

Data Report: UT-GOM2-1 Sediment Grain Size Measurements at Site GC 955, Holes H002 and H005¹

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1. Abstract

Sediment grain size measurement in marine sediments provides a record of the stratigraphic variation in grain size and thus energy regime at the time of deposition. In addition to the grain size distribution, the degree of sediment sorting can also be calculated, and together they both influence primary sediment porosity and permeability. Here we present sediment grain size results from laser diffraction particle size analysis of samples from pressure cores collected during the 2017 UT GOM2-1 Expedition. We measured both bulk sediment and organic carbon-free sediment fractions for 46 samples and organic carbon-free sediment for 5 samples at Site GC 955, Holes H002 and H005. Differences between the bulk sediment and organic carbon-free fractions reflect the relative amount and size fraction of the organic carbon. The sample results presented here represent the grain size variation of the host lithology across the Green Canyon (GC) 955 gas hydrate reservoir.

¹ Johnson, J.E., MacLeod, D.R., Divins, D.L., 2020. Data Report: UT-GOM2-1 Sediment Grain Size Measurements at Site GC 955, Holes H002 and H005. In Flemings, P.B., Phillips, S.C, Collett, T., Cook, A., Boswell, R., and the UT-GOM2-1 Expedition Scientists, Proceedings of the UT-GOM2-1 Hydrate Pressure Coring Expedition: Austin, TX (University of Texas Institute for Geophysics, TX). 87 p.

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2. Introduction

The objective of this report is to present both bulk sediment and organic carbon-free sediment grain size data from samples of UT-GOM2-1 pressure cores (Flemings et al, 2018). The majority of the samples measured for grain size were collected from UT-GOM2-1 cores stored at Ohio State University and sampled there during sediment core description (Johnson et al., 2020). These cores were not recovered under pressure during the UT GOM2-1 expedition. Additional samples for grain size analysis were collected from pressure cores recovered under pressure during the UT-GOM2-1 expedition and subsequently quantitatively degassed, either on-board or on-shore (UT-Austin) to determine the hydrate concentration and the gas composition. Samples from some of the quantitatively degassed pressure cores were mailed to us for grain size measurement at the University of New Hampshire.

Sediment grain size measurements throughout the gas hydrate bearing reservoir at Site GC 955 is an important data set that serves to quantify the grain size distribution of the host reservoir materials, determine the degree of sorting, and identify the size fraction containing the TOC (total organic carbon).

During the UT-GOM2-1 expedition, two holes were drilled in Green Canyon Block 955 (GC 955) in the deep-water Gulf of Mexico: Hole GC 955 H002 (H002) and Hole GC 955 H005 (H005). 21 10 ft (3.05 m) pressure cores were attempted in and near the methane hydrate reservoir at 409-450 mbsf. In the first hole, H002, 1 of the 8 cores were recovered under pressure and there was 34% recovery of sediment (both pressurized and depressurized). In the second hole, H005, 12 of the 13 cores were recovered under pressure and there was 72% recovery of sediment (Flemings et al., 2020; Thomas et al., 2020). The pressure cores were imaged and logged under pressure.

To document the sediment grain size throughout the cored intervals in both Holes H002 and H005 at GC 955, we used the Malvern Mastersizer 2000 Laser Particle Size Analyzer with a Hydro 2000G wet dispersion unit at the University of New Hampshire. The complete grain size data set is available as an excel data file associated with this data report (UNH GOM2-1 Grain Size Data-v-4.xlsx in http://www-udc.ig.utexas.edu/gom2/H005/6_Lithostratigraphy/Grain_size/)

3. Methods and Materials

To document the sediment grain size throughout the cored intervals in both Holes H002 and H005 at GC 955, we used the Malvern Mastersizer 2000 Laser Particle Size Analyzer with a Hydro 2000G wet dispersion unit at the University of New Hampshire. In total, 51 sediment samples were measured. Bulk sediment and organic carbon-free sediment fractions were measured for a majority of the samples (n= 46), while some samples (n= 5) only had enough material to make organic carbon-free measurements. Replicate samples (n= 15) of some bulk and organic carbon-free sediments were also measured throughout our analyses and show good agreement (Appendix Figures A1-A15). In addition, we ran a check standard in the UNH Sedimentology lab (the Wallis Sand), a natural beach sand (Appendix Figure A16) and a Malvern standard (15-150 μ m) at the beginning and end of each day to insure good instrument calibration and consistent performance. Comparison of bulk and organic carbon-free grain size measurements on the same samples allow us to determine the relative amount of TOC in the samples and in what size fraction it resides.

Bulk Sediment Sample Preparation

About 2mL of each sediment sample was added to 50mL centrifuge vials. A solution of sodium hexametaphosphate containing 5g of $(\text{NaPO}_3)_6$ per 10L of DI water was then added to the centrifuge vials up to the 25mL line. The sodium hexametaphosphate solution helps to keep the fine-grained sediment particles from aggregating together during analysis. The vials were capped and mixed for 60 seconds on a vortex mixer then left overnight. Samples were analyzed the following day on the UNH Malvern Mastersizer 2000 laser diffractometer. Samples were again mixed for 60 seconds on a vortex mixer immediately prior to analysis.

Organic Carbon-Free Sample Preparation

About 2 mL of each sediment sample was added to 50mL centrifuge vials. The organic carbon was then removed from the samples via a multi-step hydrogen peroxide treatment procedure. First, 5mL of 30% hydrogen peroxide was added to each centrifuge vial via pipette and allowed to sit overnight. Second, a flushing procedure was performed three times the following day. DI water was added to each centrifuge vial up to the 30mL line then the vials were capped and mixed. The vials were then spun in a centrifuge at 3000 rpm for 4 minutes, or until the water was no longer cloudy. The water was then decanted off via pipette without removing any sediment. Once this flushing procedure was performed three times, 5mL of 30% hydrogen peroxide was added and allowed to sit overnight. The process was repeated until 30mL of hydrogen peroxide had been added and flushed to ensure all organic carbon was removed. After hydrogen peroxide treatment, a solution of sodium hexametaphosphate containing 5g of $(\text{NaPO}_3)_6$ per 10L of DI water was added to the centrifuge vials up to the 25mL line. The vials were capped and mixed for 60 seconds on a vortex mixer then left overnight. Samples were analyzed the following day on the UNH Malvern Mastersizer 2000 laser diffractometer. Samples were mixed for 60 seconds on a vortex mixer immediately prior to analysis.

Grain Size Analysis

Analyses of grain size distributions were performed with the UNH Malvern Mastersizer 2000 laser diffractometer. Malvern Mastersizer 2000 software (version 5.60) was used for all analyses. Optimal software settings were determined empirically and are consistent with Sperazza et al. (2004). For the UT-GOM2-1 samples, the following software settings were used.

Particle refractive index	1.544 (quartz)
Particle absorption index	0.5
Dispersant refractive index	1.330 (DI water)
Obscuration	15-20%
Sonication	60 seconds

Three measurements were made for each sample aliquot, then averaged within the software to determine the final grain size distribution. The single average grain size distribution for each sample is reported.

4. Results

The results of our laser particle size analysis are presented graphically in Figures 1-60 and Appendix 1, and the full grain size data are included in the accompanying excel spreadsheet (UNH GOM2-1 Grain Size Data-v-4.xlsx in http://www-udc.ig.utexas.edu/gom2/H005/6_Lithostratigraphy/Grain_size/) and in Tables 1 and 2. Results from both bulk sediment and organic carbon-free sediment measurements are shown for each Hole (H002 Figures 1-32 and H005 Figures 33-51) and each sample is presented in full grain size distribution and cumulative distribution plots. Volume loss between the bulk sediment and organic carbon-free sediment profiles documents the relative amount and size of the organic carbon in the sample. When there is a significant difference in profiles (e.g. Figure 1), the organic carbon typically resides in the fine fraction (clay to fine silt), when there is no difference in the profiles (e.g. Figure 6), there is likely very little organic carbon in the sample. Three dominant grain size distribution profiles are identified in the data set that we have called Type A, B, and C. Type A profiles are the finest grained distributions, Type C profiles the coarsest grained distributions, and Type B profiles are intermediate between A and C. Each sample's profile shape is identified in Tables 1 and 2 and summary plots for each profile shape are presented in Figures 52-57, as both organic carbon-free and bulk sediment summaries. We have also binned the results for each of the organic-carbon free and bulk measurements into % Sand, % Silt, and % Clay using the Wentworth Grain Size Scale (Wentworth, 1922) where sand is $> 62.5 \mu\text{m}$, clay is $< 3.9 \mu\text{m}$, and silt is between 62.5 and $3.9 \mu\text{m}$ and summarized these results in Tables 1 and 2 and on the ternary diagrams shown in Figures 58 and 59. These results show the grain sizes measured in both Holes H002 and H005 are silt dominated, but range from silty sand to silty clay, with a predominance of sandy silt and clayey silt. These results are consistent with the laser diffraction grain size measurements presented in (Flemings et al., 2018; and Meazell et al., 2020), however it is important to note they use a silt/clay boundary of $2 \mu\text{m}$, not $3.9 \mu\text{m}$ when calculating their % sand, silt, and clay. Meazell et al. (2020) also measured grain size using the hydrometer method and noted finer results than the laser diffraction method for the same lithofacies, especially with higher clay content. This observation has been noted in other studies (e.g. Di Stefano et al. 2010) and attributed to non-spherical particles in the clay size fraction. We have also calculated the sorting for the organic carbon-free samples and plotted it against the median grain size (shown in the accompanying excel spreadsheet) (Fig. 60). This plot emphasizes the differences between our Type A, B, and C profile shapes and shows the spectrum of grain sizes and degree of sorting present throughout the GC 955 gas hydrate reservoir.

5. Acknowledgements

We gratefully acknowledge the 2017 UT-GOM2-1 Scientific Party for their tremendous efforts at sea to collect the GOM2-1 pressure cores and Dr. Ann Cook and Dr. Derek Sawyer of The Ohio State University for hosting Dr. Johnson and providing lab space and access to the GOM2-1 cores for core description and grain size sampling in 2017.

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7. Figures

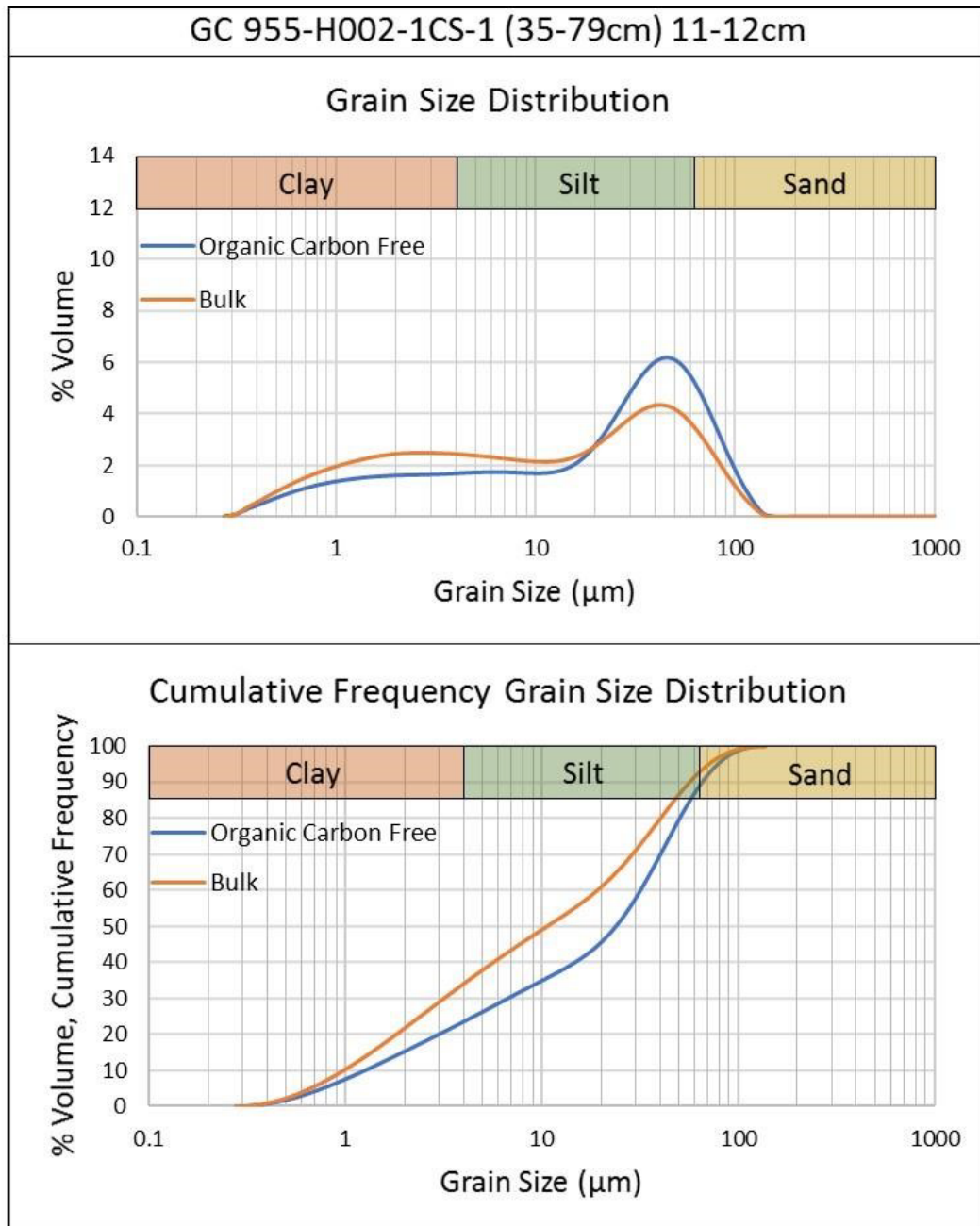


Figure 1: Grain size distribution and cumulative grain size distribution of GC 955-H002-1CS-1 (35-79cm) 11-12cm.

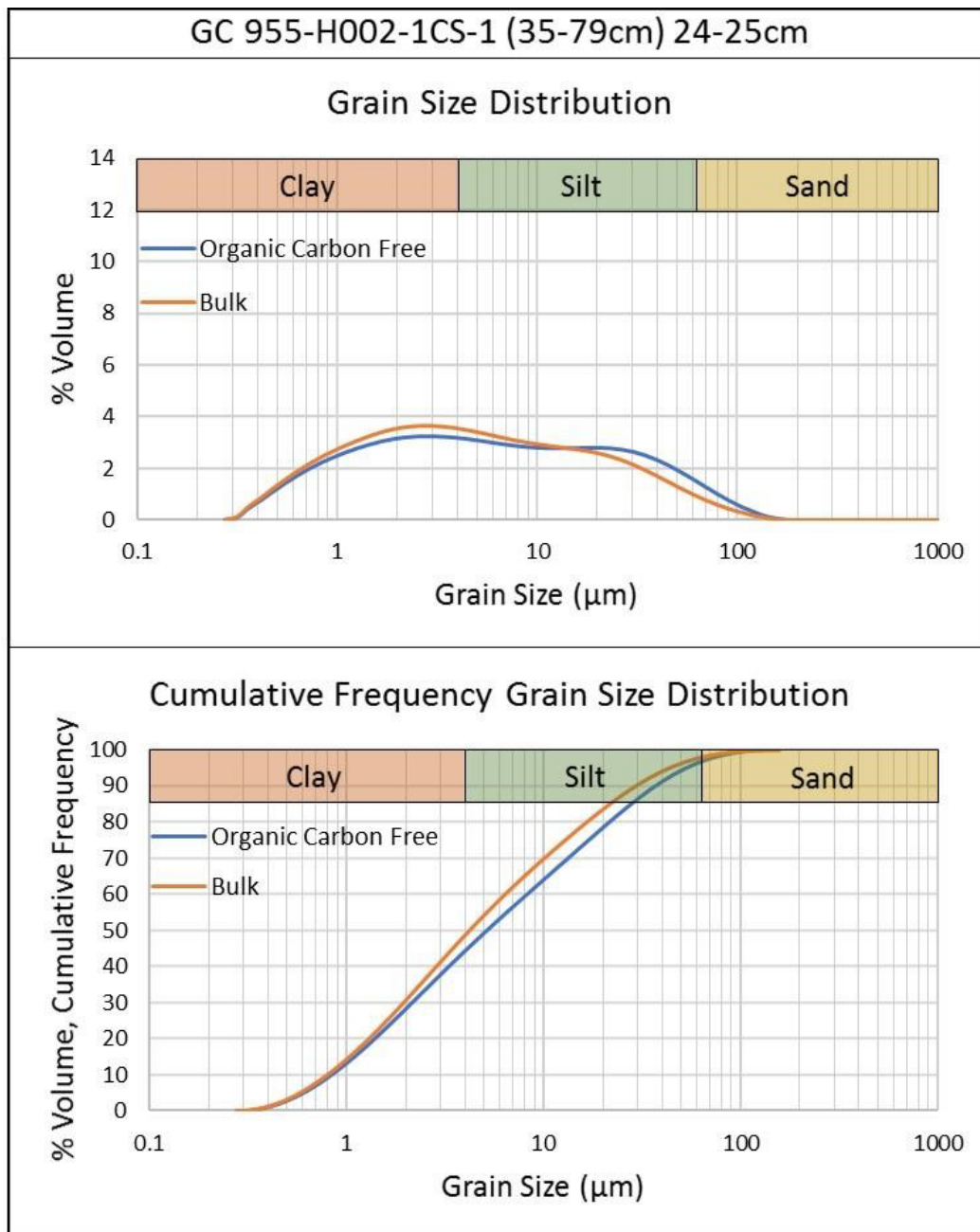


Figure 2: Grain size distribution and cumulative grain size distribution of GC 955-H002-1CS-1 (35-79cm) 24-25cm.

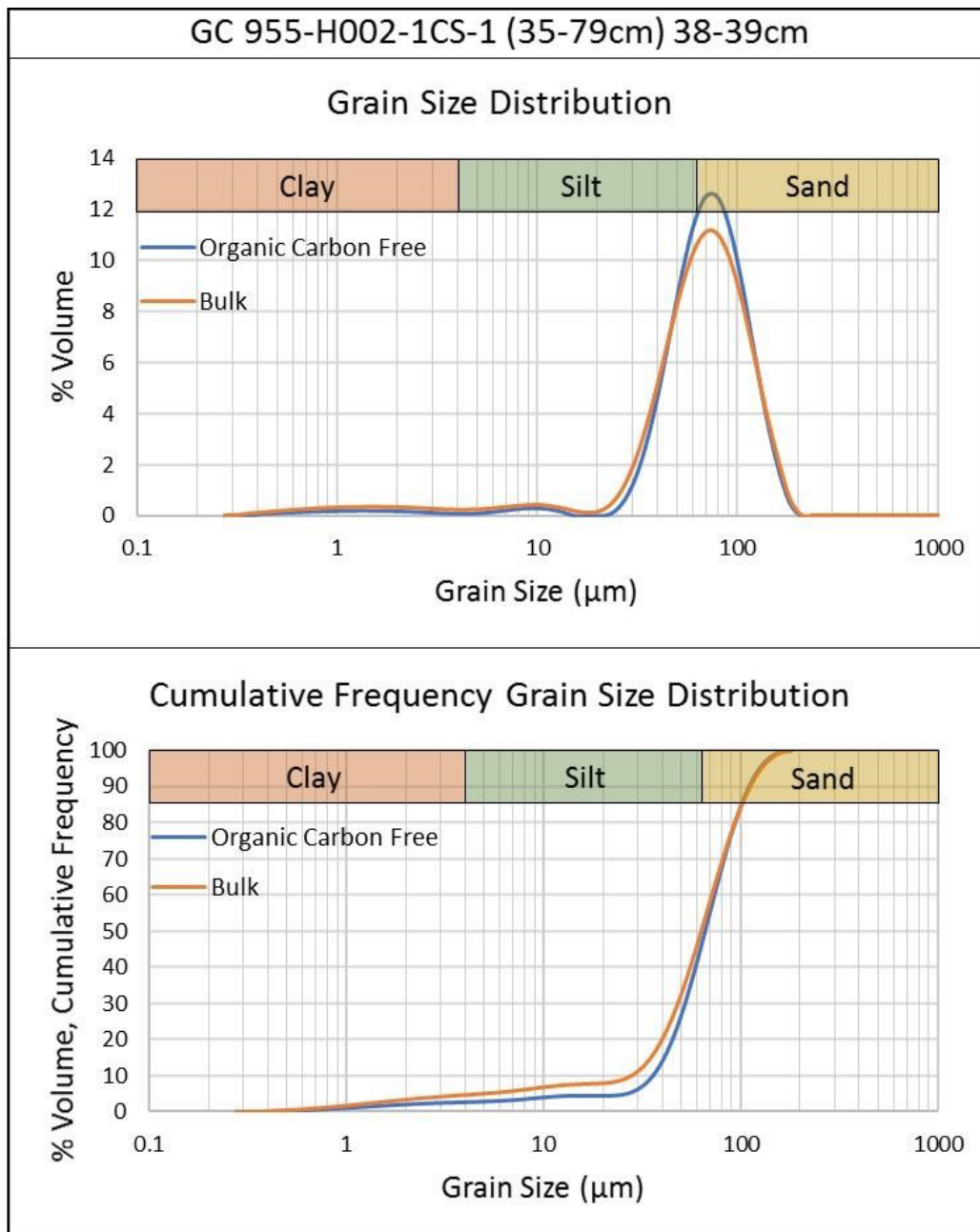


Figure 3: Grain size distribution and cumulative grain size distribution of GC 955-H002-1CS-1 (35-79cm) 38-39cm.

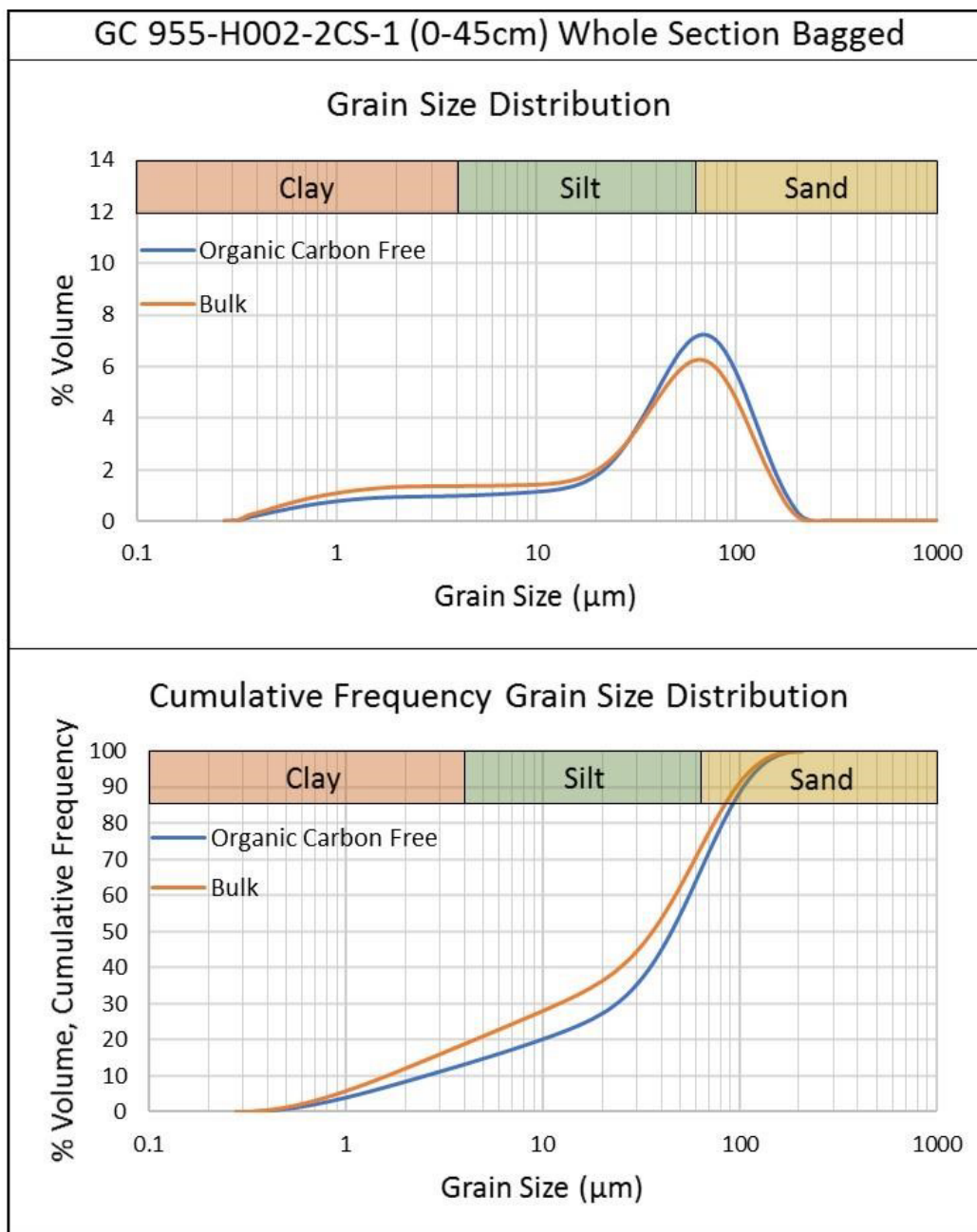


Figure 4: Grain size distribution and cumulative grain size distribution of GC 955-H002-2CS-1 (0-45cm) Whole Section Bagged.

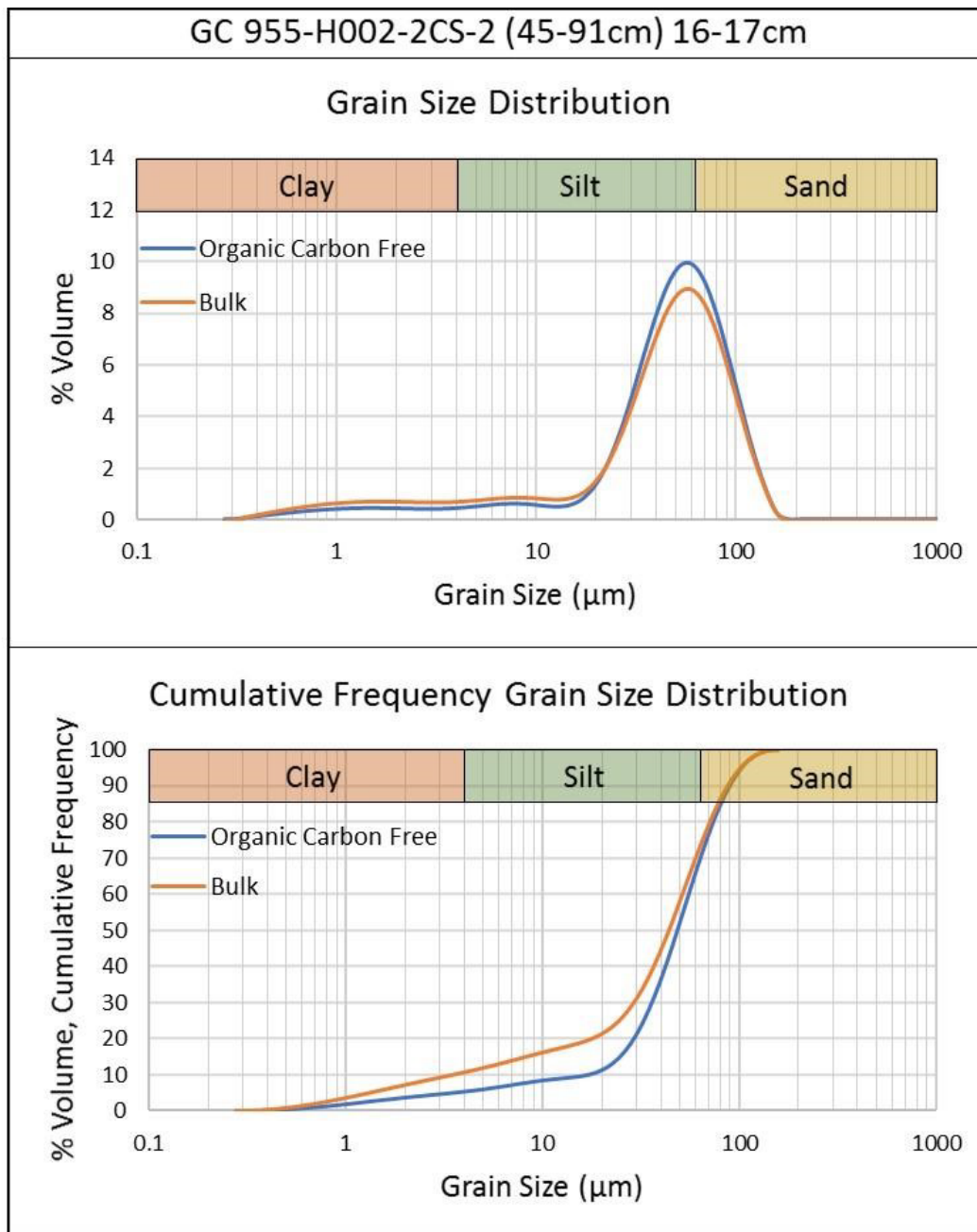


Figure 5: Grain size distribution and cumulative grain size distribution of GC 955-H002-2CS-2 (45-91cm) 16-17cm.

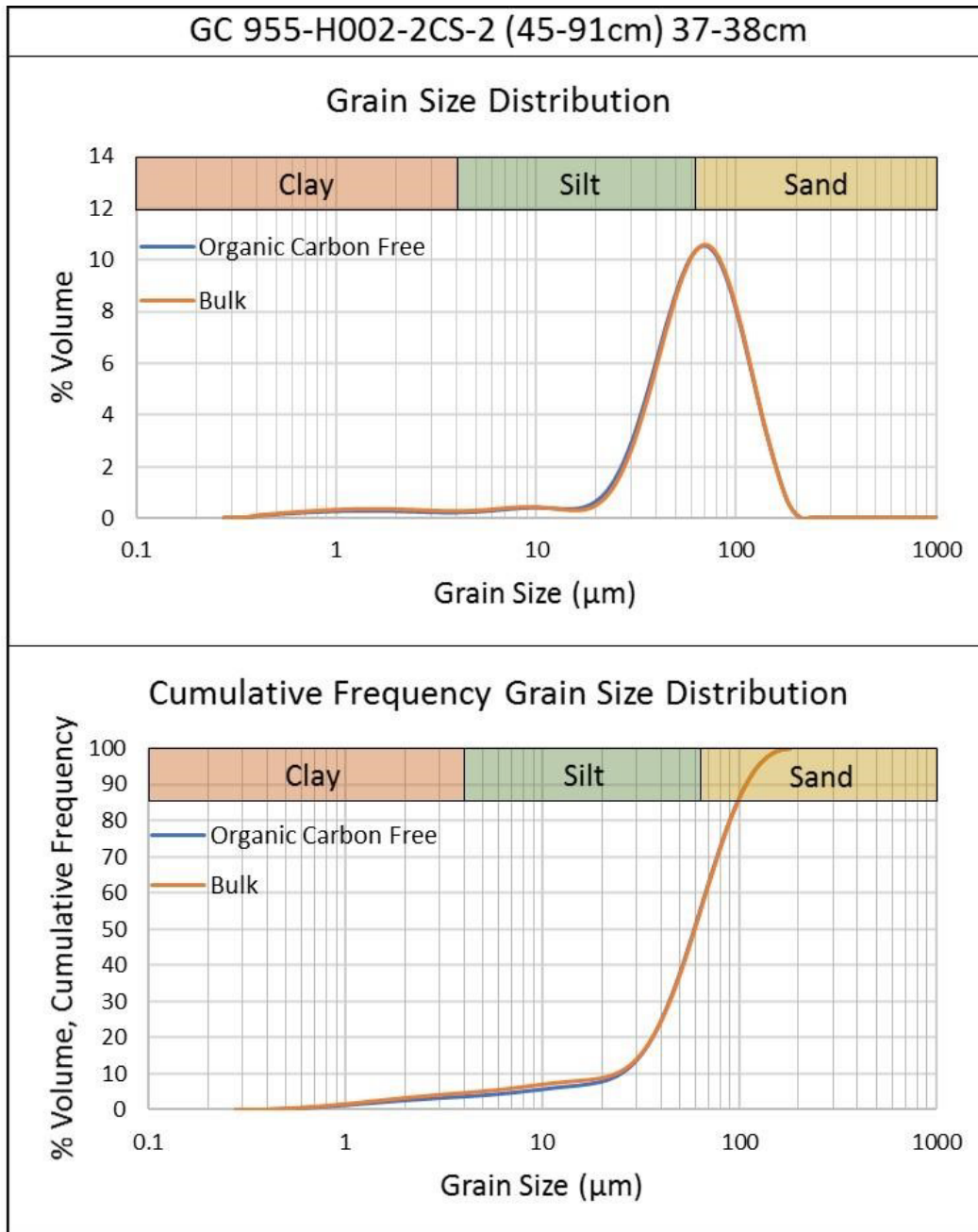


Figure 6: Grain size distribution and cumulative grain size distribution of GC 955-H002-2CS-2 (45-91cm) 37-38cm.

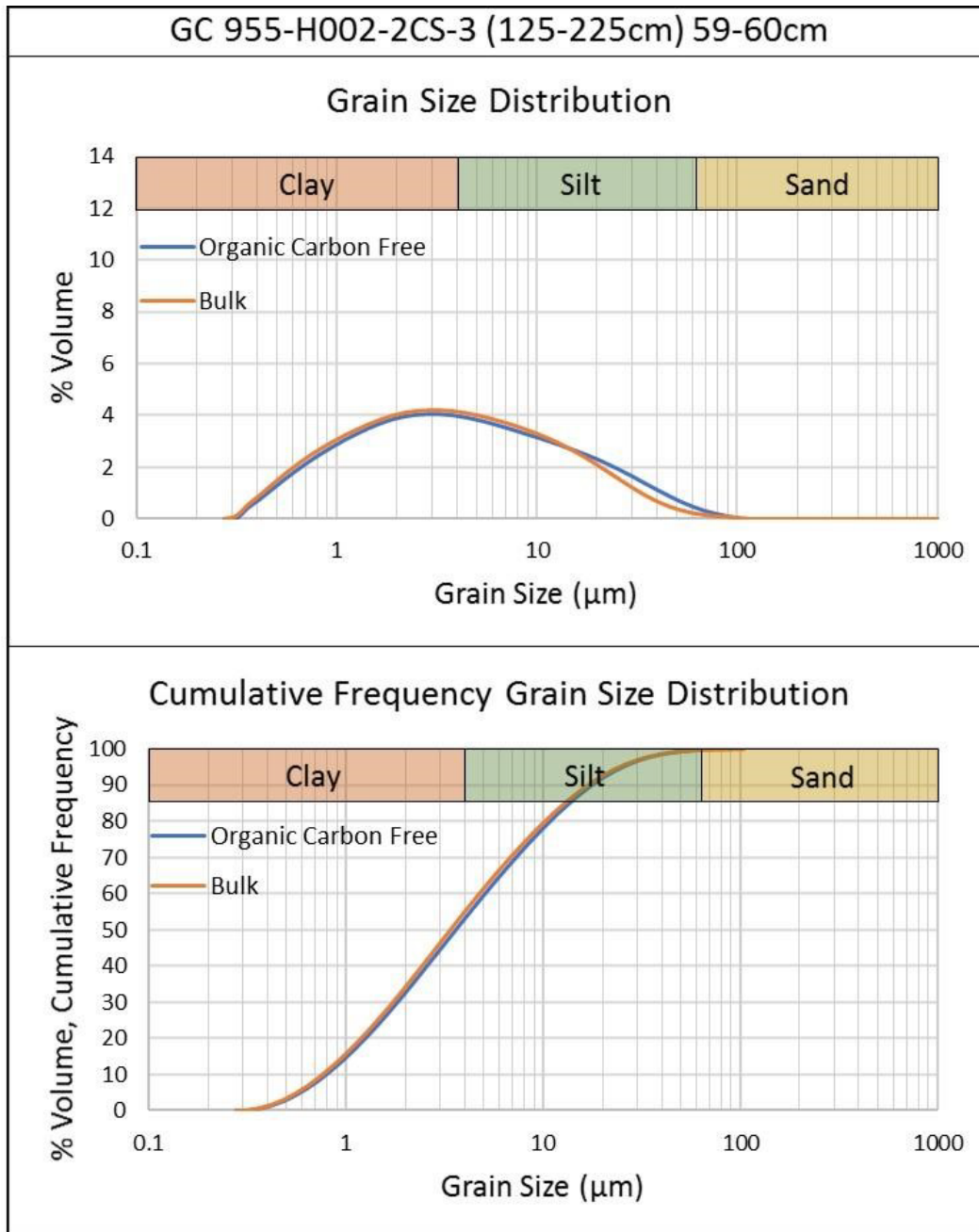


Figure 7: Grain size distribution and cumulative grain size distribution of GC 955-H002-2CS-3 (125-225cm) 59-60cm.

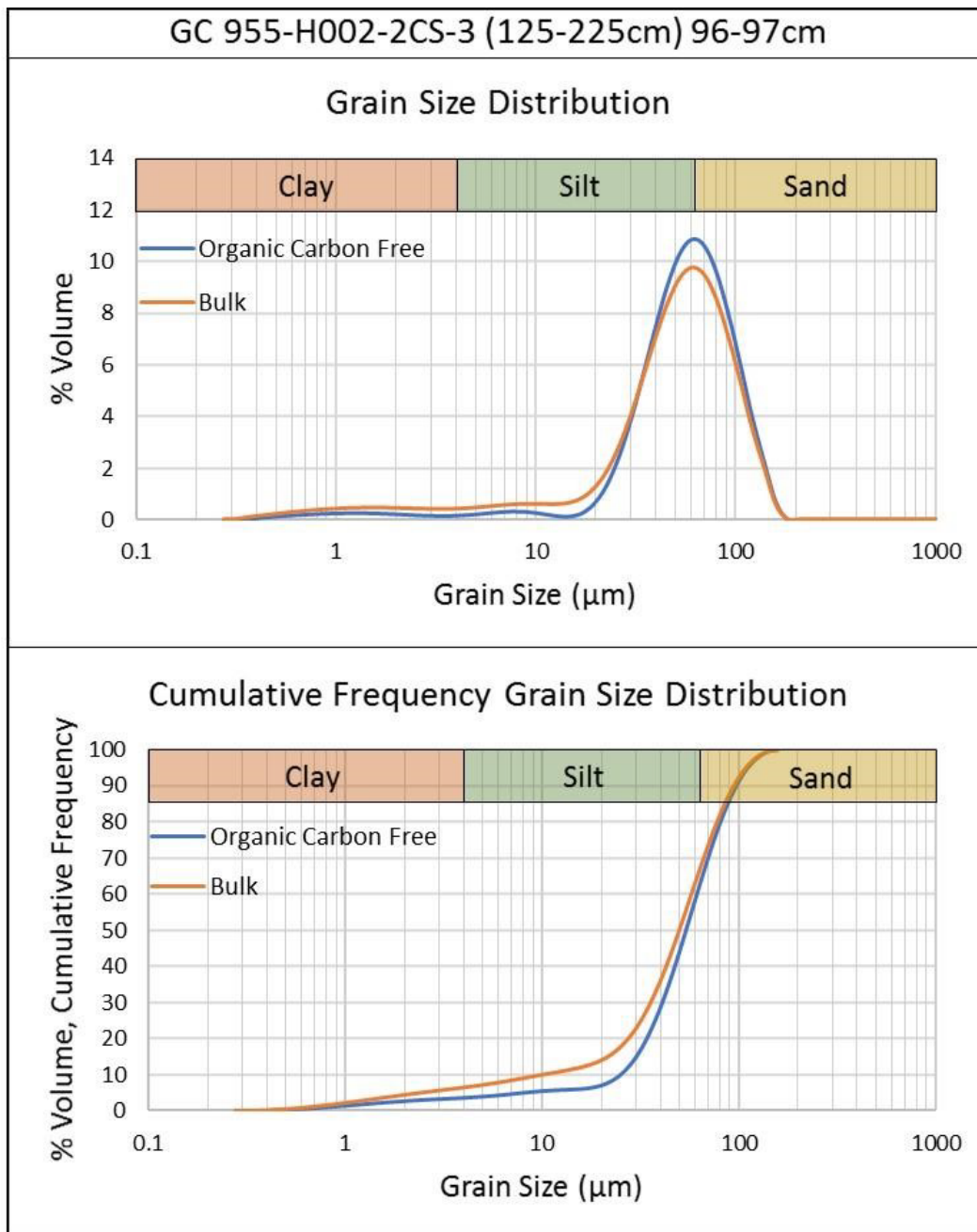


Figure 8: Grain size distribution and cumulative grain size distribution of GC 955-H002-2CS-3 (125-225cm) 96-97cm.

