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FINDING THE TIME: AGE-DEPTH MODELS IN ROCKSHELTERS  
AND THEIR PALEOENVIRONMENTAL IMPLICATIONS

by

Caleb E. Ferbrache

A thesis submitted in partial fulfillment  
of the requirements for the degree

of

MASTER OF SCIENCE

in

Anthropology

Approved:

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UTAH STATE UNIVERSITY  
Logan, Utah

2019

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## ABSTRACT

Finding the Time: Age-Depth Models in Rockshelters  
and Their Paleoenvironmental Implications

by

Caleb E. Ferbrache, Master of Science

Utah State University, 2019

Major Professor: Judson Byrd Finley, Ph.D.

Department: Sociology, Social Work, and Anthropology

The site of Last Canyon Cave (LCC) in Montana's Pryor Mountains possesses a deep sedimentary deposit rich with environmental data reaching back into the Late Pleistocene (Kornfeld et al. 2012), which was used to create an extensive environmental reconstruction (Minckley et al. 2015). This reconstruction was based on a smooth-spline age-depth model built from radiocarbon ages (mostly acquired from bighorn sheep feces) and was applied to a variety of environmental proxies, including a pollen. Using these radiocarbon ages to build an age-depth model for a pollen analysis could be a problem if the material used for the radiocarbon ages are not synchronous with the surrounding sediment. A solution is to use optically stimulated luminescence (OSL) to find an age for the eolian sediment that was most certainly deposited at the same time as the pollen.

This study creates age-depth models at LCC using radiocarbon, small aliquot OSL, and single-grain OSL in order to determine how differing age-depth models influence the



interpretation of paleoenvironmental proxies and granulometry samples. I did this by re-evaluating the stratigraphy at LCC, collecting OSL and granulometry samples from three exposures, and using the results to construct new age-depth models for the site and interpret the granulometry data. After all of the ages were acquired, I created age-depth models using Bchron Bayesian modeling software (Haslett and Parnell 2008). While the small aliquot OSL was determined to be a sub-optimal representation of age, the single-grain OSL resulted in an age-depth model that produced ages that according to a t-test, were statistically distinct from the radiocarbon model.

I conclude that significant differences could be observed between the single-grain OSL and radiocarbon age-depth models at LCC, therefore bringing the existing environmental reconstruction into question. In addition, the use of granulometry aided in clarifying the site formation. Altogether, both single-grain OSL and granulometry should be consistently factored into the development of age-depth models of rockshelters.

(246 pages)

## PUBLIC ABSTRACT

Finding the Time: Age-Depth Models in Rockshelters and  
Their Paleoenvironmental Implications

Caleb E. Ferbrache

Rockshelters are capable of preserving excellent environmental records within their sediments. But the matter of interpreting an environmental record from rockshelter sediments presents a significant hurdle in the form of dating. An “age-depth model” is typically used to estimate the age of environmental information extending through the deposit. An age-depth model calculates the changes in time between direct ages (like a radiocarbon age) and can provide an estimated age for any depth. While radiocarbon dating can provide an age for organic remains, optically stimulated luminescence (OSL) can provide a direct age on quartz sand deposition and is particularly effective when applied to deposits formed by the wind. This study compares radiocarbon and OSL age-depth models from Last Canyon Cave (LCC) in the Pryor Mountains of south-central Montana. While radiocarbon ages are quite frequently used to construct age-depth models, it is possible they fail to provide accurate ages for the environmental material they aim to date.

I re-evaluated the stratigraphy at LCC and then collected OSL samples as well as samples for grain-size analysis from three different sedimentary exposures. Radiocarbon ages had already been produced for one of the exposures (Kornfeld et al. 2012). The OSL samples were most reliable when analyzed on a single-grain level. After creating age-depth models and collecting the grain-size data, I applied ages to all of the grain-size samples

according to each of the three age-depth models. Ultimately, the single-grain OSL proved to be fundamentally different than the radiocarbon age-depth model, thereby challenging the current paleoenvironmental reconstruction of the site (Minckley et al. 2015).

I conclude that the radiocarbon and single-grain OSL age-depth models were not sufficiently similar, and therefore both dating methods should always be used together when investigating deposits in rockshelters in order to understand how they relate to one another and to the site formation. The use of granulometry also proved to be an important part of reconstruction site formation history. Ultimately, both single-grain OSL and granulometry were determined to be essential parts of studying environmental records in sedimentary deposits in rockshelters.

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Finally, I would like to dedicate this thesis to the memory of my parents, Edgar and Deborah Ferbrache. They showed me a world far greater than the backwoods of southern Ohio, and that whatever is good and beautiful is worth pursuing. Their labor and love showed me how to live generously, even through the bleakest of times. Without their lives and legacies near me, I would not have achieved the goals I can now claim.

Caleb E. Ferbrache

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## CHAPTER 1:

### INTRODUCTION

Rockshelters are important in archaeological research due to their ability to preserve stratified cultural, biological, and paleontological remains commonly with material available for age control (Aikens 1970; Barton et al. 2016; Frison 1962; Husted and Edgar 2002; Jelinek 1982; Jennings 1957; Kennett et al. 2014). In addition, these combined records can serve as reliable climate proxies for regional paleoenvironmental reconstruction (Davis 1990; Farrand 1979; Woodward and Goldberg 2001). Age-depth models are important tools in the construction and analysis of environmental records where a series of absolute ages of known depth can be used to model stratigraphically intervening samples of unknown age (Lowe et al. 1999; Mauquoy et al. 2002; Walker et al. 2003). Age-depth models allow researchers to assign an age to an archaeological, geological, or paleoecological sample that has not been directly dated, and thus create a time-series that facilitates comparison of independent datasets. However, applying an age-depth model to rockshelter deposits without fully considering the processes that formed the deposit could generate significant uncertainties with age estimates. While radiocarbon dating has typically been the default method used in most Quaternary research, optically stimulated luminescence (OSL) dating provides a reliable alternative and provides an age estimate of sediment deposition itself (Huntley et al. 1985). Researchers must carefully consider

exactly what they seek to date and how accurately their selected method reflects their targeted reconstruction.

This thesis compares age-depth models created using three independent chronologies from a single site, Last Canyon Cave, located in the Pryor Mountains of southern Montana (Kornfeld et al. 2012). The rockshelter contains an eolian sedimentary deposit (with contributions from sandstone roof fall and granular disintegration) reaching back >40,000 years, yielding environmental records from fossilized bighorn sheep (*Ovis catclawensis*) fecal pellets and eolian pollen (Minckley et al. 2015). Radiocarbon from the feces provided the majority of ages for an age-depth model, allowing interpretation of the environmental records. Because plant pollen is deposited as part of the eolian sediment rain, I argue that direct ages on sediment deposition provide more accurate age models for analyzing pollen from terrestrial sediments like rockshelter deposits. I compare the effectiveness of radiocarbon and luminescence chronologies in age-depth models focusing on the ability of independent chronologies to reconstruct deposit formation and place environmental data in time with a reasonable level of accuracy and precision. Ultimately, I question whether data used in paleoenvironmental reconstructions are more accurately interpreted through OSL dating of eolian sediment or through radiocarbon dating based on specimens of unknown association or built-in age. This research challenges the current default strategy of basing age control on radiocarbon dating alone and has major implications for environmental reconstruction using terrestrial paleoecological proxies preserved in rockshelters. In particular, it may result in archaeologists more frequently using OSL when constructing age-depth models for rockshelters. In addition, it may result

in the re-evaluation of existing studies where radiocarbon ages may have been misinterpreted.

I hypothesize that due to the fundamental difference in the forces placing the material for radiocarbon dating versus the forces placing the material for OSL dating, that age-depth models built from the two methods at Last Canyon Cave will not be in statistically supported agreement. But in order to evaluate the paleoenvironmental interpretation of Last Canyon Cave, I collected and analyzed OSL and granulometry samples from three columns of a re-occupied original excavation site. The OSL samples were analyzed using traditional small and more refined single-grain techniques, allowing for the construction of alternative chronologies, while the granulometry provided an environmental proxy that could be interpreted through both the radiocarbon and OSL chronologies. This was accomplished by first creating age-depth models from the radiocarbon and OSL ages and using the age-depth models to assign dates to the granulometry samples. Then the modeled OSL and radiocarbon ages were compared by performing a two-tailed t-test between the two sets of ages to determine the existence of statistically significant differences between the two age-depth models. The granulometry could then be discussed in context of the previous environmental reconstruction in 2015 and any conflicts between the reconstruction and granulometry could be identified. This step is particularly important if significant differences were to be found between the OSL and radiocarbon age-depth models.

At the completion of these analyses, I found that an age-depth model built from radiocarbon ages was not compatible with an age-depth model built from single-grain OSL ages. I concluded five things about building age-depth models in rockshelters: 1) that



single-grain OSL should be used rather than small aliquot OSL, 2) that single-grain OSL should be used to either challenge or confirm radiocarbon ages, 3) that in situations where radiocarbon and single-grain OSL ages are in agreement, an age-depth model built on a combination of the two sets of ages are ideal, 4) that granulometry aids in understanding the formation and stratigraphy of the site, and 5) that sampling multiple walls from the back towards the front of the shelter further aids in perceiving the formation history of the deposit. But in order to successfully describe these methods, their results, and interpretation, it should first be established how radiocarbon and OSL dating differ from each other, the existing variations in age-depth modeling procedures, and why Last Canyon Cave provides an excellent opportunity to study age-depth modeling of rockshelter sediments.

## CHAPTER 2:

### BACKGROUND

#### *Age-Depth Models*

The use of radiocarbon for the development of age-depth models has a long application in paleoenvironmental research where the age of non-directly dated boundaries in lake cores and other sedimentary records were needed for identification and correlation between sites (Godwin 1961; Pilcher 1969, 1973; Van Geel 1978). While radiocarbon dating remains the basis for most age-depth models, the manner of extrapolating the ages has seen many advances (Bennett 1994; Blaauw 2010; Bronk Ramsay 2008; Telford et al.

2004; Träschel and Telford 2017). Modern age-depth models include smooth spline and polynomial regression models (Bennett 1994), “wigggle matching” (Van Geel and Mook 1989), which can improve the calibration of a series of radiocarbon dates, Markov Chain Monte Carlo (MCMC) simulations to estimate uncertainty (Bennett 1994), and Bayesian models, which are most widely applied today (Blaauw and Christen 2005; Bronk Ramsey 2008).

### *Bayesian Models*

Bayesian age-depth models are based in Bayesian statistics, which is in turn based in Bayes’ Theorem (Bayes 1763). Bayes’ Theorem describes the influence prior information has on probability calculations. Consequently, Bayesian Statistics operates within the conceptual structure of “degrees of belief,” as opposed to probability based in frequency (Daston 1994). Bayes’ Theorem is typically used to update an existing belief as new information becomes available. Essentially, Bayesian statistics analyze data by incorporating “prior probabilities” into the calculation, and then producing “posterior probabilities,” which summarize the degree of belief in a proposition or random event. A prior probability (or sometimes simply called a “prior”) is a pre-existing piece of information, and the posterior probability (or simply a “posterior”) is the probability that results from considering new information/priors.

Direct ages such as those provided by radiocarbon and OSL act as priors for Bayesian age-depth models, and Bayesian algorithms are able to process that information into posterior models providing ages through the entire sedimentary column. Currently, a number of software programs are available which incorporate Bayesian statistics into their

modeling routines, including OxCal (Bronk Ramsey 2008), Bchron (Haslett and Parnell 2008), and Bacon (Blaauw and Christen 2011). While these programs were developed with radiocarbon ages specifically in mind, other dating methods such as OSL can be used as priors. These tools are still fairly new to professional archaeologists, and their integration into the discipline has not been without its challenges (Hamilton and Krus 2018). However, Bayesian age-depth models are still proving their innate value in archaeology. For example, they can provide assistance in understanding the complex structures of archaeological sites (Pelton et al. 2017), and they more broadly provide an effective way to model the formation of the site and estimate ages for the material therein. This is particularly true of rockshelter sites since the deposit formation can be reliably modeled due to the frequent absence of strong erosional forces erasing parts of the depositional record.

### *Optically Stimulated Luminescence (OSL) & Radiocarbon Dating: Advantages and Limitations*

*Optically Stimulated Luminescence.* Optically stimulated luminescence, or OSL (Huntley et al. 1985), provides a method for calculating the date when quartz grains were buried. Once a grain of quartz is buried, ionizing radiation from local elements as well as cosmic sources will cause electrons to become trapped in defects in the crystal lattice. These electrons will remain stored in the defects until stimulated by light or heat. Once stimulated, the energy will leave the trap and enter a “recombination center” and release a photon. Since the process of electron entrapment should steadily continue once the quartz has been buried, an age can be calculated once the rate of radiation exposure and the

amount of radiation the quartz received have been quantified. The amount of radiation received over time, or “equivalent dose” ( $D_E$ ) can be calculated by collecting sediment in a light-protected tube and studying the luminescence responses of quartz grains in a laboratory setting. The rate of radiation exposure, or “dose rate,” can be largely calculated by collecting sediment surrounding the  $D_E$  sample, and analyzing it for minerals that produce ionizing radiation. However, these methods cannot produce reliable results unless the quartz had been thoroughly “bleached” upon deposition, meaning that any trapped electrons have been cleared out, typically by sunlight, immediately prior to the targeted depositional event.

OSL dating is a particularly useful tool in dating Quaternary geological deposits including archaeological sites (Feathers 2003a; Rittenour 2008). It provides an important alternative to radiocarbon, particularly where organic materials are absent or deposit age exceeds the limits of radiocarbon dating. Recent advances in OSL dating, particularly the single aliquot regenerative (SAR) dose method (Murray and Wintle 2000) and single-grain dating (Duller et al. 1999; Duller 2008) provide more accurate age estimates. While its application in archaeology was originally focused on dating ceramics (Aitken 1997; Aitken et al. 1964; 1968; Mejdahl 1969), its usefulness in dating sedimentary deposits at archaeological sites has been proven repeatedly (Chazan et al. 2013; Feathers et al. 2006; Pederson et al. 2014; Rittenour et al. 2015; Vafiadou et al. 2007). Particularly, advances in single-grain analysis have shown to be invaluable for discerning the finer details of site formation including the potential for post-depositional mixing (Bateman et al. 2007). However, radiocarbon dating still dominates archaeological work, and luminescence dating may be underused, particularly in the development of age-depth models. While

radiocarbon and OSL are the most frequently used dating methods at archaeological sites, not all sites are well-suited for one or the other. Site-specific factors can determine the acceptability of results from either method, which in turn impacts the quality of age-depth models that can be constructed.

*Radiocarbon Dating.* Radiocarbon dating (Libby 1955) is based on the idea that if a radioactive isotope begins decaying at a constant, known rate after an organism dies, then the date of death should be calculatable. The isotope  $^{14}\text{C}$  (alternatively referred to as “radiocarbon”) provides the opportunity to make this calculation, being present in all organic matter and possessing a half-life is about 5,730 years (Godwin 1962).  $^{14}\text{C}$  is formed in the atmosphere when cosmic rays create energized neutrons, and when such a neutron collides with an  $^{14}\text{N}$  atom, the result will be  $^{14}\text{C}$  and a proton. Living organisms will absorb the elements in the atmosphere, maintaining the same ratios of elemental isotopes present in the atmosphere. When the organism dies, it will cease to absorb elements from the atmosphere, meaning that the isotopic ratios present in the organism at the time of death should match those that were present in the atmosphere at the time of death. Stable isotopes will remain, while radioactive isotopes will begin decaying. Radiocarbon in particular will begin transforming into  $^{14}\text{N}$  through the emission of beta particles. So, if the ratio of  $^{14}\text{C}$  to  $^{12}\text{C}$  (a stable isotope) in the atmosphere at the time of the organism’s death is known, then the approximate date of the organism’s death can be calculated after identifying the ratios of  $^{14}\text{C}$  to  $^{12}\text{C}$  currently present in the organism’s remains. Due to the limited occurrence of  $^{14}\text{C}$  in an organism, radiocarbon dating tends to be limited to ages younger than 50,000 years BP. The current method for detecting quantities of carbon isotopes is accelerator mass spectrometry, or AMS (Bronk Ramsey et al. 2004; Kromer et al. 2013; Steier et al.

2004). This process uses a beam of accelerated ions to separate the isotopes and counts the quantities using Faraday cups and particle detectors (usually a gas or solid-state detector). But even when this process is performed without reproach, there are a few spaces for error and necessary adjustments that require attention.

*Comparison of OSL and Radiocarbon.* A well-known hazard in radiocarbon dating is the “old wood” problem, whereby a piece of wood from a tree that died decades or even centuries earlier could be re-deposited in a much younger context (Schiffer 1986). Additional sources of error can come from contamination, isotopic fractionation, variations in atmospheric radiocarbon production, and from reservoir effects (Walker 2005). Contamination predominantly results from improper handling or from existing environmental factors. A handling error could be as simple as touching the sample with a bare hand, and environmental contamination can include naturally occurring hydrocarbons in the bedrock (Rittenour et al. 2015), or incorporation of ancient carbon from  $^{14}\text{C}$ -deficient sources such as carbonate rocks (Lee et al. 2011). Isotopic fractionation refers to the tendency of organisms to absorb lighter isotopes faster than heavier ones such as  $^{14}\text{C}$ , and this fact needs accounted for when calculating a radiocarbon age (Craig 1953; Harkness 1979; O’Leary 1981). Within this context, the rates of  $^{14}\text{C}$  absorption can vary from species to species. The radiocarbon produced in the atmosphere varies over time, and calibration curves based on tree rings (and other proxies) are required to correct for these changes (de Vries 1958; 1959; Stuiver and Suess 1966; Reimer et al. 2013). Reservoir effects generally refer to an environment where the radiocarbon content is not in equilibrium with the atmospheric content. A major example are marine reservoirs, where the slow movement of atmospheric carbon from the surface of a body of water down to its deepest reaches, which

later upwells towards the surface, bringing old carbon with it (Arnold and Anderson 1957; Broecker 1963; Revelle and Seuss 1957). The result is that datable material taken from a deep body of water may appear deceptively old and will require a calibration of the date (Jull et al. 2013; Mangerud 1972; Oana and Deevey 1960). Consumers of aquatic life can also be impacted (Philippsen 2013).

Where OSL is concerned, the calculations to produce an age rely on a number of significant assumptions. These assumptions include a constant dose rate from surrounding elements, a constant cosmic contribution, a constant moisture content, and that the sediment was fully bleached (complete solar resetting) before deposition. Perhaps the most common problem with OSL is that the sediment was partially bleached before deposition (Alexanderson 2007; King et al. 2014; Li et al. 2018; Rittenour 2018), or that sediment underwent mixing (Jacobs et al. 2006; Porat et al. 2006). While eolian sediments have the highest probability of being fully bleached (Bailey and Arnold 2006; Olley et al. 1998; Rittenour 2018), partial bleaching can be expected in fluvial deposits in relationship to depth, mode of transport, and distance transported (Rittenour 2008). In addition, some amount of mixing is to be expected from factors like erosion and water turbidity (Rittenour 2008; 2018). Therefore, environments that have been heavily shaped by water may be a problematic place for OSL, though advances in single-grain OSL have yielded ages for sediments that were previously difficult to date (Duller 2008; Jacobs and Roberts 2007). However, dry and undisturbed eolian deposits remain the ideal setting for OSL (Nathan et al. 2003; Olley et al. 1998; Rittenour 2018).

Both radiocarbon and OSL have limits on their applicable time intervals. For radiocarbon, the maximum age obtainable is about 50,000 years (Reimer et al. 2013) due

to the time it takes  $^{14}\text{C}$  to decay into nearly undetectable amounts. For OSL, sediment can reach a saturation point where all electron traps have been filled and it will no longer build a greater luminescence signal. This limits the use of OSL to about 100-150 ka, but this is dependent on indirect sample properties, and reliable ages up to one million years are possible in ideal settings (Rhodes 2011).

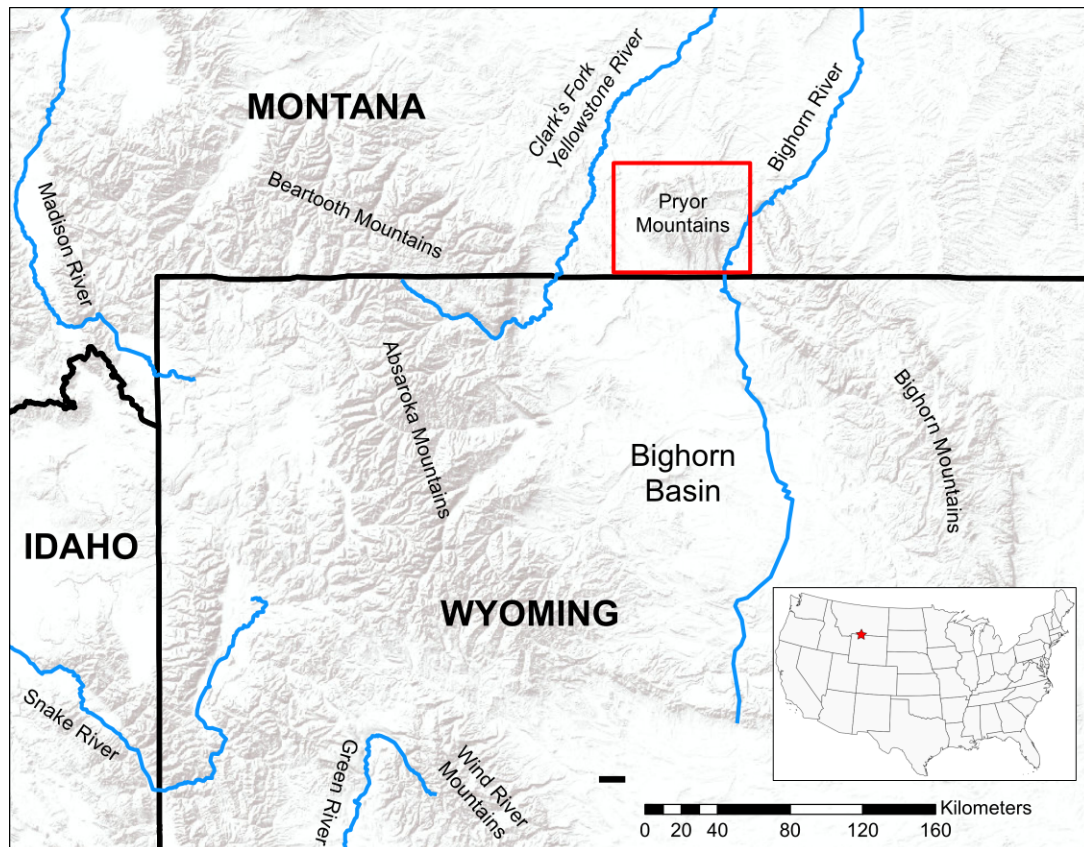
### *OSL in Rockshelters*

When rockshelters are excavated, OSL is frequently disqualified from dating methods due to the presence of colluvial and/or alluvial sediments that have been subject to mixing, partial bleaching, and varying moisture content over time (Fuller et al. 1994; Gemmell 1994). But as established, OSL is effective on eolian sediments within rockshelters. One of the earliest and most notable applications of OSL on eolian sediments in a rockshelter occurred at Jinmium Cave in Australia during the 1990s. When excavations began in 1992 (Fullagar et al. 1996), 17 samples were taken for thermoluminescence dating, an older luminescence dating technique (Nanson et al. 1991; Redhead 1984; 1988; Shepherd and Price 1990). The initial results of this study led the authors to conclude that humans occupied Australia prior to 116 ka. These results were re-evaluated, particularly through the use of single-grain luminescence, which revealed that partially bleached contributions from the shelter ceiling influenced the thermoluminescence ages (Roberts et al. 1998; 1999). The revised ages were comparable to the radiocarbon ages acquired at the site and placed human occupation at Jinmium after 10 ka. In addition to establishing the effectiveness of single-grain OSL in rockshelters, the OSL samples were interpreted with



the assistance of age models such as the minimum and central age models to constrain OSL ages (Galbraith and Roberts 2012). Due to the ability of OSL dating to identify ages greater than those achievable through radiocarbon, it has been particularly important in investigating Paleolithic sites in rockshelters, such as Taforalt (Clark-Balzan et al. 2012), Rhafas Cave (Mercier et al. 2007), Blombos Cave (Jacobs et al. 2003; 2006), Rose Cottage Cave (Pienaar et al. 2008), Gorham's Cave (Blasco et al. 2015) and Sibudu Cave (Wadley and Jacobs 2004). Single-grain analysis tends to be the preferred method, though small aliquots are still used at times (Jacobs et al. 2003).

The current research illustrates that OSL is effective and reliable at sites where viable radiocarbon is absent, or where the deposit reaches ages outside the range of radiocarbon dating. But what other reasons should prompt OSL dating? This question confronts some problems specific to archaeological excavations. First of all, while archaeologists aim to understand human behavior, they are also interested in the context where this behavior took place. This means that environmental reconstructions are frequently part of their research. But as a discipline oriented towards human behavior, datable organic remains associated with human behavior, such as hearths, are frequently the sought-after source of a defined age. While this is a good and reasonable strategy for the study of human activity, a potential for error is raised when those same carbon dates are used in an age-depth model intended for application to environmental information in eolian sediments, such as pollen. Can organic material deposited by the disruptive forces of humans and animals create the appropriate age-depth model for studying eolian pollen? Or does this organic material end up at depths that do not accurately represent the age-



**Figure 1. Location of the Pryor Mountains and Last Canyon Cave in South-Central Montana.**

depth relationship in the eolian sediments? To critically evaluate these questions, I examine the stratigraphy and chronology of Last Canyon Cave.

*Last Canyon Cave: Late Quaternary Paleoecology of the Northern Bighorn Basin*

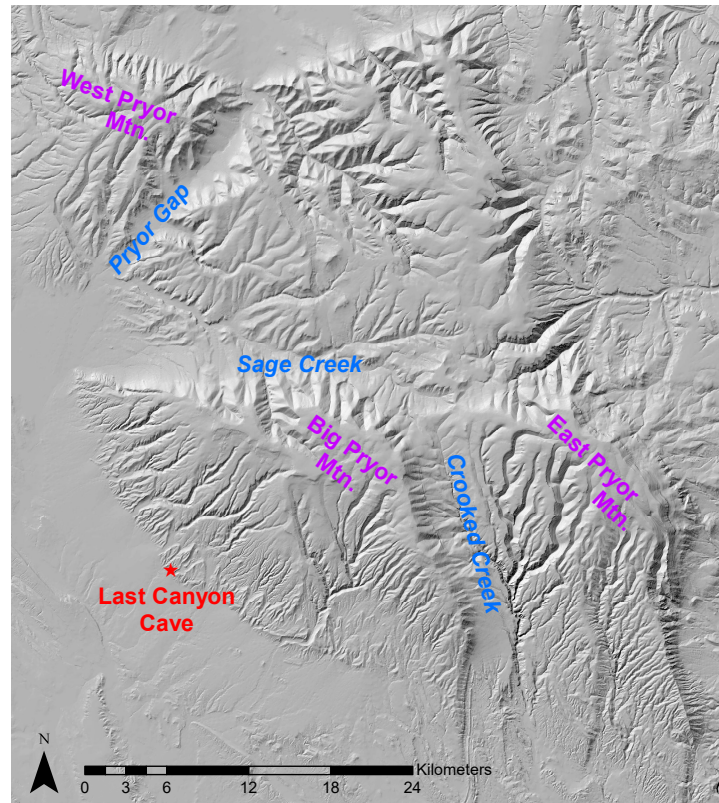
Last Canyon Cave (24CB879) is a small rockshelter situated at 2,597 m above sea level (ASL) within the Tensleep Formation Sandstone on the southwestern edge of the Pryor Mountains in south-central Montana, USA (Figures 1-4). Major work was conducted at the site during 2007-2012 (Kornfeld et al. 2012). The excavation (Figure 4b) yielded a few stone artifacts and 530 bones, including specimens identified as Pleistocene horse

(*Equus sp.*) and Pleistocene bighorn sheep (*Ovis catclawensis*). A total of 11 radiocarbon ages (Table 1) were acquired to build the chronology of the site, with feces providing the majority of ages, along with two ages from bone collagen and one from charcoal. The charcoal came from a presumed hearth at the highest point sampled in the column and provided the age 12,800-12,690 cal BP<sup>1</sup> (Beta 242805; Table 1), while the lowest sample was an *Ovis catclawensis* fecal pellet, offering an age of 44,690-42,200 cal BP (Beta 242808). The well-sorted silty very fine sand comprising the bulk of the rockshelter deposit was determined to largely be the result of eolian sedimentation (Kornfeld et al. 2012), though autogenic sedimentation from the parent Tensleep Sandstone were undoubtedly included in the deposit as well. Late Pleistocene environmental conditions near the site were reconstructed using pollen extracted from 125 contiguous 1-cm samples and a smooth spline age-depth model based on the radiocarbon ages of *Ovis catclawensis* fecal pellets, bone collagen, and charcoal (Minckley et al. 2015). Stable isotopes extracted from the fecal pellets serve as a second, independent paleoenvironmental proxy in the reconstruction.

Radiocarbon age control suggests the environmental reconstruction covered the period between 45,500 – 11,500 cal BP, which included depths below the lowest radiocarbon sample. Producing ages for these deeper environmental samples was solved by extending the age-depth model beyond the lowest radiocarbon sample and applying the

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<sup>1</sup> All radiocarbon ages are presented with 2 sigma standard deviations using the IntCal13 dataset (Reimer et al. 2013).



**Figure 2. The Pryor Mountains, showing the location of Last Canyon Cave.**

ages produced by the model. The environmental record was divided into five pollen zones, which was further analyzed by integrating the stable isotope data, producing a final interpretation of the environmental record at the site (Table 8). The beginning of the record shows a cool climate, followed by a warmer period between 45,500 and 38,500 cal BP that transitions to cooler conditions between 38,500 and 27,500 cal BP. The build-up and aftermath of the Last Glacial Maximum (LGM) is indicated by an increase in arboreal pollen from 27,500 to 13,800 cal BP. Warming conditions are suggested for the period between 13,800 and 11,500 cal BP, which also includes the Younger Dryas chron from 12,900-11,700 cal BP (Alley et al. 1993). The environmental reconstruction from Last Canyon Cave (LCC) stands out among other environmental studies from the Central Rockies (Larsen et al. 2016; Moser and Kimball 2009; Pribyl and Shuman 2014; Whitlock

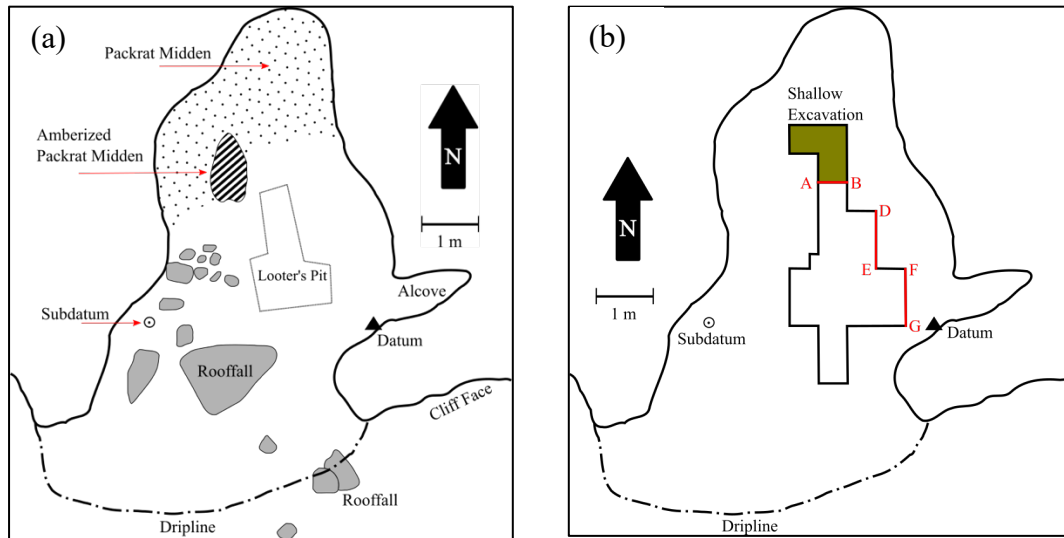


1993) due to its terrestrial formation, lower elevation, and depositional age range, making it a valuable record in western paleoclimatology.

The methods behind the LCC environmental reconstruction are worthy of deeper consideration. Prior to the arrival of humans, the three dominant forces that appear to have created LCC's deposit are weathering of the parent rock, eolian sedimentation, and zoogenic contributions. While pollen in the sediment would have been laid down through the same eolian processes that deposited most of the quartz sediment, coprolites and bones were deposited through zoogenic processes. OSL should provide an accurate age on pollen deposition due to the stable environment in the shelter, ensuring pollen and nearby quartz grains remain associated long after deposition. It may intuitively seem that there should not be any difference between radiocarbon and OSL ages in a rockshelter since both the sediment and coprolites are put in place through the pull of gravity, creating a continuous



**Figure 3. View of Last Canyon Cave, looking northeast. Photo taken about 50 m from site. Shelter opening is about 6 m wide.**



**Figure 4. Plan view of the Last Canyon Cave interior. (a) Site prior to formal excavations. Packrat middens on map were limited to the top surface of the shelter floor. (b) View of excavation units from 2013; walls that were sampled for this study are shown in red.**

and superimposed record. While this may be true, the radiocarbon dates could still misrepresent the rate of sediment deposition in the shelter and thus distort the age-depth model.

For example, during a period of reduced sedimentation, coprolites covering a broad range of dates could be deposited over a similar elevation before eolian sedimentation returned to a faster rate. While these processes would not impact the expected superposition of datable material, it could result in problems modeling the age-depth relationship of the deposit, particularly the deposits immediately above the radiocarbon sample. In other words, if feces that were deposited at the beginning of a thousand-year break in eolian sedimentation were collected for radiocarbon dating, the sediment immediately above the radiocarbon sample will return an inaccurately old age estimation by the age-depth model. In addition, the activity of animals such as packrats inside the shelter could have altered the position of feces. A number of studies have used both AMS radiocarbon and OSL

dating methods (Bishop et al. 2016; Crombé et al. 2012; Lang et al. 2003; Újvári et al. 2014; Yu et al. 2016), and the consensus is that multiple dating methods are better than one. This is because one method can reveal flaws in the other or can provide complementary details about the site formation chronology (Bishop et al. 2016; Rittenour et al. 2015; Roberts et al. 1998; 1999; Yu et al. 2016). Since the deposition of organic material in LCC including coprolites, bone, and charcoal may not have coincided with the deposition of eolian pollen at similar depths, the chronology produced by the radiocarbon samples may not coincide with the analyzed pollen samples. The result is that inappropriate ages may have been applied to the pollen record and the resulting environmental reconstruction is unreliable. The best way to determine if the ages between these two environmental records are indeed mismatched is to build an independent OSL chronology as a second approximation of the pollen timeline.

Potential mismatches between depositional chronologies built on sediment versus paleontological ages highlight the need to clarify the LCC formation processes and determine the best age-depth model for the specific set of circumstances provided by the site. There are two possible outcomes to this research: 1) the radiocarbon chronology is significantly different from the OSL chronology, and therefore does not accurately represent the eolian sedimentation; or 2) both age-depth models will overlap enough that they can be considered equally valid. If the radiocarbon age-depth model is an inaccurate representation of eolian sedimentation, then age-depth models based on OSL ages should provide the best ages for studying records coeval with eolian sedimentation. If the models are statistically indistinguishable, then the two methods should inform and support one

Table 1. Radiocarbon samples used to construct the age-depth model.

Lab ID	Sample ID	Depth (cm)	Stratum	Context	$\delta^{13}C$	$^{14}C$ age <sup>2</sup> (BP)	2 $\sigma$ calibrated age range [relative area]	Median age <sup>3</sup> (cal BP <sub>2010</sub> )
Beta 242805	24CB879-1	0	2b	Hearth/ Charcoal	--	10,860 $\pm$ 40	12,692-12,798 cal BP [1.0]	12,810 $\pm$ 50
Beta 242806	24CB879-2	9	2b	Feces	--	11,100 $\pm$ 40	12,831-13,074 cal BP [1.0]	13,010 $\pm$ 120
LC15-151	--	10	2b	Bone/ Collagen	-19.99	11,600 $\pm$ 80	13,278-13,574 cal BP [1.0]	13,490 $\pm$ 150
UGAMS 9821 29	--	19	2b	Feces	--	12,030 $\pm$ 35	13,759-14,009 cal BP [1.0]	13,940 $\pm$ 130
UGAMS 9822 38	--	20	2b	Feces	--	12,140 $\pm$ 35	13,901-14,148 cal BP [0.037] 13,856-13,898 cal BP [0.963]	14,060 $\pm$ 150
UGAMS 51	--	34	2b	Feces	--	12,440 $\pm$ 80	14,176-15,008 cal BP [1.0]	14,650 $\pm$ 420
UGAMS 11347 64	--	42	2b	Feces	--	16,010 $\pm$ 50	19,142-19,525 cal BP [1.0]	19,390 $\pm$ 190
UGAMS 11348 61	--	44	2b	Feces	--	16,940 $\pm$ 70	20,190-20,639 cal BP [1.0]	20,470 $\pm$ 220
LC17-57-c2	513LC57-c2	51	2a	Bone/ Collagen	--	21,700 $\pm$ 210	25,582-26,405 cal BP [1.0]	26,050 $\pm$ 410
Beta 242807	24CB879-5	72	2a	Packrat middens/ Feces	--	38,670 $\pm$ 700	41,683-43,778 cal BP [1.0]	42,790 $\pm$ 1,050
Beta 242808	24CB879-6	90	1	Feces	--	39,570 $\pm$ 800	42,201-44,685 cal BP [1.0]	43,500 $\pm$ 1,240

<sup>2</sup>Conventional radiocarbon age with  $\pm 1\sigma$  error, shown in radiocarbon years before AD 1950 (BP)

<sup>3</sup>2 $\sigma$  calibrated ages were rounded to the nearest decade, then 60 years were added in order to show the age relative to the year 2010.



another, producing a refined sedimentation model. Either outcome may provide a valid argument for making OSL a routine part of age-depth modeling in rockshelters.

## CHAPTER 3:

### METHODS

To address the problems and objectives identified in this study, I use data gathered from Last Canyon Cave. Specifically, I use field observations of stratigraphic relationships, OSL dating, the construction of age-depth models for OSL and radiocarbon ages, and comparative granulometry data for each age-depth model. But in order to plan the sampling methods for OSL and granulometry, the stratigraphy had to first be exposed, evaluated, and mapped.

LCC's stratigraphy was initially identified and described during the 2007-2011 field seasons (Kornfeld et al. 2012). In May 2016, Dr. Judson Finley and I re-evaluated the stratigraphy in the exposures targeted for sampling (Figures 5 and 6). This involved removing backfill that had been placed in the excavation units at the end of the 2011 excavation season and examining the sedimentary profiles of the old excavation units. Official stratigraphic profiles were published in 2012 (Kornfeld et al. 2012), but these designations needed confirmed to ensure that major sedimentary units were identified for strategic OSL and granulometry sampling. The corners of the excavation units received alphabetical designations on the 2012 maps, and these designations were carried over onto the updated maps (Figures 4, 5, and 6), and were used to create identifiers for the sampled exposures by conjoining the corner IDs on either side of the exposure into a single ID for

the wall. For example, the exposure that went from corner A to corner B became “Wall AB.” The specific exposures that were targeted for sampling were designated Wall AB, Wall DE, and Wall FG. Some sediment had been removed or had collapsed from the face of Wall AB since the last time a profile was sketched, which likely accounts for most of the variations in the shape of the lines separating strata depicted between the 2012 and the current sketches.

OSL samples were collected from the three columns designated Wall AB, Wall DE, and Wall FG (Table 2). Wall AB was near the back (northern end) of the shelter and was the same location of the existing radiocarbon chronology (Figure 5). Walls DE and FG were in the eastern exposures, with Wall DE being on the northern end (towards the back of the shelter) of the eastern exposures, and Wall FG being on the southern end (towards the entrance) of the eastern exposures (Figure 6). While Wall AB was the location of the existing radiocarbon age-depth model and environmental reconstruction and therefore required sampling for this study in order to have new data that was directly comparable to the existing data, Walls DE and FG were sampled in order to provide additional details regarding the site formation history by detailing the growth of the deposit in relation to the shelter mouth. When sampling the stratigraphy itself, the OSL samples were collected from the top and bottom of each stratum in order to bracket stratigraphic changes.

In order to demonstrate that differing age-depth models can affect the interpretations of environmental proxies, I analyzed sediment grain-size distributions from LCC (Table 2). These granulometry samples would not only generate new environmental information from the LCC sedimentary deposit, but could also be used as points to compare the various age-depth models generated for this study. In addition, the granulometry data

could be used to analyze the stratigraphy and broader formation history of the site. Broadly speaking, a dominant value of granulometry as an environmental proxy is its ability to reflect changes in the environmental conditions that influence depositional processes. But more specifically, grain-size distributions in rockshelters ranging between coarse sand and clay can reveal changing eolian sedimentation processes, as well as the

Table 2. Total Samples Collected in 2016

OSL Samples					Granulometry Samples				
ID	Wall	Stratum	Depth (cm)	Thickness (cm)	ID	Wall	Stratum	Depth (cm)	Thickness (cm)
AB-1	AB	1	137	3.81	AB-1	AB	1	134	5
AB-2	AB	2a	119	3.81	AB-2	AB	2a	124	5
AB-3	AB	2a	87	3.81	AB-3	AB	2a	113	5
AB-4	AB	2b	73	3.81	AB-4	AB	2a	105	5
AB-5	AB	2b	44	3.81	AB-5	AB	2a	94	5
DE-1	DE	2a	102	3.81	AB-6	AB	2b	86	5
DE-2	DE	2b	72	3.81	AB-7	AB	2b	75	5
DE-3	DE	2a	39	3.81	AB-8	AB	2b	64	5
FG-1	FG	2b	78	3.81	AB-9	AB	2b	55	5
FG-2	FG	2b	47	3.81	AB-10	AB	2b	41	5
FG-3	FG	2b	18	3.81	AB-11	AB	2b	32	5
					DE-1	DE	2b	107	5
					DE-2	DE	2a	97	5
					DE-3	DE	2a	87	5
					DE-4	DE	2a	77	5
					DE-5	DE	2a	67	5
					DE-6	DE	2b	57	5
					DE-7	DE	2b	47	5
					DE-8	DE	2b	37	5
					FG-1	FG	1	84	5
					FG-2	FG	2b	74	5
					FG-3	FG	2b	64	5
					FG-4	FG	2b	54	5
					FG-5	FG	2b	44	5
					FG-6	FG	2b	34	5
					FG-7	FG	2b	24	5

influence of autogenic sedimentation (Abbot 1997; Donahue and Adavasio 1990; Finley 2008; 2012; Kibler 1998). Sediment for granulometry was collected from each stratum exposed in the same three columns that were sampled for OSL. The samples were collected with the ultimate goal of gaining insight into the formation of the entire deposit, but for the purposes of testing the two age-depth models, only the samples from the wall toward the back of the shelter were used in the comparative analysis. Sediment was collected from Walls AB, DE, and FG, each one adjacent to a column where OSL samples were collected. Samples were collected up the column at 10 cm intervals, and each one generally contained 300-500 grams of sediment.

### *OSL Methods*

OSL samples were collected according to the guidelines established for the USU Luminescence Laboratory (Nelson et al. 2015). In order to collect samples for the equivalent dose ( $D_E$ ), aluminum conduit tubes measuring 1.5-x-6" were pounded into the sedimentary profiles, the exposed end of the tube was stuffed with paper tissue to keep the sediment tightly packed inside, then the tubes were carefully pulled out with the sediment secured inside. Both ends of the tube were carefully wrapped with black duct tape to ensure that the sediment would neither leak nor undergo light exposure. Afterwards, a sample for the dose rate calculation and a sample to measure the moisture content were collected from the 15 cm surrounding the space left by the extracted conduit tube. The dose rate sample filled about half of a quart-sized zipper bag and would be used to identify the amount of ionizing radiation contributed by local material. The moisture sample was collected in a

water-tight film canister, which was then sealed with duct tape. Since water attenuates the penetration of radioactive particles (Aitken 1998; Mejdahl 1979), the moisture content of the sediment needed factored into the relevant calculations.

The equivalent dose samples were prepared and tested at the Utah State University Luminescence Lab under dim amber lights. In order to prepare the sample, quartz grains that had been protected from light during the collection process needed isolated and sieved to a known range of grain sizes. First, two centimeters of sediment was removed from each side of the OSL sample and discarded. The remaining sediment was wet-sieved to a narrow range of grain sizes, ideally ones that are within the ranges of very fine to fine sand ( $63\text{ }\mu\text{m}$  –  $250\text{ }\mu\text{m}$ ) (Aitken 1998) and would still retain a large portion of collected material. The relevant samples were sieved to  $90\text{ }\mu\text{m}$  –  $150\text{ }\mu\text{m}$  or  $90\text{ }\mu\text{m}$  –  $180\text{ }\mu\text{m}$ . The sieved sediment was washed with 10% hydrochloric acid to remove carbonates, then bleach was used to remove organic material. Although quartz was prioritized for dating, feldspar was also collected from the samples as back-up in case quartz failed to produce acceptable results. A  $2.58\text{ g/cm}^3$  solution of sodium polytungstate was used to separate grains of feldspar from the rest of the sample, which were collected and stored at the lab. A  $2.70\text{ g/cm}^3$  solution of sodium polytungstate was used to separate grains of quartz from the rest of the sample. Hydrofluoric acid was applied to the quartz to etch it and remove any remaining feldspar.

Before the equivalent dose samples were tested on the OSL reader, the dose rate samples and moisture samples were prepared and analyzed. The dose rate sample was homogenized with a mortar and pestle, and a representative split of about 20 g was shipped to Chemex in Elko, Nevada to undergo inductively coupled plasma mass spectrometry (ICP-MS) and inductively coupled plasma atomic emission spectroscopy (ICP-AES) to

identify radioisotopes of potassium, uranium, thorium, and rubidium. The moisture sample was measured, left to dry in a warm oven overnight until completely dry, and then measured again so that the water content could be calculated through the difference in weight.

*Small Aliquot OSL.* The OSL testing on the equivalent dose samples was performed on a Risø TL/OSL DA-20 reader with a single-grain attachment (Bøtter-Jensen et al. 2000). Initial testing used small aliquots under the single-aliquot regenerative (SAR) protocol (Murray and Wintle 2000). Aliquots of sediment measuring 2 mm in diameter were mounted on metal disks with a silicone-based spray adhesive. Once the aliquots were loaded onto the Risø machine, the protocol began by exposing the aliquot to light and measuring the natural luminescence response. The machine took the aliquots through a series of regenerative cycles which built a response curve that allowed for equivalent dose identification. For small aliquot testing, the machine used blue-green LEDs (470 nm) for stimulation, and photons were detected with a 7-mm UV filter.

The OSL reader applied a series of regenerative dose cycles to the sediment to build a luminescence response curve that allowed equivalent dose calculation. Each regenerative cycle dosed the quartz with beta particles from a  $^{90}\text{Sr}/^{90}\text{Y}$  source, then preheated it for 10 seconds at  $240^{\circ}\text{C}$ , stimulated it with 470 nm (blue) diodes at 90% power for 40 seconds, and measured the luminescence response. The aliquots were then given a test dose (100 seconds of beta particles), followed by cut heat of  $160^{\circ}\text{C}$ , and stimulated it with the blue diodes and measured the luminescence response. The next regenerative cycle gave the aliquot an increased dose of radiation, then completed the subsequent actions as before. All measurements were conducted at  $125^{\circ}\text{C}$ . The regenerative cycle described above was run

a total of five times on an aliquot of sediment, with each initial dose of radiation changing as the procedure continued, the final cycle repeating the same dose that was given to the sample at the beginning of the regeneration process. The doses of beta radiation applied to the LCC samples were as follows: 0 seconds (this cycle measures the initial luminescence), 50 seconds, 100 seconds, 150 seconds, and 50 seconds. At the end of the process, an infrared source stimulated the sample to check for feldspar. Six small aliquots were tested at a time for each sample.

*Single-Grain OSL.* After initial testing of the small aliquots, signs of partial bleaching were observed (Figure 8; Figure 9; Appendix A). Since the shelter was formed in sandstone, grains from the shelter ceiling were undoubtedly a part of the floor deposit, and subsequently influenced the OSL age results. Since these grains would not be fully bleached, the results would show mixing of the reset eolian and non-reset roof fall grains and ultimately produce excessively old ages, similar to those observed at Jinmium Shelter (Roberts et al. 1998). Single-grain OSL was performed on the LCC samples on the Risø TL/OSL DA-20 reader with a single-grain attachment at the Utah State University Luminescence Lab, using the SAR protocol (Murray and Wintle 2000). A green laser (532 nm) at 90% power provided the stimulation source. After dosing the sample, it was heated to 200 °C for 10 seconds and then stimulated by the laser for 1 second. The doses during regeneration followed the same pattern as the small aliquot tests. Test doses of 10 seconds were applied between regeneration cycles and cut heat of 160°C was applied for 10 seconds before stimulation. The final luminescence signal was measured by subtracting the average signal during the last 0.2 seconds of stimulation from the initial 0.05 seconds of stimulation.

### *Age-Depth Model*

Age-depth models were constructed using the ages produced by both the small aliquot OSL (Figure 11) and the single-grain OSL (Figure 12), as well as the radiocarbon ages (Figure 10) from the northern exposure used in the environmental reconstruction (Minckley et al. 2015). The updated age-depth model from the previously acquired radiocarbon ages was needed for comparison with the OSL models in order to observe any distinguishable differences. Both models were calculated using the Bchron package in R (Haslett and Parnell 2008). This software used Bayesian statistics and piecewise linear accumulations to create a model that was more accurate than “classical” models (Blaauw 2010), taking particular care to represent the best error ranges. In a comparison of existing programs that use Bayesian analysis in the construction of age-depth models (Traschel and Telford 2007), the predominant critique was that Bchron tends to over-estimate the error ranges. Even so, the models provided by Bchron have performed well when compared to similar software packages (Traschel and Telford 2007).

In order to construct the models in Bchron, tables including uncalibrated ages,  $2\sigma$  error ranges, sample depth, and approximate sample thickness were loaded into R (See Appendix D for complete R code). Bchron requires the user to specify a calibration curve to apply towards each age, so IntCal13 (Reimer et al. 2013) was used to calibrate the radiocarbon dates in cal yr BP. A normal distribution curve was applied to the OSL ages. While a normal distribution curve is included with the Bchron package, it does not go beyond 50,000 BP. I created a user-defined curve called “ExpandedNormal” (see Appendix D for R code and data tables) that would extend the range of the normal distribution curve



to 100,000 BP and applied it to all OSL ages. The range of depths modeled were 0-140 cm, which an age prediction every 1 cm. Otherwise, I left all other parameters within Bchron at their default settings.

In order to compare the radiocarbon and OSL chronologies, the ages need to be modeled through the entire deposit. This was achieved by using the *bchronology* function in Bchron. By providing the software with uncalibrated ages, error ranges, depth values, and a calibration curve (IntCal13 for radiocarbon dates and normal distribution for OSL), Bchron provides an age-depth model based on the processes described by Haslett and Parnell (2008). Based on the plots for Wall AB (Figures 10-12), there is an immediate distinction between the radiocarbon and OSL models based on the overall breadth of OSL error ranges and the exceptionally narrow error ranges in the upper elevations of the radiocarbon models due to the greater number of direct ages.

By using the age-depth models to apply ages to the granulometry samples, a one-to-one comparison could be made between chronologies. Using the *summary* function in R, I generated tables for each age-depth model (Appendix D). Age predictions at 2.5%, 10%, 50%, 90%, and 97.5% quantiles were provided for each centimeter of depth through the exposure. In order to acquire a 95% confidence interval, the values provided at the 2.5% and 97.5% quantiles were rounded to the nearest decade and used as the error range extremities for the corresponding granulometry sample. In order to find a central age, the median for each pair of error range extremities was identified by adding them together and dividing the result by two. The result was rounded to the nearest decade as well. Bchron produced an age-depth model for the radiocarbon ages that was calibrated with the year 1950 as the present day. The ages produced by OSL, on the other hand, use the terminology

“ka,” which refers to how many thousands of years had passed since deposition up to the date when the sample was analyzed. In order to compare the radiocarbon and OSL, the radiocarbon ages needed updated to a present day in the year 2010. This was done by adding 60 years to the 2.5% and 97.5% quantiles produced by Bchron, rounding them to the nearest decade, and proceeding with the rest of the previously described calculations.

### *Grain Size Analysis*

Before any of the granulometry samples could be analyzed, they were sifted to isolate the fine sediments. A set of nested screens were used to perform the sifting, with a two-millimeter screen resting on top of a one-millimeter screen, which rested on top of a solid-bottomed pan. The sifting process separated all samples into three size classes: particles greater than two millimeters, particles less than two millimeters but greater than one millimeter, and particles less than one millimeter. The fine sediment less than one millimeter was poured through a sample splitter, and then recombined in order to ensure it was properly mixed. Finally, each size group was weighed and bagged.

After isolating particles less than one millimeter, they were taken to the Utah State University geochemistry lab for grain-size analysis on a Malvern Mastersizer 2000 with a Hydro 2000 MU attachment. The instrument used laser diffraction to analyze the particle size distribution in the sediment and was capable of detecting particles as small as 0.02 microns (Malvern Instruments 2007). Laser diffraction functions by measuring the light patterns that result when the particles are exposed to a laser, and the patterns are interpreted into grain sizes through “Mie scattering theory” (Mie 1908). That is, when light comes into

contact with a particle, the light is scattered in predictable patterns, which the instrument can detect and interpret into a grain size.

The first step in the process was to turn on the instrument and put a fresh beaker of water under the pump. The pump was set to 3,000 revolutions per minute and turned on. The sediment was analyzed according to a pre-programmed operating procedure that takes three measurements for 30 seconds each. As sediment was added to the water, the obscuration level increases. In order to get an acceptable reading for these samples, the obscuration needed to be between 5% and 15%. Before the sample could be analyzed, it needed sonicated for a minute. This caused any lingering clumps of fine sediment to break apart and also caused the obscuration to increase. I typically added enough sediment to the water prior to sonication so that it was at about 5% obscuration, and after sonicating, the obscuration would be approximately 10% making it ready for analysis. After the machine had finished taking measurements, the beaker of sediment was dumped, and the system rinsed by allowing it to pump through two 1,000 milliliter beakers of deionized water for two minutes each. After that, another 1,000-milliliter beaker of deionized water was placed under the pump, and the analysis would begin again. Each sediment sample had three aliquots analyzed on the Malvern, and each aliquot was measured three times by the instrument. Altogether, each sediment sample had a set of nine total granulometry readings. After completing all of these measurements, I was able to begin organizing the data in preparation for analysis relating it to the site stratigraphy and chronology.

In order to simplify the set of six readings produced by the Malvern for each sample, I calculated the average of the six readings for each grain size category. The data were then corrected to ensure that the percentages provided for each grain size category were a proper

representation of the entire sample rather than just the fine fraction less than one millimeter. The total sample weight was divided by the weight of the sediment less than one millimeter in diameter in order to identify the percentage of the sample that was less than one millimeter. The averaged quantity for each grain size category was divided by the fine fraction weight percentage in order to ensure that the grain size percentage is in appropriate proportion to the whole sample. In order to calculate the significant statistical values described above, I inserted the adjusted values into the GRADISTAT (Blott and Pye 2001) spreadsheet, which automatically performed the calculations.

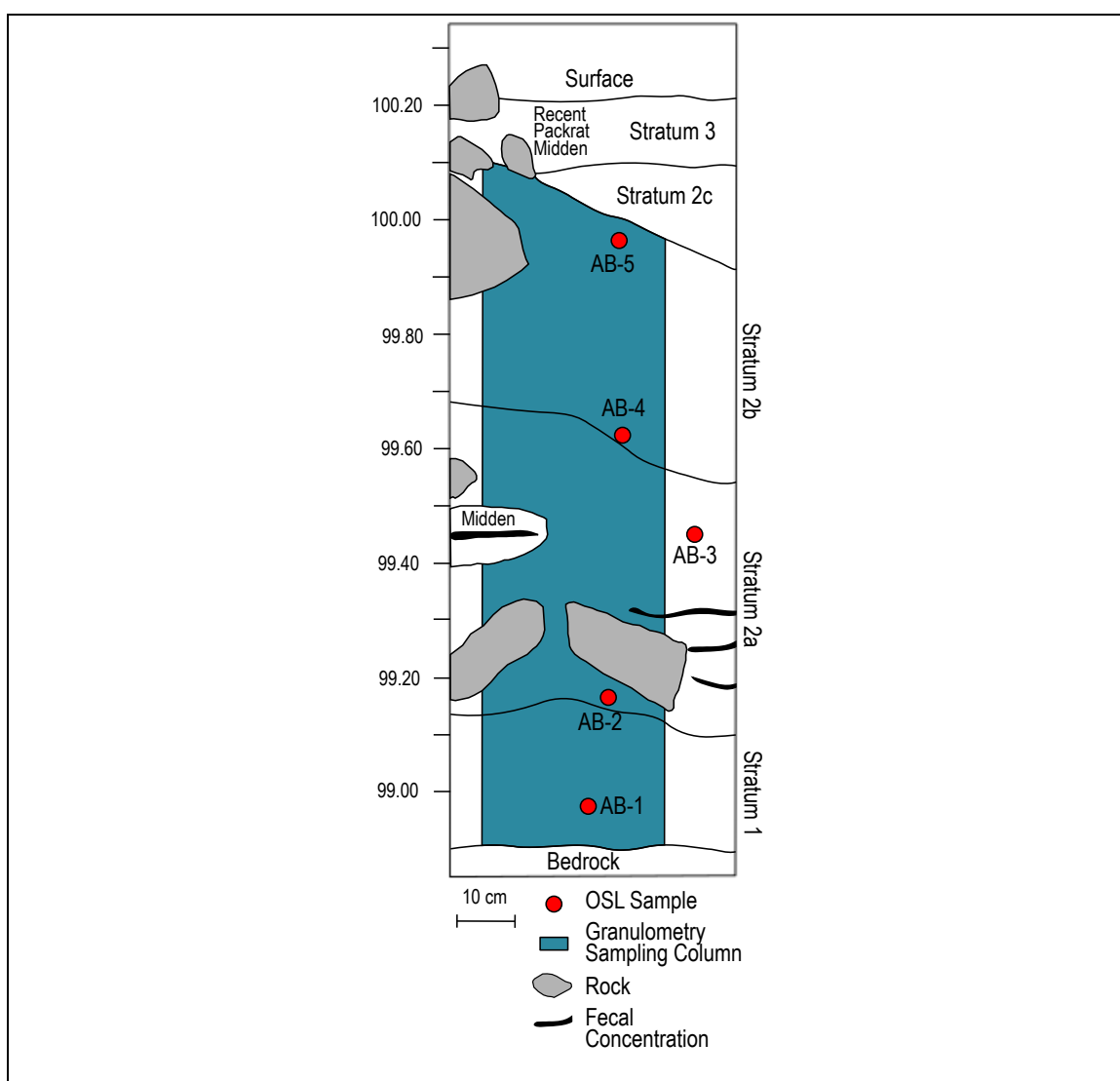
## CHAPTER 4:

### RESULTS

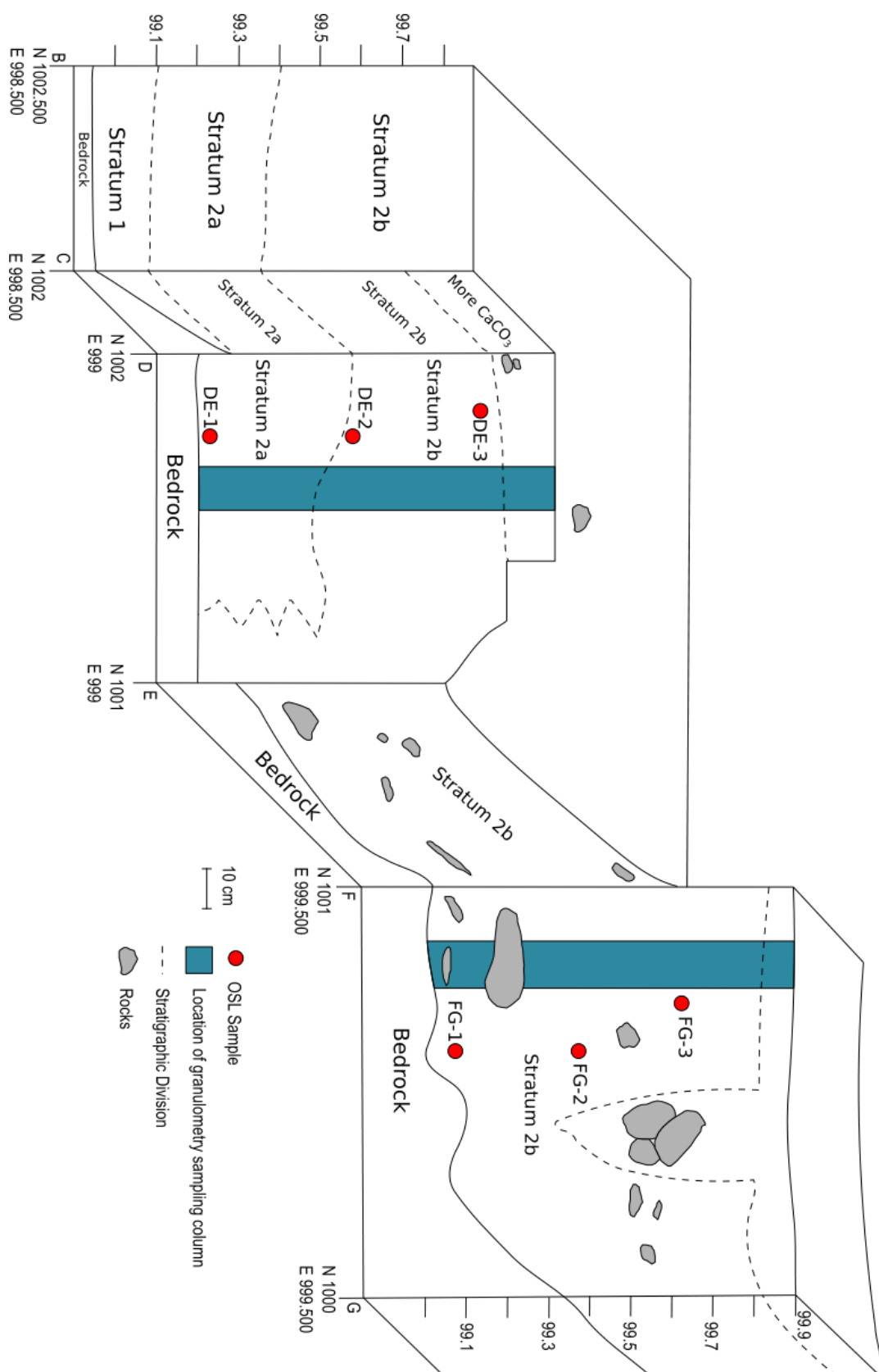
#### *Stratigraphy*

Stratum 1 was situated immediately above bedrock. While it was divided into two subunits in 2012 (Kornfeld et al. 2012), Strata 1a and 1b were consolidated into a single unit called Stratum 1 due to the absence of distinguishing characteristics necessitating the subdivision. Stratum 2 is marked by darker sediment color and contains more silt and clay than Stratum 1. It makes up the majority of the deposit and is divided into 3 subunits. Stratum 2a was not altered from the previous designation. It is distinguished by the high content of bighorn sheep feces, which in Wall AB was periodically exposed in thin, curvilinear concentrations. Stratum 2b was a consolidation of Strata 2b and 2c from 2012 (Kornfeld et al. 2012). Fecal pellets are more dispersed through 2b, and there is an increase

in grain size accompanied by the presence of angular to subangular sandstone clasts 3-5 cm in diameter, which are probably the products of roof fall. Stratum 2b also contained some  $\text{CaCO}_3$  flecking, which differentiates it from overlying strata. Stratum 2c was previously identified as Stratum 2d in 2012 (Kornfeld et al. 2012). It contains a mixture of bedded eolian sands and animal midden materials. Stratum 3 is made of a Holocene packrat midden. The establishment of visible stratigraphic boundaries then allowed for strategic sampling and a contextualized analysis of those samples.



