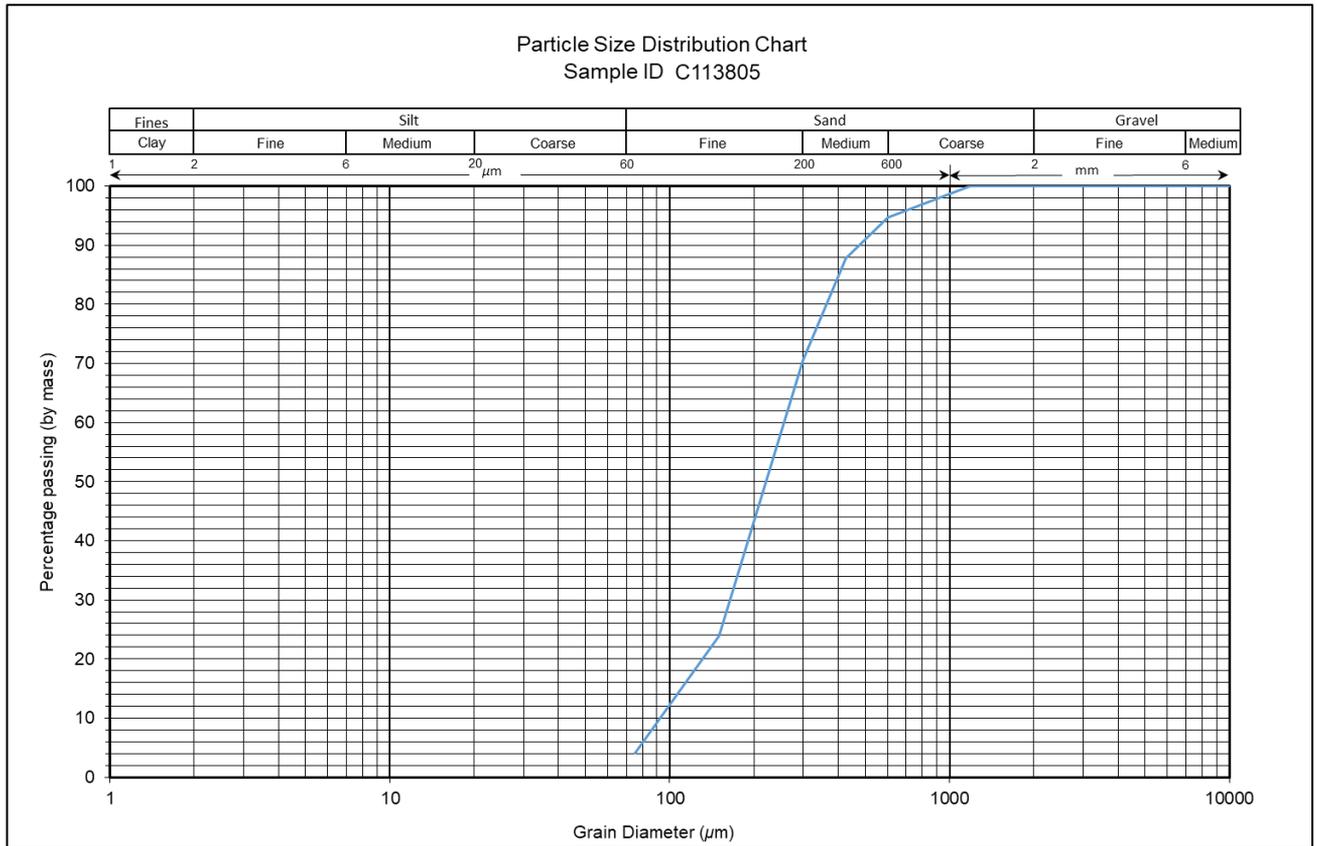
Sample ID:	C113804
Date:	22/04/2024

Weight of sample used (g)	301.3
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Retained on Sieve size (microns)	wt. (g)	wt. %
>13200	0	0.00
13200-9500	0.00	0.00
9500-6700	0.00	0.00
6700-4750	0.00	0.00
4750-2360	0.40	0.13
2360-1180	8.50	2.84
1180-600	22.00	7.35
600-425	25.40	8.48
425-300	62.90	21.01
300-150	138.30	46.19
150-75	36.20	12.09
<75	5.70	1.90
Total	299.40	100.00

cum. % passing	Sieve size (microns)
100.00	19000
100.00	13200
100.00	9500
100.00	6700
100.00	4750
99.87	2360
97.03	1180
89.68	600
81.20	425
60.19	300
13.99	150
1.90	75
	Test

**C113805 Cumulative Histogram & PSD Data**



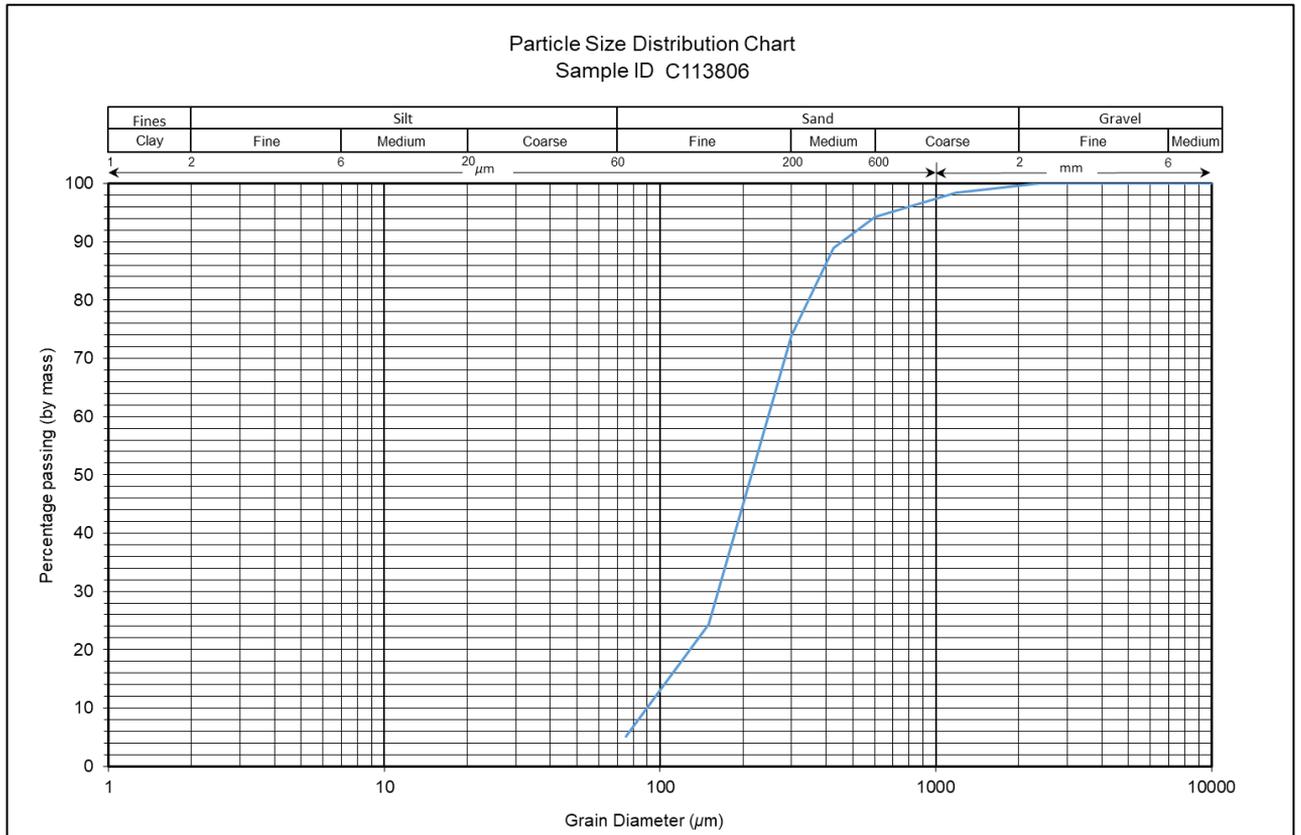
Sample ID:	C113805
Date:	22/04/2024

Weight of sample used (g)	105.7
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Retained on Sieve size (microns)	wt. (g)	wt. %
>13200	0	0.00
13200-9500	0.00	0.00
9500-6700	0.00	0.00
6700-4750	0.00	0.00
4750-2360	0.00	0.00
2360-1180	0.00	0.00
1180-600	5.60	5.36
600-425	7.10	6.80
425-300	18.00	17.24
300-150	48.70	46.65
150-75	20.70	19.83
<75	4.30	4.12
Total	104.40	100.00