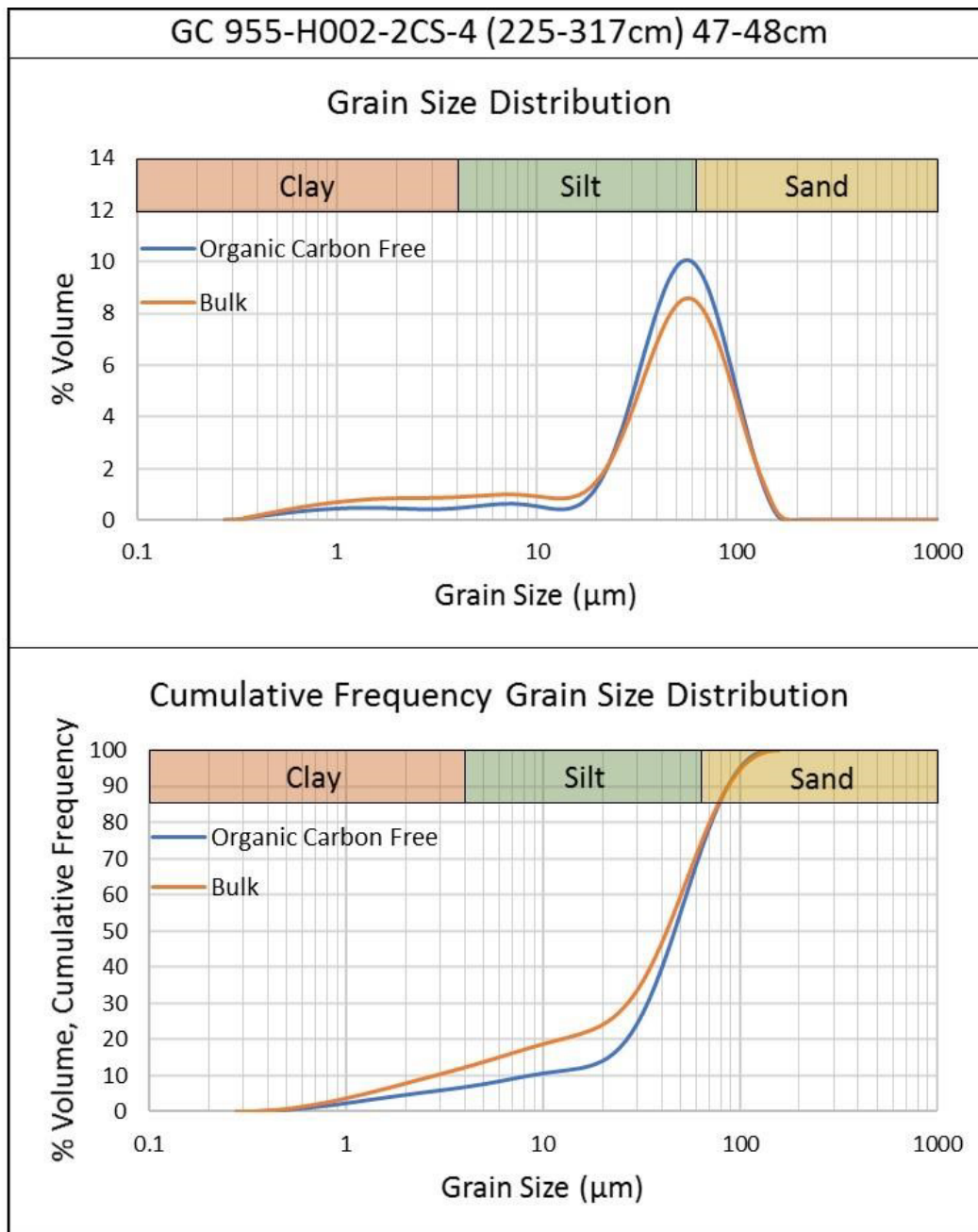


Figure 9: Grain size distribution and cumulative grain size distribution of GC 955-H002-2CS-4 (225-317cm) 47-48cm.

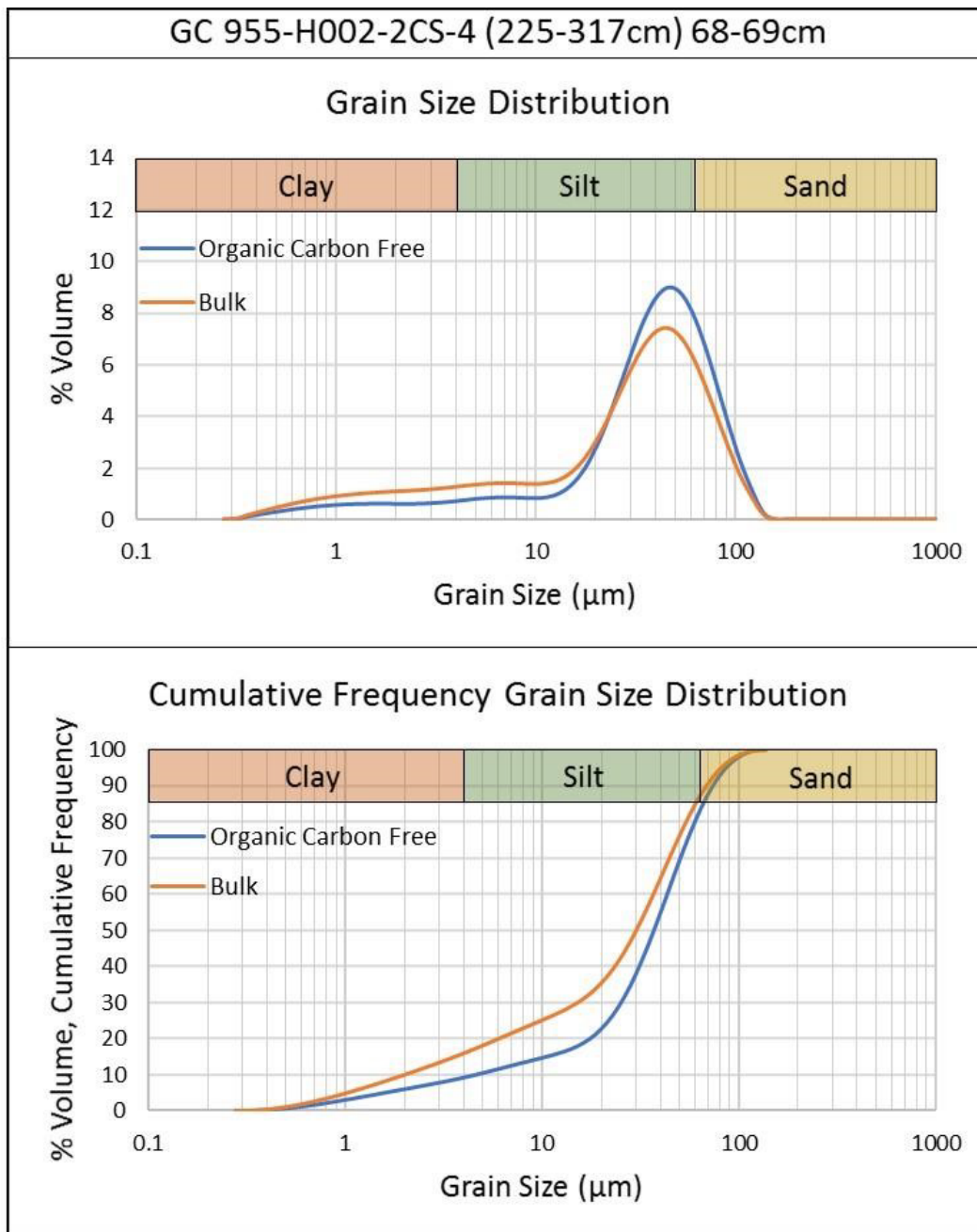


Figure 10: Grain size distribution and cumulative grain size distribution of GC 955-H002-2CS-4 (225-317cm) 68-69cm.

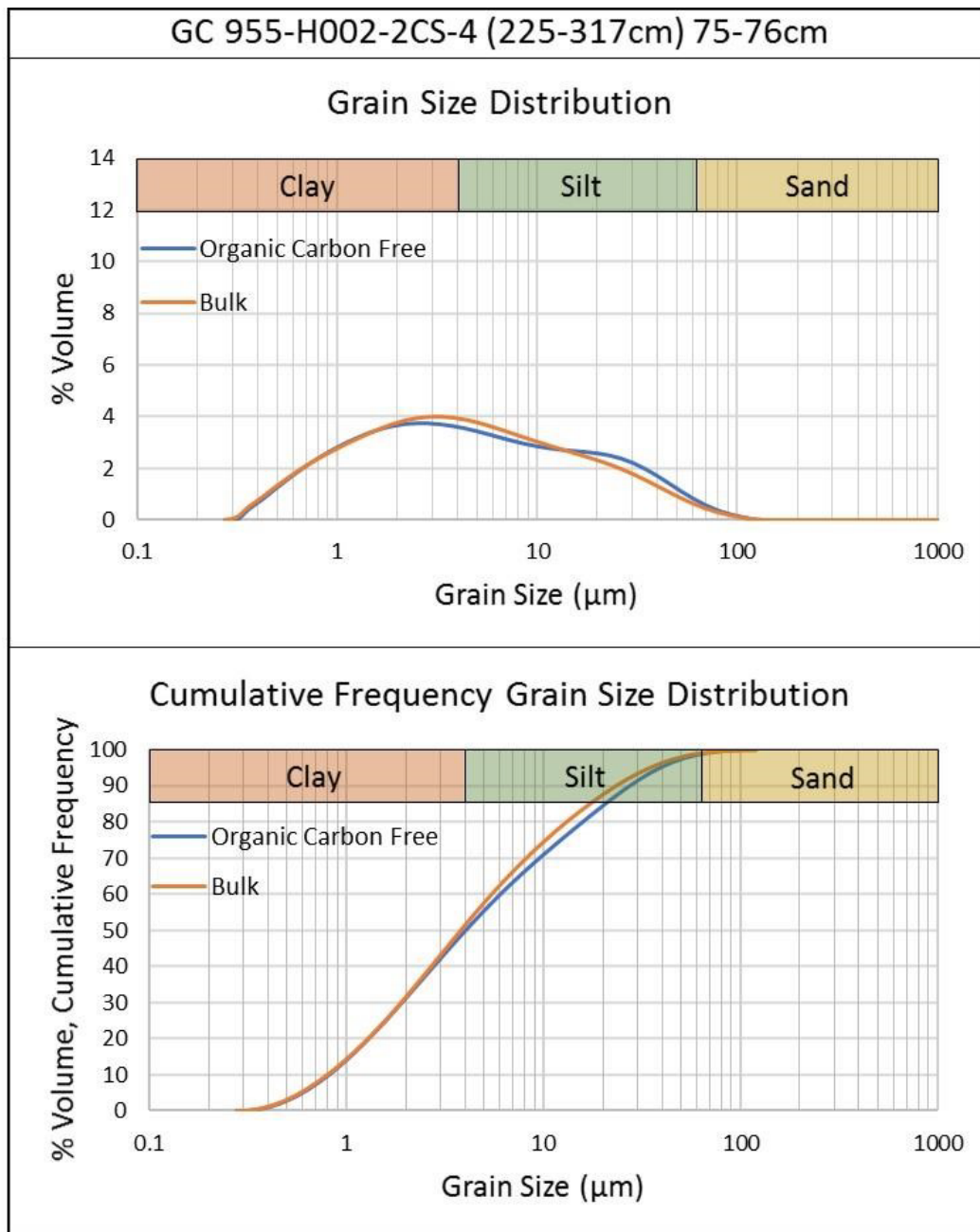


Figure 11: Grain size distribution and cumulative grain size distribution of GC 955-H002-2CS-4 (225-317cm) 75-76cm.

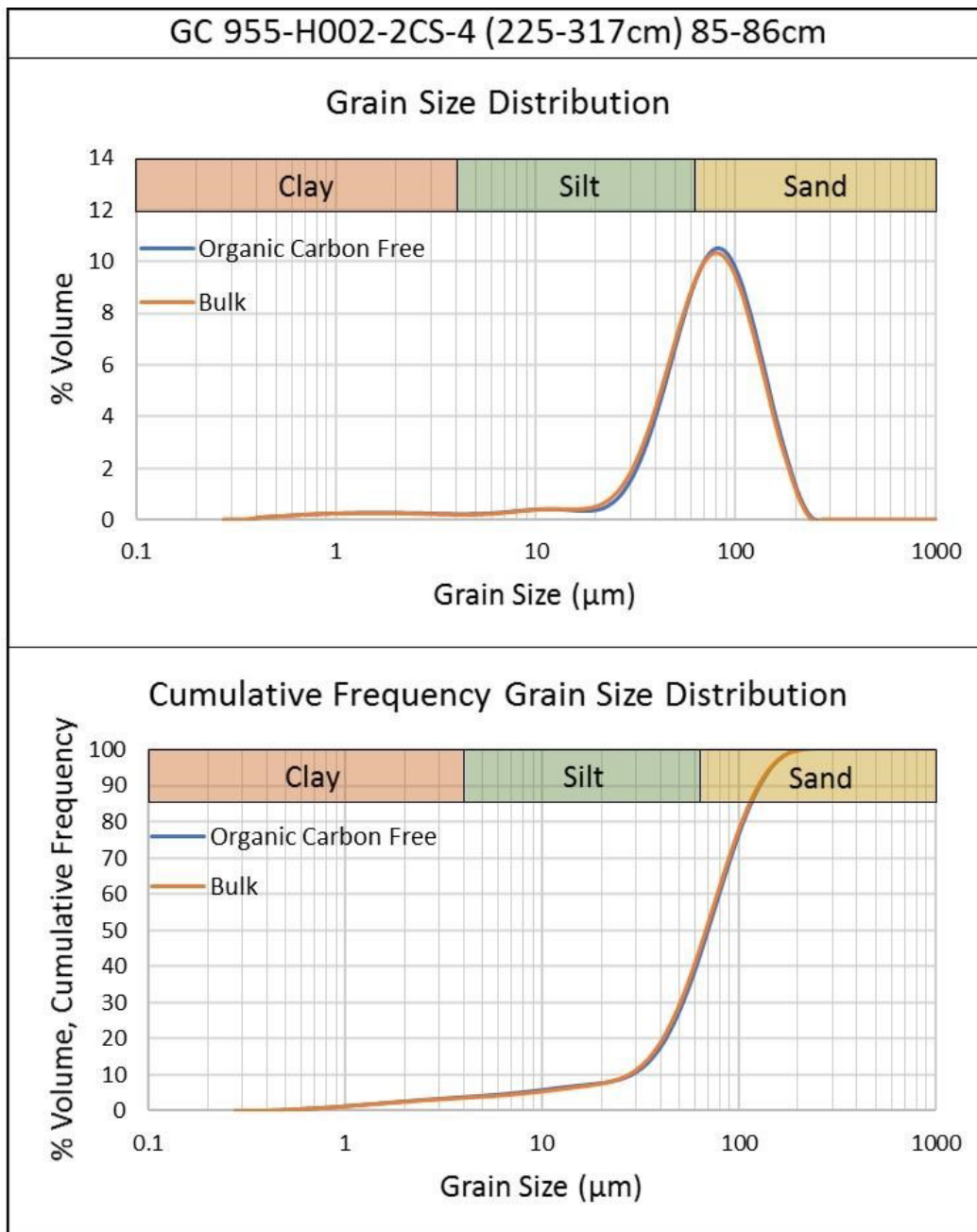


Figure 12: Grain size distribution and cumulative grain size distribution of GC 955-H002-2CS-4 (225-317cm) 85-86cm.

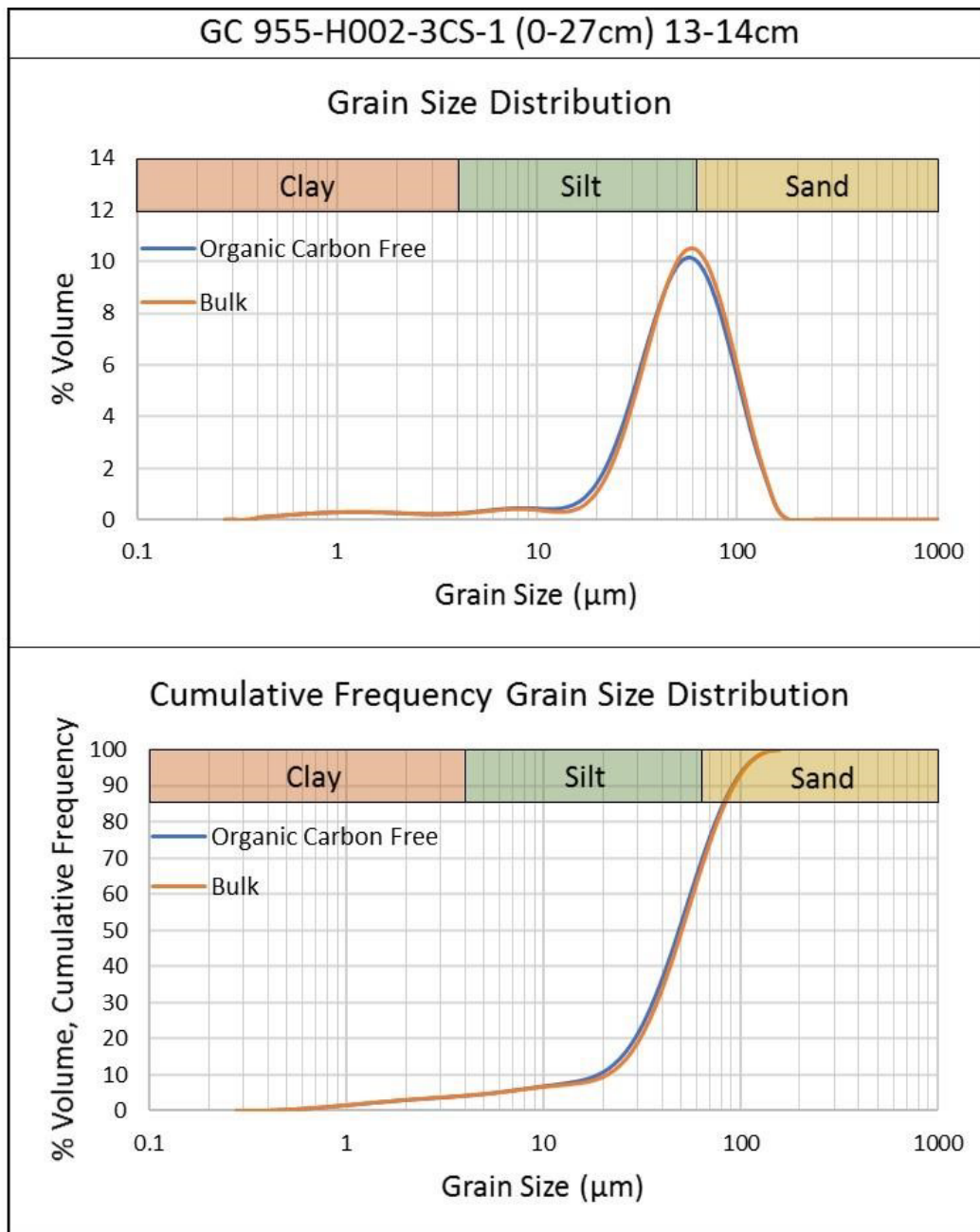


Figure 13: Grain size distribution and cumulative grain size distribution of GC 955-H002-3CS-1 (0-27cm) 13-14cm.

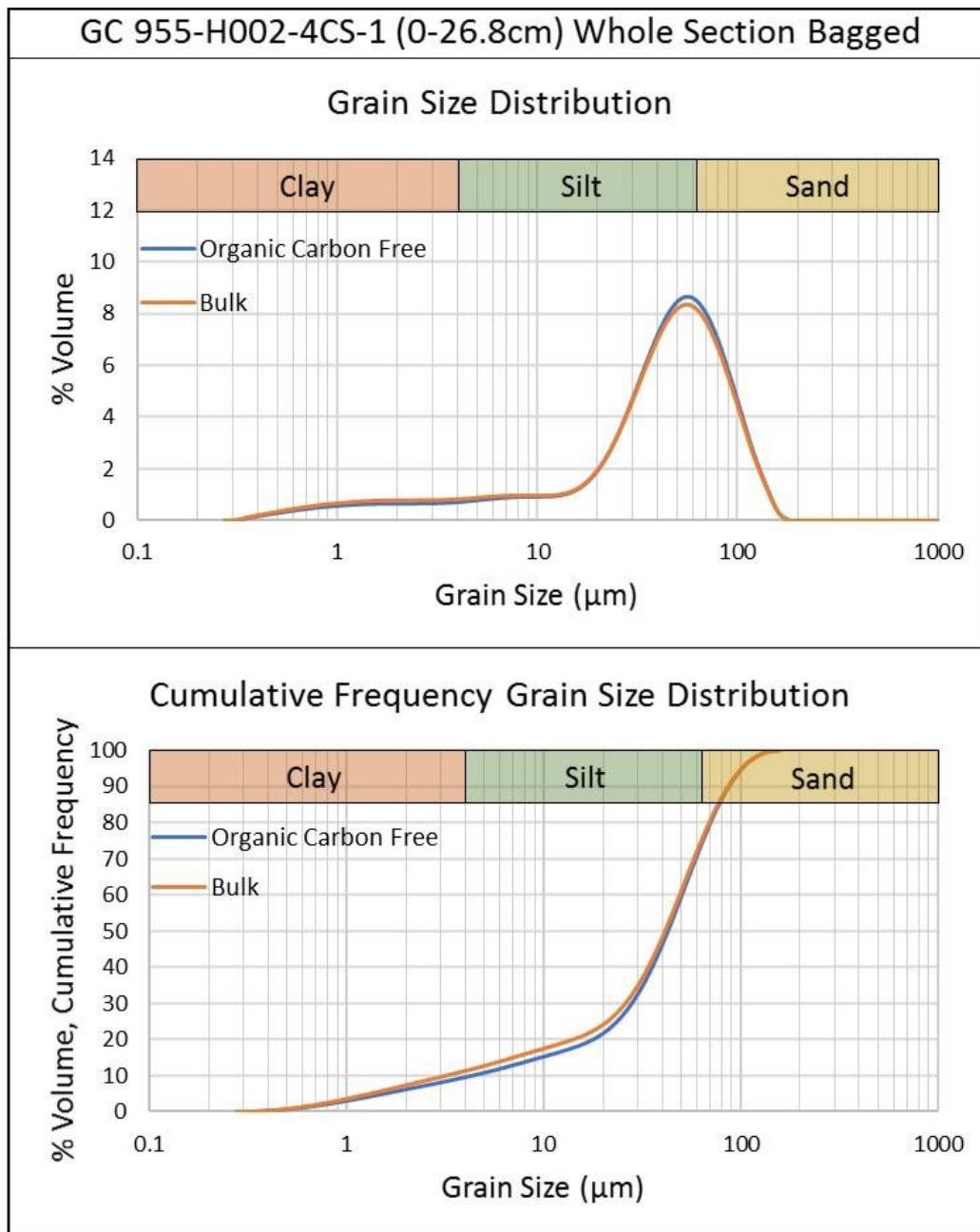


Figure 14: Grain size distribution and cumulative grain size distribution of GC 955-H002-4CS-1 (0-26.8cm) Whole Section Bagged.

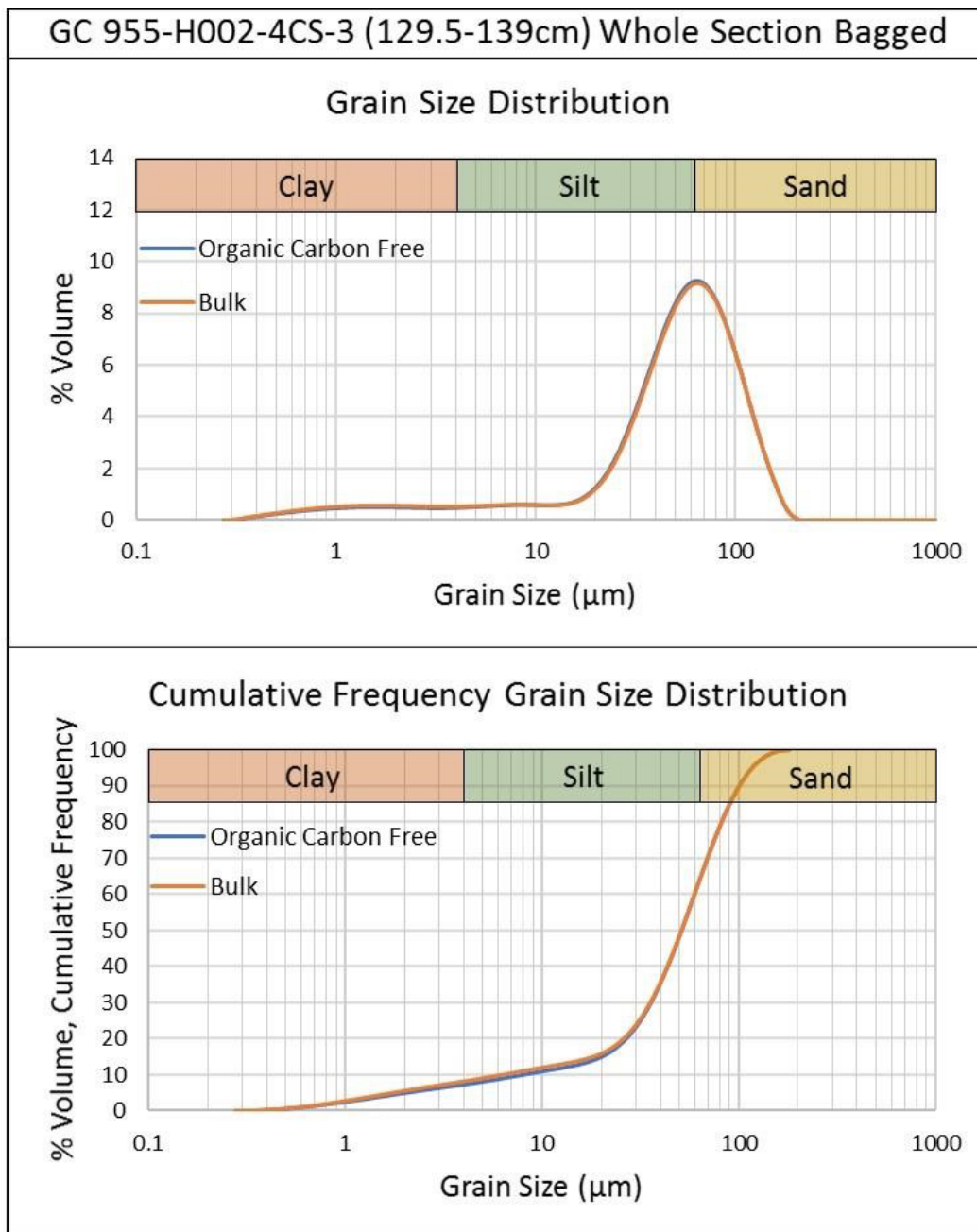


Figure 15: Grain size distribution and cumulative grain size distribution of GC 955-H002-4CS-3 (129.5-139cm) Whole Section Bagged.

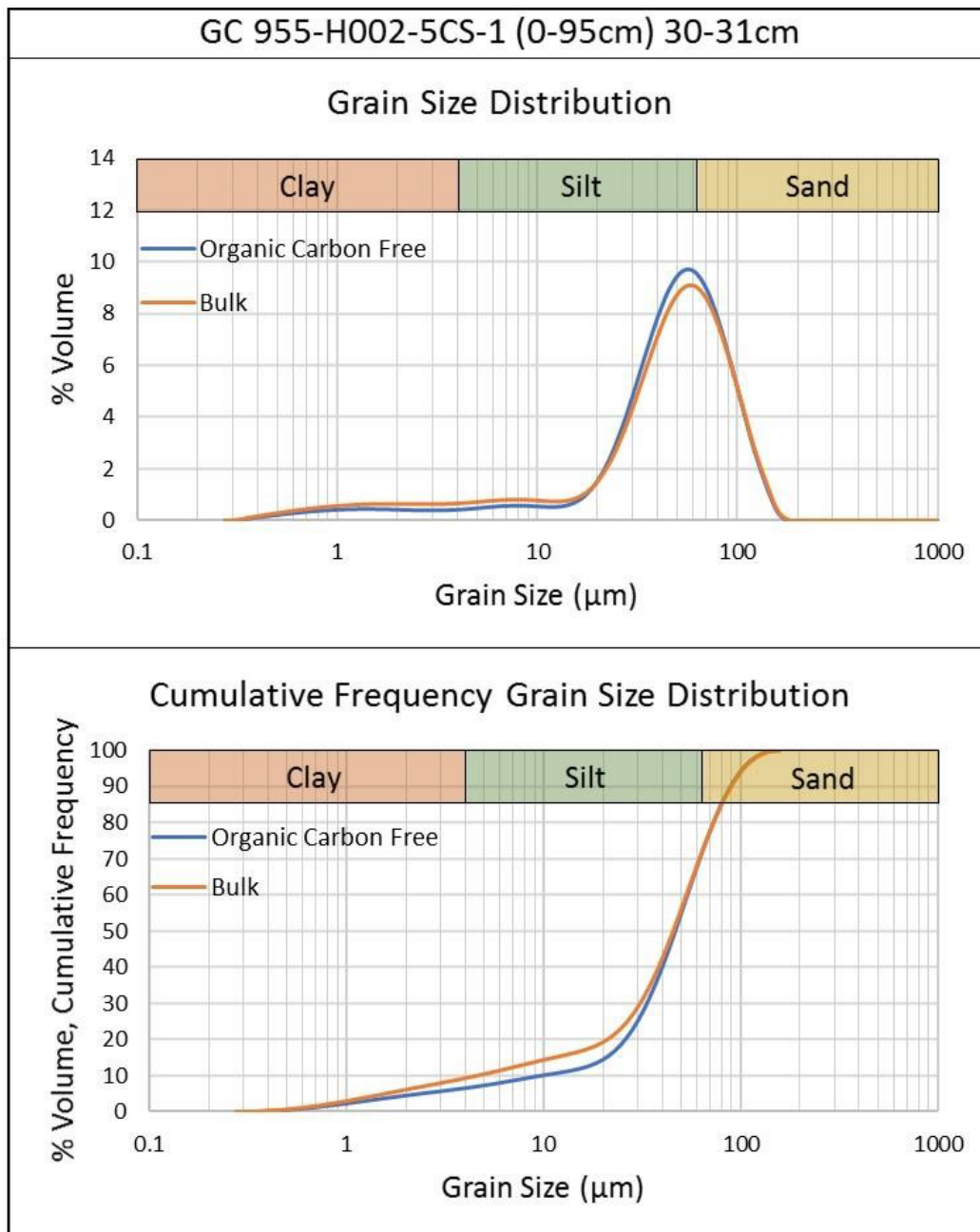


Figure 16: Grain size distribution and cumulative grain size distribution of GC 955-H002-5CS-1 (0-95cm) 30-31cm.

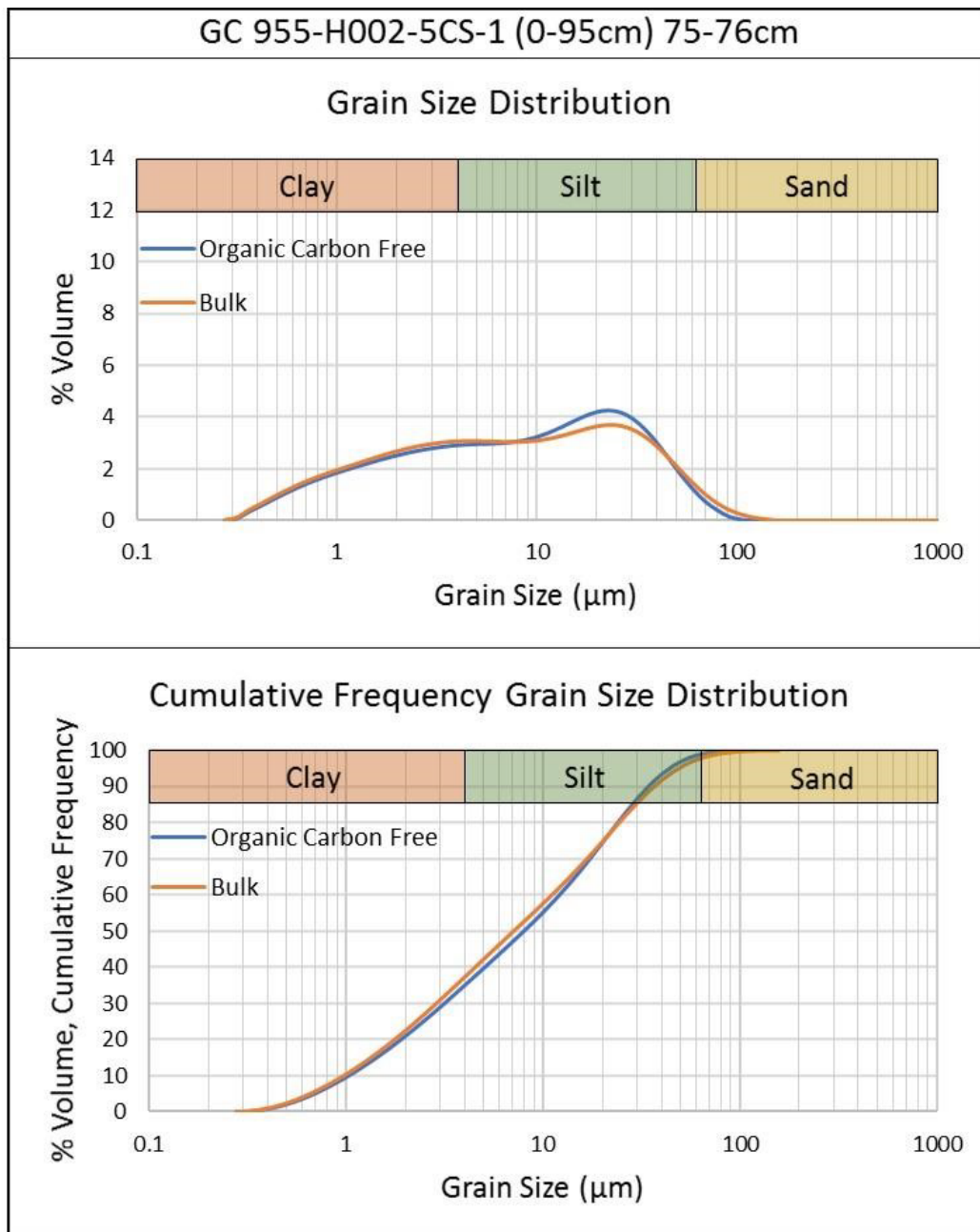


Figure 17: Grain size distribution and cumulative grain size distribution of GC 955-H002-5CS-1 (0-95cm) 75-76cm.

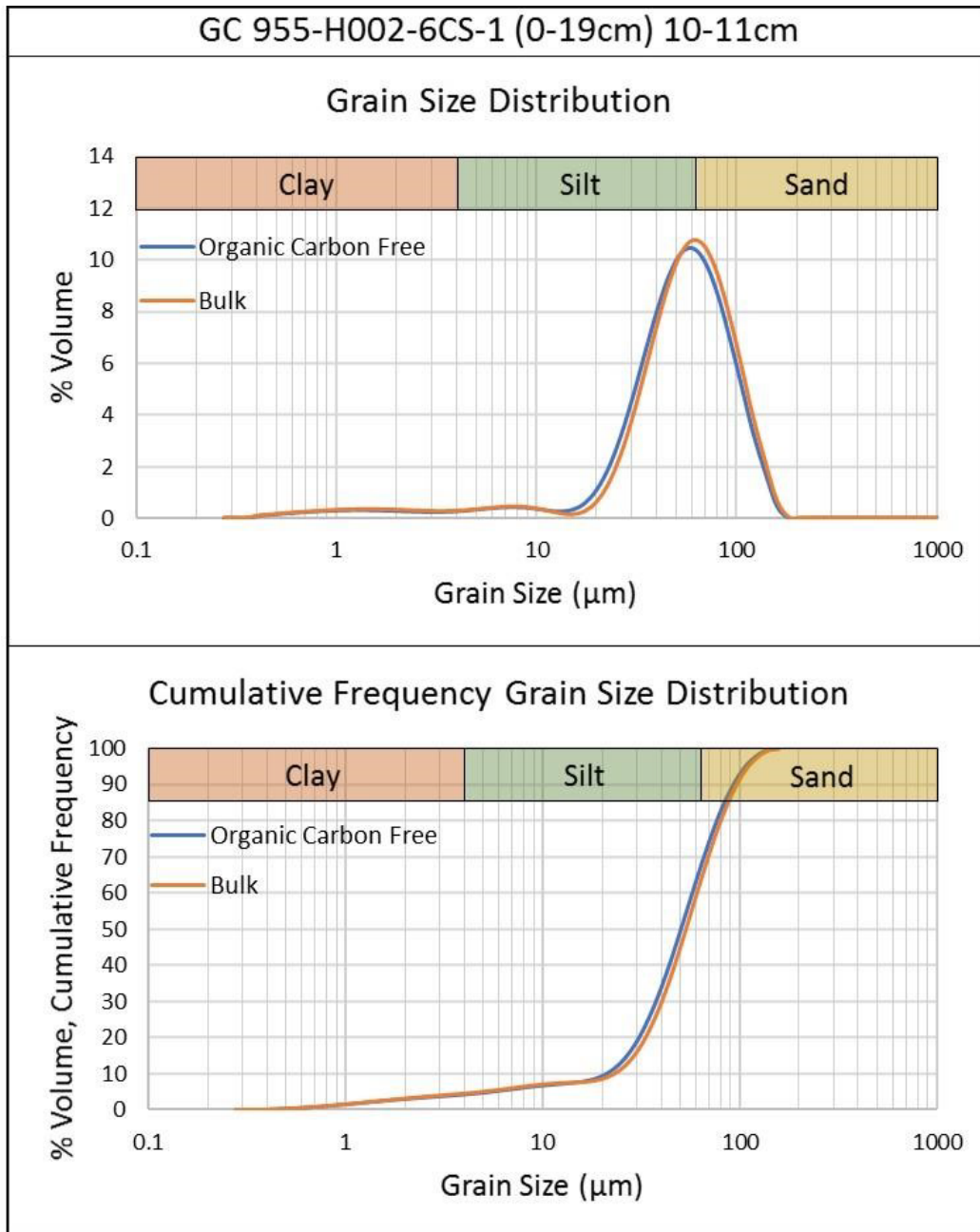


Figure 18: Grain size distribution and cumulative grain size distribution of GC 955-H002-6CS-1 (0-19cm) 10-11cm.