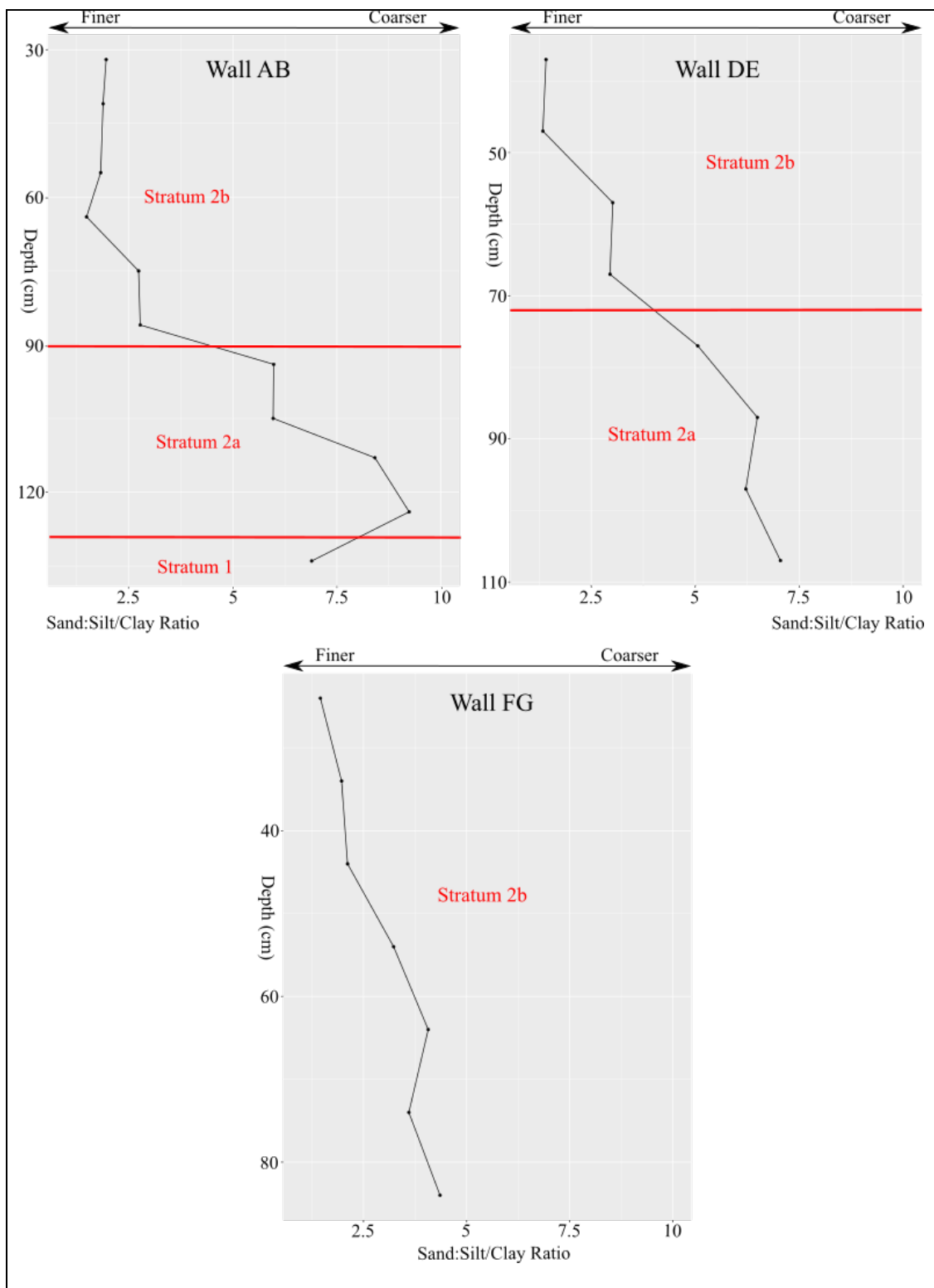
**Figure 5. Stratigraphic profile of Wall AB.**



**Figure 6. Stratigraphic profile of the eastern exposure, including Walls DE and FG.**

### *Granulometry*

For the purpose of clarity, it should be reiterated that the collection of the granulometry samples had three primary purposes: 1) to provide a new set of environmental data from the LCC sediments, 2) to provide insight into the stratigraphy and formation history of the site, and 3) provide points (specifically points associated with environmental data) on each of the profiles targeted for age-depth modeling that could be used for comparing the relevant age-depth models. In any case, after the granulometry data was collected and simplified, it was inserted into the GRADISTAT (Blott and Pye 2001) spreadsheet (see Appendix C for all GRADISTAT results). It was immediately clear that the majority of the deposit was fine sand that was poorly sorted and finely skewed. After creating plots demonstrating the changes in the sand:silt/clay ratio (Figure 7), the first notable quality observed was the increasing deposition of silt and clay over time exhibited in all three exposures. In addition, there was a slight but noticeable increase in overall silt/clay content as the sampling columns moved closer to the shelter entrance. While the sediment from Wall AB possessed the most sand in relation to silt/clay, the sand proportions declined in Wall DE, and then declined even more in Wall FG. But before these results could be considered any further, they required a chronology.

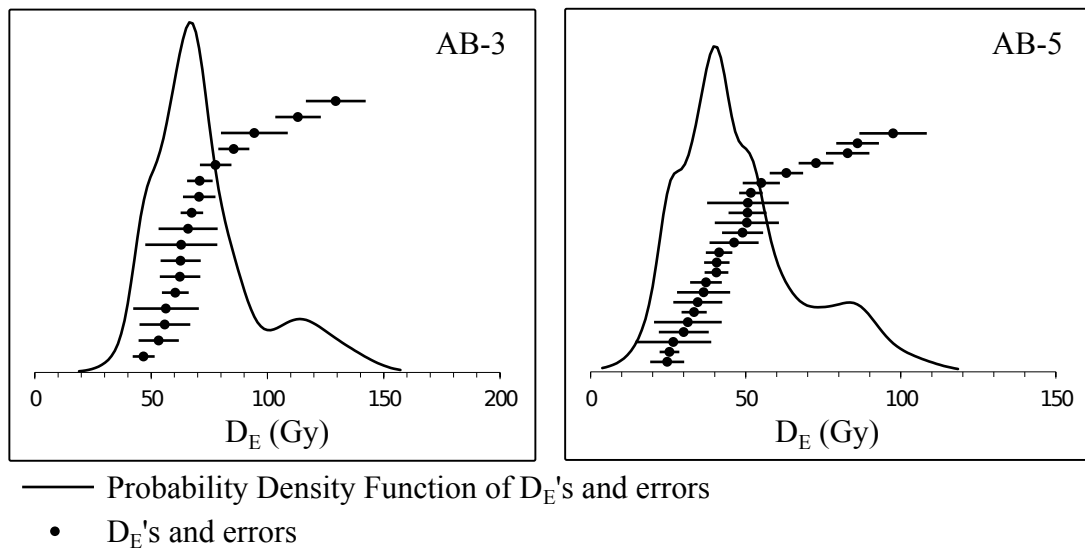


**Figure 7. Sand:Silt/Clay ratio in Wall AB, Wall DE, and Wall FG. Higher numbers on the x-axis indicate more sand, while lower numbers indicate more silt/clay.**

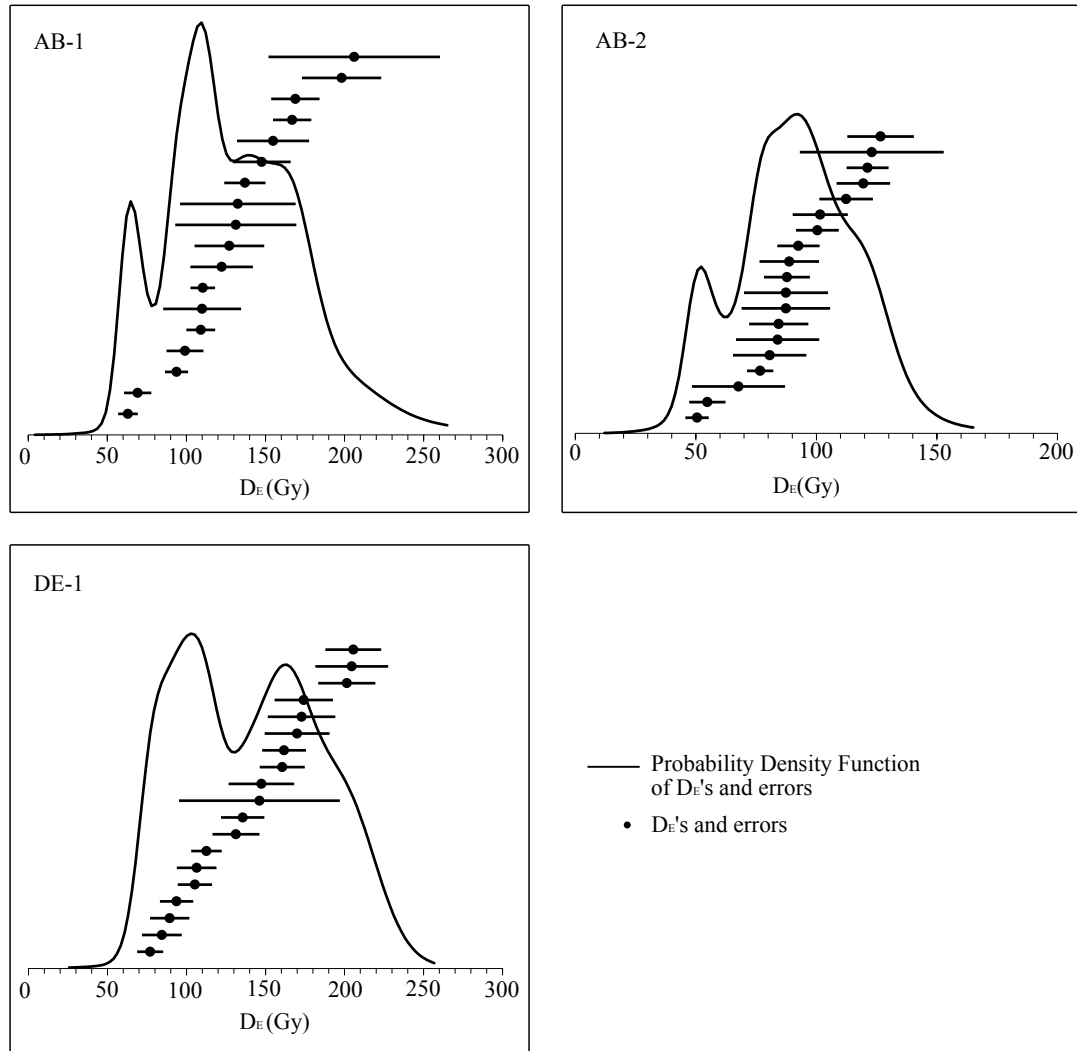


## Chronology

The OSL samples were initially run as small aliquots (Table 3; Table 5; Appendix A). However, it became clear that there were partially bleached grains in the sediment (Table 3; Figure 8; Figure 9; Appendix A). As a result, the small aliquot OSL ages could easily overestimate the age of sediment deposition. This is because there are many grains of sediment included on a single small aliquot which have their luminescence measured together as a unit. If there are partially bleached grains in the aliquot, the overall luminescence of the aliquot will be brighter than a fully bleached sample, and consequently the age calculations will be inappropriately old. A few common signs of partial bleaching include: a  $D_E$  distribution with a long tail stretching toward higher levels of radiation



**Figure 8. Probability functions from small aliquot OSL results for samples (a) AB-3 and (b) AB-5. These results are clear examples of samples that have been contaminated by partially bleached grains on account of the skewed  $D_E$  distribution.**



**Figure 9. Probability functions and radial plots from small aliquot OSL results for samples AB-1, AB-2, and DE-1. These results are clear examples of samples that have been contaminated by partially bleached grains on account of polymodal  $D_E$  distribution.**

(Murray and Roberts 1997), polymodal  $D_E$  distribution (Bateman et al. 2007), and high overdispersion (OD) values, typically greater than 20% (Galbraith and Roberts 2012). Samples AB-3 and AB-5 are good examples of skewed distributions (Figure 8; Appendix A), while AB-1, AB-2, and DE-1 are clear examples of polymodal distributions (Figure 9; Appendix A). All but two samples (AB-4 and DE-2) had overdispersions over 20% (Table

Table 3. Small Aliquot OSL results

Sample Number	USU Lab Number	Number of Aliquots <sup>4</sup>	Dose Rate (Gy)	Equivalent Dose (Gy) <sup>5</sup>	Overdispersion (%)	OSL Age (yr) $\pm 2 \text{ se}^6$
AB-1	USU-2326	18 (27)	$1.07 \pm 0.05$	$71.53 \pm 14.72$	$28.9 \pm 6.0$	<b><math>66.81 \pm 15.16</math></b>
AB-2	USU-2327	19 (28)	$1.16 \pm 0.06$	$59.62 \pm 11.80$	$22.5 \pm 4.9$	<b><math>51.57 \pm 11.33</math></b>
AB-3	USU-2328	17 (31)	$1.76 \pm 0.08$	$51.91 \pm 11.69$	$24.0 \pm 5.3$	<b><math>29.46 \pm 7.20</math></b>
AB-4	USU-2329	19 (25)	$1.82 \pm 0.08$	$48.35 \pm 6.50$	$17.6 \pm 3.8$	<b><math>26.56 \pm 4.28</math></b>
AB-5	USU-2330	24 (29)	$1.95 \pm 0.09$	$29.50 \pm 6.85$	$34.1 \pm 6.0$	<b><math>15.17 \pm 3.81</math></b>
DE-1	USU-2331	19 (33)	$1.12 \pm 0.05$	$87.39 \pm 16.10$	$28.6 \pm 5.4$	<b><math>78.26 \pm 16.24</math></b>
DE-2	USU-2332	20 (34)	$1.45 \pm 0.07$	$58.50 \pm 9.97$	$18.1 \pm 4.2$	<b><math>40.27 \pm 7.85</math></b>
DE-3	USU-2333	20 (24)	$1.85 \pm 0.08$	$54.63 \pm 9.21$	$22.8 \pm 4.7$	<b><math>29.51 \pm 5.71</math></b>
FG-1	USU-2334	20 (23)	$1.40 \pm 0.07$	$39.04 \pm 13.23$	$39.0 \pm 6.9$	<b><math>27.83 \pm 9.79</math></b>
FG-2	USU-2335	19 (24)	$1.73 \pm 0.08$	$61.56 \pm 8.97$	$27.2 \pm 5.6$	<b><math>35.55 \pm 6.18</math></b>
FG-3	USU-2336	14 (25)	$2.05 \pm 0.09$	$48.70 \pm 8.50$	$23.2 \pm 5.8$	<b><math>23.79 \pm 4.73</math></b>

<sup>4</sup> Aliquots used in age calculation with total number of aliquots analyzed in parentheses

<sup>5</sup> Calculated using Minimum Age Model from Galbraith and Roberts (2012)

<sup>6</sup> Age datum is 2010.

Table 4. Single grain OSL results

Sample Number	USU Lab Number	Number of Grains <sup>7</sup>	Dose Rate (Gy)	Equivalent Dose (Gy) <sup>8</sup>	Overdispersion (%)	OSL Age (yr) $\pm 2 \text{ se}^9$
AB-1	USU-2326	80 (1400)	$1.07 \pm 0.05$	$66.48 \pm 9.91$	$38.1 \pm 4.1$	<b><math>62.09 \pm 11.00</math></b>
AB-2	USU-2327	38 (900)	$1.16 \pm 0.06$	$42.24 \pm 7.34$	$28.2 \pm 5.4$	<b><math>36.53 \pm 7.24</math></b>
AB-3	USU-2328	94 (1300)	$1.76 \pm 0.08$	$42.15 \pm 5.54$	$38.0 \pm 4.0$	<b><math>23.93 \pm 3.88</math></b>
AB-4	USU-2329	60 (600)	$1.82 \pm 0.08$	$38.18 \pm 4.53$	$21.6 \pm 3.5$	<b><math>20.97 \pm 3.19</math></b>
AB-5	USU-2330	63 (700)	$1.95 \pm 0.09$	$27.96 \pm 5.37$	$38.1 \pm 4.5$	<b><math>14.37 \pm 3.08</math></b>
DE-1	USU-2331	59 (700)	$1.12 \pm 0.05$	$97.94 \pm 12.57$	$27.5 \pm 3.9$	<b><math>87.70 \pm 14.03</math></b>
DE-2	USU-2332	47 (500)	$1.45 \pm 0.07$	$34.25 \pm 4.46$	$36.0 \pm 4.7$	<b><math>23.58 \pm 3.80</math></b>
DE-3	USU-2333	73 (600)	$1.85 \pm 0.08$	$29.37 \pm 3.87$	$28.9 \pm 3.5$	<b><math>15.86 \pm 2.58</math></b>
FG-1	USU-2334	47 (900)	$1.40 \pm 0.07$	$52.49 \pm 9.96$	$32.4 \pm 5.2$	<b><math>37.42 \pm 7.94</math></b>
FG-2	USU-2335	63 (900)	$1.73 \pm 0.08$	$52.41 \pm 10.17$	$28.3 \pm 4.4$	<b><math>30.27 \pm 6.54</math></b>
FG-3	USU-2336	72 (700)	$2.05 \pm 0.09$	$37.20 \pm 4.13$	$25.7 \pm 3.6$	<b><math>18.17 \pm 2.66</math></b>

<sup>7</sup> Grains used in age calculation with total number of grains analyzed in parentheses

<sup>8</sup> Calculated using Minimum Age Model from Galbraith and Roberts (2012)

<sup>9</sup> Age datum is 2010.

3), but those two samples were still close enough to 20% to be treated cautiously on the basis of overdispersion, particularly in light of the consistently large values through the deposit.

In order to improve the OSL ages, single-grain analysis was performed on all samples (Table 4; Table 5; Appendix A). While overall  $D_E$  distributions still showed the characteristics of incomplete solar resetting, the single-grain results allowed for the productive application of the minimum age model (MAM; Galbraith and Roberts 2012).

The MAM is frequently applied to single-grain samples that include both fully and partially bleached grains. It attempts to target the completely bleached grains and provide the youngest possible age for the sample. Partially bleached grains can return deceptively old ages (Roberts et al. 1998; 1999), and by disregarding them as much as possible, the model provides an improved calculation of the sample age. It should be noted that the MAM could not be applied as effectively on the small aliquot samples, since one sample could contain any ratio of fully bleached to partially bleached grains, and there would be no consistency in the ratio from sample to sample. On the other hand, the single grain testing allowed for the two types of grains to be more readily isolated and the model to work more successfully. In any case, the single-grain OSL produced on the whole (with two exceptions: DE-1 and FG-1) noticeably younger ages than the small aliquot OSL. In addition, while the single-grain results were entirely in proper chronological order, there was a reversal in the small aliquot results. Namely, the small aliquot age for FG-2 was older than FG-1.

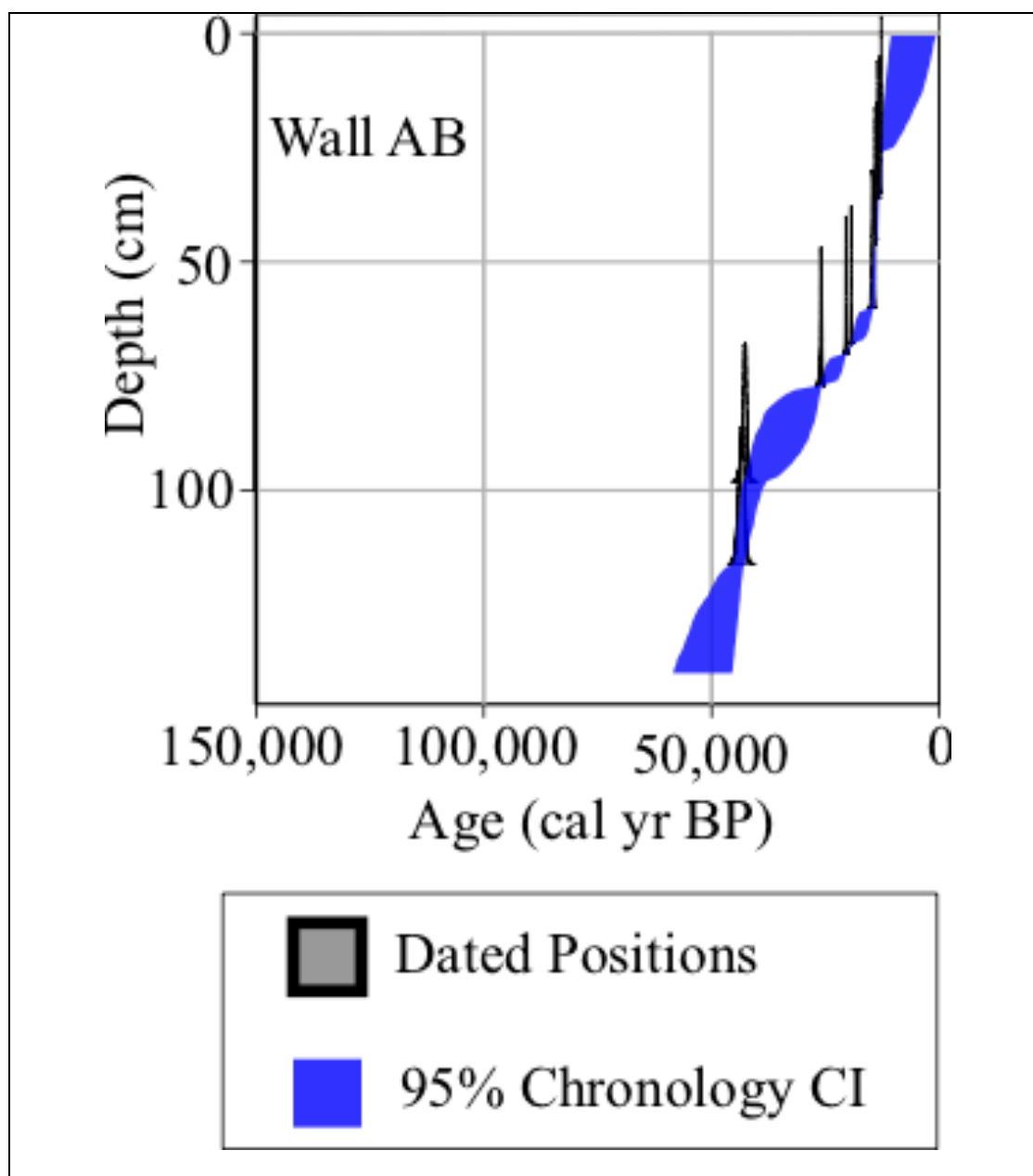
Table 5. Dose rate information

Sample Number	USU Lab Number	H <sub>2</sub> O (%)	Grain Size (μm)	K%	Rb (ppm)	Th (ppm)	U (ppm)	Cosmic (Gy/ka)
AB-1	USU-2326	0.8	90-150	0.57±0.01	17.9±0.7	1.3±0.2	1.2±0.1	0.16±0.02
AB-2	USU-2327	1.1	90-180	0.65±0.02	20.2±0.8	1.5±0.2	1.2±0.1	0.17±0.02
AB-3	USU-2328	0.8	90-180	1.02±0.03	33.6±1.3	3.5±0.3	1.7±0.1	0.17±0.02
AB-4	USU-2329	1.1	90-180	1.09±0.03	35.8±1.4	3.7±0.3	1.6±0.1	0.17±0.02
AB-5	USU-2330	0.8	90-180	1.16±0.03	35.1±1.4	3.8±0.3	1.8±0.1	0.18±0.02
DE-1	USU-2331	0.7	75-150	0.60±0.02	18.3±0.7	1.5±0.2	1.2±0.1	0.17±0.02
DE-2	USU-2332	1.4	75-150	0.84±0.02	25.9±1.0	2.3±0.2	1.4±0.1	0.17±0.02
DE-3	USU-2333	1.2	75-150	1.12±0.03	34.8±1.4	3.4±0.3	1.6±0.1	0.18±0.02
FG-1	USU-2334	1.1	75-150	0.78±0.02	22.8±0.9	1.7±0.2	1.6±0.1	0.17±0.02
FG-2	USU-2335	1.8	75-150	1.04±0.03	30.6±1.2	2.8±0.3	1.6±0.1	0.18±0.02
FG-3	USU-2336	1.4	75-150	1.25±0.03	38.1±1.5	3.7±0.3	1.8±0.1	0.18±0.02

### *Age-Depth Models Results and Analysis*

*Results.* After the age-depth models had been generated with Bchron, it was possible to visualize them using the *plot* function in R (Figures 10-12). After using the models to estimate ages for the granulometry samples (Table 6), plots were created for the results (Figure 13). The small aliquot and single-grain OSL chronologies both possess the distinctively large error ranges associated with OSL ages (Figures 11-12). When the modeled mean ages of the granulometry samples from both the small aliquot and single-grain OSL chronologies are shown as overlapping line plots (Figure 13), some differences were immediately visible, particularly in the amount of space between the single-grain OSL and small aliquot OSL results in Walls AB and DE. It should be mentioned that while the single-grain and small aliquot OSL results in Wall FG appear quite similar, the small aliquot results should be disregarded not only due to the innate problems with small aliquot OSL at the site, but also because of the age reversal with sample FG-2.

*Analysis.* A paired 2-tailed t-test performed on the mean ages of the granulometry samples according to the single-grain OSL and small aliquot OSL resulted in ( $t = 0$ ;  $df = 10$ ;  $p < 0.05$ ) for Wall AB, ( $t = 0.01$ ;  $df = 10$ ;  $p < 0.05$ ) for Wall DE, and ( $t = 0.26$ ;  $df = 10$ ;  $p < 0.05$ ) for Wall FG (Table 7). This indicates that there is a significant difference between the two OSL age-depth models in Wall DE and AB. Even though the t-test did not



**Figure 10. Age-Depth model for radiocarbon samples in Wall AB.**

indicate such difference between single-grain and small aliquot OSL in Wall FG, due to the age reversal with sample FG-2, the small aliquot age-depth model is particularly unreliable and therefore the results of the t-test cannot be considered valid. Overall, these results continue to support the problems with using small aliquot OSL in a rockshelter setting, and that single-grain OSL is preferable.

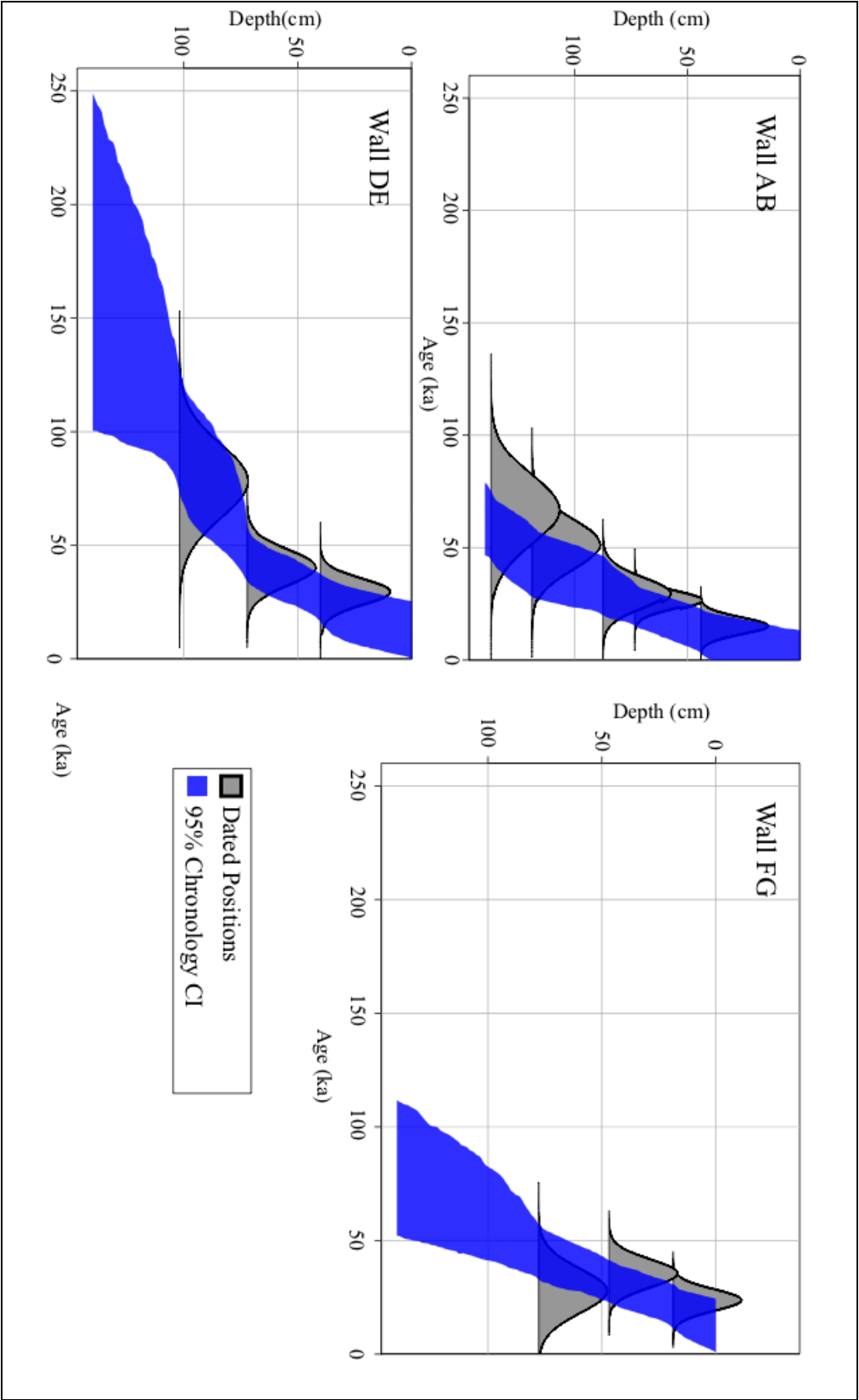


Figure 11. Age-Depth models for small aliquot tests on (a) Wall AB, (b) Wall DE, and (c) Wall FG OSL samples.

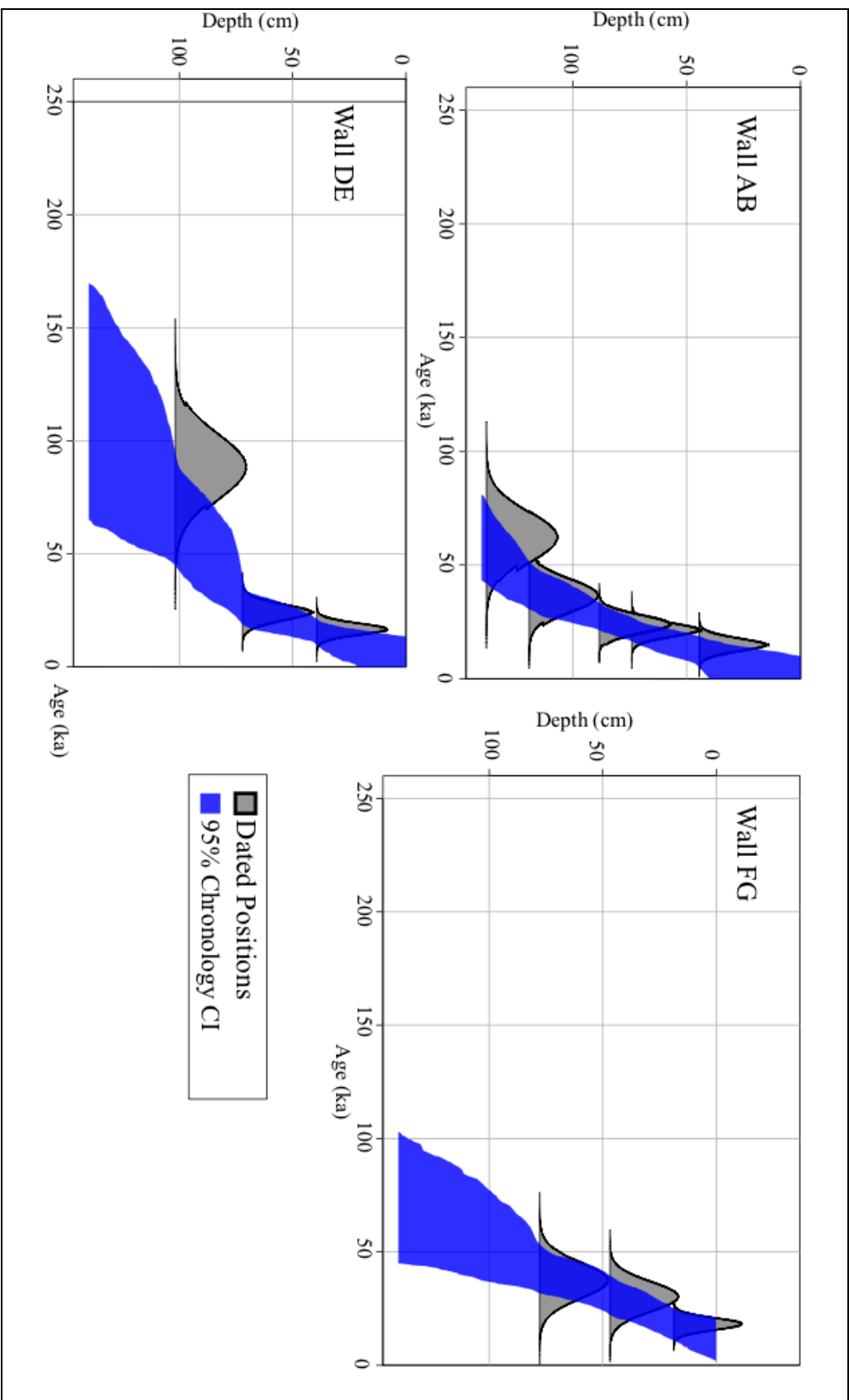


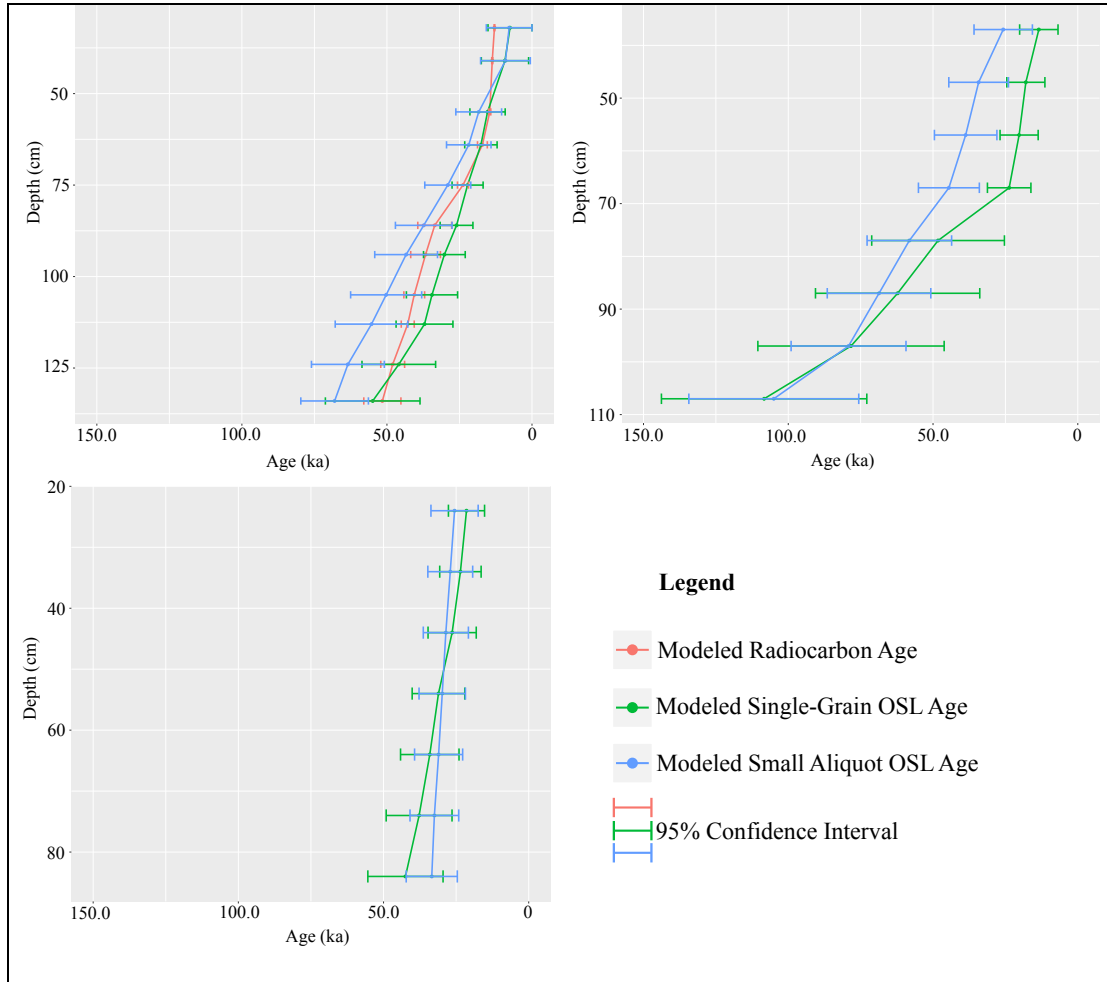
Figure 12. Age-Depth models for single-grain tests on (a) Wall AB, (b) Wall DE, and (c) Wall FG OSL samples.



Since the single-grain OSL age-depth model has been demonstrated as preferable over the small aliquot, the single-grain model should then be checked against the radiocarbon age-depth model from Wall AB for similarities. When the modeled granulometry ages from both the radiocarbon and single-grain OSL age-depth models from Wall AB are shown as overlapping line plots (Figure 13), possess a few places of close proximity, particularly between 50 cm and 75 cm beneath the surface, while also possessing areas where there appears to be substantial difference, with the single-grain OSL maintaining noticeably younger ages and the central radiocarbon ages tending to line up near the older extremities of the error range from the single-grain OSL model. The

Table 6. Modeled ages of granulometry samples.

Sample Number	Depth (cm)	Stratum	$^{14}\text{C}$ Age (cal BP <sub>2010</sub> ± 95% Conf. Int.)	Single Grain OSL (ka ± 95% Conf. Int.)	Small Aliquot OSL (ka ± 95% Conf. Int.)
AB-1	134	1	51,580 ± 6,400	54.91 ± 16.31	68.04 ± 11.65
AB-2	124	2a	48,020 ± 4,110	45.91 ± 12.69	63.46 ± 12.56
AB-3	113	2a	42,830 ± 2,240	37.05 ± 9.8	55.32 ± 12.51
AB-4	105	2a	40,590 ± 3,580	34.47 ± 8.82	50.27 ± 12.25
AB-5	94	2a	36,690 ± 5,120	30.2 ± 7.19	43.39 ± 10.82
AB-6	86	2b	33,530 ± 5,840	26.01 ± 5.65	37.32 ± 9.76
AB-7	75	2b	23,790 ± 1,890	22.22 ± 5.35	29.03 ± 7.93
AB-8	64	2b	17,090 ± 1,690	17.61 ± 5.58	21.79 ± 7.67
AB-9	55	2b	14,560 ± 350	15.32 ± 6.08	18.36 ± 7.89
AB10	41	2b	13,700 ± 180	9.32 ± 8.15	9.15 ± 8.57
AB-11	32	2b	12,940 ± 130	7.58 ± 7.58	7.87 ± 7.87
DE-1	107	1	-	108.34 ± 35.47	105 ± 29.34
DE-2	97	2a	-	78.33 ± 32.17	79.18 ± 19.84
DE-3	87	2a	-	62.23 ± 28.37	68.65 ± 17.88
DE-4	77	2a	-	48.26 ± 22.92	58.18 ± 14.6
DE-5	67	2a	-	23.7 ± 7.51	44.52 ± 10.52
DE-6	57	2b	-	20.27 ± 6.58	38.73 ± 10.79
DE-7	47	2b	-	17.94 ± 6.58	34.25 ± 10.3
DE-8	37	2b	-	13.46 ± 6.63	25.76 ± 10.08
FG-1	84	1	-	42.45 ± 12.95	33.39 ± 8.8
FG-2	74	2b	-	37.75 ± 11.34	32.49 ± 8.39
FG-3	64	2b	-	34.07 ± 10.07	31.03 ± 8.28
FG-4	54	2b	-	31.08 ± 9.06	29.78 ± 7.99
FG-5	44	2b	-	26.37 ± 8.3	28.54 ± 7.77
FG-6	34	2b	-	23.52 ± 7.13	27.02 ± 7.72
FG-7	24	2b	-	21.43 ± 6.22	25.54 ± 8.13



**Figure 13. Modeled mean ages for the granulometry samples in (a) Wall AB, (b) Wall DE, and (c) Wall FG.**

differences are accentuated by a paired two-tailed t-test on the mean granulometry ages from the radiocarbon and single-grain OSL chronologies in Wall AB ( $t = 0.001$ ;  $df = 10$ ;  $p < 0.05$ ) (Table 7). This t-test supports the idea that the radiocarbon and OSL modeled ages would be fundamentally different, and rather informs us that we cannot dismiss the null hypothesis and that the two chronologies are not fundamentally different.

Additionally, the null hypothesis was dismissed when a two-tailed t-test was performed on the granulometry samples according to the radiocarbon and small aliquot

OSL age depth models ( $t = 0.01$ ;  $df = 10$ ;  $p < 0.05$ ) (Table 7). This should not be too surprising considering the gap that exists between the predicted radiocarbon ages and the small aliquot OSL, particularly at depths lower than 90 cm (Figure 13). Neither does it detract from the conclusions that the single-grain is the more reliable of the OSL models.

Table 7. T-Tests on Modeled Ages on Granulometry Samples.

Wall AB						
Group 1	Group 2	t-value	df	p	Interpretation	Summary
Radiocarbon	Single Grain OSL	0.01	10	<0.05	Reject null hypothesis	Models are different
Radiocarbon	Small Aliquot OSL	0.01	10	<0.05	Reject null hypothesis	Models are different
Small Aliquot OSL	Single Grain OSL	0	10	<0.05	Reject null hypothesis	Models are different
Wall DE						
Group 1	Group 2	t-value	df	p	Interpretation	Summary
Small Aliquot OSL	Single Grain OSL	0.01	10	<0.05	Reject null hypothesis	Models are different
Wall FG						
Group 1	Group 2	t-value	df	p	Interpretation	Summary
Small Aliquot OSL	Single Grain OSL	0.22	10	<0.05	Fail to reject null hypothesis	Models are similar

## CHAPTER 5:

## DISCUSSION

The chronologies provided by this study offer a detailed perspective into the formation of the Last Canyon Cave deposit. But do these new data have the potential to change the Minckley et al. (2015) environmental interpretation? In this section, I will make the connection between the radiocarbon, small aliquot OSL, and single grain OSL age-depth models and an environmental interpretation. First, I will discuss the strengths and

weaknesses of each age-depth model, and what they all communicate about the formation of the deposit. Then I will provide an interpretation of the granulometry data according to each age-depth model. Finally, I will consider if any of these interpretations are potentially at odds with the Minckley et al. (2015). By doing this, I ensure that the data analysis remains consistent when applied to an interpretation of the site, as well as formulate conclusions concerning the reliability of the age-depth model used in Minckley et al. (2015).

### *Comparison of Chronologies*

*Small Aliquot OSL.* To begin with, it should be noted that the small aliquot OSL chronology presents an immediate concern due to the accuracy problems resulting from analyzing sediment that included partially bleached grains. As a result, the chronology produced by the small aliquot OSL should not be viewed as reliable set of ages, but rather as tainted by partially bleached grains of quartz. Even though the Minimum Age Model was applied to the small aliquot results, the influence of the partially bleached grains should still cause the results to appear inappropriately old. In addition, the small aliquot OSL returned an age reversal in Wall FG. However, the single-grain results provide a better way to examine the influence of partially bleached grains since the single-grain results show the spread of specific grains rather than data points which represent the average of many grains. Even though the small aliquot tests ultimately analyzed a greater number of grains overall than the single-grain tests, the inability to estimate the ratio of fully bleached to partially

bleached grains in each aliquot still makes the results difficult to meaningfully apply to the current study.

*Single Grain OSL.* Previous studies (Duller 2008; Galbraith et al. 1999, Roberts et al. 1998; 1999) have recommended the use of single-grain OSL and the application of a Minimum Age Model when dealing with sediments where partially bleached grains are mixed with grains that had been fully bleached upon deposition. Since a partially bleached grain will possess more electrons upon deposition than a fully bleached grain, the partially bleached grain will produce a greater luminescence signal and therefore appear older. This will result in small aliquot tests consistently providing deceptively old ages. By analyzing single grains, the analyst can achieve a finer level of detail that allows the exclusion of most grains impacted by partial bleaching and isolating the youngest age that could apply to the sample by using the MAM. By excluding most of the partially bleached grains and finding an acceptable minimum age, the single-grain analysis performed at LCC is ideally more accurate than small aliquot.

Even though the single-grain ages are more accurate than the small aliquot, they still suffer from very wide error ranges. The impact of these error ranges can be readily observed when comparing the OSL models in Figures 11 and 12 to the radiocarbon model in Figure 10. In spite of this, the single grain OSL provides an excellent way to perceive the sedimentation history of the LCC deposit by clarifying the relationship of the radiocarbon chronology to broader sedimentation processes and resolving the problems with the small aliquot OSL.

*Radiocarbon.* One of the greatest advantages of working with the radiocarbon age-depth model is that the error ranges are already narrower than either OSL method, and

when those ages are modeled, the error ranges are able to remain particularly narrow at elevations where a greater number of ages were acquired. Due to the nature of OSL sample collection, particularly the need to collect the sediment surrounding the  $D_E$  sample, it is uncommon to see OSL samples taken at a density similar to the number of radiocarbon ages that were acquired from the upper elevations of the LCC deposit. However, the radiocarbon tells us little about the deposit formation, and to use these ages as a basis for an age-depth model requires the major assumption that the analyzed material has always been at the elevation where it was discovered. If the sample moved locations from the time it was deposited to the time it was collected, the radiocarbon dating process itself could not perceive this problem, but an analysis of the surrounding sediments would be needed to identify processes that may have moved the sample.

#### *Comparative Accuracy of Age-Depth Models*

The most important aspect of assessing the relative accuracy of each age-depth model is that if the dating method is more accurate, then the age-depth model will be more accurate. As a result, the small aliquot OSL age-depth model cannot be considered reliably accurate when the samples were taken from mixed sediments. Further consideration needs to be given to the radiocarbon and single-grain OSL models. In order to appropriately assess these two age-depth models, the formation processes within the shelter and the assumptions made about them should be evaluated. First, as has been previously stated, the radiocarbon age-depth model assumes that the organic material sampled was deposited synchronously with the surrounding eolian sediment. It also assumes that the organic

material was not subject to bioturbation or the “old wood problem” (Schiffer 1986). Single-grain OSL is notable for its ability to recover from some of the negative impacts of sedimentary mixing. However, the MAM that was applied to the LCC samples assumes that the youngest ages are the most accurate, and that the primary sources of contamination in the sample would come from older grains. The underlying assumption is that younger sediment was not moved down to lower elevations. However, there is no physical evidence of such downward movement taking place, and there was no reason to doubt the accuracy of the MAM.

Two other questions need to be considered when addressing the accuracy of the single-grain OSL and radiocarbon age-depth models: 1) what specific event am I targeting to date, and 2) is one age-depth model enough, or are two models built on different methods needed? The first question addresses the fundamental concern of this thesis, that being the possibility that radiocarbon samples may not accurately date the dominant sedimentation processes. The data acquired suggests that radiocarbon samples are not the most reliable way to date granular sedimentation, but as Figure 13 shows, the modeled radiocarbon ages can still fall within the error ranges of single-grain OSL, even though the central ages for each sample do not necessarily maintain the desired proximity. In the case of LCC, the radiocarbon ages modeled for the granulometry samples in Wall AB all fell within the (albeit broad) error ranges for the single-grain OSL ages. The full error range of the modeled radiocarbon ages fit within the error range of the modeled single-grain OSL ages on several occasions, such as granulometry samples AB-2, AB-2, and AB-3. Otherwise, only most of the radiocarbon error range overlapped with that of the single-grain OSL error range, such as in granulometry samples AB-4, and AB-5. Granulometry sample AB-6 had

the least amount of overlap out of any of the granulometry samples, but there was still some overlap of error ranges between modeled radiocarbon and single-grain OSL ages.

When OSL is used applied to a sedimentary deposit in a rockshelter, namely one with substantial levels of eolian sedimentation, it can provide certainty that sedimentation is the targeted event, whereas the use of radiocarbon to date the surrounding sediment requires bridging arguments defending the relationship between the dated material and the targeted event. The more direct approach to dating a targeted event should remove the layer of uncertainty that an indirect method creates. As long as the OSL ages themselves are accurate, one can be confident that the resulting age-depth model should properly date material deposited through the relevant processes.

As for the need for multiple age-depth models, having two or more age-depth models built from different dating methods can only refine the understanding of the deposit and ensure that acquired ages are accurate. At LCC, the relationship between the radiocarbon and single-grain OSL age-depth models aids in understanding the formation of the site. For example, the largest gap between the radiocarbon and single-grain OSL occurs around 125 cm – 75 cm in depth, which is almost entirely contained in Stratum 2a, which is noted for dense concentrations of fecal material. In addition, the single-grain OSL at these depths leans significantly younger than the radiocarbon. This means that the fecal material was probably older than the surrounding sediment. Perhaps animal activity in the site pushed old feces deeper into the sediment. In any case, Wall AB at LCC demonstrates that the construction of multiple age-depth models, particularly one based on radiocarbon and one on single-grain OSL can be of great assistance in understanding the formation of the site and the relationship of the sediments to the objects they contain.



### *LCC Stratigraphy*

Since chronologies, age-depth models, and granulometry have been established for the deposit at Last Canyon Cave, the stratigraphy can be more carefully described and dated. In order to do this, the field observations for each stratum will be summarized, then the granulometry will be discussed, and finally the maximum and minimum age for each stratum will be discussed and evaluated. An important part of this process involves noting discrepancies between the field observations and the lab data. For instance, there may be some inconsistencies in the stratigraphic ages between sampled columns. Finally, this information will be used to make a statement about the formation history of that particular stratigraphic unit.

*Stratum 1.* The initial interpretation of Stratum 1 was that the relatively higher levels of sand-sized grains were evidence that granular disintegration of the shelter walls and ceiling was a major contributor to the stratum formation (Kornfeld et al. 2012). This is consistent with the current granulometry analysis, since the sediment from Stratum 1 was indeed sandier than any part of Stratum 2. Stratum 1 was strategically sampled for OSL in Wall AB and produced a single-grain age of  $62.09 \pm 11$  ka. The sample was collected slightly below the middle elevation in Stratum 1's exposure in Wall AB. In the 2012 LCC report (Kornfeld et al. 2012), it notes that Stratum 1 is older than  $39,570 \pm 800$   $^{14}\text{C}$  BP, referring to the earliest radiocarbon age that was acquired from Stratum 2a, which is consistent with the single-grain OSL results. Granulometry sample AB-1 was collected from Stratum 1, about three centimeters above the location of OSL sample AB-1. The

radiocarbon age-depth model produced an age for this sample of  $51,580 \pm 6,400$  BP<sub>2010</sub>, while the single-grain OSL age-depth model provided an age of  $54.91 \pm 16.31$  ka. While OSL sample AB-1 provides a good approximation of the earliest sedimentation in Stratum 1, the modeled single-grain OSL age should be used to identify an age for the higher elevations of Stratum 1, since the OSL age is a more direct approximation of the sediment deposition. Also, the granulometry sample is lower than the lowest direct radiocarbon age, which tends to increase the uncertainty of the age-depth model (Table 1; Table 6). Therefore, Stratum 1 can be said to cover  $62.09 \pm 11$  ka to  $54.91 \pm 16.31$  ka. It should be noted that this exposure is limited to Wall AB. Stratum 1 was therefore deposited early in the MIS 2 (Pinedale) glacial period and represents a period where there was significant disintegration of the shelter walls that supplemented the eolian deposition.

*Stratum 2a.* The entirety of Stratum 2 comprises the bulk of the deposit, and is divided into two subunits, primarily based on color and density of fecal deposits. As a unified whole, Stratum 2 possesses a consistent texture and appears roughly parallel to the shelter floor. Stratum 2a is distinguished by its dark reddish-brown color and numerous lenses of concentrated bighorn sheep droppings. It predominantly appears in Wall AB, but also extends into Wall DE. However, the extension into Wall DE is largely based on color, since the concentrations of bighorn sheep dropping do not extend into Wall DE. The granulometry from 2012 (Kornfeld et al. 2012) reported that the silt and clay content was still fairly low, but consistent with eolian deposition. This is in agreement with the current granulometry, which shows a distinct increase in silt/clay content when compared to Stratum 1.

OSL samples were collected at the top and bottom of the exposure in Wall AB and at the bottom of the exposure in Wall DE. The single-grain OSL results for Wall AB are  $36.53 \pm 7.24$  ka to  $23.93 \pm 3.88$  ka, and the lower age for Wall DE is  $87.7 \pm 14.03$  ka. The age from Wall DE is notable for being wildly different from the Wall AB ages for Stratum 2a, and for having a greater age than Stratum 1. There are three ways to interpret this. First, it could be part of a new stratigraphic unit that did not stand out during the field observations, and is in fact older than Stratum 1. On the other hand, the stratigraphic divisions could have been incorrectly observed in the field, and OSL sample DE-1 actually belongs in Stratum 1 and not Stratum 2a. Finally, it could be that what was described as Stratum 2a was the first of the exposed strata to begin forming, and that Stratum 1 was a localized development in Wall AB, and when it finished forming, Stratum 2a continued forming over top of it. The most likely explanation is that it is actually part of Stratum 1.

One piece of evidence in favor of this is that the granulometry sample AB-1 from Stratum 1 possesses nearly identical grain-size distributions to granulometry sample DE-1, which was located 5.2 cm above OSL sample DE-1. This would mean that Stratum 1 actually covers  $87.7 \pm 14.03$  ka to  $60.43 \pm 0.45$  ka, and therefore Stratum 1 would cover a portion of the MIS 5a-4 (Sangamon) Interglacial to glacial conditions. If sample DE-1 is excluded from Stratum 2a, then Stratum 2a is only present in Wall AB and covers  $36.53 \pm 7.24$  ka to  $23.93 \pm 3.88$  ka. Overall, while there is an increase in the abundance of silt and clay in Stratum 2a, the difference is not necessarily stark when compared to Stratum 1. The most defining feature of this stratum are indeed the concentrations of bighorn sheep droppings, which seem to be isolated to Wall AB. The ages on this stratum place it cleanly

in the Pinedale Glaciation (MIS 2), and seems to show an uptick in eolian deposition as well as wildlife visitation.

*Stratum 2b.* Stratum 2b is a light brown color, in opposition to the dark reddish-brown observed in Stratum 2a. Stratum 2b is the only unit that clearly appears in all three exposures. Rather than dense lenses of bighorn sheep droppings that are found in Stratum 2a, Stratum 2b possesses dispersed bighorn sheep droppings. Kornfeld et al. (2013) has little in regard of specifics used to describe this stratum, but it is understood that the granulometry trends highlighting eolian deposition that were observed in 2a continue into 2b. The current granulometry generally displays an increase in silt/clay content, suggesting an increase in eolian sedimentation. Upper and lower limits of the stratum were sampled for OSL in Walls AB, DE, and FG. In addition, an OSL sample was collected mid-height from the exposure in Wall FG. The single-grain OSL ages for Wall AB were  $20.97 \pm 3.19$  ka to  $14.37 \pm 3.08$  ka, for Wall DE they were  $23.58 \pm 3.8$  ka to  $15.86 \pm 2.58$  ka, and in Wall FG they were  $37.42 \pm 7.94$  ka to  $18.17 \pm 2.66$  ka. This reduces to an overall range of  $37.42 \pm 7.94$  ka to  $14.37 \pm 3.08$  ka. The earliest age comes from Wall FG and the latest comes from Wall AB. It should be reiterated that the ages for Stratum 2a was  $36.53 \pm 7.24$  ka to  $23.93 \pm 3.88$  ka, placing it in the MIS 2 (Pinedale). This shows strata 2a and 2b having roughly synchronous beginning ages, while Stratum 2b last a considerably longer time.