cum. % passing	Sieve size (microns)
100.00	19000
100.00	13200
100.00	9500
100.00	6700
100.00	4750
100.00	2360
100.00	1180
94.64	600
87.84	425
70.59	300
23.95	150
4.12	75
	Test

**C113806 Cumulative Histogram & PSD Data**



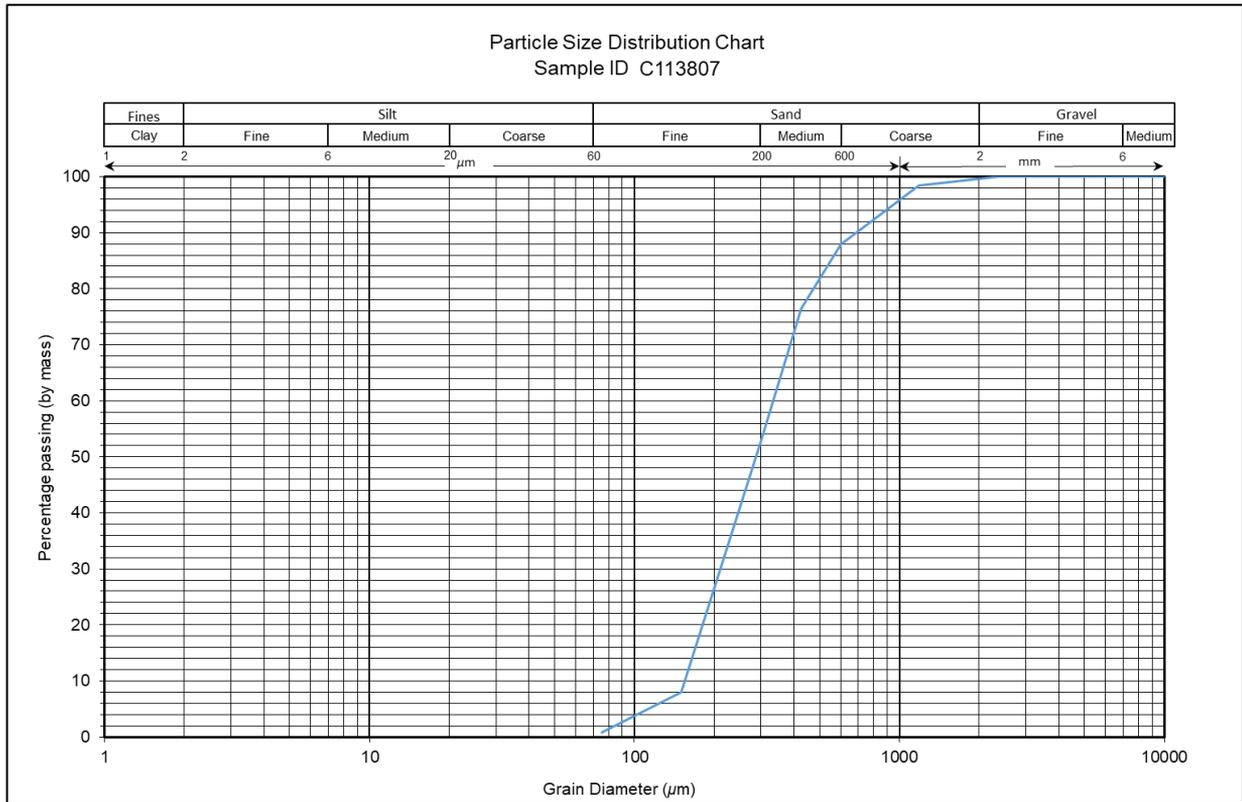
Sample ID:	C113806
Date:	22/04/2024

Weight of sample used (g)	77.6
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Retained on Sieve size (microns)	wt. (g)	wt. %
>13200	0	0.00
13200-9500	0.00	0.00
9500-6700	0.00	0.00
6700-4750	0.00	0.00
4750-2360	0.00	0.00
2360-1180	1.20	1.57
1180-600	3.20	4.18
600-425	4.10	5.36
425-300	11.50	15.03
300-150	37.90	49.54
150-75	14.70	19.22
<75	3.90	5.10
<b>Total</b>	<b>76.50</b>	<b>100.00</b>

cum. % passing	Sieve size (microns)
100.00	<b>19000</b>
100.00	13200
100.00	9500
100.00	6700
100.00	4750
100.00	2360
98.43	1180
94.25	600
88.89	425
73.86	300
24.31	150
5.10	75
	<b>Test</b>