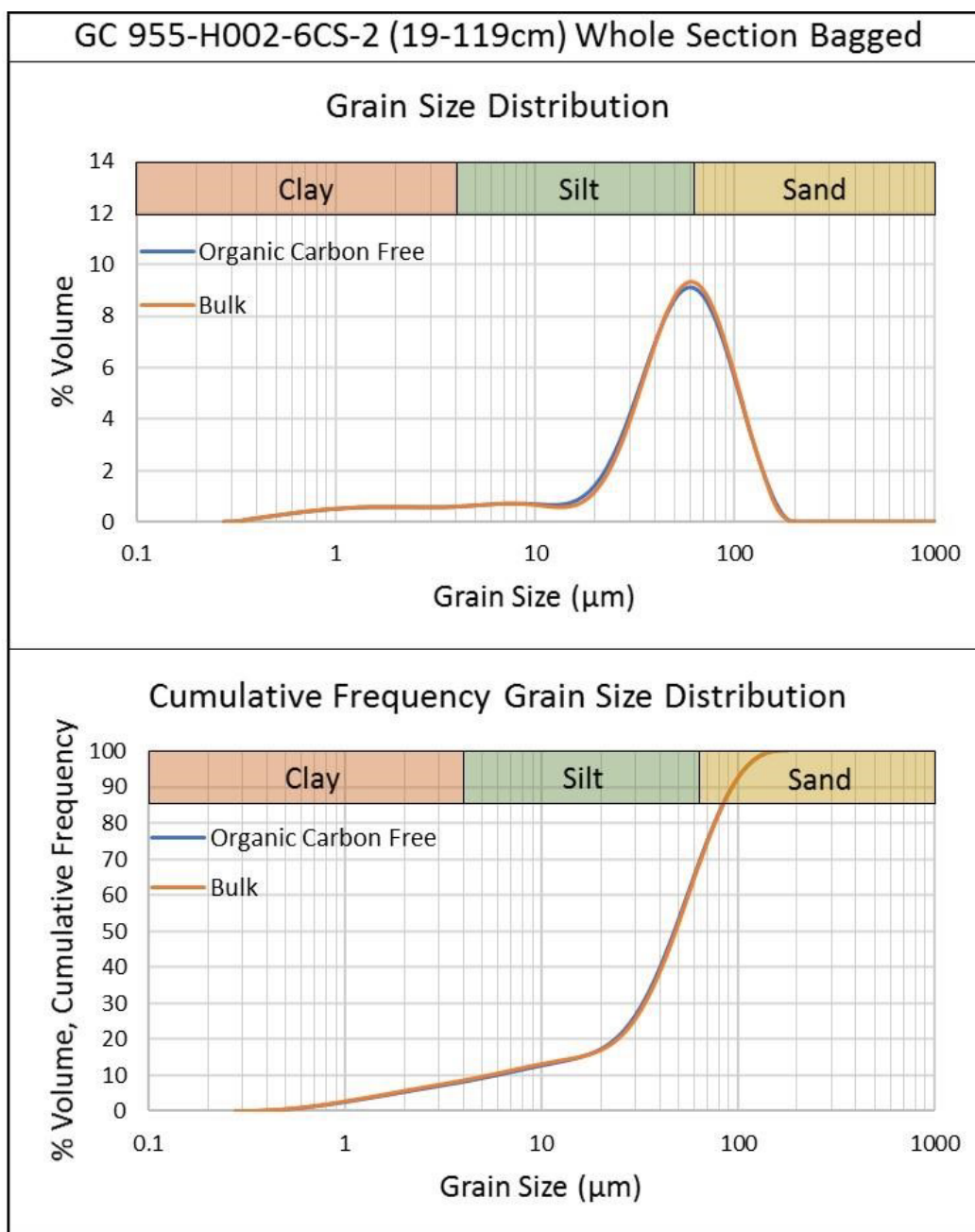


Figure 19: Grain size distribution and cumulative grain size distribution of GC 955-H002-6CS-2 (19-119cm) Whole Section Bagged.

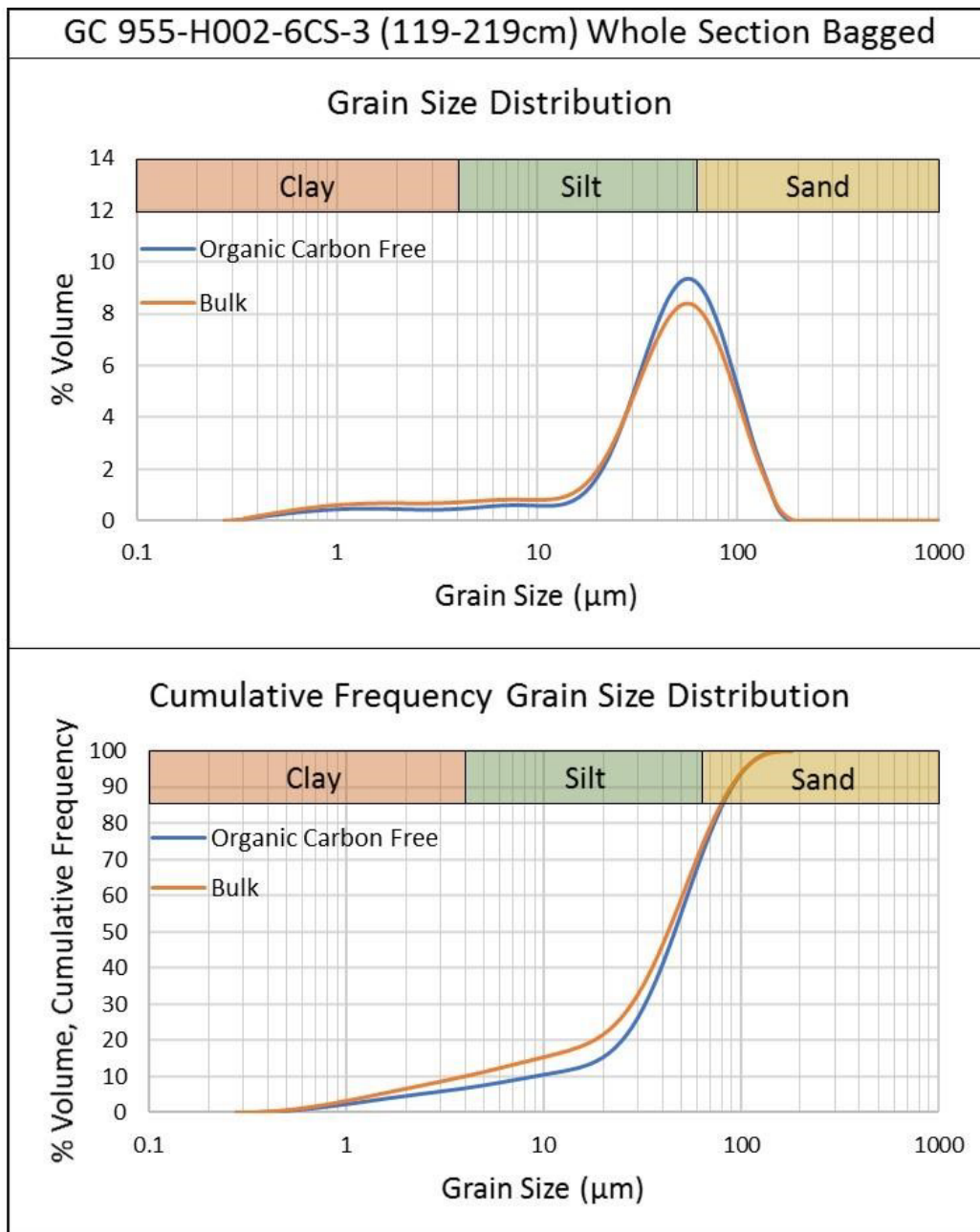


Figure 20: Grain size distribution and cumulative grain size distribution of GC 955-H002-6CS-3 (119-219cm) Whole Section Bagged.

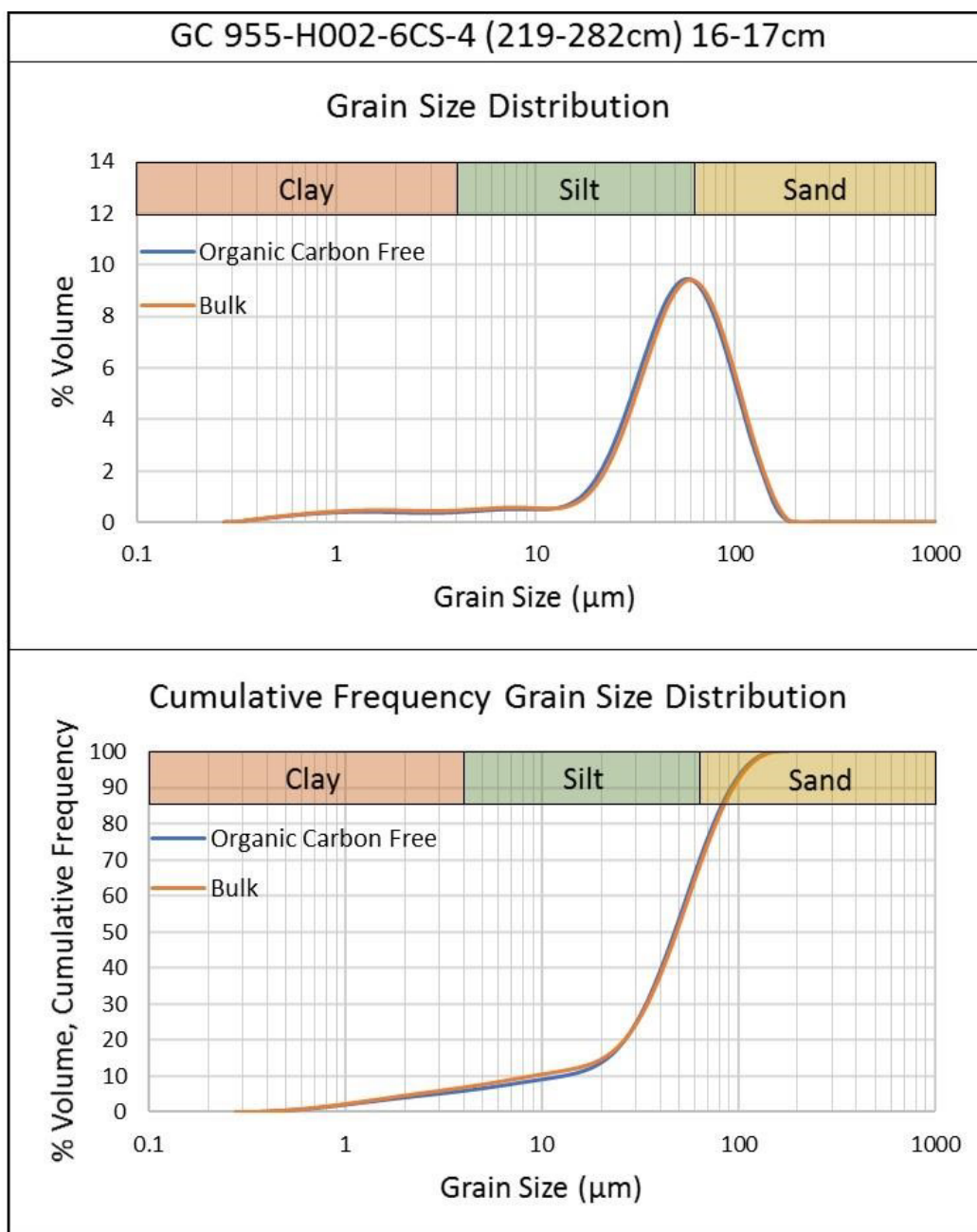


Figure 21: Grain size distribution and cumulative grain size distribution of GC 955-H002-6CS-4 (219-282cm) 16-17cm.

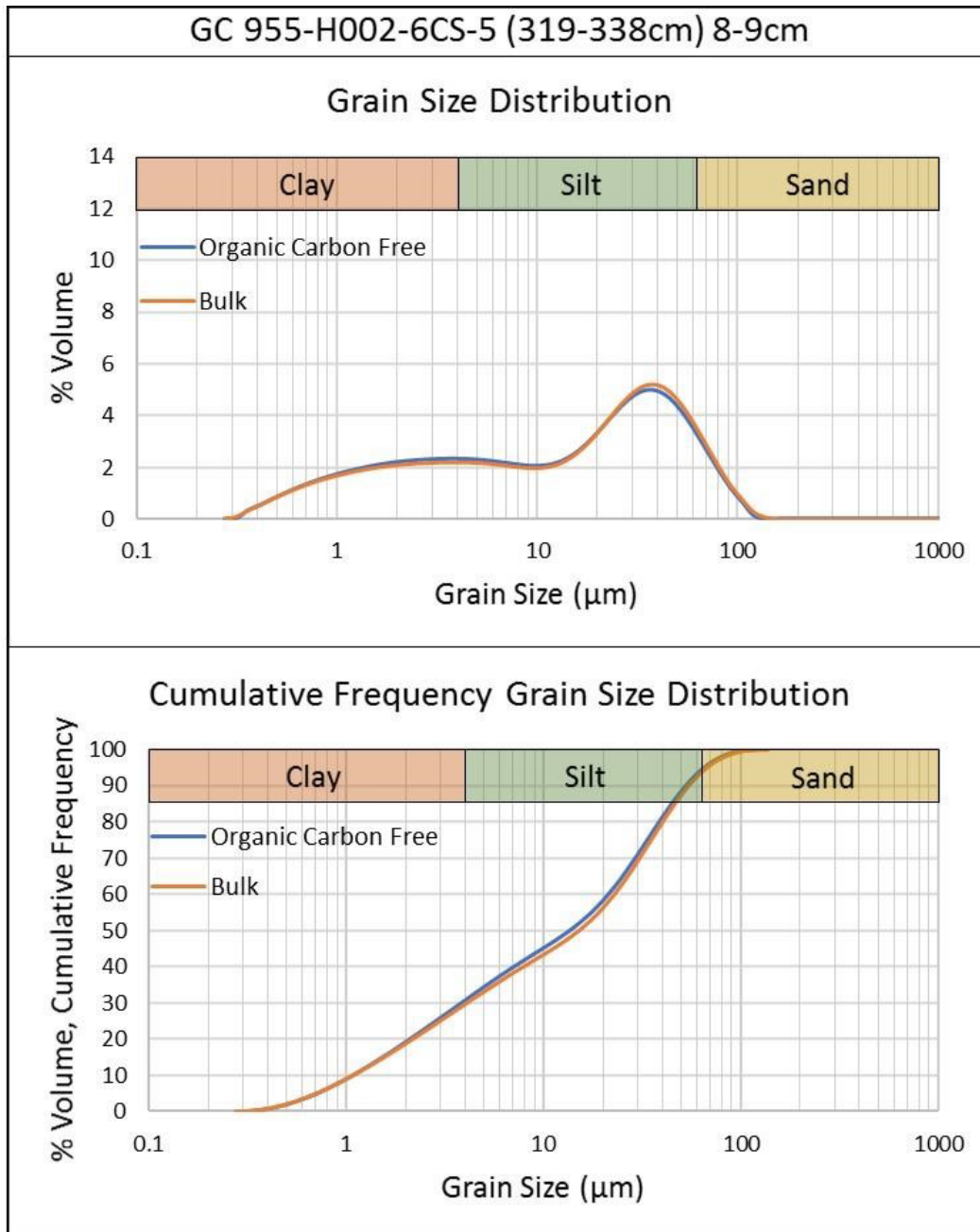


Figure 22: Grain size distribution and cumulative grain size distribution of GC 955-H002-6CS-5 (319-338cm) 8-9cm.

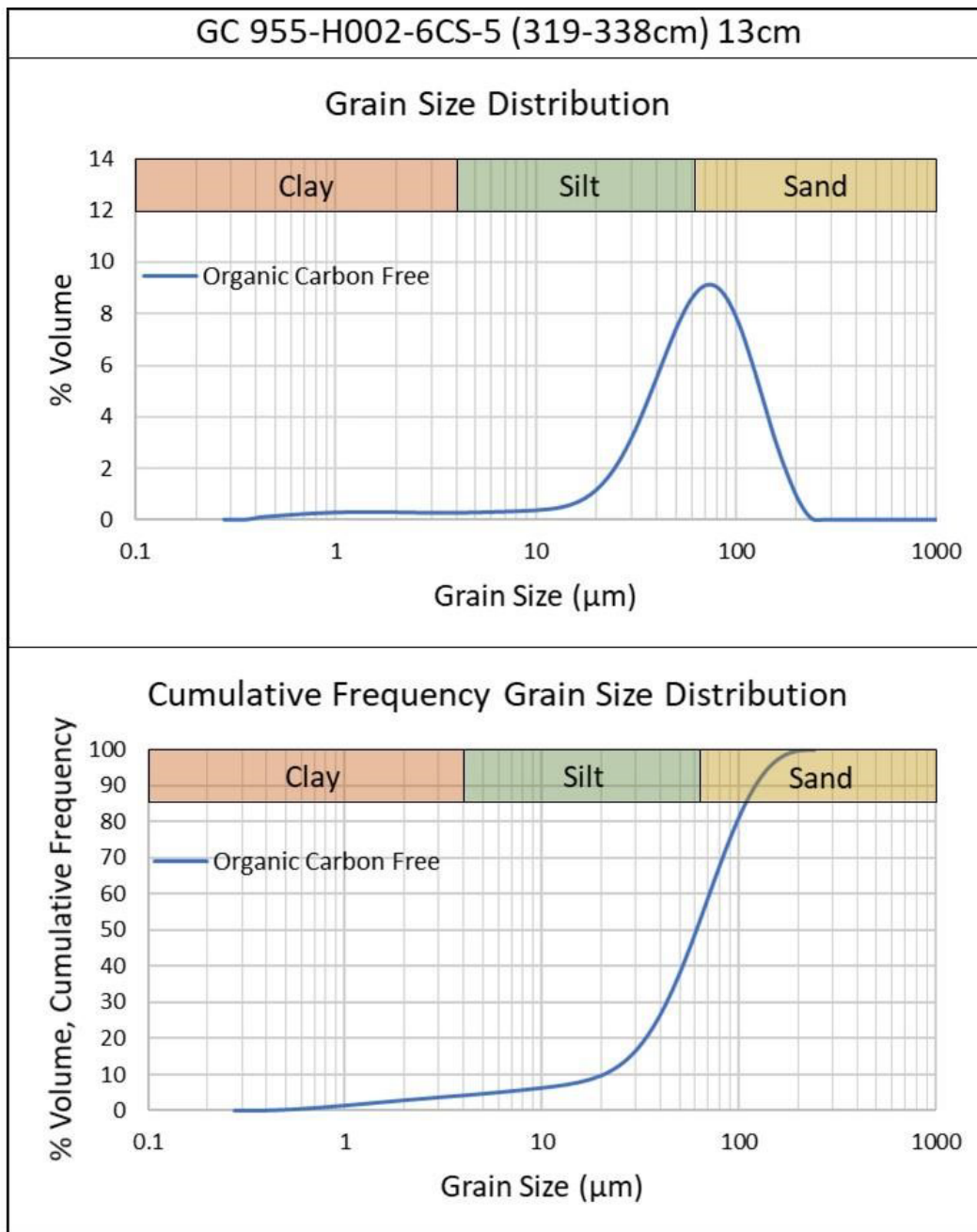


Figure 23: Grain size distribution and cumulative grain size distribution of GC 955-H002-6CS-5 (319-338cm) 13cm.

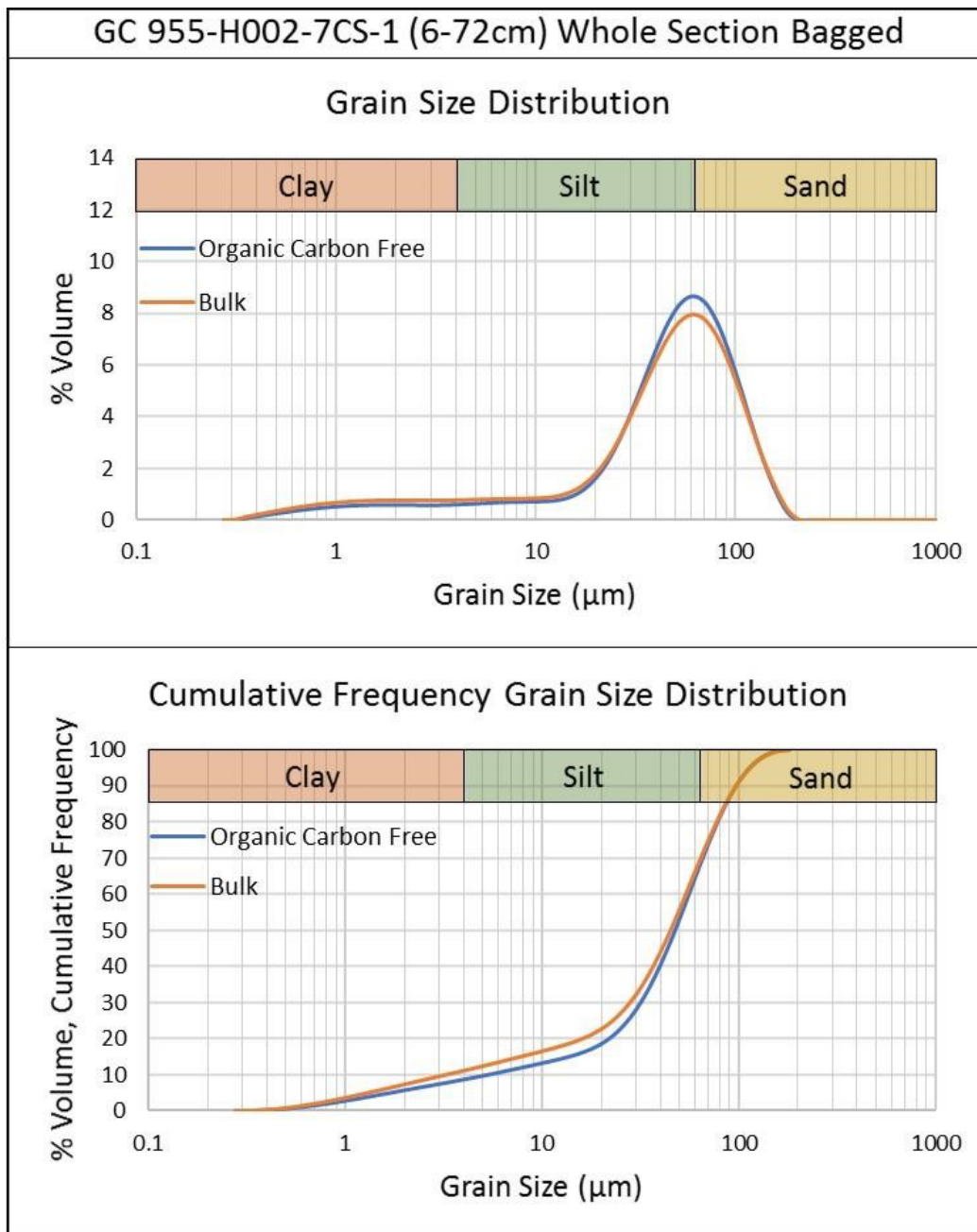


Figure 24: Grain size distribution and cumulative grain size distribution of GC 955-H002-7CS-1 (6-72cm) Whole Section Bagged.

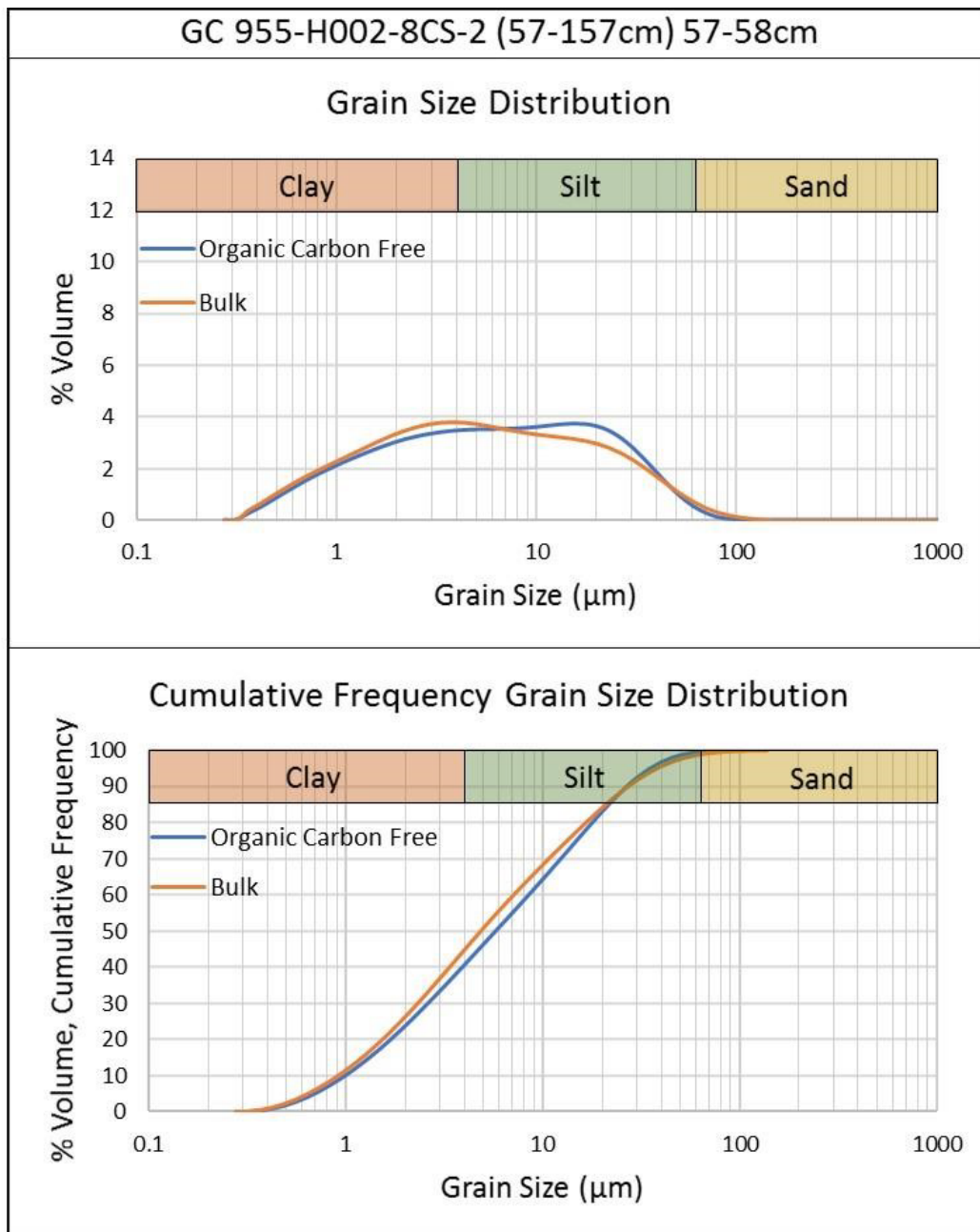


Figure 25: Grain size distribution and cumulative grain size distribution of GC 955-H002-8CS-2 (57-157cm) 57-58cm.

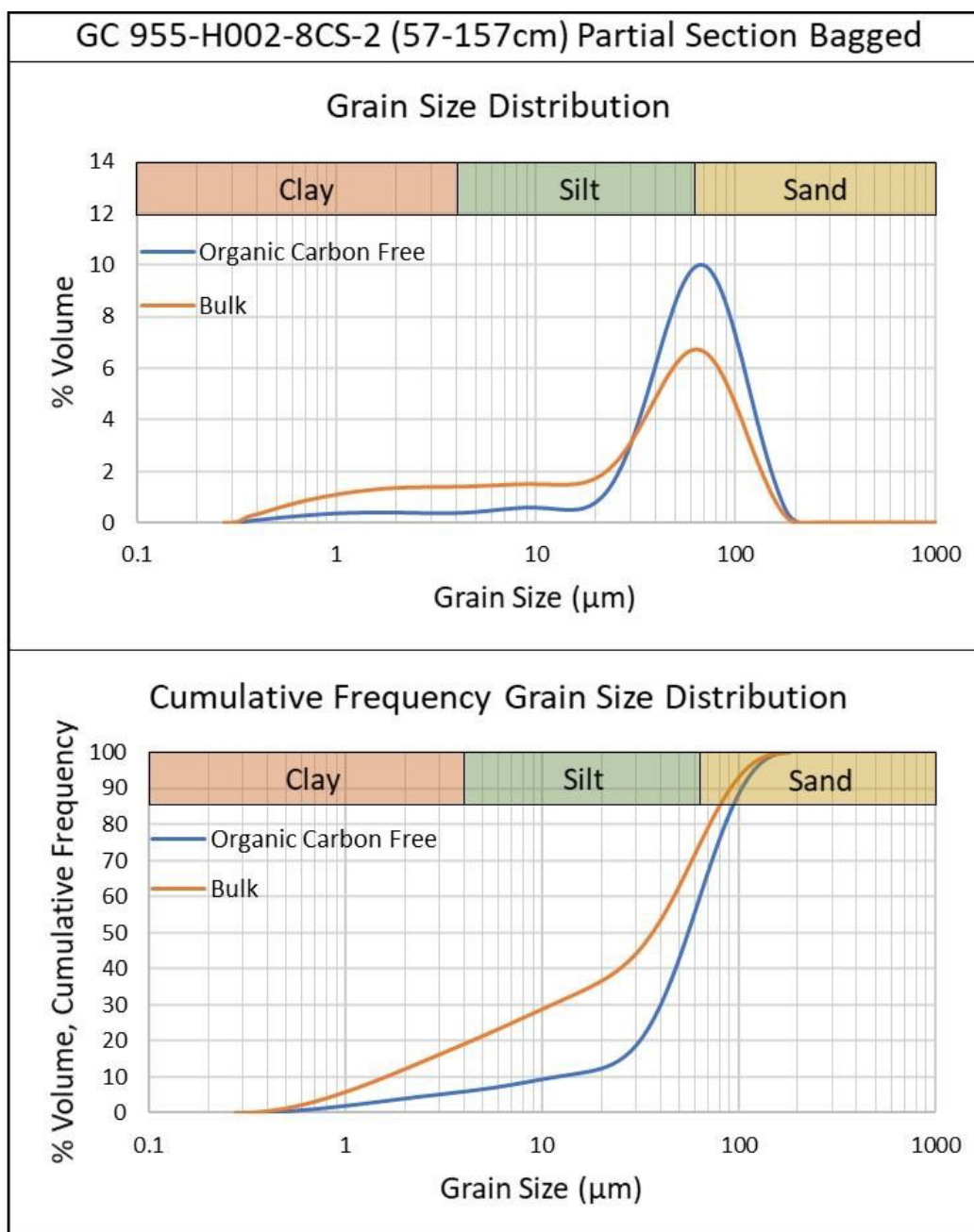


Figure 26: Grain size distribution and cumulative grain size distribution of GC 955-H002-8CS-2 (57-157cm) Partial Section Bagged. Note: this sample was collected from a bagged sample from the lower interval in the core (62-100 cm), see Johnson et al. (2020).

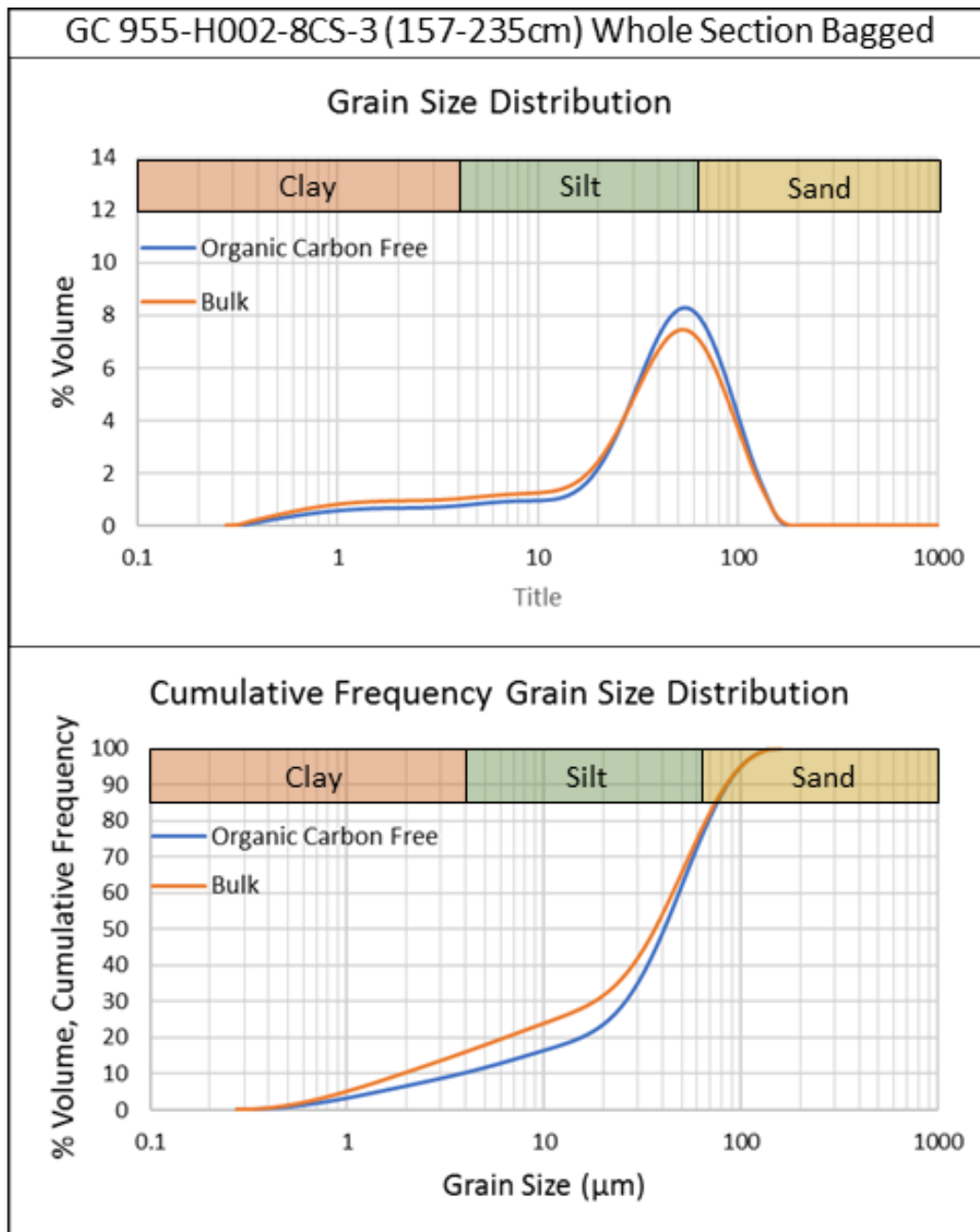


Figure 27: Grain size distribution and cumulative grain size distribution of GC 955-H002-8CS-3 (157-235cm) Whole Section Bagged.

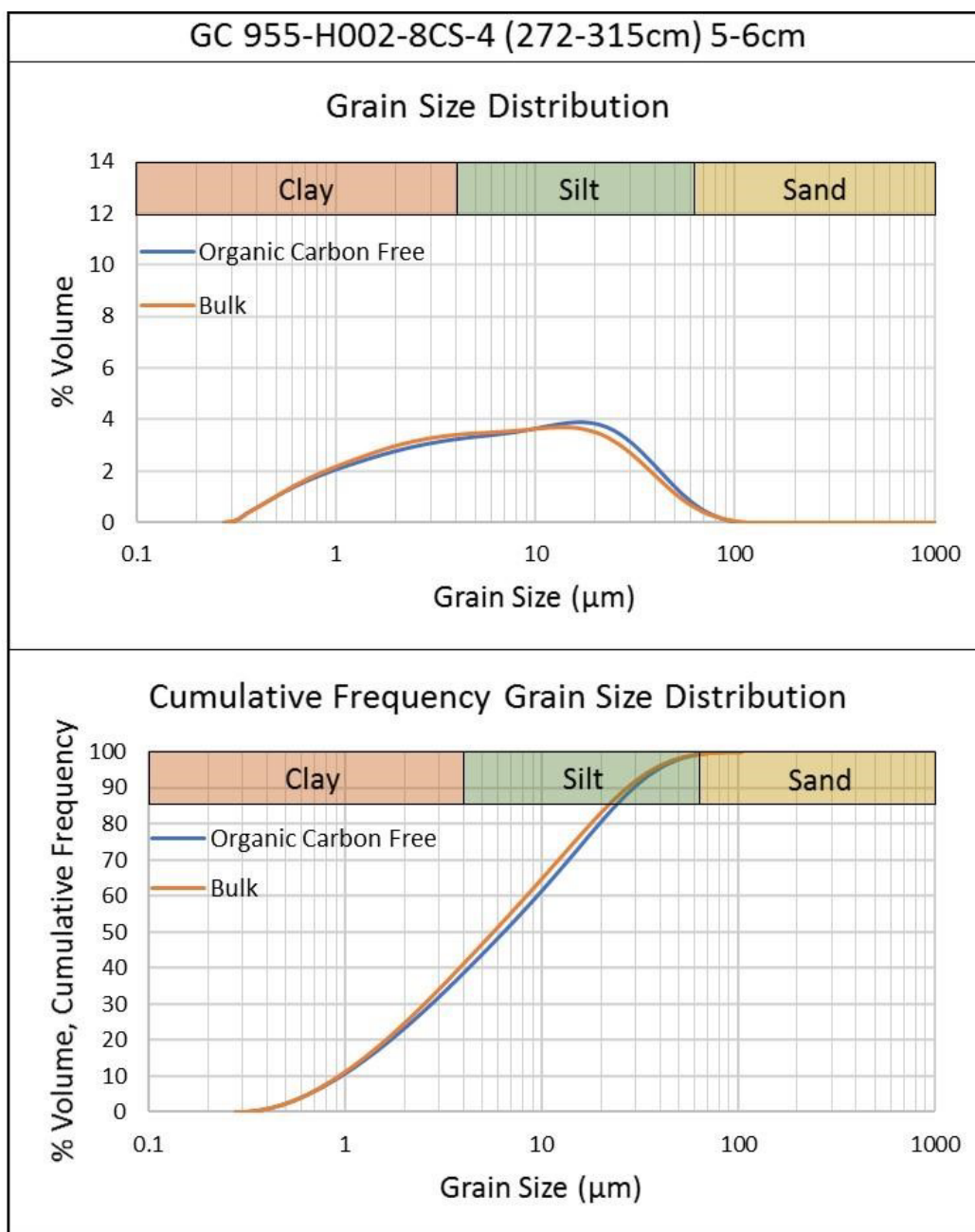


Figure 28: Grain size distribution and cumulative grain size distribution of GC 955-H002-8CS-4 (272-315cm) 5-6cm.