*Relationships Between Columns.* The single-grain OSL ages acquired for this study isolates the earliest sedimentation to Wall DE, with a modeled age of  $108.34 \pm 35.47$  ka at 99 m elevation (107 cm beneath the surface), and a direct age of  $87.7 \pm 14.03$  ka at 99.052 m elevation (101.8 cm beneath the surface). This formation would have been the result of both eolian sedimentation and autogenic granular disintegration of the Tensleep Sandstone.

Sedimentation later shows up in Wall AB with a direct age of  $62.09 \pm 11$  ka at 98.973 m elevation (136.7 cm beneath the surface). At an early point in the MIS 2 (early Pinedale) glaciation, eolian sedimentation increased, resulting in the formation of Strata 2a and 2b. The separation of these two strata is somewhat confusing, since the separation is not based on chronological differences. Stratum 2a was forming in Wall AB at the same time Stratum 2b was forming in Wall FG. However, since Wall AB possessed a distinctive physical appearance (probably in part caused by the heightened use by bighorn sheep), it gives the false impression that it is altogether older than the entirety of the light brown sediment identified as Stratum 2b.

The transition from Stratum 1 to Stratum 2 likely occurs somewhere between granulometry samples DE-4 (taken at elevation 99.3 m [77 cm beneath the surface]) and DE-5 (taken at elevation 99.4 m [67 cm beneath the surface]). First of all, the age for DE-4 according to the single-grain OSL age-depth model is  $48.26 \pm 22.92$  ka, and for DE-5 it is  $23.7 \pm 7.51$  ka. If Stratum 2 begins around  $36.53 \pm 7.24$  ka in Wall AB, and  $37.42 \pm 7.94$  ka in Wall FG, then Stratum 2 would be expected a short elevation above granulometry sample DE-4. Also, the 50% quantile of predicted ages produced by the single-grain OSL age-depth model for granulometry sample DE-4 was 35.26 ka, further supporting an age at around 99.3 m in Wall DE that is close to the earliest ages for Stratum 2 elsewhere. In addition, if there is a stratigraphic separation between these two granulometry samples, then it should be expected that the granulometry itself would show some differences.

There is indeed a difference, though a slight one. Granulometry sample DE-4 is unimodal, poorly sorted, coarse silty fine sand with a mean grain size of  $126.2 \mu\text{m}$  (2.986  $\phi$ ). Granulometry samples DE-1 through DE-3 are all also unimodal, poorly sorted, coarse

silty fine sands with mean grain sizes ranging from 136.4  $\mu\text{m}$  (2.874  $\phi$ ) to 144.4  $\mu\text{m}$  (2.792  $\phi$ ). Samples DE-1 through DE-4 all have a grain size mode of 170.2  $\mu\text{m}$  (2.558  $\phi$ ). In addition, Granulometry sample AB-1 is unimodal, poorly sorted, coarse silty fine sand with a mean grain size of 143.1  $\mu\text{m}$  (2.804  $\phi$ ) and a grain size mode of 170.2  $\mu\text{m}$  (2.558  $\phi$ ). Granulometry sample AB-1 is the only one that was positively identified as originating from Stratum 1 when collected, but the fact that granulometry samples DE-1 through DE-4 all have matching granulometry with AB-1, and also have ages derived from the single-grain OSL model that places them in the age range of Stratum 1 makes it likely that they were all collected from an exposure of Stratum 1 in Wall DE that was not identified in the field. On the other hand, granulometry sample DE-5 is a unimodal, poorly sorted, very coarse silty fine sand with a mean grain size of 92.76  $\mu\text{m}$  (3.430  $\phi$ ) and a grain size mode of 148.3  $\mu\text{m}$  (2.757  $\phi$ ). At this point, the sediment has become finer in agreement with the description of Stratum 2b being the result of greater eolian sedimentation than Stratum 1. This pattern continues through the rest of Wall DE, and becomes particularly silty in the top two granulometry samples (DE-7 and DE-8). It also matches very closely with granulometry sample AB-6, which is the lowest granulometry sample taken from Stratum 2b in Wall AB.

Finally, the proposed Stratum 1 boundary in Wall DE is comparable in thickness to Stratum 1 in Wall AB. The proposed Stratum 1/Stratum 2 division exists at around 99.35 m in elevation in Wall DE, while it is at about 99.15 m in Wall AB. In addition, the shelter floor at Wall DE was at about 99.0 m, and 98.9 m in Wall AB. This means that while Stratum 1 is about 35 cm thick in Wall DE, it is about 25 cm thick in Wall AB. Since Stratum 1 began deposition earlier in Wall DE, it makes sense that it is slightly thicker

there than it is in Wall AB. However, the shape Stratum 1 between points C and D, as well as between E and F on the larger site profile (Figure 17) remains unclear.

Therefore, Stratum 1 represents the earliest formation with the largest autogenic contributions, beginning around  $87.7 \pm 14.03$  ka in Wall DE. Strata 2a and 2b built up from fairly uniformly from an increase in eolian deposition, while processes around Wall AB (animal activity being the most obvious) resulted in a slightly different morphology from the rest of the sediment that was being deposited. Sedimentation in Stratum 2 tapered off around  $14.37 \pm 3.08$  ka. The suggested revisions to the LCC stratigraphy are presented in Figures 16 and 17.

### *Sedimentation Rates*

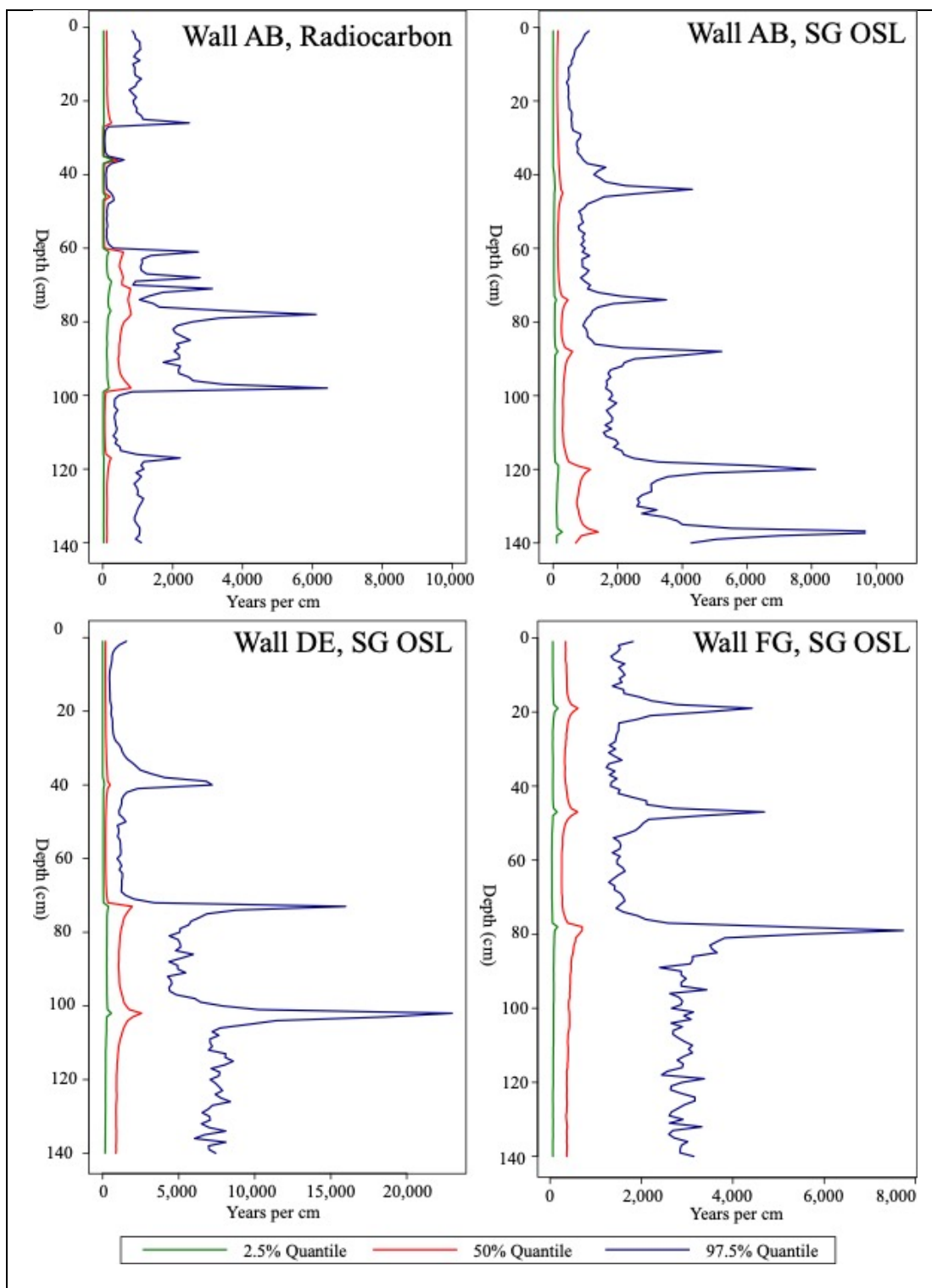
Sedimentation rates were generated in Bchron (R code is in Appendix D) for all 3 walls using the single-grain OSL model and using the radiocarbon model for Wall AB (Figure 14; Appendix D). The intent was to gain further insight into the site formation and to perceive any further differences between the single-grain OSL and radiocarbon age-depth models. It should first be noted that spikes appear on the plotted sedimentation rates around where direct ages were collected. In any case, there were indeed noticeable differences between the two models for Wall AB. While the 50% quantile rates for the radiocarbon model show relatively low rates up until the depths of 100 cm and 60 cm. This covers a small part of the upper portion of Stratum 2a and a significant lower portion of Stratum 2b. Between the depths of 100 cm and 120 cm (the majority of Stratum 2a) on the radiocarbon model, the sedimentation slows considerably when compared to the depths

preceding them. But according to the single-grain OSL age-depth model, the 50% quantile rates are noticeably higher between the elevations of 120 cm and 140 cm when compared to the radiocarbon, and between the depths of 100 cm and 60 cm, the single-grain OSL model shows lower rates that continue a tapering down trend.

Though the single-grain OSL ideally represents a more accurate picture of sedimentation, it is worth noting that more dramatic variations appear on the radiocarbon model. The most notable point of change according the single-grain age-depth model occurs a little above 120 cm, where there is a sudden drop in the sedimentation rate, as seen in the plotted 50% quantile. This is approximately the location of the Stratum 1 and Stratum 2a division, and it is near granulometry sample AB-2, which has the largest sand content of any of any samples considered in this study. But because the rates produced by the radiocarbon model have such noticeable variations, there are more points to look for connections between the sedimentation rates, the stratigraphy, and the granulometry. But such connections may not be valid on account of the level of uncertainty when using a radiocarbon age-depth model to study sedimentation processes.

But as an example of an connection it would be tempting to make when studying the sedimentation rates produced by the radiocarbon age-depth model, at around 60 cm (the end of the period of high sedimentation rates), there is a corresponding increase of silt/clay contributions occurring between granulometry samples AB-5 and AB-6. This increase in silt/clay contributions does not end with the slowing of the depositional rate at around 60 cm in depth, but rather the deposit continues to increase its silt/clay content up to the top elevations. Even though connecting the radiocarbon age-depth model to the





**Figure 14. Sedimentation rates for Wall AB according to the radiocarbon age-depth model, and Walls AB, DE, and FG according to the single-grain OSL age depth model.**

granulometry seems inadvisable, there may be some value in applying it to the biological material that contributes to the deposit. Between the depths of 100 cm and 120 cm, where the radiocarbon sedimentation rate slows considerably when compared to the depths preceding them, it generally corresponds to the area where concentrations of sheep feces occur in Stratum 2a. This sedimentation rate may be indicating a slow build-up of the fecal material.

Finally, the sedimentation rates for Walls DE and FG are mostly linear. The primary exception occurs at around 70 cm on wall DE, where the 50% quantile rate drops suddenly. This is in part due to the spike created by OSL sample DE-2, but after the spike, the rate is noticeably lower than before. This is the approximate location of the proposed division between Strata 1 and 2. As discussed earlier, there is the additional shift in granulometry that occurs in this area between granulometry samples DE-4 (sand:silt/clay ratio is 5.06) and DE-5 (sand:silt/clay ratio is 2.95). This means that the increase in silt/clay sizes was accompanied by a lower sedimentation rate.

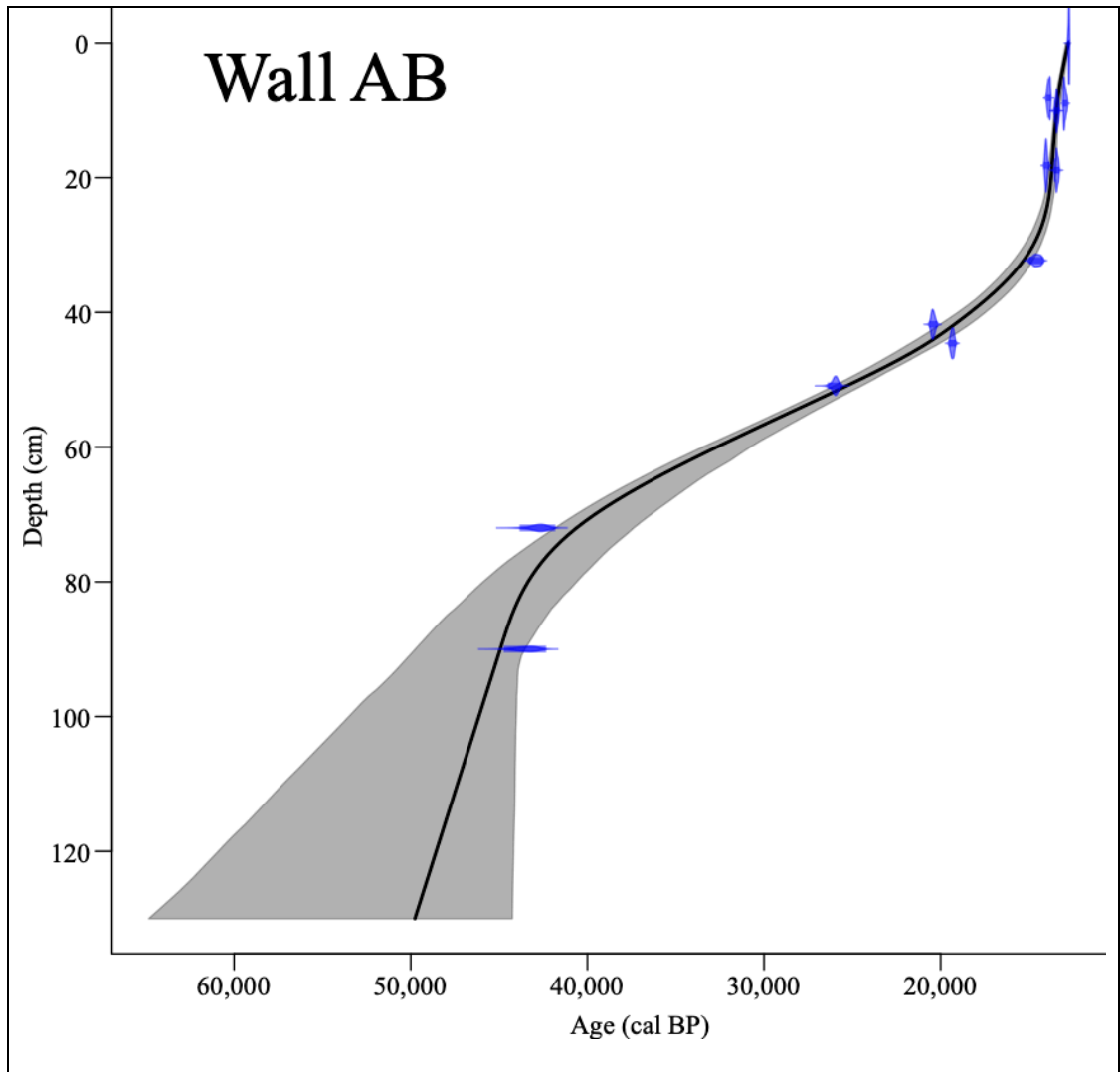
#### *Age-Depth Models and the LCC Paleoenvironment*

One of the driving questions behind all of this research has been: how should formation processes influence the interpretation of environmental proxies? Namely, when modeling ages for eolian proxies such as pollen, should OSL ages derived from eolian sediment take priority over the more routine radiocarbon tests based on samples from non-eolian sources? Perhaps the best way to deal with this question is to consider the Minckley et al. (2015) reconstruction and attempt to find any ways that these new chronologies

challenge the reconstruction as it was originally presented. To do this, I simply applied the names of the pollen zones defined in Minckley et al. (2015; Table 8) to the granulometry samples matching the appropriate age, according to each chronology (Table 9). The pollen zones represent periods of environmental change through the history of the site and provide date ranges for environmental phases at LCC.

It should be mentioned that the age ranges for the pollen zones are based on the original smooth-spline model made in CLAM (Figure 15), rather than a Bchron model. Because of this, some disagreement between the Bchron age-depth models and the CLAM model is possible. But in any case, the main purpose of this exercise is to demonstrate the relationship between an age depth model and the subsequent interpretation of the proxy. That is, it will demonstrate how variations in the age-depth model can create variations in the possible interpretations of the proxy. Fully integrating the granulometry data into the existing paleoenvironmental reconstruction is beyond the scope of this study, but the age-depth models created here can certainly be used in a future reevaluation and synthesis of all the existing environmental data, including granulometry. In addition, recognition should be given to the fact that by assigning each granulometry sample to an age range purely based on the central age value will to some extent overlook the error range of each modeled age. It should be expected that this will result in some discrepancies, particularly in the location of boundaries between zones from the environmental reconstruction. But if the models generally agree, then there should be some consistency in the sequence of pollen zone categories associated with the granulometry samples.

In any case, after associating each one of the granulometry samples with one of Minckley's pollen zones, according to the ages produced by each age-depth model, a



**Figure 15. Smooth-spline age-depth model made in CLAM, used for the Minckley et al. (2015) environmental reconstruction. Adapted from Minckley et al. (2015).**

considerable amount of variation was immediately apparent. In Wall AB, granulometry samples AB-1 and AB-2 fit with LCan I in all three age-depth models, but they began diverging soon afterwards. The radiocarbon model went through a complete sequence of all the listed pollen zones, typically including two granulometry samples in each zone. The only exception was LCan IV, which covered three granulometry samples (AB-7 through AB-9). In both OSL age-depth models, a few pollen zones went unrepresented. For the single-grain OSL model, it was LCan II and V, and for the small aliquot OSL, it was just

LCan V. LCan V went unrepresented in both OSL age-depth models because the two samples nearest the surface returned ages younger than the age limits provided for LCan V. There were no pollen zones defined for ages younger than LCan V, so granulometry samples AB-10 and AB-11 did receive pollen zone associations according to the two OSL models. In summary, the differences observed between the radiocarbon and single-grain OSL models were not problematic throughout the profile, but samples taken between the depths of 86 cm – 113 cm (granulometry samples AB-3 through AB-6) are significant enough that an environmental reconstruction would look fairly different at these elevations depending on the age-depth model that was used. As for the small-aliquot OSL model for Wall AB, the conflicts with the other two models were pretty consistent, primarily due to the large number of samples that fell within the age range of LCan I. This is further support of the idea that small aliquot OSL in a rockshelter setting should be avoided in favor of single-grain OSL.

In Wall DE, samples DE-5 through DE-7 were all assigned to LCan IV with the single-grain OSL model, while according to the small aliquot OSL, DE-5 was LCan II and DE-6 and DE-7 were LCan III. LCan II and III did not appear in the single-grain model in Wall DE, while they both appeared in the less-reliable small aliquot OSL model. In addition, the sample closest to the surface is identified as LCan V in the single-grain OSL model, and LCan IV in the small aliquot OSL model. To summarize for Wall DE, the single-grain OSL model does not include two pollen zones that appeared in the small aliquot model, but rather it showed the bulk of the deposit as belonging to LCan IV, while this pollen zone only appeared at the terminal sample with the small aliquot model. In Wall FG, there was disagreement between both age-depth models concerning the points where

one pollen zone ends and the other begins, but they both had enough overlap that they could be considered quite similar, as the results of the t-test also suggested. However, it should be reiterated that the small aliquot age-depth model for Wall FG is particularly unreliable due to the age reversal in the direct ages the model is built on. Therefore, although this is a good example of agreement between two age-depth models, the fact that one of the models is so unreliable means that it has little illustrative value.

Altogether, this exercise shows that the age-depth model that is chosen can influence an environmental reconstruction. To further relate this idea to the LCC data, the sand:silt/clay ratio undergoes a major shift from 5.98 in sample AB-5, to 2.77 in sample AB-6. Both of these samples are in LCan III according to the radiocarbon age-depth model, but according to the single-grain OSL model, AB-5 is in LCan III and AB-6 is in LCan IV. So, the changes in the sand:silt/clay ratio clearly represents an environmental shift that took place between these two granulometry samples. If applying the radiocarbon age-depth model, it would be a challenge to try and explain this change in grain-size distributions as part of a cohesive environmental unit. Whereas the shift makes complete sense when the single-grain OSL model is applied. Before moving on, it should be reiterated that the existing pollen zones were aged with a radiocarbon model built in CLAM, and while this shift in the granulometry when aged with the single-grain OSL model relates nicely to the existing pollen zone ages, the ages of the pollen zones would probably need re-evaluated with the use of the single-grain OSL model before a confident connection could be made.

Table 8. Environmental reconstruction of Last Canyon Cave. Adapted from Minckley et al. (2015).

Pollen Zone	Major Pollen Types (% Abundance)	Isotopic Values				Geography of Modern Analogues	Climate Interpretation
		Mean Sediment Organic Matter		Coprolites			
		C:N	δ <sup>13</sup> C	C <sub>4</sub> % wet glacial (dry glacial)	Small δ <sup>13</sup> C	Large δ <sup>13</sup> C	
LCan I >45.5 kyr BP	<i>Artemisia</i> (74%)	5.7 ± 0.8	-24.4± 0.2‰	12.1 ± 1.5% (0%)	-25.2± 0.9‰	-25.3± 0.8‰	Columbia Basin, WA (low elevation), Albion Mountains, ID, (high elevation), Great Basin
	<i>Asteraceae</i> (9%)						
LCan II 45.5-38.5 kyr BP	<i>Artemisia</i> (52%)	6.6 ± 0.8	-24.6± 0.3‰	<10% (0%)	-25.3± 0.9‰	-25.6± 1.1‰	Snake River Plain, ID, Great Plains, SD
	<i>Asteraceae</i> (28%) <i>Pinus</i> (4%)						
LCan III 38.5-27.5 kyr BP	<i>Artemisia</i> (54%)	8.6 ± 1.4	-18.5± 2.0‰	40.4± 15.1% (31.0 ± 19.3%)	-26.5± 0.6‰	-24.0± 0.9‰	Snake River Plain, ID, Great Plains, SD
	<i>Amaranth.</i> (7%) <i>Asteraceae</i> (13%) <i>Fabaceae</i> (5%) <i>Poaceae</i> (6%) <i>Pinus</i> (2%)						
LCan IV 27.5-13.8 kyr BP	<i>Artemisia</i> (33%)	9.7 ± 0.5	-16.3± 1.7‰	62.6± 14.0% (53.4±17.4%)	-26.7± 0.6‰	-25.8± 0.9‰	Great Basin, Snake River Plain, ID, Great Plains, SD
	<i>Amaranth.</i> (13%) <i>Fabaceae</i> (10%) <i>Poaceae</i> (10%) <i>Rosaceae</i> (6%) <i>Pinus</i> (4%)						
LCan V 13.8-11.5 kyr BP	<i>Artemisia</i> (24%)	8.8 ± 1.2	-22.9± 2.3‰	22.3± 15.3% (9.2±14.7%)	-26.3± 0.6‰	-	Southern CA, Colorado Plateau, Snake River Plain, ID
	<i>Asteraceae</i> (32%) <i>Amaranth.</i> (17%) <i>Pinus</i> (<1%)						
							Warmer-than- previous annual temp.

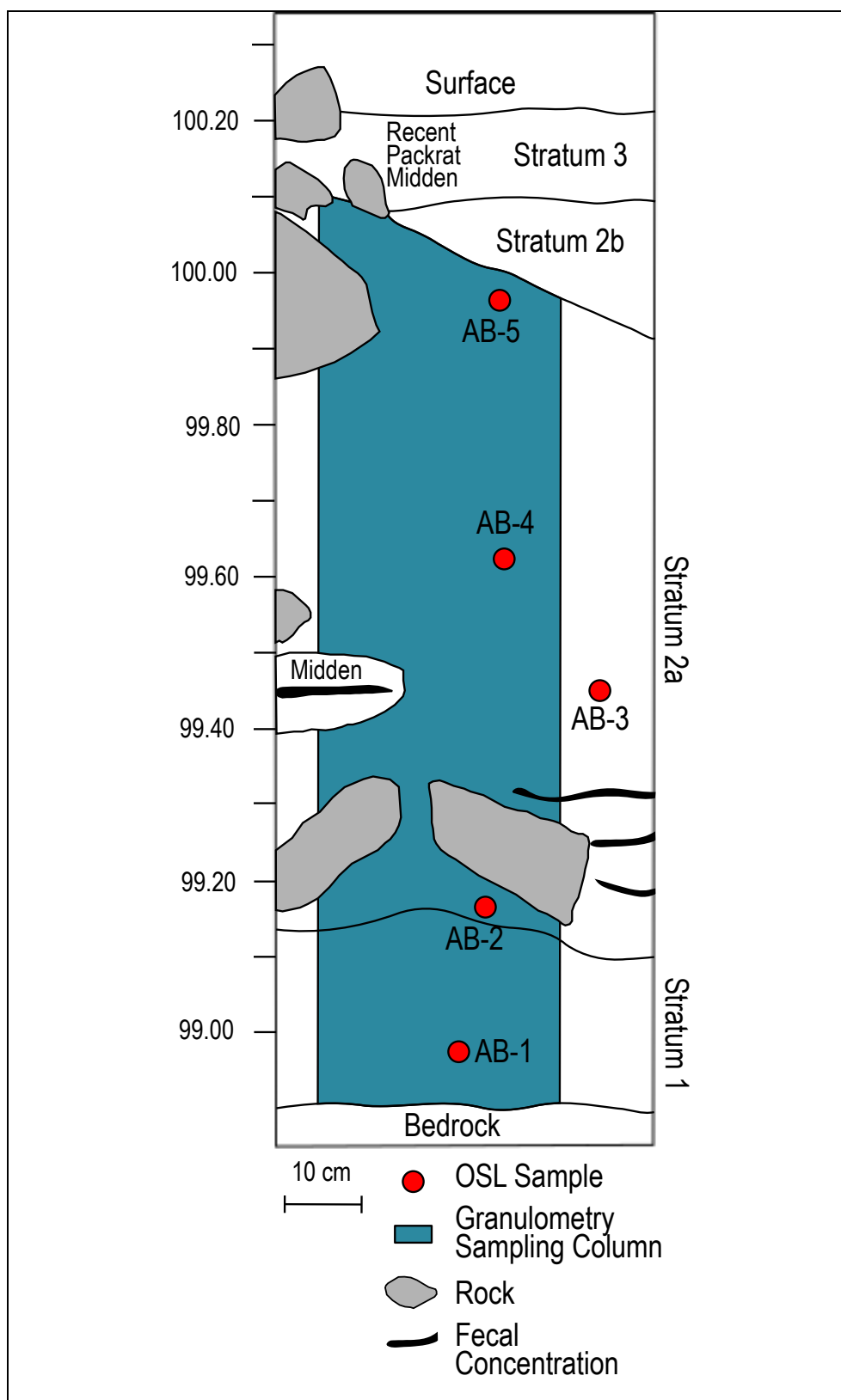
Table 9. Description of sand/silt/clay content, ages, and pollen zone of LCC granulometry samples.

Granulometry Sample	Depth	Stratum	Sand Content (Relative %)	Silt/Clay Content (Relative %)	Sand to Silt/Clay Ratio	Modeled Radiocarbon Age (BP <sub>2010</sub> )	Minckley (2015) Pollen Zone	Modeled Single-Grain OSL Age (ka)	Minckley (2015) Pollen Zone	Modeled Small Aliquot OSL Age (ka)	Minckley (2015) Pollen Zone
AB-1	134	1	87.33	12.67	6.89	51,580 ± 6,400	LCan I	54.91 ± 16.31	LCan I	68.04 ± 11.65	LCan I
AB-2	124	2a	90.23	9.77	9.24	48,020 ± 4,110	LCan I	45.91 ± 12.69	LCan I	63.46 ± 12.56	LCan I
AB-3	113	2a	89.38	10.62	8.41	42,830 ± 2,240	LCan II	37.05 ± 9.8	LCan III	55.32 ± 12.51	LCan I
AB-4	105	2a	85.65	14.35	5.97	40,590 ± 3,580	LCan II	34.47 ± 8.82	LCan III	50.27 ± 12.25	LCan I
AB-5	94	2a	85.67	14.33	5.98	36,690 ± 5,120	LCan III	30.2 ± 7.19	LCan III	43.39 ± 10.82	LCan II
AB-6	86	2b	73.49	26.51	2.77	33,530 ± 5,840	LCan III	26.01 ± 5.65	LCan IV	37.32 ± 9.76	LCan III
AB-7	75	2b	73.22	26.78	2.73	23,790 ± 1,890	LCan IV	22.22 ± 5.35	LCan IV	29.03 ± 7.93	LCan III
AB-8	64	2b	59.73	40.27	1.48	17,090 ± 1,690	LCan IV	17.61 ± 5.58	LCan IV	21.79 ± 7.67	LCan IV
AB-9	55	2b	64.58	35.42	1.82	14,560 ± 350	LCan IV	15.32 ± 6.08	LCan IV	18.36 ± 7.89	LCan IV
AB-10	41	2b	65.28	34.72	1.88	13,700 ± 180	LCan V	9.32 ± 8.15	-	9.15 ± 8.57	-
AB-11	32	2b	66.15	33.85	1.95	12,940 ± 130	LCan V	7.58 ± 7.58	-	7.87 ± 7.87	-
DE-1	107	1	87.58	12.42	7.05	-	-	108.34 ± 35.47	LCan I	105 ± 29.34	LCan I
DE-2	97	2a	86.14	13.86	6.21	-	-	78.33 ± 32.17	LCan I	79.18 ± 19.84	LCan I
DE-3	87	2a	86.66	13.34	6.49	-	-	62.23 ± 28.37	LCan I	68.65 ± 17.88	LCan I
DE-4	77	2a	83.5	16.5	5.06	-	-	48.26 ± 22.92	LCan I	58.18 ± 14.6	LCan I
DE-5	67	2a	74.68	25.32	2.95	-	-	23.7 ± 7.51	LCan IV	44.52 ± 10.52	LCan II
DE-6	57	2b	75.11	24.89	3.02	-	-	20.27 ± 6.58	LCan IV	38.73 ± 10.79	LCan II
DE-7	47	2b	57.19	42.81	1.34	-	-	17.94 ± 6.58	LCan IV	34.25 ± 10.3	LCan III
DE-8	37	2b	58.52	41.48	1.41	-	-	13.46 ± 6.63	LCan V	25.76 ± 10.08	LCan IV
FG-1	84	1	81.33	18.67	4.36	-	-	42.45 ± 12.95	LCan II	33.39 ± 8.8	LCan III
FG-2	74	2b	78.26	21.74	3.6	-	-	37.75 ± 11.34	LCan III	32.49 ± 8.39	LCan III
FG-3	64	2b	80.27	19.73	4.07	-	-	34.07 ± 10.07	LCan III	31.03 ± 8.28	LCan III
FG-4	54	2b	46.45	53.55	0.87	-	-	31.08 ± 9.06	LCan III	29.78 ± 7.99	LCan III
FG-5	44	2b	67.88	32.12	2.11	-	-	26.37 ± 8.3	LCan IV	28.54 ± 7.77	LCan III
FG-6	34	2b	66.31	33.69	1.97	-	-	23.52 ± 7.13	LCan IV	27.02 ± 7.72	LCan IV
FG-7	24	2b	59.27	40.73	1.46	-	-	21.43 ± 6.22	LCan IV	25.54 ± 8.13	LCan IV



### *Combining Radiocarbon and Single-Grain OSL Together*

Even though the radiocarbon and single-grain OSL age-depth models showed significant differences, this may not be the case at all site. In situations where a t-test performed on central ages from a selection of modeled ages between a radiocarbon and single-grain OSL age-depth models returns a result where the null hypothesis cannot be rejected, indicating that the two models are sufficiently similar, it should be safe to combine them into a single age-depth model. The resulting age-depth model should provide the best results possible for the sedimentary exposure. The radiocarbon ages assist in keeping the error ranges narrow, while the single-grain OSL ages keep the model closer to the timeline of eolian sedimentation. The primary methodological challenge is that the radiocarbon ages will need to be adjusted past the 1950 date they are typically calibrated to in order to make them comparable to the OSL ages. In any case, the combination of radiocarbon and single-grain OSL into a single age-depth model should be considered the ideal method to model ages in a rockshelter deposit since it combines the strengths of radiocarbon with those of single-grain OSL into one reliable model.



**Figure 16. Revised stratigraphy for Wall AB.**

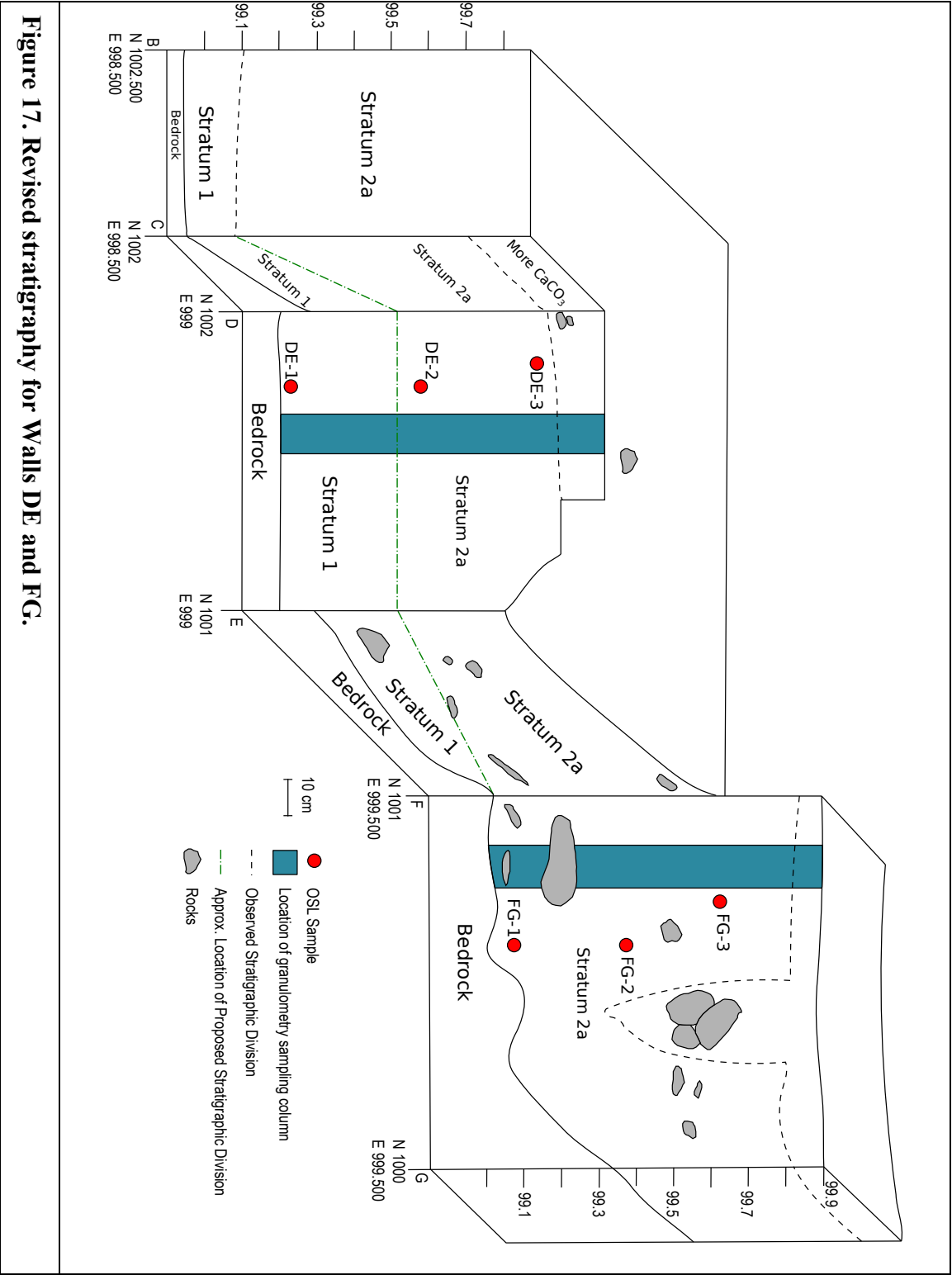


Figure 17. Revised stratigraphy for Walls DE and FG.

## CHAPTER 6:

### CONCLUSIONS

The central question of this study was whether or not OSL provided a more accurate method to age environmental proxies in rockshelter sediments when compared to radiocarbon. The results have shown that radiocarbon and single-grain OSL can create age-depth models in a rockshelter with statistically significant differences. Further, the use of both single-grain OSL and radiocarbon dating provide the best insights into the formation of the site, particularly when granulometry was integrated into the study. Altogether, there are five primary lessons about building age-depth models in rockshelters that can be gleaned from this study: 1) that single-grain OSL should be used while small aliquot OSL should generally be avoided, 2) that single-grain OSL is an effective way to verify or challenge radiocarbon ages collected from the same profile, 3) the ideal age-depth model, when circumstances allow it, is one built on a combination of radiocarbon and single-grain OSL ages, 4) that granulometry can clarify the site formation and stratigraphy, and 5) that sampling multiple exposures from the back towards the front of the shelter can further clarify the site formation history.

Even though the sampled material for radiocarbon ages was assumed to be deposited at the same time as the surrounding eolian sediment, that assumption could not be validated without the addition of another dating method. In the case of a deposit like LCC where a substantial portion of the sediment was deposited through eolian processes, OSL was a reasonable method to apply (Feathers 1997; Murray and Olley 2002; Prescott and Hutton 1995). Not only would it verify or refute the radiocarbon age-depth model, but

it could potentially be used to reinterpret the pollen assemblage from the site, if necessary. In this particular circumstance, the single-grain OSL and radiocarbon age-depth models were not entirely similar, and the existing environmental reconstruction should be reconsidered in light of this. While some of the differences could be seen visually when modelled central ages were plotted out (Figure 13), a t-test of the central ages (Table 7) further indicated that the differences were significant. Finally, when both the single-grain OSL and radiocarbon modeled ages of the granulometry samples were placed within the Minckley et al. (2015) pollen zones according to the cited ages for each zone, there were a few troubling disagreements between the two models.

The addition of the OSL ages to the existing data repertoire at LCC also clarified the extent to which the disintegration of the parent Tensleep Sandstone contributed to the development of the deposit. Even though the initial discussion of the stratigraphy (Kornfeld et al. 2012) mentioned sedimentary contributions from the parent rock, the OSL analysis helped to further validate and clarify this aspect of the shelter's sedimentary history. As a result, the small aliquot OSL ages were problematic, whereas the single-grain OSL ages (with the aid of the MAM) proved to be reliable. As a result of this experience, it is recommended that single-grain OSL always be used instead of small aliquot OSL in a rockshelter setting.

Although the radiocarbon and single-grain age-depth models in Wall AB were not similar enough, there may be other sites where this is not the case. When radiocarbon and single-grain OSL age-depth models from the same exposure can be statistically demonstrated to be sufficiently similar, the next logical step should be to combine the two sets of ages into a single age-depth model. Ideally, the resulting ages from the model should

be preferable to those produced by a model built on a single dating method since not only would there would be a greater number of ages through the column and thus producing more reliable modeled ages, but the integration of multiple methods should produce improved ages. This is because if one method produced a direct age that was a bit too old or too young, a nearby direct age from the alternate method should provide a slight corrective force in the model. In addition, OSL samples can be collected more strategically than radiocarbon, thus allowing for the establishment of important benchmarks such as points adjacent to apparent stratigraphic divisions. Ultimately, a hybridized age-depth model finds the middle-ground between the single-grain OSL ages and the radiocarbon ages. Not only should the ages produced by this hybrid model preferable, but it should produce ages with tighter error ranges than the single-grain OSL model alone.

In addition to the direct importance of dating methodologies in the construction of age-depth models, the inclusion of granulometry from the targeted sedimentary exposure aided with the process of applying and interpreting the model. At LCC, the granulometry particularly helped clarify stratigraphic divisions. While the single-grain OSL ages brought attention to problems in the previously drawn stratigraphy as it progressed from the back to the front of the shelter, the granulometry in particular helped to identify the likely location for a previously overlooked division between Stratum 1 and Stratum 2a in Wall AB. Therefore, it is recommended that when building an age-depth model in a rockshelter, granulometry samples should be collected in addition to the samples collected for radiocarbon and single-grain OSL dating.

Finally, this study demonstrated that sampling multiple exposures from the back towards the front of the shelter can be very important for understanding the formation

history, as well as identifying and dating the stratigraphy. At LCC, this was proven when the single-grain OSL showed similar dates for the beginning of Strata 2a and 2b, thus suggesting 2a began forming in Wall AB at the same time 2b was forming in the rest of the shelter. OSL dating was also able to acquire ages from locations where organic material was scarce, and that may be beyond the limits of radiocarbon dating, as we the case with samples like DE-1. By looking at the modeled ages for the granulometry samples and looking for signals of stratigraphic changes in the granulometry data, it was further possible to defend the common origin age for Strata 2a and 2b. Therefore, future work in rockshelters should employ a similar sampling strategy in order to similarly reconstruct the formation history of the deposit.

While this study provided helpful insights into the way archaeological and environmental remains in rockshelter sediments are studied, it also prompts some questions for future consideration. First of all, the Minckley et al. (2015) environmental reconstruction needs reevaluated in light of the present research. Also, further work could be done to understand the extent to which grains from the parent rock were included in the grain sizes targeted for OSL, and if it might be possible to intentionally exclude most of those grains when the OSL sample is being sieved. Also, the specific impact of large mammals on the development of an eolian deposit in a rockshelter remains ambiguous. For example, to what extent was the sediment mixing in the OSL results the product of contributions from the shelter ceiling, and to what extent was it caused by bioturbation from bighorn sheep?

In addition, the concentrations of sheep feces observed in Stratum 2a in Wall AB indicate some integrity to the deposit. These concentrations of sheep feces are

exceptionally abundant proxies of animal behavior in the shelter and have the potential to provide further insight into the formation of the deposit in LCC. For example, why do they seem so specific to one isolated part of the deposit? Namely, do they represent a few events over a relatively short period of time, or did they somehow build up over a longer period of time? And how do they relate to the build-up of the deposit through eolian processes? It would be interesting to take multiple radiocarbon dates from a single concentration to see what the distribution of ages looks like. If all of the ages from a single concentration were limited to narrow age ranges that were in agreement with the current age-depth models, then there is little to be concerned about. But if there were many ages over a long period of time, especially time that is problematic in context of the current age-depth models, it may illustrate very specific, localized disturbances related to repeated use. While bioturbation is a frequent impact on rockshelter sites such as LCC, and there are many other forms of disturbance and destruction, this study has illustrated that such disturbances and variations in depositional formation do not always introduce unsolvable chronology problems.

This study ultimately confirmed my hypothesis that there would be a significant difference between a radiocarbon and an OSL age depth model. Furthermore, it was able to effectively demonstrate the value of incorporating single-grain OSL and granulometry into the research strategy of archaeological excavations inside rockshelters. In the case of Last Canyon Cave, acquiring single-grain OSL ages challenged the applications of the existing radiocarbon age-depth model, showed the impact of disintegrating parent rock, and with the additional aid of the granulometry samples, helped refine the site stratigraphy and formation history. To make a final reiteration of the lessons future researchers can take



away from this study, when working in a rockshelter, multiple columns from the back to the front of the shelter should be targeted for sampling. Samples should be collected for radiocarbon dating, single-grain OSL dating, and granulometry from each of the targeted exposures. As long as they are compatible, single-grain OSL and radiocarbon ages should be combined into a single age depth model, otherwise they should operate separately and be applied with consideration towards the depositional processes under investigation, and the granulometry samples can be used in the process of applying and interpreting an age-depth model. By applying these recommendations, researchers should be able to produce better age-depth models and more complete formation histories for sedimentary deposits in rockshelters.

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## APPENDIX A:

### GLOSSARY OF KEY TERMS



**Accelerator Mass Spectrometry (AMS):** A common way to perform radiocarbon dating. It uses accelerated ions to separate isotopes in the targeted material for eventual quantification.

**Age-Depth Model:** A tool used to create an age estimate for any depth in a sedimentary column. Typically involves taking a series of direct dates through the column and then calculating a continuous series of ages between those points.

**Aliquot:** A portion of a sample.

**Bayesian:** A branch of statistics oriented towards understanding probability as a degree of belief, and which is capable of incorporating new information into its calculations.

**Bleaching:** Term used in OSL dating referring to the removal of electrons from traps in the quartz lattice through light exposure.

**Cut Heat:** A term used in relation to single aliquot regeneration (SAR) OSL. It is the reduced preheat temperature applied to a sample following exposure to a “test dose” of radiation.

**Dose Rate ( $D_R$ ):** The rate at which quartz grains sampled for OSL dating have been exposed to ionizing radiation.

**Equivalent Dose ( $D_E$ ):** A calculated quantity of radiation that should be approximately equal to the total amount of radiation the sample received while buried.

**Fully Bleached:** Term used in OSL dating referring to the condition when a grain of quartz is deposited with all electron traps fully empty.

**Granulometry:** Measurement of the distribution of grain sizes in a sediment sample.

**Gray (Gy):** A unit of ionizing radiation, where one gray is equal to one joule of radiation per kilogram.

**Minimum Age Model (MAM):** A statistical calculation used to adjust the representative  $D_E$  from partially bleached samples, and which assumes that the youngest set of  $D_E$  values have been fully bleached.

**Null Hypothesis:** A standard term in statistics that refers to the circumstance where multiple datasets are *not* significantly different. If the null hypothesis cannot be rejected, then the sets of data lack statistically significant difference. If the null hypothesis is rejected, then there is sufficient statistical evidence to declare the datasets significantly different.

**Optically Stimulated Luminescence (OSL):** Process used to calculate an age for quartz sediment deposition.

**Overdispersion:** When there is greater variation in a dataset than predicted by a relevant statistical model

**Partially Bleached:** Term used in OSL dating to refer to the condition when a grain of quartz is deposited without all of the electron traps having first been emptied.

**Pollen Zone:** Designations given by palynologists to areas in a pollen core possessing a cohesive pollen population. Age ranges can be applied to a pollen zones with the assistance of an age-depth model.

**Polymodal Distribution:** When a dataset exhibits multiple modes, visible as multiple peaks on a histogram.

**Posterior:** A probability distribution that results from the integration of new evidence into a prior distribution.

**Prior:** A previously known probability distribution that is being integrated into a Bayesian calculation. For example, a radiocarbon age is often a prior in a Bayesian age-depth model.

**Proxy:** Material that can be used to reconstruct past environments. Pollen is a common example of an environmental proxy.

**Sediment Mixing:** Generally refers to the postdepositional disturbance of sediment consequently distorting the vertical consistency of the sediment.

**Single Aliquot Regeneration (SAR):** A method of OSL first described in Murray and Wintle (2000) that measures the natural luminescence signal, then builds a “regeneration curve” based on the response of the sample to laboratory-applied doses of radiation which can then be used to identify the  $D_E$ . Between dose cycles used in the construction of the regeneration curve, a standardized “test dose” is given to detect changes in sample sensitivity.

**Single-Grain OSL:** OSL performed on individual grains of quartz.

**Small Aliquot OSL:** OSL performed on a small collection of quartz grains together, typically a small dot of sediment on the disc that is placed in the OSL machine.

**Radiocarbon Dating:** A method to date organic remains by determining the amount of  $^{14}\text{C}$  (radiocarbon) that has broken down over time.

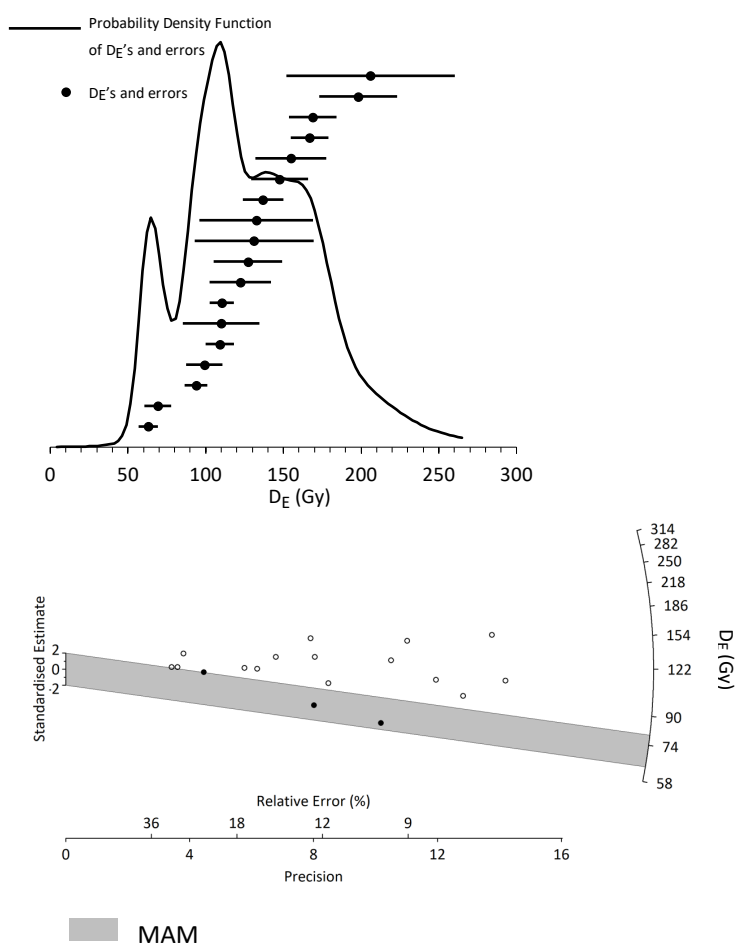
**Regenerative Cycle:** A repeated process in single aliquot regeneration (SAR) OSL where the aliquot is given a dose of radiation, preheated, stimulated with light, and has the luminescence response measured.

**Test Dose:** A repeated amount of radiation applied to an aliquot of sediment undergoing single aliquot regeneration (SAR) OSL. The test dose is given after each regenerative cycle, and is followed by the application of cut heat, light stimulation, and luminescence measurement.

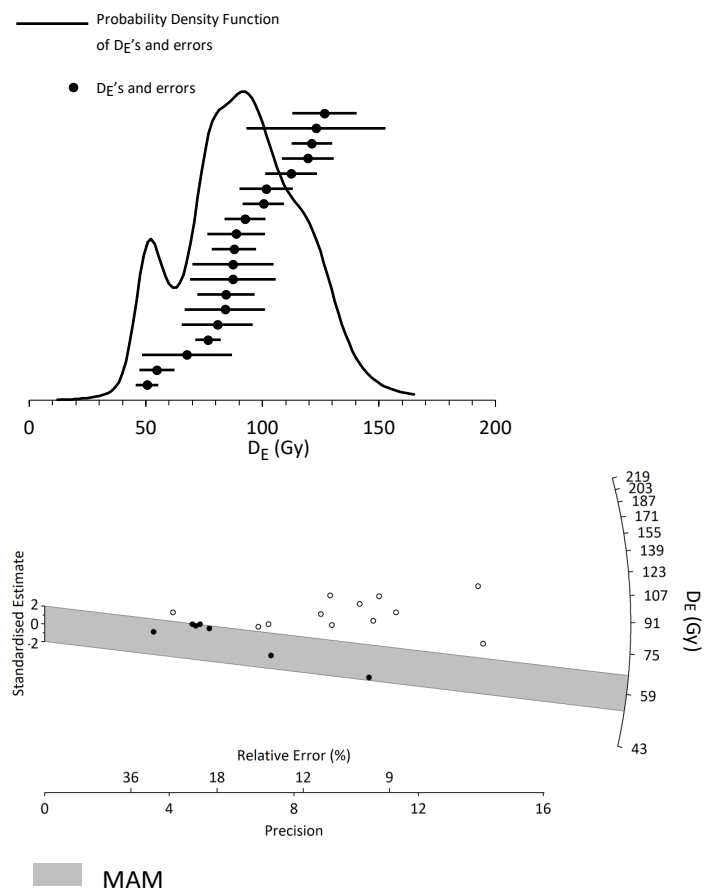
**t-Test (Paired, 2-Tailed):** A t-test checks two datasets to determine if they are distinct populations by analyzing their means (averages). A 2-tailed test means that there is no “direction” in the relationship between the two datasets, and therefore a 2-tailed test compares the two datasets bidirectionally. A paired t-test couples specific observations together and looks at the difference between them. In the context of this thesis, the observations were paired at each elevation where predicted ages were being compared between the two models.