**C113807 Cumulative Histogram & PSD Data**



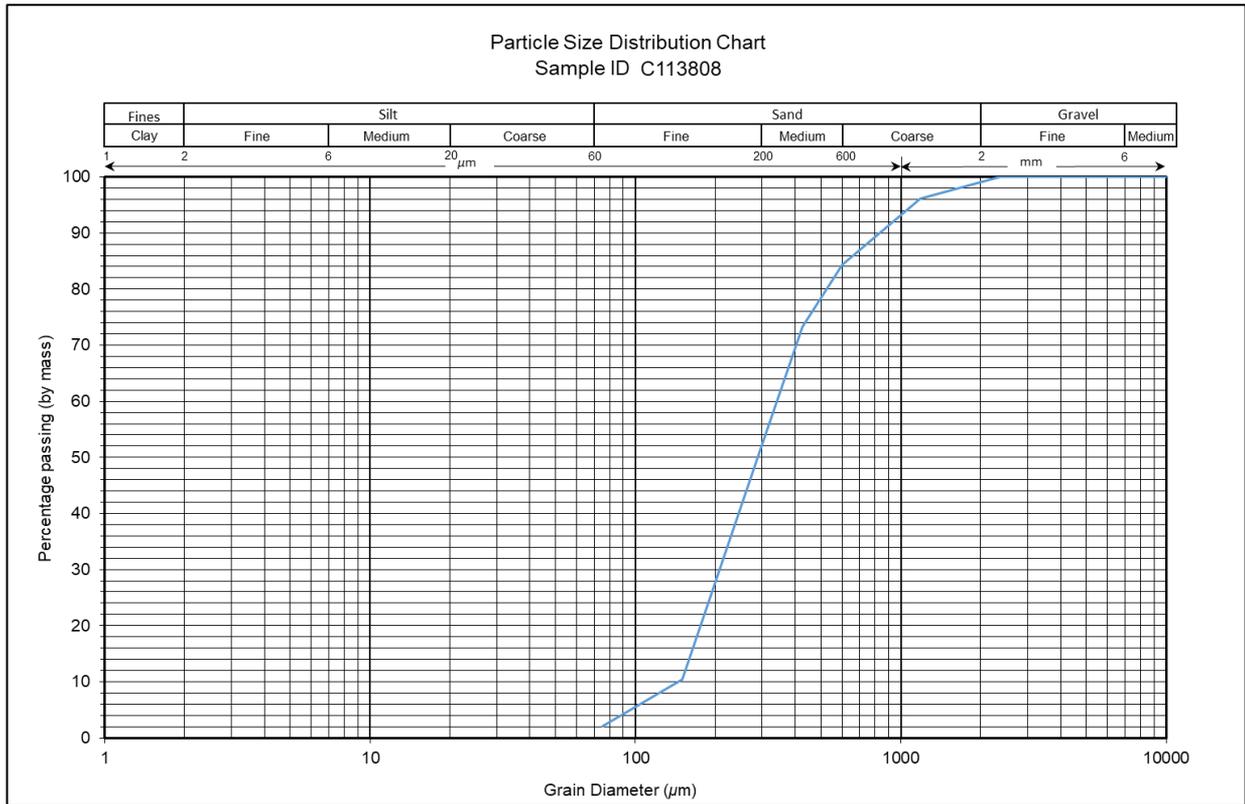
Sample ID:	C113807
Date:	22/04/2024

Weight of sample used (g)	60.1
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Retained on Sieve size (microns)	wt. (g)	wt. %
>13200	0	0.00
13200-9500	0.00	0.00
9500-6700	0.00	0.00
6700-4750	0.00	0.00
4750-2360	0.00	0.00
2360-1180	0.90	1.52
1180-600	6.20	10.49
600-425	6.80	11.51
425-300	14.10	23.86
300-150	26.40	44.67
150-75	4.20	7.11
<75	0.50	0.85
Total	59.10	100.00

cum.% passing	Sieve size (microns)
100.00	19000
100.00	13200
100.00	9500
100.00	6700
100.00	4750
100.00	2360
98.48	1180
87.99	600
76.48	425
52.62	300
7.95	150
0.85	75
	Test

**C113808 Cumulative Histogram & PSD Data**



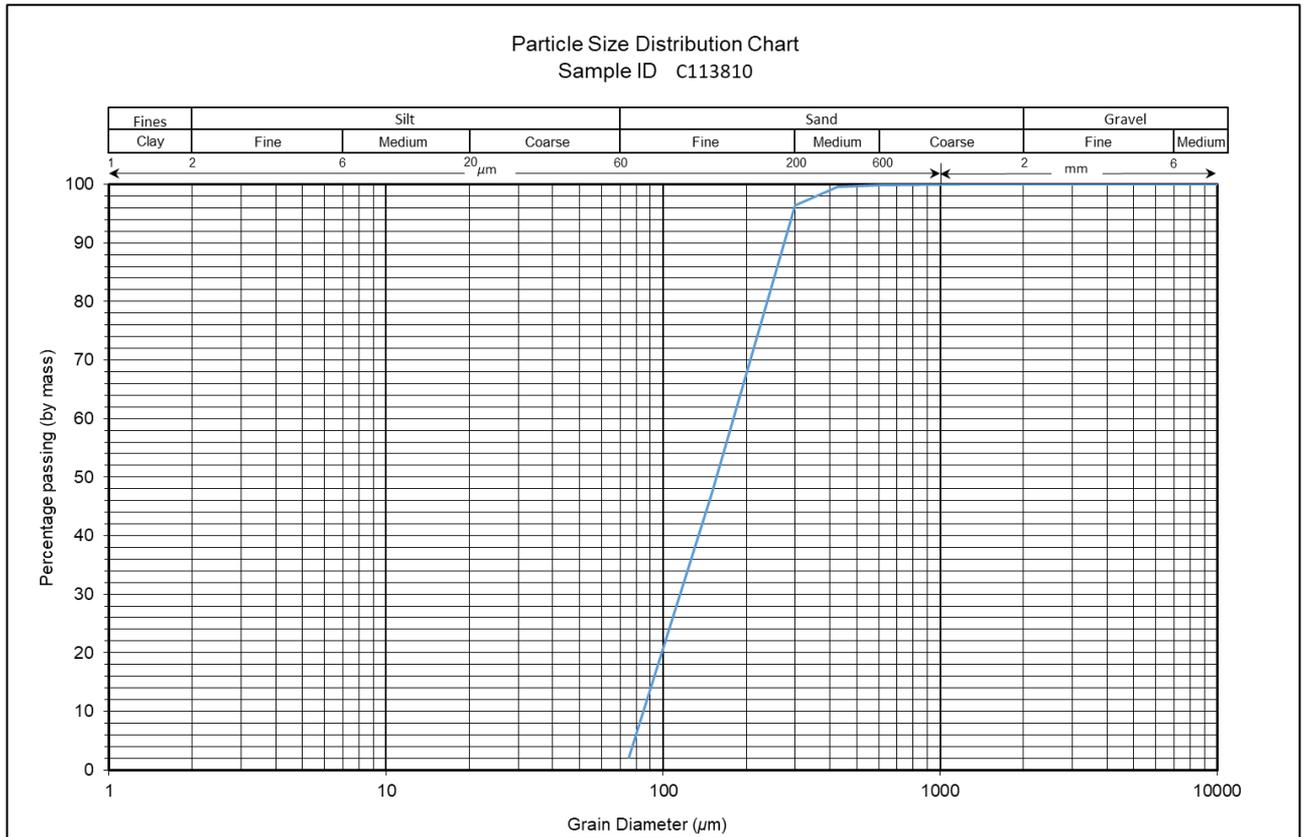
Sample ID:	C113808
Date:	22/04/2024

Weight of sample used (g)	58
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Retained on Sieve size (microns)	wt. (g)	wt. %
>13200	0	0.00
13200-9500	0.00	0.00
9500-6700	0.00	0.00
6700-4750	0.00	0.00
4750-2360	0.00	0.00
2360-1180	2.20	3.81
1180-600	6.80	11.79
600-425	6.40	11.09
425-300	12.20	21.14
300-150	24.10	41.77
150-75	4.80	8.32
<75	1.20	2.08
Total	57.70	100.00

cum. % passing	Sieve size (microns)
100.00	19000
100.00	13200
100.00	9500
100.00	6700
100.00	4750
100.00	2360
96.19	1180
84.40	600
73.31	425
52.17	300
10.40	150
2.08	75
	Test