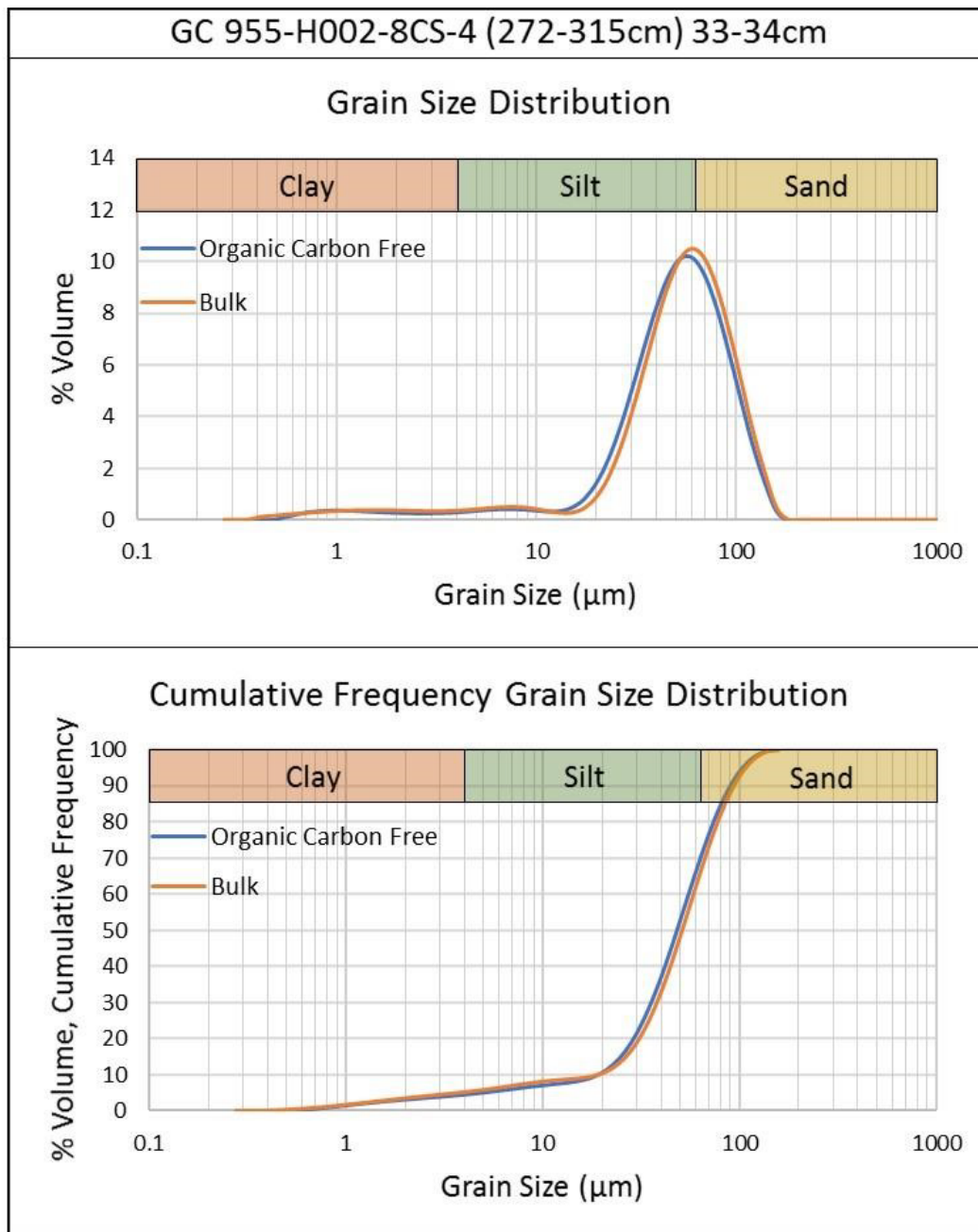


Figure 29: Grain size distribution and cumulative grain size distribution of GC 955-H002-8CS-4 (272-315cm) 33-34cm.

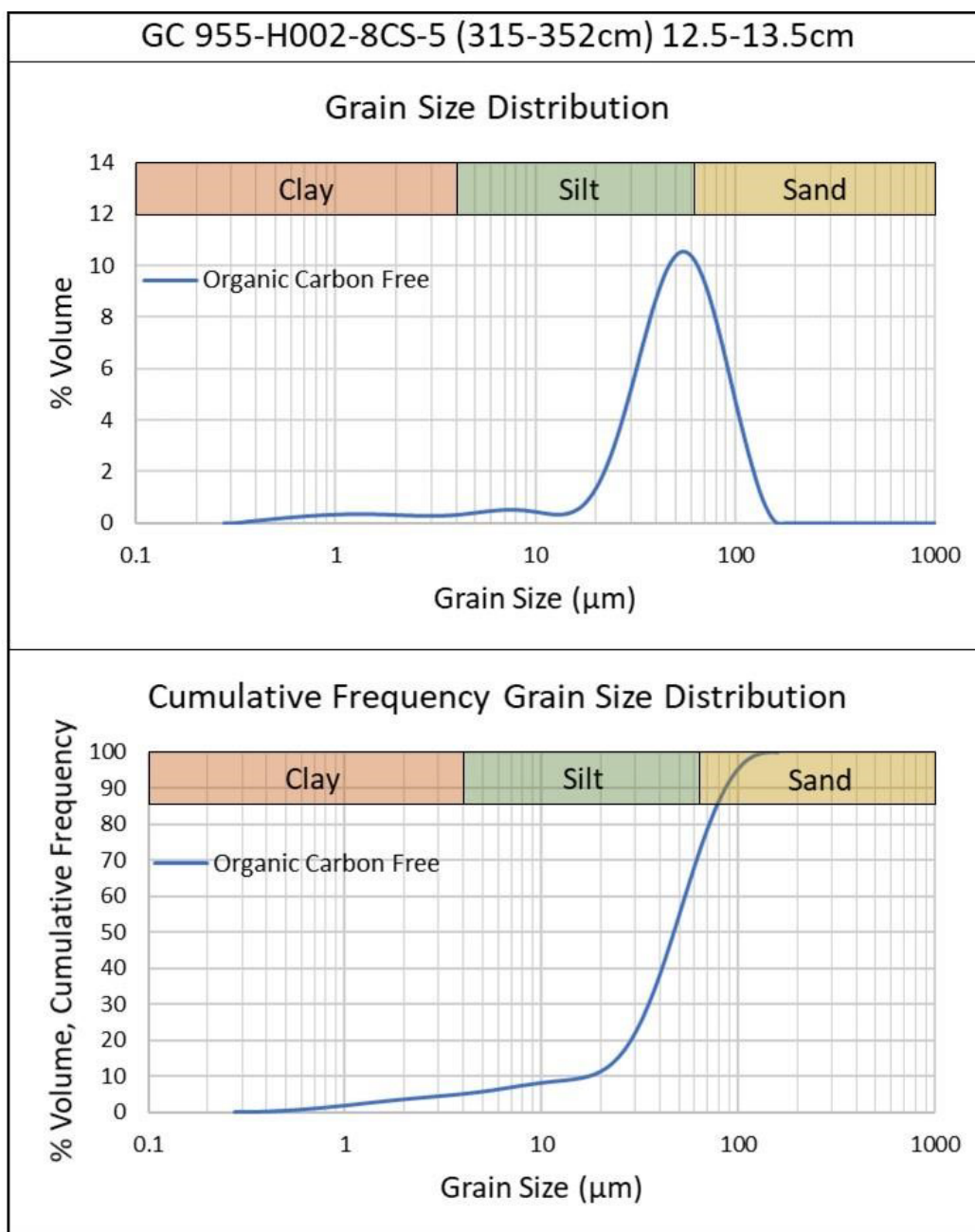


Figure 30: Grain size distribution and cumulative grain size distribution of GC 955-H002-8CS-5 (315-352cm) 12.5-13.5cm.

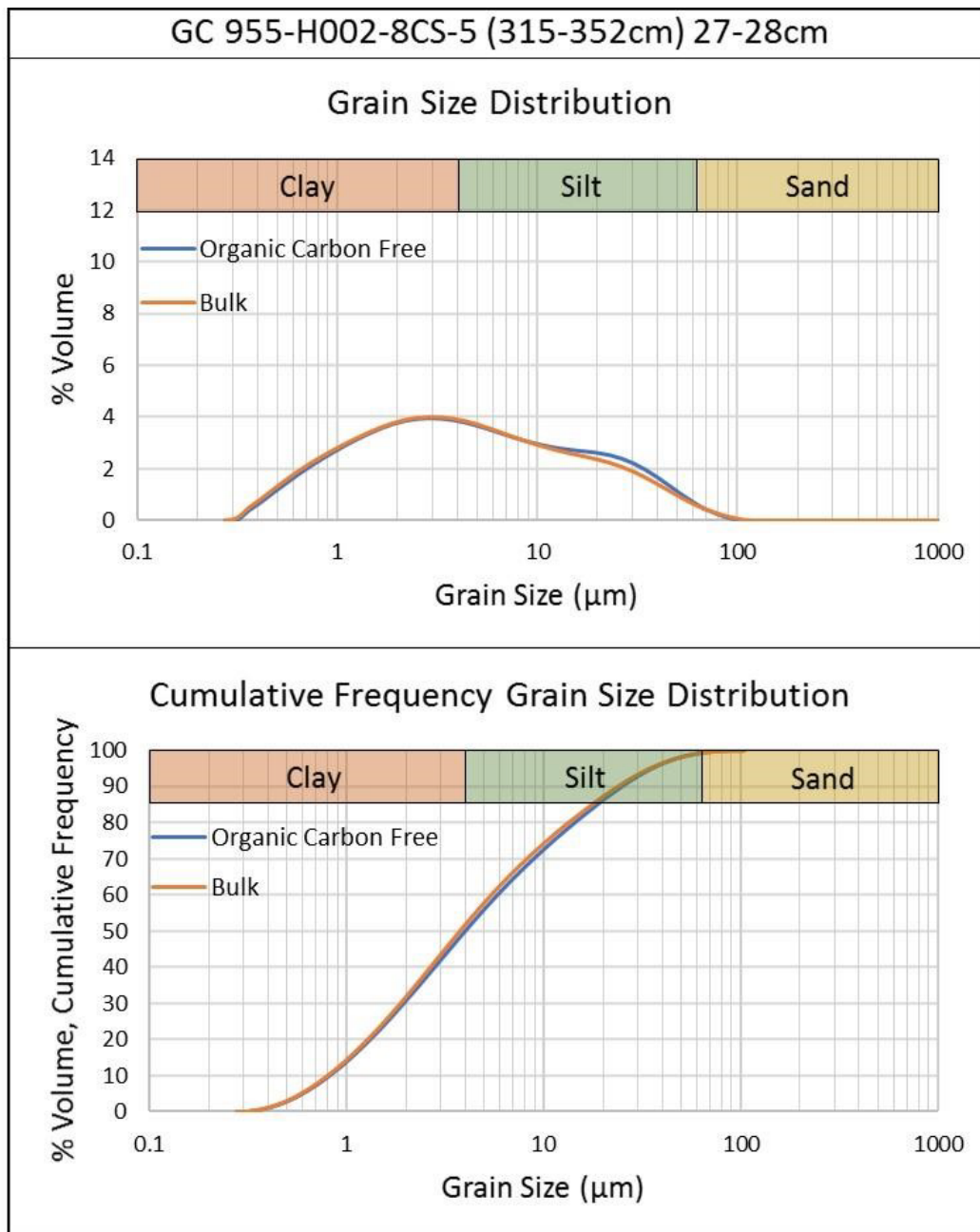


Figure 31: Grain size distribution and cumulative grain size distribution of GC 955-H002-8CS-5 (315-352cm) 27-28cm.

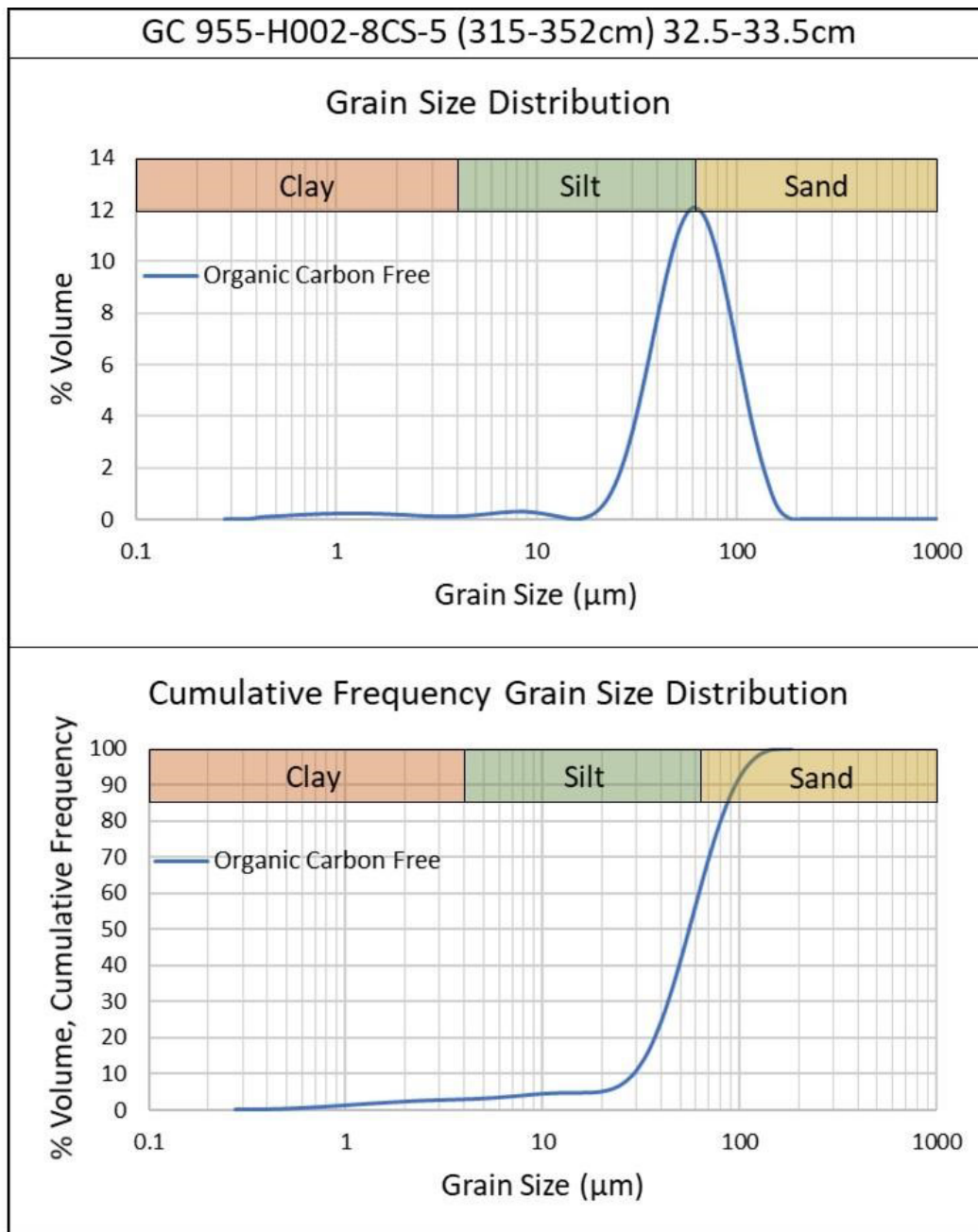


Figure 32: Grain size distribution and cumulative grain size distribution of GC 955-H002-8CS-5 (315-352cm) 32.5-33.5cm.

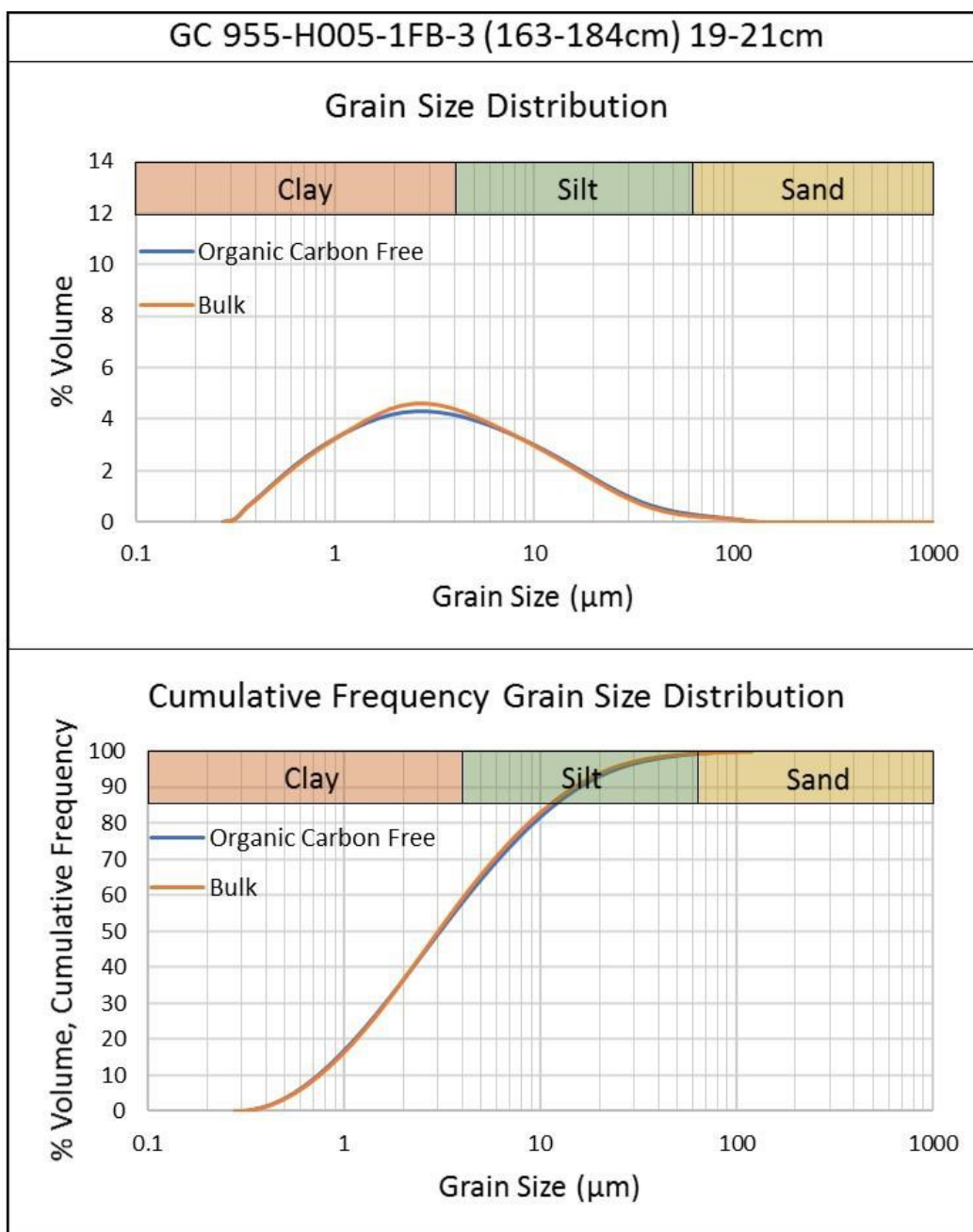


Figure 33: Grain size distribution and cumulative grain size distribution of GC 955-H005-1FB-3 (163-184cm) 19-21cm.

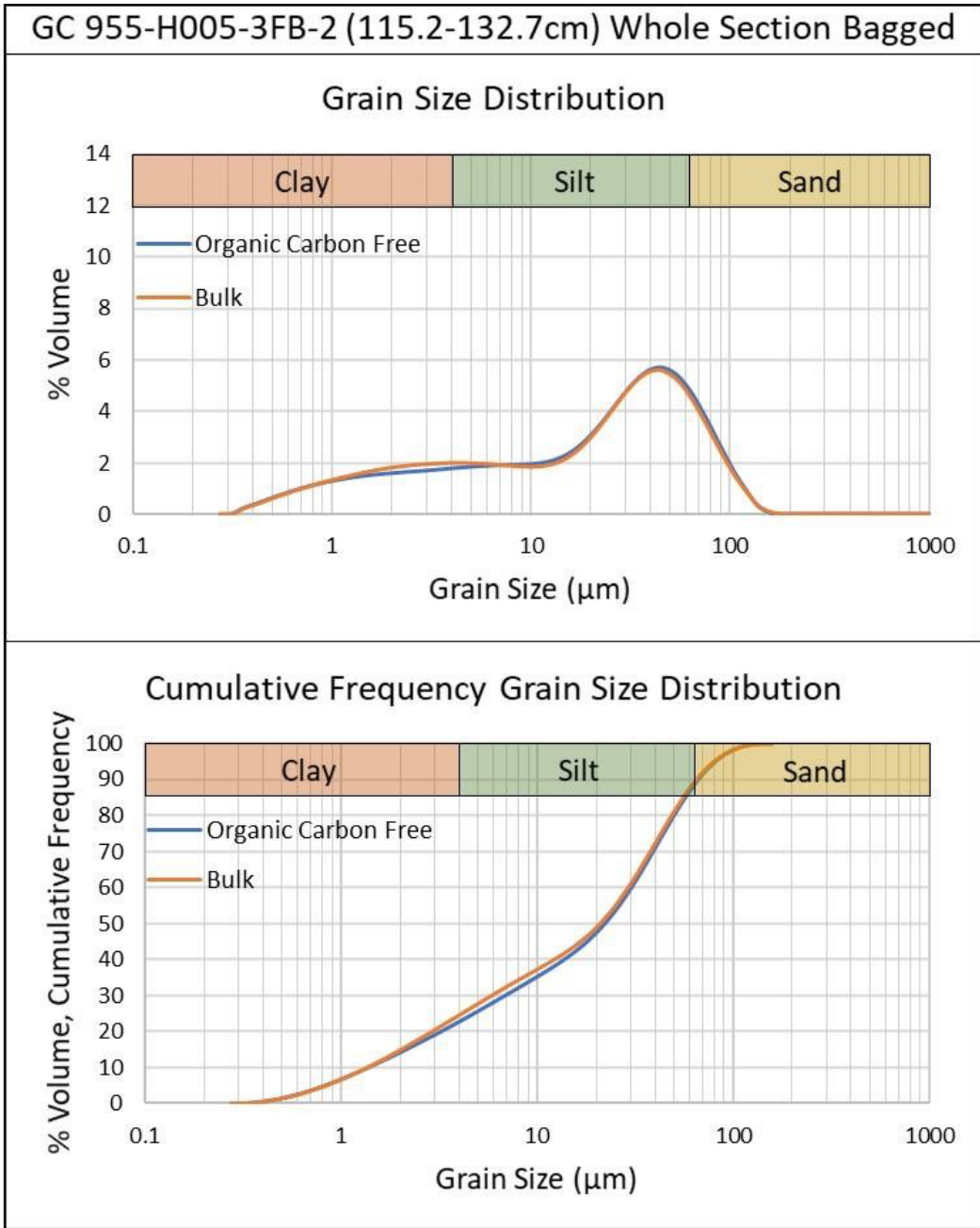


Figure 34: Grain size distribution and cumulative grain size distribution of GC 955-H005-3FB-2 (115.2-132.7cm) Whole Section Bagged.

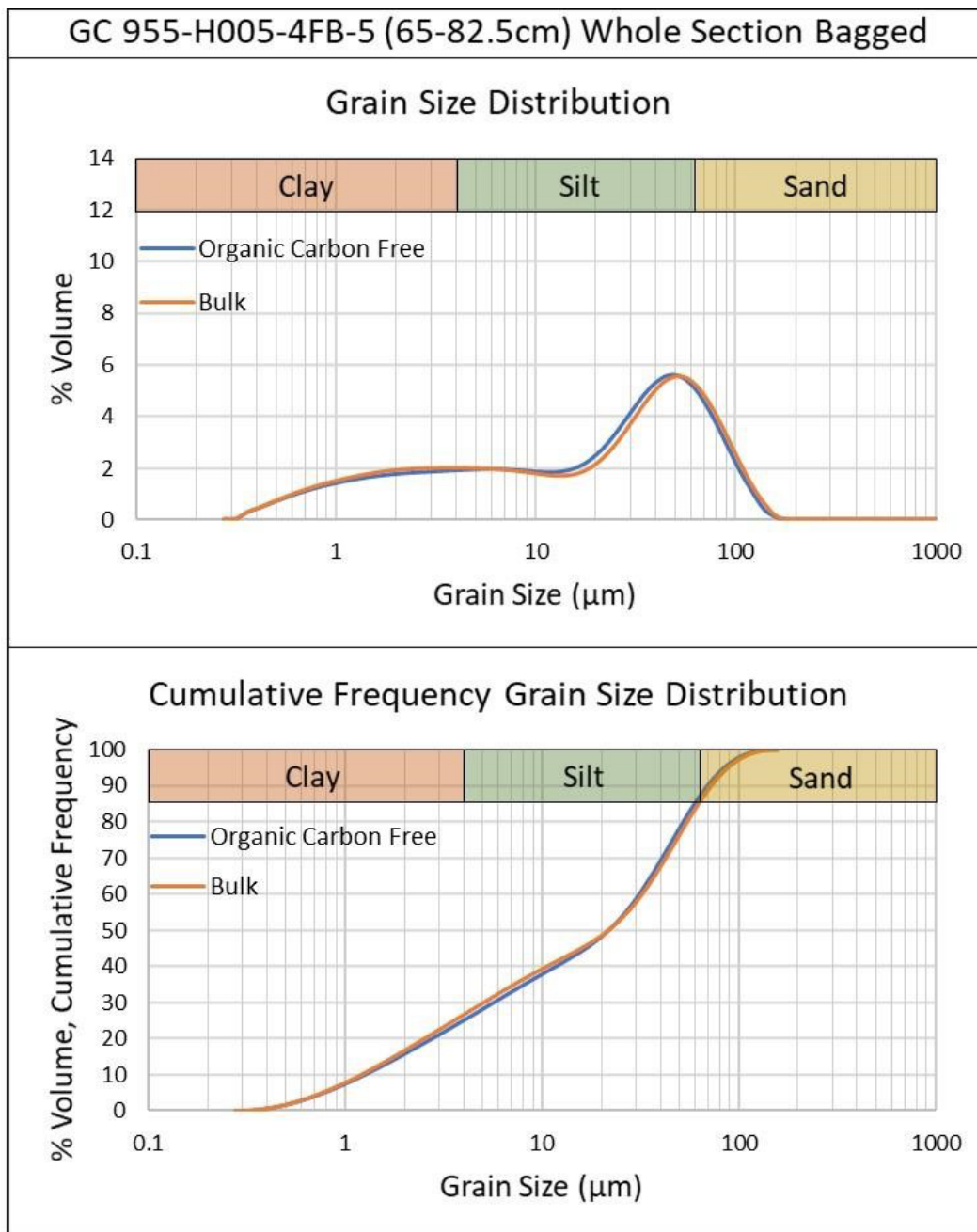


Figure 35: Grain size distribution and cumulative grain size distribution of GC 955-H005-4FB-5 (65-82.5cm) Whole Section Bagged.

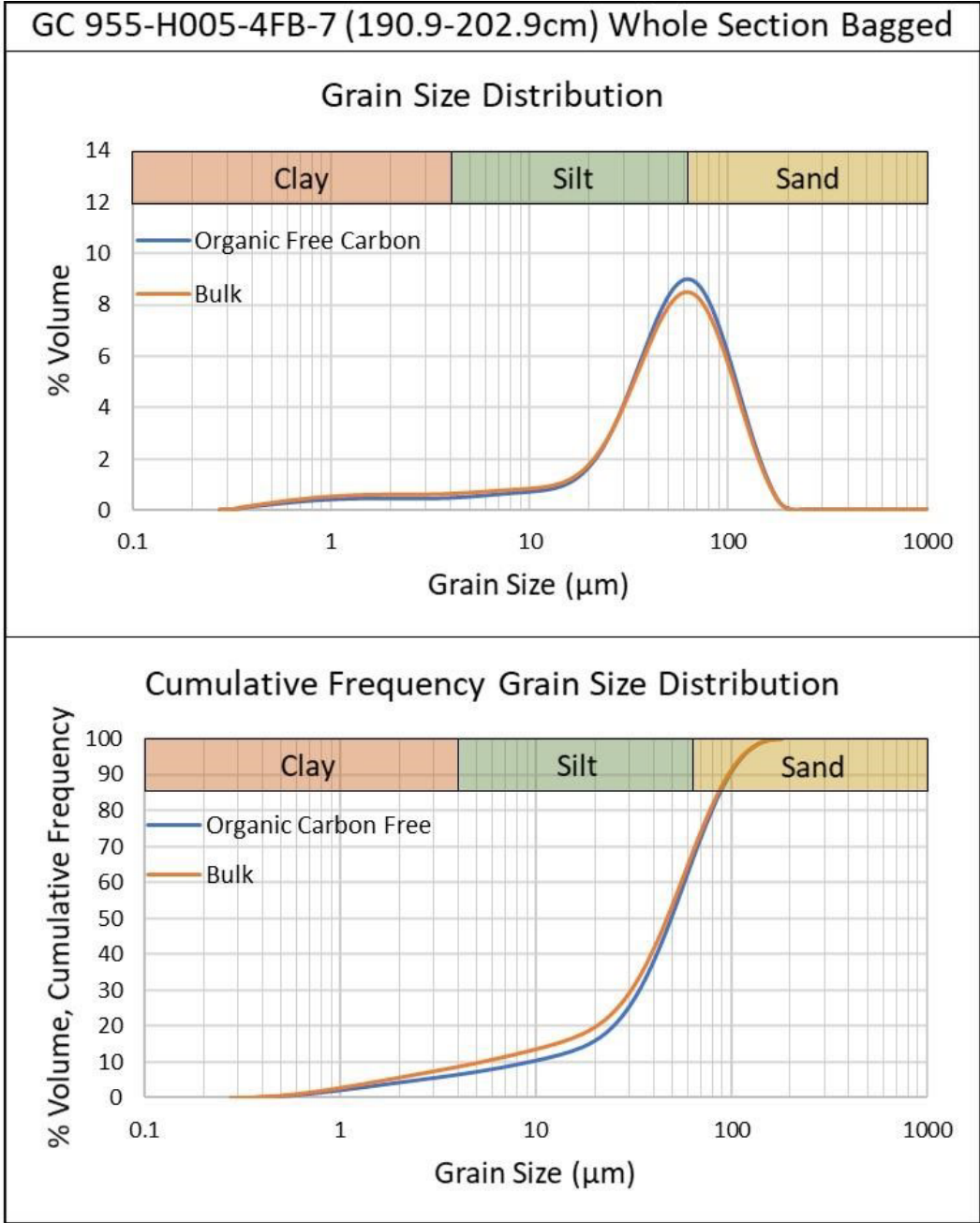


Figure 36: Grain size distribution and cumulative grain size distribution of GC 955-H005-3FB-2 (115.2-132.7cm) Whole Section Bagged.

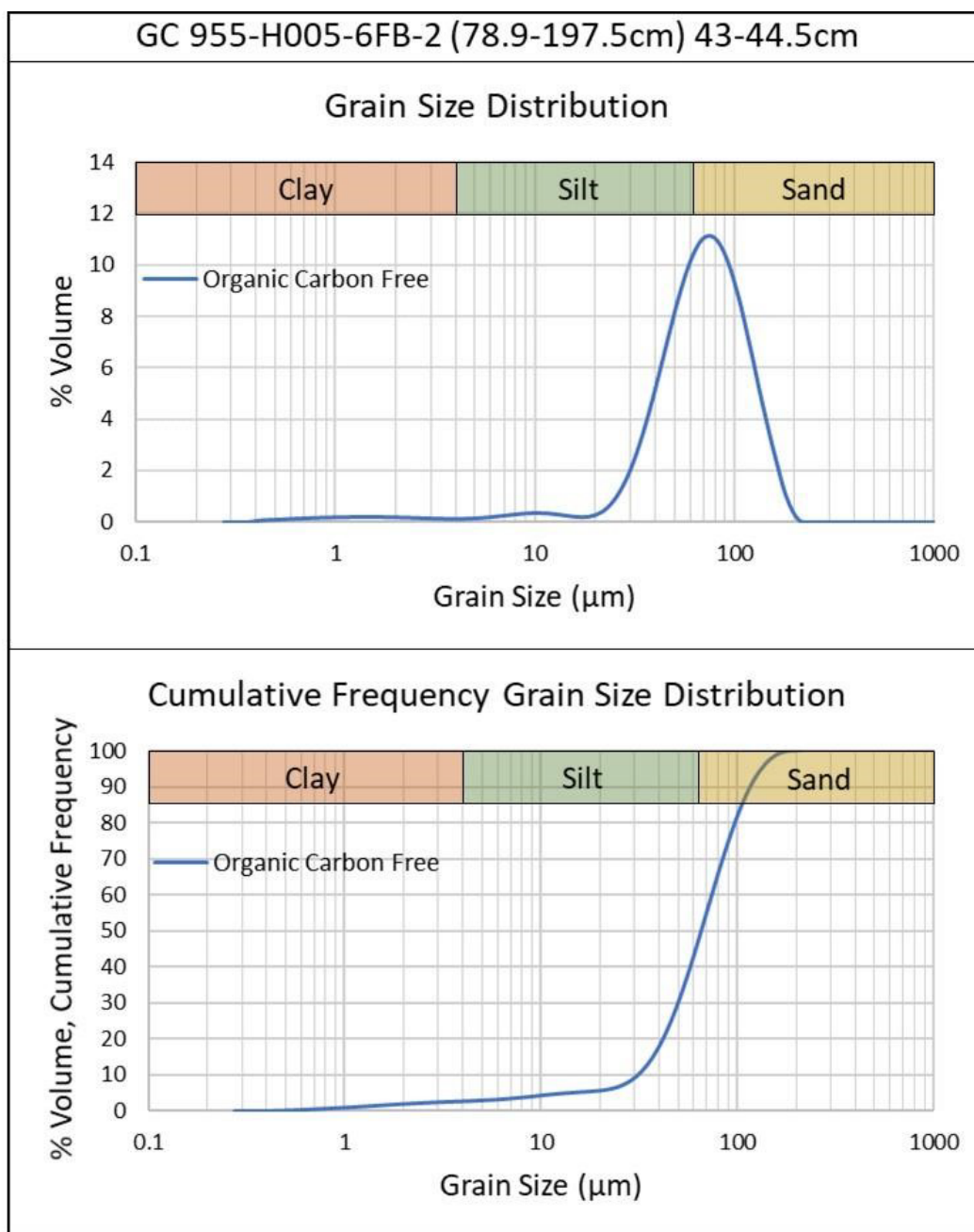


Figure 37: Grain size distribution and cumulative grain size distribution of GC 955-H005-6FB-2 (78.9-197.5cm) 43-44.5cm.

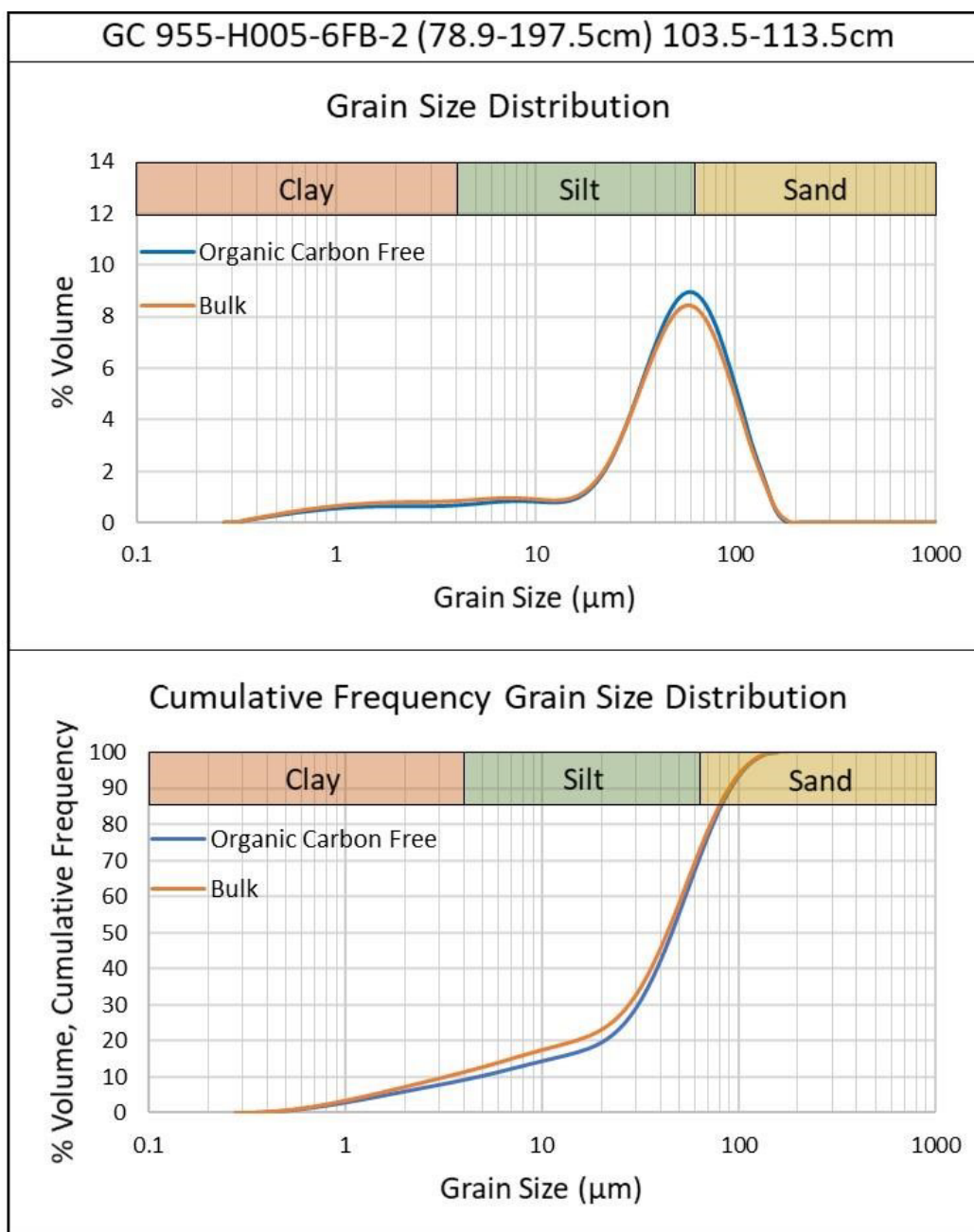


Figure 38: Grain size distribution and cumulative grain size distribution of GC 955-H005-6FB-2 (78.9-197.5cm) 103.5-113.5cm.