## APPENDIX B:

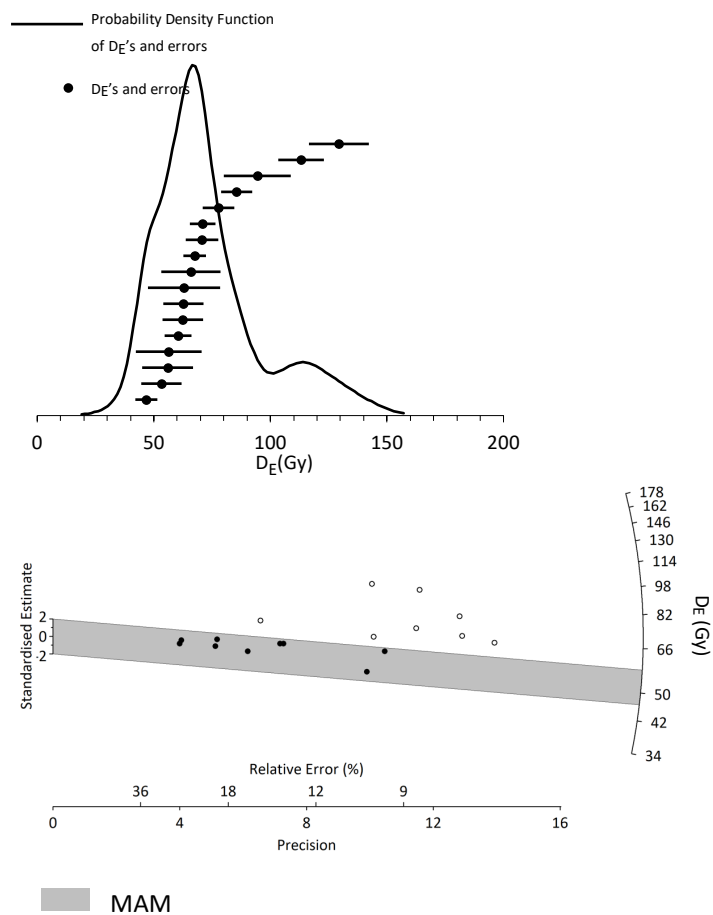
### OSL RADIAL PLOTS & PROBABILITY DISTRIBUTIONS

OSL  $D_E$  DISTRIBUTIONS AND RADIAL PLOTS*Small-Aliquot Equivalent dose ( $D_E$ ) Distributions*

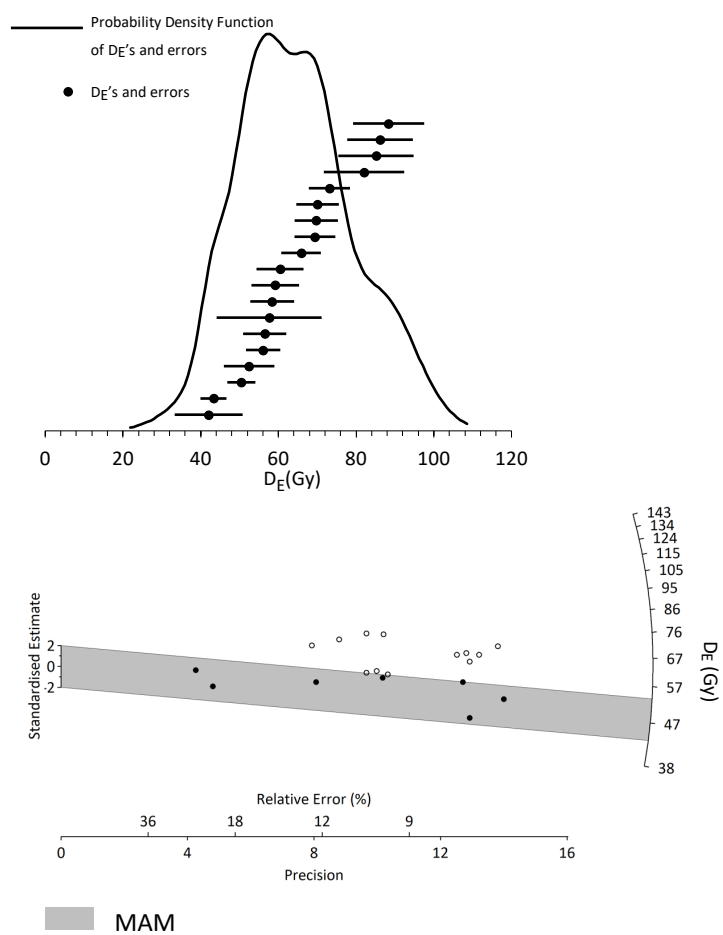
**Figure 18. Small aliquot  $D_E$  distributions for sample AB-1 (USU-2326).**



**Figure 19. Small aliquot  $D_E$  distributions for sample AB-2 (USU-2327).**

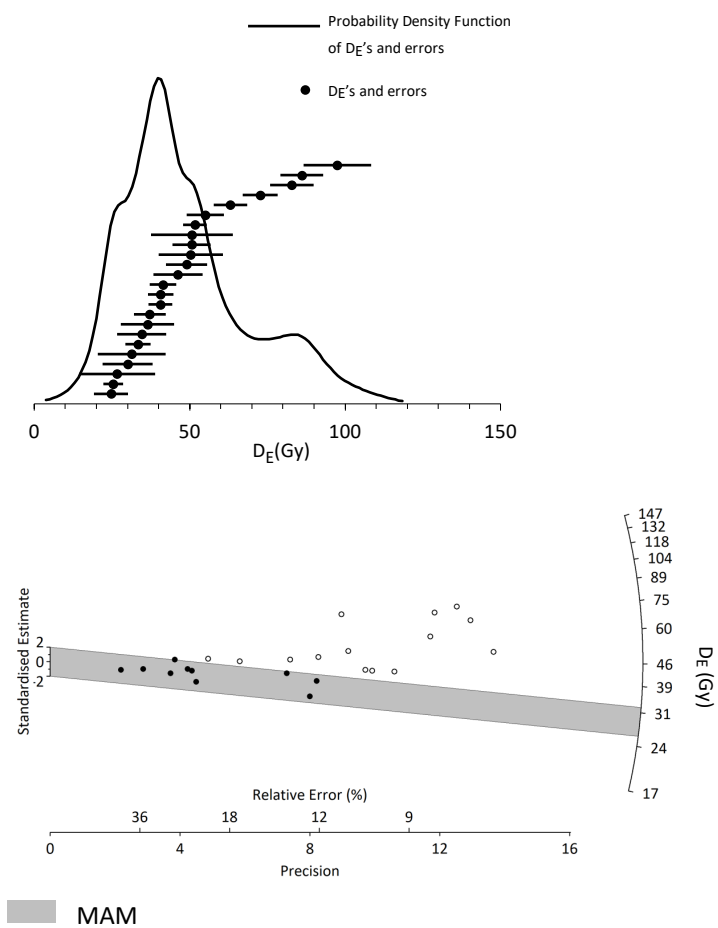


**Figure 20. Small aliquot  $D_E$  distributions for sample AB-3 (USU-2328).**

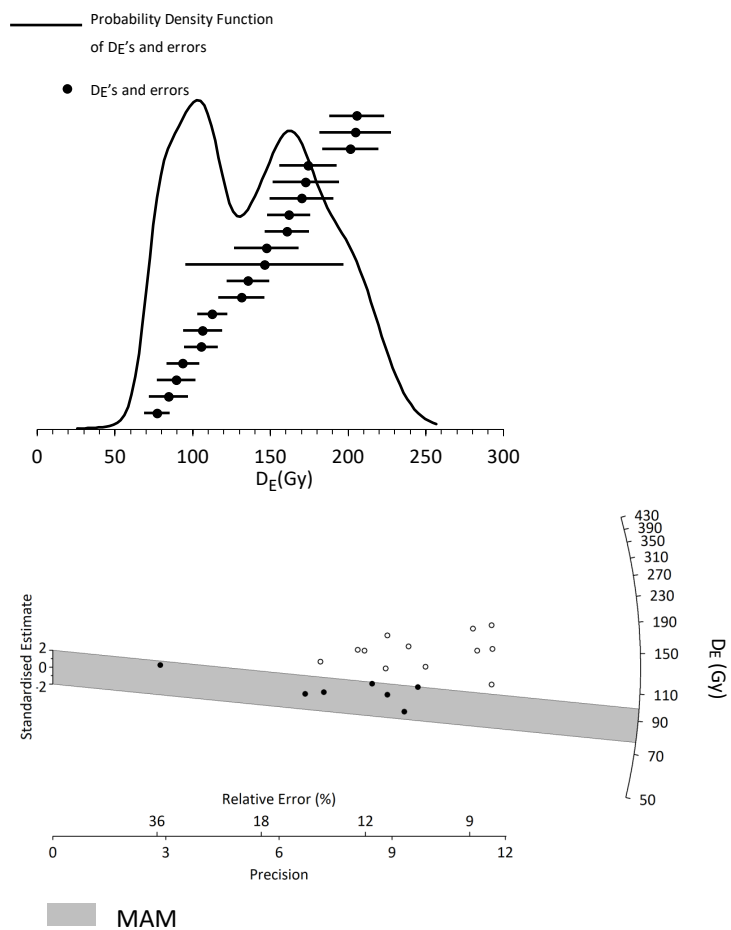


**Figure 21. Small aliquot  $D_E$  distributions for sample AB-4 (USU-2329).**

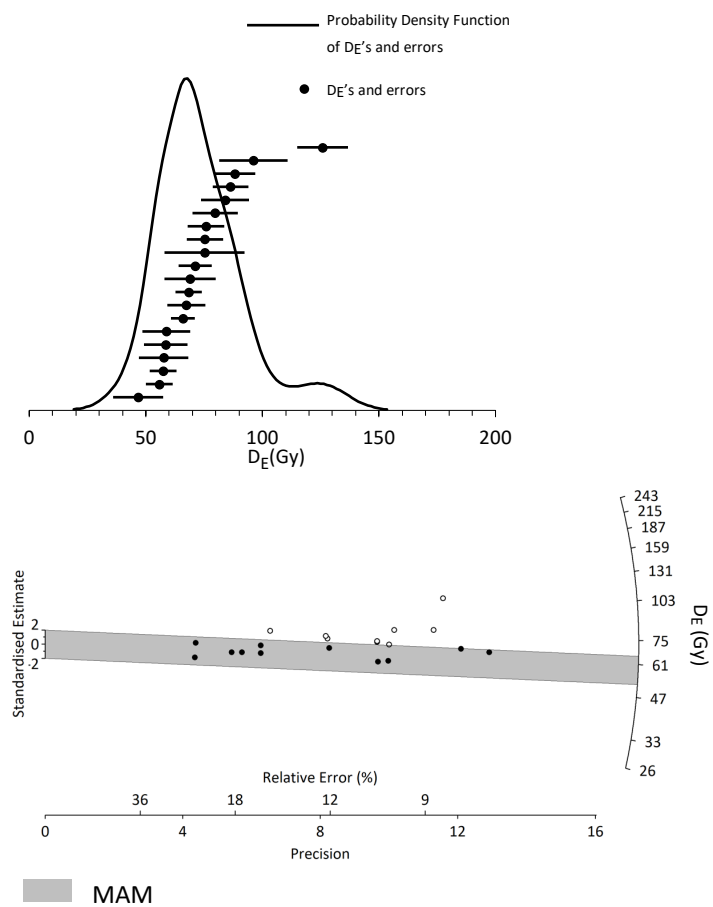




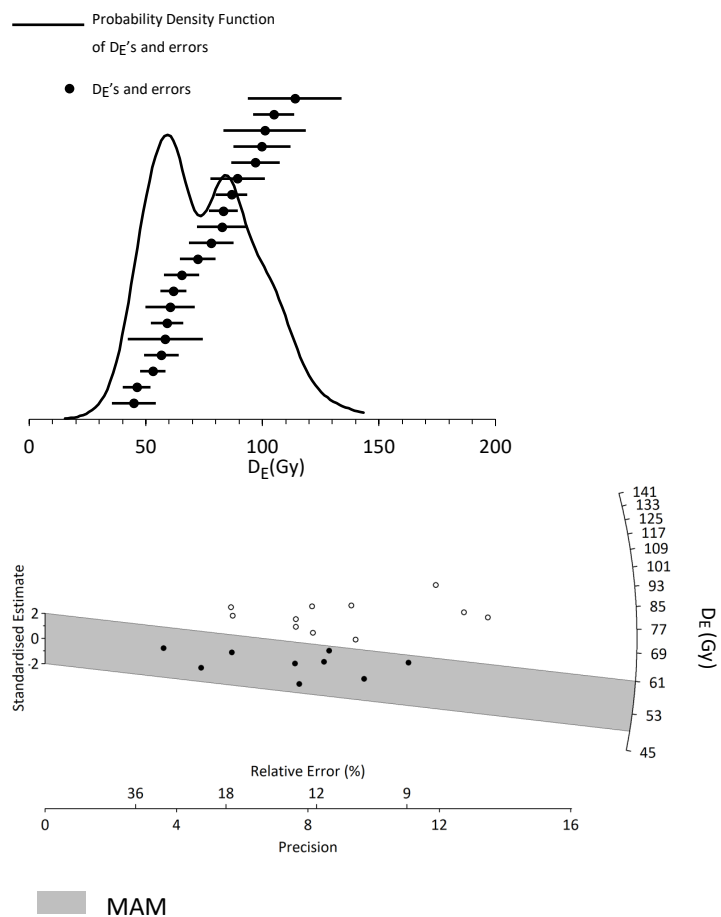
**Figure 22. Small aliquot  $D_E$  distributions for sample AB-5 (USU-2330).**



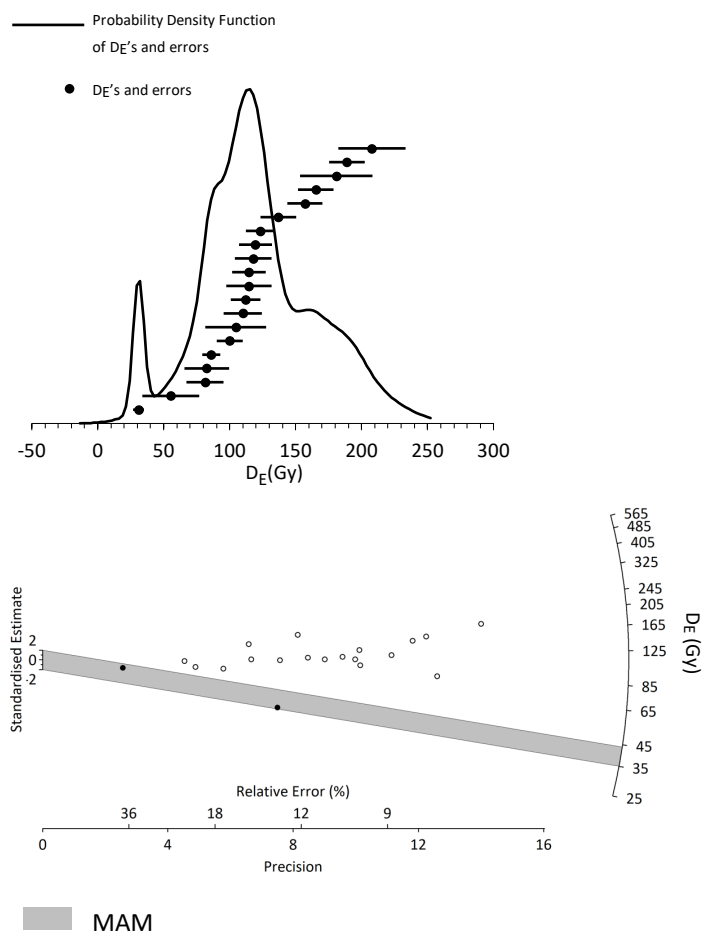
**Figure 23. Small aliquot  $D_E$  distributions for sample DE-1 (USU-2331).**



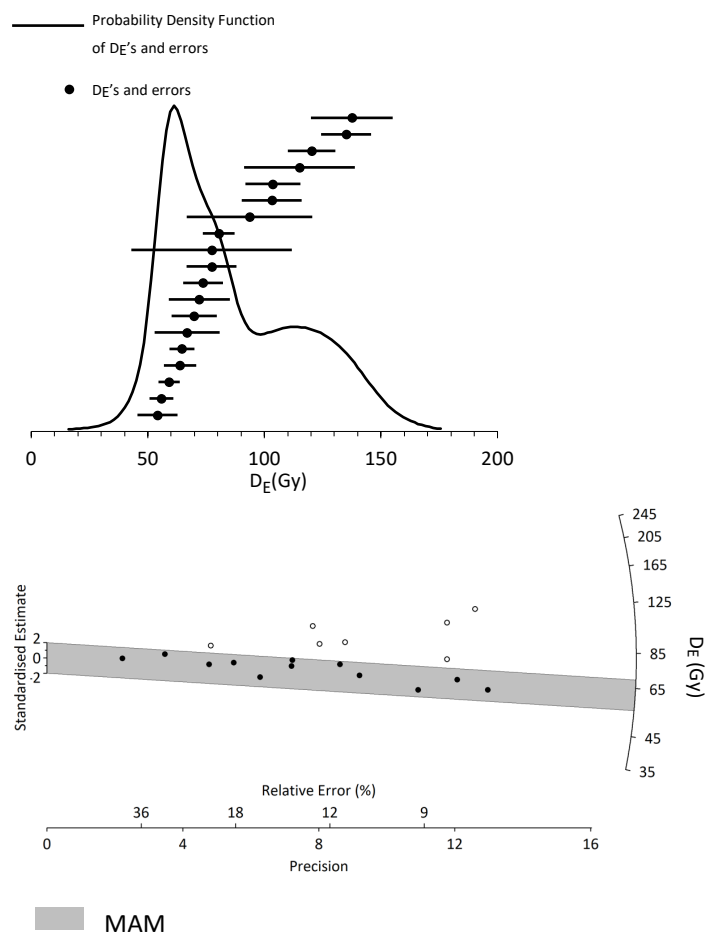
**Figure 24. Small aliquot  $D_E$  distributions for sample DE-2 (USU-2332).**



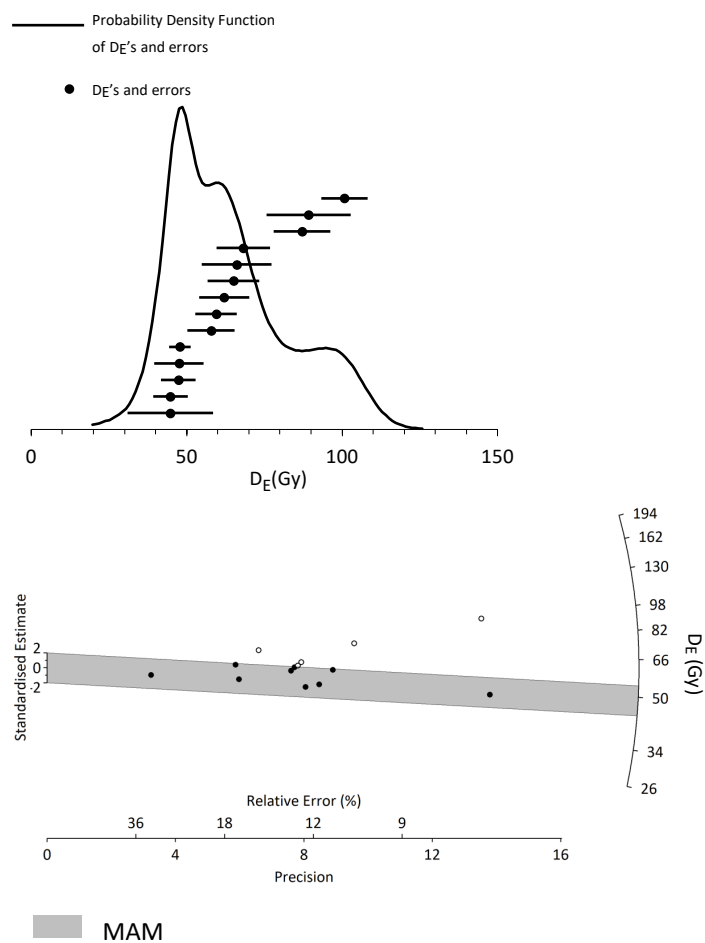
**Figure 25. Small aliquot  $D_E$  distributions for sample DE-3 (USU-2333).**



**Figure 26. Small aliquot  $D_E$  distributions for sample FG-1 (USU-2334).**

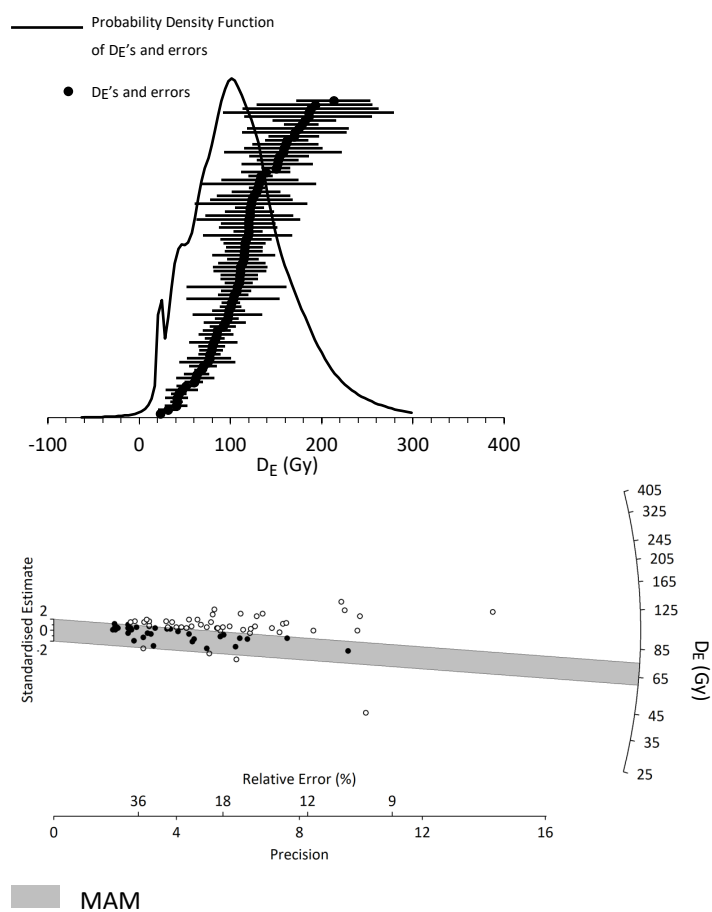


**Figure 27. Small aliquot  $D_E$  distributions for sample FG-2 (USU-2335).**



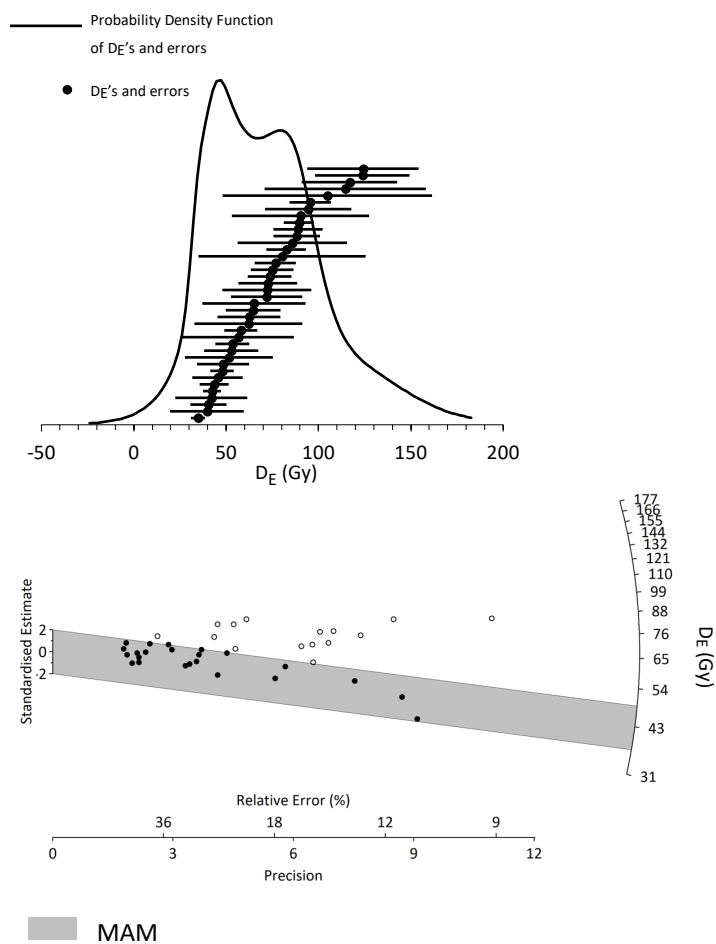
**Figure 28. Small aliquot  $D_E$  distributions for sample FG-3 (USU-2336).**

### Single-Grain Equivalent dose ( $D_E$ ) Distributions

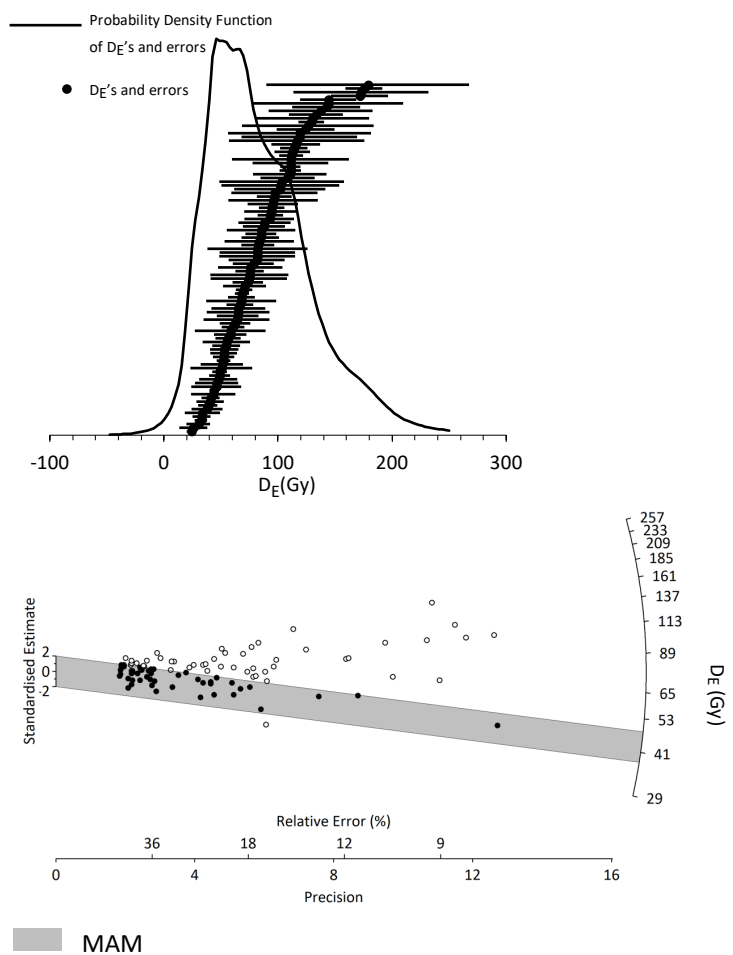


**Figure 29. Single-grain  $D_E$  distributions for sample AB-1 (USU-2326).**

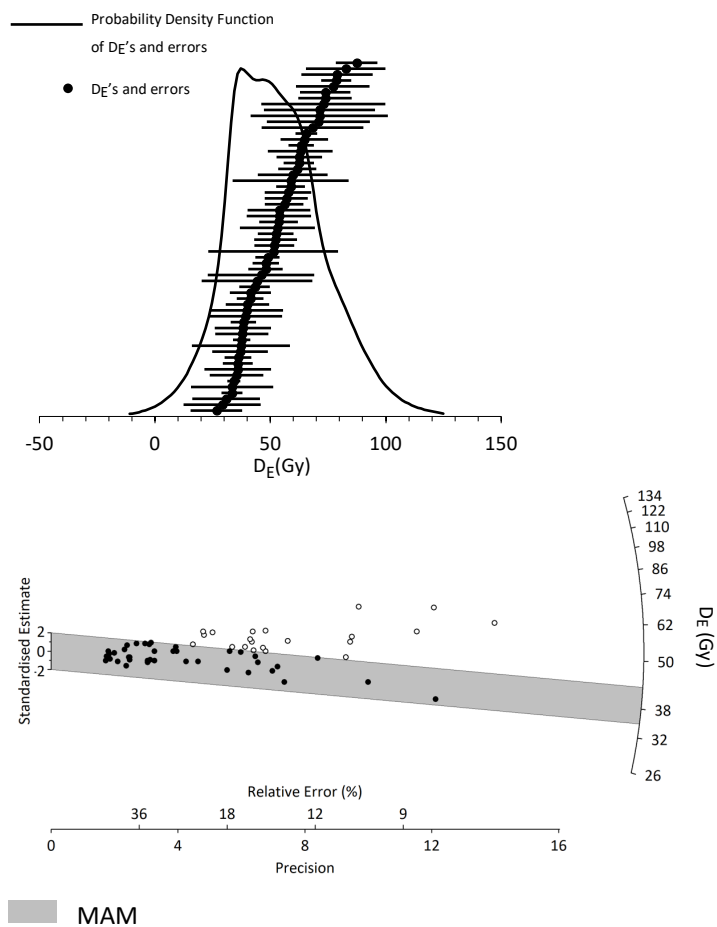




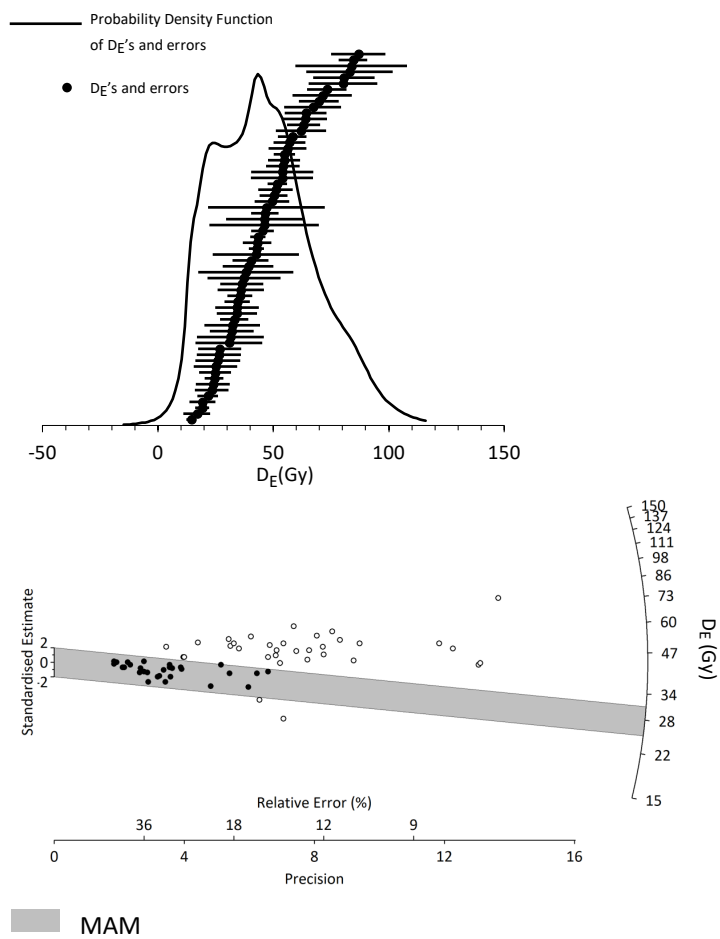
**Figure 30. Single-grain  $D_E$  distributions for sample AB-2 (USU-2327).**



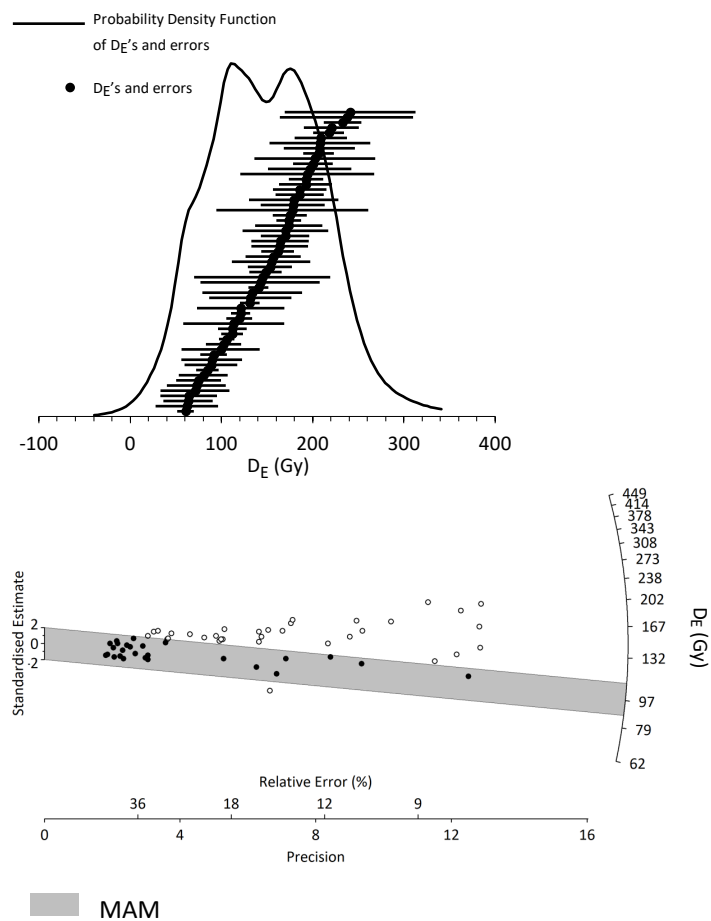
**Figure 31. Single-grain  $D_E$  distributions for sample AB-3 (USU-2328).**



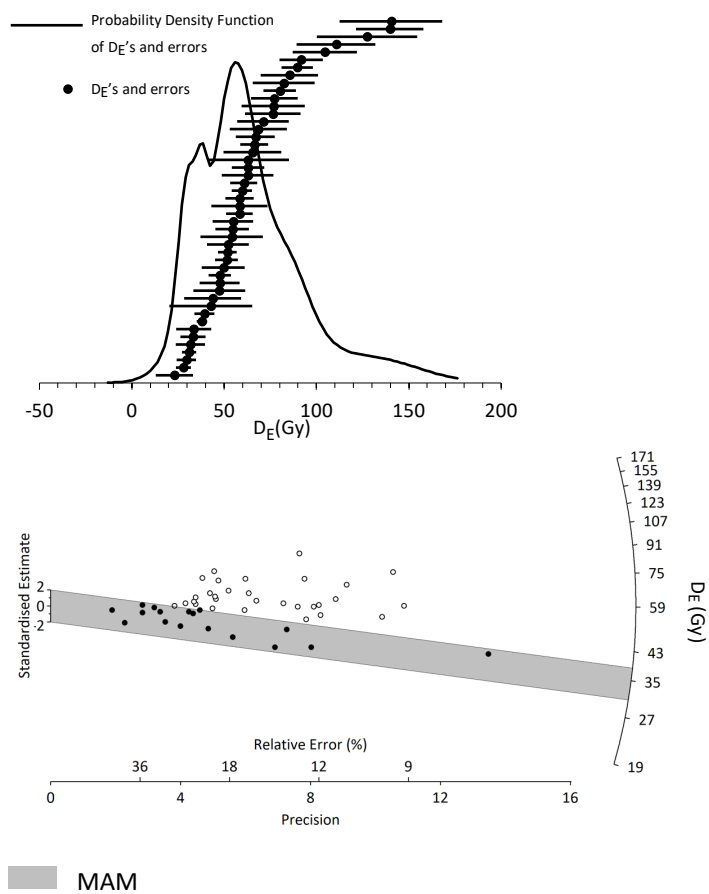
**Figure 32. Single-grain  $D_E$  distributions for sample AB-4 (USU-2329).**



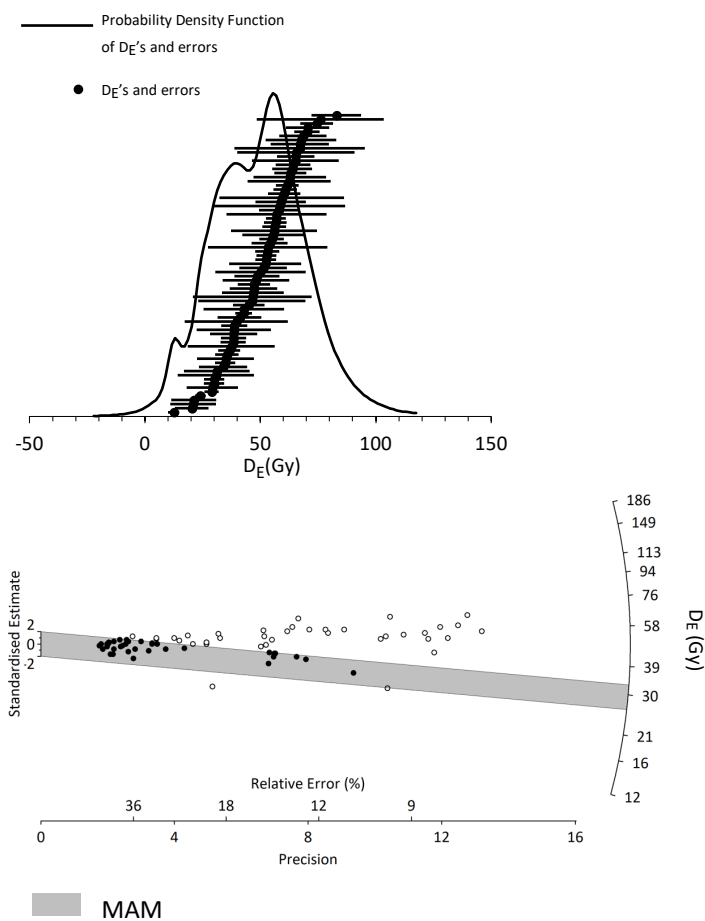
**Figure 33. Single-grain  $D_E$  distributions for sample AB-5 (USU-2330).**



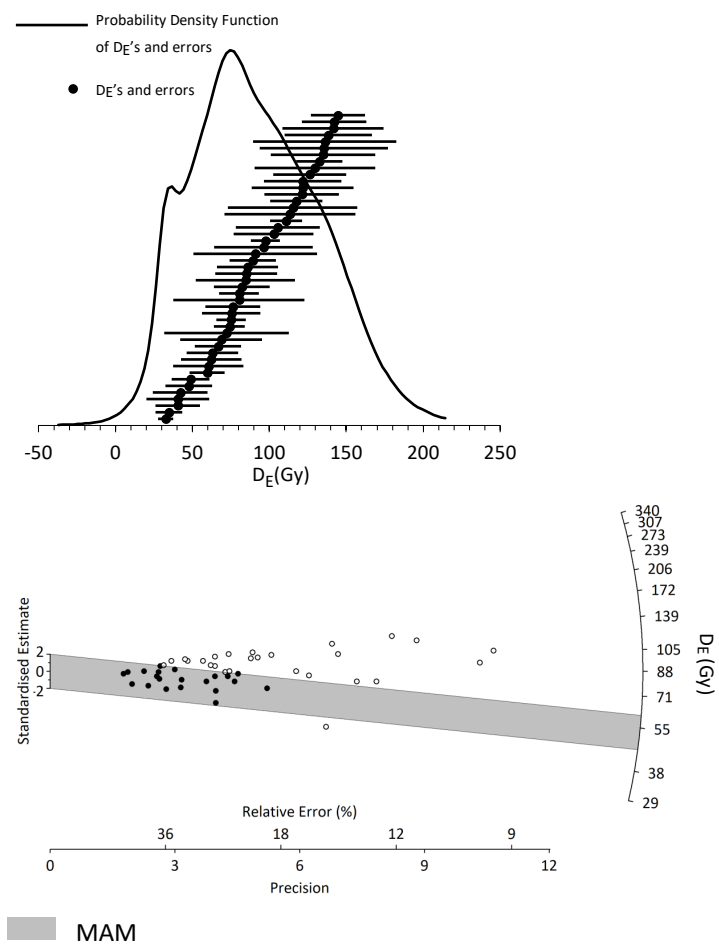
**Figure 34. Single-grain  $D_E$  distributions for sample DE-1 (USU-2331).**



**Figure 35. Single-grain  $D_E$  distributions for sample DE-2 (USU-2332).**

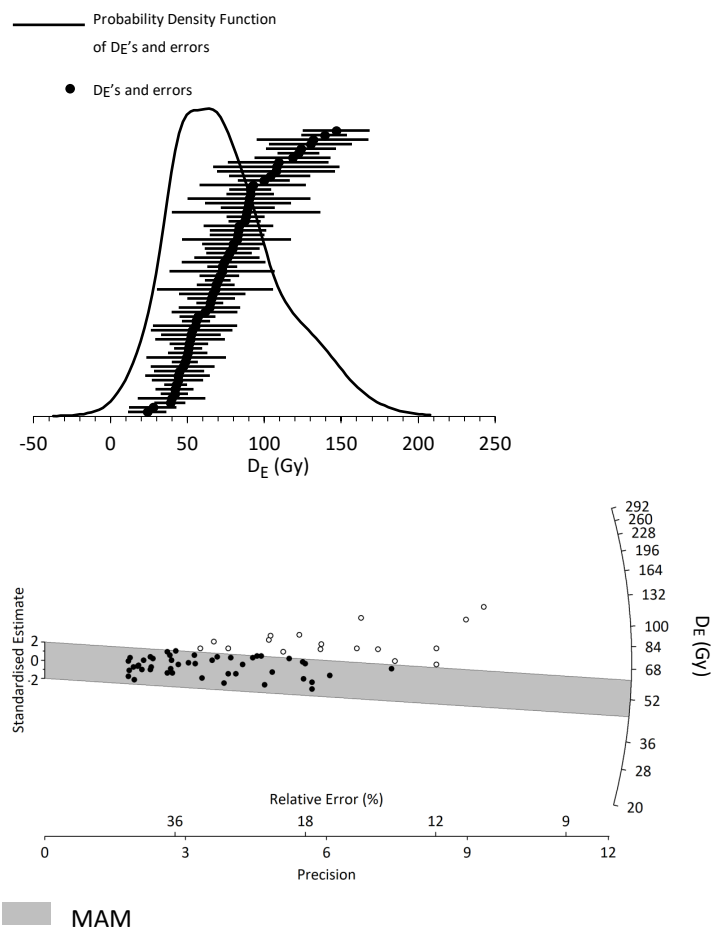


**Figure 36. Single-grain  $D_E$  distributions for sample DE-3 (USU-2333).**

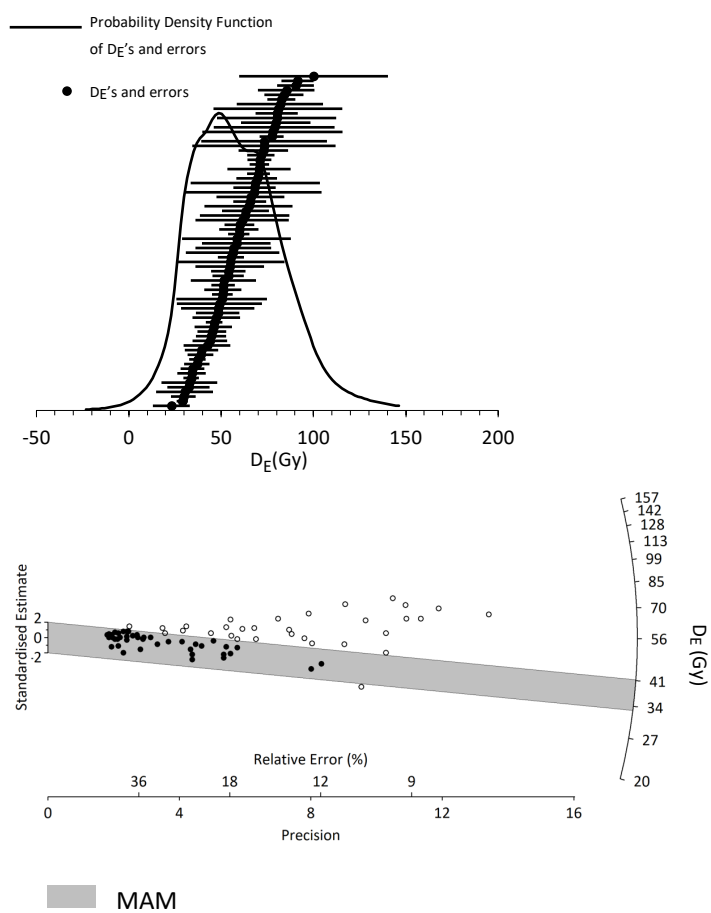


**Figure 37. Single-grain  $D_E$  distributions for sample FG-1 (USU-2334).**





**Figure 38. Single-grain  $D_E$  distributions for sample FG-2 (USU-2335).**



**Figure 39. Single-grain  $D_E$  distributions for sample FG-3 (USU-2336).**

APPENDIX C:

GRANULOMETRY RESULTS

Table 10. Sample Weights and Content of Pebbles, Very Coarse Sand, and Sediment Finer than Very Coarse Sand.

<b>Sample Name</b>	<b>Total Weight</b>	<b>&gt;2mm Weight</b>	<b>&lt;2, &gt;1 mm Weight</b>	<b>&lt;1mm Weight</b>	<b>&gt;2mm Content</b>	<b>&lt;2, &gt;1mm Content</b>	<b>&lt;1 mm Content</b>
AB-1	316.40	43.2	6.90	266.30	13.65%	2.18%	84.17%
AB-2	220.90	20.2	4.40	196.30	9.14%	1.99%	88.86%
AB-3	315.10	40.6	7.30	267.20	12.88%	2.32%	84.80%
AB-4	368.70	23.2	3.80	341.70	6.29%	1.03%	92.68%
AB-5	316.30	20.5	4.80	291.00	6.48%	1.52%	92.00%
AB-6	396.80	21.8	8.40	366.60	5.49%	2.12%	92.39%
AB-7	366.60	23.9	6.00	336.70	6.52%	1.64%	91.84%
AB-8	332.30	29.9	9.10	293.30	9.00%	2.74%	88.26%
AB-9	315.60	35.5	6.60	273.50	11.25%	2.09%	86.66%
AB-10	398.40	40.6	8.20	349.60	10.19%	2.06%	87.75%
AB-11	320.80	27.4	10.20	283.20	8.54%	3.18%	88.28%
DE-1	448.00	45.9	8.60	393.50	10.25%	1.92%	87.83%
DE-2	444.00	66.2	3.70	374.10	14.91%	0.83%	84.26%
DE-3	441.30	14.7	2.80	423.80	3.33%	0.63%	96.03%
DE-4	463.70	10.5	2.90	450.30	2.26%	0.63%	97.11%
DE-5	574.50	15.3	6.10	553.10	2.66%	1.06%	96.28%
DE-6	480.80	7.5	3.90	469.40	1.56%	0.81%	97.63%
DE-7	410.30	23.5	1.30	385.50	5.73%	0.32%	93.96%
DE-8	437.70	27.8	1.90	408.00	6.35%	0.43%	93.21%
FG-1	498.00	35.4	5.10	457.50	7.11%	1.02%	91.87%
FG-2	493.10	26.9	2.40	463.80	5.46%	0.49%	94.06%
FG-3	483.20	16.8	4.10	462.30	3.48%	0.85%	95.67%
FG-4	578.20	25	2.40	550.80	4.32%	0.42%	95.26%
FG-5	438.20	15.9	0.90	421.40	3.63%	0.21%	96.17%
FG-6	457.40	11.7	0.70	445.00	2.56%	0.15%	97.29%
FG-7	469.60	26.1	1.90	441.60	5.56%	0.40%	94.04%

Table 11. Device Settings for Granulometry Analysis.

Particle name	Particle refractive index	Particle absorption index	Dispersant name	Dispersant refractive index	Accessory name	Analysis model	Start result channel size	Last result channel size	Result emulation	Result transform type
Dirt	1.56	0.1	Water	1.33	Hydro 2000M U (A)	General purpose	0.1	1000	Off	Volume

Table 12. General Data from Wall AB Granulometry Tests.

Sample Name	Run	Reading	Obscuration	Residual	Concentration	Span	D [4, 3]	Uniformity	Specific surface area	D [3, 2]	d (0.1)	d (0.5)	d (0.9)
AB-1	A	1	7.25	0.549	0.045	1.557	140.336	0.452	0.135	44.39	36.076	133.729	244.231
		2	7.3	0.55	0.0457	1.549	140.406	0.451	0.134	44.782	36.937	133.753	244.13
		3	7.23	0.553	0.045	1.558	140.168	0.452	0.135	44.525	35.817	133.6	243.933
	B	1	7.54	0.519	0.0462	1.561	139.734	0.453	0.137	43.701	35.345	133.278	243.418
		2	7.63	0.513	0.0474	1.558	140.431	0.454	0.135	44.297	36.424	133.735	244.796
		3	7.55	0.523	0.0464	1.557	138.924	0.453	0.137	43.845	35.617	132.465	241.854
	C	1	8.52	0.577	0.0522	1.568	138.775	0.456	0.138	43.47	35.031	132.173	242.304
		2	8.46	0.565	0.0518	1.572	138.783	0.457	0.138	43.475	34.844	132.162	242.558
		3	8.46	0.553	0.0518	1.571	138.568	0.457	0.138	43.51	34.933	131.914	242.18
AB-2	A	1	8.36	0.617	0.061	1.383	142.8	0.428	0.115	52.351	55.782	135.484	243.2
		2	8.34	0.619	0.0586	1.386	141.821	0.428	0.12	49.846	54.857	134.687	241.554
		3	8.37	0.59	0.0611	1.385	142.393	0.428	0.115	52.332	55.533	135.056	242.632
	B	1	7.66	0.665	0.0576	1.354	145.762	0.421	0.111	54.155	59.888	138.218	246.987
		2	7.71	0.665	0.0581	1.358	145.727	0.422	0.111	54.168	59.533	138.155	247.18
		3	7.85	0.671	0.0601	1.351	146.16	0.42	0.109	54.972	60.497	138.476	247.612
	C	1	8.68	0.609	0.0602	1.405	140.931	0.432	0.122	49.083	52.754	133.823	240.798
		2	8.74	0.624	0.0608	1.4	140.714	0.431	0.122	49.261	53.105	133.624	240.21
		3	8.75	0.621	0.0612	1.4	140.869	0.431	0.121	49.444	53.18	133.778	240.446
AB-3	A	1	9.4	0.591	0.0643	1.432	140.92	0.436	0.124	48.213	49.991	133.871	241.752
		2	9.49	0.579	0.0653	1.436	141.337	0.438	0.124	48.458	50.303	134.102	242.815
		3	9.57	0.59	0.0661	1.431	141.281	0.436	0.123	48.643	50.536	134.128	242.415
	B	1	8.2	0.55	0.0574	1.403	143.15	0.431	0.121	49.67	53.783	135.945	244.524
		2	8.16	0.547	0.0567	1.408	142.543	0.432	0.122	49.341	53.013	135.4	243.652
		3	8.23	0.544	0.0579	1.401	142.903	0.431	0.12	49.852	53.919	135.677	244.064
	C	1	8.72	0.505	0.0592	1.452	142.134	0.44	0.125	48.069	48.864	134.909	244.759
		2	8.8	0.531	0.0603	1.438	142.041	0.437	0.124	48.457	49.931	134.908	243.972
		3	8.81	0.518	0.0604	1.439	142.164	0.437	0.124	48.52	49.804	135.048	244.188
AB-4	A	1	9.89	0.46	0.0557	1.612	134.934	0.469	0.154	39.076	31.679	128.161	238.292
		2	10.01	0.451	0.057	1.61	135.363	0.468	0.152	39.42	32.141	128.499	239.009
		3	10.06	0.466	0.0573	1.604	135.066	0.467	0.152	39.446	32.23	128.333	238.138
	B	1	8.91	0.428	0.048	1.647	133.491	0.478	0.16	37.563	28.857	126.838	237.737
		2	8.99	0.438	0.0488	1.645	133.716	0.478	0.159	37.835	29.186	126.97	238.097
		3	8.97	0.418	0.0484	1.656	133.866	0.481	0.159	37.625	28.905	126.927	239.144
	C	1	9.43	0.494	0.0532	1.627	136.846	0.473	0.153	39.227	31.831	129.629	242.686
		2	9.54	0.498	0.0544	1.62	137.138	0.472	0.151	39.655	32.511	129.873	242.9
		3	9.53	0.512	0.0538	1.62	136.075	0.471	0.153	39.273	31.848	129.005	240.891
AB-5	A	1	10.45	0.468	0.0631	1.623	136.045	0.475	0.142	42.36	32.955	128.588	241.66
		2	10.52	0.462	0.0637	1.625	135.922	0.476	0.141	42.498	33.146	128.321	241.644
		3	10.68	0.464	0.0659	1.622	137.135	0.476	0.139	43.206	34.2	129.259	243.827
	B	1	9.75	0.414	0.057	1.649	135.598	0.482	0.146	41.225	30.965	128.138	242.286
		2	9.78	0.41	0.0571	1.649	135.212	0.481	0.146	41.205	30.843	127.794	241.559
		3	9.77	0.418	0.0571	1.658	135.442	0.484	0.146	41.185	30.75	127.764	242.6
	C	1	10.09	0.472	0.0607	1.619	135.602	0.475	0.142	42.296	33.323	128.111	240.731
		2	10.08	0.46	0.0603	1.627	135.062	0.477	0.143	42.035	32.808	127.496	240.238
		3	10.19	0.473	0.0618	1.614	135.597	0.473	0.141	42.625	33.656	128.116	240.473
AB-6	A	1	11.66	0.324	0.0415	1.944	112.165	0.593	0.25	24.013	17.258	103.769	218.957
		2	11.72	0.322	0.042	1.95	112.606	0.594	0.248	24.215	17.407	103.945	220.052
		3	11.79	0.318	0.0427	1.95	113.152	0.594	0.246	24.411	17.536	104.384	221.107

	B	1	11.06	0.324	0.0391	1.953	113.2	0.596	0.25	23.956	17.112	104.621	221.489
		2	11.17	0.313	0.04	1.958	114.026	0.597	0.248	24.236	17.331	105.174	223.266
		3	11.26	0.318	0.0405	1.953	114.001	0.596	0.246	24.376	17.433	105.209	222.938
	C	1	8.84	0.391	0.0307	1.96	113.48	0.597	0.251	23.886	16.83	104.817	222.28
		2	8.89	0.393	0.0311	1.955	112.918	0.595	0.25	24.034	16.932	104.29	220.861
		3	8.91	0.383	0.0312	1.956	112.745	0.595	0.25	24.037	16.899	104.129	220.559
AB-7	A	1	11.41	0.341	0.0424	1.932	112.995	0.589	0.239	25.11	18.331	104.337	219.898
		2	11.45	0.337	0.0428	1.941	113.548	0.592	0.238	25.205	18.378	104.606	221.402
		3	11.57	0.336	0.0436	1.944	113.943	0.592	0.236	25.418	18.548	104.8	222.23
	B	1	9.04	0.318	0.0319	1.973	110.102	0.606	0.249	24.118	17.286	101.013	216.572
		2	9.18	0.313	0.0331	1.955	111.285	0.599	0.243	24.683	17.767	102.355	217.896
		3	9.32	0.307	0.0337	1.961	110.916	0.601	0.242	24.743	17.815	101.774	217.428
	C	1	10.35	0.306	0.0375	1.968	112.416	0.602	0.243	24.646	17.757	103.097	220.697
		2	10.41	0.318	0.038	1.963	112.411	0.6	0.242	24.775	17.829	103.18	220.413
		3	10.46	0.305	0.038	1.975	112.072	0.605	0.243	24.676	17.707	102.615	220.341
	A	1	11.46	0.182	0.0252	2.727	85.167	0.852	0.405	14.822	8.144	66.9	190.607
		2	11.56	0.178	0.026	2.727	87.714	0.855	0.395	15.191	8.447	68.75	195.96
		3	11.65	0.184	0.0265	2.7	87.588	0.847	0.392	15.322	8.563	69.014	194.929
AB-8	B	1	9.27	0.307	0.0221	2.59	94.836	0.813	0.369	16.267	9.388	76.761	208.164
		2	9.45	0.305	0.0229	2.574	95.491	0.807	0.363	16.549	9.613	77.503	209.119
		3	9.62	0.313	0.024	2.532	96.636	0.791	0.353	16.986	9.996	79.385	210.983
	C	1	8.49	0.456	0.0196	2.632	93.5	0.828	0.378	15.887	8.988	75.046	206.536
		2	8.77	0.451	0.021	2.597	95.479	0.814	0.365	16.426	9.441	77.154	209.812
		3	8.94	0.452	0.0219	2.587	97.35	0.814	0.357	16.8	9.758	78.593	213.074
	A	1	9.12	0.355	0.0258	2.319	97.642	0.716	0.311	19.323	13.179	82.172	203.777
		2	9.46	0.364	0.0276	2.322	99.888	0.719	0.302	19.899	13.766	83.611	207.902
		3	9.79	0.37	0.0293	2.306	101.329	0.716	0.294	20.382	14.257	84.715	209.611
	B	1	10.04	0.352	0.0255	2.444	94.809	0.757	0.346	17.32	10.833	78.362	202.328
		2	10.36	0.364	0.0277	2.411	98.12	0.752	0.33	18.162	11.692	81.045	207.072
		3	10.54	0.363	0.0288	2.411	99.971	0.755	0.323	18.561	12.078	82.198	210.254
AB-9	C	1	12.16	0.248	0.031	2.436	93.116	0.752	0.349	17.194	10.769	77.06	198.46
		2	12.36	0.253	0.0324	2.407	94.117	0.744	0.34	17.631	11.185	78.305	199.627
		3	12.48	0.257	0.0331	2.395	94.818	0.744	0.336	17.843	11.379	78.803	200.101
	A	1	9.68	0.266	0.0253	2.36	94.516	0.728	0.337	17.829	11.768	79.187	198.653
		2	9.96	0.271	0.0271	2.312	95.962	0.714	0.324	18.523	12.542	81.065	200.002
		3	10.24	0.268	0.029	2.317	99.972	0.723	0.311	19.293	13.38	83.495	206.804
	B	1	10.61	0.299	0.0284	2.331	97.239	0.725	0.33	18.195	11.989	81.627	202.291
		2	10.87	0.306	0.03	2.278	97.4	0.705	0.32	18.75	12.614	82.776	201.165
		3	11.05	0.314	0.031	2.278	98.239	0.707	0.315	19.038	12.923	83.201	202.495
	C	1	9.77	0.187	0.0247	2.391	94.336	0.738	0.346	17.328	10.89	78.868	199.487
		2	10.01	0.205	0.0265	2.361	97.311	0.733	0.332	18.09	11.732	81.39	203.859
		3	10.21	0.206	0.0281	2.431	104.358	0.79	0.321	18.708	12.394	83.048	214.263
AB-10	A	1	10.55	0.29	0.0311	2.42	94.516	0.728	0.337	17.829	11.768	79.187	198.653
		2	10.83	0.29	0.0333	2.398	95.962	0.714	0.324	18.523	12.542	81.065	200.002
		3	10.99	0.303	0.0348	2.445	99.972	0.723	0.311	19.293	13.38	83.495	206.804
	B	1	9.32	0.389	0.0269	2.385	97.239	0.725	0.33	18.195	11.989	81.627	202.291
		2	9.53	0.384	0.0285	2.388	97.4	0.705	0.32	18.75	12.614	82.776	201.165
		3	9.83	0.395	0.0307	2.405	98.239	0.707	0.315	19.038	12.923	83.201	202.495
	C	1	10.04	0.362	0.0306	2.385	94.336	0.738	0.346	17.328	10.89	78.868	199.487
		2	10.35	0.364	0.0329	2.387	99.701	0.776	0.3	20.029	14.017	78.807	204.75
		3	10.67	0.367	0.0352	2.434	102.452	0.773	0.288	20.848	14.839	80.991	209.065
AB-11	A	1	9.23	0.563	0.0462	1.61	133.548	0.457	0.171	35.027	27.419	128.098	233.612
		2	9.26	0.544	0.0461	1.615	133.13	0.459	0.172	34.882	27.072	127.654	233.239
		3	9.3	0.565	0.0465	1.612	133.111	0.458	0.171	35.027	27.217	127.67	233.03
	B	1	9.21	0.563	0.0455	1.618	133.593	0.46	0.173	34.622	26.811	128.167	234.149
		2	9.2	0.55	0.045	1.621	132.466	0.46	0.175	34.244	26.096	127.239	232.407
		3	9.27	0.548	0.0457	1.622	133.041	0.461	0.174	34.53	26.522	127.64	233.542
	C	1	9.01	0.547	0.0447	1.613	134.271	0.458	0.172	34.833	27.047	128.795	234.843

Table 13. General Data from Wall DE Granulometry Tests.

Samp le Nam e	R u n	Read ing	Obscur ation	Resid ual	Concent ration	Span	D [4, 3]	Unif ormit y	Speci fic surfa ce area	D [3, 2]	d (0.1)	d (0.5)	d (0.9)
DE-1	A	1	7.94	0.824	0.0402	1.573	140.629	0.448	0.168	35.79	32.07	134.667	243.865
		2	8.01	0.813	0.0409	1.569	140.717	0.447	0.166	36.07	32.686	134.665	243.975
		3	8.01	0.809	0.0404	1.58	139.999	0.449	0.168	35.645	31.142	134.07	243.036
	B	1	8.75	0.707	0.0439	1.586	139.918	0.451	0.17	35.335	30.828	133.954	243.25
		2	8.75	0.705	0.0435	1.593	138.889	0.452	0.172	34.92	29.808	133.023	241.765
		3	8.83	0.734	0.0445	1.588	140.001	0.451	0.169	35.436	30.754	134.007	243.494
	C	1	8.53	0.747	0.0416	1.594	137.58	0.451	0.175	34.331	28.66	131.985	239.083
		2	8.6	0.74	0.0422	1.593	137.48	0.451	0.174	34.501	28.937	131.816	238.913
		3	8.62	0.745	0.0422	1.594	137.608	0.451	0.174	34.482	28.798	131.986	239.223
DE-2	A	1	9.23	0.563	0.0462	1.61	133.548	0.457	0.171	35.027	27.419	128.098	233.612
		2	9.26	0.544	0.0461	1.615	133.13	0.459	0.172	34.882	27.072	127.654	233.239
		3	9.3	0.565	0.0465	1.612	133.111	0.458	0.171	35.027	27.217	127.67	233.03
	B	1	9.21	0.563	0.0455	1.618	133.593	0.46	0.173	34.622	26.811	128.167	234.149
		2	9.2	0.55	0.045	1.621	132.466	0.46	0.175	34.244	26.096	127.239	232.407
		3	9.27	0.548	0.0457	1.622	133.041	0.461	0.174	34.53	26.522	127.64	233.542
	C	1	9.01	0.547	0.0447	1.613	134.271	0.458	0.172	34.833	27.047	128.795	234.843

		2	9.17	0.54	0.0463	1.609	134.824	0.457	0.17	35.372	27.89	129.135	235.68
		3	9.2	0.54	0.0462	1.611	134.135	0.458	0.17	35.199	27.657	128.45	234.621
	A	1	8.61	0.546	0.0367	1.644	130.949	0.463	0.199	30.079	23.408	125.99	230.503
		2	8.6	0.534	0.0365	1.652	130.967	0.466	0.2	29.939	23.171	125.884	231.104
		3	8.66	0.534	0.037	1.647	131.068	0.464	0.199	30.13	23.316	126.045	230.965
DE-3	B	1	8.07	0.561	0.0367	1.611	136.664	0.452	0.186	32.234	26.917	130.979	237.947
		2	8.1	0.569	0.0372	1.607	137.262	0.452	0.184	32.524	27.365	131.551	238.824
		3	8.09	0.566	0.037	1.616	137.508	0.454	0.185	32.381	26.888	131.729	239.756
	C	1	8.67	0.581	0.039	1.623	136.19	0.455	0.189	31.754	25.846	130.534	237.7
		2	8.71	0.584	0.0395	1.617	136.319	0.453	0.188	31.99	26.194	130.707	237.562
		3	8.73	0.585	0.0397	1.621	136.718	0.455	0.187	32.065	26.237	130.992	238.559
	A	1	9.48	0.824	0.0367	1.706	127.104	0.484	0.221	27.182	19.97	122.136	228.346
		2	9.52	0.826	0.037	1.708	127.194	0.485	0.22	27.281	20.035	122.119	228.668
		3	9.53	0.824	0.037	1.706	126.672	0.484	0.221	27.196	19.882	121.784	227.666
DE-4	B	1	9.3	0.962	0.0369	1.698	129.369	0.482	0.215	27.903	20.754	124.159	231.629
		2	9.29	0.967	0.0367	1.702	129.024	0.483	0.216	27.718	20.464	123.911	231.309
		3	9.32	0.961	0.0368	1.709	129.518	0.486	0.216	27.756	20.472	124.194	232.684
	C	1	9	0.886	0.0357	1.708	130.41	0.486	0.215	27.888	20.764	124.983	234.191
		2	8.98	0.88	0.0354	1.71	129.832	0.486	0.216	27.759	20.555	124.464	233.343
		3	9	0.88	0.0353	1.713	129.438	0.488	0.217	27.624	20.332	124.099	232.91
	A	1	9.53	0.726	0.0282	1.91	112.237	0.572	0.295	20.363	13.866	106.058	216.41
		2	9.57	0.723	0.0281	1.912	111.26	0.573	0.297	20.234	13.68	105.152	214.729
		3	9.58	0.718	0.0282	1.919	111.772	0.576	0.296	20.267	13.701	105.447	216.08
DE-5	B	1	10.57	0.755	0.0319	1.9	113.705	0.569	0.291	20.654	14.206	107.513	218.452
		2	10.58	0.748	0.0316	1.9	112.545	0.569	0.293	20.46	13.967	106.542	216.442
		3	10.56	0.742	0.0314	1.906	112.424	0.571	0.295	20.353	13.826	106.378	216.575
	C	1	10.35	0.677	0.0306	1.908	111.768	0.571	0.296	20.244	13.826	105.667	215.432
		2	10.38	0.676	0.0307	1.915	111.644	0.574	0.296	20.238	13.774	105.359	215.564
		3	10.4	0.668	0.0308	1.912	111.781	0.573	0.296	20.284	13.831	105.581	215.701
	A	1	9.58	0.722	0.0283	1.893	110.015	0.566	0.295	20.343	14.323	104.165	211.496
		2	9.64	0.731	0.0288	1.885	110.325	0.563	0.292	20.531	14.471	104.557	211.607
		3	9.63	0.73	0.0284	1.902	109.925	0.57	0.296	20.28	14.151	103.91	211.796
DE-6	B	1	11.08	0.687	0.0342	1.892	114.157	0.565	0.285	21.044	15.081	107.601	218.66
		2	11.11	0.697	0.0344	1.888	114.211	0.564	0.284	21.107	15.112	107.752	218.553
		3	11.1	0.684	0.034	1.887	112.881	0.563	0.288	20.866	14.813	106.657	216.11
	C	1	11.83	0.724	0.0361	1.896	112.72	0.568	0.29	20.673	14.88	106.353	216.48
		2	11.89	0.731	0.0362	1.897	112.127	0.568	0.291	20.645	14.802	105.789	215.434
		3	11.95	0.734	0.0367	1.892	112.896	0.567	0.288	20.818	14.922	106.601	216.581
	A	1	9.96	0.455	0.0179	2.667	85.97	0.84	0.487	12.331	5.484	70.039	192.261
		2	10.01	0.45	0.0181	2.674	86.732	0.842	0.484	12.408	5.525	70.576	194.238
		3	10.01	0.44	0.0177	2.687	83.925	0.846	0.494	12.156	5.369	68.109	188.382
DE-7	B	1	11.55	0.447	0.0209	2.723	87.086	0.858	0.489	12.281	5.462	69.978	196.021
		2	11.56	0.446	0.0207	2.729	85.564	0.859	0.493	12.174	5.394	68.677	192.821
		3	11.58	0.447	0.0209	2.752	87.221	0.869	0.489	12.267	5.452	69.499	196.7
	C	1	9.83	0.464	0.0174	2.71	86.693	0.856	0.493	12.182	5.361	70.021	195.132
		2	9.82	0.466	0.0174	2.777	87.841	0.879	0.493	12.182	5.36	69.658	198.778
		3	9.83	0.473	0.0175	2.736	87.457	0.864	0.49	12.248	5.401	70.199	197.44
	A	1	8.7	0.417	0.0159	2.598	88.037	0.819	0.475	12.624	5.651	73.015	195.336
		2	8.73	0.416	0.0161	2.592	89.387	0.817	0.47	12.778	5.749	74.231	198.173
		3	8.72	0.405	0.016	2.616	88.611	0.825	0.473	12.684	5.686	73.159	197.081
DE-8	B	1	9.73	0.362	0.0178	2.674	90.179	0.846	0.478	12.549	5.574	73.358	201.728
		2	9.74	0.364	0.0177	2.657	89.357	0.839	0.479	12.525	5.552	73.161	199.968
		3	9.76	0.367	0.0179	2.695	90.44	0.85	0.476	12.594	5.594	73.331	203.242
	C	1	10.16	0.384	0.0178	2.682	89.191	0.85	0.497	12.063	5.165	72.884	200.654
		2	10.15	0.382	0.0179	2.719	90.753	0.861	0.494	12.136	5.207	73.487	205.004
		3	10.15	0.381	0.0178	2.683	88.921	0.851	0.498	12.049	5.154	72.657	200.072

Table 14. General Data from Wall FG Granulometry Tests.