**C113810 Cumulative Histogram and PSD Data**



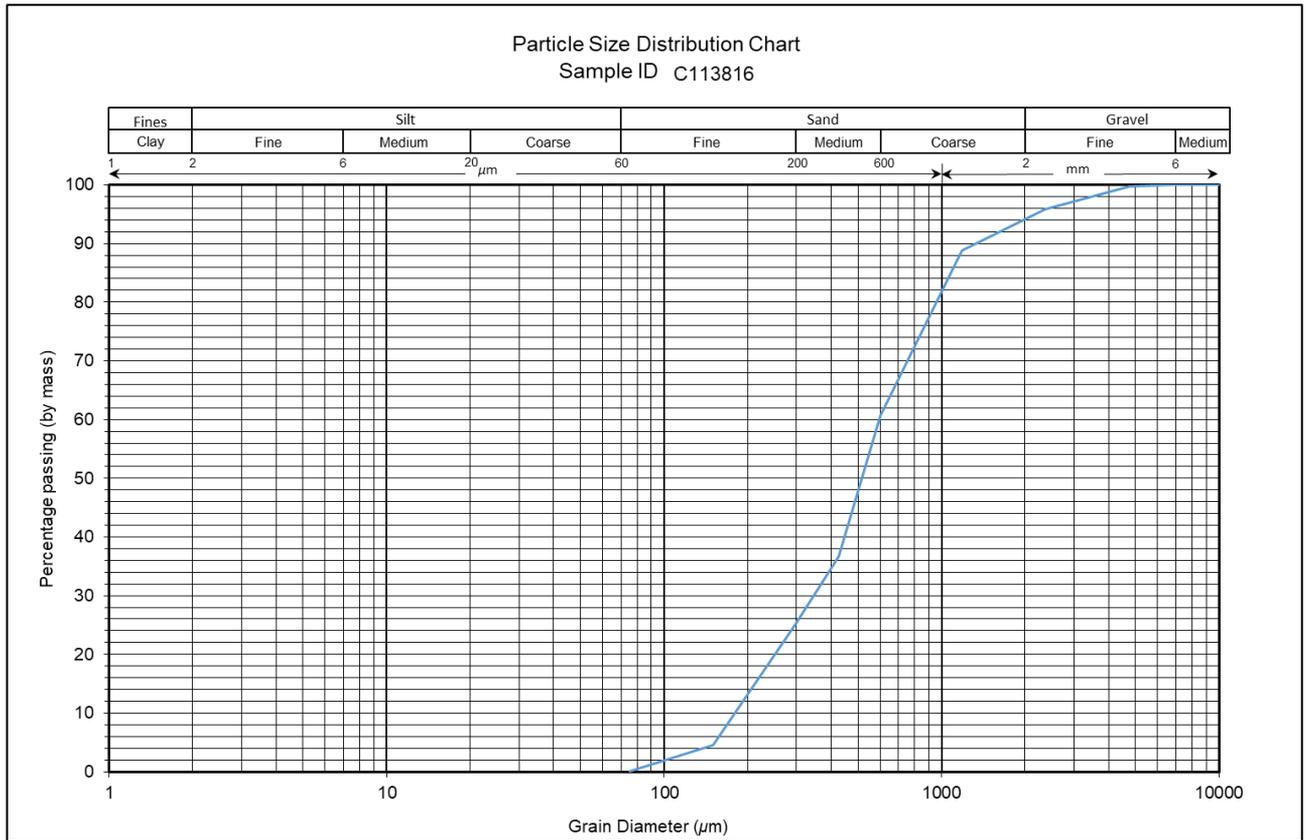
Sample ID:	C113810
Date:	22/04/2024

Weight of sample used (g)	53.2
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Retained on Sieve size (microns)	wt. (g)	wt.%
>13200	0	0.00
13200-9500	0.00	0.00
9500-6700	0.00	0.00
6700-4750	0.00	0.00
4750-2360	0.00	0.00
2360-1180	0.00	0.00
1180-600	0.05	0.09
600-425	0.15	0.28
425-300	1.68	3.17
300-150	26.00	49.08
150-75	24.00	45.30
<75	1.10	2.08
Total	52.98	100.00

cum.% passing	Sieve size (microns)
100.00	19000
100.00	13200
100.00	9500
100.00	6700
100.00	4750
100.00	2360
100.00	1180
99.91	600
99.62	425
96.45	300
47.38	150
2.08	75
	Test

**C113816 Cumulative Histogram & PSD Data**



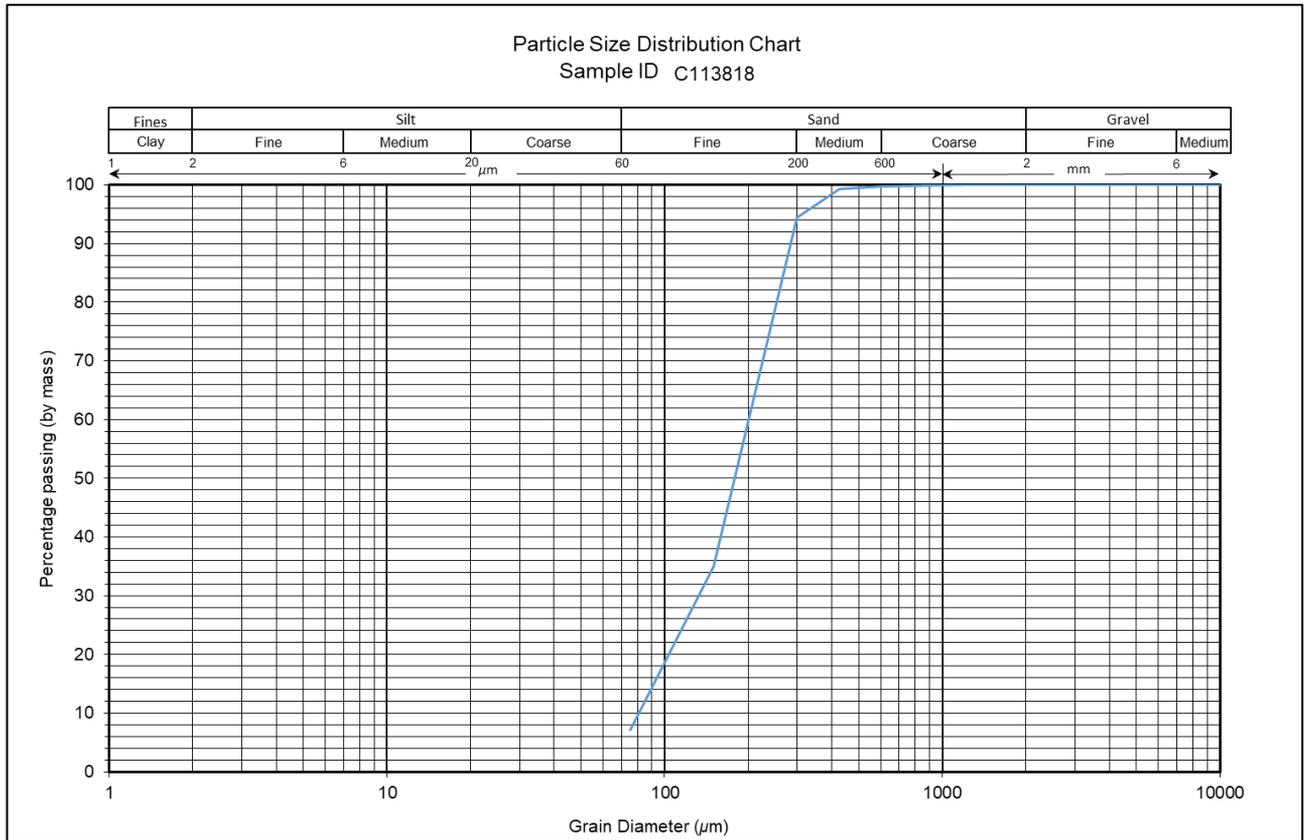
Sample ID:	C113816
Date:	22/04/2024

Weight of sample used (g)	64.47
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Retained on Sieve size (microns)	wt. (g)	wt.%
>13200	0	0.00
13200-9500	0.00	0.00
9500-6700	0.00	0.00
6700-4750	0.20	0.31
4750-2360	2.43	3.80
2360-1180	4.49	7.02
1180-600	18.00	28.16
600-425	15.30	23.94
425-300	7.30	11.42
300-150	13.30	20.81
150-75	2.80	4.38
<75	0.10	0.16
Total	63.92	100.00

cum.% passing	Sieve size (microns)
100.00	19000
100.00	13200
100.00	9500
100.00	6700
99.69	4750
95.89	2360
88.86	1180
60.70	600
36.76	425
25.34	300
4.54	150
0.16	75
	Test