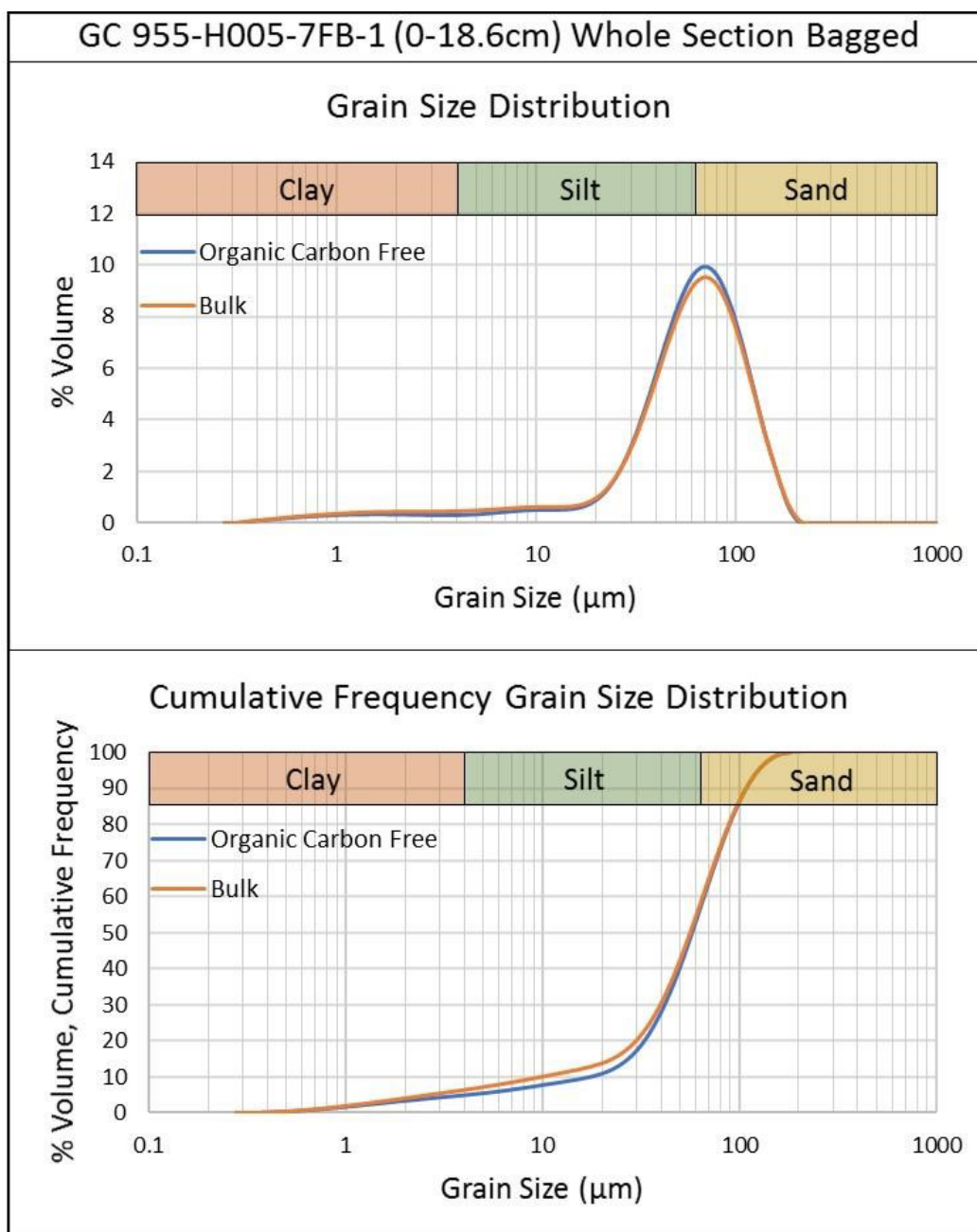


Figure 39: Grain size distribution and cumulative grain size distribution of GC 955-H005-7FB-1 (0-18.6cm) Whole Section Bagged.

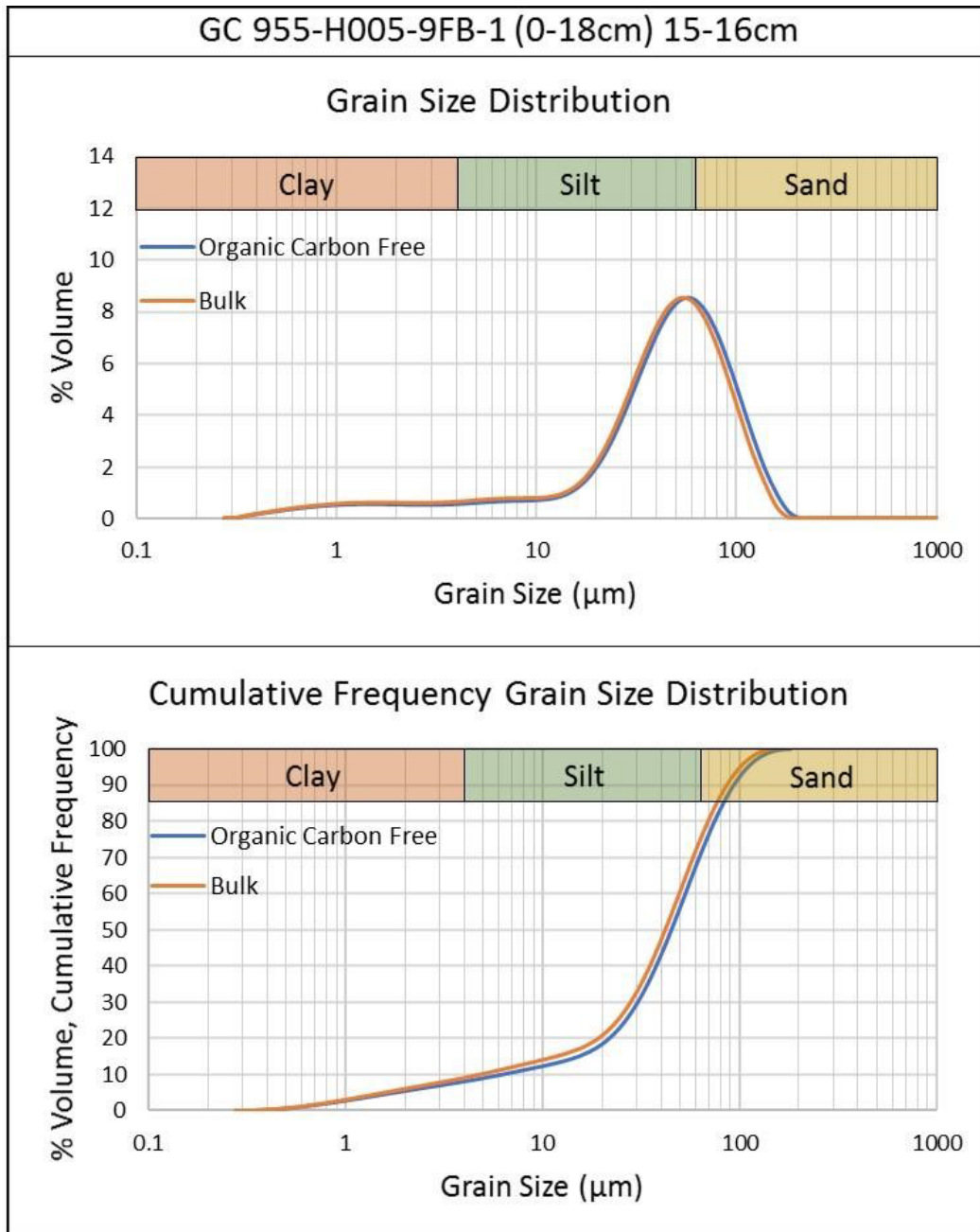


Figure 40: Grain size distribution and cumulative grain size distribution of GC 955-H005-9FB-1 (0-18cm) 15-16cm.

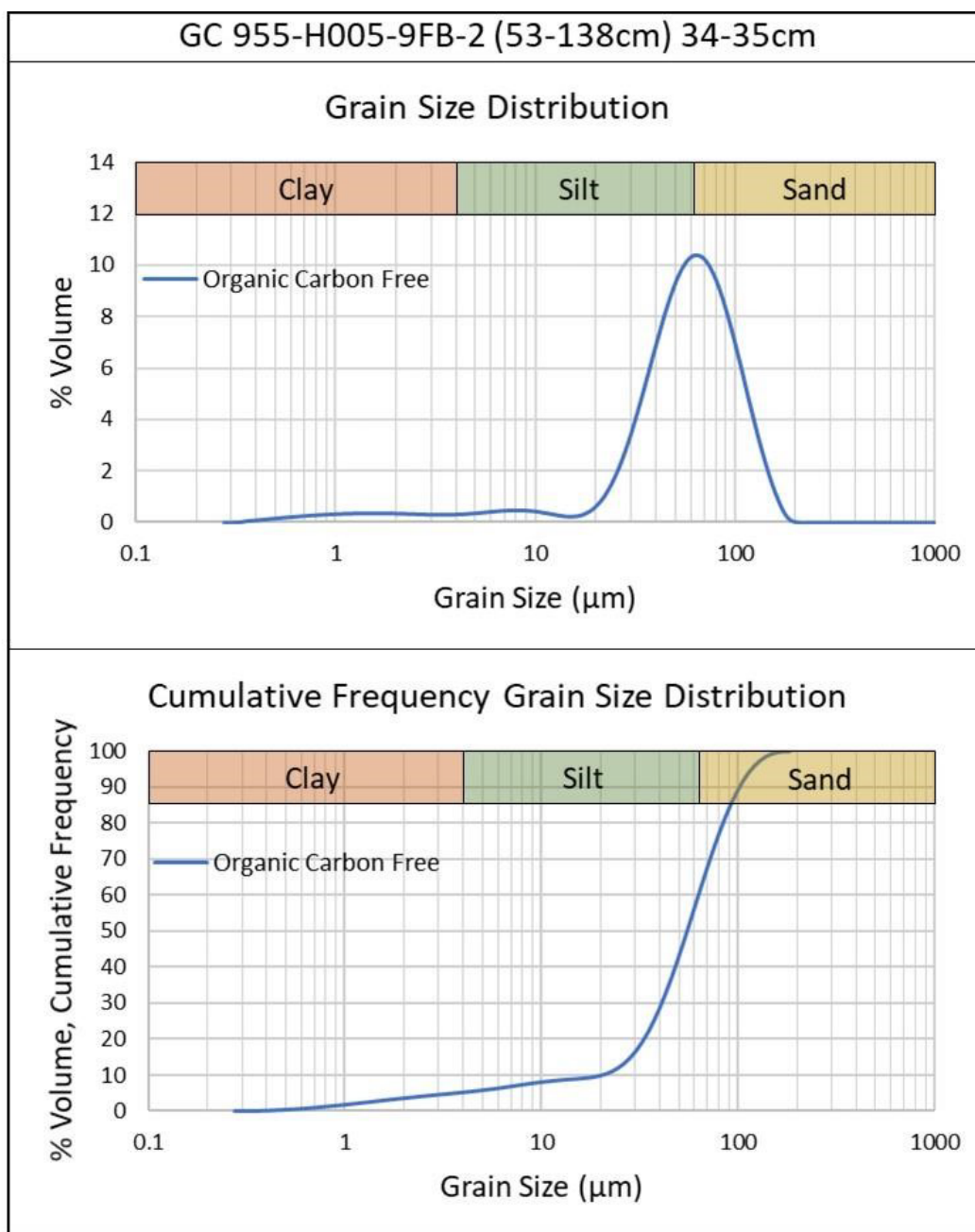


Figure 41: Grain size distribution and cumulative grain size distribution of GC 955-H005-9FB-2 (53-138cm) 34-35cm.

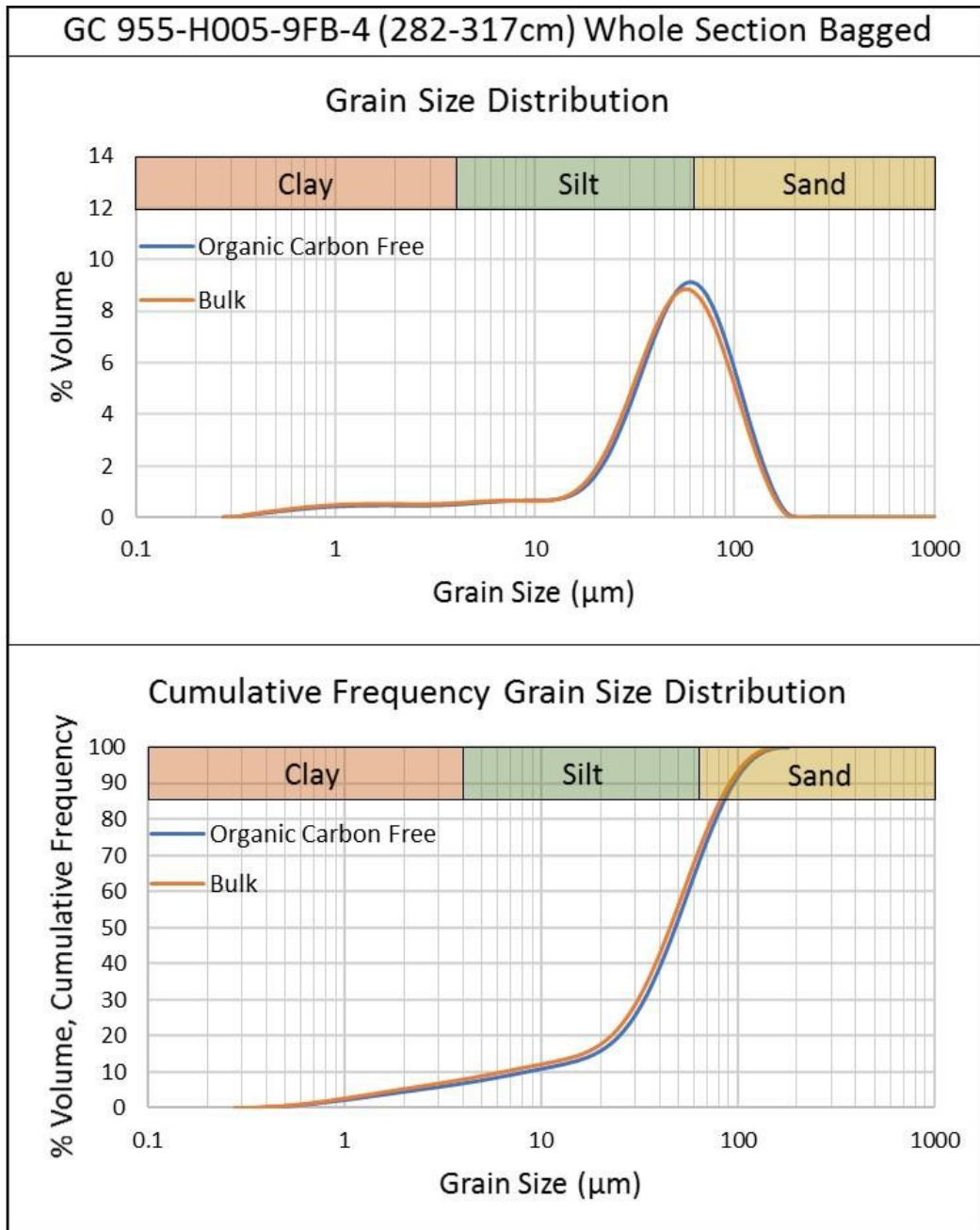


Figure 42: Grain size distribution and cumulative grain size distribution of GC 955-H005-9FB-4 (282-317cm) Whole Section Bagged.

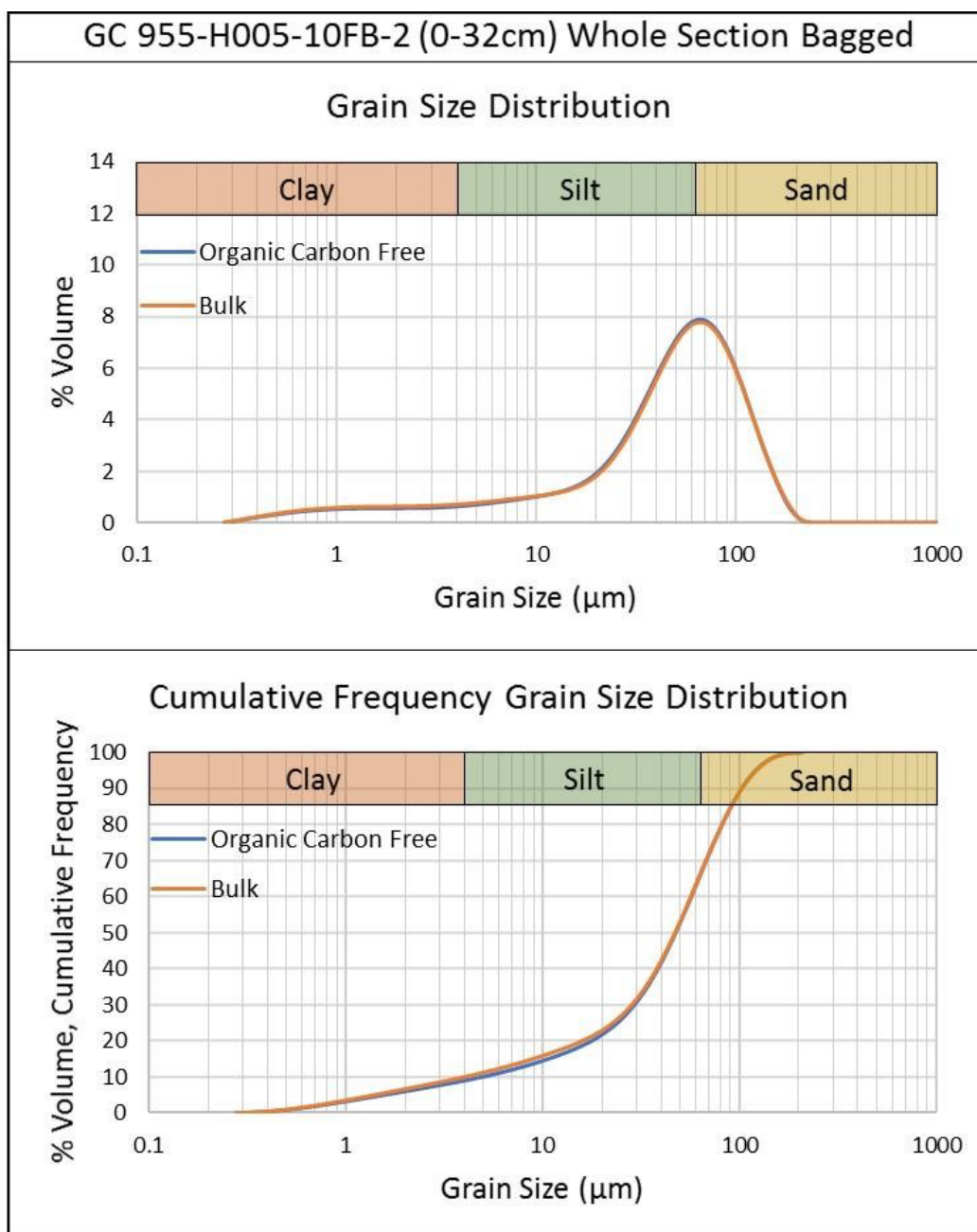


Figure 43: Grain size distribution and cumulative grain size distribution of GC 955-H005-10FB-2 (0-32cm) Whole Section Bagged.

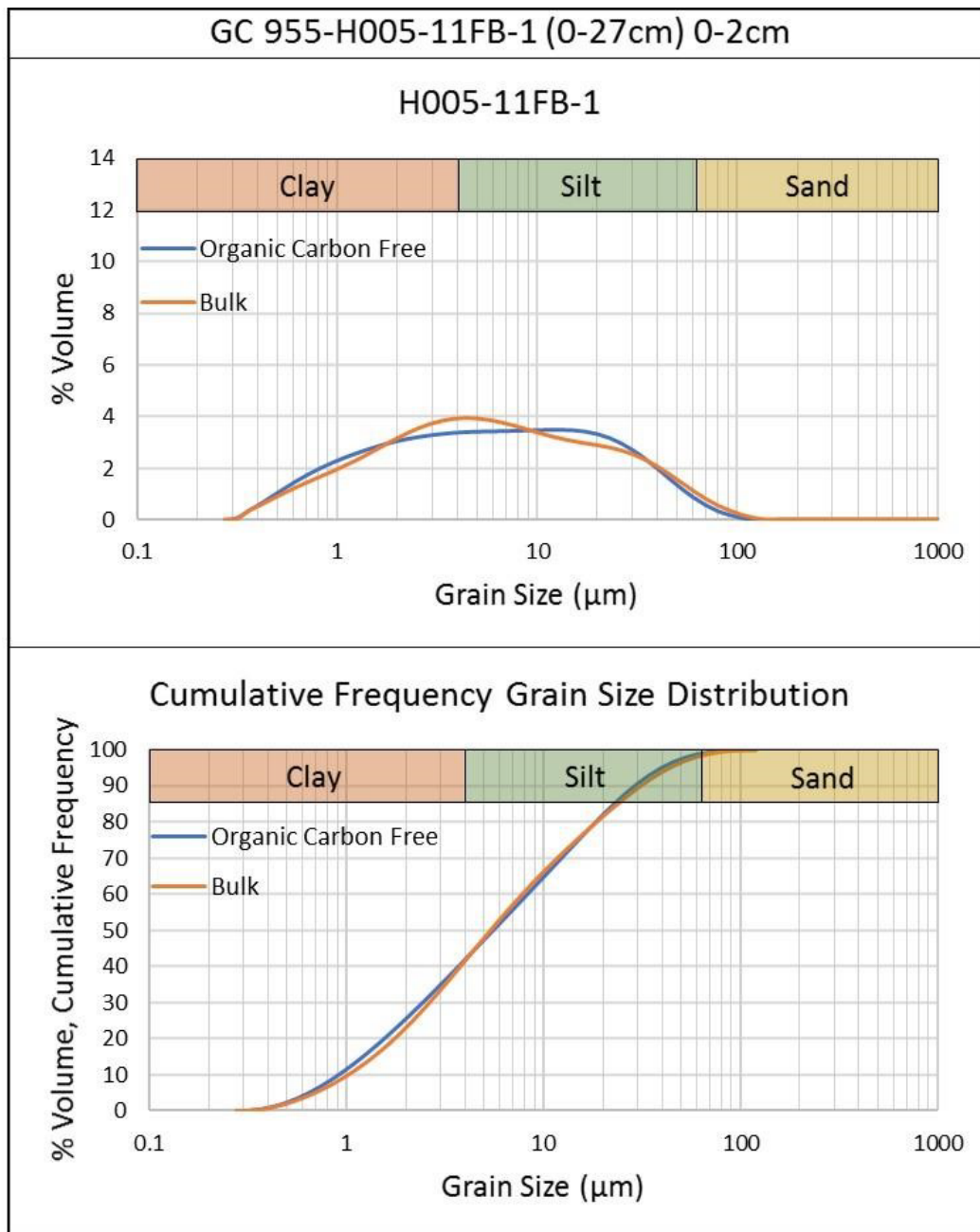


Figure 44: Grain size distribution and cumulative grain size distribution of GC 955-H005-11FB-1 (0-27cm) 0-2cm.

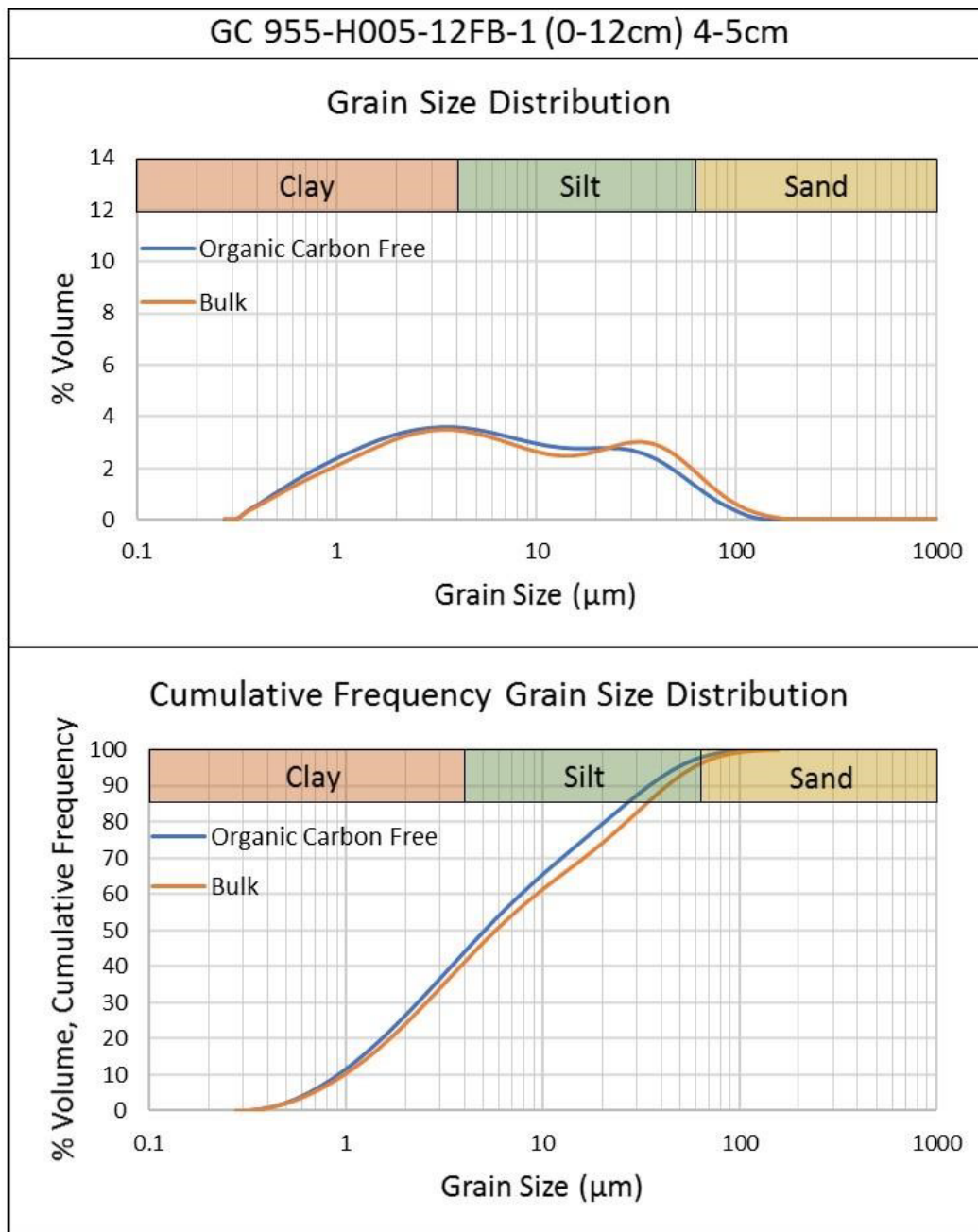


Figure 45: Grain size distribution and cumulative grain size distribution of GC 955-H005-12FB-1 (0-12cm) 4-5cm.

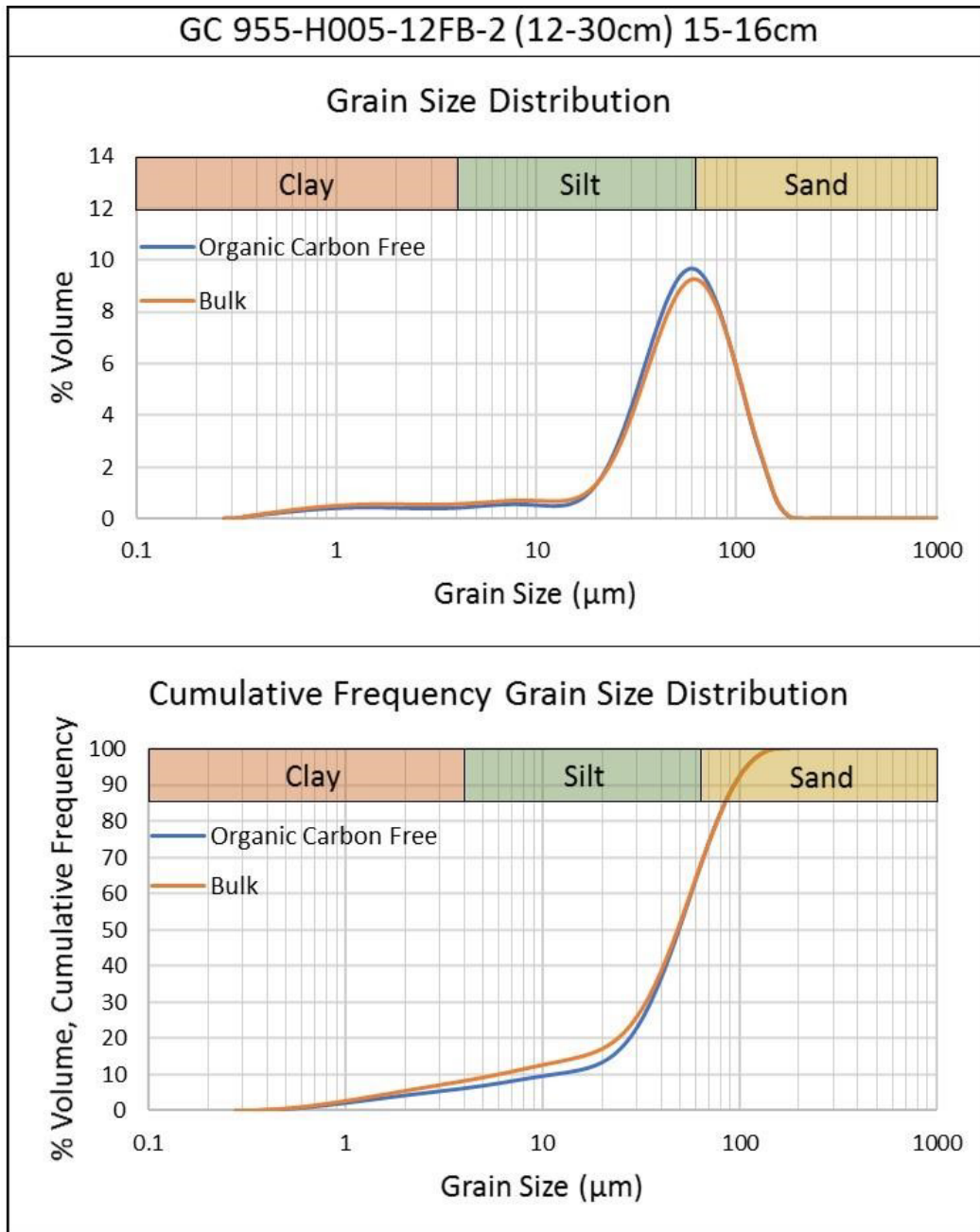


Figure 46: Grain size distribution and cumulative grain size distribution of GC 955-H005-12FB-2 (12-30cm) 15-16cm.

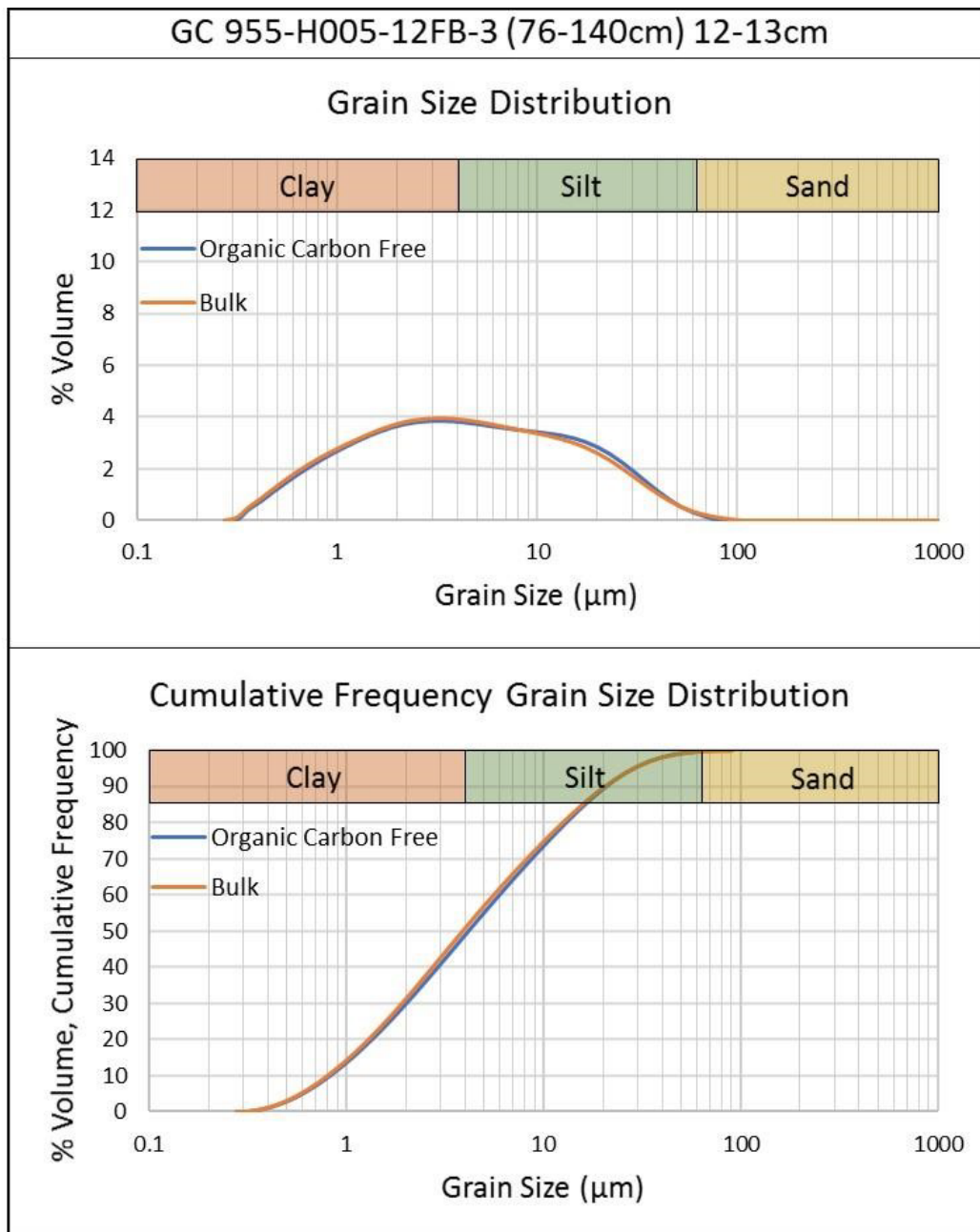


Figure 47: Grain size distribution and cumulative grain size distribution of GC 955-H005-12FB-3 (76-140cm) 12-13cm.

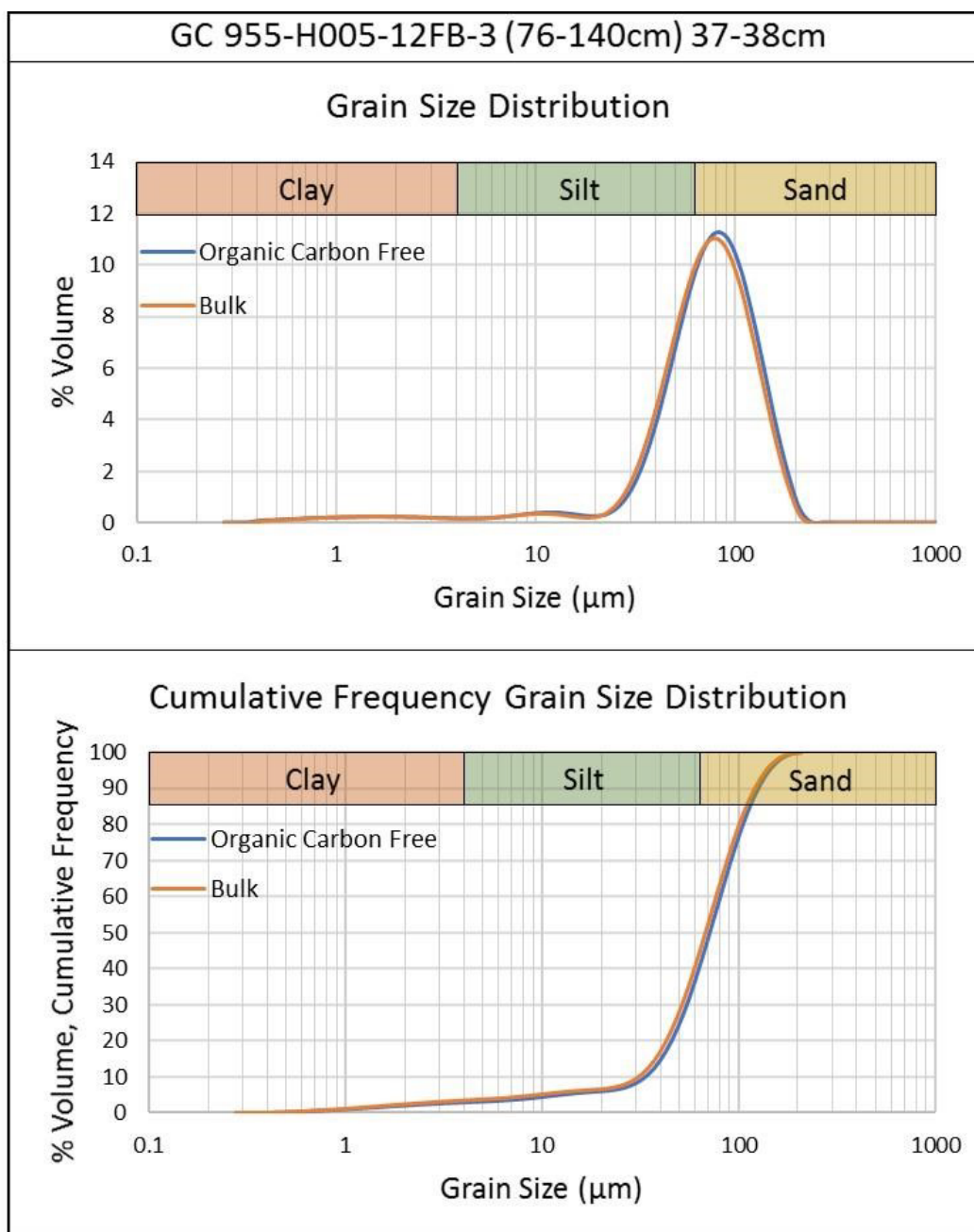


Figure 48: Grain size distribution and cumulative grain size distribution of GC 955-H005-12FB-3 (76-140cm) 37-38cm.