Sample Name	Run	Reading	Obscuration	Residual	Concentration	Specific surface area							
						Span	D [4, 3]	Unif ormit y	D [3, 2]	d (0.1)	d (0.5)	d (0.9)	
FG-1	A	1	7.84	0.665	0.0277	1.747	126.183	0.498	0.24	25.037	16.804	121.754	229.555
		2	7.84	0.659	0.0274	1.755	125.645	0.501	0.242	24.821	16.554	121.146	229.125
		3	7.84	0.642	0.0273	1.76	125.316	0.503	0.243	24.691	16.347	120.743	228.886
	B	1	8.51	0.611	0.029	1.759	123.701	0.504	0.253	23.757	16.106	119.361	226.004
		2	8.5	0.587	0.0289	1.761	123.451	0.505	0.254	23.656	15.978	119.142	225.737
		3	8.52	0.584	0.0289	1.761	123.573	0.505	0.254	23.668	15.939	119.292	226.017
	C	1	8.19	0.756	0.028	1.759	124.517	0.503	0.251	23.906	16.204	120.003	227.238
		2	8.24	0.763	0.0284	1.756	124.853	0.501	0.249	24.102	16.368	120.297	227.574
		3	8.25	0.754	0.0283	1.761	124.446	0.503	0.25	23.978	16.207	119.837	227.227
FG-2	A	1	7.72	0.565	0.0232	1.835	119.026	0.538	0.285	21.075	12.912	114.664	223.328
		2	7.71	0.556	0.0231	1.842	119.183	0.541	0.286	20.997	12.784	114.711	224.092

	3	7.73	0.556	0.0232	1.839	119.015	0.54	0.285	21.029	12.812	114.593	223.576
	1	8.87	0.559	0.0269	1.839	119.299	0.538	0.284	21.108	12.991	114.648	223.87
	2	8.92	0.567	0.0272	1.83	119.305	0.535	0.283	21.226	13.107	114.875	223.316
	3	8.92	0.563	0.0271	1.833	118.781	0.537	0.284	21.121	12.988	114.328	222.597
	1	8.1	0.612	0.0247	1.831	121.015	0.534	0.281	21.331	13.131	116.447	226.331
	2	8.06	0.609	0.0243	1.836	120.353	0.536	0.284	21.112	12.884	115.81	225.527
	3	8.06	0.601	0.0241	1.846	119.976	0.54	0.286	20.969	12.701	115.249	225.484
	1	7.96	0.552	0.0254	1.78	121.437	0.512	0.269	22.319	14.472	117.29	223.266
	2	7.99	0.538	0.0256	1.787	122.282	0.514	0.267	22.446	14.569	117.83	225.148
	3	7.97	0.539	0.0252	1.789	121.28	0.516	0.271	22.133	14.183	117.06	223.589
	1	8.84	0.562	0.0286	1.782	122.347	0.513	0.266	22.561	14.829	117.946	225.046
	2	8.82	0.541	0.0283	1.786	121.414	0.514	0.268	22.351	14.574	117.029	223.602
FG-3	3	8.84	0.545	0.0284	1.784	121.549	0.514	0.268	22.363	14.517	117.277	223.705
	1	8.88	0.618	0.0286	1.785	120.977	0.515	0.267	22.457	14.738	116.572	222.833
	2	8.89	0.621	0.0287	1.784	120.887	0.514	0.267	22.46	14.669	116.508	222.575
	3	8.92	0.622	0.0289	1.786	121.487	0.515	0.266	22.572	14.758	117.014	223.745
	1	9.43	0.487	0.0269	1.88	114.651	0.556	0.303	19.802	11.917	109.781	218.275
	2	9.43	0.51	0.0271	1.875	114.824	0.554	0.301	19.91	12.033	109.997	218.3
FG-4	3	9.44	0.5	0.0271	1.882	115.137	0.556	0.301	19.92	12.022	110.099	219.246
	1	8.9	0.606	0.0254	1.873	114.065	0.554	0.303	19.803	11.975	109.437	216.907
	2	8.93	0.599	0.0258	1.876	115.397	0.555	0.299	20.048	12.216	110.46	219.422
	3	8.91	0.598	0.0255	1.876	114.585	0.555	0.302	19.888	11.993	109.828	218.042
	1	9.21	0.51	0.0265	1.873	115.361	0.554	0.301	19.956	12.079	110.621	219.243
	2	9.17	0.513	0.026	1.878	114.406	0.556	0.305	19.672	11.743	109.789	217.969
	3	9.21	0.508	0.0264	1.876	115.275	0.555	0.301	19.901	11.976	110.534	219.309
	1	10.79	0.437	0.0244	2.131	102.32	0.66	0.387	15.486	7.692	94.771	209.618
	2	10.8	0.434	0.0244	2.131	101.882	0.66	0.388	15.469	7.665	94.363	208.717
	3	10.79	0.433	0.0242	2.143	101.534	0.664	0.39	15.369	7.566	93.802	208.627
	1	11.65	0.389	0.0265	2.12	102.905	0.655	0.386	15.536	7.727	95.49	210.122
	2	11.67	0.389	0.0267	2.116	103.073	0.653	0.384	15.607	7.791	95.687	210.242
FG-5	3	11.67	0.392	0.0268	2.116	103.734	0.654	0.383	15.668	7.828	96.303	211.601
	1	9.89	0.377	0.022	2.147	102.234	0.666	0.39	15.371	7.513	94.445	210.28
	2	9.89	0.375	0.022	2.16	102.306	0.671	0.391	15.347	7.49	94.198	210.938
	3	9.9	0.383	0.022	2.148	102.165	0.667	0.391	15.343	7.475	94.416	210.298
	1	10.52	0.448	0.0252	2.164	98.489	0.669	0.366	16.386	9.238	89.45	202.774
	2	10.51	0.44	0.0251	2.175	98.221	0.673	0.368	16.315	9.154	88.994	202.685
FG-6	3	10.54	0.44	0.0253	2.177	99.228	0.673	0.365	16.431	9.259	89.819	204.784
	1	9.84	0.339	0.0233	2.18	98.661	0.675	0.368	16.282	9.031	89.324	203.758
	2	9.82	0.35	0.0231	2.178	97.56	0.675	0.371	16.155	8.902	88.475	201.602
	3	9.84	0.338	0.0232	2.176	97.608	0.674	0.371	16.177	8.921	88.549	201.601
	1	9.71	0.439	0.0233	2.148	98.238	0.663	0.364	16.48	9.295	89.515	201.559
	2	9.72	0.427	0.0233	2.159	98.159	0.667	0.365	16.451	9.241	89.224	201.917
	3	9.72	0.423	0.0232	2.159	97.587	0.668	0.366	16.381	9.165	88.728	200.717
	1	11.25	0.326	0.0219	2.602	90.716	0.82	0.453	13.249	6.265	74.879	201.065
	2	11.3	0.334	0.0223	2.585	91.63	0.816	0.448	13.403	6.376	75.779	202.265
	3	11.3	0.329	0.0221	2.574	90.211	0.811	0.451	13.309	6.308	74.938	199.232
	1	10.39	0.367	0.0203	2.55	89.89	0.803	0.449	13.355	6.339	75.135	197.97
	2	10.38	0.354	0.02	2.58	88.519	0.812	0.454	13.202	6.228	73.453	195.707
FG-7	3	10.38	0.358	0.0201	2.57	89.229	0.81	0.452	13.271	6.267	74.236	197.079
	1	9.76	0.368	0.0188	2.568	88.677	0.81	0.453	13.244	6.256	73.795	195.781
	2	9.74	0.36	0.0188	2.612	89.64	0.823	0.452	13.267	6.268	73.748	198.92
	3	9.75	0.366	0.0189	2.617	90.476	0.827	0.45	13.332	6.315	74.206	200.536

Table 15. Granulometry Averages and Standard Deviations.

Sample Name	Mean			Standard Deviation			Corrected Percentage		
	d (0.1)	d (0.5)	d (0.9)	d (0.1)	d (0.5)	d (0.9)	d (0.1)	d (0.5)	d (0.9)
AB-1	35.67	132.98	243.27	0.716105	0.784514	1.065742	30.02131	111.9224	204.7473
AB-2	56.13	135.70	243.40	3.08468	2.033718	3.05381	49.87517	120.5882	216.2962
AB-3	51.13	134.89	243.57	1.904838	0.729558	1.02025	43.35501	114.3826	206.5447
AB-4	31.02	128.25	239.65	1.550675	1.149187	2.005875	28.74922	118.8567	222.1049
AB-5	32.52	128.18	241.67	1.312673	0.518531	1.133316	29.91534	117.9238	222.3382
AB-6	17.19	104.48	221.28	0.259133	0.513171	1.385933	15.88456	96.52999	204.4375
AB-7	17.94	103.09	219.65	0.40118	1.303698	1.918042	16.47252	94.67858	201.738
AB-8	9.15	74.35	204.35	0.644022	4.780045	8.216022	8.074944	65.61968	180.37
AB-9	12.13	80.70	204.35	1.298413	2.673349	4.50043	10.50882	69.93209	177.0887
AB-10	12.25	81.63	203.22	0.740495	1.704553	4.82132	10.74774	71.62988	178.3314



AB-11	14.93	81.04	209.87	0.794459	2.200056	7.191706	13.18167	71.54027	185.2746
DE-1	30.41	133.35	241.84	1.455929	1.170594	2.174729	26.70989	117.13	212.424
DE-2	27.08	128.09	233.90	0.556309	0.614174	1.016945	22.81776	107.928	197.0787
DE-3	25.48	129.38	235.88	1.700183	2.581554	3.826897	24.47192	124.2484	226.526
DE-4	20.36	123.54	231.19	0.329168	1.186961	2.395464	19.77034	119.9688	224.513
DE-5	13.85	105.97	216.15	0.157714	0.745086	1.043864	13.33698	102.0191	208.1022
DE-6	14.73	105.93	215.19	0.336992	1.430482	2.869197	14.37912	103.42	210.0885
DE-7	5.42	69.64	194.64	0.059729	0.782521	3.155321	5.095319	65.43029	182.8766
DE-8	5.48	73.25	200.14	0.237452	0.446328	3.008447	5.109399	68.28306	186.5594
FG-1	16.28	120.18	227.48	0.2763	0.896297	1.435126	14.9547	110.4017	208.9845
FG-2	12.92	115.04	224.24	0.145145	0.684959	1.253031	12.15543	108.2007	210.9116
FG-3	14.59	117.17	223.72	0.193355	0.48936	0.875586	13.95883	112.1016	214.0465
FG-4	1.01	25.59	284.23	0.041325	6.245507	30.7734	0.958327	24.37966	270.7581
FG-5	7.64	94.83	210.05	0.132455	0.816791	0.957799	7.345704	91.19488	201.9962
FG-6	9.13	89.12	202.38	0.147891	0.463352	1.264536	8.88638	86.70376	196.891
FG-7	6.29	74.46	198.73	0.046594	0.764628	2.30859	5.916211	70.02334	186.8791

Table 16. Wall AB, Clay Sizes.

Sa mpl e Na me	R u n	Rea din g	0.54 954 1	0.63 095 7	0.72 443 6	0.83 176 4	0.95 499 3	1.09 647 8	1.25 892 5	1.44 544	1.65 7	1.90 546 1	2.18 776 2	2.51 188 6	2.88 403 1	3.31 131 1	3.80 189 4
AB -1	A	1	0	0	0.04	0.07	0.08	0.08	0.08	0.09	0.09	0.10	0.12	0.14	0.16	0.18	0.20
					183	527	0.08	430	760	006	619	706	290	0.14	457	0.18	341
		2	0	0	6	4	252	3	1	5	2	1	8	275	6	569	6
					0.04	0.07	0.08	0.08	0.08	0.08	0.09	0.10	0.12	0.14	0.16	0.18	0.19
		3	0	0	108	408	134	326	657	901	495	547	085	018	153	228	978
					9	1	6	4	7	2	4	8	6	1	3	6	8
	B	1	0	0	0.04	0.08	0.08	0.08	0.08	0.08	0.09	0.10	0.12	0.14	0.16	0.18	0.20
					135	0.07	169	0.08	0.08	0.08	0.09	0.10	0.12	0.14	0.16	0.18	0.20
		2	0	0	6	448	9	9	2	9	6	9	9	3	7	3	7
					0.04	0.08	0.08	0.08	0.09	0.09	0.09	0.10	0.12	0.14	0.16	0.18	0.20
		3	0	0	474	025	769	904	189	0.09	873	866	365	283	436	571	420
					5	3	8	5	2	352	9	7	2	1	9	6	9
	C	1	0	0	0.04	0.07	0.08	0.08	0.08	0.09	0.09	0.10	0.12	0.13	0.16	0.18	0.19
					355	825	562	0.08	995	163	676	0.10	102	966	0.16	140	948
		2	0	0	8	3	8	709	9	1	5	645	6	7	061	4	4
					0.04	0.07	0.08	0.08	0.09	0.09	0.09	0.10	0.12	0.14	0.16	0.18	0.20
		3	0	0	0.04	0.07	0.08	0.08	0.09	0.09	0.09	0.10	0.12	0.14	0.16	0.18	0.20
					991	0.08	838	098	235	732	699	170	054	171	0.18	0.18	0.18
AB -2	A	1	0	0	457	6	726	6	9	6	4	7	1	9	7	271	1
					0.04	0.08	0.08	0.08	0.09	0.09	0.09	0.10	0.12	0.14	0.16	0.18	0.20
		2	0	0	535	0.08	836	957	248	424	966	0.10	471	350	422	439	157
					3	106	8	3	4	2	8	976	2	4	2	2	5
		3	0	0	0.04	0.08	0.08	0.08	0.09	0.09	0.09	0.10	0.12	0.14	0.16	0.18	0.20
					515	079	814	0.08	0.09	402	940	942	427	296	366	0.18	142
	B	1	0	0	9	3	938	228	4	8	5	3	8	3	395	7	7
					0.04	0.08	0.08	0.08	0.09	0.09	0.09	0.10	0.12	0.14	0.16	0.18	0.20
		2	0	0	0.04	0.064	797	920	207	376	906	897	371	229	288	0.18	038
					507	4	7	5	5	6	7	9	2	5	2	305	9
		3	0	0	0.04	0.08	0.09	0.09	0.09	0.09	0.10	0.11	0.12	0.14	0.16	0.18	0.20
					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	C	1	0	0	174	290	295	266	0.00	209	179	157	143	138	140	147	156
					0	0	5	1	2	245	3	5	1	8	6	5	7
		2	0	0	0.04	0.07	0.07	0.07	0.08	0.08	0.08	0.09	0.10	0.12	0.14	0.15	0.17
					0.00	0.00	0.04	0.07	0.07	0.08	0.08	0.09	0.10	0.12	0.14	0.15	0.17
		3	0	0	0.03	0.06	0.07	0.07	0.07	0.07	0.08	0.09	0.10	0.12	0.13	0.15	0.16
					599	510	167	356	640	824	292	153	440	066	846	527	864
AB -2	A	1	0	0	5	2	6	7	8	2	9	8	1	9	3	5	2
					0.03	0.07	0.07	0.07	0.07	0.07	0.08	0.09	0.10	0.12	0.13	0.15	0.16
		2	0	0	641	326	516	410	788	202	067	346	0.11	759	449	792	792
					4	4	7	8	1	8	1	8	974	6	5	2	2
		3	0	0	0.03	0.06	0.07	0.07	0.07	0.07	0.08	0.09	0.10	0.12	0.13	0.14	0.16
					400	895	137	124	540	983	824	032	0.11	218	807	087	087
	B	1	0	0	9	6	9	5	5	6	7	9	552	8	4	9	9
					0.03	0.06	0.07	0.07	0.07	0.07	0.08	0.09	0.10	0.12	0.13	0.14	0.16
		2	0	0	0.03	0.06	0.07	0.07	0.07	0.07	0.08	0.09	0.10	0.12	0.13	0.14	0.16
					400	895	137	124	540	983	824	032	0.11	218	807	087	087
		3	0	0	9	6	9	5	5	6	7	9	552	8	4	9	9
					0.03	0.06	0.07	0.07	0.07	0.07	0.08	0.09	0.10	0.12	0.13	0.14	0.16

AB-3	C	2				0.03	0.06	0.07	0.07	0.07	0.07	0.08		0.11	0.13	0.14	0.16
			0	0	0	359	822	074	080	506	959	805	0.10	527	186	767	044
						5	2	8	5	5	7	1	013	5	5	2	7
		3				0.03	0.06	0.06	0.06	0.07	0.07	0.08	0.09	0.11	0.12	0.14	0.15
						282	669	918	919	323	748	556	726	208	845	415	690
			0	0	0	5	5	8	8	7	7	8	4	6	8	8	7
	C	1				0.03	0.06	0.07	0.07	0.07	0.08	0.08	0.10	0.12	0.13	0.15	0.16
						761	774	435	604	878	037	479	0.09	561	153	905	571
			0	0		3	9	9	8	7	2	3	309	1	8	8	2
		2				0.03		0.07	0.07	0.07	0.07	0.08	0.09		0.12	0.13	0.15
						709	0.06	352	531	809	973	416	242	0.10	074	817	472
			0	0		9	691	3	4	9	8	4	8	489	3	3	9
							0.06		0.07	0.07	0.07	0.08	0.09	0.10	0.12	0.13	0.15
		3				0.03	629	0.07	463	740	905	348	174	418	002	745	403
			0	0		675	1	285	6	9	8	7	3	8	6	6	5
	Average Standard Deviation		0.00	0.00		0.02	0.05	0.07	0.07	0.07	0.08	0.08	0.09	0.10	0.12	0.14	0.15
						0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Corrected Percentage					943	683	278	246	346	239	241	247	279	327	379	424
			0	0		4	5	1	9	3	5	9	2	8	7	9	2
			0.00	0.00		0.01	0.04	0.06	0.07	0.07	0.07	0.07	0.08	0.09	0.11	0.12	0.14
AB-4	A	1				0.03	0.07	0.07	0.07	0.08	0.08	0.08	0.09	0.10		0.14	0.15
						907	003	658	804	077	232	682	525	792	0.12	178	879
			0	0		9	6	7	9	5	8	4	1	8	403	6	5
		2				0.03			0.07	0.07	0.08	0.08	0.09	0.10	0.12	0.14	0.15
						883	0.06	0.07	730	994	142	585	420	679	280	046	738
			0	0		6	952	595	4	6	7	2	2	4	4	5	5
						0.03	0.06	0.07	0.07	0.07	0.08	0.08	0.09	0.10	0.12		0.15
		3				832	866	507	652	921	077	523	358	616	217	0.13	681
			0	0		3	3	9	4	9	4	4	8	7	2	985	2
	B	1				0.03	0.06	0.07	0.07	0.07	0.08	0.09		0.12	0.13	0.15	0.16
						644	590	259	461	758	945	402	226	0.10	004	722	383
			0	0		2	9	4	6	5	7	3	8	452	9	9	5
		2				0.03	0.06	0.07	0.07	0.07	0.08	0.09	0.10	0.12	0.13	0.15	
						679	647	314	506	800	987	452	292	536	106	838	508
			0	0		1	7	8	9	2	1	2	2	1	7	5	4
						0.03	0.06	0.07	0.07	0.07	0.08	0.09	0.10	0.11		0.15	0.16
		3				618	541	201	393	682	865	319	141	360	900	0.13	232
			0	0		1	5	4	8	8	3	5	4	4	4	598	3
	C	1				0.03	0.06	0.07	0.07		0.08	0.08	0.09		0.12	0.14	0.15
						883	983	655	819	0.08	263	717	560	0.10	432	216	950
			0	0		7	9	6	5	1	4	3	6	825	7	6	9
		2				0.03	0.06		0.07				0.09	0.10	0.12	0.14	0.15
						800	860	0.07	739	0.08	0.08	0.08	475	703	268	011	711
			0	0		2	4	545	9	035	209	656	5	1	2	2	6
						0.03	0.06	0.07		0.07	0.08	0.08	0.09	0.10	0.12	0.13	
		3				802	850	520	0.07	974	134	573	392	628	211	979	0.15
			0	0		3	6	9	695	4	2	1	3	7	6	8	71
	Average Standard Deviation		0.00	0.00		0.04	0.07	0.07	0.08	0.08	0.08	0.09	0.09	0.11	0.12	0.14	0.16
						0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00		0.00
	Corrected Percentage					109	173	171	154	0.00	137	0.00	138	152	174	0.00	230
			0	0		7	8	7	4	148	5	134	3	1	4	202	3
			0.00	0.00		0.03	0.06	0.06	0.06	0.07	0.07	0.07	0.08	0.09	0.10	0.12	0.13
AB-5	A	1				0.04	0.07	0.09	0.10	0.10	0.10	0.10	0.11	0.13	0.15	0.17	0.19
						613	906	332	027	363	365	459	896	844	290	117	130
			0			6	3	4	5	5	1	1	8	9	9	7	2
		2				0.04	0.07	0.09	0.09	0.10	0.10	0.10	0.11	0.13	0.14	0.16	
						520	760	170	870	215	233	340	781	719	142	937	914
			0			9	1	5	2	3	5	3	4	5	6	5	7
						0.04		0.09	0.09	0.10	0.10	0.10	0.11	0.13	0.14	0.16	0.18
		3				516	0.07	158	856	198	213	315	751	685	106	902	884
			0			3	751	9	2	8	6	8	9	7	8	8	4
	B	1				0.04	0.08	0.09	0.10	0.10	0.10	0.11	0.12	0.13	0.15	0.18	0.20
						822	301	816	550	889	872	950	394	381	903	843	002
			0			1	6	2	9	7	6	5	1	6	8	5	1
		2				0.04	0.08	0.09	0.10	0.10	0.10	0.11	0.12	0.13	0.15	0.17	0.19
						744	178	677	409	749	739	823	269	253	767	695	841
			0			4	3	5	8	4	2	3	2	4	1	4	8
						0.04	0.08	0.09	0.10	0.10	0.10	0.11	0.12	0.13	0.15	0.17	
		3				812	273	772	487	811	782	854	297	290	822	777	955
			0			9	7	8	8	9	6	1	1	1	8	5	9
	C	1				0.04	0.07	0.09	0.09	0.10	0.10	0.10	0.11	0.13	0.15	0.17	0.19
						517	784	222	954	323	366	497	962	927	378	201	204
			0			5	9	1	6	7	7	2	9	4	4	2	2
		2				0.04	0.07	0.09	0.09	0.10	0.10	0.10	0.11	0.13	0.14	0.16	0.18
						436	640	047	763	125	170	306	776	740	183	990	967
			0			1	2	7	5	7	7	5	5	5	8	1	4

	3		0.04	0.07	0.09	0.09	0.10		0.10			0.13	0.15	0.17	0.19	0.20
	0		496	746	173	895	256		417	0.10	0.11	296	119	121	069	745
			4	3	4	8	2	0.10	292	88	844	1	8	8	4	8
	Average	0.00	0.05	0.08	0.09	0.10	0.10	0.10	0.11	0.11	0.12	0.13	0.15	0.17	0.19	0.21
	Standard		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Deviation		146	254	0.00	304	295	272	253	250	269	312	377	461	559	662
	Corrected	0	9	5	297	6	1	2	6	4	6	2	3	9	9	9
	Percentage	0.00	0.04	0.07	0.09	0.09	0.10	0.10	0.10	0.10	0.11	0.12	0.14	0.16	0.18	0.20
AB -5	1			0.04	0.08	0.09	0.09	0.09	0.09	0.10	0.12		0.16	0.18	0.20	
				849	548	214	206	419	494	0.09	881	304	177	233	077	
	0	0		2	5	6	6	2	8	952	4	6	127	4	9	1
	2			0.04		0.09	0.09	0.09	0.09	0.10	0.12	0.14	0.16	0.18	0.19	
				807	0.08	131	120	332	414	880	818	244	061	096	128	939
	0	0		4	473	1	5	8	5	5	1	6	9	9	2	7
	3			0.04	0.08	0.08	0.08	0.09	0.09	0.10	0.11	0.13	0.15	0.17	0.19	
				681	263	915	916	126	204	649	549	925	686	668	658	444
	0	0		8	1	2	4	6	3	3	3	4	7	9	6	9
	1				0.08	0.09		0.09	0.09	0.10	0.11	0.12	0.14	0.16		0.21
				0.04	810	502	0.09	714	808	309	307	815	731	885	0.19	0.44
	0	0		991	1	4	493	9	5	8	6	5	8	3	06	7
	2				0.08	0.09	0.09	0.09	0.09	0.10	0.11	0.12		0.16		0.21
				0.04	780	468	455	671	759	256	254	768	0.14	870	0.19	0.75
	0	0		974	1	8	2	3	3	5	3	4	698	7	068	5
	3			0.04			0.09		0.09		0.11	0.12	0.14		0.19	
				966	0.08	0.09	429	0.09	736	0.10	248	773	712	0.16	0.93	0.21
	0	0		5	763	447	5	645	5	241	9	8	8	892	4	105
	1				0.04	0.08	0.09	0.09	0.09	0.10	0.10	0.12	0.14	0.16	0.18	0.20
				821	511	184	192	423	528	022	991	446	286	332	364	168
	0	0		6	3	8	5	2	5	5	1	9	3	6	1	7
	2			0.04	0.08	0.09	0.09		0.09	0.10	0.11	0.12	0.14	0.16	0.18	0.20
				850	561	237	239	0.09	568	063	038	505	360	425	479	311
	0	0		6	7	3	8	467	7	6	4	3	2	6	9	5
	3			0.04	0.08	0.09	0.09	0.09	0.09	0.10	0.12	0.14	0.16	0.18	0.19	
				738	366	029	034	257	357	844	805	254	090	135	167	973
	0	0		7	8	4	4	2	7	5	3	6	5	8	9	1
	Average	0.00	0.00	0.05	0.09	0.09	0.09	0.09	0.10	0.10	0.11	0.12	0.14	0.16	0.18	0.20
	Standard			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00
	Deviation			107	189	202	196	198	201	218	252	299	0.00	425	503	593
	Corrected	0	0	3	6	9	9	3	1	7	4	9	358	5	5	4
	Percentage	0.00	0.00	0.04	0.08	0.08	0.08	0.09	0.09	0.10	0.11	0.13	0.15	0.17	0.19	
AB -6	1			0.06	0.11	0.15	0.17	0.18	0.18	0.18	0.20	0.22	0.25	0.29	0.32	0.35
				313	057	248	385	498	580	314	0.18	954	534	907	842	444
	0			7	3	7	4	6	1	5	278	5	9	8	2	5
	2			0.06			0.18	0.18	0.18	0.18	0.20	0.22	0.25	0.28	0.31	0.35
				214	0.10	0.15	0.17	270	349	084	045	0.18	267	606	500	699
	0			8	905	055	169	1	3	4	2	71	2	5	6	6
	3			0.06	0.10	0.14	0.16	0.18	0.17	0.17	0.18	0.20	0.22		0.31	0.34
				114	751	862	957	052	137	882	850	515	062	379	0.25	0.28
	0			2	4	5	7	7	4	3	9	7	1	9	244	408
	1			0.06	0.11	0.15	0.17	0.18	0.18	0.18	0.19	0.20	0.23	0.26	0.29	0.32
				254	020	256	420	560	661	413	0.18	091	700	109	087	376
	0			3	2	1	9	4	8	2	394	6	3	4	6	5
	2			0.06	0.10	0.14	0.17	0.18	0.18	0.18	0.18	0.20	0.22		0.28	0.32
				137	821	987	115	234	333	088	072	765	360	750	0.25	975
	0			1	9	8	5	8	3	9	7	8	9	4	707	5
	3			0.06	0.10		0.18	0.18	0.17		0.18	0.20	0.22	0.25	0.28	0.32
				083	729	0.14	0.16	075	166	916	0.17	566	139	504	439	692
	0			9	9	861	969	3	9	2	89	7	4	4	2	7
	1			0.05	0.10		0.17		0.18		0.18	0.19	0.21		0.30	0.33
				985	766		290		0.18		0.18	0.19	0.21		0.30	0.33
	0			5	5	085	7	476	9	436	3	4	5	643	767	1
	2			0.05	0.10	0.14	0.17	0.18	0.18	0.18	0.19	0.20	0.23	0.26	0.29	0.33
				929	670	947	122	279	403	196	0.18	047	789	346	463	859
	0			8	1	7	3	7	4	1	247	9	9	3	6	9
	3			0.05	0.10	0.14	0.17	0.18	0.18	0.18	0.18	0.20	0.23	0.26		0.33
				902	635	911	083	238	358	146	192	990	733	298	435	0.29
	0			3	8	2	3	5	8	8	4	5	8	2	861	1
	Average	0.06	0.11	0.15	0.17	0.18	0.18	0.18	0.18	0.19	0.21	0.23	0.26	0.29	0.33	0.36
	Standard	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Deviation	143	148	150	166	0.00	0.00	197	219	264	336	428	526	615	684	726
	Corrected	8	2	6	6	18	188	7	6	3	5	3	4	8	6	7
	Percentage	0.06	0.10	0.14	0.16	0.17	0.17	0.17	0.17	0.19	0.21	0.24	0.27	0.30	0.33	

AB -7	A	1	0.06 109 3	0.10 592 4	0.14 511 3	0.16 491 8	0.17 486 6	0.17 491 1	0.17 150 3	0.17 007 9	0.17 527 9	0.18 018 9	0.21 028 1	0.23 697 2	0.26 664 1	0.29 676 3	0.32 503 6	
		2	0.06 061 1	0.10 517 8	0.14 413 4	0.16 381 4	0.17 369 2	0.17 371 8	0.17 030 8	0.16 889 7	0.17 412 4	0.18 787 9	0.20 921 7	0.23 599 9	0.26 579 2	0.29 606 2	0.32 450 4	
		3	0.05 997 2	0.10 396 8	0.14 239 7	0.16 177 9	0.17 148 4	0.17 147 9	0.16 808 4	0.16 672 9	0.17 196 1	0.18 566 3	0.20 687 3	0.23 343 6	0.26 290 3	0.29 274 7	0.32 069 3	
		1	0.06 142 5	0.10 890 2	0.15 107 6	0.17 215 9	0.18 274 9	0.18 270 1	0.17 901 2	0.17 017 754	0.18 814 326	0.19 814 5	0.22 111 8	0.24 987 2	0.28 185 9	0.31 447 1	0.34 534 7	
		2	0.05 943 5	0.10 546 7	0.14 639 3	0.16 686 5	0.17 716 2	0.17 713 4	0.17 356 1	0.17 213 2	0.17 768 7	0.19 217 2	0.21 457 1	0.24 266 2	0.27 395 6	0.30 589 2	0.33 613 2	
		3	0.05 937 6	0.10 521 7	0.14 589 8	0.16 618 5	0.17 629 3	0.17 607 8	0.17 063 23	0.17 592 3	0.17 592 6	0.19 014 7	0.21 229 2	0.24 021 2	0.27 143 5	0.30 342 8	0.33 387 3	
	B	1	0.06 002 4	0.10 620 6	0.14 721 9	0.16 781 7	0.17 823 6	0.17 831 6	0.17 480 6	0.17 337 1	0.17 884 3	0.19 317 9	0.21 541 4	0.24 339 2	0.27 470 4	0.30 683 3	0.33 745 5	
		2	0.05 934 5	0.10 505 4	0.14 567 9	0.16 611 7	0.17 650 2	0.17 667 1	0.17 330 1	0.17 200 5	0.17 756 7	0.19 193 4	0.21 414 9	0.24 206 8	0.27 327 8	0.30 525 6	0.33 568 1	
		3	0.05 958 2	0.10 537 4	0.14 600 4	0.16 638 9	0.17 669 2	0.17 678 4	0.17 338 7	0.17 214 4	0.17 017 785	0.19 243 1	0.21 488 8	0.24 304 4	0.27 448 9	0.30 674 3	0.33 754 6	
		Average Standard Deviation		0.06 0.00 077 7	0.11 0.00 135 3	0.15 0.00 236 5	0.17 0.00 286 1	0.18 0.00 312 7	0.18 0.00 312 1	0.17 0.00 304 1	0.17 0.00 303 1	0.18 0.00 319 9	0.19 0.00 358 5	0.21 0.00 416 1	0.24 0.00 489 1	0.27 0.00 576 1	0.30 0.00 676 3	0.33 0.00 788 8
		Corrected Percentag e		0.06	0.10	0.13	0.15	0.16	0.16	0.16	0.16	0.16	0.18	0.20	0.22	0.25	0.28	0.31
		AB -8	A	1	0.11 702 8	0.20 147 2	0.27 390 3	0.30 919 7	0.32 595 3	0.32 492 8	0.31 899 9	0.31 866 7	0.36 136 205	0.40 332 9	0.45 330 8	0.50 772 8	0.56 410 9	0.62 104 2
	2			0.11 335 9	0.19 542 2	0.26 588 8	0.30 019 5	0.31 646 2	0.31 540 3	0.30 954 7	0.30 200 911	0.32 041 5	0.35 113 3	0.39 969 9	0.43 261 2	0.49 748 3	0.54 299 1	
3	0.11 214 4			0.19 326 8	0.26 281 9	0.29 652 5	0.31 101 234	0.31 101 8	0.30 450 8	0.30 734 8	0.31 570 4	0.34 638 8	0.38 493 5	0.43 782 8	0.48 262 9	0.54 794 7		
1	0.10 519 1			0.18 138 7	0.24 708 6	0.27 950 2	0.29 527 9	0.29 490 2	0.28 975 4	0.28 912 5	0.30 027 3	0.32 528 1	0.36 139 2	0.40 467 5	0.45 204 5	0.50 136 8	0.55 146 2	
2	0.10 312 2			0.17 731 9	0.24 110 5	0.27 256 3	0.28 784 1	0.28 750 5	0.28 263 8	0.28 229 5	0.29 351 7	0.31 823 3	0.35 368 1	0.39 597 6	0.44 212 0	0.49 919 4	0.53 919 4	
3	0.09 974 1			0.17 164 5	0.23 350 1	0.26 398 3	0.27 876 7	0.27 835 8	0.27 351 5	0.27 301 7	0.27 028 37	0.30 749 3	0.38 034 175	0.43 274 2	0.47 759 7	0.52 441 7	0.57 226 4	
C	1		0.10 668 6	0.18 531 2	0.25 353 4	0.28 707 3	0.30 334 4	0.30 708 3	0.29 605 9	0.29 730 8	0.30 333 317	0.37 095 5	0.41 666 8	0.46 704 6	0.51 969 7	0.57 317 5		
	2		0.10 310 3	0.17 814 8	0.24 290 1	0.27 470 3	0.29 003 5	0.28 937 4	0.28 401 3	0.28 319 7	0.29 421 2	0.31 925 7	0.33 985 9	0.39 853 9	0.44 953 3	0.49 147 1	0.55 147 1	
	3		0.10 033 8	0.17 335 5	0.23 633 4	0.26 721 9	0.28 203 9	0.28 125 2	0.27 584 8	0.27 482 7	0.28 530 3	0.30 945 3	0.34 482 2	0.38 778 1	0.43 550 54	0.48 674 7	0.53 8 8	
	Average Standard Deviation		0.11 0.00 609 9	0.18 0.01 045 7	0.25 0.01 410 7	0.28 0.01 573 4	0.30 0.01 612 3	0.30 0.01 574 6	0.29 0.01 585 5	0.29 0.01 688 7	0.30 0.01 891 4	0.33 0.01 166 2	0.37 0.02 478 8	0.41 0.02 803 2	0.46 0.02 122 2	0.51 0.03 210 8	0.57 0.03 424 8	
	Corrected Percentag e		0.09	0.16	0.22	0.25	0.26	0.26	0.26	0.26	0.27	0.29	0.32	0.36	0.41	0.45	0.50	
	AB -9		A	1	0.08 620 1	0.14 808 4	0.20 153 9	0.22 847 2	0.24 222 3	0.24 320 8	0.24 050 6	0.24 157 5	0.25 211 7	0.27 361 2	0.30 803 3	0.33 349 3	0.40 926 3	0.44 210 5
2				0.08 364 1	0.14 315 1	0.19 433 8	0.22 006 6	0.23 308 4	0.23 382 1	0.23 102 2	0.23 184 2	0.24 177 9	0.26 227 8	0.29 088 5	0.32 410 1	0.35 895 9	0.39 323 6	0.42 553 2
3		0.08 158 7		0.13 914 5	0.18 845 7	0.21 319 8	0.22 563 1	0.22 622 3	0.22 343 9	0.22 421 5	0.23 385 7	0.25 374 7	0.28 148 5	0.31 367 4	0.34 745 8	0.38 071 2	0.41 210 8	
B		1	0.09 684 7	0.16 731 6	0.22 873 7	0.26 013 6	0.27 684 6	0.27 928 4	0.27 773 6	0.28 062 6	0.29 434 3	0.32 054 4	0.35 623 9	0.39 723 8	0.44 000 4	0.48 184 4	0.52 097 1	

	2	0.09 182 5	0.15 811 1	0.21 565 5		0.26 048 6	0.26 260 2	0.26 105 2		0.27 678 6	0.30 157 6	0.33 526 9	0.37 387 5	0.41 405 1	0.45 333 9	0.49 020 6
	3	0.08 945 9	0.15 389 9	0.20 977 1	0.23 821 5	0.25 317 9	0.25 512 1	0.25 349 3	0.25 602 9	0.26 858 9	0.29 266 7	0.32 550 5	0.36 326 4	0.40 272 3	0.44 149 3	0.47 806 2
	1	0.10 008 4	0.17 059 5	0.23 122 5	0.26 217 9	0.27 841 5	0.28 052 1	0.27 876 9	0.28 159 6	0.29 537 9	0.32 754 172	0.35 858 9	0.39 118 1	0.44 268 9	0.48 142 9	0.52 1 1
	2	0.09 681 4	0.16 488 2	0.22 334 2	0.25 314 2	0.26 875 3	0.27 078 6	0.26 919 3	0.27 215 3	0.28 578 5	0.31 158 7	0.34 651 4	0.38 637 7	0.42 767 4	0.46 787 5	0.50 548 7
	3	0.09 517 7	0.16 204 3	0.21 946 7	0.24 871 3	0.26 401 6	0.26 596 2	0.26 437 728	0.26 075 3	0.27 630 2	0.29 095 6	0.33 059 1	0.36 171 2	0.40 175 8	0.44 919 6	0.48 6 6
	Average	0.09	0.16	0.21	0.24	0.26	0.26	0.26	0.26	0.27	0.29	0.33	0.36	0.40	0.44	0.48
	Standard	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.04
	Deviation	648	104	510	736	880	945	996	087	256	508	819	157	494	813	102
	Corrected	1	5	7	9	5	3	5	7	2	6	5	1	6	5	4
	Percentage	0.08	0.14	0.18	0.21	0.22	0.22	0.22	0.22	0.23	0.25	0.28	0.32	0.35	0.38	0.41
	1	0.09 302 6	0.16 156 1	0.22 175 1	0.25 282 9	0.26 977 4	0.27 288 9	0.27 210 6	0.27 555 6	0.28 530 942	0.31 030 9	0.35 024 7	0.39 139 3	0.43 071 5	0.47 593 3	0.50 5 5
	2	0.08 880 1	0.15 399 7	0.21 110 5	0.24 046 7	0.25 634 1	0.25 907 5	0.25 818 4	0.26 146 3	0.27 482 5	0.29 979 8	0.33 354 1	0.37 199 1	0.41 149 4	0.44 906 3	0.48 251 7
	3	0.08 482 8	0.14 669 3	0.20 073 7	0.22 849 8	0.24 342 5	0.24 586 3	0.24 484 3	0.24 779 2	0.26 038 7	0.28 415 6	0.31 646 6	0.35 346 6	0.39 798 162	0.42 036 1	0.46 5 5
	1	0.08 996 3	0.15 642 6	0.21 486 8	0.24 508 8	0.26 170 1	0.26 507 2	0.26 926 493	0.28 413 9	0.31 107 2	0.34 711 7	0.38 957 1	0.42 882 4	0.46 337 3	0.50 3 3	0.53 3 3
	2	0.08 680 5	0.15 068 8	0.20 677 2	0.23 576 1	0.25 165 8	0.25 479 8	0.25 453 9	0.25 853 2	0.27 260 6	0.29 822 2	0.33 256 9	0.37 151 8	0.41 138 7	0.44 916 2	0.48 273 2
	3	0.08 510 5	0.14 757 7	0.20 237 7	0.23 068 8	0.24 618 7	0.24 894 923	0.24 285 8	0.25 665 7	0.26 184 3	0.29 564 3	0.32 404 3	0.36 337 4	0.40 064 4	0.44 373 9	0.47 9 9
	1	0.09 334 3	0.16 368 2	0.22 606 7	0.25 846 7	0.27 659 5	0.28 075 4	0.28 123 7	0.28 645 2	0.30 275 7	0.33 172 9	0.37 021 4	0.41 377 4	0.45 840 9	0.50 087 9	0.53 885 9
	2	0.08 887 2	0.15 551 7	0.21 448 3	0.24 505 2	0.26 206 4	0.26 583 9	0.26 614 7	0.27 097 7	0.28 633 4	0.31 373 3	0.35 017 3	0.39 144 2	0.43 379 5	0.47 422 3	0.51 056 3
	3	0.08 535 4	0.14 925 1	0.20 577 8	0.23 509 142	0.25 503 4	0.25 528 7	0.25 984 6	0.25 449 3	0.27 072 7	0.30 570 7	0.33 540 1	0.37 618 7	0.41 514 7	0.45 019 4	0.49 4 4
	Average	0.09	0.15	0.21	0.24	0.26	0.26	0.26	0.26	0.28	0.31	0.34	0.38	0.42	0.46	0.49
	Standard	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02
	Deviation	324	599	860	001	090	127	152	198	289	428	600	787	0.01	157	326
	Corrected	2	2	2	5	9	5	4	8	5	4	2	2	976	9	7
	Percentage	0.08	0.14	0.19	0.21	0.23	0.23	0.23	0.23	0.24	0.27	0.30	0.33	0.37	0.40	0.43
	1	0.07 933 1	0.13 716 1	0.18 721 8	0.21 213 7	0.22 480 9	0.22 577 5	0.22 384 7	0.22 615 4	0.23 806 8	0.26 082 2	0.29 175 5	0.32 398 5	0.36 990 8	0.39 345 8	0.43 8 8
	2	0.07 526 6	0.12 999 4	0.17 728 9	0.20 081 6	0.21 274 8	0.21 365 6	0.21 188 6	0.21 575 423	0.22 763 5	0.24 728 8	0.27 118 7	0.31 639 4	0.34 038 071	0.38 275 275	0.41 039 039
	3	0.07 301 7	0.12 602 5	0.17 180 2	0.19 456 6	0.20 609 7	0.20 695 1	0.20 521 6	0.20 747 8	0.21 865 1	0.23 987 9	0.26 864 3	0.30 151 7	0.33 560 9	0.36 876 7	0.39 965 6
	1	0.08 067 6	0.13 992 3	0.19 145 9	0.21 724 5	0.23 044 8	0.23 146 8	0.23 922 4	0.23 245 1	0.24 501 4	0.26 029 62	0.33 238 2	0.37 034 2	0.40 75 5	0.44 203 5	0.47 5 5
	2	0.07 729 8	0.13 391 6	0.18 306 3	0.20 758 7	0.22 003 7	0.22 088 8	0.21 869 7	0.22 047 8	0.23 156 5	0.25 337 8	0.28 825 4	0.31 475 9	0.35 053 6	0.39 391 6	0.42 391 6
	3	0.07 373 8	0.12 725 8	0.17 347 5	0.19 642 6	0.20 795 2	0.20 856 6	0.20 020 641	0.20 814 3	0.21 880 5	0.23 966 2	0.26 827 7	0.30 122 1	0.33 551 3	0.36 886 2	0.39 978 5
	1	0.07 607 1	0.13 137 6	0.17 919 3	0.20 299 9	0.21 504 9	0.21 587 2	0.21 387 9	0.21 592 2	0.22 723 3	0.24 908 897	0.27 336 9	0.31 921 5	0.34 412 4	0.38 649 6	0.41 605 1
	2	0.07 274 3	0.12 517 1	0.17 031 5	0.19 274 2	0.20 401 8	0.20 470 7	0.20 280 5	0.20 485 9	0.21 579 3	0.23 681 5	0.26 835 1	0.29 246 4	0.33 552 4	0.36 605 4	0.39 605 1

3	0.07	0.12	0.16	0.18	0.19	0.19	0.19	0.19	0.19	0.22	0.25	0.28	0.31	0.35	0.37
027	042	338	462	518	567	379	583	0.20	694	467	632	894	031	905	
3	6	2	7	6	6	3	7	652	8	9	4	4	5	8	
Average	0.08	0.13	0.18	0.20	0.21	0.21	0.21	0.21	0.22	0.25	0.28	0.31	0.35	0.38	0.41
Standard	0.00	0.00		0.01	0.01	0.01	0.01		0.01	0.01	0.01		0.01	0.01	0.01
Deviation	333	617	0.00	021	100	115	105	0.01	134	209	323	0.01	632	809	988
	7	6	882	1	3	6	8	103	1	3	4	467	2	9	7
Corrected															
Percentage	0.07	0.11	0.16	0.18	0.19	0.19	0.19	0.19	0.20	0.22	0.24	0.27	0.30	0.34	0.36

Table 17. Wall DE, Clay Sizes.

Sample Name	Run	Reagent	0.54	0.63	0.72	0.83	0.95	1.09	1.25		1.65	1.90	2.18	2.51	2.88	3.31	3.80
			954	095	443	176	499	647	892	1.44	958	546	776	188	403	131	189
			1	7	6	4	3	8	5	544	7	1	2	6	1	1	4
DE -1	A	1		0.04	0.08	0.10	0.11	0.12	0.12	0.13	0.14	0.15	0.17	0.20	0.23	0.25	0.27
				917	658	417	511	210	626	194	184	764	891	409	068	574	650
		0		2	2	3	3	7	1	6	6	6	8	3	1	2	5
		2			0.08	0.10		0.12	0.12	0.13	0.14	0.15	0.17	0.20	0.22	0.25	0.27
				0.04	527	268	0.11	056	472	036	015	576	680	174	810	297	358
		0		836	2	8	359	3	5	7	1	3	4	2	7	7	5
	B	3		0.04	0.08		0.11	0.12	0.12	0.13	0.14	0.15	0.17	0.20	0.23	0.25	0.27
				931	675	0.10	516	207	614	176	163	745	879	407	081	607	712
		0		4	2	431	2	7	4	5	8	7	3	5	3	9	7
		1		0.05	0.08	0.10	0.11	0.12	0.12	0.13		0.15		0.20	0.23	0.25	0.27
				082	920	716	826	533	932	467	0.14	922	0.17	441	072	591	721
		0		5	4	6	9	1	8	9	407	4	981	4	6	6	4
	C	2		0.05	0.09	0.10	0.11	0.12	0.13	0.13	0.14	0.16	0.18		0.23	0.25	0.28
				170	068	886	997	697	083	609	548	075	155	0.20	303	855	024
		0		3	4	5	9	5	8	4	5	8	7	643	8	5	6
		3		0.05	0.08	0.10	0.11	0.12	0.12	0.13	0.14	0.15	0.17	0.20	0.23		0.27
				045	855	635	726	416	803	332	274	803	882	363	009	0.25	655
		0		2	6	3	8	1	1	4	8	3	1	6	4	532	8
	D	1			0.09	0.11	0.12	0.12	0.13		0.14	0.16	0.18	0.21	0.23	0.26	0.28
				0.05	265	118	253	976	386	0.13	942	538	694	251	963	532	680
		0		287	3	8	4	1	9	95	8	8	1	5	1	9	2
		2		0.05	0.09		0.12	0.12	0.13	0.13	0.14	0.16	0.18	0.21	0.23	0.26	0.28
				253	201	0.11	154	863	261	813	794	380	525	071	770	327	462
		0		3	2	037	6	2	5	1	9	4	4	7	7	4	6
	E	3		0.05	0.09	0.11		0.12	0.13	0.13	0.14		0.18	0.21	0.23	0.26	0.28
				218	164	010	0.12	870	281	839	818	0.16	525	061	762	340	518
		0		7	5	6	148	4	9	3	7	394	1	3	3	2	6
		Average	0.00	0.05	0.09	0.11	0.12	0.13	0.13	0.13	0.14	0.16	0.18	0.21	0.23	0.26	0.28
		Standard		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
		Deviation		161	266	307	325	334	332	329	331	0.00	359	383	410	439	468
	F	0		8	1	7	3	8	1	5	7	342	9	6	8	1	2
		Corrected															
		Percentage	0.00	0.04	0.08	0.09	0.10	0.11	0.11	0.12	0.13	0.14	0.16	0.18	0.20	0.23	0.25
DE -2	A	1		0.05		0.10	0.11	0.12	0.12	0.13	0.15	0.17	0.19	0.22		0.26	
				054		578	593	207	516	981	877	374	422	855	418	0.24	775
		0		8	839	2	1	4	8	7	8	4	5	8	4	815	9
		2		0.05	0.08	0.10	0.11	0.12	0.12		0.13	0.15	0.17	0.19	0.22	0.24	0.26
				058	849	593	614	236	556	0.13	944	450	499	922	467	846	799
		0		6	3	5	8	7	9	035	4	3	2	7	6	2	2
	B	3		0.05	0.08	0.10	0.11	0.12	0.12	0.13	0.15	0.17	0.19	0.22	0.24	0.26	
				039	809	537	535	138	440	906	810	314	364	789	335	711	657
		0		3	3	1	9	1	9	9	1	5	6	7	1	4	6
		1		0.05	0.08	0.10	0.11	0.12	0.12	0.13	0.14	0.15	0.17	0.20	0.22	0.25	0.27
				135	952	697	713	344	681	193	150	713	820	295	880	283	246
		0		9	4	6	5	3	6	3	3	5	8	9	4	3	5
	C	2		0.05	0.09	0.10	0.11	0.12	0.12	0.13	0.14	0.15		0.23	0.25	0.27	
				210	073	833	846	473	804	319	290	879	0.18	0.20	129	552	533
		0		6	6	3	7	1	5	1	9	5	017	521	5	1	5
		3		0.05	0.08	0.10	0.11	0.12	0.12	0.13	0.14		0.17	0.20	0.22	0.25	0.27
				146	965	706	709	325	645	141	085	0.15	746	227	830	267	284
		0		8	6	5	4	7	8	5	8	641	4	8	1	1	1
	D	1		0.05	0.08	0.10	0.11	0.12	0.12	0.13	0.14	0.15	0.17	0.20	0.22	0.25	0.27
				109	922	668	682	302	625	121	067	630	750	251	862	279	223
		0		8	5	9	6	6	7	6	6	1	8	1	8	7	9
		2		0.04	0.08	0.10	0.11		0.12	0.12	0.13	0.15	0.17		0.22	0.24	0.26
				973	695	406	408	0.12	353	849	783	317	395	0.19	388	743	634
		0		2	2	1	5	025	3	3	4	8	1	84	9	1	1



DE -5	A	1	0.07 087 8	0.13 074 1	0.18 691 7	0.21 773 8	0.23 710 8	0.24 452 3	0.24 835 6	0.25 563 6	0.27 196 5	0.29 931 1	0.33 548 1	0.37 659 3	0.41 827 3	0.45 688 3
		2	0.07 150 2	0.13 154 8	0.18 777 3	0.21 859 7	0.23 794 8	0.24 537 4	0.24 930 5	0.25 681 7	0.27 351 2	0.30 133 1	0.33 799 4	0.37 954 8	0.42 155 5	0.45 970 6
		3	0.07 122 5	0.13 116 4	0.18 729 6	0.21 802 8	0.23 728 8	0.24 463 2	0.24 849 9	0.25 597 3	0.27 266 6	0.30 053 3	0.33 730 1	0.37 902 1	0.42 125 3	0.45 967 6
	B	1	0.07 090 2	0.13 12 958	0.18 444 3	0.21 484 3	0.23 416 3	0.24 193 7	0.24 621 7	0.25 983 375	0.27 625 6	0.33 076 7	0.36 958 9	0.40 857 8	0.44 382 3	0.47 216 3
		2	0.07 173 6	0.13 090 5	0.18 610 1	0.21 657 7	0.23 585 7	0.24 352 2	0.24 775 9	0.25 187 542	0.27 890 4	0.33 418 1	0.37 384 3	0.41 366 6	0.44 966 9	0.47 862 5
		3	0.07 187 5	0.13 142 5	0.18 707 2	0.21 780 8	0.23 727 3	0.24 501 4	0.24 926 2	0.25 690 8	0.27 336 4	0.30 044 8	0.33 588 3	0.37 582 9	0.41 608 8	0.45 269 5
	C	1	0.07 302 4	0.13 317 1	0.18 923 3	0.22 014 9	0.23 964 5	0.24 728 1	0.25 136 3	0.25 883 3	0.27 514 2	0.30 744 211	0.33 731 7	0.37 754 9	0.41 412 5	0.45 373 4
		2	0.07 271 9	0.13 286 1	0.18 899 9	0.21 995 6	0.23 948 5	0.24 711 7	0.25 115 1	0.25 852 3	0.27 469 2	0.30 669 15	0.33 648 6	0.37 674 8	0.41 350 6	0.45 348 9
		3	0.07 250 2	0.13 260 5	0.18 871 1	0.21 956 2	0.23 891 5	0.24 628 3	0.24 997 9	0.25 696 9	0.27 938 279	0.30 460 3	0.33 473 6	0.37 560 2	0.41 313 3	0.45 384 3
	Average		0.07	0.13	0.19	0.22	0.24	0.25	0.25	0.26	0.27	0.30	0.34	0.38	0.42	0.45
	Standard		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Deviation		078 4	0.00 115	152 3	170 2	176 2	170 8	162 8	157 2	158 9	176 9	222 7	298 6	393 9	575 2
	Corrected															
	Percentag		0.07	0.13	0.18	0.21	0.23	0.24	0.24	0.25	0.26	0.29	0.32	0.36	0.40	0.44
	e															
DE -6	A	1	0.07 302 7	0.13 356 9	0.19 005 8	0.22 106 7	0.24 045 8	0.24 773 1	0.25 125 5	0.25 801 1	0.27 352 2	0.29 963 3	0.33 404 2	0.37 281 4	0.41 158 5	0.44 612 8
		2	0.07 203 3	0.13 177 9	0.18 749 4	0.21 807 1	0.23 719 4	0.24 437 7	0.24 467 5	0.25 015 3	0.27 615 4	0.33 038 7	0.36 894 2	0.40 748 9	0.44 184 9	0.46 854 8
		3	0.07 291 5	0.13 348 5	0.19 004 5	0.22 111 2	0.24 057 2	0.24 792 1	0.25 152 2	0.25 835 1	0.27 391 4	0.30 005 1	0.33 446 9	0.37 327 9	0.41 219 8	0.44 709 8
	B	1	0.07 150 7	0.13 890 9	0.18 230 9	0.21 236 7	0.23 174 5	0.23 992 3	0.24 448 7	0.25 180 4	0.26 687 9	0.29 139 8	0.32 325 7	0.35 890 1	0.39 445 9	0.42 626 2
		2	0.07 110 1	0.13 823 7	0.18 139 2	0.21 127 6	0.23 051 1	0.23 858 6	0.24 306 8	0.25 031 3	0.26 533 8	0.28 981 4	0.32 169 1	0.35 744 9	0.39 320 9	0.42 081 8
		3	0.07 217 7	0.13 010 2	0.18 391 2	0.21 403 5	0.23 329 7	0.24 123 7	0.25 558 6	0.26 283 7	0.29 808 8	0.32 304 5	0.36 554 4	0.39 194 4	0.43 080 8	0.45 650 7
	C	1	0.07 552 2	0.13 437 3	0.18 838 6	0.21 846 8	0.23 739 1	0.24 477 2	0.24 846 6	0.25 509 7	0.26 989 9	0.29 465 1	0.32 720 7	0.36 386 2	0.40 050 3	0.43 315 1
		2	0.07 525 9	0.13 402 8	0.18 800 6	0.21 807 9	0.23 701 6	0.24 445 5	0.24 24 824	0.25 499 1	0.26 993 2	0.29 483 4	0.32 754 6	0.36 436 8	0.40 119 8	0.45 965 7
		3	0.07 418 3	0.13 225 5	0.18 566 9	0.21 547 2	0.23 430 9	0.24 24 179	0.24 566 8	0.25 738 248	0.26 214 6	0.29 464 1	0.32 036 122	0.36 782 6	0.43 053 5	0.45 608 5
	Average		0.07	0.13	0.19	0.22	0.24	0.24	0.25	0.25	0.27	0.29	0.33	0.36	0.40	0.44
	Standard		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Deviation		159 2	228 2	0.00 322	357 5	359 4	327 2	290 4	271 5	289 6	351 9	451 8	574 7	701 9	889 1
	Corrected															
	Percentag		0.07	0.13	0.18	0.21	0.23	0.24	0.24	0.25	0.26	0.29	0.32	0.36	0.39	0.42
	e															
DE -7	A	1	0.13 792 9	0.24 530 9	0.34 210 1	0.39 319 3	0.42 302 9	0.43 182 6	0.43 518 9	0.44 586 5	0.47 337 4	0.52 023 2	0.58 177 5	0.65 160 2	0.72 410 5	0.86 011 1
		2	0.13 665 8	0.24 292 3	0.33 864 5	0.38 914 4	0.41 862 2	0.42 734 5	0.43 080 4	0.44 166 7	0.46 940 1	0.51 649 8	0.57 831 4	0.64 845 8	0.72 130 4	0.85 797 23
		3	0.13 975 7	0.24 827 3	0.34 592 3	0.39 734 8	0.42 725 8	0.43 593 6	0.44 936 4	0.45 040 8	0.47 881 6	0.52 059 7	0.59 066 258	0.73 725 6	0.80 992 3	0.87 703 1
	B	1	0.14 215 6	0.24 909 5	0.34 450 5	0.39 529 9	0.42 442 9	0.43 847 7	0.44 983 7	0.47 781 9	0.52 479 7	0.58 605 9	0.65 517 6	0.72 650 9	0.79 552 5	0.85 884 7



DE-8	C	2	0.14	0.25	0.34	0.39	0.42		0.44		0.48		0.59	0.66		0.80	0.86
			258	025	644	761	773	0.43	161	0.45	236	0.53	272	273	0.73	394	730
		3	2	8	3	6	5	724	5	354	3	039	1	5	466	1	9
			0.14	0.24	0.34	0.39	0.42	0.43	0.43	0.44	0.47	0.52	0.58	0.65	0.72	0.79	0.86
			119	786	314	381	362	304	743	938	813	597	799	763	917	815	135
			3	3	6	1	4	4	8	3	9	2	4	2	8	1	5
		1	0.13	0.24	0.34	0.39	0.42	0.43	0.44	0.45	0.48	0.53	0.59	0.66	0.73	0.81	0.87
			908	746	6	713	771	730	165	362	273	135	456	570	901	001	543
		2	0.13	0.24	0.34	0.39	0.42	0.43	0.44	0.45	0.48	0.53	0.59	0.66	0.73	0.81	0.87
			834	659	442	624	685	652	104	325	263	149	483	597	921	022	593
		3	0.13	0.24	0.34	0.39		0.43		0.45	0.47	0.52	0.59	0.66	0.73	0.80	0.87
			647	399	142	310	0.42	359	0.43	056	982	838	129	198	490	580	169
			3	6	8	3	375	1	828	1	9	4	2	8	5	8	5
		Average	0.14	0.25	0.34	0.39	0.42	0.43	0.44	0.45	0.48	0.53	0.59	0.66	0.73	0.80	0.87
		Standard			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Deviation	0.00	0.00	248	275	298	319	349	392	0.00	511	572	624	669	720	790
		Corrected	225	24	8	2	4	8	1	7	449	8	1	1	8	5	7
		Percentage	0.13	0.23	0.32	0.37	0.40	0.41	0.41	0.42	0.45	0.49	0.55	0.62	0.69	0.75	0.81
DE-8	A	1	0.13	0.23	0.32	0.38	0.40	0.41	0.42	0.43	0.46	0.51	0.57	0.64	0.71	0.78	0.84
			084	514	994	007	978	929	392	607	487	246	389	263	312	109	351
		2	5	8	7	1	2	5	1	7	7	5	8	8	3	3	4
			0.12	0.23		0.37	0.40	0.41	0.41	0.42	0.45	0.50	0.56	0.63	0.70	0.77	0.83
		3	848	137	0.32	454	388	324	773	961	794	489	568	391	413	208	468
			5	8	504	3	6	4	1	8	3	7	3	6	3	8	6
		3	0.12	0.23	0.32	0.37	0.40	0.41	0.42	0.43	0.46	0.50	0.56	0.63	0.70	0.77	0.84
			88	250	705	698	659	601	051	247	101	834	966	855	954	841	208
			3	4	8	1	4	4	2	1	7	3	2	8	7	8	8
		1	0.13	0.23	0.33	0.38	0.41	0.42	0.42			0.51	0.57	0.64	0.72	0.78	0.85
			323	769	222	243	229	206	696	0.43	0.46	645	854	833	024	989	402
		2	1	3	3	6	3	4	4	939	847	6	8	2	8	9	2
			0.13	0.23	0.33	0.38	0.41	0.42	0.42	0.43	0.46	0.51	0.57	0.65	0.72	0.79	0.85
		3	298	760	232	252	229	192	672	917	847	691	967	028	310	365	857
			4	5	6	7	9	9	7	6	8	7	6	4	9	9	3
		3	0.13	0.23	0.32	0.37	0.40	0.41	0.42	0.43	0.46	0.51		0.64	0.71	0.79	0.85
			143	538	965	959	921	877	348	577	483	300	0.57	613	914	008	551
			4	1	6	6	9	2	3	5	7	4	556	6	6	2	8
		1	0.13	0.24	0.34	0.39	0.43	0.44	0.44	0.46		0.55	0.61	0.69	0.76	0.84	0.90
			610	522	490	825	073	259	979	527	0.49	133	866	338	944	215	814
		2	2	1	6	4	4	6	1	1	841	3	6	5	5	6	9
			0.13	0.24	0.34	0.39	0.42	0.43	0.44	0.46		0.54	0.61	0.68	0.76	0.83	0.90
		3	506	350	262	567	798	977	689	219	0.49	740	414	831	399	660	282
			8	6	4	5	5	9	7	7	499	5	7	5	7	9	2
		3	0.13	0.24	0.34		0.43	0.44	0.45	0.46	0.49	0.55	0.61	0.69	0.76	0.84	0.91
			585	514	511	0.39	120	303	005	524	804	069	796	298	979	368	116
			9	7	8	863	8	4	9	9	5	7	5	4	8	5	5
		Average	0.13	0.24	0.33	0.39	0.42	0.43	0.43	0.45	0.48	0.52	0.59	0.66	0.73	0.80	0.87
		Standard	0.00	0.00	0.00	0.00	0.01		0.01	0.01	0.01	0.01	0.02	0.02	0.02		0.03
		Deviation	285	527	779	944	083	0.01	318	474	679	928	198	466	709	0.02	063
		Corrected	7	5	2	5	6	197	5	9	3	4	9	2	1	912	6
		Percentage	0.12	0.22	0.31	0.36	0.39	0.40	0.40	0.41	0.44	0.49	0.55	0.61	0.68	0.75	0.81

Table 18. Wall FG, Clay Sizes.