**C113818 Cumulative Histogram & PSD Data**



Sample ID:	C113818
Date:	22/04/2024

Weight of sample used (g)	69.7
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Retained on Sieve size (microns)	wt. (g)	wt.%
>13200	0	0.00
13200-9500	0.00	0.00
9500-6700	0.00	0.00
6700-4750	0.00	0.00
4750-2360	0.00	0.00
2360-1180	0.00	0.00
1180-600	0.20	0.29
600-425	0.30	0.43
425-300	3.40	4.92
300-150	41.00	59.33
150-75	19.30	27.93
<75	4.90	7.09
Total	69.10	100.00

cum.% passing	Sieve size (microns)
100.00	19000
100.00	13200
100.00	9500
100.00	6700
100.00	4750
100.00	2360
100.00	1180
99.71	600
99.28	425
94.36	300
35.02	150
7.09	75
	Test

**APPENDIX 2: C&S TESTING ANALYSIS****Client:** RE CMT Labs**Sample location:** Unnamed Quarry, Smithton**Job Number:** LJN2024-060**Analysis:** Chemistry**Method:** NDIR**Analyst:** A. Williams**Checked by:** R.S. Bottrill & M.R. Giddings**Lab manager:** B Frankel**Date:** 08/07/2024

C&S content was determined by Non-Dispersive Infrared (NDIR) analysis using a Bruker G4 Icarus analyser, in the MRT laboratories, Mornington, with added acid leach tests to determine the Total organic carbon (TOC) and C as carbonate. The C&S results are found below.

Job Number	LJN2024-029	LJN2024-029	LJN2024-029	LJN2024-029	LJN2024-029	LJN2024-029
Sample ID	C113803	C113805	C113807	C113808	C113810	C113818
Sample Weight (g) Dried at 105°C	1.439	1.476	1.479	1.416	1.474	1.437
Container + Filter Paper Weight (g)	63.287	63.820	61.243	58.075	37.192	36.402
Leached sample + Filter + Container (g)	64.683	65.243	62.690	59.429	38.652	37.826
Carbon (%)	0.075	0.073	0.021	0.055	0.015	0.110
Sulphur (%)	0.015	0.018	0.016	0.017	0.014	0.015
Sample Residue Weight	1.396	1.422	1.447	1.354	1.460	1.423
Residue (%)	0.970	0.964	0.978	0.957	0.991	0.991
Total Carbon in residue (%)	0.070	0.087	0.024	0.069	0.015	0.119
Sulphur in residue (%)	0.015	0.019	0.014	0.018	0.018	0.014
TOC Carbon (%)	0.073	0.071	0.021	0.052	0.014	0.109
Carbon as Carbonate (%)	0.000	0.016	0.004	0.017	0.001	0.010
Organic Matter (%)	0.132	0.127	0.037	0.094	0.026	0.196

**APPENDIX 3: LABORATORY REPORT: XRD ANALYSES**

**Client:** T Holmes MRT  
**Sample location:** Hobart Area  
**Job Number:** LJN2024-029  
**Analysis:** Mineralogy  
**Method:** XRD  
**Analyst:** T Coyte  
**Checked by:** R Bottrill  
**Lab manager:** B Frankel  
**Date:** 19/6/2024

The samples were prepared, examined and analysed in the MRT laboratories, Mornington, Tasmania. They were run on a Rigaku Miniflex 600 X-Ray Diffractometer system: a 600W generator, 150mm goniometer with a Cu tube; 40kV/15mA, sample spinner and a Scintillation counter (SC) with Be window, a graphite counter monochromator and a K $\beta$  Ni- filter. The analysis was performed using the following conditions: +3° to 63° 2Theta scanning and measuring range, with a scanning speed of 0.5 °/min with a resolution of 0.02° by step. The mineral identification software used for sample analysis is PDXL2 using the ICCD database.

Quartz, if present, is used as an internal standard; and if not present, it is often added to the sample for a supplementary scan. Our semi-quantitative results are calculated using the Siroquant software by Sietronics and is a Rietveld analysis using an internal mineral database.

### Measurement conditions

X-Ray:	40 kV , 15 mA	Scan speed / Duration time:	0.5000 deg/min
Goniometer:	MiniFlex600	Step width:	0.0200 deg
Attachment:	ASC-6	Scan axis:	Theta/2-Theta
Filter:	None	Scan range:	3.0000 - 63.0000 deg
CBO selection slit:	-	Incident slit:	1.250deg
Diffracted beam mono.:	Bent	Length limiting slit:	10.0mm
Detector:	SC-70	Receiving slit #1:	1.250deg
Scan mode:	Continuous	Receiving slit #2:	0.3mm

### XRD Summary wt% ( $\pm$ error)

Mineral	Formula	C113803	C113805	C113807	C113808
		Penna sand	Penna sand	Penna sand	Penna sand
Amorphous Clay*	Variable	-	5 ( $\pm$ 3)	-	6 ( $\pm$ 3)
Kaolinite group	$Al_2(Si_2O_5)(OH)_4$	<1	4 ( $\pm$ 2)	4 ( $\pm$ 2)	6 ( $\pm$ 3)
K-Feldspar	$KAlSi_3O_8$	7 ( $\pm$ 3)	8 ( $\pm$ 4)	7 ( $\pm$ 3)	5 ( $\pm$ 3)
Mica*	$K_{0.7}Al_2[Al_{0.7}Si_{3.3}O_{10}](OH)_2$	3 ( $\pm$ 2)	1 ( $\pm$ 2)	-	-
Plagioclase	$(Na,Ca)(Al,Si)_4O_8$	8 ( $\pm$ 3)	9 ( $\pm$ 4)	5 ( $\pm$ 3)	4 ( $\pm$ 2)
Quartz	$SiO_2$	81 ( $\pm$ 10)	73 ( $\pm$ 10)	85 ( $\pm$ 10)	80 ( $\pm$ 10)

Mineral	Formula	C113810	C113818
		Lazenbys Sand	Forcett Sediment
Amorphous Clay*	Variable	-	-
Kaolinite group	$Al_2(Si_2O_5)(OH)_4$	-	-
K-Feldspar	$KAlSi_3O_8$	-	4 ( $\pm$ 2)
Mica*	$K_{0.7}Al_2[Al_{0.7}Si_{3.3}O_{10}](OH)_2$	-	-
Plagioclase	$(Na,Ca)(Al,Si)_4O_8$	-	-
Quartz	$SiO_2$	100 ( $\pm$ 10)	96 ( $\pm$ 10)

## XRD Results-C113803: Penna sand

### General Information

<b>Measurement date:</b>	6/6/2024	<b>Interpretative date:</b>	13/6/2024
<b>Job Number/Client:</b>	LJN2024-029 T Holmes	<b>XRD</b>	Rigaku Miniflex 600
<b>Registration Number:</b>	C113803	<b>Analyst:</b>	T Coyte
<b>Quantitative Method:</b>	Siroquant	<b>Process Medium:</b>	Wholerock
<b>Sample Holder:</b>	Standard	<b>Speed (deg/min):</b>	0.5
<b>Comment:</b>	No Shift		

### Analysis Results

Phase name	Content wt% ( $\pm$ error)	Formula
Quartz	81 ( $\pm$ 10)	SiO <sub>2</sub>
Plagioclase	8 ( $\pm$ 3)	(Na,Ca)(Al,Si) <sub>4</sub> O <sub>8</sub>
K-Feldspar	7 ( $\pm$ 3)	KAlSi <sub>3</sub> O <sub>8</sub>
Mica*	3 ( $\pm$ 2)	K <sub>0.7</sub> Al <sub>2</sub> [Al <sub>0.7</sub> Si <sub>3.3</sub> O <sub>10</sub> ](OH) <sub>2</sub>
Kaolinite group	<1	Al <sub>2</sub> (Si <sub>2</sub> O <sub>5</sub> )(OH) <sub>4</sub>