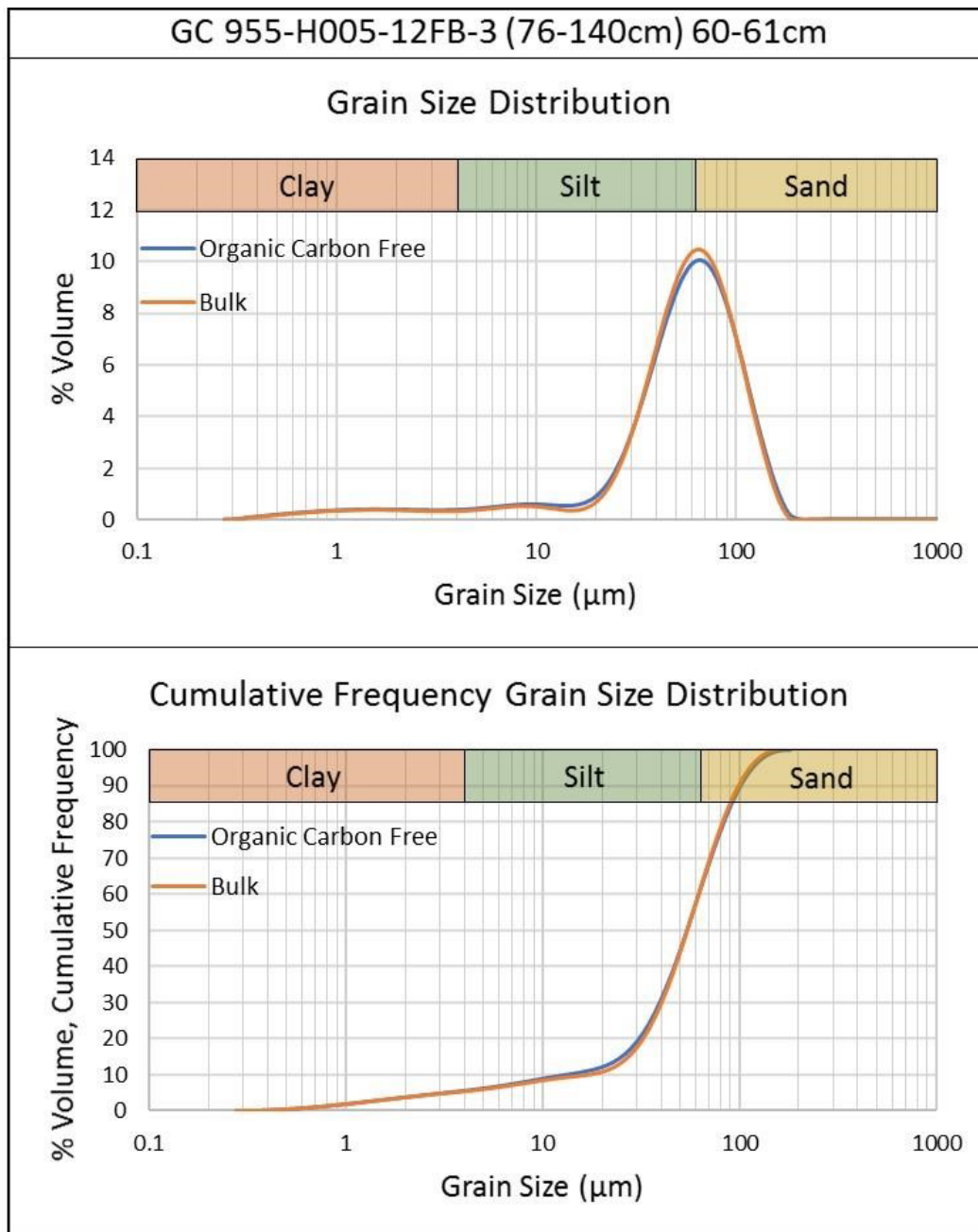


Figure 49: Grain size distribution and cumulative grain size distribution of GC 955-H005-12FB-3 (76-140cm) 60-61cm.

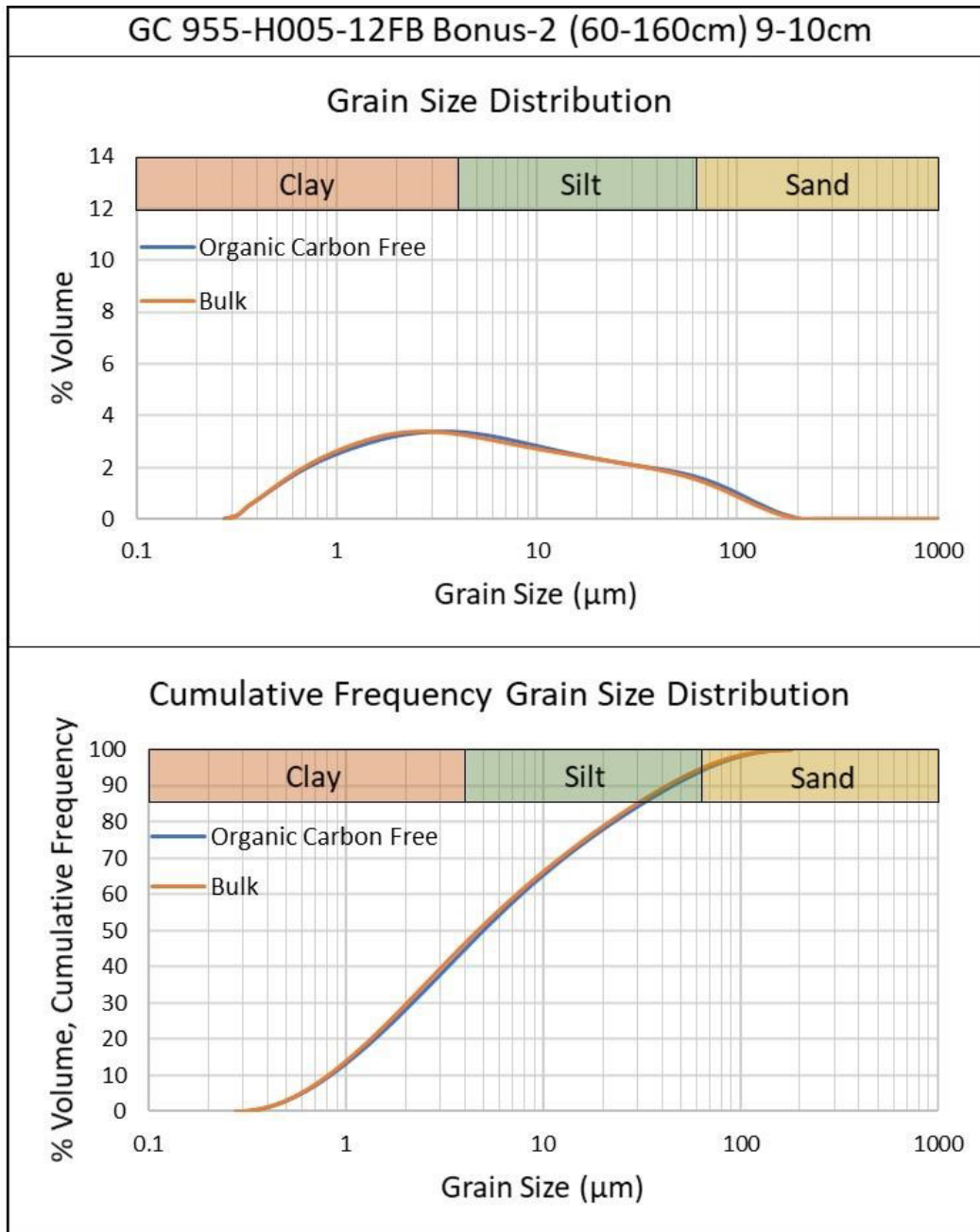


Figure 50: Grain size distribution and cumulative grain size distribution of GC 955-H005-12FB Bonus-2 (60-160cm) 9-10cm.

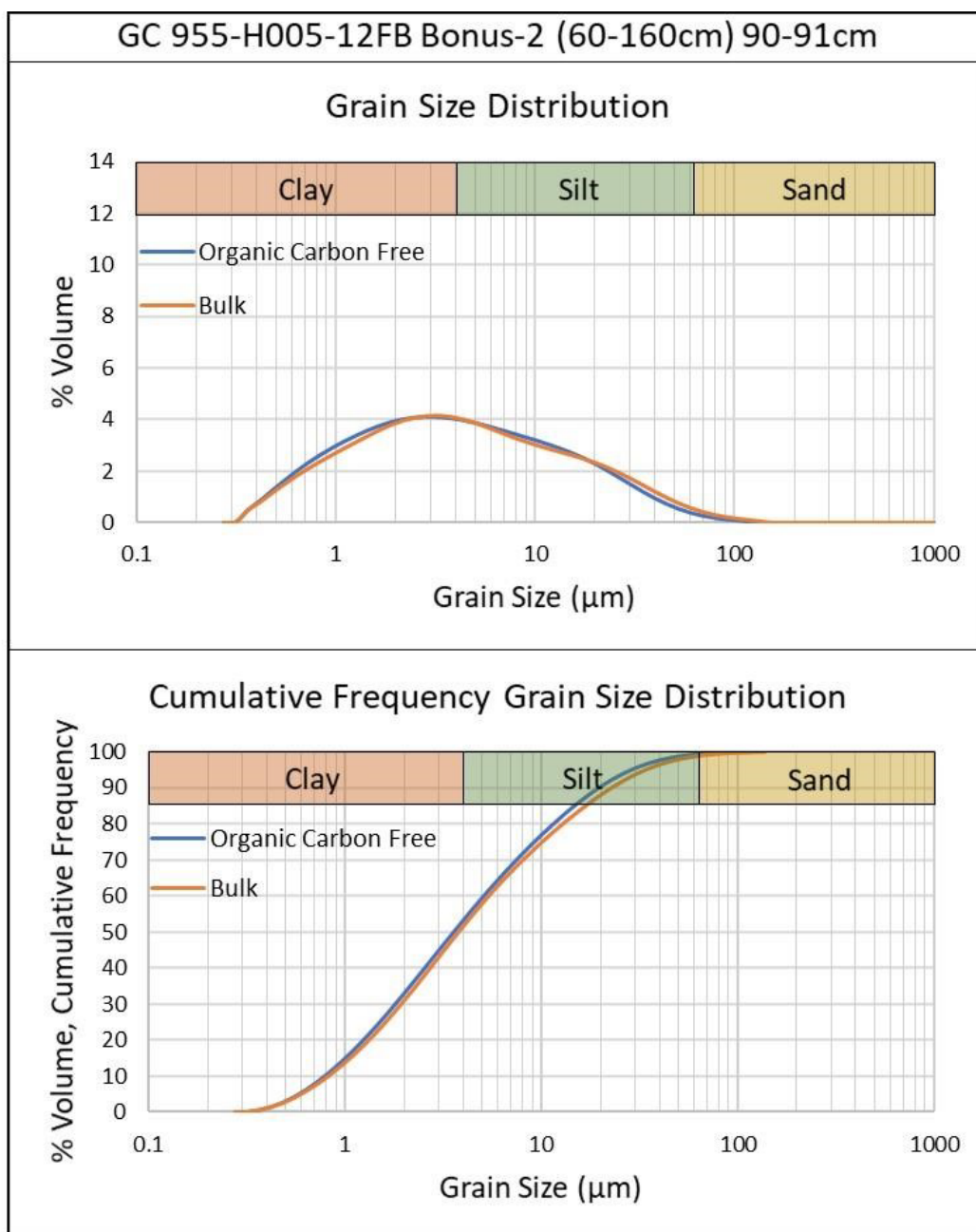


Figure 51: Grain size distribution and cumulative grain size distribution of GC 955-H005-12FB Bonus-2 (60-160cm) 90-91cm.

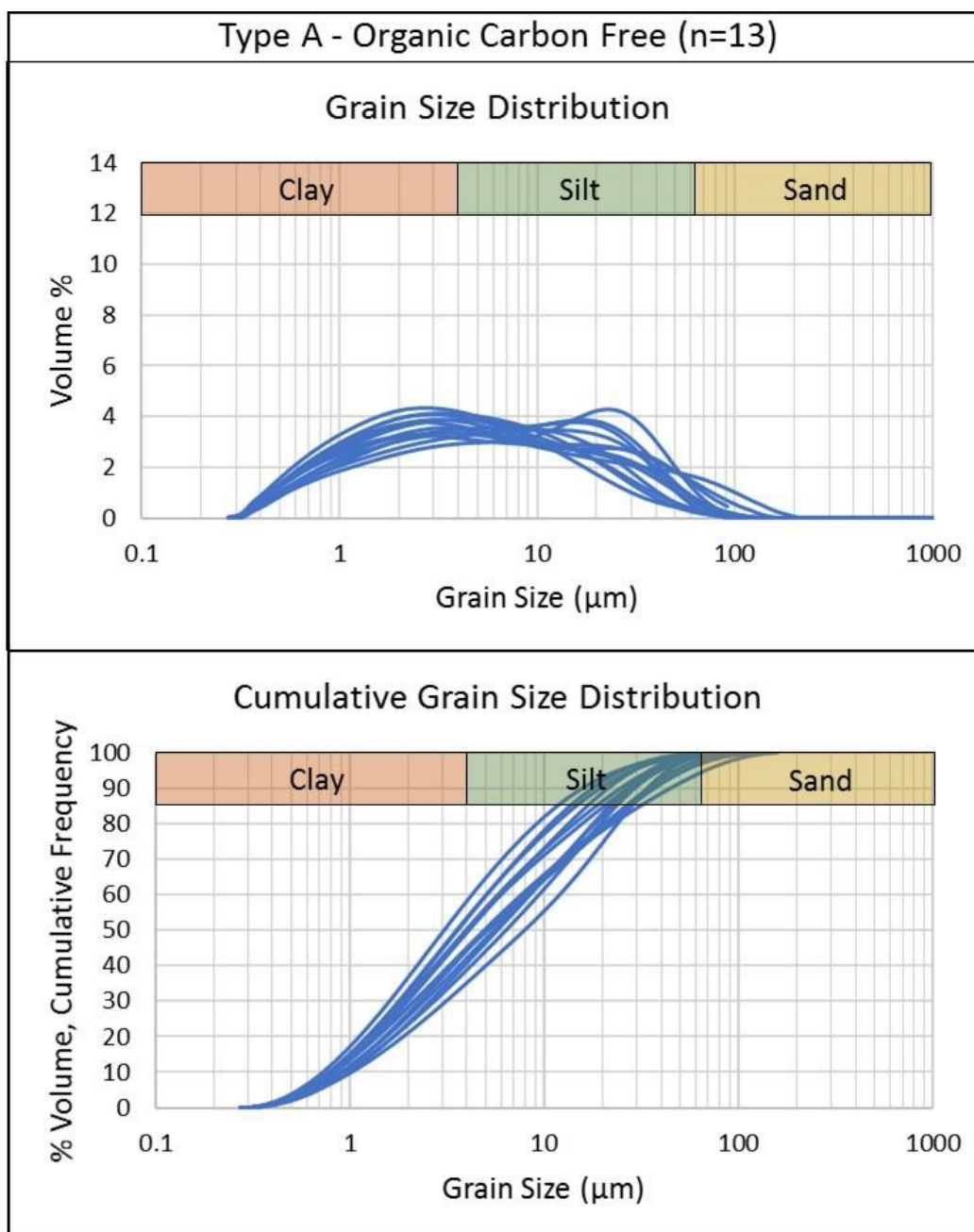


Figure 52: Grain size distribution and cumulative grain size distribution of all organic carbon free Type A graphs (replicate measurements not included).

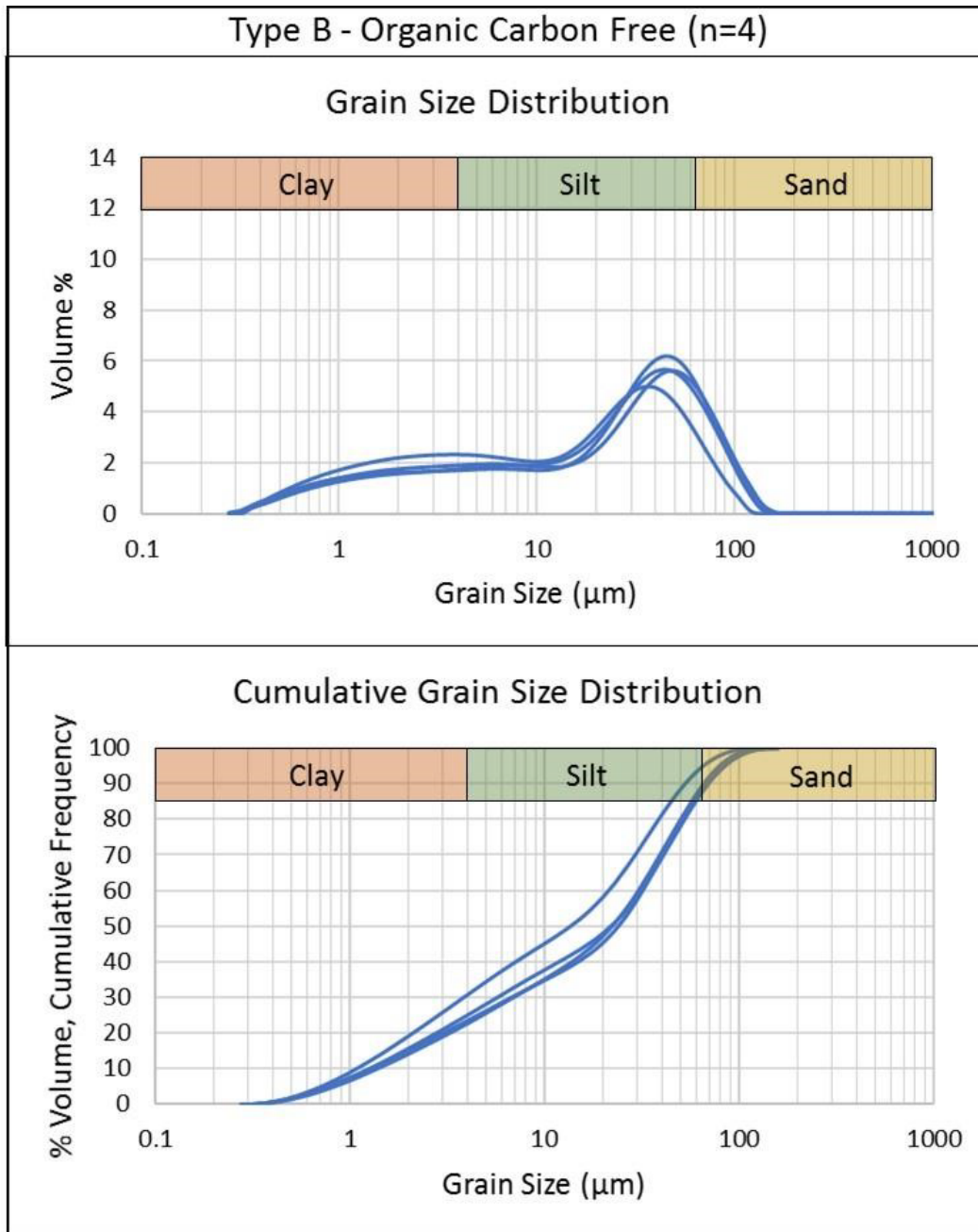


Figure 53: Grain size distribution and cumulative grain size distribution of all organic carbon free Type B graphs (replicate measurements not included).

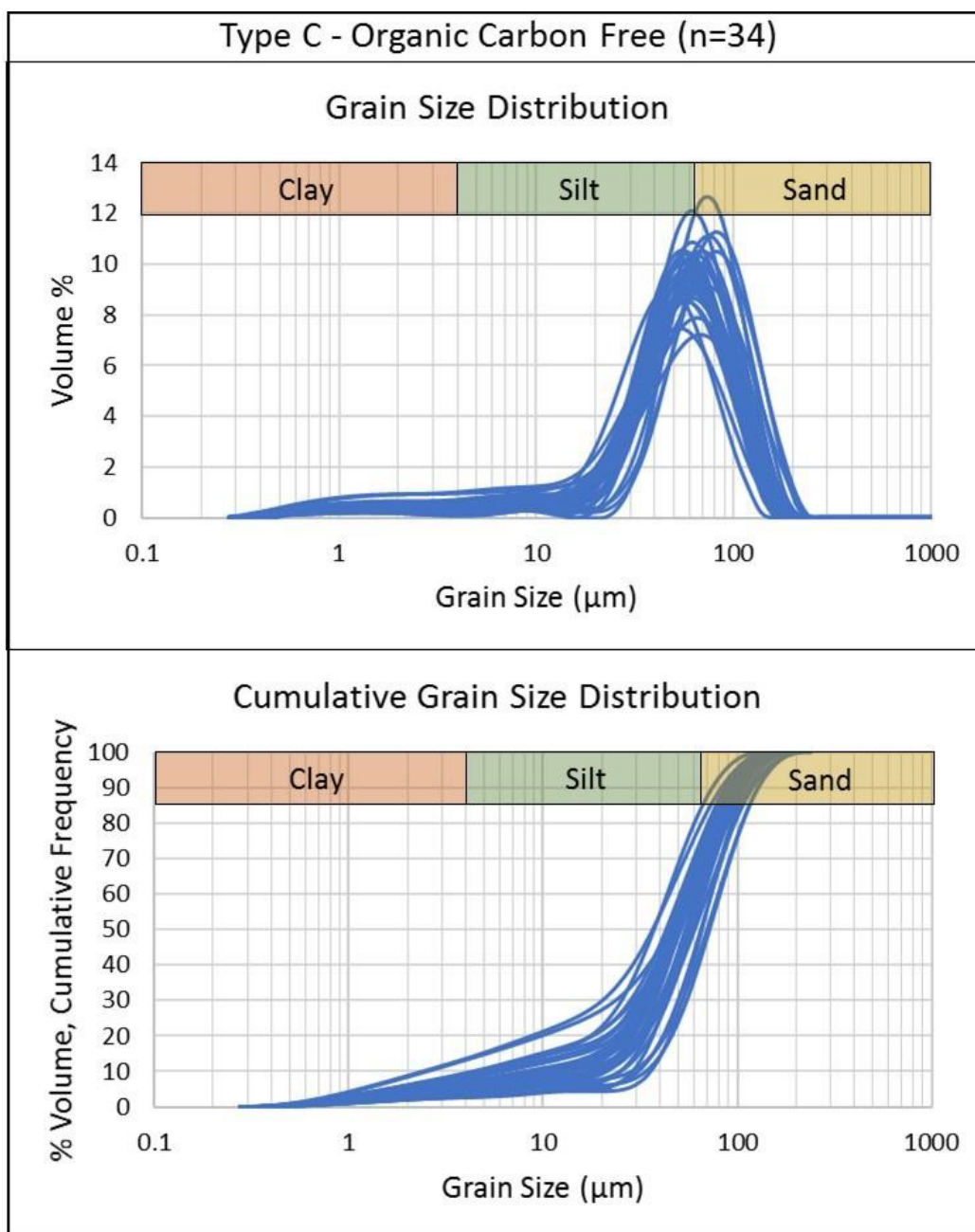


Figure 54: Grain size distribution and cumulative grain size distribution of all organic carbon free Type C graphs (replicate measurements not included).

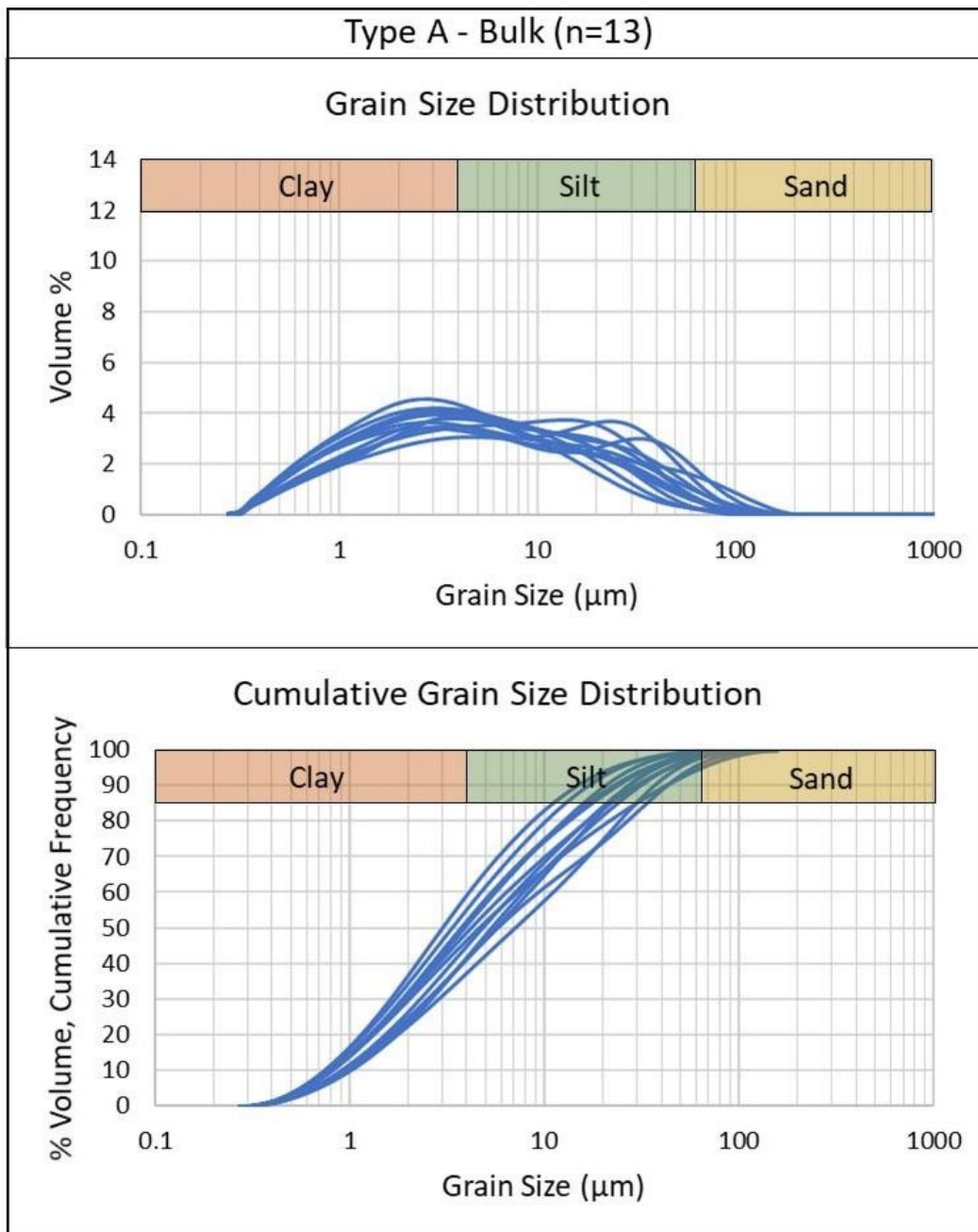


Figure 55: Grain size distribution and cumulative grain size distribution of all bulk Type A graphs (replicate measurements not included).

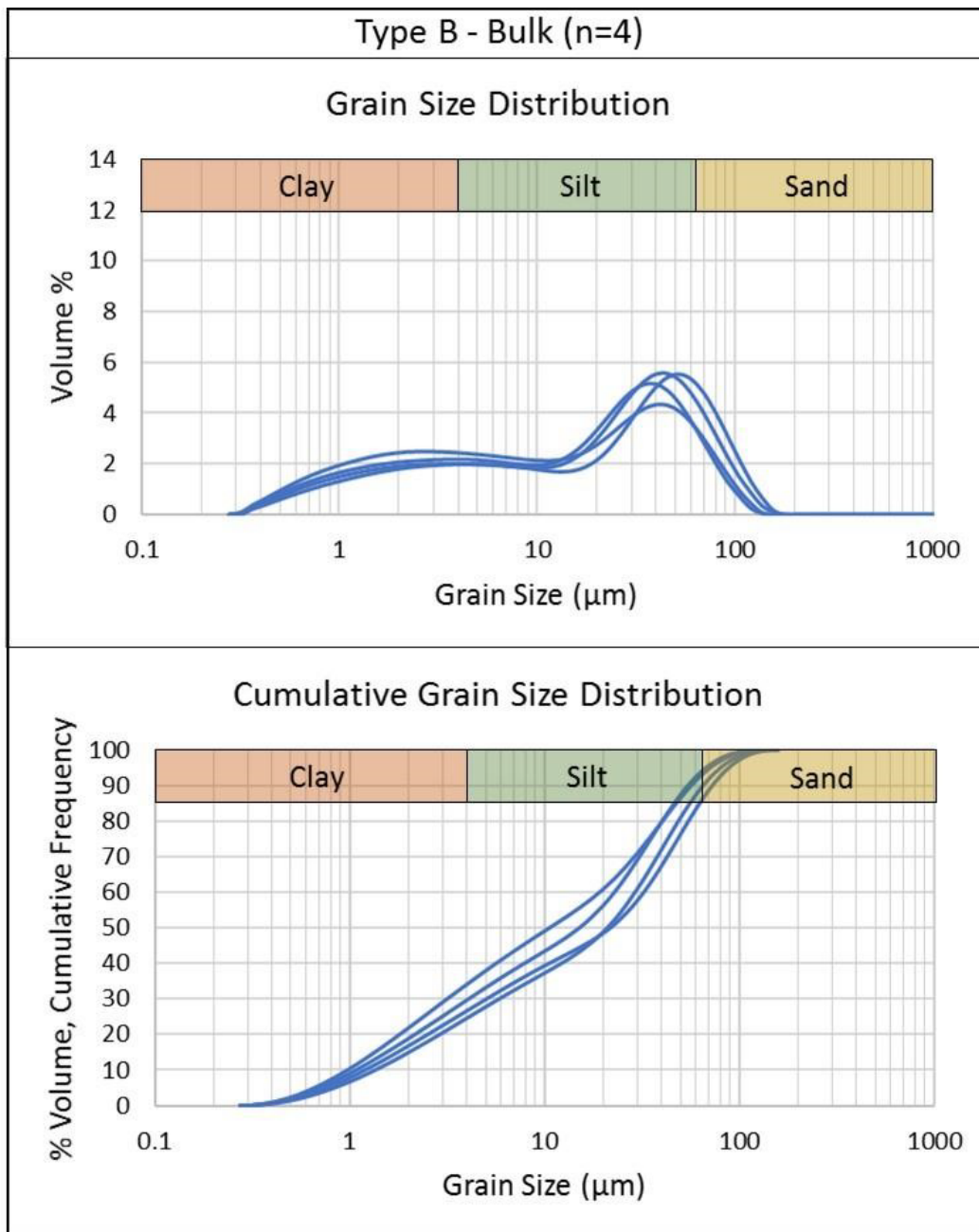


Figure 56: Grain size distribution and cumulative grain size distribution of all bulk Type B graphs (replicate measurements not included).

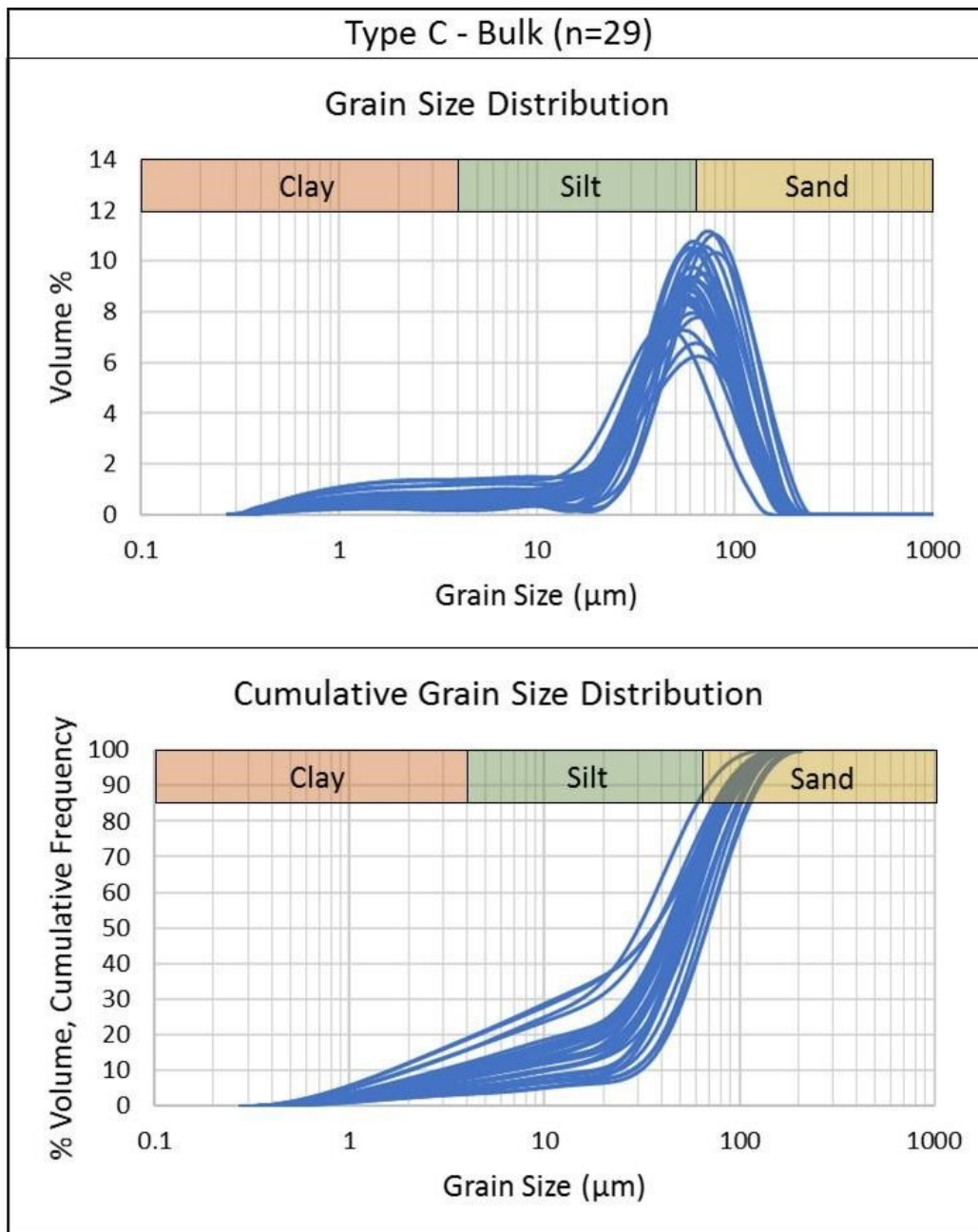


Figure 57: Grain size distribution and cumulative grain size distribution of all bulk Type C graphs (replicate measurements not included).

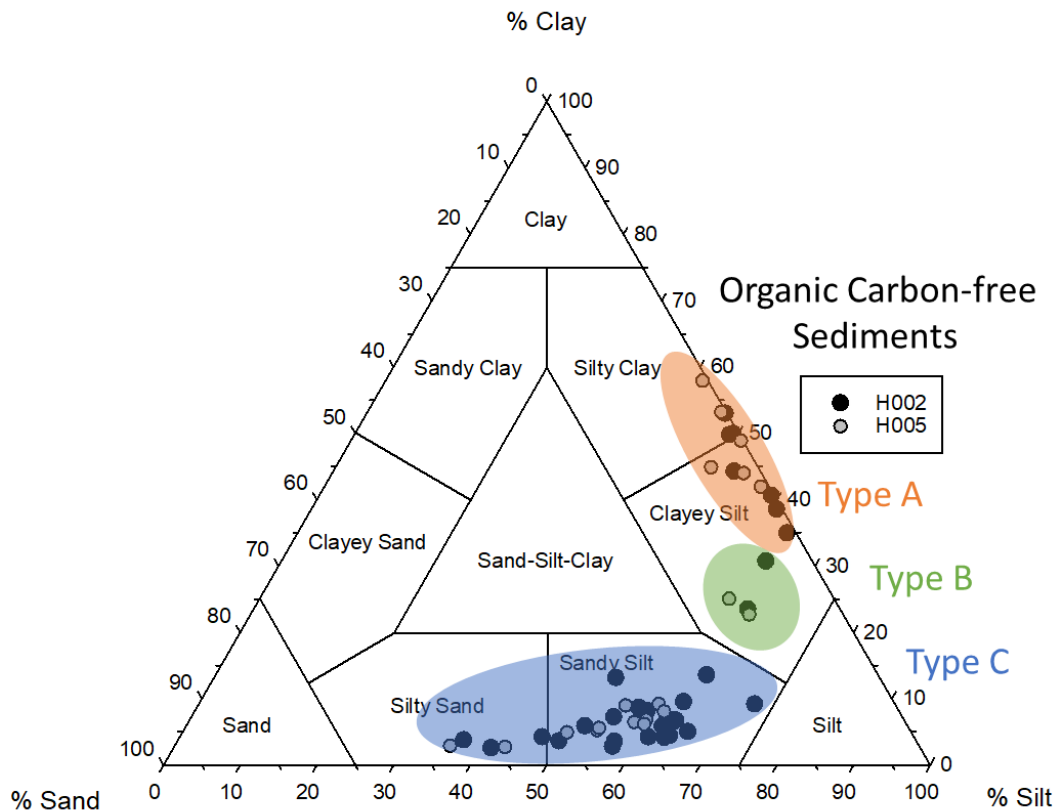


Figure 58: Ternary diagram for siliciclastic textural classification. Sand, silt, and clay percentages for the organic carbon-free sediment samples shown here were calculated by binning the output data using the Wentworth Grain Size scale (Wentworth, 1922), where sand is $> 62.5 \mu\text{m}$, clay is $< 3.9 \mu\text{m}$, and silt is between 62.5 and $3.9 \mu\text{m}$. Sample details and % sand, silt, and clay for each data point are shown in Table 1.

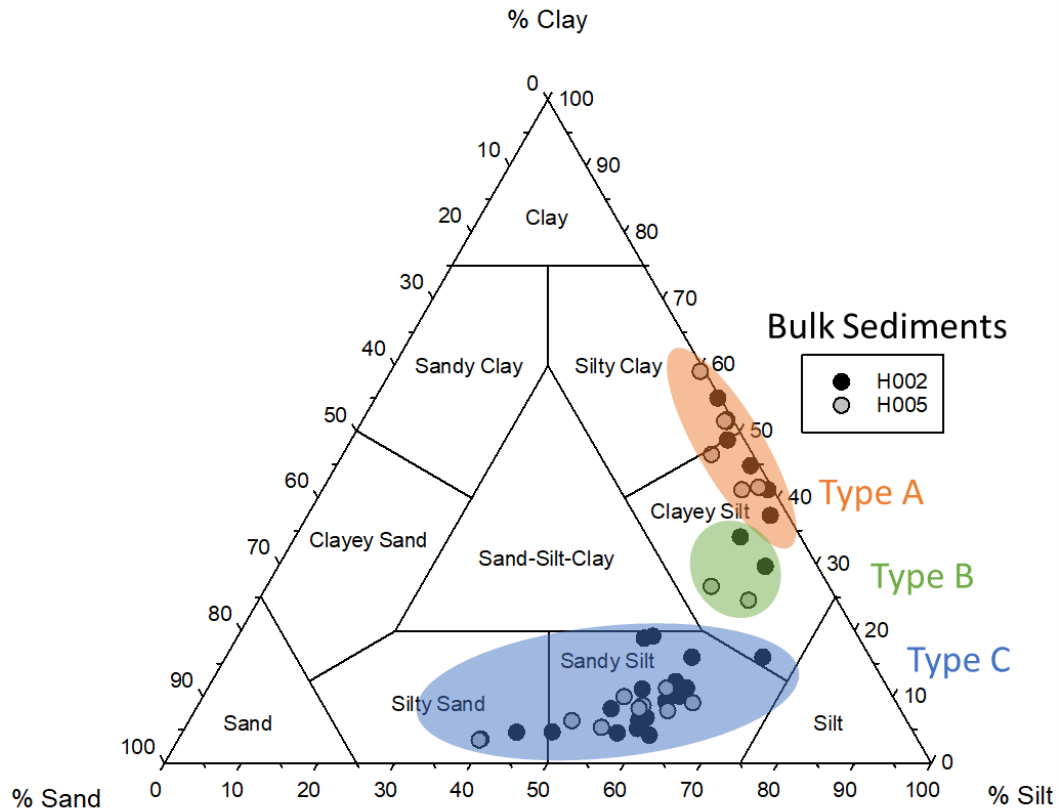


Figure 59: Ternary diagram for siliciclastic textural classification. Sand, silt, and clay percentages for the bulk sediment samples shown here were calculated by binning the output data using the Wentworth Grain Size scale (Wentworth, 1922), where sand is $> 62.5 \mu\text{m}$, clay is $< 3.9 \mu\text{m}$, and silt is between 62.5 and $3.9 \mu\text{m}$. Sample details and % sand, silt, and clay for each data point are shown in Table 2.