FG-1	A	1	Sa	Rea	0.54	0.63	0.72	0.83	0.95	1.09	1.25		1.65	1.90	2.18	2.51	2.88	3.31	3.80
			mpl		954	095	443	176	499	647	892	1.44	958	546	776	188	403	131	189
			Na		1	7	6	4	3	8	5	544	7	1	2	6	1	1	4
			me																
					0.08	0.13	0.16	0.18	0.19	0.20	0.20	0.22	0.25	0.28	0.32	0.36	0.40	0.43	
					452	846	975	536	477	055	954	593	168	532	408	460	329	690	
					2	6	3	3	7	5	6	7	5	2	8	1	2	9	
					0.08	0.14	0.17	0.18	0.19		0.21	0.22	0.25	0.28	0.32	0.36	0.40	0.44	
					549	009	178	755	700	0.20	154	781	351	722	620	709	633	061	
					0	1	2	5	5	1	269	6	9	9	2	3	8	1	3

	3		0.08	0.14	0.17	0.18	0.19	0.20	0.21	0.22		0.28	0.32		0.40	
	0		606	098	276	848	781	339	222	860	0.25	866	810	0.36	912	0.44
			5	5	2	4	8	7	5	5	457	3	5	947	8	376
	1	0.04	0.10	0.14	0.17	0.19	0.20	0.20	0.21		0.25		0.33	0.37	0.40	0.44
		763	530	358	606	194	107	659	542	0.23	783	0.29	033	039	831	106
		1	4	5	4	8	6	8	9	188	9	165	5	6	4	6
	2	0.04	0.10	0.14	0.17	0.19	0.20	0.20	0.21	0.23	0.25		0.33	0.37		0.44
		767	573	428	699	291	199	737	606	243	847	0.29	175	246	0.41	453
		7	6	7	1	6	1	7	3	9	6	257	1	9	111	8
	3	0.04	0.10	0.14	0.17	0.19	0.20	0.20	0.21	0.23	0.25	0.29	0.33	0.37	0.41	0.44
		718	515	370	649	250	170	720	598	242	849	258	175	246	114	471
		2	3	4	9	9	7	7	6	3	9	6	5	4	6	
	1	0.04	0.10		0.17	0.19	0.19	0.20	0.21	0.23		0.29	0.32	0.36	0.40	0.44
		643	390	0.14	467	055	972	526	409	051	0.25	027	914	959	805	130
		2	8	214	9	6	4	7	8	8	644	6	5	8	5	6
	2	0.04	0.10	0.14			0.19	0.20	0.21	0.22	0.25	0.28		0.36	0.40	0.43
		579	267	049	0.17	0.18	730	278	159	800	390	766	0.32	654	460	739
		3	4	5	265	829	6	1	1	3	1	3	637	6	9	5
	3	0.04	0.10	0.14	0.17	0.18	0.19	0.20	0.21	0.22	0.25	0.28	0.32	0.36	0.40	0.43
		604	324	125	352	918	818	367	257	918	538	949	852	891	705	980
		7	6	4	6	4	8	3	4	7	9	9	2	3	7	1
	Average	0.03	0.10	0.14	0.17	0.19	0.20	0.20	0.21	0.23	0.26	0.29	0.33	0.37	0.41	0.44
	Standard	0.02	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Deviation	340	954	192	240	252	0.00	0.00	228	230	239	252	260	263	267	285
		6	7	5	4	8	244	235	4	1	8	3	7	5	6	5
	Corrected															
	Percentag															
	e	0.03	0.09	0.13	0.16	0.17	0.18	0.19	0.20	0.21	0.23	0.27	0.30	0.34	0.37	0.41
	1		0.11	0.16	0.20	0.22	0.23	0.23	0.24	0.26	0.29	0.33	0.38		0.47	0.51
		0.05	399	975	080	154	116	775	803	729	747	658	125	0.42	238	195
		739	4	4	5	7	2	1	2	4	8	1	1	775	5	4
	2	0.05	0.11	0.17	0.20	0.22	0.23	0.23	0.24	0.26	0.29	0.33	0.38	0.42	0.47	0.51
		732	415	020	138	222	190	857	898	844	887	825	319	999	501	508
		4	7	1	7	7	4	4	8	8	9	1	5	8	1	7
	3	0.05	0.11	0.16		0.22	0.23	0.23	0.24	0.26	0.29	0.33	0.38	0.42		0.51
		711	388	992	0.20	201	171	834	863	786	796	696	155	812	0.47	355
		7	8	8	114	7	2	3	1	2	9	6	5	8	315	6
	1	0.05	0.11	0.17	0.20	0.22	0.23	0.23	0.24	0.26	0.29	0.33	0.38	0.42		0.51
		870	495	003	084	142	097	748	760	667	671	586	076	755	0.47	163
		2	4	4	7	4	9	2	7	1	8	2	4	1	231	7
	2		0.11	0.16		0.21	0.22	0.23	0.24	0.26	0.29	0.33	0.37	0.42		0.50
		0.05	388	868	0.19	981	929	568	564	447	427	322	804	488	0.46	930
		801	6	3	934	3	2	9	3	5	3	5	8	3	979	4
	3	0.05			0.20	0.22	0.23		0.24	0.26	0.29	0.33	0.38	0.42	0.47	0.51
		824	0.11	0.16	0.29	081	029	0.23	675	577	585	512	026	740	258	231
		4	443	952	3	6	4	671	7	9	3	4	9	7	2	9
	1	0.05	0.11	0.16	0.19	0.21	0.22	0.23			0.29	0.33	0.38	0.42	0.47	0.51
		609	161	649	729	813	818	534	0.24	0.26	661	615	126	810	283	207
		9	6	1	8	7	6	5	621	598	2	5	1	2	3	9
	2	0.05	0.11	0.16		0.22	0.23	0.23	0.24	0.26	0.30	0.34	0.38	0.43	0.47	0.51
		670	300	865	0.19	087	097	817	916	921	023	019	565	276	770	718
		5	6	8	983	5	4	3	8	3	8	7	6	2	7	3
	3	0.05	0.11	0.16	0.20	0.22	0.23	0.23	0.25	0.27	0.30	0.34	0.38	0.43	0.48	0.52
		704	378	986	122	235	246	969	082	113	256	297	885	628	145	109
		3	8	9	2	5	3	5	1	7	1	3	4	9	7	4
	Average	0.06	0.11	0.17	0.20	0.22	0.23	0.24	0.25	0.27	0.30	0.34	0.38	0.43	0.47	0.51
	Standard	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
	Deviation	080	095	117	129	134	0.00	140	162	200	246	0.00	320	340	349	353
		4	4	1	5	7	134	3	6	9	7	289	8	2	1	2
	Corrected															
	Percentag															
	e	0.05	0.11	0.16	0.19	0.21	0.22	0.22	0.23	0.25	0.28	0.32	0.36	0.40	0.45	0.48
	1	0.05	0.10	0.15	0.18	0.20	0.21	0.22	0.23	0.25			0.36	0.40	0.45	0.48
		341	604	812	755	763	758	483	563	489	0.28	0.32	525	914	012	488
		7	8	2	5	9	6	7	4	4	446	238	7	3	3	1
	2	0.04	0.11	0.15	0.18	0.20	0.21	0.22	0.23			0.32	0.36	0.40	0.44	0.48
		921	093	216	762	535	621	344	447	0.25	0.28	119	392	765	848	311
		4	2	7	9	7	2	1	2	381	337	4	5	1	2	5
	3	0.05	0.10	0.15	0.18	0.20		0.22	0.23	0.25	0.28	0.32	0.36	0.41	0.45	0.49
		358	667	926	897	925	0.21	668	768	728	734	587	941	395	552	079
		4	5	6	1	1	931	3	4	6	8	7	9	7	7	4
	1		0.11	0.15	0.18	0.20	0.21	0.22	0.23	0.25	0.28	0.31	0.35	0.40	0.44	0.47
		0.05	146	238	742	492	549	238	291	155	020	700	878	181	229	686
		007	7	6	9	6	2	3	7	3	1	7	8	6	1	4
	2	0.05	0.10	0.15		0.20	0.21	0.22	0.23	0.25	0.28	0.31	0.36	0.40	0.44	0.48
		394	659	857	0.18	800	784	485	523	385	259	963	175	519	610	110
		7	2	2	798	9	4	9	2	4	6	4	5	3	1	1

FG -4	3	0.05 397 7	0.10 651 4	0.15 828 2	0.18 746 3	0.20 726 1	0.21 692 6	0.22 388 6	0.23 436 6	0.25 324 6	0.28 235 6	0.31 979 6	0.36 225 6	0.40 587 6	0.44 680 1	0.48 168 3			
		1	0.05 453 8	0.10 668 8	0.15 785 1	0.18 673 2	0.20 631 3	0.21 588 6	0.22 278 6	0.23 314 5	0.25 175 8	0.28 036 6	0.31 700 9	0.35 837 5	0.40 071 4	0.44 035 1	0.47 419 8		
	C	2	0.05 422 4	0.10 627 7	0.15 739 6	0.18 623 6	0.20 581 9	0.21 544 6	0.22 245 9	0.23 299 2	0.25 182 3	0.28 066 3	0.31 750 9	0.35 901 3	0.40 140 2	0.44 100 2	0.47 476 7		
		3	0.05 025 2	0.11 132 9	0.15 195 5	0.18 391 6	0.20 434 5	0.21 123 3	0.22 187 5	0.23 065 5	0.25 933 1	0.27 589 3	0.31 702 6	0.35 900 4	0.39 827 4	0.43 827 1	0.47 189 1		
	Average Standard Deviation	0.05 0.00 209 5	0.11 0.00 240 1	0.16 0.00 308 3	0.19 0.00 081 2	0.21 0.00 168 4	0.22 0.00 151 1	0.22 0.00 164 9	0.22 0.00 176 6	0.23 0.00 204 8	0.25 0.00 252 5	0.28 0.00 318 7	0.32 0.00 397	0.36 0.00 477	0.40 0.00 550	0.45 0.00 550	0.48 0.00 602		
		Corrected Percentag e	0.05 0.00 209 5	0.11 0.00 240 1	0.16 0.00 308 3	0.19 0.00 081 2	0.21 0.00 168 4	0.22 0.00 151 1	0.22 0.00 164 9	0.22 0.00 176 6	0.23 0.00 204 8	0.25 0.00 252 5	0.28 0.00 318 7	0.32 0.00 397	0.36 0.00 477	0.40 0.00 550	0.45 0.00 550	0.48 0.00 602	
	FG -5	A	1	0.06 701 6	0.12 784 6	0.18 633 9	0.21 878 6	0.24 004 3	0.25 951 1	0.26 589 4	0.28 681 6	0.31 904 1	0.36 079 2	0.40 698 82	0.45 299 1	0.50 279 8	0.54 279 9		
			2	0.06 631 4	0.12 678 7	0.18 502 2	0.21 850 1	0.23 792 6	0.24 423 4	0.25 464 5	0.26 482 2	0.28 679 4	0.31 829 9	0.35 551 7	0.40 417 7	0.45 012 5	0.50 986 6	0.53 986 6	
		B	3	0.06 637 4	0.12 683 8	0.18 501 8	0.21 724 4	0.23 830 5	0.24 760 2	0.25 407 3	0.26 415 6	0.28 606 3	0.31 754 3	0.35 477 7	0.40 045 352	0.45 965 4	0.50 972 4	0.54 972 1	
			1	0.06 694 3	0.12 802 6	0.18 676 4	0.21 918 9	0.24 03 03	0.25 952 2	0.26 563 9	0.28 625 3	0.31 847 4	0.36 024 5	0.40 762 2	0.45 627 4	0.50 206 7	0.54 155 8		
		C	2	0.06 563 7	0.12 583 7	0.18 382 7	0.21 584 8	0.23 672 7	0.24 198 5	0.25 226 4	0.26 238 3	0.28 430 5	0.31 566 5	0.35 254 4	0.40 064 7	0.45 585 4	0.50 477 6	0.54 477 6	
			3	0.06 615 1	0.12 686 5	0.18 529 4	0.21 746 6	0.23 744 8	0.24 348 8	0.25 415 3	0.26 646 5	0.28 834 7	0.31 582 5	0.35 455 1	0.40 045 4	0.45 050 042	0.50 000 9	0.54 000 9	
		A	1	0.06 563 2	0.12 602 2	0.18 437 6	0.21 685 2	0.23 827 8	0.24 458 6	0.25 516 7	0.26 529 7	0.28 691 4	0.31 035 774	0.36 040 405	0.40 178 3	0.45 702 1	0.50 644 5	0.54 644 5	
			2	0.06 686 1	0.12 826 1	0.18 748 5	0.21 031 9	0.23 187 7	0.24 154 3	0.25 809 4	0.26 882 9	0.28 941 1	0.31 178 3	0.32 355 6	0.36 087 5	0.41 956 7	0.45 566 2	0.50 583 2	
		B	3	0.06 565 3	0.12 618 4	0.18 468 7	0.21 720 2	0.23 862 4	0.24 830 2	0.25 485 1	0.26 544 2	0.28 566 2	0.31 747 1	0.35 858 1	0.40 525 1	0.45 340 6	0.49 912 4	0.53 908 7	
			Average Standard Deviation	0.07 0.00 056 8	0.13 0.00 089 5	0.19 0.00 119 5	0.22 0.00 136 7	0.24 0.00 160 15	0.25 0.00 160 7	0.25 0.00 172 4	0.27 0.00 185 2	0.29 0.00 198 2	0.32 0.00 211 7	0.36 0.00 227 6	0.41 0.00 248 1	0.45 0.00 272 7	0.50 0.00 299	0.54 0.00 326 2	
		FG -5	A	1	0.06 798 8	0.12 902 1	0.18 414 7	0.21 487 3	0.23 027 4	0.24 024 4	0.25 653 3	0.27 439 883	0.30 530 4	0.34 797 3	0.39 722 6	0.43 806 3	0.48 615 1	0.51 813 7	
				2	0.09 767 6	0.17 872 6	0.25 392 5	0.29 464 6	0.32 002 7	0.33 996 1	0.33 623 5	0.34 856 8	0.37 424 9	0.41 834 537	0.46 799 8	0.52 927 4	0.58 782 6	0.64 070 7	0.70 027 5
			B	3	0.09 813 3	0.17 978 3	0.25 559 9	0.29 663 5	0.32 220 4	0.33 218 3	0.33 844 8	0.35 079 1	0.37 787 8	0.41 115 3	0.47 121 2	0.53 305 4	0.59 233 3	0.65 573 8	0.70 573 3
				1	0.09 858 4	0.17 908 1	0.25 405 35	0.29 405 6	0.32 953 8	0.33 990 6	0.33 675 1	0.34 962 2	0.37 558 7	0.41 657 9	0.46 751 894	0.52 738 1	0.58 615 3	0.64 518 435	0.69 813 1
			C	2	0.09 773 1	0.17 779 5	0.25 187 9	0.29 222 7	0.32 757 3	0.33 786 8	0.33 466 3	0.34 747 3	0.37 335 2	0.41 424 3	0.46 651 5	0.52 502 5	0.58 484 4	0.64 171 6	0.69 234 3
				3	0.09 694 1	0.17 669 6	0.25 059 8	0.29 083 9	0.32 612 8	0.33 638 8	0.33 583 313	0.35 154 4	0.37 221 1	0.41 426 4	0.46 262 8	0.52 241 5	0.58 942 4	0.63 037 3	0.69 037 1
			A	1	0.09 574 9	0.17 734 1	0.25 378 3	0.29 533 7	0.32 155 8	0.33 219 2	0.33 909 2	0.35 823 2	0.37 990 8	0.41 346 6	0.47 379 2	0.53 596 8	0.59 575 1	0.65 984 8	0.70 984 8
2				0.09 576 3	0.17 754 9	0.25 420 5	0.29 583 5	0.32 207 5	0.33 264 7	0.33 946 7	0.35 231 7	0.37 854 7	0.41 042 03	0.47 401 9	0.53 453 9	0.59 694 4	0.65 132 697	0.71 132 7	
B			3	0.09 569 2	0.17 736 7	0.25 385 7	0.29 530 7	0.32 138 7	0.33 188 1	0.33 873 7	0.35 178 4	0.37 837 9	0.42 063 5	0.47 491 5	0.53 599 9	0.59 886 4	0.65 919 4	0.71 365 9	
			1	0.09 574 9	0.17 734 1	0.25 378 3	0.29 533 7	0.32 155 8	0.33 219 2	0.33 909 2	0.35 823 2	0.37 990 8	0.41 346 6	0.47 379 2	0.53 596 8	0.59 575 1	0.65 984 8	0.70 984 8	
C			2	0.09 576 3	0.17 754 9	0.25 420 5	0.29 583 5	0.32 207 5	0.33 264 7	0.33 946 7	0.35 231 7	0.37 854 7	0.41 042 03	0.47 401 9	0.53 453 9	0.59 694 4	0.65 132 697	0.71 132 7	
			3	0.09 569 2	0.17 736 7	0.25 385 7	0.29 530 7	0.32 138 7	0.33 188 1	0.33 873 7	0.35 178 4	0.37 837 9	0.42 063 5	0.47 491 5	0.53 599 9	0.59 886 4	0.65 919 4	0.71 365 9	

	Average Standard Deviation	0.10	0.18	0.25	0.29	0.32	0.33	0.34	0.35	0.38	0.42	0.47	0.53	0.59	0.65	0.70		
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		114	103	7	2	208	9	7	5	6	8	9	8	1	4	7		
Corrected Percentag e	0.09	0.17	0.24	0.28	0.31	0.32	0.32	0.34	0.36	0.40	0.45	0.51	0.57	0.62	0.67			
FG -6	A	1	0.09 654 3	0.17 291 4	0.24 240 7	0.27 946 5	0.30 140 5	0.30 809 5	0.31 046 6	0.31 758 3	0.33 649 9	0.36 945 4	0.41 354 6	0.46 421 7	0.51 687 7	0.56 731 7	0.61 210 9	
		2	0.09 681 8	0.17 356 8	0.24 341 2	0.28 058 5	0.30 254 9	0.30 918 8	0.31 152 8	0.31 869 9	0.33 778 9	0.37 102 4	0.41 545 1		0.46 943 1	0.57 015 8	0.61 521 8	
		3	0.09 615 6	0.17 226 9	0.24 147 8	0.27 826 6	0.29 992 6	0.30 634 5	0.30 847 3	0.31 540 4	0.33 424 1	0.36 727 4	0.41 163 7	0.46 276 6	0.51 600 6	0.56 704 6	0.61 235 4	
	B	1	0.09 524 7	0.17 238 8	0.24 301 2	0.28 049 2	0.30 277 2	0.30 976 1	0.31 267 1	0.32 068 6	0.34 079 5	0.37 499 9	0.42 008 8	0.47 138 7	0.52 445 4	0.57 538 9	0.62 106 2	
		2	0.09 567 8	0.17 345 9	0.24 471 2	0.28 245 6	0.30 487 4	0.31 189 8	0.31 489 1	0.32 314 8	0.34 371 3	0.37 856 1	0.42 438 1	0.47 638 6	0.53 006 4		0.62 749 7	
		3	0.09 530 9	0.17 298 4	0.24 419 9	0.28 192 7	0.30 435 6	0.31 141 1	0.31 444 4	0.32 273 5	0.34 330 9	0.37 812 3	0.42 384 8	0.47 567 8	0.52 909 6	0.58 018 5	0.62 586 2	
	C	1	0.09 448 6	0.17 037 8	0.23 971 7	0.27 660 8		0.30 552 8	0.30 846 5		0.33 619 5	0.36 979 9	0.41 399 8	0.46 407 9	0.51 556 8	0.56 461 5	0.60 824 5	
		2	0.09 387 7	0.16 995 1	0.23 970 5	0.27 686 9	0.29 906 7	0.30 614 2		0.31 030 907	0.33 686 7	0.36 976 8	0.41 374 3	0.46 376 9		0.56 494 5	0.60 935 3	
		3	0.09 398 5	0.17 046 4	0.24 066 1	0.27 801 9	0.30 031 7	0.30 738 8	0.31 029 5	0.31 811 8	0.32 776 9	0.37 127 9	0.41 041 5	0.46 571 8	0.51 759 8	0.56 735 8	0.61 206 7	
	Average Standard Deviation	0.10	0.17	0.24	0.28	0.30	0.31	0.31	0.32	0.34	0.37	0.42	0.47	0.52	0.57	0.62		
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		106	140	186	211	225	230	242		0.00	332	401	468	0.00	585	646	710	
	Corrected Percentag e	8	5	2	3	4	4	9	276	3	7	8	528	1	3	5		
	FG -7	A	1	0.09 018 4	0.17 782 5	0.24 439 5	0.27 968 6	0.29 551 7	0.30 245 6	0.30 477 9	0.31 410 6	0.33 897 8	0.36 140 3	0.41 690 9	0.46 953 9	0.51 434 9	0.56 754 6	0.60 652 9
			2	0.12 779 7	0.22 410 4		0.35 430 4	0.37 981 2	0.38 669 8	0.38 908 7	0.39 846 8	0.42 327 1	0.46 546 3	0.52 056 8	0.58 270 2	0.64 693 3	0.70 950 6	
			3	0.12 877 7	0.22 584 2	0.31 199 2	0.35 695 6	0.38 254 3	0.38 932 7	0.39 156 2	0.40 084 1	0.42 567 5	0.46 805 9	0.52 350 5	0.58 611 8	0.65 098 4	0.71 437 2	0.77 373 7
		B	1	0.12 620 3	0.22 295 6	0.30 948 4	0.35 486 2	0.38 106 7	0.38 855 6		0.40 039 153	0.42 151 7	0.46 977 4	0.52 536 5	0.58 768 9	0.65 171 2	0.71 369 8	0.77 119 1
			2		0.22 511 9	0.31 269 9	0.35 859 3	0.38 512 4	0.39 278 5	0.39 598 3	0.40 638 7	0.43 248 4	0.47 612 8	0.53 254 9	0.59 557 7	0.66 014 7	0.72 259 2	0.78 059 1
			3	0.12 605 9	0.22 328 4	0.31 036 6	0.35 596 2	0.38 232 4	0.38 995 2	0.39 320 1	0.40 370 6	0.42 992 1	0.47 370 1	0.53 028 5	0.59 350 3	0.65 825 5	0.72 080 6	0.77 875 9
		C	1	0.12 675 8	0.22 470 1	0.31 239 5	0.35 809 9	0.38 422 7		0.39 356 7		0.42 831 9	0.47 146 1	0.52 787 3	0.59 144 8	0.65 704 1	0.72 078 1	0.78 008 4
			2	0.12 616 9	0.22 390 9	0.31 144 9	0.35 699 2	0.38 299 3	0.38 991 8		0.40 184 4	0.42 724 9	0.47 047 6	0.52 685 2	0.59 024 4	0.65 557 5		0.77 856 9
			3	0.12 531 5	0.22 246 7	0.30 946 8	0.35 467 3	0.38 044 5	0.38 960 7	0.39 915 3	0.42 451 8	0.46 762 6	0.52 380 3	0.58 695 6	0.65 202 4	0.71 535 5	0.77 463 5	
		Average Standard Deviation	0.13	0.22	0.31	0.36	0.38	0.39	0.39	0.40	0.43	0.47	0.53	0.59	0.65	0.72	0.78	
			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
153			164	171	188	201	211	225	249	282	323	363	394	0.00	420	430		
Corrected Percentag e		4	9	8	3	5	6	8	2	9	6	5	3	412	6	4		
		0.12	0.21	0.29	0.34	0.36	0.37	0.37	0.38	0.40	0.44	0.50	0.55	0.62	0.67	0.73		

Table 19. Wall AB, Very Fine Silt to Fine Silt Sizes.

Sam ple Na me	R un	Read ing	4.365 158	5.011 872	5.754 399	6.606 934	7.585 776	8.709 636	10	11.48 1536	13.18 2567	15.13 5612
AB- 1	A	1	0.215 696	0.222 309	0.225 165	0.229 136	0.241 332	0.270 75	0.324 342	0.408 367	0.518 533	0.648 041
		2	0.211 974	0.218 584	0.221 482	0.225 5	0.237 733	0.267 191	0.320 831	0.404 886	0.514 974	0.644 163
		3	0.214 233	0.220 985	0.223 967	0.228 048	0.240 392	0.270 114	0.324 286	0.409 276	0.520 751	0.651 824
	B	1	0.217 606	0.225 334	0.228 794	0.232 352	0.242 796	0.269 119	0.318 874	0.399 149	0.506 876	0.636 192
		2	0.212 684	0.220 465	0.224 199	0.228 157	0.238 961	0.265 416	0.314 894	0.394 361	0.500 776	0.628 385
		3	0.214 3	0.222 278	0.226 341	0.230 869	0.242 55	0.270 241	0.321 242	0.402 443	0.510 547	0.639 564
	C	1	0.213 892	0.221 163	0.225 135	0.230 345	0.243 417	0.272 96	0.325 763	0.408 254	0.516 733	0.645 157
		2	0.214 199	0.222 022	0.226 52	0.232 092	0.245 213	0.274 382	0.326 374	0.407 688	0.514 901	0.642 336
		3	0.213 026	0.220 781	0.225 382	0.231 35	0.245 233	0.275 543	0.328 885	0.411 519	0.519 607	0.647 102
	Average		0.21	0.22	0.23	0.23	0.24	0.27	0.32	0.41	0.51	0.64
	Standard		0.001	0.001	0.002	0.002	0.002	0.003	0.004	0.005	0.006	0.007
	Deviation		68	826	011	244	602	267	292	52	555	038
	Corrected											
	Percentage		0.18	0.19	0.19	0.19	0.20	0.23	0.27	0.34	0.43	0.54
AB- 2	A	1	0.175 915	0.178 554	0.177 439	0.176 812	0.183 098	0.204 309	0.246 972	0.316 674	0.409 646	0.519 068
		2	0.176 718	0.179 298	0.178 177	0.177 69	0.184 356	0.206 278	0.249 999	0.321 096	0.415 616	0.526 542
		3	0.175 959	0.178 337	0.176 829	0.175 797	0.181 873	0.203 312	0.246 861	0.318 274	0.413 687	0.526 062
	B	1	0.168 787	0.171 476	0.170 531	0.170 021	0.176 211	0.196 996	0.238 892	0.307 549	0.399 384	0.507 619
		2	0.168 44	0.171 399	0.170 946	0.171 164	0.178 237	0.199 959	0.242 649	0.311 777	0.403 558	0.511 1
		3	0.164 882	0.167 735	0.166 986	0.166 629	0.172 84	0.193 439	0.234 882	0.302 755	0.393 468	0.500 217
	C	1	0.177 125	0.179 702	0.178 523	0.177 975	0.184 727	0.207 122	0.251 951	0.325 08	0.422 652	0.537 735
		2	0.175 946	0.178 5	0.177 401	0.177 068	0.184 184	0.207 094	0.252 542	0.326 321	0.424 403	0.539 661
		3	0.175 448	0.178 145	0.177 171	0.176 89	0.183 925	0.206 572	0.251 571	0.324 752	0.422 222	0.537 01
	Average		0.17	0.18	0.17	0.17	0.18	0.20	0.25	0.32	0.41	0.52
	Standard		0.004	0.004	0.004	0.004	0.004	0.004	0.006	0.008	0.010	0.014
	Deviation		564	434	225	103	274	942	242	292	988	253
	Corrected											
	Percentage		0.15	0.16	0.16	0.16	0.16	0.18	0.22	0.28	0.37	0.46

AB-3	A	1	0.181 351	0.184 635	0.184 142	0.184 211	0.191 506	0.214 491	0.260 164	0.334 759	0.434 781	0.553 759
		2	0.179 86	0.183 222	0.182 936	0.183 352	0.191 087	0.214 504	0.260 427	0.334 889	0.434 211	0.551 814
		3	0.179 394	0.182 759	0.182 397	0.182 64	0.190 117	0.213 232	0.258 901	0.333 271	0.432 783	0.550 941
	B	1	0.176 669	0.180 687	0.181 078	0.181 774	0.188 899	0.210 384	0.252 942	0.322 692	0.416 653	0.528 891
		2	0.178 03	0.182 138	0.182 705	0.183 718	0.191 338	0.213 532	0.256 973	0.327 726	0.422 641	0.535 635
		3	0.174 639	0.178 529	0.178 977	0.179 978	0.187 672	0.209 962	0.253 406	0.323 923	0.418 252	0.530 251
	C	1	0.184 004	0.189 031	0.190 645	0.192 89	0.201 892	0.225 58	0.270 468	0.342 564	0.438 694	0.553 077
		2	0.181 239	0.186 17	0.187 667	0.189 703	0.198 381	0.221 655	0.266 145	0.337 955	0.433 974	0.548 362
		3	0.181 8	0.186 943	0.188 575	0.190 669	0.199 331	0.222 526	0.266 89	0.338 561	0.434 493	0.548 934
	Average Standard Deviation Corrected Percentag e		0.18 0.002 866	0.18 0.003 264	0.18 0.003 818	0.19 0.004 486	0.19 0.005 113	0.22 0.005 615	0.26 0.006 065	0.33 0.006 802	0.43 0.008 13	0.54 0.010 087
			0.15	0.16	0.16	0.16	0.16	0.18	0.22	0.28	0.36	0.46
AB-4	A	1	0.220 087	0.228 076	0.233 554	0.241 065	0.256 972	0.289 554	0.345 028	0.429 425	0.538 728	0.667 082
		2	0.217 341	0.225 435	0.231 159	0.238 993	0.255 188	0.287 889	0.343 173	0.426 959	0.535 236	0.662 227
		3	0.217 277	0.225 449	0.231 226	0.239 079	0.255 256	0.287 914	0.343 138	0.426 845	0.534 992	0.661 74
	B	1	0.234 206	0.243 899	0.250 819	0.259 511	0.276 404	0.310 04	0.366 969	0.453 736	0.566 755	0.700 777
		2	0.232 308	0.241 957	0.248 883	0.257 641	0.274 64	0.308 358	0.365 226	0.451 635	0.563 881	0.696 642
		3	0.234 759	0.244 944	0.252 385	0.261 562	0.278 786	0.312 462	0.368 993	0.454 802	0.566 338	0.698 497
	C	1	0.220 757	0.229 025	0.235 027	0.243 328	0.260 202	0.293 741	0.349 774	0.433 87	0.541 606	0.666 943
		2	0.217 493	0.225 625	0.231 644	0.240 094	0.257 165	0.290 827	0.346 763	0.430 409	0.537 278	0.661 292
		3	0.219 977	0.228 418	0.234 735	0.243 506	0.260 966	0.295 161	0.351 829	0.436 478	0.544 576	0.669 971
	Average Standard Deviation Corrected Percentag e		0.22 0.007 603	0.23 0.008 437	0.24 0.009 055	0.25 0.009 467	0.26 0.009 744	0.30 0.010 064	0.35 0.010 646	0.44 0.011 791	0.55 0.013 807	0.68 0.017 151
			0.21	0.22	0.22	0.23	0.24	0.28	0.33	0.41	0.51	0.63
AB-5	A	1	0.215 338	0.225 895	0.233 92	0.243 511	0.260 443	0.292 489	0.345 538	0.425 536	0.529 091	0.651 293
		2	0.213 648	0.223 974	0.231 95	0.241 755	0.259 184	0.291 97	0.345 837	0.426 525	0.530 356	0.652 199
		3	0.208 627	0.219 014	0.227 084	0.236 866	0.253 998	0.286 075	0.338 792	0.417 91	0.519 969	0.640 036
	B	1	0.226 701	0.239 231	0.249 406	0.261 195	0.280 101	0.313 694	0.367 621	0.447 766	0.550 867	0.672 467

AB-6	C	2	0.227 218	0.239 938	0.250 305	0.262 339	0.281 586	0.315 647	0.370 126	0.450 826	0.554 327	0.676 037	
		3	0.227 592	0.240 474	0.251 121	0.263 562	0.283 3	0.317 864	0.372 731	0.453 588	0.556 914	0.678 104	
		1	0.215 875	0.226 231	0.234 394	0.244 541	0.262 363	0.295 403	0.349 105	0.428 888	0.530 848	0.649 719	
	C	2	0.217 622	0.228 368	0.237 003	0.247 721	0.266 199	0.299 968	0.354 408	0.434 898	0.537 444	0.656 729	
		3	0.213 91	0.224 228	0.232 316	0.242 356	0.260 057	0.292 989	0.346 639	0.426 466	0.528 586	0.647 698	
		Average Standard Deviation Corrected Percentag e	0.22 0.006 943	0.23 0.008 039	0.24 0.009 145	0.25 0.010 206	0.27 0.011 133	0.30 0.011 898	0.35 0.012 458	0.43 0.012 854	0.54 0.013 188	0.66 0.013 765	
	AB-7	A	1	0.20 409	0.21 528	0.22 12	0.23 547	0.25 511	0.28 769	0.33 381	0.40 769	0.49 317	0.61 914
			2	0.377 128	0.400 531	0.421 625	0.444 699	0.475 295	0.521 969	0.591 543	0.693 255	0.827 462	0.996 171
			3	0.373 449	0.396 89	0.418 207	0.441 656	0.472 687	0.519 737	0.589 465	0.690 949	0.824 453	0.991 98
		B	1	0.385 731	0.409 063	0.429 672	0.451 96	0.481 751	0.527 983	0.597 916	0.701 096	0.837 793	1.009 613
			2	0.381 42	0.404 766	0.425 391	0.447 616	0.477 162	0.522 858	0.591 917	0.693 868	0.829 117	0.999 423
			3	0.378 736	0.402 343	0.423 307	0.445 906	0.475 78	0.521 666	0.590 664	0.692 204	0.826 663	0.995 818
C		1	0.394 787	0.418 118	0.438 938	0.461 866	0.492 773	0.540 467	0.611 753	0.715 534	0.851 26	1.019 8	
		2	0.391 132	0.414 273	0.435 057	0.458 239	0.489 783	0.538 51	0.611 033	0.715 948	0.852 204	1.020 201	
		3	0.392 415	0.415 976	0.437 111	0.460 553	0.492 248	0.541 009	0.613 445	0.718 161	0.854 17	1.021 967	
AB-7		A	Average Standard Deviation Corrected Percentag e	0.38 0.007 422	0.41 0.007 389	0.43 0.007 317	0.45 0.007 407	0.48 0.007 863	0.53 0.008 805	0.60 0.010 093	0.70 0.011 397	0.84 0.012 142	1.01 0.011 811
			1	0.35 691	0.38 784	0.40 743	0.42 027	0.45 514	0.49 121	0.55 054	0.65 875	0.77 862	0.93 85
			2	0.349 339	0.370 611	0.389 724	0.411 1	0.440 567	0.486 992	0.557 551	0.661 785	0.800 033	0.974 223
	B	3	0.345 025	0.365 849	0.384 646	0.405 873	0.435 364	0.481 948	0.552 721	0.657 123	0.795 349	0.969 185	
		1	0.372 656	0.396 447	0.418 085	0.442 068	0.474 261	0.523 747	0.597 773	0.706 109	0.849 064	1.028 886	
		2	0.362 847	0.386 058	0.407 106	0.430 417	0.461 774	0.510 097	0.582 502	0.688 543	0.828 498	1.004 536	
	C	3	0.360 946	0.384 654	0.406 279	0.430 183	0.462 043	0.510 7	0.583 184	0.689 011	0.828 496	1.003 926	
		1	0.364 707	0.388 526	0.410 09	0.433 633	0.464 717	0.512 087	0.582 836	0.686 589	0.823 969	0.997 409	
		2	0.362 704	0.386 291	0.407 673	0.431 132	0.462 284	0.509 911	0.581 104	0.685 448	0.823 417	0.997 256	

	3	0.365 11	0.389 437	0.411 719	0.436 16	0.468 198	0.516 444	0.587 815	0.691 85	0.829 164	1.002 337
	Average	0.36	0.38	0.40	0.43	0.46	0.50	0.58	0.68	0.82	0.99
	Standard	0.009	0.010	0.011	0.012	0.013	0.014	0.015	0.016	0.017	0.018
	Deviation	107	397	682	912	999	944	751	538	449	745
	Corrected										
	Percentag										
	e	0.33	0.35	0.37	0.39	0.42	0.46	0.53	0.63	0.75	0.91
AB-8	1	0.677 946	0.736 737	0.799 26	0.870 587	0.953 877	1.056 119	1.179 025	1.329 969	1.505 987	1.711 49
	2	0.658 652	0.716 423	0.778 175	0.848 906	0.931 646	1.033 15	1.154 854	1.303 744	1.476 609	1.677 611
	3	0.653 221	0.710 356	0.771 231	0.840 907	0.922 575	1.023 139	1.144 229	1.292 961	1.466 206	1.668 116
	1	0.601 934	0.654 669	0.711 587	0.777 658	0.856 133	0.953 713	1.071 683	1.216 105	1.382 499	1.573 022
	2	0.588 968	0.641 56	0.698 973	0.766 115	0.845 941	0.944 672	1.062 875	1.205 879	1.368 748	1.553 547
	3	0.570 96	0.622 471	0.678 687	0.744 325	0.822 219	0.918 46	1.033 731	1.173 477	1.333 2	1.515 248
	1	0.626 832	0.682 425	0.741 758	0.809 815	0.889 809	0.988 513	1.107 28	1.252 395	1.419 678	1.611 704
	2	0.603 719	0.657 946	0.715 838	0.782 185	0.860 083	0.956 146	1.071 726	1.212 949	1.375 657	1.562 163
	3	0.588 435	0.642 109	0.699 304	0.764 625	0.841 047	0.935 06	1.048 076	1.186 253	1.345 769	1.529 161
	Average	0.62	0.67	0.73	0.80	0.88	0.98	1.10	1.24	1.41	1.60
	Standard	0.036	0.039	0.041	0.043	0.046	0.048	0.051	0.055	0.061	0.070
	Deviation	993	504	781	956	118	546	541	763	783	488
	Corrected										
	Percentag										
	e	0.55	0.59	0.65	0.71	0.78	0.86	0.97	1.10	1.24	1.41
AB-9	1	0.472 13	0.500 888	0.530 705	0.566 317	0.612 049	0.674 503	0.756 865	0.865 463	0.998 734	1.160 325
	2	0.455 356	0.484 138	0.513 992	0.549 371	0.594 309	0.655 142	0.734 973	0.840 103	0.969 324	1.126 571
	3	0.441 183	0.469 346	0.498 684	0.533 604	0.578 124	0.638 532	0.717 852	0.822 159	0.949 942	1.104 68
	1	0.556 581	0.590 051	0.623 525	0.661 864	0.709 611	0.773 941	0.858 723	0.971 284	1.110 857	1.281 903
	2	0.524 062	0.556 377	0.589 291	0.627 473	0.675 125	0.738 916	0.822 138	0.931 438	1.065 622	1.228 697
	3	0.511 81	0.544 119	0.576 993	0.614 924	0.661 934	0.724 502	0.805 827	0.912 443	1.043 291	1.202 443
	1	0.556 779	0.590 367	0.624 455	0.663 855	0.712 847	0.778 304	0.863 799	0.976 603	1.116 137	1.287 347
	2	0.540 083	0.573 387	0.607 723	0.647 834	0.697 755	0.763 989	0.849 581	0.961 245	1.097 993	1.264 5
	3	0.533 563	0.566 58	0.600 633	0.640 567	0.690 546	0.757 142	0.843 341	0.955 638	1.092 619	1.258 485
	Average	0.51	0.54	0.57	0.61	0.66	0.72	0.81	0.92	1.05	1.21
	Standard	0.043	0.045	0.047	0.049	0.051	0.053	0.055	0.058	0.062	0.068
	Deviation	553	778	744	596	426	439	794	856	88	311
	Corrected										
	Percentag										
	e	0.44	0.47	0.50	0.53	0.57	0.63	0.70	0.79	0.91	1.05



AB-10	A	1	0.535 794	0.561 205	0.584 258	0.609 831	0.643 414	0.693 072	0.764 69	0.867 001	1.001 029	1.171 863
		2	0.510 705	0.534 654	0.556 625	0.581 615	0.615 206	0.665 395	0.737 761	0.840 477	0.973 727	1.141 633
		3	0.487 631	0.510 696	0.531 734	0.555 579	0.587 671	0.635 801	0.705 449	0.804 584	0.933 465	1.096 151
	B	1	0.532 043	0.556 009	0.577 77	0.602 56	0.636 062	0.686 116	0.757 82	0.858 545	0.987 691	1.148 528
		2	0.511 034	0.535 228	0.557 653	0.583 243	0.617 241	0.667 02	0.737 278	0.835 079	0.959 902	1.115 171
		3	0.501 621	0.525 469	0.547 664	0.573 173	0.607 26	0.657 27	0.727 794	0.825 737	0.950 401	1.105 101
	C	1	0.571 051	0.598 456	0.623 232	0.650 337	0.685 159	0.735 516	0.806 794	0.907 112	1.037 11	1.201 742
		2	0.541 622	0.568 376	0.592 858	0.619 785	0.654 243	0.703 692	0.773 217	0.870 596	0.996 365	1.155 256
		3	0.520 212	0.546 209	0.570 23	0.596 897	0.631 12	0.680 075	0.748 504	0.843 736	0.966 01	1.119 794
	Average		0.52	0.55	0.57	0.60	0.63	0.68	0.75	0.85	0.98	1.14
	Standard		0.024	0.026	0.027	0.027	0.028	0.028	0.029	0.029	0.031	0.034
	Deviation		771	08	153	993	576	944	206	688	001	092
	Corrected											
	Percentage		0.46	0.48	0.50	0.52	0.55	0.60	0.66	0.75	0.86	1.00
AB-11	A	1	0.464 008	0.492 762	0.521 438	0.553 883	0.593 518	0.645 978	0.714 514	0.805 89	0.921 419	1.068 328
		2	0.441 965	0.469 589	0.497 382	0.529 171	0.568 341	0.620 391	0.688 345	0.778 553	0.891 828	1.034 687
		3	0.427 813	0.454 568	0.481 816	0.513 472	0.552 953	0.605 693	0.674 487	0.765 347	0.878 577	1.020 158
	B	1	0.472 956	0.501 167	0.528 274	0.558 268	0.595 197	0.645 651	0.714 226	0.809 034	0.932 201	1.091 239
		2	0.454 032	0.481 842	0.508 949	0.539 248	0.576 592	0.627 291	0.695 55	0.789 01	0.909 388	1.063 777
		3	0.427 672	0.453 737	0.479 86	0.510 086	0.548 257	0.600 429	0.670 197	0.764 358	0.883 537	1.033 703
	C	1	0.445 593	0.472 537	0.499 119	0.529 334	0.566 959	0.617 945	0.685 847	0.777 436	0.893 629	1.040 768
		2	0.423 449	0.448 946	0.474 466	0.504 057	0.541 498	0.592 582	0.660 516	0.751 489	0.865 693	1.008 621
		3	0.404 732	0.428 715	0.453 125	0.482 14	0.519 613	0.571 259	0.639 985	0.731 475	0.845 162	0.985 688
	Average		0.44	0.47	0.49	0.52	0.56	0.61	0.68	0.77	0.89	1.04
	Standard		0.021	0.022	0.023	0.024	0.024	0.024	0.024	0.024	0.027	0.032
	Deviation		541	942	951	515	643	485	376	951	202	348
	Corrected											
	Percentage		0.39	0.41	0.44	0.46	0.50	0.54	0.60	0.68	0.79	0.92

Table 20. Wall DE, Very Fine Silt to Fine Silt Sizes.

Sam	R	Read	4.365	5.011	5.754	6.606	7.585	8.709		11.48	13.18	15.13
ple	un	ing	158	872	399	934	776	636	10	1536	2567	5612

Name															
DE-1	A	1	0.290 843	0.298 486	0.301 128	0.303 208	0.311 262	0.333 446	0.376 199	0.444 813	0.535 031	0.639 215			
		2	0.287 813	0.295 395	0.298 03	0.300 172	0.308 366	0.330 783	0.373 865	0.442 907	0.533 599	0.638 214			
		3	0.291 874	0.300 115	0.303 592	0.306 804	0.316 26	0.340 097	0.384 603	0.454 951	0.546 606	0.651 698			
		B	1	0.292 374	0.300 915	0.304 267	0.306 664	0.314 536	0.336 111	0.378 147	0.446 42	0.537 262	0.643 509		
			2	0.295 929	0.305 215	0.309 599	0.313 371	0.322 888	0.346 275	0.389 996	0.459 541	0.550 823	0.656 374		
			3	0.291 644	0.300 241	0.303 931	0.307 08	0.316 12	0.339 195	0.382 776	0.452 326	0.543 736	0.649 521		
	C	1	0.301 919	0.310 481	0.314 312	0.318 093	0.328 558	0.354 097	0.401 079	0.474 645	0.569 684	0.677 512			
		2	0.299 644	0.308 127	0.311 894	0.315 624	0.326 068	0.351 668	0.398 85	0.472 809	0.568 39	0.676 798			
		3	0.300 819	0.310 002	0.314 387	0.318 482	0.328 875	0.353 923	0.400 104	0.472 76	0.567 096	0.674 697			
		Average Standard Deviation Corrected Percentage	0.29 0.005 006	0.30 0.005 411	0.31 0.005 935	0.31 0.006 643	0.32 0.007 601	0.34 0.008 937	0.39 0.010 664	0.46 0.012 717	0.55 0.014 68	0.66 0.016 04			
			0.26	0.27	0.27	0.27	0.28	0.30	0.34	0.40	0.48	0.58			
			DE-2	A	1	0.281 113	0.288 329	0.291 691	0.296 437	0.309 898	0.341 188	0.397 033	0.483 122	0.593 782	0.720 105
					2	0.281 483	0.289 151	0.293 335	0.299 287	0.314 224	0.347 114	0.404 388	0.491 493	0.602 483	0.728 342
		3			0.279 95	0.287 462	0.291 481	0.297 294	0.312 162	0.345 07	0.402 444	0.489 719	0.600 945	0.727 136	
B	1	0.285 991			0.293 753	0.298 21	0.304 661	0.320 203	0.353 513	0.410 598	0.496 517	0.605 263	0.728 071		
	2	0.289 072			0.297 141	0.302 069	0.309 235	0.325 781	0.360 447	0.419 204	0.507 106	0.617 937	0.742 76		
	3	0.287 096			0.295 735	0.301 1	0.308 349	0.324 415	0.357 896	0.414 824	0.500 429	0.608 994	0.732 08		
C	1	0.285 04		0.291 385	0.293 748	0.297 605	0.310 592	0.342 067	0.398 889	0.486 714	0.599 486	0.727 758			
	2	0.278 807		0.285 071	0.287 612	0.291 845	0.305 271	0.337 078	0.393 904	0.481 195	0.592 754	0.719 041			
	3	0.279 593		0.285 996	0.288 857	0.293 651	0.307 871	0.340 662	0.398 497	0.486 64	0.598 619	0.724 665			
	Average Standard Deviation Corrected Percentage	0.28 0.003 724		0.29 0.004 307	0.29 0.005 15	0.30 0.006 22	0.31 0.007 325	0.35 0.008 231	0.40 0.008 658	0.49 0.008 474	0.60 0.007 787	0.73 0.006 97			
		0.24		0.24	0.25	0.25	0.26	0.29	0.34	0.41	0.51	0.61			
		DE-3		A	1	0.359 343	0.366 435	0.367 341	0.367 199	0.373 505	0.395 318	0.439 728	0.512 142	0.607 405	0.716 372
					2	0.362 256	0.370 1	0.371 792	0.372 394	0.379 253	0.401 272	0.445 406	0.517 01	0.611 087	0.718 792

DE-4	B	3	0.359 368	0.367 264	0.369 129	0.370 043	0.377 354	0.399 957	0.444 741	0.516 988	0.611 567	0.719 538
		1	0.338 085	0.344 118	0.344 176	0.343 274	0.348 706	0.369 156	0.411 328	0.480 09	0.569 947	0.671 132
		2	0.334 812	0.341 397	0.342 226	0.342 192	0.348 369	0.369 222	0.411 237	0.479 163	0.567 59	0.666 984
	C	3	0.337 231	0.344 232	0.345 603	0.346 213	0.353 032	0.374 408	0.416 685	0.484 546	0.572 61	0.671 494
		1	0.344 461	0.349 442	0.348 126	0.345 983	0.350 89	0.372 038	0.416 394	0.488 81	0.583 11	0.688 619
		2	0.341 35	0.346 649	0.345 741	0.343 974	0.349 09	0.370 185	0.414 208	0.486 075	0.579 808	0.684 95
		3	0.340 843	0.346 388	0.345 675	0.344 0344	0.349 063	0.369 949	0.413 639	0.485 12	0.578 564	0.683 7
	Average		0.35	0.35	0.35	0.35	0.36	0.38	0.42	0.49	0.59	0.69
	Standard		0.010	0.011	0.012	0.012	0.013	0.014	0.014	0.016	0.018	0.021
	Deviation		809	529	231	928	576	19	887	035	071	44
	Corrected											
	Percentage											
	e		0.33	0.34	0.34	0.34	0.34	0.37	0.41	0.47	0.56	0.66
	A	1	0.394 835	0.400 8	0.400 672	0.400 451	0.408 483	0.434 52	0.485 796	0.567 736	0.674 274	0.795 738
		2	0.394 308	0.400 826	0.401 275	0.401 585	0.409 988	0.436 119	0.487 087	0.568 236	0.673 555	0.793 52
		3	0.396 305	0.403 222	0.404 008	0.404 579	0.413 166	0.439 44	0.490 581	0.572 054	0.677 976	0.798 949
DE-5	B	1	0.385 892	0.391 406	0.390 786	0.389 906	0.397 002	0.421 711	0.471 256	0.551 009	0.655 027	0.773 744
		2	0.389 953	0.395 805	0.395 468	0.394 785	0.401 977	0.426 717	0.476 341	0.556 403	0.661 169	0.781 293
		3	0.389 789	0.395 671	0.395 497	0.395 113	0.402 664	0.427 705	0.477 424	0.557 281	0.661 557	0.781 058
	C	1	0.387 193	0.394 286	0.395 463	0.396 127	0.403 864	0.427 726	0.474 657	0.550 179	0.649 389	0.764 027
		2	0.388 999	0.395 85	0.396 784	0.397 33	0.405 219	0.429 633	0.477 579	0.554 616	0.655 726	0.772 547
		3	0.391 481	0.398 722	0.400 232	0.401 568	0.410 397	0.435 795	0.484 549	0.562 024	0.663 031	0.779 201
	Average		0.39	0.40	0.40	0.40	0.41	0.43	0.48	0.56	0.66	0.78
	Standard		0.003	0.003	0.004	0.004	0.005	0.005	0.006	0.007	0.009	0.011
	Deviation		556	75	05	514	075	711	56	935	795	715
	Corrected											
	Percentage											
	e		0.38	0.39	0.39	0.39	0.39	0.42	0.47	0.54	0.64	0.76
DE-5	A	1	0.507 872	0.519 592	0.524 912	0.530 08	0.543 528	0.575 588	0.634 326	0.727 385	0.851 585	1.002 372
		2	0.511 477	0.523 381	0.529 157	0.535 18	0.549 896	0.583 586	0.644 088	0.738 841	0.864 32	1.015 716
		3	0.511 993	0.524 047	0.529 787	0.535 537	0.549 758	0.582 81	0.642 729	0.737 187	0.862 916	1.015 27
	B	1	0.491 735	0.503 27	0.509 77	0.517 327	0.533 785	0.568 688	0.629 028	0.721 554	0.842 548	0.987 412
		2	0.498 661	0.510 513	0.517 219	0.524 939	0.541 599	0.576 833	0.637 691	0.730 989	0.853 013	0.999 229
		3	0.503 279	0.515 923	0.523 229	0.531 219	0.547 708	0.582 331	0.642 326	0.734 839	0.856 638	1.003 613

DE-6	C	1	0.504 289	0.516 269	0.522 488	0.529 001	0.543 889	0.577 142	0.636 486	0.729 409	0.852 758	1.002 204
		2	0.504 61	0.517 359	0.524 504	0.532 04	0.547 916	0.582 005	0.641 855	0.734 827	0.857 697	1.006 182
		3	0.505 438	0.518 223	0.524 866	0.531 394	0.545 976	0.578 805	0.637 879	0.730 931	0.854 945	1.005 591
		Average	0.50	0.52	0.52	0.53	0.54	0.58	0.64	0.73	0.86	1.00
	Standard	Deviation	0.006	0.006	0.006	0.005	0.005	0.004	0.004	0.005	0.006	0.008
		Corrected	28	411	144	603	05	753	838	345	471	48
		Percentag										
		e	0.49	0.50	0.50	0.51	0.52	0.56	0.61	0.70	0.82	0.97
	A	1	0.489 916	0.497 727	0.499 659	0.502 304	0.514 522	0.546 941	0.607 81	0.704 844	0.834 475	0.991 901
		2	0.485 57	0.493 631	0.496 032	0.499 344	0.512 31	0.545 397	0.606 598	0.703 368	0.831 917	0.987 278
		3	0.492 553	0.501 746	0.505 351	0.509 85	0.523 859	0.557 795	0.619 641	0.717 019	0.846 411	1.003 259
		B	1	0.467 987	0.476 875	0.480 923	0.485 967	0.499 706	0.531 558	0.588 812	0.678 635	0.798 004
DE-7	B	2	0.467 906	0.477 225	0.481 613	0.486 852	0.500 596	0.532 254	0.589 15	0.678 512	0.797 416	0.941 777
		3	0.473 661	0.483 005	0.487 54	0.493 235	0.507 899	0.541 068	0.600 021	0.691 921	0.813 503	0.960 365
		C	1	0.474 579	0.481 921	0.483 582	0.485 768	0.496 924	0.527 309	0.585 156	0.678 405	0.958 3
		2	0.476 009	0.483 701	0.485 815	0.488 595	0.500 469	0.531 663	0.590 269	0.684 062	0.810 066	0.964 11
	C	3	0.472 55	0.480 538	0.483 13	0.486 541	0.499 094	0.530 867	0.589 729	0.683 25	0.808 313	0.960 682
		Average	0.48	0.49	0.49	0.49	0.51	0.54	0.60	0.69	0.82	0.97
		Standard	0.009	0.009	0.008	0.008	0.009	0.010	0.011	0.014	0.017	0.021
		Deviation	201	111	843	741	112	092	704	133	415	57
		Corrected										
		Percentag										
		e	0.47	0.47	0.48	0.48	0.49	0.53	0.58	0.67	0.80	0.94
DE-7	A	1	0.917 628	0.967 583	1.010 813	1.051 558	1.093 959	1.145 234	1.210 416	1.297 542	1.408 129	1.546 887
		2	0.915 776	0.965 953	1.009 299	1.049 989	1.092 08	1.142 717	1.206 967	1.293 004	1.402 706	1.541 212
		3	0.936 018	0.987 237	1.031 653	1.073 721	1.117 762	1.171 222	1.239 213	1.329 956	1.444 903	1.588 83
		B	1	0.914 217	0.962 304	1.004 45	1.045 22	1.088 745	1.141 823	1.208 713	1.296 79	1.407 21
	B	2	0.922 741	0.971 245	1.014 517	1.057 44	1.104 202	1.161 497	1.232 958	1.325 285	1.438 578	1.577 052
		3	0.916 823	0.965 589	1.009 329	1.052 861	1.100 226	1.157 947	1.229 443	1.321 247	1.433 417	1.570 244
		C	1	0.933 067	0.983 515	1.027 897	1.070 583	1.115 552	1.169 772	1.237 812	1.327 427	1.439 73
		2	0.934 314	0.986 122	1.032 436	1.077 452	1.124 714	1.180 741	1.249 584	1.338 697	1.449 168	1.585 569
	C	3	0.930 531	0.983 017	1.030 114	1.075 879	1.123 669	1.179 847	1.248 346	1.336 581	1.445 751	1.580 577
		Average	0.92	0.97	1.02	1.06	1.11	1.16	1.23	1.32	1.43	1.57

		Standard Deviation Corrected Percentage	0.008 873	0.010 064	0.011 345	0.012 651	0.013 963	0.015 355	0.016 724	0.017 888	0.018 575	0.018 726
			0.87	0.92	0.96	1.00	1.04	1.09	1.15	1.24	1.34	1.47
DE-8	A	1	0.898 434	0.946 738	0.989 848	1.032 291	1.077 964	1.133 348	1.202 019	1.290 397	1.398 296	1.529 112
		2	0.889 832	0.938 198	0.980 964	1.022 452	1.066 543	1.119 881	1.186 538	1.273 49	1.381 193	1.513 426
		3	0.898 482	0.948 304	0.992 694	1.035 917	1.081 653	1.136 38	1.203 961	1.291 331	1.399 02	1.531 047
		1	0.910 348	0.959 416	1.002 295	1.043 275	1.086 307	1.138 169	1.203 258	1.288 932	1.396 129	1.528 866
		2	0.915 489	0.964 927	1.008 01	1.049 183	1.092 586	1.145 171	1.211 353	1.298 382	1.406 842	1.540 347
		3	0.912 977	0.962 829	1.006 015	1.046 819	1.089 314	1.140 507	1.205 138	1.290 93	1.399 158	1.534 019
	B	1	0.965 229	1.014 214	1.056 549	1.096 872	1.139 32	1.190 525	1.254 43	1.337 571	1.440 042	1.564 781
		2	0.960 395	1.010 003	1.052 865	1.093 367	1.135 401	1.185 425	1.247 405	1.328 025	1.427 893	1.550 502
		3	0.969 767	1.019 991	1.062 926	1.102 981	1.144 273	1.193 655	1.255 605	1.337 246	1.439 325	1.565 119
		Average	0.92	0.97	1.02	1.06	1.10	1.15	1.22	1.30	1.41	1.54
		Standard	0.031	0.031	0.031	0.030	0.029	0.028	0.026	0.023	0.020	0.017
		Deviation	561	885	63	856	66	073	145	757	885	39
		Corrected										
		Percentage										
		e	0.86	0.91	0.95	0.99	1.03	1.08	1.14	1.22	1.31	1.44

Table 21. Wall FG, Very Fine Silt to Fine Silt Sizes.