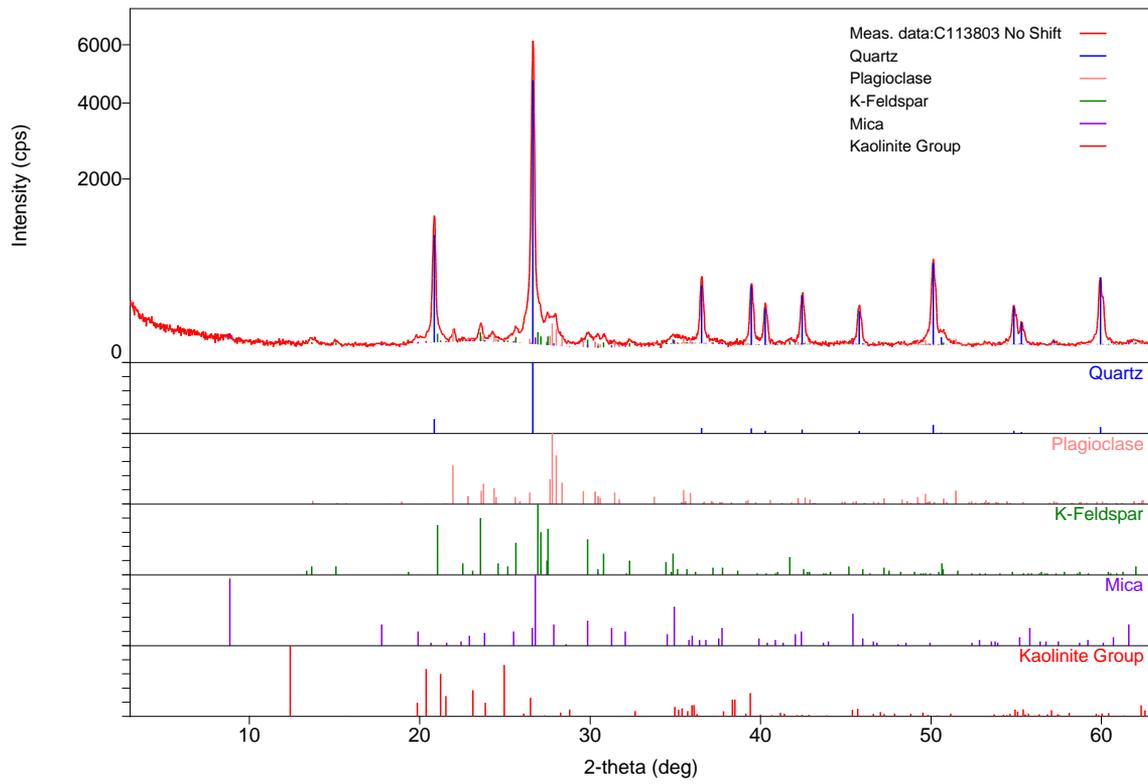
#### Notes

Mica\* Likely Di-Octahedral; muscovite or illite

Peak overlaps may interfere with identifications and quantitative calculations.

Amorphous minerals and minerals present in trace amounts may not be detected.

Phase Data Pattern



## XRD Results-C113805: Penna sand

### General Information

<b>Measurement date:</b>	6/6/2024	<b>Interpretative date:</b>	19/6/2024
<b>Job Number/Client:</b>	LJN2024-029 T Holmes	<b>XRD</b>	Rigaku Miniflex 600
<b>Registration Number:</b>	C113805	<b>Analyst:</b>	T Coyte
<b>Quantitative Method:</b>	Siroquant	<b>Process Medium:</b>	Wholerock
<b>Sample Holder:</b>	Standard	<b>Speed (deg/min):</b>	0.5
<b>Comment:</b>	Shifted -0.03		

### Analysis Results

Phase name	Content wt% ( $\pm$ error)	Formula
Quartz	73 ( $\pm$ 10)	SiO <sub>2</sub>
Plagioclase	9 ( $\pm$ 4)	(Na,Ca)(Al,Si) <sub>4</sub> O <sub>8</sub>
K-Feldspar	8 ( $\pm$ 4)	KAlSi <sub>3</sub> O <sub>8</sub>
Amorphous Clay*	5 ( $\pm$ 3)	Variable
Kaolinite Group	4 ( $\pm$ 2)	Al <sub>2</sub> (Si <sub>2</sub> O <sub>5</sub> )(OH) <sub>4</sub>
Mica*	1 ( $\pm$ 2)	K <sub>0.7</sub> Al <sub>2</sub> [Al <sub>0.7</sub> Si <sub>3.3</sub> O <sub>10</sub> ](OH) <sub>2</sub>

#### Notes

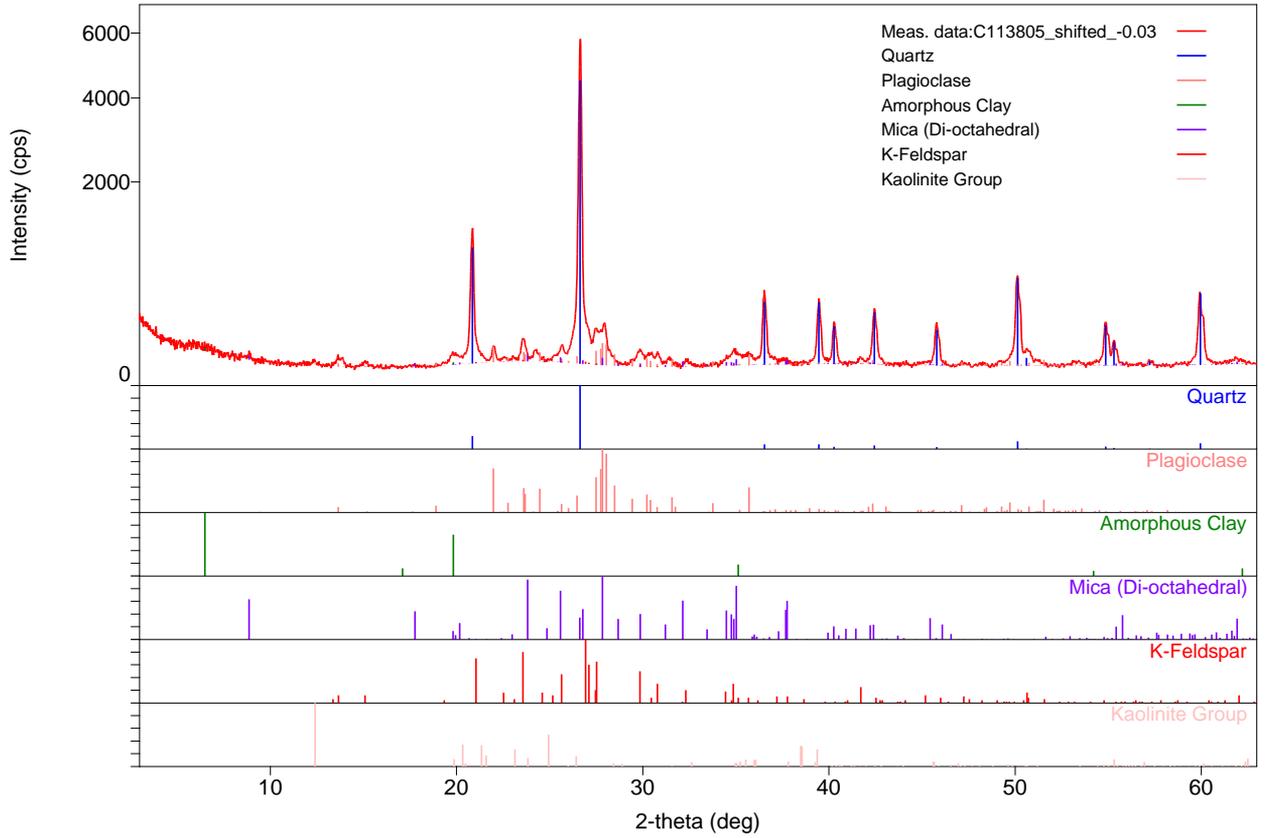
Amorphous Clay\* Possibly a mixed layer clay

Mica\* Likely Di-Octahedral; muscovite or illite

Peak overlaps may interfere with identifications and quantitative calculations.