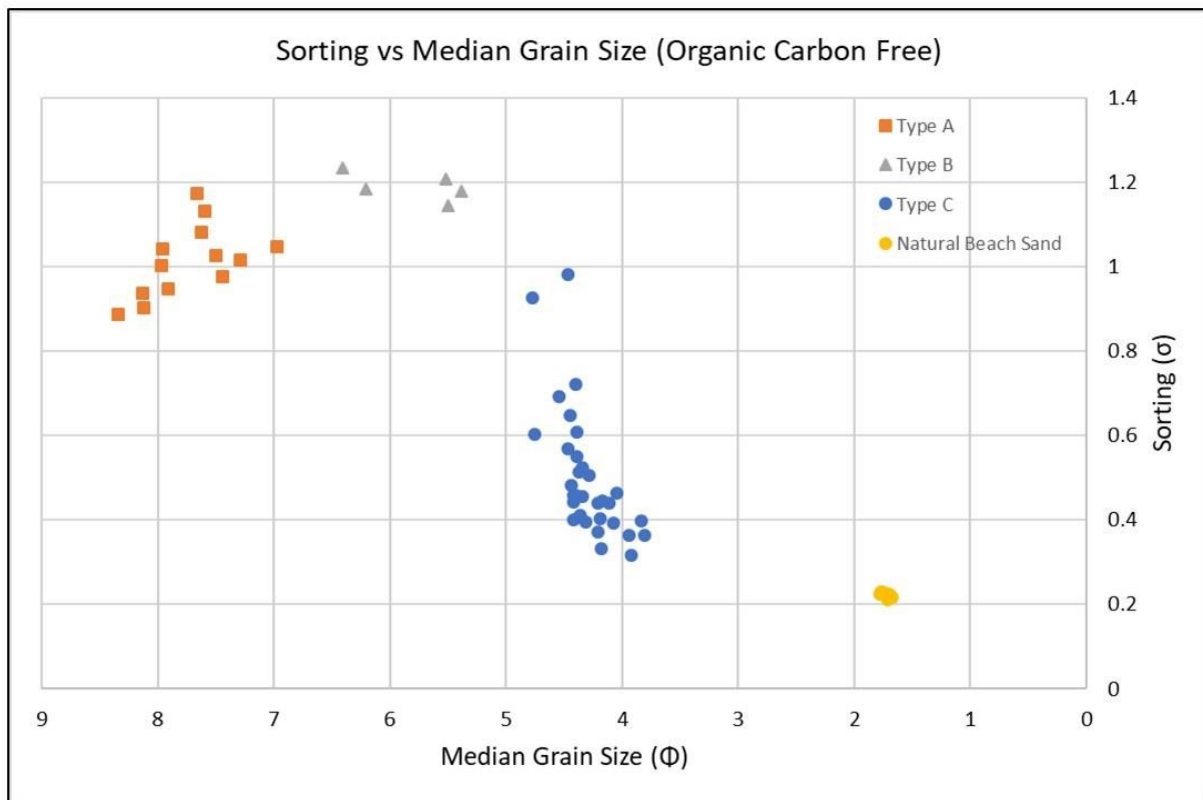


Figure 60: Sorting of all samples plotted against their median grain sizes in Phi units. Smaller sorting values equate to better sorting while smaller Phi values equate to larger grain sizes. The UNH lab standard Wallis Sand, a natural beach sand, is also shown for reference. Sorting was calculated by the Folk and Ward (1957) sorting equation:

$$\sigma = \frac{\Phi_{84} - \Phi_{16}}{4} + \frac{\Phi_{95} - \Phi_5}{6.6}$$

8. Tables

Table 1. % Sand, Silt, and Clay for the organic carbon-free samples using the Wentworth Grain Size Scale (Wentworth, 1922). These data are plotted in Figure 58.

Core ID	Section Interval	Sample Interval	mbsf	% Clay <3.9 μm	% Silt 3.9- 62.5 μm	% Sand >62.5 μm	Type
GC 955-H002-1CS-1	35-79cm	11-12cm	409.81	23.53	64.43	12.04	B
GC 955-H002-1CS-1	35-79cm	24-25cm	409.94	44.29	52.27	3.44	A
GC 955-H002-1CS-1	35-79cm	38-39cm	410.08	2.63	41.40	55.97	C
GC 955-H002-2CS-1	0-45cm	Whole Section Bagged	412.62	13.18	52.40	34.42	C
GC 955-H002-2CS-2	45-91cm	16-17cm	413.45	5.31	62.72	31.97	C
GC 955-H002-2CS-2	45-91cm	37-38cm	413.66	3.64	49.76	46.60	C
GC 955-H002-2CS-3	125-225cm	59-60cm	415.48	53.03	46.73	0.24	A
GC 955-H002-2CS-3	125-225cm	96-97cm	415.85	3.57	57.03	39.40	C
GC 955-H002-2CS-4	225-317cm	47-48cm	417.36	6.78	63.43	29.79	C
GC 955-H002-2CS-4	225-317cm	68-69cm	417.57	9.21	72.49	18.30	C
GC 955-H002-2CS-4	225-317cm	75-76cm	417.64	49.80	48.94	1.26	A
GC 955-H002-2CS-4	225-317cm	85-86cm	417.74	3.80	37.23	58.97	C
GC 955-H002-3CS-1	0-27cm	13-14cm	415.57	4.16	63.23	32.61	C
GC 955-H002-4CS-1	0-26.8cm	Whole Section Bagged	418.63	9.55	63.06	27.39	C
GC 955-H002-4CS-3	129.5-139cm	Whole Section Bagged	419.83	7.26	55.10	37.64	C
GC 955-H002-5CS-1	0-95cm	30-31cm	421.84	6.53	63.16	30.31	C
GC 955-H002-5CS-1	0-95cm	75-76cm	422.29	34.97	63.83	1.20	A
GC 955-H002-6CS-1	0-19cm	10-11cm	424.69	4.24	61.12	34.64	C

GC 955-H002-6CS-2	19-119	Whole Section Bagged	425.47	8.18	59.01	32.81	C
GC 955-H002-6CS-3	119-219cm	Whole Section Bagged	427.47	6.77	62.80	30.43	C
GC 955-H002-6CS-4	219-282cm	16-17cm	429.13	5.88	62.11	32.01	C
GC 955-H002-6CS-5	319-385cm	8-9cm	431.05	30.72	63.20	6.08	B
GC 955-H002-6CS-5	385cm	13cm	431.10	4.26	47.26	48.48	C
GC 955-H002-7CS-1	6-72cm	Whole Section Bagged	428.02	8.67	57.64	33.69	C
GC 955-H002-8CS-2	57-157cm	57-58cm	432.39	40.64	58.95	0.41	A
GC 955-H002-8CS-2	57-157cm	Partial Section Bagged ¹	432.32	5.91	51.99	42.10	C
GC 955-H002-8CS-3	157-235cm	Whole Section Bagged	434.21	10.21	64.47	25.32	C
GC 955-H002-8CS-4	272-315cm	5-6cm	435.80	38.59	60.65	0.76	A
GC 955-H002-8CS-4	272-315cm	33-34cm	436.08	4.46	63.76	31.78	C
GC 955-H002-8CS-5	315-352cm	12.5-13.5cm	437.11	5.05	65.85	29.10	C
GC 955-H002-8CS-5	315-352cm	27-28cm	437.25	49.97	49.28	0.75	A
GC 955-H002-8CS-5	315-352cm	32.5-33.5cm	437.31	2.82	57.15	40.03	C
GC 955-H005-1FB-3	163-184cm	19-21cm	284.28	57.94	41.34	0.72	A
GC 955-H005-3FB-2	115.2-132.7cm	Whole Section Bagged	419.73	22.70	65.05	12.25	B
GC 955-H005-4FB-5	65-82.5cm	Whole Section Bagged	422.28	25.04	61.25	13.71	B
GC 955-H005-4FB-7	190.9-202.9cm	Whole Section Bagged	423.51	6.47	58.18	35.35	C
GC 955-H005-6FB-2	78.9-197.5cm	43-44.5cm	428.91	2.72	43.16	54.12	C
GC 955-H005-6FB-2	78.9-197.5cm	103.5-113.5cm	429.51	9.16	60.02	30.82	C

GC 955-H005-7FB-1	0-18.6cm	Whole Section Bagged	430.78	4.93	50.17	44.90	C
GC 955-H005-9FB-1	0-18cm	15-16cm	436.93	8.06	61.26	30.68	C
GC 955-H005-9FB-2	53-138cm	34-35cm	437.83	5.24	53.93	40.83	C
GC 955-H005-9FB-4	282-317cm	Whole Section Bagged	439.36	6.82	59.54	33.64	C
GC 955-H005-10FB-2	0-32cm	Whole Section Bagged	439.99	8.98	55.76	35.26	C
GC 955-H005-11FB-1	0-27cm	0-2cm	441.49	41.92	56.95	1.13	A
GC 955-H005-12FB-1	0-12cm	4-5cm	444.40	43.99	53.68	2.33	A
GC 955-H005-12FB-2	12-30cm	15-16cm	444.79	6.16	59.59	34.25	C
GC 955-H005-12FB-3	76-140cm	12-13cm	446.04	48.87	50.87	0.26	A
GC 955-H005-12FB-3	76-140cm	37-38	446.29	2.90	35.92	61.18	C
GC 955-H005-12FB-3	76-140cm	60-61	445.16	5.58	54.00	40.42	C
GC 955-H005-12FB Bonus-2*	60-160cm	9-10cm	–	44.86	49.01	6.13	A
GC 955-H005-12FB Bonus-2*	60-160cm	90-91cm	–	53.22	46.15	0.63	A

Note: For "whole section bagged" intervals, samples for grain size analysis were taken carefully from intact strata within the bag, however their exact depth within the sections remains unknown.

* This sample was collected from a core section of sediment that resulted from additional material that flowed in through the bottom of the coring tool and was lodged between the liner and the rabbit (see Flemings et al., 2018).

¹ This sample was collected from a bagged sample from the lower interval in the core (62-100 cm).

Table 2. % Sand, Silt, and Clay for the bulk samples using the Wentworth Grain Size Scale (Wentworth, 1922). These data are plotted in Figure 59.

Core ID	Section Interval	Sample Interval	mbsf	% Clay	% Silt	% Sand	Type
GC 955-H002-1CS-1	35-79cm	11-12cm	409.81	34.05	58.08	7.87	B

GC 955-H002-1CS-1	35-79cm	24-25cm	409.94	48.67	49.10	2.23	A
GC 955-H002-1CS-1	35-79cm	38-39cm	410.08	4.64	46.62	51.74	C
GC 955-H002-2CS-1	0-45cm	Whole Section Bagged	412.62	18.80	53.18	28.02	C
GC 955-H002-2CS-2	45-91cm	16-17cm	413.45	10.67	61.08	28.25	C
GC 955-H002-2CS-2	45-91cm	37-38cm	413.66	4.68	48.23	47.09	C
GC 955-H002-2CS-3	125-225cm	59-60cm	415.48	55.01	44.66	0.33	A
GC 955-H002-2CS-3	125-225cm	96-97cm	415.85	6.46	58.62	34.92	C
GC 955-H002-2CS-4	225-317cm	47-48cm	417.36	12.25	60.54	27.21	C
GC 955-H002-2CS-4	225-317cm	68-69cm	417.57	15.94	70.06	14.00	C
GC 955-H002-2CS-4	225-317cm	75-76cm	417.64	51.46	47.55	0.99	A
GC 955-H002-2CS-4	225-317cm	85-86cm	417.74	3.56	39.48	56.96	C
GC 955-H002-3CS-1	0-27cm	13-14cm	415.57	4.20	61.13	34.67	C
GC 955-H002-4CS-1	0-26.8cm	Whole Section Bagged	418.63	11.30	62.44	26.26	C
GC 955-H002-4CS-3	129.5-139cm	Whole Section Bagged	419.83	8.17	54.17	37.66	C
GC 955-H002-5CS-1	0-95cm	30-31cm	421.84	9.29	60.73	29.98	C
GC 955-H002-5CS-1	0-95cm	75-76cm	422.29	37.29	60.37	2.34	A
GC 955-H002-6CS-1	0-19cm	10-11cm	424.69	4.52	56.79	33.49	C
GC 955-H002-6CS-2	19-119	Whole Section Bagged	425.47	8.57	57.94	33.49	C
GC 955-H002-6CS-3	119-219cm	Whole Section Bagged	427.47	10.06	62.08	27.86	C
GC 955-H002-6CS-4	219-282cm	16-17cm	429.13	6.83	59.42	33.75	C
GC 955-H002-6CS-5	319-385cm	8-9cm	431.05	29.62	63.55	6.83	B
GC 955-H002-7CS-1	6-72cm	Whole Section Bagged	428.02	11.12	56.76	32.12	C
GC 955-H002-8CS-2	57-157cm	57-58cm	432.39	44.80	54.04	1.16	A

GC 955-H002-8CS-2	57-157cm	Partial Section Bagged ¹	432.32	19.08	54.15	26.77	C
GC 955-H002-8CS-3	157-235cm	Whole Section Bagged	434.21	15.93	60.83	23.24	C
GC 955-H002-8CS-4	272-315cm	5-6cm	435.80	41.16	58.12	0.72	A
GC 955-H002-8CS-4	272-315cm	33-34cm	436.08	5.19	59.07	35.74	C
GC 955-H002-8CS-5	315-352cm	27-28cm	437.25	51.74	47.47	0.79	A
GC 955-H005-1FB-3	163-184cm	19-21cm	284.28	59.03	40.36	0.61	A
GC 955-H005-3FB-2	115.2-132.7cm	Whole Section Bagged	419.73	24.52	63.91	11.57	B
GC 955-H005-4FB-5	65-82.5cm	Whole Section Bagged	422.28	26.59	58.02	15.39	B
GC 955-H005-4FB-7	190.9-202.9cm	Whole Section Bagged	423.51	8.65	58.10	33.25	C
GC 955-H005-6FB-2	78.9-197.5cm	103.5-113.5cm	429.51	11.26	59.85	28.89	C
GC 955-H005-7FB-1	0-18.6cm	Whole Section Bagged	430.78	6.37	49.95	43.68	C
GC 955-H005-9FB-1	0-18cm	15-16cm	436.93	9.06	64.36	26.58	C
GC 955-H005-9FB-4	282-317cm	Whole Section Bagged	439.36	7.88	61.69	30.43	C
GC 955-H005-10FB-2	0-32cm	Whole Section Bagged	439.99	9.99	54.93	35.08	C
GC 955-H005-11FB-1	0-27cm	0-2cm	441.49	41.54	56.70	1.76	A
GC 955-H005-12FB-1	0-12cm	4-5cm	444.40	41.17	54.72	4.11	A
GC 955-H005-12FB-2	12-30cm	15-16cm	444.79	8.21	57.79	34.00	C
GC 955-H005-12FB-3	76-140cm	12-13cm	446.04	59.03	40.36	0.61	A
GC 955-H005-12FB-3	76-140cm	37-38	446.29	3.46	39.31	57.23	C
GC 955-H005-12FB-3	76-140cm	60-61	445.16	5.38	54.30	40.32	C
GC 955-H005-12FB Bonus-2	60-160cm	9-10cm	–	46.48	48.09	5.43	A
GC 955-H005-12FB Bonus-2	60-160cm	90-91cm	–	51.56	47.28	1.16	A

Note: For "whole section bagged" intervals, samples for grain size analysis were taken carefully from intact strata within the bag, however their exact depth within the sections remains unknown.

* This sample was collected from a core section of sediment that resulted from additional material that flowed in through the bottom of the coring tool and was lodged between the liner and the rabbit (see Flemings et al., 2018).

¹ This sample was collected from a bagged sample from the lower interval in the core (62-100 cm).

9. Appendix 1

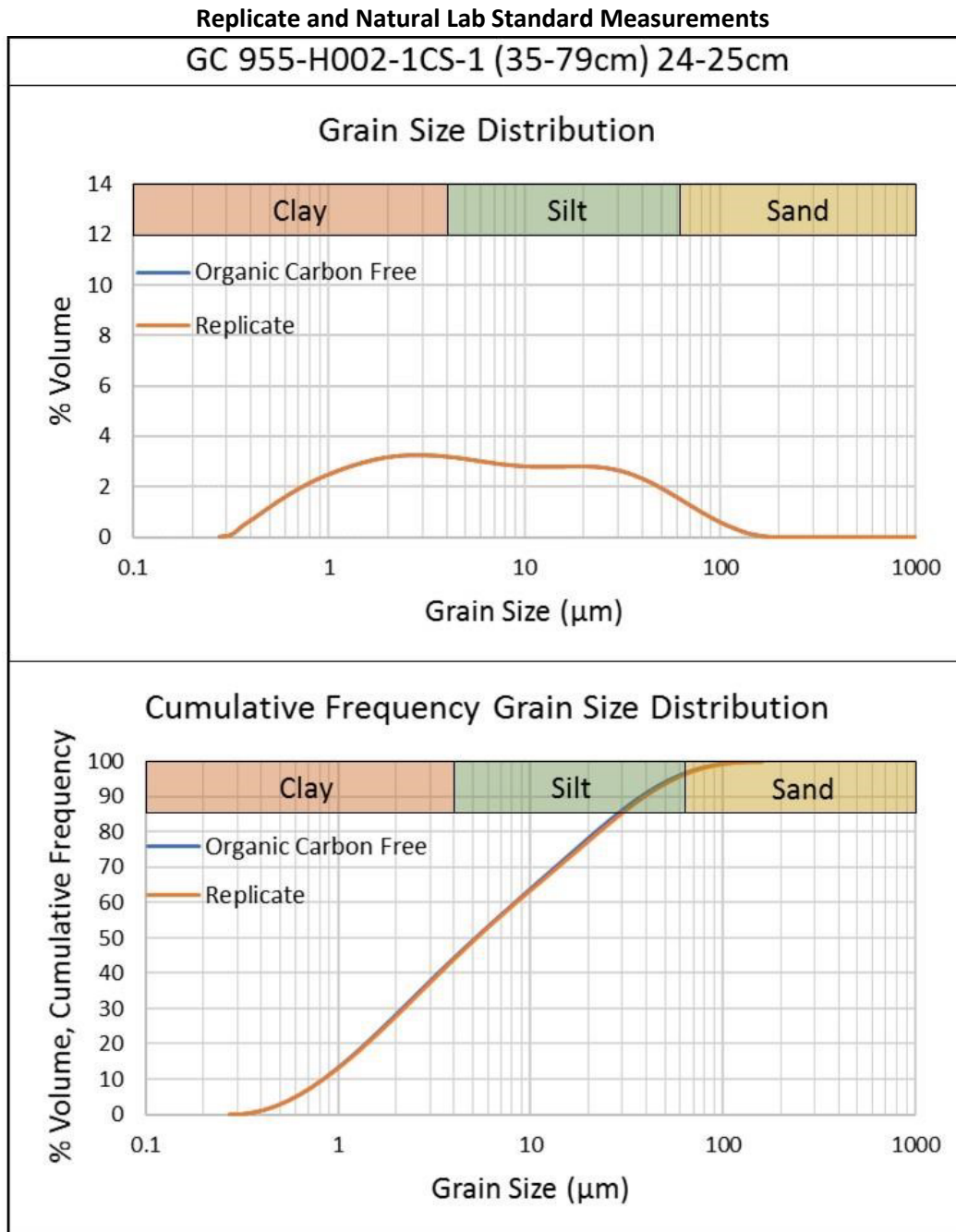


Figure A.1: Replicate Grain size distribution and cumulative grain size distribution of GC 955-H002-1CS-1 (35-79cm) 24-25cm.

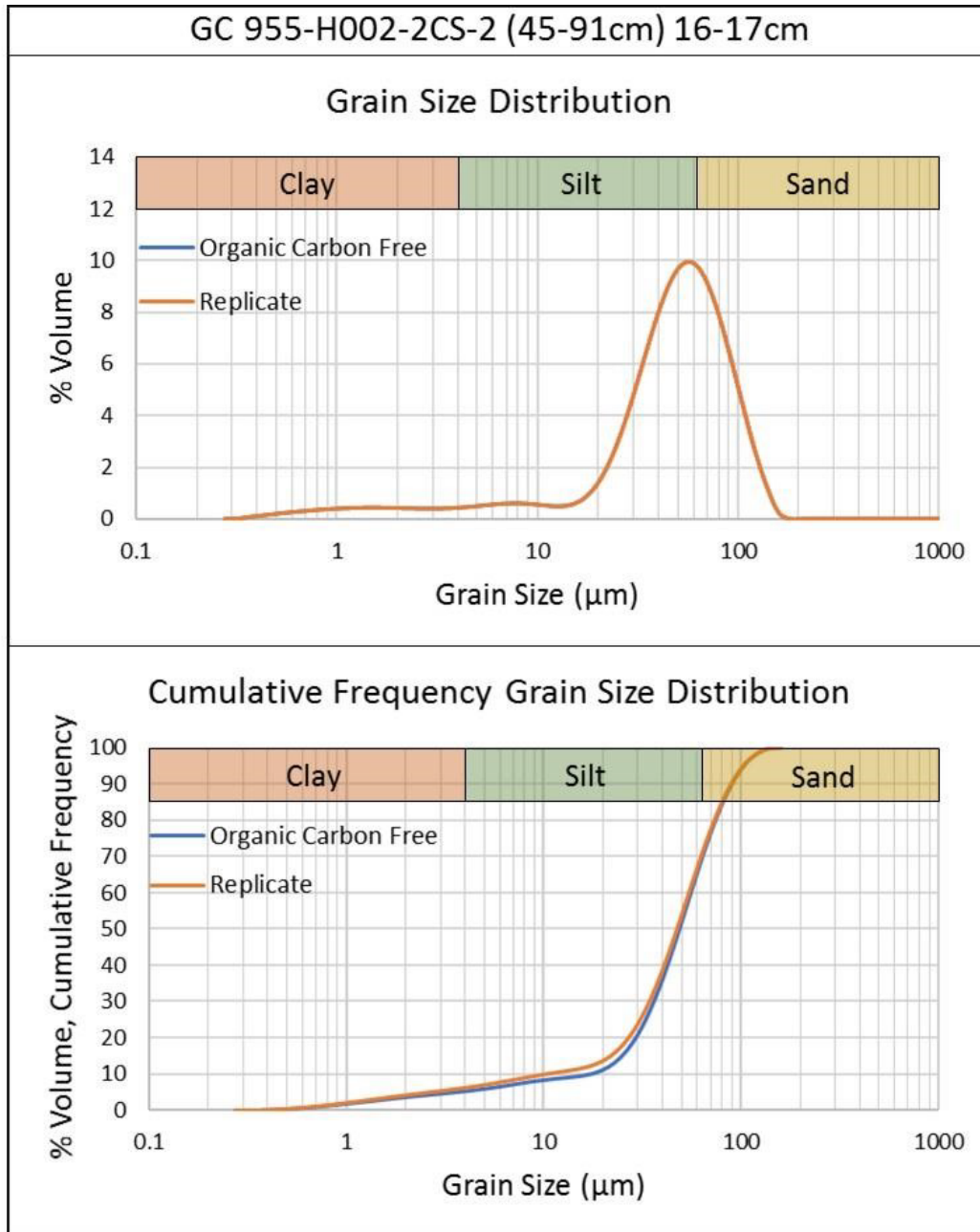


Figure A.2: Replicate Grain size distribution and cumulative grain size distribution of GC 955-H002-2CS-2 (45-91cm) 16-17cm.

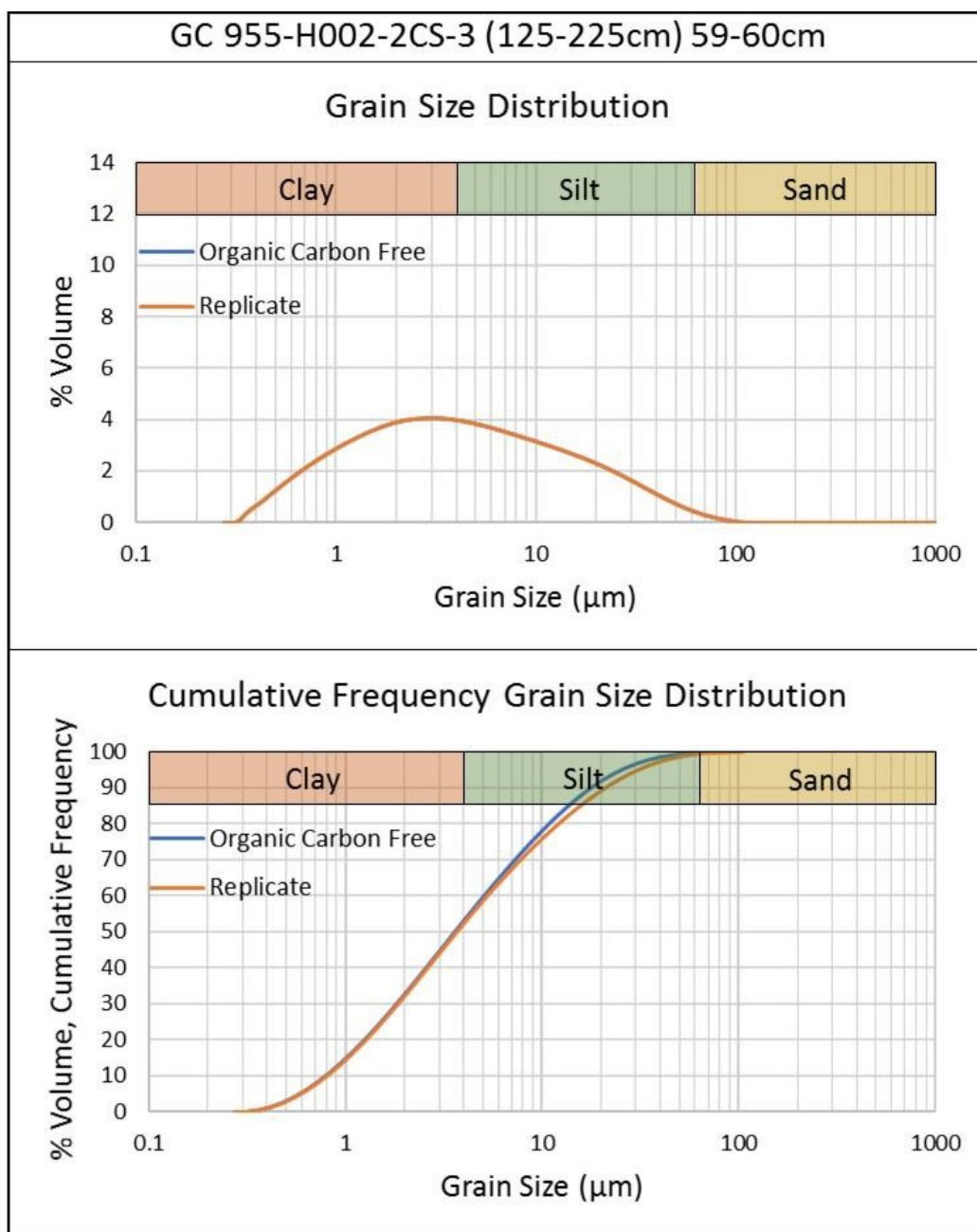


Figure A.3: Replicate Grain size distribution and cumulative grain size distribution of GC 955-H002-2CS-3 (125-225cm) 59-60cm.

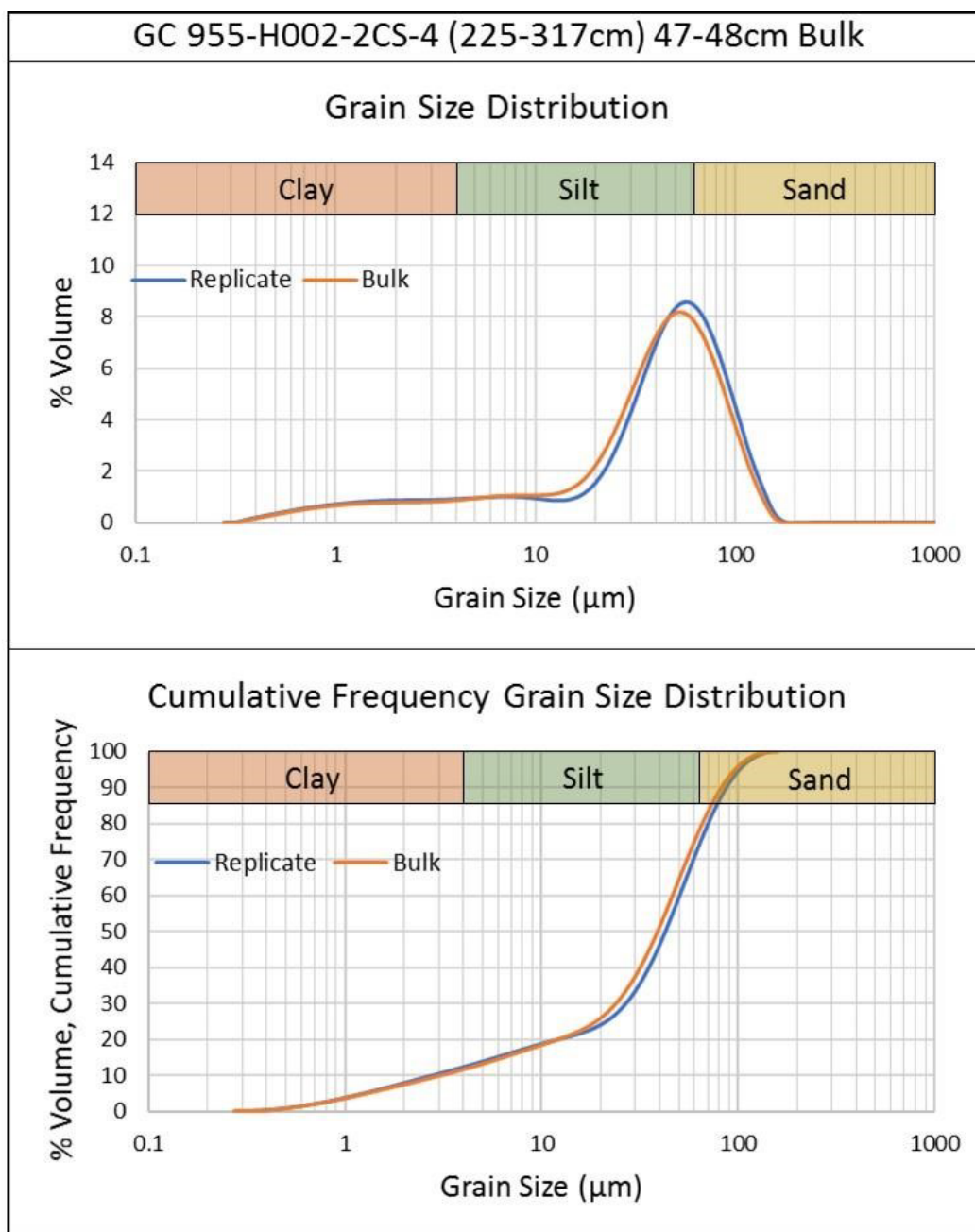


Figure A.4: Replicate Grain size distribution and cumulative grain size distribution of GC 955-H002-2CS-4 (225-317cm) 47-48cm Bulk.

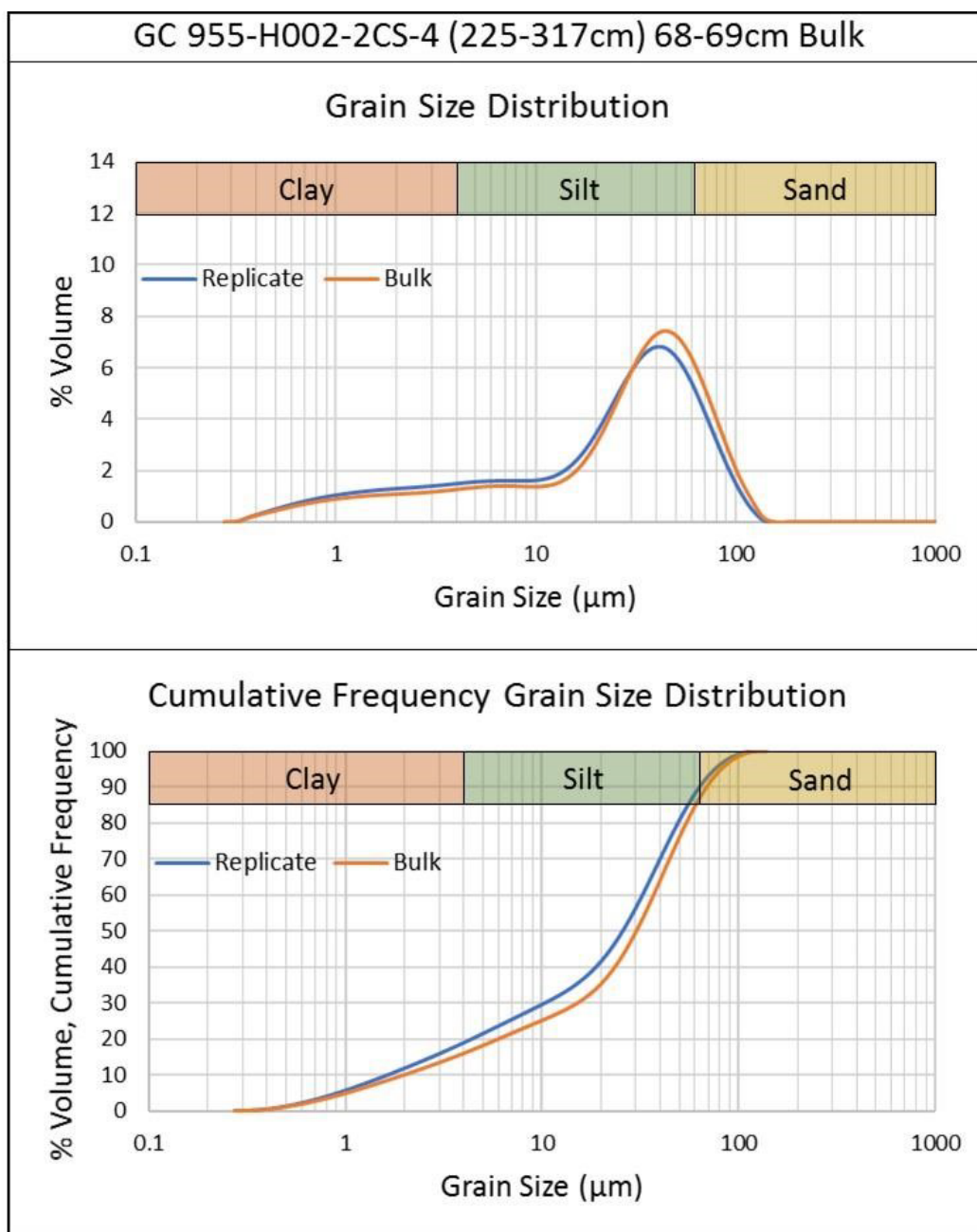


Figure A.5: Replicate Grain size distribution and cumulative grain size distribution of GC 955-H002-2CS-4 (225-317cm) 68-69cm Bulk.

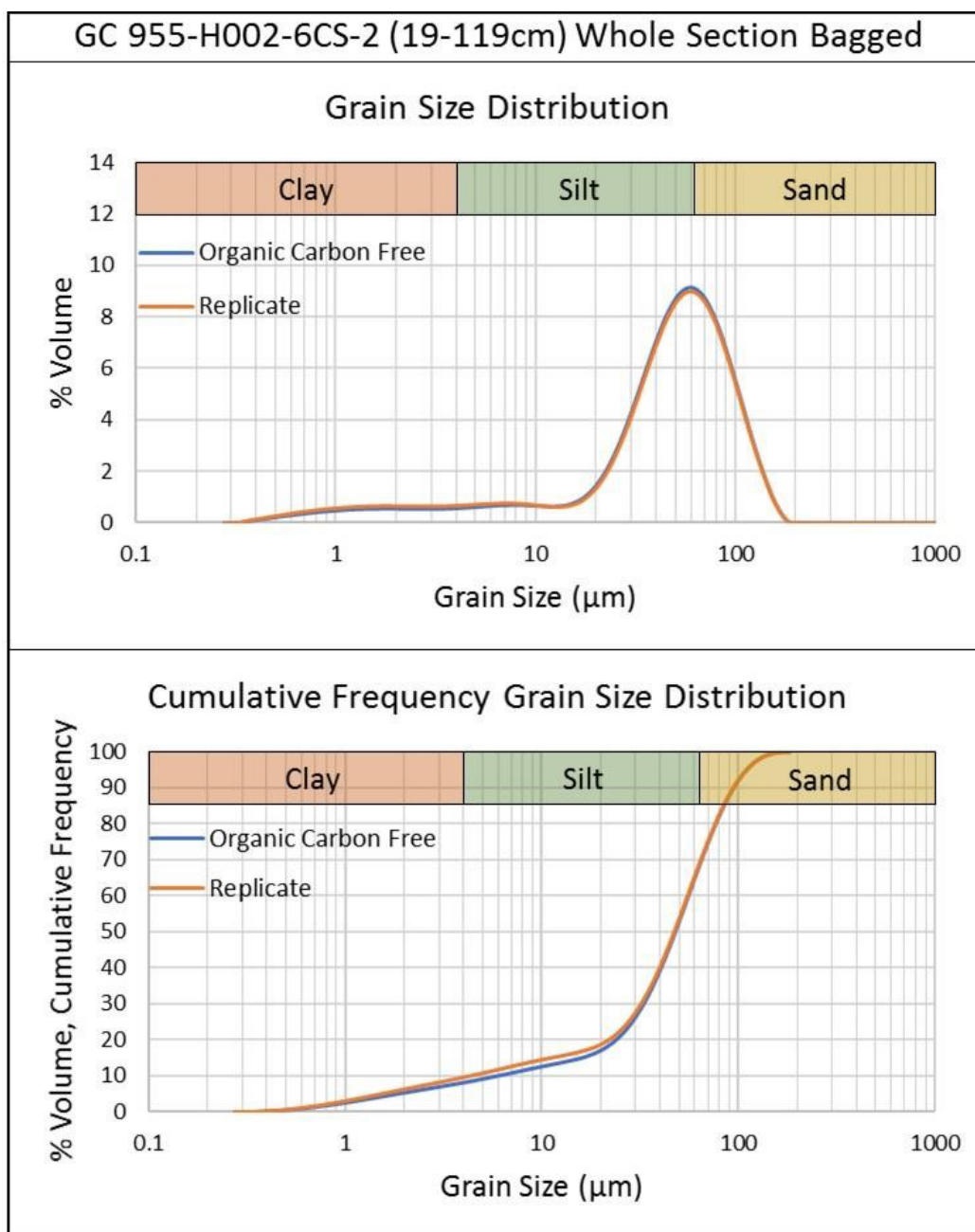


Figure A.6: Replicate Grain size distribution and cumulative grain size distribution of GC 955-H002-6CS-2 (19-119cm) Whole Section Bagged.