Sample Name	Run	Reading	4.365 158	5.011 872	5.754 399	6.606 934	7.585 776	8.709 636	10	11.48 1536	13.18 2567	15.13 5612
			0.462 876	0.480 792	0.492 023	0.501 052	0.514 235	0.539 887	0.584 481	0.653 592	0.743 312	0.846 557
FG-1	A	2	0.467 308	0.485 968	0.497 913	0.507 618	0.521 406	0.547 571	0.592 532	0.661 835	0.751 55	0.854 62
		3	0.470 719	0.489 581	0.501 736	0.511 791	0.526 197	0.553 358	0.599 645	0.670 481	0.761 569	0.865 454
		1	0.466 471	0.484 584	0.497 167	0.508 905	0.525 912	0.556 01	0.604 702	0.676 773	0.767 569	0.869 82
		2	0.470 468	0.488 892	0.501 542	0.513 117	0.529 779	0.559 423	0.607 682	0.679 496	0.770 414	0.873 347
		3	0.470 93	0.489 779	0.502 943	0.515 047	0.532 149	0.562 069	0.610 38	0.682 024	0.772 627	0.875 235
		1	0.466 909	0.484 678	0.496 262	0.506 431	0.521 682	0.550 356	0.598 604	0.671 649	0.764 797	0.870 194
	C	2	0.462 551	0.479 99	0.491 468	0.501 828	0.517 568	0.546 962	0.595 99	0.669 71	0.763 223	0.868 534
		3	0.464 857	0.482 237	0.493 82	0.504 554	0.520 98	0.551 361	0.601 539	0.676 416	0.770 838	0.876 639

		Average	0.47	0.49	0.50	0.51	0.52	0.55	0.60	0.67	0.76	0.87	
		Standard	0.003	0.003	0.004	0.004	0.005	0.006	0.007	0.008	0.009	0.009	
		Deviation	223	714	256	894	724	793	936	978	707	965	
		Corrected											
		Percentag											
		e	0.43	0.45	0.46	0.47	0.48	0.51	0.55	0.62	0.70	0.80	
FG-2	A	1	0.544	0.568	0.587	0.604	0.626	0.660	0.711	0.784	0.876	0.978	
			053	639	224	442	134	037	361	86	051	494	
		2	0.547	0.573	0.592	0.610	0.632	0.666	0.717	0.789	0.880	0.981	
			84	217	628	561	653	498	267	826	006	708	
		3	0.546	0.573	0.593	0.612	0.634	0.667	0.716	0.787	0.875	0.974	
			961	214	51	074	247	413	727	194	08	692	
	B	1	0.543	0.566	0.583	0.599	0.620	0.654	0.705	0.779	0.870	0.971	
			018	458	725	753	664	267	673	334	258	324	
		2	0.540	0.564	0.581	0.597	0.617	0.650	0.701	0.774	0.866	0.967	
			827	282	371	009	367	359	283	777	027	99	
		3	0.544	0.567	0.584	0.600	0.621	0.654	0.706	0.780	0.872	0.975	
			013	603	816	615	225	625	138	411	526	321	
	C	1	0.543	0.566	0.582	0.597	0.615	0.646	0.695	0.767	0.858	0.959	
			263	237	572	027	759	786	781	738	169	935	
		2	0.548	0.572	0.589	0.604	0.623	0.656	0.706	0.779	0.871	0.973	
			682	114	07	32	995	126	326	53	046	528	
		3	0.552	0.576	0.594	0.610	0.631	0.664	0.715	0.789	0.880	0.981	
			796	607	214	423	249	533	592	155	392	983	
		Average	0.55	0.57	0.59	0.60	0.62	0.66	0.71	0.78	0.87	0.97	
		Standard	0.003	0.004	0.004	0.005	0.006	0.007	0.007	0.007	0.006	0.006	
	FG-3	A	1	0.511	0.528	0.540	0.550	0.565	0.593	0.641	0.711	0.799	0.897
				084	853	218	243	464	916	137	496	691	566
			2	0.509	0.526	0.538	0.548	0.563	0.591	0.638	0.708	0.796	0.894
				22	91	196	112	188	474	552	8	859	397
3			0.517	0.535	0.547	0.558	0.574	0.603	0.652	0.724	0.813	0.912	
			45	68	574	259	295	772	226	038	71	776	
B		1	0.503	0.520	0.532	0.541	0.556	0.583	0.629	0.697	0.784	0.882	
			072	861	097	709	161	445	187	905	726	017	
		2	0.507	0.525	0.537	0.548	0.563	0.591	0.638	0.708	0.795	0.892	
			72	945	706	022	397	827	784	559	868	687	
		3	0.508	0.526	0.538	0.549	0.565	0.594	0.643	0.714	0.802	0.899	
			146	313	25	086	338	95	197	17	301	406	
C		1	0.500	0.518	0.531	0.543	0.560	0.590	0.638	0.707	0.793	0.888	
			132	413	073	017	337	513	396	877	647	127	
		2	0.500	0.519	0.532	0.544	0.562	0.594	0.643	0.713	0.799	0.893	
			655	027	019	606	868	209	25	627	68	542	
		3	0.497	0.516	0.530	0.543	0.562	0.593	0.642	0.711	0.797	0.890	
			898	662	233	439	154	614	337	982	113	194	
		Average	0.51	0.52	0.54	0.55	0.56	0.59	0.64	0.71	0.80	0.89	
		Standard	0.006	0.006	0.005	0.005	0.004	0.005	0.006	0.006	0.007	0.008	
FG-4		A	1	0.573	0.596	0.612	0.627	0.647	0.680	0.731	0.807	0.901	1.009
				959	647	825	609	379	255	825	14	8	472

FG-5		2	0.570 933	0.593 458	0.609 392	0.623 861	0.643 286	0.675 843	0.727 21	0.802 53	0.897 484	1.005 761
		3	0.571 255	0.594 359	0.610 887	0.625 85	0.645 521	0.677 956	0.728 793	0.803 229	0.897 149	1.004 474
		1	0.572 345	0.594 626	0.610 399	0.624 788	0.644 169	0.676 61	0.727 656	0.802 377	0.896 619	1.004 513
	B	2	0.565 024	0.586 805	0.602 147	0.616 234	0.635 548	0.668 248	0.719 887	0.795 43	0.890 44	0.998 706
		3	0.570 97	0.593 578	0.609 912	0.625 194	0.645 826	0.679 868	0.732 674	0.809 086	0.904 549	1.012 857
		1	0.567 656	0.590 739	0.607 478	0.622 781	0.642 813	0.675 563	0.726 614	0.801 167	0.895 196	1.002 873
	C	2	0.577 708	0.601 447	0.618 889	0.635 008	0.655 971	0.689 78	0.741 946	0.817 647	0.912 784	1.021 569
		3	0.065 653	0.126 184	0.184 687	0.217 202	0.238 624	0.248 302	0.254 851	0.265 442	0.285 664	0.317 472
		Average	0.57	0.59	0.61	0.63	0.65	0.68	0.73	0.81	0.90	1.01
		Standard	0.003	0.003	0.004	0.004	0.005	0.005	0.006	0.006	0.006	0.006
		Deviation	574	972	453	967	42	773	027	235	433	661
		Corrected										
		Percentage	0.54	0.57	0.58	0.60	0.61	0.65	0.70	0.77	0.86	0.96
		1	0.097 988	0.179 021	0.254 147	0.294 873	0.320 274	0.330 244	0.336 533	0.348 83	0.374 394	0.415 303
		2	0.097 676	0.178 726	0.253 925	0.294 646	0.320 027	0.329 961	0.336 235	0.348 568	0.374 249	0.415 37
		3	0.098 133	0.179 783	0.255 599	0.296 635	0.322 204	0.332 183	0.338 448	0.350 791	0.376 558	0.417 873
	B	1	0.098 584	0.179 081	0.253 5	0.294 056	0.319 538	0.329 906	0.336 751	0.349 622	0.375 587	0.416 579
		2	0.097 731	0.177 795	0.251 879	0.292 227	0.317 573	0.327 868	0.334 663	0.347 473	0.373 352	0.414 243
		3	0.096 941	0.176 696	0.250 598	0.290 839	0.316 128	0.326 388	0.333 13	0.345 834	0.371 541	0.412 214
	C	1	0.095 749	0.177 341	0.253 783	0.295 337	0.321 558	0.332 192	0.339 09	0.378 0.352	0.419 232	0.419 908
		2	0.095 763	0.177 549	0.254 205	0.295 835	0.322 07	0.332 647	0.339 467	0.352 317	0.378 547	0.420 3
		3	0.095 692	0.177 367	0.253 85	0.295 307	0.321 387	0.331 881	0.338 737	0.351 784	0.378 379	0.420 635
		Average	0.75	0.78	0.81	0.84	0.88	0.92	0.98	1.07	1.17	1.29
		Standard	0.010	0.012	0.013	0.015	0.016	0.017	0.017	0.017	0.016	0.017
		Deviation	271	037	754	292	453	129	275	071	93	458
		Corrected										
		Percentage	0.72	0.75	0.78	0.81	0.84	0.89	0.95	1.03	1.12	1.24
FG-6		1	0.096 543	0.172 914	0.242 407	0.279 465	0.301 405	0.308 095	0.310 466	0.317 583	0.336 499	0.369 454
		2	0.096 818	0.173 568	0.243 412	0.280 585	0.302 549	0.309 188	0.311 528	0.318 699	0.337 789	0.371 024
		3	0.096 156	0.172 269	0.241 478	0.278 266	0.299 926	0.306 345	0.308 473	0.315 404	0.334 241	0.367 274
	B	1	0.095 247	0.172 388	0.243 012	0.280 492	0.302 772	0.309 761	0.312 671	0.320 686	0.340 795	0.374 999
		2	0.095 678	0.173 459	0.244 712	0.282 456	0.304 874	0.311 898	0.314 891	0.323 148	0.343 713	0.378 561

FG-7	C	3	0.095 309	0.172 984	0.244 199	0.281 927	0.304 356	0.311 411	0.314 444	0.322 735	0.343 309	0.378 123
		1	0.094 486	0.170 378	0.239 717	0.276 608	0.298 57	0.305 528	0.308 465	0.316 4	0.336 195	0.369 799
		2	0.093 877	0.169 951	0.239 705	0.276 869	0.299 067	0.306 142	0.309 07	0.316 867	0.336 428	0.369 763
		3	0.093 985	0.170 464	0.240 661	0.278 019	0.300 317	0.307 388	0.310 295	0.318 11	0.337 768	0.371 279
		Average	0.65	0.68	0.71	0.74	0.77	0.82	0.89	1.00	1.13	1.30
		Standard	0.007	0.008	0.008	0.009	0.009	0.008	0.008	0.007	0.008	0.010
		Deviation	729	309	816	191	282	951	259	712	288	298
		Corrected										
		Percentage										
		c	0.64	0.67	0.69	0.72	0.75	0.80	0.87	0.97	1.10	1.26
	A	1	0.130 18	0.227 824	0.314 395	0.359 686	0.385 517	0.392 456	0.394 779	0.404 106	0.428 978	0.471 408
		2	0.127 797	0.224 104	0.309 61	0.354 304	0.379 812	0.386 698	0.389 087	0.398 468	0.423 271	0.465 463
		3	0.128 777	0.225 842	0.311 992	0.356 956	0.382 543	0.389 327	0.391 562	0.400 841	0.425 675	0.468 059
		1	0.126 203	0.222 956	0.309 484	0.354 862	0.381 067	0.388 556	0.391 53	0.401 517	0.426 957	0.469 774
		2	0.127 26	0.225 119	0.312 699	0.358 593	0.385 124	0.392 785	0.395 983	0.406 387	0.432 484	0.476 128
		3	0.126 059	0.223 284	0.310 366	0.355 962	0.382 324	0.389 952	0.393 201	0.403 706	0.429 921	0.473 701
	C	1	0.126 758	0.224 701	0.312 395	0.358 099	0.384 227	0.391 22	0.393 567	0.403 04	0.428 319	0.471 461
		2	0.126 169	0.223 909	0.311 449	0.356 992	0.382 993	0.389 918	0.392 28	0.401 844	0.427 249	0.470 476
		3	0.125 315	0.222 467	0.309 468	0.354 673	0.380 445	0.387 27	0.389 603	0.399 158	0.424 516	0.467 623
		Average	0.83	0.88	0.92	0.97	1.03	1.10	1.18	1.29	1.41	1.56
		Standard	0.004	0.004	0.005	0.006	0.006	0.007	0.008	0.008	0.009	0.010
		Deviation	531	968	585	29	959	561	093	61	196	14
		Corrected										
		Percentage										
		c	0.78	0.83	0.87	0.91	0.97	1.03	1.11	1.21	1.33	1.47

Table 22. Wall AB, Medium Silt to Coarse Silt Sizes.

AB-1	R	Na me	Rea ding	17.37	19.95	22.90	26.3	30.19	34.67	39.81	45.70	52.48	60.25
				8008	2623	8677	0268	9517	3685	0717	8819	0746	5959
				1	0.775	0.877	0.928	0.91	0.827	0.708	0.620	0.658	0.938
				06	578	313	1092	881	837	042	35	067	201
				2	0.770	0.872	0.921	0.90	0.819	0.700	0.612	0.653	0.936
				52	007	501	3093	126	111	435	145	554	498
				3	0.780	0.884	0.936	0.91	0.836	0.716	0.627	0.664	0.942
				409	305	042	9393	282	844	17	193	417	238
				1	0.765	0.874	0.933	0.92	0.857	0.751	0.673	0.717	0.994
				912	273	724	7822	568	65	518	094	218	151



AB-2	C	2	0.756 317	0.863 136	0.921 705	0.91 5894	0.846 919	0.743 503	0.668 827	0.716 215	0.996 489	1.610 563
		3	0.768 234	0.874 749	0.931 666	0.92 283	0.850 089	0.743 51	0.668 384	0.720 398	1.012 262	1.645 304
		1	0.772 608	0.877 937	0.934 553	0.92 7006	0.857 523	0.756 238	0.688 032	0.747 688	1.046 343	1.683 175
	C	2	0.769 603	0.876 054	0.935 399	0.93 2201	0.868 105	0.772 268	0.708 15	0.769 157	1.065 459	1.696 08
		3	0.773 313	0.877 496	0.933 655	0.92 6917	0.859 885	0.762 716	0.699 77	0.764 943	1.068 291	1.707 959
		Average	0.77	0.88	0.93	0.92	0.85	0.74	0.66	0.71	1.00	1.63
	e	Standard	0.006	0.005	0.005	0.00	0.016	0.025	0.035	0.044	0.052	0.058
		Deviation	697	688	651	9308	205	193	137	839	997	392
		Corrected										
		Percentag										
		e	0.65	0.74	0.78	0.77	0.71	0.62	0.56	0.60	0.84	1.37
	A	1	0.624 493	0.704 709	0.734 784	0.70 0991	0.609 276	0.494 089	0.425 702	0.504 102	0.844 562	1.548 11
		2	0.633 072	0.713 689	0.743 231	0.70 8012	0.614 472	0.498 009	0.430 206	0.512 31	0.860 253	1.574 568
		3	0.634 312	0.716 487	0.746 771	0.71 0881	0.614 937	0.494 515	0.421 992	0.499 743	0.844 809	1.558 307
	B	1	0.611 615	0.689 371	0.714 662	0.67 184	0.565 119	0.427 65	0.330 257	0.375 322	0.682 818	1.360 189
		2	0.613 811	0.689 918	0.713 724	0.67 025	0.564 425	0.429 85	0.337 174	0.387 843	0.700 179	1.379 673
		3	0.602 479	0.678 42	0.702 218	0.65 8722	0.552 711	0.417 72	0.324 505	0.374 834	0.687 529	1.368 618
	C	1	0.649 2	0.735 225	0.770 065	0.73 9773	0.650 625	0.538 228	0.474 361	0.560 322	0.911 611	1.627 749
		2	0.650 731	0.735 576	0.768 363	0.73 5198	0.642 81	0.527 589	0.462 446	0.549 77	0.905 791	1.630 057
		3	0.647 962	0.733 21	0.766 995	0.73 5356	0.644 707	0.530 916	0.466 201	0.552 366	0.905 444	1.625 355
		Average	0.63	0.71	0.74	0.70	0.61	0.48	0.41	0.48	0.82	1.52
	e	Standard	0.017	0.021	0.025	0.03	0.037	0.047	0.061	0.078	0.097	0.116
		Deviation	806	605	692	0679	489	369	022	326	766	297
		Corrected										
		Percentag										
		e	0.56	0.63	0.66	0.63	0.54	0.43	0.36	0.43	0.73	1.35
AB-3	A	1	0.670 678	0.763 703	0.806 29	0.78 3321	0.699 172	0.587 505	0.518 441	0.592 477	0.925 437	1.618 218
		2	0.666 821	0.757 715	0.798 58	0.77 4977	0.691 899	0.583 292	0.518 986	0.598 547	0.936 203	1.630 851
		3	0.666 828	0.758 768	0.800 476	0.77 7049	0.693 012	0.582 058	0.514 196	0.589 648	0.923 735	1.616 68
	B	1	0.639 477	0.727 286	0.766 31	0.74 1052	0.654 702	0.538 883	0.461 515	0.521 577	0.835 37	1.507 195
		2	0.646 603	0.734 36	0.772 989	0.74 7276	0.660 864	0.545 892	0.470 732	0.534 618	0.853 741	1.531 817
		3	0.639 913	0.726 204	0.763 462	0.73 6662	0.649 591	0.534 432	0.459 552	0.524 147	0.844 354	1.523 825
	C	1	0.666 144	0.757 627	0.802 435	0.78 6013	0.711 662	0.610 295	0.547 545	0.618 932	0.936 411	1.600 043
		2	0.661 382	0.752 498	0.796 333	0.77 8103	0.701 115	0.596 556	0.530 77	0.600 328	0.918 467	1.586 438

	3	0.662 231	0.753 906	0.798 548	0.78 122	0.704 889	0.600 288	0.533 278	0.600 095	0.914 008	1.576 847
	Average	0.66	0.75	0.79	0.77	0.69	0.58	0.51	0.58	0.90	1.58
	Standard	0.012	0.014	0.016	0.01	0.023	0.028	0.033	0.037	0.041	0.045
	Deviation	308	555	841	9685	539	329	268	655	504	463
	Corrected										
	Percentag										
	e	0.56	0.63	0.67	0.65	0.58	0.49	0.43	0.49	0.76	1.34
AB-4	1	0.794 322	0.900 788	0.962 044	0.96 5429	0.915 722	0.845 106	0.818 128	0.926 627	1.274 996	1.952 177
	2	0.788 018	0.893 214	0.953 727	0.95 7164	0.908 437	0.839 573	0.814 53	0.924 219	1.272 105	1.946 714
	3	0.787 125	0.891 728	0.951 512	0.95 417	0.904 745	0.835 401	0.810 269	0.920 517	1.269 995	1.947 708
	1	0.835 847	0.952 564	1.025 937	1.04 2582	1.005 567	0.945 097	0.923 085	1.028 655	1.363 804	2.016 288
	2	0.830 074	0.944 985	1.016 808	1.03 2579	0.995 761	0.936 765	0.917 43	1.026 489	1.365 27	2.020 786
	3	0.831 786	0.947 424	1.021 23	1.04 054	1.008 704	0.955 612	0.941 891	1.054 633	1.393 314	2.043 353
	1	0.790 114	0.892 211	0.950 031	0.95 1888	0.902 937	0.834 586	0.809 255	0.915 566	1.254 457	1.912 599
	2	0.782 77	0.882 876	0.938 621	0.93 8531	0.888 087	0.818 982	0.793 9	0.901 645	1.243 229	1.905 249
	3	0.792 733	0.893 773	0.949 858	0.94 9497	0.898 484	0.829 203	0.805 289	0.916 457	1.264 199	1.934 83
	Average	0.80	0.91	0.97	0.98	0.94	0.87	0.85	0.96	1.30	1.96
	Standard	0.021	0.028	0.035	0.04	0.050	0.056	0.060	0.060	0.056	0.049
	Deviation	992	377	756	3547	792	655	168	465	922	878
	Corrected										
	Percentag										
	e	0.74	0.84	0.90	0.91	0.87	0.81	0.79	0.89	1.20	1.82
AB-5	1	0.773 819	0.879 034	0.944 733	0.96 0088	0.930 271	0.886 15	0.887 906	1.020 658	1.380 426	2.048 595
	2	0.773 643	0.877 153	0.940 92	0.95 468	0.924 358	0.881 561	0.887 016	1.026 004	1.394 098	2.071 493
	3	0.760 004	0.862 469	0.925 644	0.93 9033	0.908 176	0.864 216	0.867 544	1.003 341	1.367 361	2.040 146
	1	0.795 049	0.901 971	0.971 763	0.99 3736	0.971 948	0.935 169	0.940 623	1.070 622	1.419 386	2.068 267
	2	0.798 359	0.904 697	0.973 796	0.99 5262	0.973 482	0.937 487	0.944 642	1.077 294	1.429 589	2.082 688
	3	0.799 68	0.905 263	0.973 937	0.99 5649	0.975 049	0.941 251	0.951 397	1.087 297	1.442 2	2.096 13
	1	0.767 386	0.866 793	0.927 051	0.93 8757	0.908 557	0.868 273	0.878 3	1.023 258	1.398 012	2.082 253
	2	0.774 591	0.874 035	0.934 379	0.94 662	0.917 915	0.880 592	0.895 294	1.046 549	1.428 573	2.119 707
	3	0.765 558	0.864 938	0.924 792	0.93 5659	0.904 286	0.862 713	0.871 723	1.016 476	1.392 494	2.079 965
	Average	0.78	0.88	0.95	0.96	0.93	0.90	0.90	1.04	1.41	2.08
	Standard	0.015	0.017	0.021	0.02	0.030	0.033	0.033	0.030	0.025	0.023
	Deviation	044	516	218	5741	082	031	315	293	224	793
	Corrected										
	Percentag										
	e	0.72	0.81	0.87	0.89	0.86	0.82	0.83	0.96	1.29	1.91



AB-9	2	1.750	1.958	2.165	2.37	2.574	2.778	2.995	3.242	3.540	3.904
		561	152	844	2559	562	823	23	365	404	927
	3	1.710	1.916	2.123	2.32	2.531	2.734	2.951	3.199	3.500	3.869
		251	571	548	975	22	984	306	346	022	88
	1	1.818	2.036	2.253	2.46	2.665	2.858	3.053	3.270	3.535	3.869
		205	454	55	5647	842	652	418	801	768	792
	2	1.762	1.973	2.184	2.39	2.591	2.790	2.997	3.233	3.521	3.879
		314	572	148	1773	658	146	445	69	7	694
	3	1.726	1.935	2.145	2.35	2.551	2.751	2.961	3.203	3.500	3.870
		665	862	029	1835	617	189	573	729	752	235
	Average	1.81	2.03	2.25	2.47	2.68	2.89	3.11	3.35	3.63	3.98
		Standard	0.082	0.096	0.113	0.13	0.149	0.164	0.173	0.174	0.166
		Deviation	105	887	914	2183	593	102	27	849	637
	Corrected										
		Percentag									
	e	1.60	1.79	1.99	2.18	2.37	2.55	2.74	2.95	3.20	3.51
AB-10	1	1.343	1.551	1.776	2.02	2.302	2.619	2.990	3.428	3.939	4.514
		906	102	413	5683	095	895	727	927	932	575
	2	1.306	1.509	1.732	1.98	2.257	2.575	2.949	3.391	3.908	4.491
		113	931	896	091	16	928	087	394	667	824
	3	1.280	1.478	1.695	1.93	2.206	2.522	2.897	3.348	3.879	4.482
		358	751	147	6239	772	786	908	099	56	499
	1	1.477	1.699	1.937	2.19	2.466	2.762	3.091	3.466	3.898	4.385
		769	101	292	3824	092	671	538	701	11	576
	2	1.414	1.623	1.848	2.09	2.358	2.652	2.988	3.380	3.839	4.361
		298	432	921	3852	105	796	393	532	167	997
	3	1.383	1.589	1.811	2.05	2.317	2.613	2.953	3.351	3.817	4.348
		924	04	161	3846	532	763	184	279	513	921
	1	1.484	1.708	1.950	2.21	2.497	2.806	3.149	3.540	3.987	4.485
		23	137	998	482	088	321	882	816	184	779
	2	1.455	1.671	1.907	2.16	2.445	2.755	3.104	3.504	3.963	4.476
		102	709	513	5758	313	637	464	568	283	615
3	1.447	1.660	1.891	2.14	2.420	2.729	3.078	3.483	3.950	4.475	
	2	517	97	5459	986	188	889	552	68	77	
Average	1.40	1.61	1.84	2.09	2.36	2.67	3.02	3.43	3.91	4.45	
	Standard	0.075	0.083	0.091	0.09	0.100	0.096	0.085	0.069	0.056	
	Deviation	116	11	136	7581	096	495	718	664	992	
Corrected											
	Percentag										
e	1.21	1.40	1.59	1.81	2.05	2.31	2.62	2.97	3.39	3.85	
AB-10	1	1.372	1.603	1.854	2.12	2.417	2.737	3.098	3.515	4.000	4.548
		8	734	717	6744	519	782	194	463	05	271
	2	1.336	1.558	1.798	2.05	2.336	2.649	3.010	3.438	3.945	4.526
		791	672	017	7151	404	496	336	272	134	427
	3	1.285	1.501	1.734	1.98	2.261	2.570	2.928	3.356	3.867	4.457
		545	234	383	7545	516	434	858	97	674	577
	1	1.333	1.541	1.765	2.00	2.273	2.575	2.931	3.359	3.871	4.460
		464	927	815	8803	545	798	16	319	16	63
	2	1.293	1.496	1.715	1.95	2.220	2.527	2.891	3.333	3.863	4.474
		997	46	515	5786	973	667	942	625	368	624
	3	1.282	1.484	1.702	1.94	2.208	2.517	2.884	3.331	3.866	4.482
		984	291	348	2243	17	045	928	329	249	211
	1	1.395	1.618	1.862	2.12	2.415	2.729	3.079	3.479	3.938	4.457
		078	03	09	8774	151	644	795	564	871	066
	2	1.341	1.556	1.790	2.04	2.326	2.636	2.987	3.394	3.868	4.409
		499	008	87	8288	808	587	175	178	419	125

AB-11	A	3	1.299 682	1.507 202	1.735 86	1.98 9377	2.267 884	2.582 525	2.942 844	3.363 182	3.851 55	4.402 992
		Average	1.33	1.54	1.77	2.03	2.30	2.61	2.97	3.40	3.90	4.47
		Standard	0.039	0.047	0.057	0.06	0.076	0.080	0.077	0.066	0.051	0.047
		Deviation	641	868	855	8216	581	364	143	197	449	53
	B	Corrected										
		Percentag										
		e	1.16	1.35	1.56	1.78	2.02	2.29	2.61	2.98	3.42	3.92
		1	1.246 234	1.462 931	1.718 262	2.02 1741	2.375 26	2.788 616	3.262 82	3.798 621	4.384 747	4.994 732
	C	2	1.206 23	1.413 681	1.657 123	1.94 6743	2.286 475	2.688 716	3.157 69	3.696 892	4.296 679	4.930 42
		3	1.188 756	1.391 239	1.627 754	1.90 8654	2.238 595	2.630 805	3.090 77	3.623 169	4.219 23	4.852 52
		1	1.284 375	1.517 542	1.787 368	2.10 0719	2.457 385	2.866 762	3.330 886	3.852 4	4.422 349	5.016 932
	D	2	1.250 413	1.475 283	1.735 697	2.03 9159	2.386 606	2.788 582	3.248 66	3.771 049	4.348 165	4.956 761
		3	1.212 404	1.425 249	1.670 458	1.95 6918	2.288 169	2.677 345	3.130 8	3.654 842	4.242 914	4.871 141
	E	1	1.217 193	1.429 359	1.676 373	1.96 7716	2.306 779	2.705 805	3.169 299	3.701 394	4.293 518	4.920 72
		2	1.178 131	1.380 401	1.615 354	1.89 3774	2.221 444	2.613 026	3.075 325	3.613 831	4.220 154	4.868 268
		3	1.150 345	1.345 105	1.570 697	1.83 9184	2.158 407	2.544 917	3.007 002	3.550 456	4.165 735	4.824 409
		Average	1.21	1.43	1.67	1.96	2.30	2.70	3.16	3.70	4.29	4.92
		Standard	0.040	0.052	0.066	0.08	0.092	0.100	0.102	0.097	0.084	0.066
		Deviation	864	634	3	032	367	364	364	203	741	125
		Corrected										
		Percentag										
		e	1.07	1.26	1.48	1.73	2.03	2.38	2.79	3.26	3.79	4.34

Table 23. Wall DE, Medium Silt to Coarse Silt Sizes.

DE-1	A	Sample Name	17.37 8008	19.95 2623	22.90 8677	26.3 0268	30.19 9517	34.67 3685	39.81 0717	45.70 8819	52.48 0746	60.25 5959
		1	0.736 223	0.803 792	0.816 459	0.75 9554	0.638 921	0.488 577	0.379 296	0.411 795	0.703 204	1.357 454
		2	0.735 42	0.802 718	0.814 453	0.75 5957	0.633 456	0.481 67	0.372 267	0.406 655	0.702 106	1.361 962
		3	0.748 768	0.815 335	0.825 948	0.76 6282	0.643 032	0.491 356	0.383 246	0.420 19	0.719 151	1.382 726
	B	1	0.744 115	0.816 646	0.834 939	0.78 3604	0.667 602	0.520 438	0.412 728	0.445 512	0.736 497	1.390 11
		2	0.755 061	0.824 689	0.839 877	0.78 6271	0.670 068	0.525 802	0.424 591	0.467 263	0.770 427	1.436 582
		3	0.748 528	0.818 526	0.833 977	0.78 0195	0.662 839	0.515 751	0.409 481	0.444 603	0.738 06	1.393 363
		1	0.775 458	0.840 096	0.845 743	0.77 88	0.648 045	0.491 555	0.384 781	0.432 222	0.752 379	1.446 734
	C	1	0.775 458	0.840 096	0.845 743	0.77 88	0.648 045	0.491 555	0.384 781	0.432 222	0.752 379	1.446 734
		2	0.775 458	0.840 096	0.845 743	0.77 88	0.648 045	0.491 555	0.384 781	0.432 222	0.752 379	1.446 734
		3	0.775 458	0.840 096	0.845 743	0.77 88	0.648 045	0.491 555	0.384 781	0.432 222	0.752 379	1.446 734
		1	0.775 458	0.840 096	0.845 743	0.77 88	0.648 045	0.491 555	0.384 781	0.432 222	0.752 379	1.446 734

DE-2	A	2	0.775 156	0.839 857	0.845 127	0.77 743	0.645 837	0.488 955	0.382 964	0.433 076	0.758 115	1.459 158
		3	0.773 135	0.839 132	0.846 948	0.78 2765	0.654 909	0.501 043	0.396 227	0.444 634	0.764 375	1.456 569
		Average Standard Deviation Corrected Percentage	0.75 0.016 155	0.82 0.014 725	0.83 0.012 342	0.77 0.01 1091	0.65 0.012 96	0.50 0.016 063	0.39 0.017 826	0.43 0.019 039	0.74 0.025 531	1.41 0.040 502
	B	1	0.837 795	0.922 464	0.946 791	0.89 7022	0.782 427	0.643 118	0.556 554	0.628 423	0.975 826	1.695 329
		2	0.844 871	0.928 012	0.951 042	0.90 0854	0.787 289	0.650 755	0.568 622	0.646 146	0.999 564	1.724 12
		3	0.844 111	0.927 809	0.951 414	0.90 168	0.788 23	0.651 252	0.567 976	0.643 725	0.995 188	1.718 545
	C	1	0.841 529	0.922 457	0.945 002	0.89 633	0.785 684	0.652 084	0.570 947	0.645 468	0.990 327	1.700 67
		2	0.857 828	0.939 748	0.962 553	0.91 3595	0.802 597	0.669 258	0.589 708	0.667 724	1.018 194	1.735 792
		3	0.846 547	0.929 385	0.954 698	0.90 9565	0.802 971	0.673 731	0.596 987	0.675 683	1.024 021	1.736 211
	C	1	0.846 411	0.930 294	0.951 49	0.89 5849	0.772 684	0.622 422	0.523 553	0.583 158	0.919 988	1.632 186
		2	0.835 082	0.915 957	0.934 298	0.87 6564	0.752 784	0.603 929	0.508 697	0.573 885	0.917 407	1.636 098
		3	0.839 656	0.918 664	0.934 658	0.87 4732	0.749 981	0.602 601	0.512 372	0.586 619	0.942 769	1.675 941
DE-3	A	1	0.84 0.006 584	0.93 0.007 123	0.95 0.009 124	0.90 0.01 3135	0.78 0.019 008	0.64 0.025 96	0.56 0.032 65	0.63 0.037 724	0.98 0.040 14	1.69 0.039 647
		Average Standard Deviation Corrected Percentage	0.84 0.006 584	0.93 0.007 123	0.95 0.009 124	0.90 0.01 3135	0.78 0.019 008	0.64 0.025 96	0.56 0.032 65	0.63 0.037 724	0.98 0.040 14	1.69 0.039 647
		e	0.71	0.78	0.80	0.76	0.66	0.54	0.47	0.53	0.82	1.43
	B	1	0.815 759	0.881 921	0.889 807	0.82 7929	0.708 499	0.574 049	0.503 559	0.602 684	0.986 139	1.745 319
		2	0.817 365	0.883 694	0.893 155	0.83 4404	0.719 294	0.589 634	0.523 253	0.624 551	1.007 092	1.761 52
		3	0.818 044	0.883 887	0.892 36	0.83 2012	0.714 677	0.582 212	0.512 702	0.610 975	0.991 291	1.745 226
	C	1	0.760 087	0.812 345	0.802 42	0.71 7788	0.570 567	0.403 469	0.297 577	0.362 01	0.716 898	1.460 394
		2	0.754 308	0.805 639	0.795 99	0.71 2949	0.568 123	0.403 107	0.297 42	0.358 688	0.706 234	1.438 786
		3	0.758 446	0.809 889	0.801 156	0.72 0002	0.577 868	0.415 832	0.312 393	0.373 748	0.717 627	1.441 618
	C	1	0.780 408	0.833 008	0.820 586	0.73 1316	0.579 126	0.408 92	0.303 597	0.372 692	0.734 804	1.484 837
		2	0.776 761	0.829 778	0.817 92	0.72 8911	0.576 139	0.404 11	0.295 748	0.361 188	0.720 206	1.469 097
		3	0.776 007	0.830 228	0.820 33	0.73 3922	0.583 914	0.414 089	0.306 406	0.370 054	0.724 169	1.465 028
	C	Average Standard Deviation	0.78 0.026 259	0.84 0.032 942	0.84 0.041 953	0.76 0.05 4084	0.62 0.069 304	0.47 0.087 057	0.37 0.105 729	0.45 0.123 401	0.81 0.137 734	1.56 0.146 089

		Corrected Percentag e	0.75	0.81	0.80	0.73	0.60	0.45	0.36	0.43	0.78	1.50
DE-4	A	1	0.907 739	0.986 564	1.007 209	0.95 9405	0.856 425	0.741 629	0.692 732	0.811 46	1.205 201	1.955 672
		2	0.904 107	0.981 981	1.002 557	0.95 5857	0.855 218	0.743 812	0.698 824	0.821 253	1.217 627	1.968 874
		3	0.910 942	0.990 509	1.012 709	0.96 7164	0.866 847	0.754 84	0.708 543	0.829 398	1.224 464	1.975 144
	B	1	0.883 151	0.959 747	0.978 463	0.92 8174	0.820 699	0.697 685	0.635 923	0.737 691	1.113 01	1.847 89
		2	0.892 839	0.972 29	0.994 227	0.94 7044	0.841 817	0.719 466	0.656 166	0.753 942	1.123 041	1.850 188
		3	0.892 157	0.971 683	0.994 505	0.94 9151	0.846 552	0.727 217	0.666 495	0.765 221	1.132 238	1.853 105
	C	1	0.871 737	0.950 158	0.974 58	0.93 3374	0.836 617	0.723 397	0.666 943	0.765 758	1.126 789	1.835 27
		2	0.882 436	0.962 782	0.988 496	0.94 7662	0.850 198	0.735 392	0.677 202	0.775 271	1.137 65	1.849 981
		3	0.888 095	0.967 463	0.992 743	0.95 2509	0.856 967	0.745 35	0.691 081	0.792 947	1.157 978	1.870 917
	Average Standard Deviation Corrected Percentag e		0.89 0.012 973	0.97 0.013 156	0.99 0.012 492	0.95 0.01 215	0.85 0.013 596	0.73 0.017 23	0.68 0.023 048	0.78 0.031 803	1.16 0.043 975	1.89 0.058 591
DE-5	A	1	1.159 881	1.306 365	1.418 169	1.48 5054	1.511 36	1.527 407	1.588 924	1.772 041	2.156 303	2.799 751
		2	1.172 92	1.318 124	1.427 956	1.49 2862	1.518 32	1.535 897	1.602 277	1.793 827	2.189 225	2.844 43
		3	1.174 102	1.321 431	1.433 475	1.50 0256	1.526 762	1.544 109	1.608 498	1.795 782	2.184 202	2.829 68
	B	1	1.137 13	1.275 007	1.378 924	1.43 9577	1.461 745	1.475 221	1.534 699	1.715 312	2.096 698	2.738 832
		2	1.150 647	1.290 708	1.397 349	1.46 135	1.487 379	1.505 055	1.568 69	1.752 933	2.136 764	2.779 386
		3	1.156 968	1.300 032	1.410 107	1.47 7147	1.504 88	1.522 327	1.583 582	1.763 388	2.141 009	2.776 104
	C	1	1.158 338	1.303 891	1.415 675	1.48 3706	1.512 258	1.531 332	1.596 195	1.782 768	2.170 941	2.819 555
		2	1.161 12	1.305 607	1.416 987	1.48 5802	1.516 698	1.539 781	1.609 952	1.802 26	2.195 131	2.845 637
		3	1.163 259	1.310 473	1.423 814	1.49 3208	1.522 836	1.542 659	1.607 87	1.794 172	2.180 961	2.826 434
	Average Standard Deviation Corrected Percentag e		1.16 0.011 161	1.30 0.014 073	1.41 0.016 661	1.48 0.01 8752	1.51 0.020 456	1.52 0.022 2	1.59 0.024 479	1.77 0.027 726	2.16 0.031 899	2.81 0.035 984
DE-6	A	1	1.12 1.156 802	1.25 1.311 629	1.36 1.432 839	1.42 1.51 077	1.45 1.550 116	1.47 1.581 85	1.53 1.661 875	1.71 1.866 248	2.08 2.273 907	2.70 2.941 606
		2	1.149 213	1.300 337	1.417 599	1.49 1828	1.528 325	1.558 492	1.638 563	1.844 809	2.256 28	2.929 679

	B	3	1.167 609	1.322 249	1.443 884	1.52 2912	1.563 77	1.596 897	1.677 486	1.880 896	2.285 424	2.947 315
		1	1.094 119	1.235 333	1.344 018	1.41 0951	1.441 421	1.466 545	1.542 27	1.744 321	2.151 101	2.818 922
		2	1.092 86	1.233 928	1.342 529	1.40 9259	1.439 129	1.462 96	1.536 594	1.735 975	2.140 133	2.806 308
	C	3	1.113 244	1.255 01	1.362 97	1.42 7892	1.455 531	1.477 933	1.552 406	1.756 043	2.168 176	2.845 083
		1	1.122 202	1.276 915	1.398 769	1.47 7171	1.515 791	1.544 635	1.618 796	1.813 621	2.207 731	2.858 576
		2	1.126 577	1.280 096	1.401 026	1.47 9424	1.519 656	1.552 273	1.632 46	1.835 097	2.237 607	2.895 616
		3	1.120 885	1.271 709	1.389 763	1.46 51	1.501 969	1.530 621	1.606 086	1.803 29	2.200 062	2.852 875
		Average	1.13	1.28	1.39	1.47	1.50	1.53	1.61	1.81	2.21	2.88
		Standard	0.026	0.031	0.036	0.04	0.046	0.049	0.052	0.053	0.053	0.053
		Deviation	285	425	634	1711	243	897	309	367	359	091
		Corrected										
		Percentag										
		e	1.10	1.25	1.36	1.43	1.47	1.49	1.57	1.77	2.16	2.81
DE-7	A	1	1.707 967	1.889 229	2.078 851	2.27 2019	2.461 898	2.653 888	2.859 602	3.101 962	3.406 429	3.791 94
		2	1.703 091	1.886 358	2.078 727	2.27 4321	2.464 712	2.653 797	2.852 367	3.083 593	3.374 348	3.745 803
		3	1.755 51	1.942 43	2.136 835	2.33 2953	2.523 003	2.712 071	2.912 355	3.148 069	3.446 003	3.825 503
	B	1	1.704 905	1.886 249	2.078 314	2.27 686	2.474 317	2.674 018	2.884 183	3.124 077	3.416 176	3.778 163
		2	1.735 257	1.912 44	2.098 965	2.29 2076	2.486 227	2.686 651	2.902 946	3.154 616	3.462 591	3.840 977
		3	1.726 576	1.901 94	2.086 934	2.27 869	2.471 214	2.668 923	2.880 549	3.125 064	3.423 739	3.792 012
	C	1	1.738 843	1.916 02	2.097 924	2.27 9168	2.453 437	2.627 099	2.813 452	3.037 001	3.324 738	3.696 718
		2	1.742 087	1.916 534	2.097 415	2.28 0243	2.458 991	2.639 405	2.832 939	3.061 304	3.348 181	3.710 864
		3	1.735 485	1.908 364	2.087 735	2.26 8934	2.445 762	2.623 801	2.814 526	3.039 892	3.324 268	3.686 246
		Average	1.73	1.91	2.09	2.28	2.47	2.66	2.86	3.10	3.39	3.76
		Standard	0.018	0.018	0.018	0.01	0.022	0.028	0.036	0.044	0.051	0.056
		Deviation	5	22	311	9501	801	702	399	423	287	119
		Corrected										
		Percentag										
		e	1.62	1.79	1.97	2.15	2.32	2.50	2.69	2.91	3.19	3.54
DE-8	A	1	1.676 808	1.839 58	2.007 559	2.17 7942	2.346 994	2.522 757	2.719 613	2.962 754	3.279 378	3.688 849
		2	1.664 059	1.830 663	2.001 97	2.17 351	2.339 974	2.508 604	2.694 233	2.923 582	3.226 226	3.624 332
		3	1.681 602	1.848 539	2.020 739	2.19 3779	2.362 349	2.533 772	2.722 843	2.955 879	3.261 386	3.659 849
	B	1	1.680 976	1.849 861	2.023 952	2.19 8468	2.367 406	2.536 733	2.719 21	2.939 107	3.224 168	3.596 419
		2	1.692 237	1.859 497	2.030 406	2.20 0354	2.364 086	2.528 627	2.708 077	2.927 855	3.216 311	3.595 117
		3	1.689 105	1.861 259	2.037 904	2.21 3301	2.380 745	2.546 084	2.722 633	2.935 67	3.214 155	3.580 964



C	1	1.705 089	1.857 722	2.011 698	2.16 3082	2.308 331		2.621 731	2.831 301	3.112 392	3.486 057
	2	1.689 866	1.843 211	1.999 666	2.15 4977	2.304 651	2.456 878	2.622 606	2.829 164	3.102 546	3.464 271
	3	1.707 812	1.863 662	2.020 809	2.17 4555	2.320 759	2.467 734	2.631 174	2.837 22	3.114 302	3.484 491
	Average	1.69	1.85	2.02	2.18	2.34	2.51	2.68	2.90	3.19	3.58
	Standard	0.013	0.011	0.012	0.01	0.027	0.036	0.045	0.055	0.067	0.080
	Deviation	664	137	927	9179	441	397	589	534	134	509
	Corrected										
	Percentag										
	e	1.57	1.72	1.88	2.04	2.18	2.34	2.50	2.71	2.98	3.33

Table 24. Wall FG, Medium Silt to Coarse Silt Sizes.

Sample Name	Run	Reading	Concentration (mg/L)										
			17.378008	19.952623	22.908677	26.30268	30.199517	34.673685	39.810717	45.708819	52.480746	60.25959	
FG-1	A	1	0.943199	1.012762	1.032554	0.991908	0.9007	0.796247	0.74816	0.850187	1.204652	1.894101	
			0.951023	1.020485	1.040636	1.001183	0.912239	0.811164	0.767318	0.874033	0.874989	1.232786	1.925786
		3	0.96165	1.029625	1.047151	1.004456	0.912588	0.809884	0.766554	0.876304	0.876558	1.240558	1.939995
			1	0.963733	1.029658	1.046425	1.005293	0.918268	0.824442	0.794107	0.920337	1.302845	2.019661
		2		0.968554	1.036286	1.054976	1.015369	0.9289	0.834357	0.802164	0.925947	1.306137	2.021371
			3	0.970306	1.038271	1.057643	1.019101	0.933758	0.839844	0.807044	0.928304	1.303738	2.012268
	C	1		0.966672	1.032885	1.045907	0.995752	0.894625	0.783389	0.736247	0.851191	1.2326	1.960679
			0.964348	1.029201	1.040151	0.987267	0.883066	0.768815	0.719261	0.832951	1.214871	1.945708	
		3	0.972428	1.036837	1.047212	0.994057	0.89039	0.777912	0.73155	0.849638	1.236373	1.971147	
			Average Standard Deviation Corrected Percentage	0.960009	1.030008	1.050007	1.00001	0.910017	0.810025	0.760032	0.880037	1.250040	1.970044
		0.96509		1.0329	1.05605	1.000655	0.91349	0.81255	0.76225	0.88016	1.25189	1.97742	
		FG-2	A	1	1.073887	1.144671	1.171539	1.146851	1.081347	1.010809	0.999551	1.13328	1.503794
	1.077007				1.148594	1.177213	1.155048	1.092242	1.023641	1.012357	1.143038	1.506982	2.175954
	3			1.068604	1.139773	1.169013	1.148356	1.087689	1.021746	1.013658	1.148177	1.5165	2.189979
				1	1.063635	1.12927	1.149447	1.11784	1.047602	0.977148	0.97286	1.120816	1.51072
	2				1.061627	1.128684	1.149778	1.117939	1.045799	0.971649	0.962408	1.105262	1.491381
				B	1	1.073887	1.144671	1.171539	1.146851	1.081347	1.010809	0.999551	1.13328
	1.077007		1.148594			1.177213	1.155048	1.092242	1.023641	1.012357	1.143038	1.506982	2.175954
3	1.068604		1.139773		1.169013	1.148356	1.087689	1.021746	1.013658	1.148177	1.5165	2.189979	
	1		1.063635		1.12927	1.149447	1.11784	1.047602	0.977148	0.97286	1.120816	1.51072	2.209663
2			1.061627	1.128684	1.149778	1.117939	1.045799	0.971649	0.962408	1.105262	1.491381	2.189322	

FG-3	C	3	1.069 545	1.136 783	1.157 566	1.12 503	1.052 216	0.978 121	0.970 511	1.117 166	1.509 171	2.214 082
		1	1.053 459	1.119 52	1.137 603	1.09 9578	1.017 497	0.929 691	0.904 212	1.030 009	1.400 758	2.087 923
		2	1.067 169	1.132 679	1.149 689	1.11 0415	1.027 434	0.939 597	0.915 329	1.043 612	1.417 717	2.108 295
		3	1.074 346	1.138 538	1.154 713	1.11 5635	1.034 396	0.950 195	0.931 394	1.066 395	1.447 169	2.142 439
		Average	1.07	1.14	1.16	1.13	1.05	0.98	0.96	1.10	1.48	2.17
		Standard	0.007	0.008	0.012	0.01	0.027	0.034	0.040	0.043	0.044	0.044
		Deviation	33	896	783	923	109	814	611	643	384	278
		Corrected										
		Percentage										
		e	1.00	1.07	1.09	1.06	0.99	0.92	0.91	1.04	1.39	2.04
	A	1	0.984 863	1.041 793	1.048 267	0.99 7271	0.903 525	0.808 875	0.786 042	0.929 113	1.336 24	2.080 829
		2	0.980 952	1.036 597	1.041 378	0.98 8635	0.893 649	0.798 741	0.776 781	0.921 342	1.329 228	2.071 926
		3	1.000 483	1.056 657	1.061 148	1.00 7287	0.910 614	0.813 945	0.790 825	0.935 354	1.344 402	2.088 936
		1	0.970 197	1.030 095	1.041 783	0.99 7805	0.911 451	0.822 774	0.802 528	0.943 321	1.342 691	2.074 635
		2	0.979 157	1.036 08	1.044 071	0.99 6654	0.908 627	0.821 621	0.807 621	0.959 608	1.374 154	2.122 797
		3	0.985 541	1.041 506	1.047 919	0.99 8148	0.906 781	0.815 222	0.795 639	0.941 669	1.350 956	2.096 052
	C	1	0.972 542	1.029 044	1.039 569	0.99 844	0.920 196	0.845 371	0.843 948	1.006 77	1.428 315	2.178 409
		2	0.976 274	1.029 977	1.036 809	0.99 1388	0.908 875	0.830 56	0.827 437	0.991 275	1.417 07	2.174 403
		3	0.972 716	1.027 074	1.035 423	0.99 1991	0.911 091	0.832 957	0.827 532	0.985 881	1.403 061	2.149 785
		Average	0.98	1.04	1.04	1.00	0.91	0.82	0.81	0.96	1.37	2.12
		Standard	0.009	0.009	0.007	0.00	0.007	0.013	0.022	0.030	0.037	0.042
		Deviation	31	271	781	5401	113	952	264	48	568	588
		Corrected										
		Percentage										
		e	0.94	0.99	1.00	0.95	0.87	0.79	0.77	0.92	1.31	2.02
FG-4	A	1	1.111 71	1.191 377	1.229 856	1.22 1347	1.178 407	1.138 652	1.166 148	1.343 788	1.756 332	2.464 108
		2	1.108 79	1.189 157	1.227 769	1.21 8305	1.173 002	1.129 566	1.152 799	1.326 865	1.738 149	2.448 437
		3	1.106 932	1.187 326	1.226 671	1.21 8599	1.175 091	1.133 489	1.158 091	1.332 488	1.742 434	2.449 216
		1	1.108 317	1.191 667	1.236 179	1.23 5572	1.200 808	1.167 697	1.198 722	1.376 044	1.784 585	2.485 84
		2	1.102 077	1.183 83	1.225 423	1.22 0608	1.180 774	1.142 224	1.167 951	1.340 372	1.744 609	2.442 445
		3	1.115 932	1.197 178	1.238 218	1.23 2952	1.192 897	1.154 419	1.180 522	1.353 55	1.758 538	2.457 286
	C	1	1.106 278	1.188 533	1.230 586	1.22 5517	1.184 087	1.142 051	1.162 058	1.326 52	1.721 336	2.410 159
		2	1.126 079	1.209 452	1.252 524	1.24 8258	1.207 327	1.165 549	1.185 706	1.350 217	1.744 669	2.432 044
		3	1.113 369	1.195 736	1.237 673	1.23 2079	1.189 64	1.146 219	1.164 762	1.327 916	1.721 507	2.408 664

FG-5	A	1	Average	1.11	1.19	1.23	1.23	1.19	1.15	1.17	1.34	1.75	2.44
			Standard	0.006	0.007	0.008	0.00	0.011	0.013	0.014	0.016	0.019	0.024
			Deviation	967	502	47	9976	749	372	682	291	489	792
			Corrected										
			Percentag										
			e	1.06	1.14	1.18	1.17	1.13	1.09	1.12	1.28	1.66	2.33
				1.411	1.533	1.632	1.70	1.744	1.782	1.858	2.032	2.369	2.915
				513	455	776	2162	239	02	297	999	638	473
				1.417	1.537	1.633	1.69	1.736	1.773	1.850	2.031	2.377	2.936
				925	447	222	8461	926	009	9	378	824	134
				1.424	1.545	1.644	1.71	1.758	1.799	1.880	2.061	2.403	2.952
				581	324	165	4177	279	622	801	159	07	15
FG-5	B	1		1.386	1.499	1.588	1.64	1.685	1.721	1.803	1.990	2.345	2.913
				816	172	455	89	141	897	383	281	486	58
				1.389	1.500	1.585	1.64	1.671	1.703	1.783	1.973	2.334	2.911
				3	08	666	0735	252	627	752	171	536	205
				1.384	1.497	1.585	1.64	1.676	1.708	1.784	1.964	2.312	2.874
				217	159	888	4279	899	625	093	33	611	29
				1.424	1.541	1.638	1.70	1.750	1.789	1.866	2.038	2.367	2.901
				074	838	36	6969	193	867	778	695	698	169
				1.427	1.546	1.644	1.71	1.760	1.802	1.881	2.054	2.383	2.914
				658	271	123	4573	035	176	416	9	761	319
				1.433	1.552	1.649	1.71	1.761	1.799	1.872	2.039	2.360	2.884
				566	433	888	8989	813	684	934	019	173	658
FG-6	C	1	Average	1.41	1.53	1.62	1.69	1.73	1.76	1.84	2.02	2.36	2.91
			Standard	0.019	0.022	0.027	0.03	0.038	0.041	0.040	0.035	0.027	0.023
			Deviation	246	647	421	2968	054	165	636	52	317	715
			Corrected										
			Percentag										
			e	1.36	1.47	1.56	1.62	1.66	1.70	1.77	1.94	2.27	2.80
				1.481	1.666	1.829	1.96	2.060	2.148	2.265	2.467	2.816	3.351
				786	391	736	1715	921	572	07	902	204	031
				1.489	1.674	1.839	1.97	2.077	2.168	2.288	2.492	2.838	3.367
				562	682	552	4247	135	848	693	799	916	135
				1.484	1.670	1.833	1.96	2.065	2.152	2.265	2.463	2.802	3.324
				734	016	958	6315	417	002	697	033	439	993
FG-6	B	1		1.465	1.650	1.820	1.96	2.077	2.178	2.302	2.501	2.834	3.343
				896	731	186	3807	632	797	482	849	361	452
				1.486	1.673	1.844	1.98	2.100	2.199	2.321	2.520	2.853	3.364
				107	754	679	8239	711	846	7	248	338	155
				1.487	1.670	1.835	1.97	2.082	2.180	2.304	2.507	2.848	3.368
				311	439	947	419	759	484	149	819	705	689
				1.453	1.633	1.796	1.93	2.041	2.141	2.270	2.484	2.841	3.382
				584	417	37	3134	713	634	835	84	786	811
				1.462	1.642	1.806	1.94	2.052	2.153	2.281	2.494	2.849	3.387
				565	633	061	3521	798	089	996	844	718	638
				1.473	1.654	1.818	1.95	2.064	2.163	2.291	2.504	2.860	3.400
				415	462	515	6009	667	928	929	607	488	637
FG-7	A	1	Average	1.48	1.66	1.83	1.96	2.07	2.17	2.29	2.49	2.84	3.37
			Standard	0.012	0.014	0.016	0.01	0.017	0.018	0.019	0.018	0.018	0.023
			Deviation	823	91	067	6653	46	663	287	618	571	386
			Corrected										
			Percentag										
			e	1.44	1.61	1.78	1.91	2.01	2.11	2.23	2.43	2.76	3.27
				1.720	1.898	2.074	2.24	2.401	2.556	2.724	2.935	3.222	3.607
				826	07	203	3859	749	266	525	808	213	956

	2	1.707	1.880	2.049	2.21	2.364	2.514	2.683	2.901	3.200	3.603
		71	061	873	2516	155	874	656	238	229	847
	3	1.719	1.892	2.063	2.22	2.381	2.534	2.705	2.925	3.227	3.632
		324	548	679	8053	734	725	897	913	169	416
	B	1	1.713	1.887	2.058	2.22	2.378	2.533	2.706	2.927	3.230
			975	088	182	3056	045	02	305	97	226
		2	1.735	1.910	2.084	2.25	2.416	2.581	2.764	2.994	3.300
			765	104	172	4331	896	247	35	296	779
		3	1.736	1.912	2.084	2.25	2.405	2.559	2.730	2.949	3.247
			835	015	791	0623	533	316	441	112	481
	C	1	1.739	1.922	2.103	2.27	2.437	2.593	2.762	2.974	3.264
			946	593	578	7128	576	293	007	445	402
		2	1.736	1.916	2.095	2.26	2.432	2.593	2.768	2.986	3.278
			588	211	495	9423	77	73	888	931	981
		3	1.733	1.911	2.088	2.26	2.420	2.578	2.750	2.966	3.257
			735	605	76	0132	529	265	376	247	834
	Average	1.73	1.90	2.08	2.25	2.40	2.56	2.73	2.95	3.25	3.65
	Standard	0.011	0.014	0.017	0.02	0.025	0.028	0.030	0.031	0.031	0.030
	Deviation	816	474	901	1735	392	386	361	259	24	687
	Corrected Percentag e	1.62	1.79	1.95	2.11	2.26	2.41	2.57	2.78	3.05	3.43

Table 25. Wall AB, Very Fine Sand to Fine Sand Sizes.