Amorphous minerals and minerals present in trace amounts may not be detected.

Phase Data Pattern



**XRD Results-C113807: Penna sand****General Information**

<b>Measurement date:</b>	6/6/2024	<b>Interpretative date:</b>	19/6/2024
<b>Job Number/Client:</b>	LJN2024-029 T Holmes	<b>XRD</b>	Rigaku Miniflex 600
<b>Registration Number:</b>	C113807	<b>Analyst:</b>	T Coyte
<b>Quantitative Method:</b>	Siroquant	<b>Process Medium:</b>	Wholerock
<b>Sample Holder:</b>	Standard	<b>Speed (deg/min):</b>	0.5
<b>Comment:</b>	Shifted -0.09		

**Analysis Results**

<b>Phase name</b>	<b>Content wt% (<math>\pm</math> error)</b>	<b>Formula</b>
Quartz	85 ( $\pm$ 10)	SiO <sub>2</sub>
K-Feldspar	7 ( $\pm$ 3)	KAISi <sub>3</sub> O <sub>8</sub>
Plagioclase	5 ( $\pm$ 3)	(Na,Ca)(Al,Si) <sub>4</sub> O <sub>8</sub>
Kaolinite Group	4 ( $\pm$ 2)	Al <sub>2</sub> (Si <sub>2</sub> O <sub>5</sub> )(OH) <sub>4</sub>

**Notes**

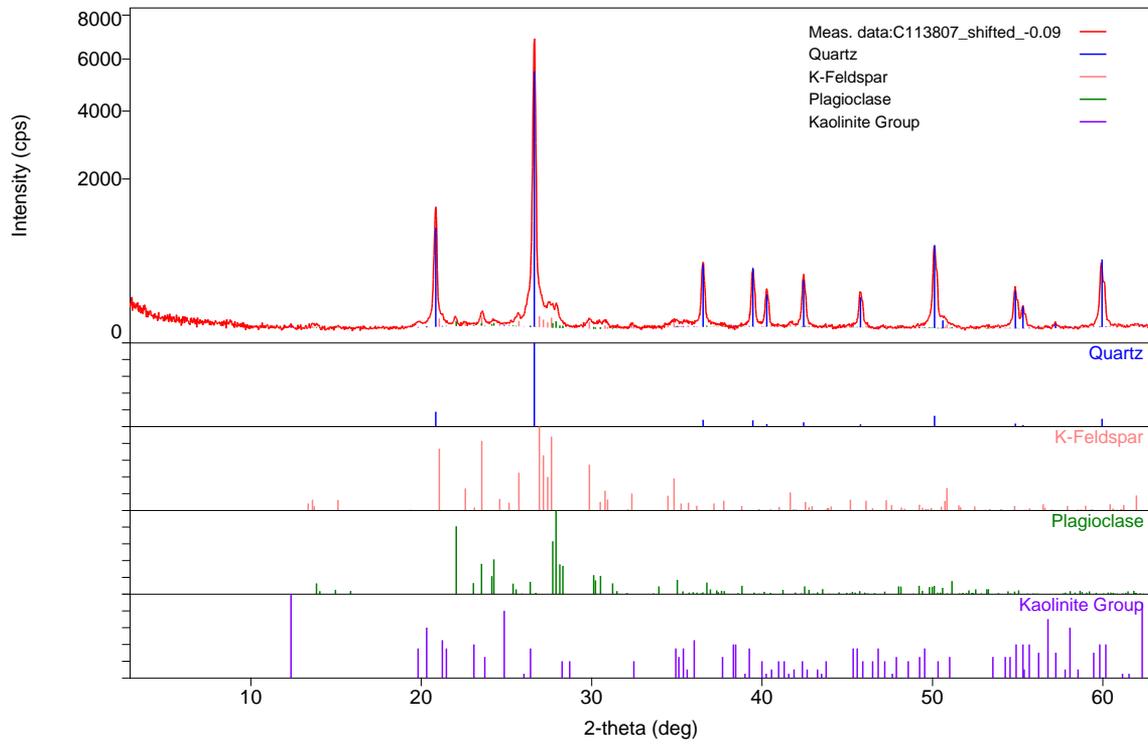
Possible trace of mixed layer clay

Possible trace Mica

Peak overlaps may interfere with identifications and quantitative calculations.

Amorphous minerals and minerals present in trace amounts may not be detected.

Phase Data Pattern



## XRD Results-C113808: Penna sand

### General Information

<b>Measurement date:</b>	6/6/2024	<b>Interpretative date:</b>	19/6/2024
<b>Job Number/Client:</b>	LJN2024-029 T Holmes	<b>XRD</b>	Rigaku Miniflex 600
<b>Registration Number:</b>	C113808	<b>Analyst:</b>	T Coyte
<b>Quantitative Method:</b>	Siroquant	<b>Process Medium:</b>	Wholerock
<b>Sample Holder:</b>	Standard	<b>Speed (deg/min):</b>	0.5
<b>Comment:</b>	Shifted -0.14		

### Analysis Results

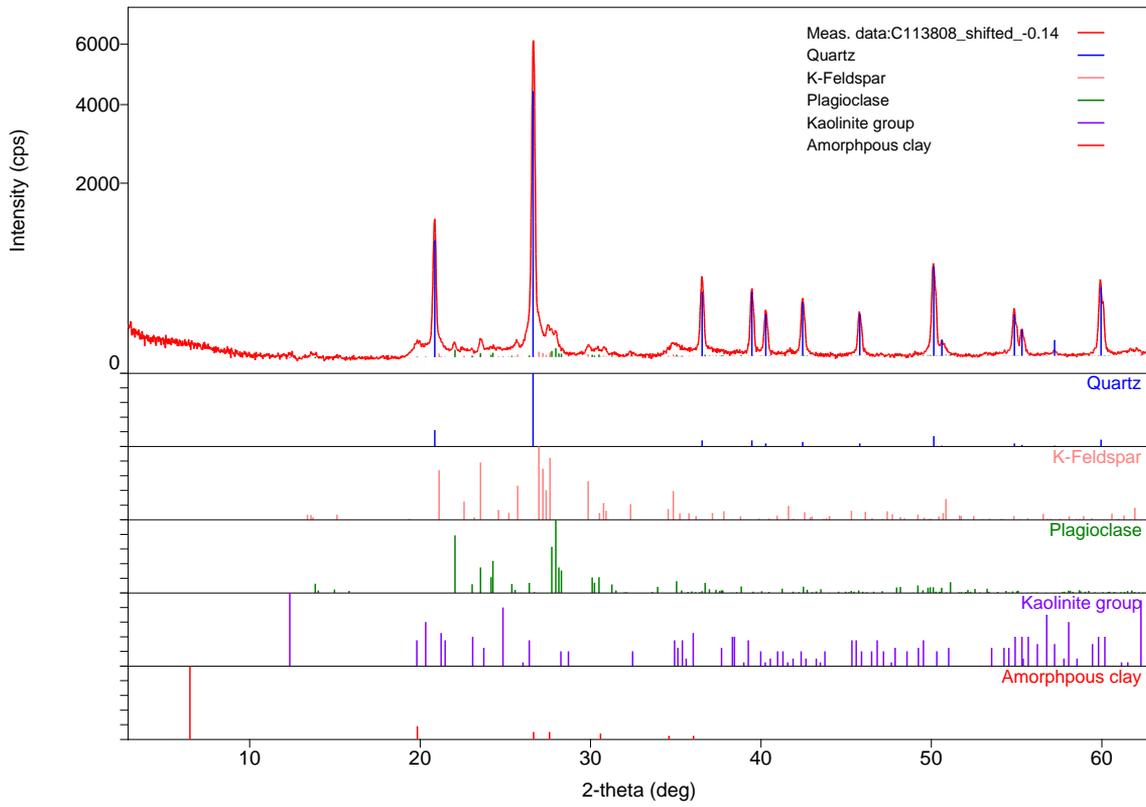
Phase name	Content wt% ( $\pm$ error)	Formula
Quartz	80 ( $\pm$ 10)	SiO <sub>2</sub>
Amorphous Clay*	6 ( $\pm$ 3)	Variable
Kaolinite Group	6 ( $\pm$ 3)	Al <sub>2</sub> (Si <sub>2</sub> O <sub>5</sub> )(OH) <sub>4</sub>
K-Feldspar	5 ( $\pm$ 3)	KAlSi <sub>3</sub> O <sub>8</sub>
Plagioclase	4 ( $\pm$ 2)	(Na,Ca)(Al,Si) <sub>4</sub> O <sub>8</sub>