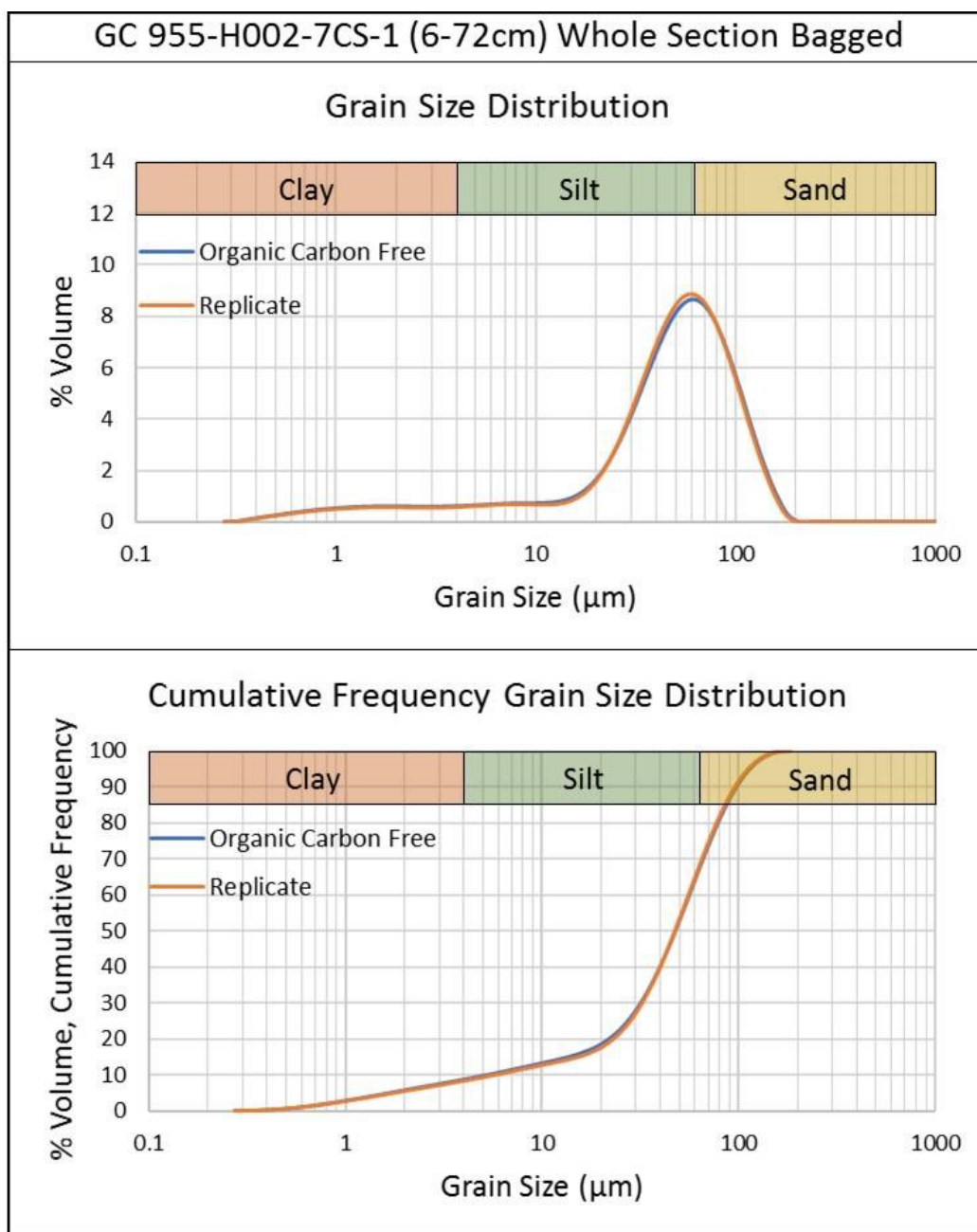


Figure A.7: Replicate Grain size distribution and cumulative grain size distribution of GC 955-H002-7CS-1 (6-72cm) Whole Section Bagged.

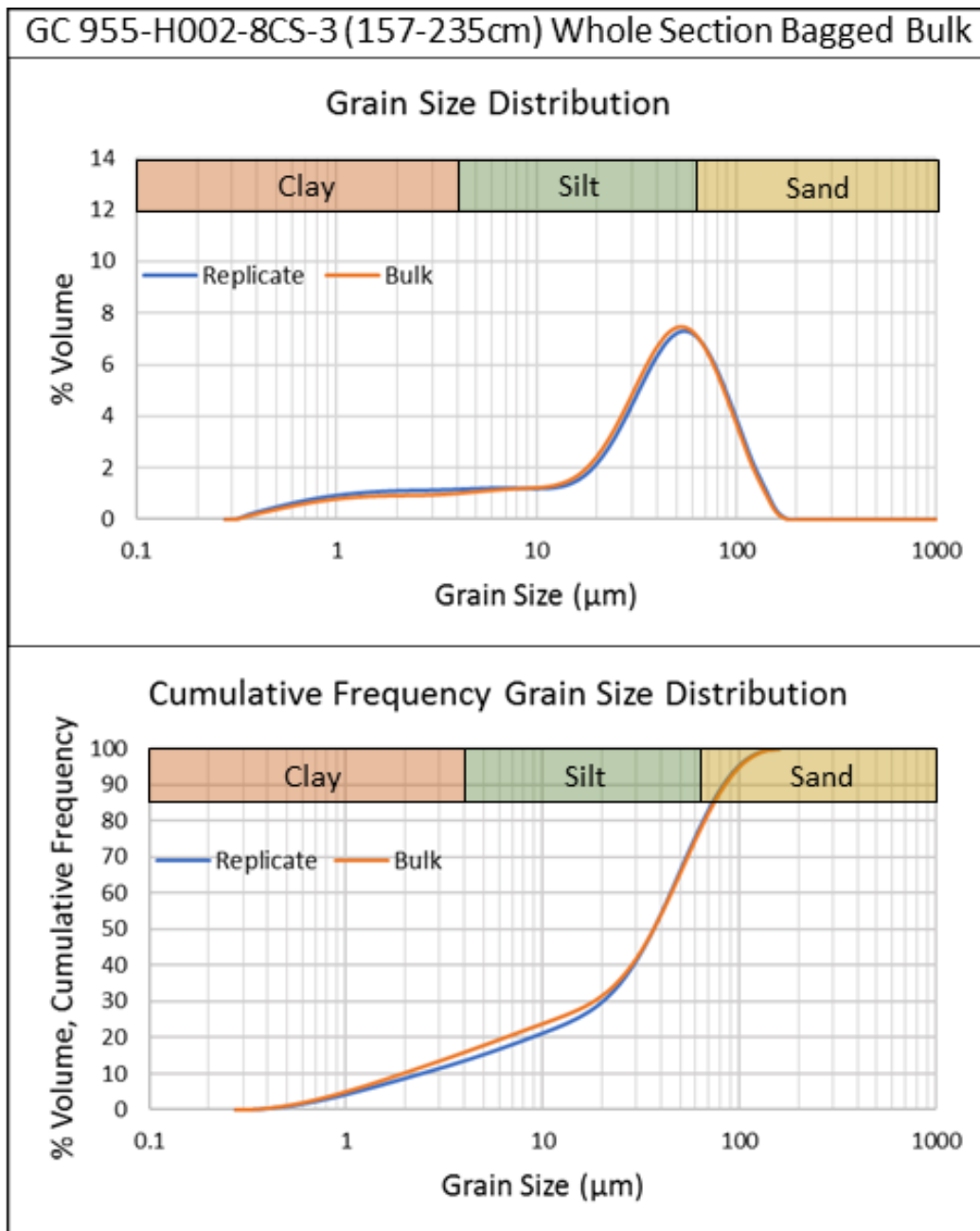


Figure A.8: Replicate Grain size distribution and cumulative grain size distribution of GC 955-H002-8CS-3 (157-235cm) Whole Section Bagged Bulk.

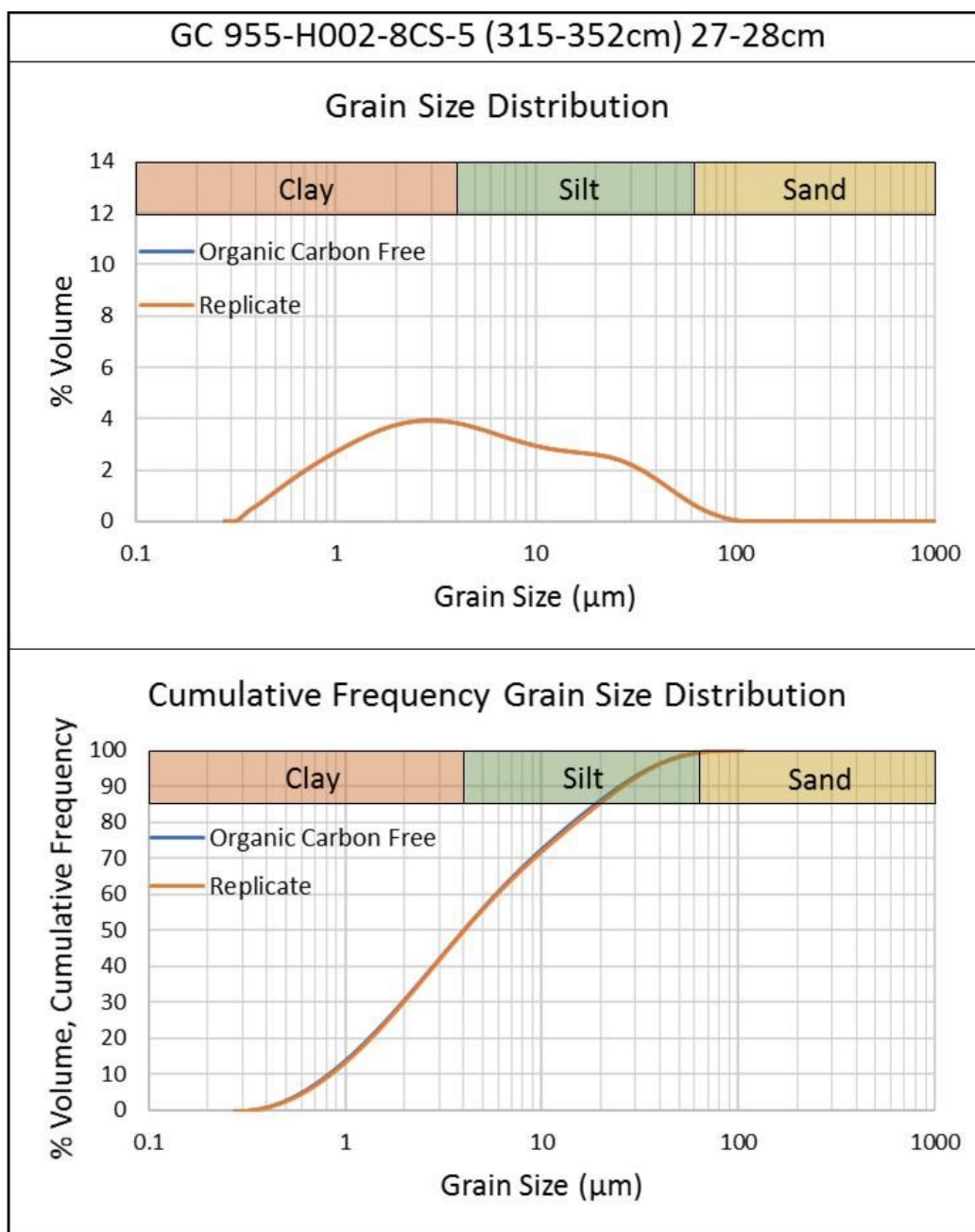


Figure A.9: Replicate Grain size distribution and cumulative grain size distribution of GC 955-H002-8CS-5 (315-352cm) 27-28cm.

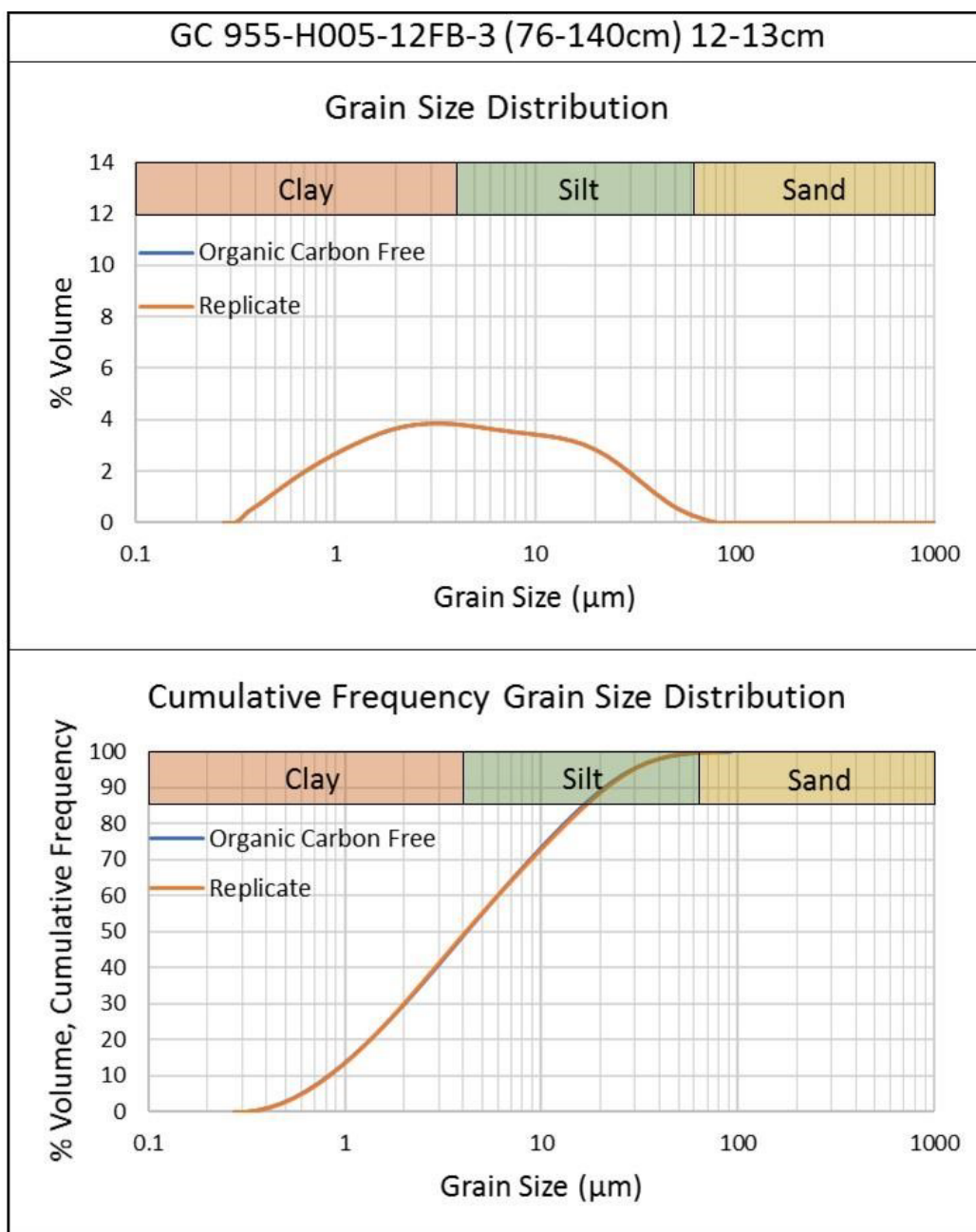


Figure A.10: Replicate Grain size distribution and cumulative grain size distribution of GC 955-H00512FB-3 (76-140cm) 12-13cm.

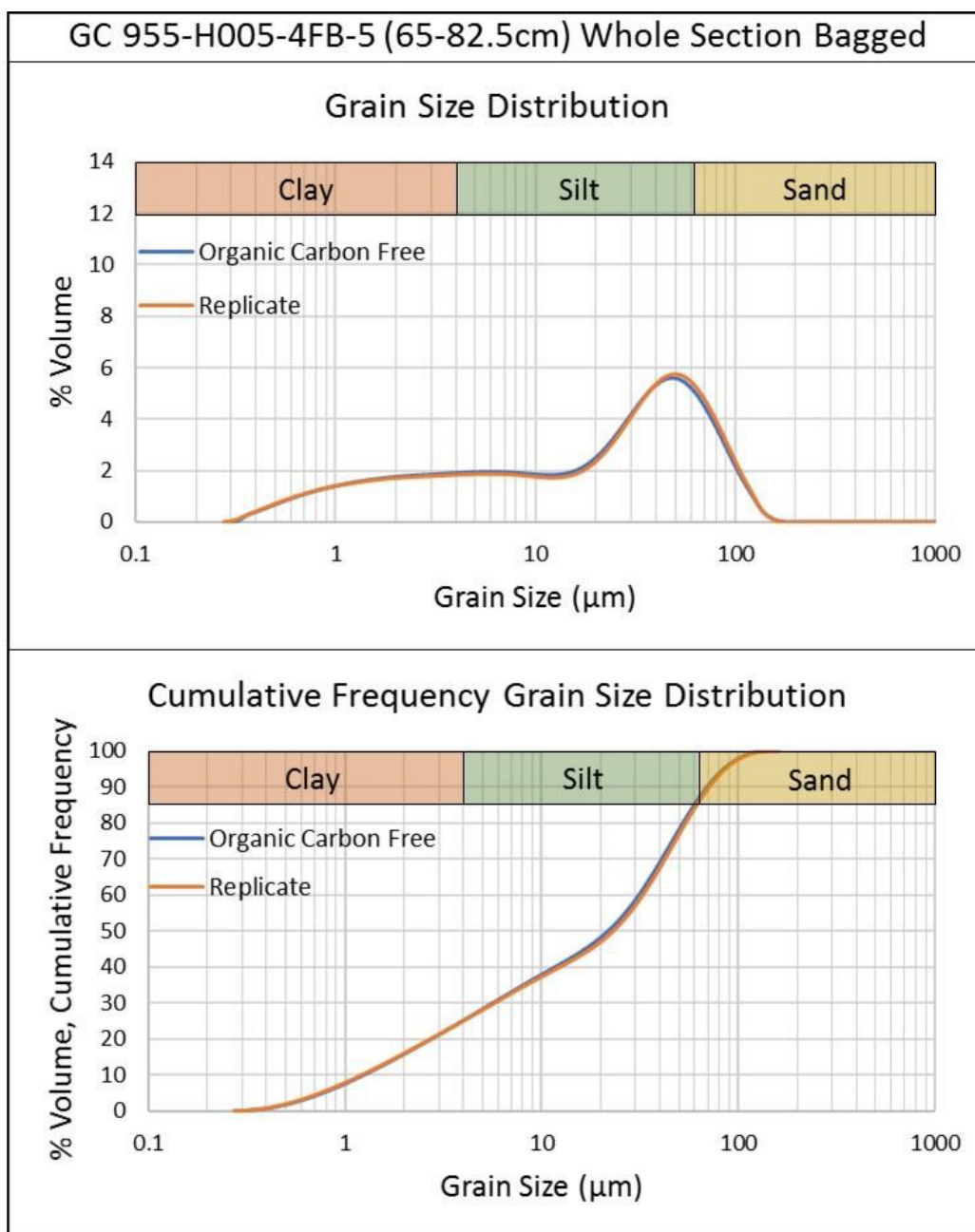


Figure A.11: Replicate Grain size distribution and cumulative grain size distribution of GC 955-H005-4FB5 (65-82.5cm) Whole Section Bagged.

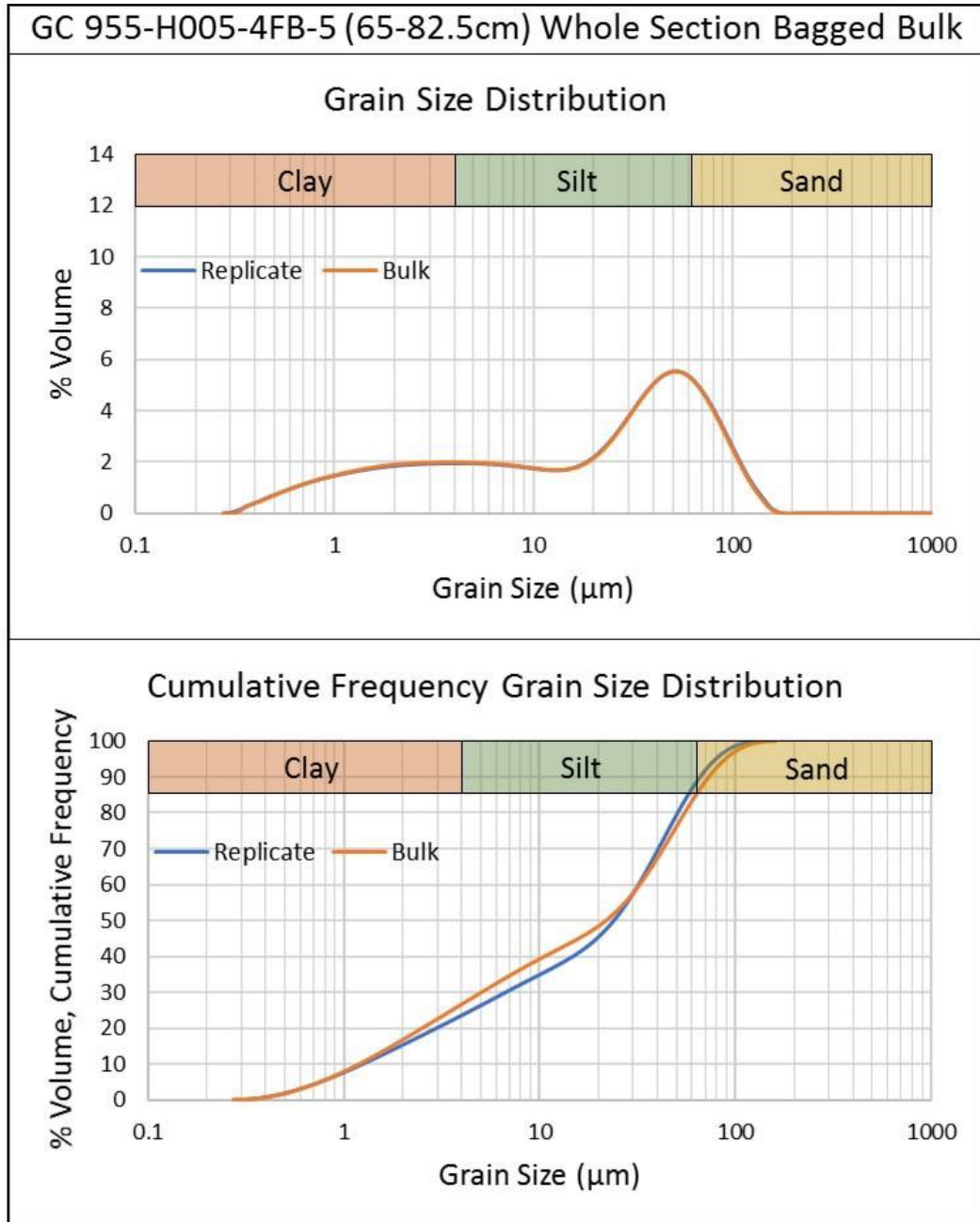


Figure A.12: Replicate Grain size distribution and cumulative grain size distribution of GC 955-H005-4FB5 (65-82.5cm) Whole Section Bagged Bulk.

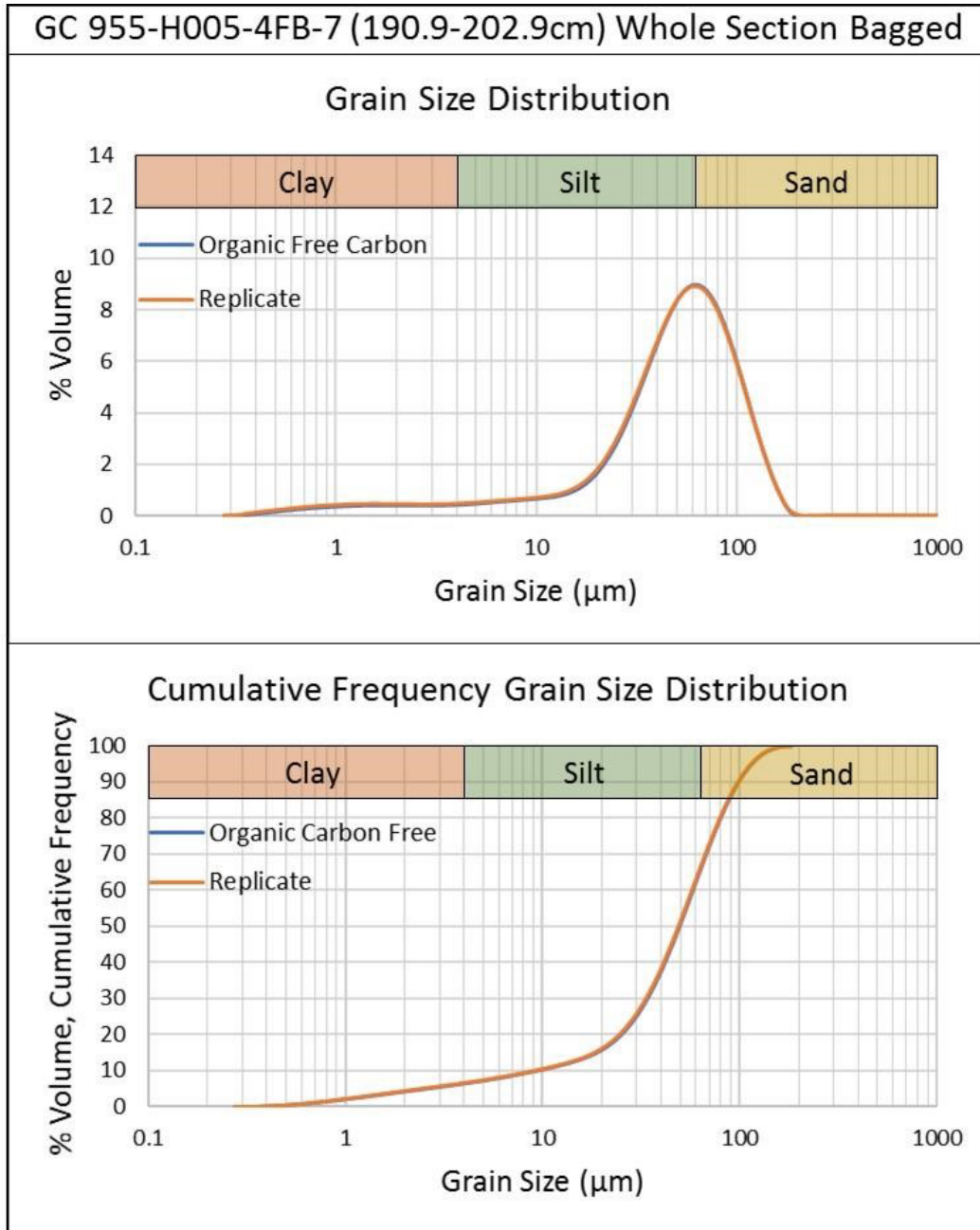


Figure A.13: Replicate Grain size distribution and cumulative grain size distribution of GC 955-H005-4FB7 (190.9-202.9cm) Whole Section Bagged.

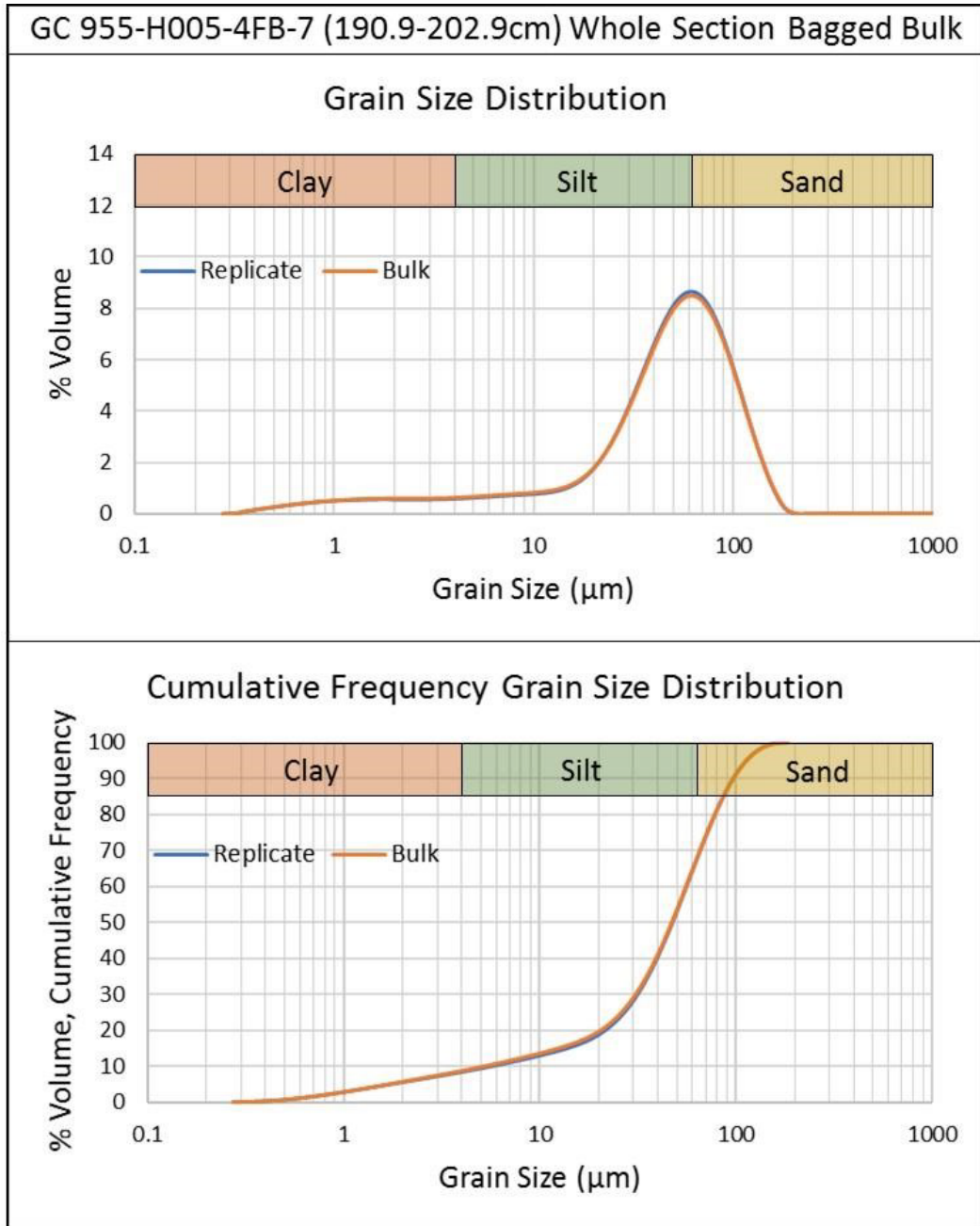


Figure A.14: Replicate Grain size distribution and cumulative grain size distribution of GC 955-H005-4FB7 (190.9-202.9cm) Whole Section Bagged Bulk.

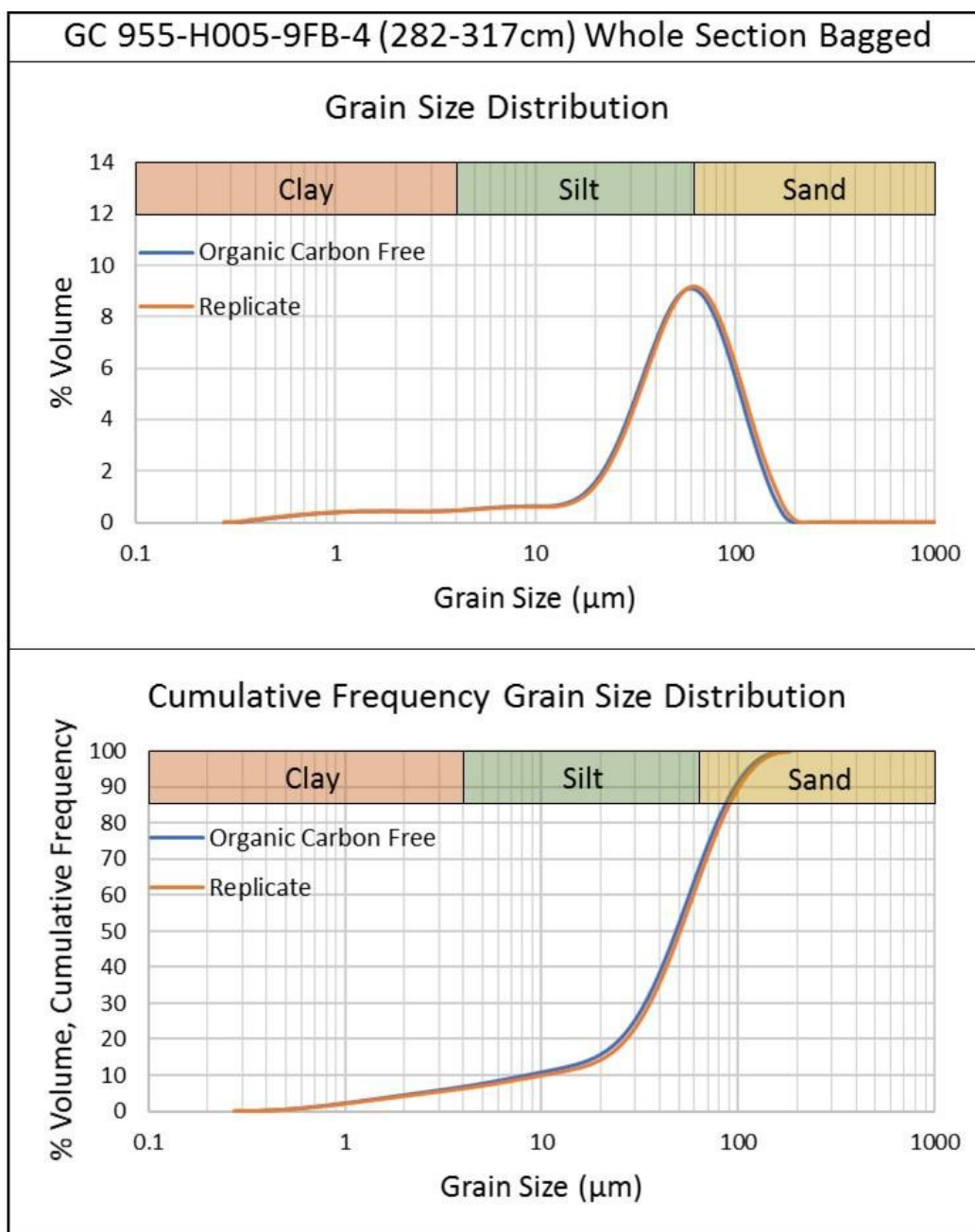


Figure A.15: Replicate Grain size distribution and cumulative grain size distribution of GC 955-H005-9FB4 (282-317cm) Whole Section Bagged.

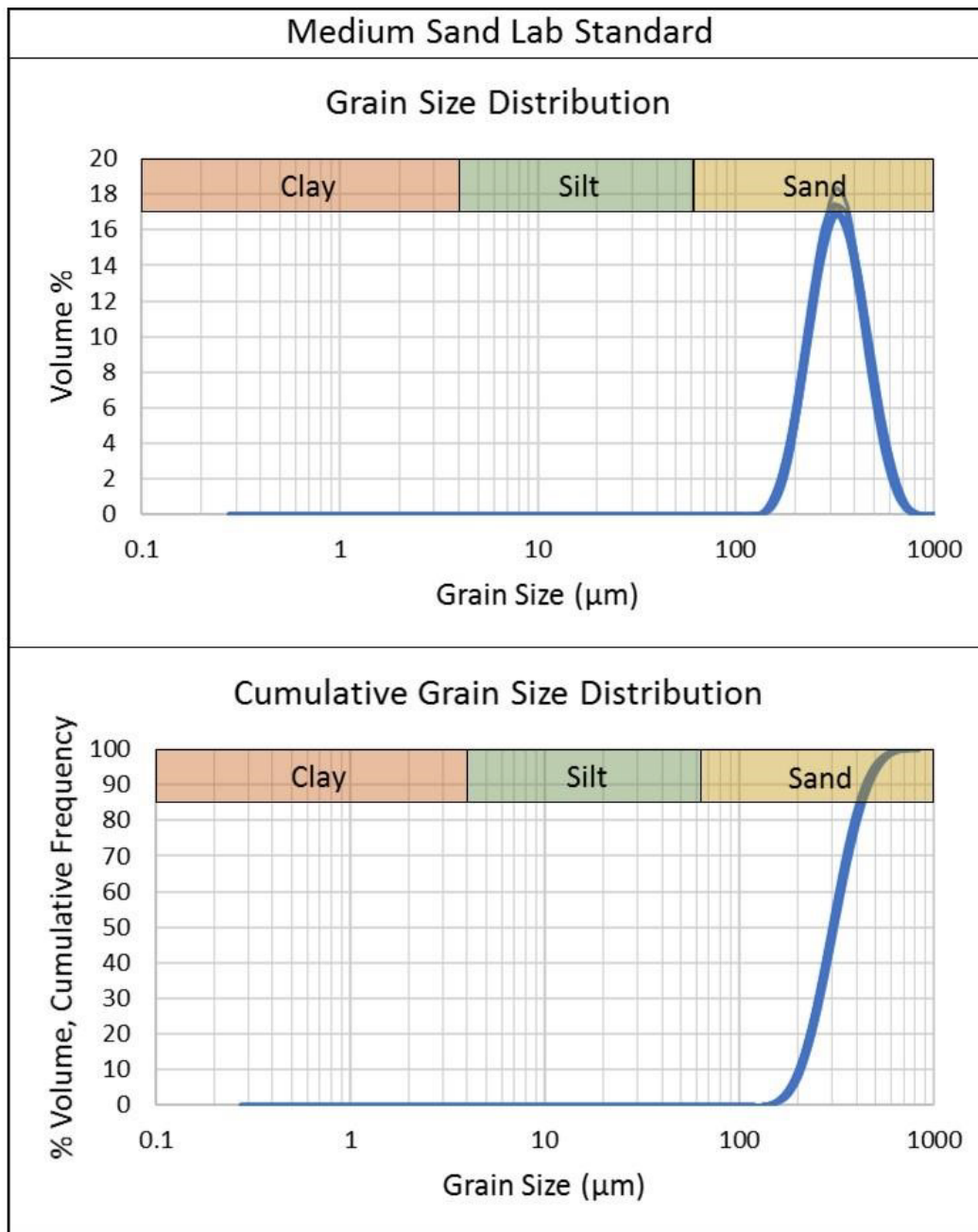


Figure A.16: Replicate Grain size distribution and cumulative grain size distribution of the UNH Sedimentology Lab natural medium sand (Wallis Sand) lab standard. These results are also shown on Figure 60.