#### Notes

Peak overlaps may interfere with identifications and quantitative calculations.

Amorphous minerals and minerals present in trace amounts may not be detected.

Phase Data Pattern



## XRD Results-C113810: Lazenbys Sand

### General Information

<b>Measurement date:</b>	6/6/2024	<b>Interpretative date:</b>	19/6/2024
<b>Job Number/Client:</b>	LJN2024-029 T Holmes	<b>XRD</b>	Rigaku Miniflex 600
<b>Registration Number:</b>	C113810	<b>Analyst:</b>	T Coyte
<b>Quantitative Method:</b>	NA	<b>Process Medium:</b>	Wholerock
<b>Sample Holder:</b>	Standard	<b>Speed (deg/min):</b>	0.5
<b>Comment:</b>	Shifted 0.04		

### Analysis Results

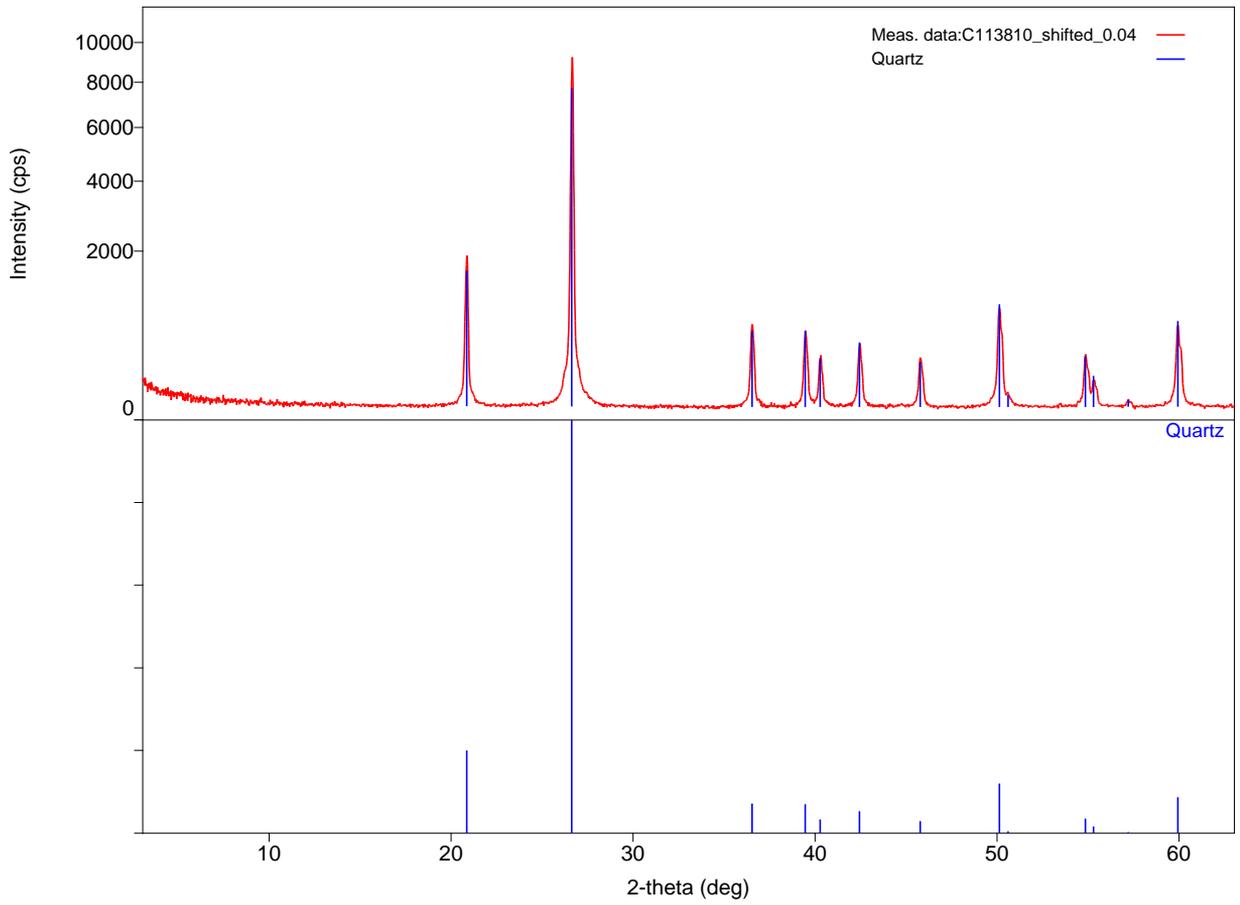
Phase name	Content wt% ( $\pm$ error)	Formula
Quartz	100 ( $\pm$ 10)	SiO <sub>2</sub>

#### Notes

Peak overlaps may interfere with identifications and quantitative calculations.

Amorphous minerals and minerals present in trace amounts may not be detected.

Phase Data Pattern



## XRD Results-C113818: Forcett Sediment

### General Information

<b>Measurement date:</b>	6/6/2024	<b>Interpretative date:</b>	19/6/2024
<b>Job Number/Client:</b>	LJN2024-029 T Holmes	<b>XRD</b>	Rigaku Miniflex 600
<b>Registration Number:</b>	C113818	<b>Analyst:</b>	T Coyte
<b>Quantitative Method:</b>	Siroquant	<b>Process Medium:</b>	Wholerock
<b>Sample Holder:</b>	Standard	<b>Speed (deg/min):</b>	0.5
<b>Comment:</b>	Shifted -0.05		

### Analysis Results

Phase name	Content wt% ( $\pm$ error)	Formula
Quartz	96 ( $\pm 10$ )	SiO <sub>2</sub>
K-feldspar	4 ( $\pm 2$ )	KAISi <sub>3</sub> O <sub>8</sub>

#### Notes

Unknown 4.4Å peak suggests trace poorly crystalline clays present – Mixed layer or Kaolinite Group

Peak overlaps may interfere with identifications and quantitative calculations.

Amorphous minerals and minerals present in trace amounts may not be detected.

Phase Data Pattern