Sam ple Na me	R un	Rea ding	69.18 3097	79.43 2823	91.20 1084	104.71 2855	120.22 6443	138.03 8426	158.48 9319	181.97 0086	208.92 9613	239.88 3292		
AB- 1	A	1	2.594 256	4.006 182	5.698 522	7.4380 51	8.9873 94	10.048 458	10.439 231	10.064 079	8.9642 51	7.3517 62		
		2	2.603 136	4.020 647	5.717 59	7.4596 16	9.0087 49	10.067 037	10.453 291	10.073 184	8.9687 8	7.3525 69		
		3	2.596 623	4.008 75	5.701 939	7.4423 26	8.9917 96	10.051 786	10.440 283	10.062 071	8.9587 84	7.3426 63		
		1	2.621 157	4.012 411	5.686 37	7.4141 71	8.9596 86	10.023 151	10.418 375	10.045 166	8.9426 05	7.3229 68		
		2	2.622 369	4.007 423	5.671 69	7.3886 2	8.9254 05	9.9863 58	10.388 257	10.031 352	8.9524 24	7.3579 42		
		3	2.681 8	4.092 848	5.778 483	7.5050 24	9.0342 37	10.068 349	10.425 596	10.014 141	8.8798 21	7.2415 86		
	C	1	2.717 854	4.119 091	5.785 956	7.4872 25	8.9895 69	10.002 775	10.350 831	9.9447 54	8.8283 81	7.2145 98		
		2	2.721 419	4.111 875	5.768 522	7.4622 83	8.9610 43	9.9750 87	10.327 934	9.9292 49	8.8213 56	7.2153 33		
		3	2.742 804	4.141 032	5.801 584	7.4937 27	8.9849 54	9.9869 49	10.325 544	9.9139 79	8.7970 55	7.1878 55		
		Average	2.66	4.06	5.73	7.45	8.98	10.02	10.40	10.01	8.90	7.29		
		Standard	0.059	0.056	0.048	0.0381	0.0311	0.0367	0.0502	0.0625	0.0699	0.0708		
		Deviation	982	883	916	35	7	74	28	7	79	75		
	Corrected													
	Percentag e	2.24	3.42	4.83	6.27	7.56	8.44	8.75	8.42	7.49	6.13			
	AB- 2	A	1	2.673 783	4.184 682	5.972 024	7.7896 17	9.3902 05	10.465 928	10.830 789	10.392 741	9.2024 92	7.4911 14	
			2	2.712 518	4.234 248	6.027 934		9.4357 73	10.493 566	10.833 413	10.367 304	9.1499 12		7.4179

AB-3	B	3	2.697 27	4.220 848	6.015 909	7.8325 55	9.4220 62	10.478 5	10.819 987	10.361 072	9.1571 25	7.4425 42
		1	2.473 321	3.991 386	5.809 223	7.6798 19	9.3522 69	10.508 808	10.954 441	10.583 681	9.4390 16	7.7444 57
		2	2.490 661	4.001 867	5.808 938	7.6671 88	9.3285 52	10.478 569	10.924 154	10.559 708	9.4254 18	7.7410 34
	C	3	2.482 782	3.998 62	5.811 277	7.6752 42	9.3418 94	10.496 258	10.945 296	10.583 547	9.4513 76	7.7681 56
		1	2.764 437	4.279 739	6.059 555	7.8540 8	9.4155 62	10.442 028	10.755 622	10.275 583	9.0585 38	7.3380 95
		2	2.777 452	4.304 132	6.093 553	7.8931 79	9.4535 75	10.472 553	10.773 504	10.278 692	9.0475 12	7.3166 25
		3	2.767 844	4.290 311	6.077 431	7.8776 6	9.4419 3	10.467 46	10.776 43	10.288 996	9.0629 23	7.3336 29
	Average		2.65	4.17	5.96	7.79	9.40	10.48	10.85	10.41	9.22	7.51
	Standard		0.129	0.132	0.120	0.0919	0.0467	0.0197	0.0766	0.1309	0.1707	0.1892
	Deviation		659	719	909	44	11	03	95	4	86	19
	Corrected											
	Percentag											
	e		2.35	3.70	5.30	6.92	8.35	9.31	9.64	9.25	8.19	6.67
	A	1	2.728 653	4.218 23	5.976 434	7.7576 3	9.3167 03	10.352 334	10.684 839	10.229 235	9.0387 93	7.3437 23
		2	2.738 476	4.219 69	5.964 66	7.7306 88	9.2766 36	10.306 008	10.642 384	10.201 234	9.0331 87	7.3622 33
		3	2.725 681	4.212 028	5.965 742	7.7426 36	9.2993 57	10.336 304	10.674 756	10.229 109	9.0508 58	7.3668 3
	B	1	2.600 884	4.085 37	5.856 46	7.6712 69	9.2833 99	10.383 371	10.782 294	10.381 839	9.2270 79	7.5417 14
		2	2.631 615	4.120 46	5.892 398	7.7030 01	9.3050 75	10.389 954	10.770 399	10.351 712	9.1821 07	7.4888 37
		3	2.625 311	4.116 129	5.890 382	7.7037 02	9.3091 31	10.398 055	10.783 213	10.369 308	9.2038 44	7.5130 43
	C	1	2.670 569	4.116 769	5.837 306	7.5969 37	9.1574 79	10.219 84	10.601 653	10.208 392	9.0833 52	7.4429 29
		2	2.665 717	4.124 82	5.861 213	7.6368 99	9.2106 52	10.279 805	10.659 717	10.255 222	9.1110 59	7.4475
		3	2.651 108	4.106 637	5.842 02	7.6198 76	9.1988 4	10.275 129	10.662 613	10.264 179	9.1235 51	7.4609 77
	Average		2.67	4.15	5.90	7.68	9.26	10.33	10.70	10.28	9.12	7.44
	Standard		0.049	0.053	0.056	0.0568	0.0577	0.0609	0.0664	0.0713	0.0729	0.0700
	Deviation		806	707	089	51	57	91	93	74	93	31
	Corrected											
	Percentag											
	e		2.26	3.52	5.00	6.52	7.85	8.76	9.07	8.71	7.73	6.31
AB-4	A	1	3.005 842	4.392 966	6.004 523	7.6098 1	8.9832 61	9.8565 65	10.075 951	9.5807 03	8.4288 37	6.8378 63
		2	2.996 097	4.378 452	5.986 383	7.5908 9	8.9673 97	9.8474 72	10.076 452	9.5917 3	8.4496 94	6.8664 07
		3	3.002 131	4.391 414	6.007 533	7.6198 85	9.0020 3	9.8834 42	10.108 118	9.6132 84	8.4563 41	6.8556 67
	B	1	3.034 325	4.378 19	5.943 504	7.5065 3	8.8468 15	9.7006 56	9.9152 73	9.4292 29	8.2983 56	6.7363 93
		2	3.040 667	4.384 832	5.948 921	7.5095 99	8.8470 75	9.6986 46	9.9125 75	9.4282 94	8.3017 57	6.7455 49
		3	3.051 443	4.377 982	5.920 444	7.4594 55	8.7794 79	9.6226 03	9.8397 75	9.3705 78	8.2686 26	6.7415 67
	C	1	2.937 766	4.290 833	5.869 487	7.4527 66	8.8238 17	9.7200 44	9.9884 78	9.5612 19	8.4866 21	6.9668 05
		2	2.935 283	4.293 768	5.877 883	7.4660 06	8.8410 03	9.7400 73	10.010 246	9.5834 64	8.5079 56	6.9858 86
		3	2.974 835	4.342 683	5.933 275	7.5224 05	8.8907 39	9.7744 43	10.020 765	9.5650 18	8.4594 37	6.9120 38

AB-5	A	1	Average	3.00	4.36	5.94	7.53	8.89	9.76	9.99	9.52	8.41	6.85
			Standard	0.042	0.040	0.050	0.0652	0.0789	0.0870	0.0895	0.0894	0.0908	0.0948
			Deviation	094	538	14	88	41	19	55	78	56	55
		2	Corrected										
			Percentag	2.78	4.04	5.51	6.98	8.24	9.05	9.26	8.83	7.79	6.35
			e										
		3	1	3.068	4.400	5.944	7.4839	8.8099	9.6679	9.9091	9.4683	8.3921	6.8798
			882	855	167	24	72	38	63	09	32	85	
			2	3.100	4.437	5.979	7.5116	8.8227	9.6616	9.8840	9.4306	8.3515	6.8469
AB-6	B	1	089	047	717	63	57	13	1	05	96	17	
			3	3.063	4.396	5.936	7.4689	8.7866	9.6393	9.8827	9.4536	8.3985	6.9118
			949	55	39	95	44	56	37	89	92	08	
		2	1	3.062	4.365	5.879	7.3941	8.7028	9.5541	9.8011	9.3779	8.3288	6.8478
			569	175	229	28	12	61	65	9	77	56	
			2	3.081	4.388	5.905	7.4197	8.7242	9.5673	9.8027	9.3668	8.3059	6.8163
		3	575	384	117	56	13	15	63	78	09	73	
			3	3.092	4.394	5.901	7.4032	8.6939	9.5250	9.7530	9.3166	8.2635	6.7887
			952	039	156	44	37	69	6	81	34	24	
	C	1	1	3.117	4.460	6.008	7.5434	8.8556	9.6927	9.9097	9.4466	8.3534	6.8321
			54	546	179	12	32	9	92	37	32	19	
			2	3.159	4.502	6.042	7.5625	8.8532	9.6666		9.3850	8.2881	6.7738
		2	494	12	336	3	93	81	9.8621	04	6	81	
			3	3.120	4.469	6.023	7.5639	8.8785	9.7150	9.9284	9.4595	8.3590	6.8306
			455	864	858	32	2	39	78	29	91	09	
		3	Average	3.10	4.42	5.96	7.48	8.79	9.63	9.86	9.41	8.34	6.84
			Standard	0.032	0.045	0.058	0.0668	0.0696	0.0667	0.0600	0.0521	0.0455	0.0425
			Deviation	028	59	449	95	02	96	54	06	68	05
		4	Corrected										
			Percentag	2.85	4.07	5.48	6.88	8.09	8.86	9.07	8.66	7.67	6.29
			e										
AB-7	A	1	1	3.908	4.836	5.878	6.8758	7.6711	8.0858	8.0175	7.4439	6.4159	5.1096
			551	315	355	63	68	11	08	75	2	9	
			2	3.918	4.838	5.868	6.8542	7.6403	8.0519	7.9886	7.4279	6.4185	5.1315
		2	979	299	703	32	74	72	63	84	01	64	
			3	3.901	4.822	5.855	6.8451	7.6360	8.0521	7.9934	7.4379	6.4350	5.1571
			819	153	466	75	01	72	7	52	36	06	
	B	1	1	3.831	4.749	5.787	6.7894	7.5995	8.0397	8.0055	7.4691	6.4763	5.1968
			867	986	81	26	79	25	89	98	37	24	
			2	3.821	4.732	5.762	6.7575	7.5660	8.0112	7.9897	7.4722	6.5020	5.2444
		2	304	252	059	11	44	31	11	35	62	72	
			3	3.830	4.746	5.780	6.7800	7.5900	8.0335	8.0070	7.4822	6.5036	5.2388
			927	429	946	83	57	52	48	15	98	9	
	C	1	1	3.818	4.741	5.781	6.7814	7.5876	8.0241	7.9904	7.4610	6.4807	5.2148
			615	475	32	95	17	19	84	42	43	94	
			2	3.882	4.817	5.861	6.8545	7.6429	8.0538	7.9904	7.4332	6.4311	5.1532
		2	667	96	445	62	6	57	97	54	12	31	
			3	3.889	4.824	5.866	6.8573	7.6428	8.0507	7.9848	7.4259	6.4229	5.1439
			268	134	383	54	54	12	01	44	49	99	
		3	Average	3.87	4.79	5.83	6.82	7.62	8.04	8.00	7.45	6.45	5.18
			Standard	0.040	0.045	0.047	0.0438	0.0346	0.0212	0.0109	0.0210	0.0363	0.0485
			Deviation	845	617	282	81	61	47	6	55	18	49
		4	Corrected										
			Percentag	3.57	4.43	5.38	6.30	7.04	7.43	7.39	6.88	5.96	4.78
			e										
AB-7	A	1	1	3.952	4.877	5.912	6.9023	7.6907	8.1021	8.0352	7.4672	6.4467	5.1470
			54	183	761	16	22	04	38	1	61	18	
			2	3.940	4.854	5.879	6.8600	7.6435	8.0568	8.0003	7.4506	6.4542	5.1789
		2	154	808	635	58	32	17	4	73	66	04	
			3	3.950	4.867	5.890	6.8656	7.6415	8.0472	7.9858	7.4367	6.4476	
			851	231	354	34	47	21	06	39	98	5.1857	
	B	1	1	4.052	4.929	5.905	6.8306	7.5557	7.9145	7.8115	7.2285	6.2143	4.9382
			463	779	837	6	6	71	04	4	94	97	

AB-8	C	2	4.023 042	4.915 936	5.911 816	6.8592 38	7.6080 96	7.9884 38	7.9017 49	7.3266 96	6.3107 96	5.0243 49
		3	4.075 229	4.965 786	5.951 309	6.8805 24	7.6052 83	7.9605 93	7.8528 84	7.2661 27	6.2498 29	4.9735 37
		1	3.982 466	4.866 222	5.853 204	6.7953 16	7.5456 11	7.9363 28	7.8698 76	7.3233 16	6.3417 39	5.0905 27
	C	2	3.986 087	4.877 446	5.871 589	6.8189 51	7.5714 85	7.9608 1	7.8896 09	7.3361 51	6.3468 68	5.0886 37
		3	4.008 957	4.887 126	5.865 297	6.7959 37	7.5329 7.5329	7.9103 84	7.8327 02	7.2795 04	6.2973 03	5.0522 23
		Average	4.00	4.89	5.89	6.85	7.60	7.99	7.91	7.35	6.35	5.08
	e	Standard	0.047	0.036	0.030	0.0373	0.0526	0.0678	0.0795	0.0862	0.0883	0.0871
		Deviation	017	298	212	51	46	37	4	15	27	27
		Corrected										
		Percentag										
		e	3.67	4.49	5.41	6.29	6.98	7.33	7.26	6.75	5.83	4.66
AB-9	A	1	4.547 491	4.933 189	5.306 778	5.5992 1	5.7432 03	5.6748 92	5.3562 17	4.8007 52	4.0343 98	3.1624 77
		2	4.520 918	4.913 697	5.293 745	5.5929 74	5.7459 93	5.6903 49	5.3890 99	4.8538 6	4.1097 62	3.2566 86
		3	4.546 795	4.950 499	5.340 426	5.6459 44	5.7996 18	5.7377 77	5.4234 31	4.8701 77	4.1057 67	3.2342
	B	1	4.304 747	4.787 484	5.284 15	5.7155 4	6.0035 82	6.0650 03	5.8489 02	5.3544 38	4.6073 07	3.7153 09
		2	4.341 318	4.826 736	5.320 687	5.7462 86	6.0284 71	6.0867 27	5.8715 84	5.3815 86	4.6409 62	3.7534 46
		3	4.315 464	4.814 729	5.327 744	5.7770 36	6.0867 63	6.1736 83	5.9862 46	5.5198 28	4.7969 81	3.9192 95
	C	1	4.282 691	4.753 249	5.238 535	5.6572 33	5.9301 99	5.9767 23	5.7505 57	5.2555 96	4.5180 56	3.6416 84
		2	4.314 289	4.801 55	5.297 659	5.7217 41	5.9967 09	6.0444 32	5.8213 24	5.3323 31	4.6038 54	3.7358 46
		3	4.317 373	4.816 1	5.320 923	5.7500 72	6.0270 19	6.0747 91	5.8512 19	5.3619 9	4.6343 92	3.7675 94
	e	Average	4.39	4.84	5.30	5.69	5.93	5.95	5.70	5.19	4.45	3.58
		Standard	0.114	0.070	0.030	0.0677	0.1319	0.1921	0.2410	0.2723	0.2852	0.2795
		Deviation	129	106	177	14	52	03	99	55	4	33
AB-9	A	1	5.128 339	5.725 714	6.243 56	6.5966 94	6.7203 77	6.5676 88	6.1254 54	5.4380 56	4.5503 59	3.5803 98
		2	5.115 918	5.724 019	6.251 285	6.6111 8	6.7393 29	6.5902 17	6.1529 12	5.4724 6	4.5947 06	3.6343 05
		3	5.130 07	5.761 851	6.309 226	6.6815 56	6.8122 81	6.6560 31	6.2043 67	5.5069 17	4.6133 07	3.6421 03
	B	1	4.915 597	5.444 974	5.919 078	6.2578 67	6.3952 13	6.2775 2	5.8830 43	5.2460 47	4.4072 55	3.4805 79
		2	4.931 74	5.499 793	6.006 831	6.3682 73	6.5162 83	6.3973 68	5.9923 74	5.3392 64	4.4833 29	3.5413 02
		3	4.927 62	5.504 267	6.019 011	6.3865 71	6.5387 31	6.4218 8	6.0177 38	5.3658 54	4.5132 59	3.5775 54
	C	1	5.019 557	5.542 405	5.998 33	6.3084 32	6.4089 78	6.2516 22	5.8190 86	5.1518 75	4.2936 03	3.3599 36
		2	5.026 993	5.567 581	6.041 725	6.3688 51	6.4836 64	6.3356 25	5.9061 71	5.2352 35	4.3671 44	3.4198 54
		3	5.040 098	5.594 825	6.081 021	6.4153 1	6.5303 13	6.3745 1	5.9300 41	5.2392 74	4.3504 58	3.3847 38
	e	Average	5.03	5.60	6.10	6.44	6.57	6.43	6.00	5.33	4.46	3.51
		Standard	0.086	0.114	0.136	0.1484	0.1497	0.1431	0.1328	0.1227	0.1141	0.1063
		Deviation	878	5	582	19	21	36	81	6	06	59

		Corrected Percentage	4.36	4.85	5.28	5.58	5.70	5.57	5.20	4.62	3.87	3.04
AB-10	A	1	5.138 789	5.716 018	6.213 255	6.5410 9	6.6310 76	6.4377 62	5.9528 02	5.2314 89	4.3282 77	3.3668 14
		2	5.157 554	5.776 917	6.311 952	6.6675 6	6.7728 83	6.5817 34	6.0872 3	5.3477 08	4.4208 85	3.4351 8
		3	5.102 971	5.742 231	6.301 807	6.6834 53	6.8129 84	6.6401 99	6.1569 61	5.4216 91	4.4961 4	3.5113 06
	B	1	5.102 112	5.733 739	6.282 8	6.6524 77	6.7695 73	6.5851 86	6.0916 04	5.3474 02	4.4131 36	3.4195 68
		2	5.141 198	5.799 695	6.375 533	6.7687 09	6.9033 56	6.7271 35	6.2298 63	5.4689 99	4.5057 07	3.4754 09
		3	5.152 061	5.811 644	6.386 23	6.7764 4	6.9076 57	6.7291 71	6.2317 57	5.4726 86	4.5120 35	3.4844 01
	C	1	5.019 241	5.578 318	6.074 405	6.4209 22	6.5473 18	6.3999 04	5.9605 82	5.2728 94	4.3857 29	3.4223 33
		2	5.000 366	5.592 565	6.122 973	6.5006 7	6.6519 51	6.5199 68	6.0861 95	5.3944 32	4.4960 95	3.5155 75
		3	4.996 94	5.580 407	6.090 284	6.4398 72	6.5622 64	6.4097 59	5.9712 43	5.2953 59	4.4337 71	3.5040 3
	Average		5.09	5.70	6.24	6.61	6.73	6.56	6.09	5.36	4.44	3.46
	Standard		0.066	0.094	0.119	0.1344	0.1366	0.1269	0.1081	0.0852	0.0634	0.0510
	Deviation		551	894	806	58	01	01	94	52	88	42
	Corrected Percentage											
	e		4.47	5.00	5.48	5.80	5.90	5.76	5.34	4.70	3.90	3.04
AB-11	A	1	5.589 235	6.104 345	6.476 995	6.6373 37	6.5423 58	6.1836 49	5.5800 06	4.8090 37	3.9286 02	3.0497 64
		2	5.556 961	6.108 817	6.519 394	6.7143 25	6.6475 39	6.3071 04	5.7106 52	4.9360 78	4.0437 92	3.1494 28
		3	5.481 47	6.037 972	6.455 409	6.6601 65	6.6077 63	6.2868 35	5.7150 78	4.9675 34	4.1012 2	3.2254 89
	B	1	5.599 73	6.109 482	6.483 91	6.6513 79	6.5646 97	6.2093 41	5.5981 6	4.8057 64	3.8909 09	2.9720 46
		2	5.559 718	6.093 404	6.492 824	6.6831 02	6.6153 15	6.2734 95	5.6708 63	4.8827 37	3.9694 21	3.0506 29
		3	5.500 26	6.063 118	6.491 681	6.7081 58	6.6628 67	6.3391 76	5.7511 15	4.9740 32	4.0688 23	3.1553 96
	C	1	5.544 073	6.098 06	6.516 506	6.7230 01	6.6678 15	6.3341 19	5.7353 61	4.9474 07	4.0318 32	3.1098 25
		2	5.517 258	6.098 595	6.543 555	6.7730 21	6.7359 35	6.4136 34	5.8185 88	5.0263 7	4.1003 23	3.1659 64
		3	5.482 896	6.070 645	6.518 55	6.7486 87	6.7125 98	6.3946 75	5.8101 51	5.0354 98	4.1339 56	3.2278 69
	Average		5.54	6.09	6.50	6.70	6.64	6.30	5.71	4.93	4.03	3.12
	Standard		0.043	0.024	0.026	0.0456	0.0639	0.0766	0.0830	0.0839	0.0835	0.0856
	Deviation		844	549	895	43	13	99	06	51	34	28
	Corrected Percentage											
	e		4.89	5.37	5.74	5.91	5.86	5.57	5.04	4.35	3.56	2.76

Table 26. Wall DE, Very Fine Sand to Fine Sand Sizes.

Sample Name	R un	Rea ding	69.18 3097	79.43 2823	91.20 1084	104.71 2855	120.22 6443	138.03 8426	158.48 9319	181.97 0086	208.92 9613	239.88 3292
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DE-4	A	1	3.093 619	4.551 204	6.195 427	7.7775 94	9.0666 97	9.8068 28	9.8652 9	9.2167 74	7.9458 42	6.2945 44	
		2	3.105 197	4.558 622	6.196 551	7.7714 52	9.0535 95	9.7886 4	9.8450 62	9.1985 31	7.9336 97	6.2914 62	
		3	3.111 974	4.567 162	6.208 049	7.7863 79	9.0710 56	9.8058 1	9.8573 51	9.2007 39	7.9215 4	6.2638 22	
		Average Standard Deviation Corrected Percentage	2.73 0.145 575	4.27 0.133 311	6.05 0.107 035	7.81 0.0677 12	9.30 0.0300 39	10.23 0.0651 19	10.44 0.1261 5	9.88 0.1802 84	8.63 0.2183 12	6.92 0.2329 96	
	B	1	2.977 787	4.438 955	6.100 627	7.7137 37	9.0459 35	9.8367 58	9.9488 38	9.3477 37	8.1112 15	6.4751 32	
		2	2.971 937	4.425 914	6.082 378	7.6929 02	9.0249 33	9.8171 04	9.9308 15	9.3306 66	8.0943 57	6.4581 24	
		3	2.963 872	4.402 933	6.042 466	7.6378 08	8.9605 67	9.7535 78	9.8803 84	9.3039 57	8.0976 8	6.4900 17	
		Average Standard Deviation Corrected Percentage	3.01 0.073 252	4.45 0.084 468	6.09 0.088 89	7.68 0.0836 41	9.00 0.0674 69	9.78 0.0444 59	9.88 0.0357 76	9.28 0.0607 6	8.05 0.0914 97	6.43 0.1124 24	
	DE-5	A	1	3.719 43	4.853 892	6.091 559	7.2352 51	8.1060 93	8.5188 29	8.3835 82	7.7039 67	6.5555 77	5.1415 96
			2	3.773 624	4.912 171	6.145 913	7.2765 02	8.1256 93	8.5118 51	8.3491 79	7.6467 23		5.0625 55
			3	3.747 088	4.873 618	6.097 48	7.2231 29	8.0743 7	8.4703 1	8.3244 83	7.6430 68	6.5015 94	5.1004 46
			Average Standard Deviation Corrected Percentage	3.73 0.038 031	4.86 0.035 91	6.10 0.028 736	7.25 0.0199 84	8.12 0.0220 02	8.53 0.0352 99	8.38 0.0485 94	7.70 0.0568 34	6.55 0.0591 51	5.13 0.0565 61
B		1	3.662 133	4.808 345	6.067 254	7.2392 93	8.1411 86	8.5813 82	8.4665 59	7.7988 64	6.6555 13	5.2416 4	
		2	3.700 498	4.841 547	6.092 463	7.2542 95	8.1440 41	8.5707 76	8.4412 61	7.7583 42	6.5995 29	5.1711 3	
		3	3.688 966	4.821 912	6.065 793	7.2229 25	8.1112 95	8.5404 43	8.4165 96	7.7409 97	6.5897 37	5.1678 74	
		Average Standard Deviation Corrected Percentage	3.73 0.038 031	4.86 0.035 91	6.10 0.028 736	7.25 0.0199 84	8.12 0.0220 02	8.53 0.0352 99	8.38 0.0485 94	7.70 0.0568 34	6.55 0.0591 51	5.13 0.0565 61	
C		1	3.745 979	4.887 539	6.130 088	7.2734 18	8.1367 58	8.5351 81	8.3809 28	7.6824 15	6.5193 36	5.0977 82	
		2	3.769 619	4.903 721	6.134 139		8.1104 7.2625 91	8.4968 23	8.3365 44	7.6398 65	6.4859 13	5.0779 98	
		3	3.747 448	4.881 418	6.115 029	7.2500 43	8.1079 47	8.5060 09	8.3572 23	7.6684 68	6.5164 83	5.1033 82	
		Average Standard Deviation Corrected Percentage	3.73 0.038 031	4.86 0.035 91	6.10 0.028 736	7.25 0.0199 84	8.12 0.0220 02	8.53 0.0352 99	8.38 0.0485 94	7.70 0.0568 34	6.55 0.0591 51	5.13 0.0565 61	
DE-6	A	1	3.883 785	5.034 054	6.274 631	7.4021 59	8.2336 27	8.5848 43	8.3718 55	7.6109 25	6.3971 12	4.9406 21	
		2	3.879 288	5.038 317	6.288 62	7.4259 84	8.2664 68	8.6243 04	8.4142 32	7.6513 76		4.9624 21	
		Average Standard Deviation Corrected Percentage	3.59 0.038 031	4.68 0.035 91	5.88 0.028 736	6.98 0.0199 84	7.82 0.0220 02	8.21 0.0352 99	8.07 0.0485 94	7.41 0.0568 34	6.30 0.0591 51	4.94 0.0565 61	

DE-7	B	3	3.880 854	5.020 359	6.249 398	7.3666 78	8.1907 55	8.5391 16	8.3284 1	7.5755 97	6.3721 92	4.9282 01
		1	3.762 477	4.917 04	6.168 601	7.3187 8	8.1899 12	8.5995 75	8.4613 4	7.7818 55	6.6376 21	5.2309 1
		2	3.750 209	4.907 933	6.165 719	7.3242 75	8.2042 27	8.6206 21	8.4852 68	7.8041 64	6.6546 41	5.2405 6
	C	3	3.800 228	4.966 259	6.225 808	7.3768 02	8.2389 62	8.6294 58	8.4632 29	7.7516 26	6.5756 7	5.1432 71
		1	3.782 993	4.919 447	6.156 287	7.2961 53	8.1598 56	8.5622 33	8.4138 32	7.7207 57	6.5613 03	5.1420 13
		2	3.823 93	4.959 357	6.189 639	7.3182 44	8.1675 37	8.5548 75	8.3924 76	7.6880 12	6.5200 13	5.0956 32
	Average Standard Deviation Corrected Percentag e	3	3.777 902	4.913 9	6.150 661	7.2928 09	8.1626 31	8.5746 26	8.4373 26	7.7527 03	6.5955 19	5.1701 67
			3.82 0.053 445	4.96 0.054 172	6.21 0.053 161	7.35 0.0477 21	8.20 0.0376 03	8.59 0.0327 37	8.42 0.0495 7	7.70 0.0784 14	6.53 0.1042 98	5.09 0.1220 05
			3.73	4.85	6.06	7.17	8.01	8.38	8.22	7.52	6.37	4.97
	A	1	4.262 536	4.787 009	5.311 503	5.7434 38	5.9965 47		5.6806 54	5.0905 13	4.2600 26	3.3145 32
		2	4.204 594	4.722 531	5.248 481	5.6916 54	5.9662 39	5.9883 6	5.7134 9	5.1547 5	4.3495 51	3.4153 94
		3	4.289 709	4.805 824	5.318 256	5.7337 13	5.9661 23	5.9362 57	5.6058 63	4.9973 55	4.1576 2	3.2070 94
	B	1	4.215 671	4.703 387	5.195 416	5.6084 69	5.8630 58	5.8803 81	5.6156 32	5.0786 88	4.2978 82	3.3885 37
		2	4.290 491	4.780 565	5.261 496	5.6492 27	5.8664 93	5.8412 45	5.5360 31	4.9695 9	4.1771 23	3.2747 32
		3	4.232 528	4.717 031	5.197 905	5.5924 5	5.8234 93	5.8169 68	5.5331 58	4.9865 51	4.2111 14	3.3193 39
	C	1	4.157 687	4.677 437	5.203 02	5.6427 45	5.9114 54	5.9277 68	5.6494 4	5.0928 66	4.2942 96	3.3743 8
		2	4.152 998	4.645 989	5.140 21	5.5493 34	5.7930 94	5.7955 99	5.5187 39	4.9802 55	4.2178 88	3.3439 96
		3	4.131 416	4.633 35	5.144 216	5.5774 28	5.8504 57	5.8815 16	5.6256 95	5.0947 86	4.3208 14	3.4213 9
	Average Standard Deviation Corrected Percentag e		4.22 0.059 235	4.72 0.061 854	5.22 0.065 066	5.64 0.0685 05	5.89 0.0707 06	5.90 0.0704 07	5.61 0.0682 31	5.05 0.0665 26	4.25 0.0666 35	3.34 0.0696 97
			3.96	4.43	4.91	5.30	5.54	5.54	5.27	4.74	4.00	3.14
DE-8	A	1	4.194 243	4.761 858	5.335 5	5.8184 8	6.1215 28	6.1574 56	5.8806 49	5.3047 03	4.4698 59	3.5007 32
		2	4.123 753	4.693 22	5.278 093	5.7817 3	6.1139 08	6.1836 91	5.9413 76	5.3939 12	4.5771 13	3.6123 31
		3	4.155 188	4.714 713	5.283 339	5.7659 22	6.0745 38	6.1222 98	5.8629 05	5.3073 44	4.4934 39	3.5425 59
	B	1	4.063 628	4.598 989	5.152 804	5.6336 85	5.9543 19	6.0256 43	5.7980 01	5.2770 49	4.4955 53	3.5700 94
		2	4.070 633	4.613 939	5.173 612	5.6574 61	5.9789 27	6.0505 93	5.8249 22	5.3084 69	4.5345 32	3.6160 17
		3	4.043 663	4.574 469	5.122 514	5.5964 78	5.9106 12	5.9794 24	5.7567 01	5.2521 74	4.4955 09	3.6031 9
	C	1	3.959 694	4.507 111	5.079 82	5.5860 51	5.9365 2	6.0371 74	5.8348 79	5.3319 08	4.5620 52	3.6422 72
		2	3.923 231	4.455 627	5.015 131	5.5124 38	5.8604 71	5.9675 38	5.7805 97	5.3016 74	4.5564 99	3.6631 08
		3	3.956 09	4.503 33	5.077 206	5.5849 59	5.9367 25	6.0382 42	5.8360 52	5.3316 48	4.5581 26	3.6324 16

Average	4.05	4.60	5.17	5.66	5.99	6.06	5.84	5.31	4.53	3.60
Standard	0.094	0.104	0.109	0.1053	0.0934	0.0757	0.0556	0.0395	0.0387	0.0515
Deviation	093	673	084	33	86	7	11	07	42	44
Corrected										
Percentage	3.78	4.29	4.82	5.28	5.58	5.65	5.44	4.95	4.22	3.35

Table 27. Wall FG, Very Fine Sand to Fine Sand Sizes.

Sample Name	Run	Reading	69.18 3097	79.43 2823	91.20 1084	104.71 2855	120.22 6443	138.03 8426	158.48 9319	181.97 0086	208.92 9613	239.88 3292
FG-1	A	1	2.956 758	4.339 322	5.924 796	7.4802 14	8.7822 8	9.5722 31	9.7056 75	9.1365 6	7.9336 54	6.3252 31
		2	2.989 332	4.368 806	5.945 756	7.4867 14	8.7691 44	9.5378 18	9.6524 03	9.0718 64	7.8675 79	6.2683 92
		3	3.010 032	4.393 689	5.970 128	7.5039 5	8.7721 86	9.5222 24	9.6179 51	9.0243 08	7.8164 33	6.2246 04
	B	1	3.103 328	4.493 787	6.067 728	7.5880 32	8.8308 79	9.5458 03	9.6000 85	8.9653 81	7.7213 93	6.1031 37
		2	3.104 473	4.495 107	6.069 094	7.5880 21	8.8270 21	9.5361 15	9.5845 97	8.9467 35	7.7030 86	6.0869 56
		3	3.087 665	4.471 348	6.041 171	7.5605 57	8.8053 48	9.5245 82	9.5854 12	8.9585 44	7.7218 57	6.1070 93
	C	1	3.065 913	4.481 761	6.077 368	7.6102 2	8.8565 98	9.5697 83	9.6220 72	8.9890 32	7.7515 88	6.1439 15
		2	3.056 032	4.478 668	6.081 722	7.6213 95	8.8732 37	9.5900 41	9.6442 66	9.0117 52	7.7737 24	6.1647 91
		3	3.083 1	4.503 762	6.100 294	7.6288 26	8.8656 33	9.5660 06	9.6052 29	8.9630 32	7.7229 63	6.1205 28
	Average		3.05	4.45	6.03	7.56	8.82	9.55	9.62	9.01	7.78	6.17
	Standard		0.053	0.062	0.065	0.0585	0.0402	0.0237	0.0385	0.0625	0.0786	0.0830
	Deviation		13	329	84	14	07	11	59	31	06	77
	Corrected											
	Percentage											
	e		2.80	4.09	5.54	6.95	8.10	8.77	8.84	8.27	7.15	5.67
FG-2	A	1	3.197 742	4.491 001	5.944 94	7.3385 89	8.4655 45	9.0971 73	9.1129 76	8.4904 19		5.7745 93
		2	3.179 608	4.461 418	5.906 223	7.2949 87	8.4218 98	9.0578 18	9.0813 14	8.4689 77	7.3043 5	5.7807 32
		3	3.197 662	4.482 301	5.928 275	7.3163 31	8.4407 52	9.0728 56	9.0915 67	8.4737 51	7.2939 75	5.7716 96
	B	1	3.241 325	4.543 311	5.996 609	7.3799 7	8.4880 48	9.0963 11	9.0897 81	8.4533 77	7.2665 15	5.7511 35
		2	3.223 932	4.533 427	5.998 84	7.3976 98	8.5225 87	9.1450 17	9.1461 36	8.5073 11	7.3070 85	5.7701 67
		3	3.254 93	4.567 404	6.030 184	7.4196 24	8.5287 69	9.1321 07	9.1144 61	8.4619 14	7.2554 32	5.7203 2
	C	1	3.118 726	4.432 524	5.910 464	7.3298 18	8.4836 65	9.1423 2	9.1854 47	8.5884 77	7.4239 47	5.9089 96
		2	3.141 517	4.455 471	5.929 916	7.3410 85	8.4817 7	9.1239 09	9.1495 09	8.5381 6	7.3655 43	5.8512 19
		3	3.176 163	4.484 4	5.945 641	7.3369 15	8.4535 92	9.0729 88	9.0821 68	8.4654 78	7.2999 42	5.8033 04
	Average		3.19	4.49	5.95	7.35	8.48	9.10	9.12	8.49	7.31	5.79

		Standard Deviation Corrected Percentage	0.044 439	0.044 63	0.043 588	0.0402 59	0.0353 06	0.0326 05	0.0362 07	0.0441 52	0.0518 29	0.0564
			3.00	4.23	5.60	6.91	7.97	8.56	8.58	7.99	6.88	5.45
FG-3	A	1	3.188 599	4.591 34	6.158 537	7.6494 21	8.8415 82	9.4934 88	9.4829 66	8.7966 07	7.5237 89	5.9068 6
		2	3.173 471	4.565 438	6.119 112	7.5979 34	8.7843 8	9.4413 35	9.4484 62	8.7897 22	7.5494 34	5.9619 58
		3	3.192 127	4.584 644	6.136 925	7.6116 74	8.7908 27	9.4373 55	9.4307 89	8.7560 47	7.4989 71	5.8976 15
	B	1	3.166 388	4.552 278	6.105 254	7.5891 99	8.7852 16	9.4527 87	9.4681 76	8.8126 1	7.5699 57	5.9755 76
		2	3.229 15	4.623 129	6.173 985	7.6437 59	8.8141 22	9.4488 5	9.4294 28	8.7447 46	7.4835 7	5.8849 88
		3	3.201 126	4.596 348	6.151 36	7.6286 98	8.8103 79	9.4589 49	9.4534 96	8.7785 01	7.5195 54	5.9145 7
	C	1	3.279 816	4.663 037	6.199 013	7.6526 04	8.8080 34	9.4316 41	9.4055 41	8.7178 33	7.4550 16	5.8539 26
		2	3.284 941	4.677 208	6.220 11	7.6767 61	8.8307 56	9.4488 56	9.4141 49	8.7167 15	7.4452 97	5.8397 03
		3	3.249 703	4.633 888	6.173 392	7.6328 09	8.7963 29	9.4300 84	9.4157 86	8.7395 9	7.4864 63	5.8921 56
		Average Standard Deviation Corrected Percentage	3.22 0.044 575	4.61 0.042 672	6.16 0.036 722	7.63 0.0280 27	8.81 0.0199 53	9.45 0.0191 88	9.44 0.0262 64	8.76 0.0347 01	7.50 0.0412 95	5.90 0.0444 1
			3.08	4.41	5.89	7.30	8.43	9.04	9.03	8.38	7.18	5.65
FG-4	A	1	3.482 792	4.742 61	6.119 938	7.3976 1	8.3800 72	8.8644 65	8.7546 36	8.0553 86	6.8523 45	5.3654 28
		2	3.474 015	4.744 207	6.133 259	7.4209 28	8.4093 83	8.8946 16	8.7811 25	8.0756 84	6.8660 39	5.3738 51
		3	3.469 029	4.731 805	6.112 713	7.3928 77	8.3758 01	8.8592 32	8.7491 55	8.0530 75	6.8582 56	5.3841 72
	B	1	3.497 374	4.751 649	6.126 645	7.4058 33	8.3930 58	8.8827 67	8.7756 86	8.0711 77	6.8568 79	5.3474 13
		2	3.451 783	4.705 562	6.082 446	7.3669 01	8.3640 09	8.8691 88691	8.7827 62	8.1042 56	6.9152 76	5.4321 43
		3	3.467 789	4.722 846	6.100 547	7.3842 13	8.3772 86	8.8735 94	8.7728 99	8.0763 77	6.8691 65	5.3732 98
	C	1	3.413 812	4.668 41	6.054 539	7.3556 46	8.3728 9	8.8948 31	8.8165 7	8.1350 59	6.9347 2	5.4386 63
		2	3.432 245	4.680 626	6.057 396	7.3466 7	8.3508 22	8.8605 89	8.7724 6	8.0842 87	6.8801 34	5.3819 44
		3	3.409 37	4.659 279	6.039 318	7.3345 27	8.3482 76	8.8712 63	8.7992 53	8.1272 84	6.9365 28	5.4455 61
		Average Standard Deviation Corrected Percentage	3.46 0.030 813	4.71 0.034 931	6.09 0.034 736	7.38 0.0290 59	8.37 0.0192 44	8.87 0.0134 82	8.78 0.0206 49	8.09 0.0293 24	6.89 0.034 0.034	5.39 0.0356 55
			3.29	4.49	5.80	7.03	7.98	8.45	8.36	7.70	6.56	5.14
FG-5	A	1	3.685 465	4.629 795	5.656 188	6.5993 41	7.3068 47	7.6204 99	7.4610 92	6.8327 42	5.8006 83	4.5438 87
		2	3.718 876	4.672 973	5.703 007	6.6412 41	7.3346 6	7.6274 32	7.4441 49	6.7950 3	5.7499 24	4.4913 97
		3	3.721 478	4.659 627	5.673 39	6.5980 08	7.2826 86	7.5732 83	7.3945 63	6.7552 63	5.7227 73	4.4756 4
	B	1	3.705 452	4.667 101	5.704 445	6.6523 5	7.3600 45	7.6709 76	7.5071 51	6.8737 83	5.8367 13	4.5750 03

FG-6	2	3.712	4.682	5.725	6.6752	7.3814	7.6883	7.5191	6.8807	5.8400	4.5771
		37	193	189	11	57	02	02	13	3	82
	3	3.661	4.622	5.665	6.6247	7.3497	7.6813	7.5389	6.9236	5.8990	4.6423
		672	755	274	21	58	6	19	79	82	28
	1	3.655	4.584	5.598	6.5342	7.2412	7.5603	7.4109	6.7964	5.7820	4.5440
		745	555	257	97	9	4	82	98	55	91
	2	3.662	4.580	5.580	6.5028	7.1977	7.5101	7.3616	6.7559	5.7568	4.5380
		319	734	984	43	45	79	87	42	27	09
	3	3.630	4.552	5.564	6.5034	7.2193	7.5512	7.4153	6.8105	5.7993	4.5578
		534	864	21	59	91	12	19	21	5	51
	Average	3.68	4.63	5.65	6.59	7.30	7.61	7.45	6.82	5.80	4.55
	Standard	0.032	0.046	0.058	0.0644	0.0657	0.0638	0.0609	0.0579	0.0540	0.0488
	Deviation	621	484	092	87	55	22	32	15	93	97
	Corrected										
	Percentage										
	e	3.54	4.45	5.44	6.34	7.02	7.32	7.16	6.56	5.58	4.38
	1	4.080	4.949	5.863	6.6678	7.2214	7.3906	7.1154	6.4184	5.3727	4.1490
		208	068	848	58	95	95	73	88	7	09
	2	4.085	4.939	5.839	6.6309	7.1773	7.3462	7.0774	6.3907	5.3559	4.1402
		167	724	412	09	04	84	56	64	8	54
	3	4.039	4.893	5.797	6.5977	7.1572	7.3429	7.0933	6.4261		4.2089
		541	937	649	2	87	75	92	9	5.4098	81
FG-7	1	4.043	4.886	5.786	6.5897	7.1542	7.3416	7.0873	6.4096	5.3810	4.1717
		016	611	82	77	59	56	39	69	5	41
	2	4.065	4.911	5.811	6.6114	7.1684	7.3438	7.0744	6.3798	5.3358	4.1116
		948	333	623	45	07	94	07	93	66	05
	3	4.079	4.931	5.834	6.6322	7.1835	7.3513	7.0742	6.3744	5.3286	4.1063
		321	221	203	46	44	31	43	77	91	45
	1	4.116	4.990	5.910	6.7193	7.2760	7.4440	7.1612	6.4487	5.3809	4.1311
		765	266	286	24	22	27	98	21	22	98
	2	4.117	4.984	5.895	6.6947	7.2416	7.4023	7.1171	6.4088	5.3539	4.1243
		025	058	515	05	68	83	81	65	98	09
	3	4.133	5.002	5.915	6.7135	7.2551	7.4058	7.1061	6.3811	5.3094	4.0677
		027	86	7	25	06	78	14	71	95	09
	Average	4.08	4.94	5.85	6.65	7.20	7.37	7.10	6.40	5.36	4.13
	Standard	0.032	0.042	0.048	0.0495	0.0455	0.0374	0.0281	0.0247	0.0309	0.0404
	Deviation	76	247	449	97	22	17	84	65	74	21
	Corrected										
	Percentage										
	e	3.97	4.81	5.69	6.47	7.01	7.17	6.91	6.23	5.21	4.02
FG-7	1	4.100	4.667	5.253	5.7588	6.0909	6.1588	5.9142		4.5594	3.6129
		126	446	504	37	34	2	2	5.369	27	92
	2	4.116	4.703	5.304	5.8154	6.1433	6.1979	5.9346	5.3697	4.5462	3.5919
		716	614	201	2	26	65	46	33	87	93
	3	4.145	4.731	5.329	5.8366	6.1600	6.2101	5.9416	5.3710	4.5388	3.5753
		727	497	346	65	39	02	14	66	44	71
	1	4.151	4.741	5.346	5.8651	6.2014	6.2625	6.0004	5.4291	4.5912	3.6132
		529	395	784	31	6	24	7	03	16	95
	2		4.779	5.357	5.8433	6.1469	6.1799	5.8979	5.3174	4.4807	3.5123
		4.209	247	097	83	23	1	36	58	96	32
	3	4.157	4.738	5.333	5.8401	6.1646	6.2154	5.9460	5.3720	4.5367	3.5662
		001	357	385	93	87	14	58	68	58	1
	1	4.159	4.737	5.333	5.8435	6.1715	6.2234	5.9505	5.3672	4.5182	3.5340
		309	872	647	94	65	49	02	1	54	31
	2	4.158	4.716	5.286	5.7702	6.0769	6.1197	5.8536	5.2939	4.4790	3.5354
		033	845	886	56	09	5	11	45	05	25
	3	4.142	4.706	5.282	5.7689	6.0763	6.1169	5.8466	5.2818	4.4642	3.5189
		753	862	077	26	62	85	94	56	48	91
	Average	4.15	4.72	5.31	5.82	6.14	6.19	5.92	5.35	4.52	3.56
	Standard	0.030	0.031	0.034	0.0395	0.0449	0.0484	0.0488	0.0461	0.0420	0.0389
	Deviation	288	15	35	5	94	28	16	36	52	42

Corrected Percentag e	3.90	4.44	5.00	5.47	5.77	5.82	5.57	5.03	4.25	3.35
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Table 28. Wall AB, Medium Sand to Coarse Sand Sizes.

Sa mpl e Na me	R u n	Rea ding	275.4 2287	316.22 7766	363.07 8055	416.86 9383	478.63 0092	549.54 0874	630.95 7344	724.4 3596	831.76 3771	954.99 2586
AB- 1	A	1	5.445 705	3.5596 11	1.6823 11	0.1249 01	0	0	0	0	0	0
		2	5.443 408	3.5547 67	1.6720 08	0.1234 65	0	0	0	0	0	0
		3	5.432 748	3.5439 73	1.6577 8	0.1216 42	0	0	0	0	0	0
	B	1	5.408 239	3.5165 16	1.6174 71	0.1163 57	0	0	0	0	0	0
		2	5.464 278	3.5879 26	1.7345 36	0.1320 29	0	0	0	0	0	0
		3	5.322 902	3.4317 7	1.5078 25	0.1023 94	0	0	0	0	0	0
	C	1	5.320 369	3.4502 64	1.5648 29	0.1106 7	0	0	0	0	0	0
		2	5.327 489	3.4625 11	1.5888 2	0.1139 76	0	0	0	0	0	0
		3	5.302 786	3.4413 21	1.5666 19	0.1113 11	0	0	0	0	0	0
	Average		5.39	3.51	1.62	0.12	0.00	0.00	0.00	0.00	0.00	0.00
	Standard		0.065	0.0593	0.0712	0.0089						
	Deviation		48	77	14	82	0	0	0	0	0	0
	Corrected Percentag e		4.53	2.95	1.36	0.10	0.00	0.00	0.00	0.00	0.00	0.00
AB- 2	A	1	5.493 062	3.5260 45	1.5117 15	0.0992 78	0	0	0	0	0	0
		2	5.409 096	3.4368 19	1.3871 85	0.0831 36	0	0	0	0	0	0
		3	5.451 502	3.4923 99	1.4801 05	0.0956 23	0	0	0	0	0	0
	B	1	5.735 273	3.7473 96	1.7675 97	0.1309 38	0	0	0	0	0	0
		2	5.738 515	3.7562 01	1.7878 57	0.1337 88	0	0	0	0	0	0
		3	5.765 048	3.7809 82	1.8173 9	0.1374 73	0	0	0	0	0	0
	C	1	5.346 292	3.3915 02	1.3555 24	0.0799 28	0	0	0	0	0	0
		2	5.319 202	3.3608 67	1.3100 12	0.0739 51	0	0	0	0	0	0
		3	5.334 506	3.3740 1	1.3237 96	0.0756 07	0	0	0	0	0	0
	Average		5.51	3.54	1.53	0.10	0.00	0.00	0.00	0.00	0.00	0.00
	Standard		0.185	0.1741	0.2091	0.0261						
	Deviation		711	49	71	56	0	0	0	0	0	0
	Corrected Percentag e		4.90	3.15	1.36	0.09	0.00	0.00	0.00	0.00	0.00	0.00





	2	5.032	3.3067	1.6028	0.1223						
		689	78	28	96	0	0	0	0	0	0
	3	5.068	3.3232	1.5939	0.1203						
		628	74	78	39	0	0	0	0	0	0
	Average	5.10	3.38	1.70	0.14	0.00	0.00	0.00	0.00	0.00	0.00
	Standard	0.042	0.0532	0.0992	0.0136						
	Deviation	373	9	02	28	0	0	0	0	0	0
	Corrected										
	Percentage										
	e	4.69	3.11	1.57	0.12	0.00	0.00	0.00	0.00	0.00	0.00
AB-6	1	3.679	2.2825	0.7840	0.0335						
		213	73	63	86	0	0	0	0	0	0
	2	3.716	2.3304	0.8637	0.0442						
		036	54	75	85	0	0	0	0	0	0
	3	3.753	2.3767	0.9373	0.0540						
		727	23	04	79	0	0	0	0	0	0
	1	3.781	2.3922	0.9393	0.0537						
		094	89	25	73	0	0	0	0	0	0
	2	3.846	2.4698	1.0593	0.0696						
		533	55	05	62	0	0	0	0	0	0
	3	3.836	2.4559	1.0354	0.0664						
		183	07	67	49	0	0	0	0	0	0
	1	3.808	2.4272	0.9960	0.0613						
		988	81	61	51	0	0	0	0	0	0
	2	3.745	2.3657	0.9183	0.0515						
		805	43	46	12	0	0	0	0	0	0
	3	3.734	2.3525	0.8988	0.0489						
		134	48	39	5	0	0	0	0	0	0
	Average	3.77	2.38	0.94	0.05	0.00	0.00	0.00	0.00	0.00	0.00
	Standard	0.055	0.0602	0.0856	0.0111						
	Deviation	994	21	62	61	0	0	0	0	0	0
	Corrected										
	Percentage										
	e	3.48	2.20	0.87	0.05	0.00	0.00	0.00	0.00	0.00	0.00
AB-7	1	3.719	2.3228	0.8371	0.0403						
		144	56	09	72	0	0	0	0	0	0
	2	3.770	2.3890	0.9460	0.0549						
		827	36	11	6	0	0	0	0	0	0
	3	3.794	2.4259	1.0147	0.0643						
		488	74	65	69	0	0	0	0	0	0
	1	3.545	2.1868	0.7193	0.0271						
		201	37	51	49	0	0	0	0	0	0
	2	3.615	2.2403	0.7628	0.0318						
		501	64	18	97	0	0	0	0	0	0
	3	3.582	2.2232	0.7659	0.0330						
		005	23	77	81	0	0	0	0	0	0
	1	3.713	2.3609	0.9551	0.0575						
		523	75	47	2	0	0	0	0	0	0
	2	3.705	2.3484	0.9315	0.0542						
		727	95	55	86	0	0	0	0	0	0
	3	3.687	2.3469	0.9553	0.0581						
		672	62	09	06	0	0	0	0	0	0
	Average	3.68	2.32	0.88	0.05	0.00	0.00	0.00	0.00	0.00	0.00
	Standard	0.084	0.0810	0.1065	0.0137						
	Deviation	147	28	14	47	0	0	0	0	0	0
	Corrected										
	Percentage										
	e	3.38	2.13	0.80	0.04	0.00	0.00	0.00	0.00	0.00	0.00
AB-8	1	2.285	1.4272	0.5122	0.0245						
		395	82	93	55	0	0	0	0	0	0
	2	2.366	1.5332	0.9482	0.0915						
		724	72	39	78	0	0	0	0	0	0

	3	2.330 268	1.4917 25	0.9003 99	0.0857 76	0	0	0	0	0	0
	1	2.762 827	1.8621 9	1.1847 91	0.3175 55	0.0464 32	0	0	0	0	0
	2	2.800 229	1.9027 97	1.1681 76	0.3903 45	0.0126 44	0	0	0	0	0
	3	2.966 85	2.0550 88	1.2518 29	0.1163 16	0	0	0	0	0	0
	1	2.706 377	1.8206 67	1.1531 81	0.2961 16	0.0409 51	0	0	0	0	0
	2	2.804 106	1.9252 09	1.1978 15	0.4413 36	0.0231 6	0	0	0	0	0
	3	2.837 401	1.9715 88	1.2069 63	0.7120 72	0.0959 53	0	0	0	0	0
	Average	2.65	1.78	1.06	0.28	0.02	0.00	0.00	0.00	0.00	0.00
	Standard	0.253	0.2305	0.2375	0.2212	0.0324					
	Deviation	263	53	04	5	04	0	0	0	0	0
	Corrected										
	Percentag										
	e	2.34	1.57	0.93	0.24	0.02	0.00	0.00	0.00	0.00	0.00
	1	2.602 311	1.7153 15	1.0728 39	0.2481 14	0.0290 4	0	0	0	0	0
	2	2.662 978	1.7991 83	1.0693 99	0.6071 42	0.0800 38	0	0	0	0	0
	3	2.666 379	1.8021 91	1.0897 44	0.5938 66	0.2393 11	0.0636 35	0	0	0	0
	1	2.539 941	1.6828 89	1.0593 29	0.2610 11	0.0339 34	0	0	0	0	0
	2	2.588 836	1.7429 92	1.0449 32	0.5594 52	0.2098 72	0.0531 24	0	0	0	0
	3	2.633 973	1.7966 36	1.1097 43	0.6124 4	0.2979 07	0.1191 95	0.0377 07	0	0	0
	1	2.422 762	1.5757 18	0.9653 86	0.1745 11	0.0101 43	0	0	0	0	0
	2	2.467 344	1.6054 2	0.9832 87	0.1767 03	0.0099 94	0	0	0	0	0
	3	2.419 035	1.5723 87	0.8802 81	0.4348 07	0.0512 8	0	0	0	0	0
	Average	2.56	1.70	1.03	0.41	0.11	0.03	0.00	0.00	0.00	0.00
	Standard	0.098	0.0953	0.0734	0.1919	0.1110	0.0431	0.0125			
	Deviation	463	05	58	76	03	47	69	0	0	0
	Corrected										
	Percentag										
	e	2.21	1.47	0.89	0.35	0.09	0.02	0.00	0.00	0.00	0.00
	1	2.417 962	1.5715 93	0.9681 44	0.1897 16	0.0149 69	0	0	0	0	0
	2	2.464 395	1.6013 78	0.9890 09	0.2008 61	0.0175 92	0	0	0	0	0
	3	2.543 265	1.7023 34	1.0258 88	0.5468 91	0.2514 63	0.0939 39	0.0288 47	0	0	0
	1	2.444 043	1.6004 13	0.9240 48	0.4678 22	0.1625 05	0.0394 71	0	0	0	0
	2	2.460 401	1.5829 45	0.8760 55	0.4250 08	0.0494 33	0	0	0	0	0
	3	2.472 441	1.5983 51	0.9026 94	0.4395 07	0.1391 72	0.0315 59	0	0	0	0
	1	2.459 319	1.5938 55	0.9756 61	0.1757 2	0.0100 16	0	0	0	0	0
	2	2.531 21	1.6624 61	0.9517 56	0.4650 13	0.1226 37	0.0219 53	0	0	0	0
	3	2.576 489	1.7590 51	1.0930 99	0.6191 51	0.3243 32	0.1815 43	0.1420 52	0.156 759	0.1826 35	0.1701 56

AB-11	A	1	2.225 425	1.5357 73	0.9963 7	0.6202 95	0.3799 99	0.2419 48	0.1669 51	0.121 393	0.0887 88	0.0544 43
		2	2.309 61	1.6071 95	1.0576 48	0.6733 07	0.4251 98	0.2797 1	0.1964 21	0.146 064	0.1053 0.1053	0.0669 49
		3	2.392 855	1.6854 96	1.1232 32	0.7260 18	0.4734 34	0.3389 93	0.2838 73	0.271 884	0.2684 39	0.2265 93
	B	1	2.109 831	1.3934 42	0.8428 05	0.4731 81	0.2564 61	0.1549 6	0.1245 59	0.123 81	0.1335 16	0.1096 99
		2	2.187 989	1.4714 81	0.9215 61	0.5529 01	0.3353 15	0.2285 92	0.1860 37	0.168 531	0.1555 29	0.1167 0.1167
		3	2.296 273	1.5819 83	1.0330 69	0.6634 53	0.4417 29	0.3275 13	0.2739 78	0.246 493	0.2183 98	0.1663 16
	C	1	2.243 209	1.5210 46	0.9629 3	0.5848 94	0.3597 8	0.2512 48	0.2130 74	0.206 631	0.2000 79	0.1629 38
		2	2.289 43	1.5634 59	1.0088 91	0.6406 69	0.4286 47	0.3322 22	0.3013 03	0.295 523	0.2819 41	0.2258 14
		3	2.380 43	1.6792 53	1.1414 39	0.7784 46	0.5591 59	0.4449 65	0.3899 56	0.359 455	0.3231 91	0.2480 4
	Average		2.27	1.56	1.01	0.63	0.41	0.29	0.24	0.22	0.20	0.15
	Standard		0.090	0.0937	0.0942	0.0913	0.0868	0.0833	0.0817	0.083	0.0825	0.0710
	Deviation		143	91	59	94	4	04	47	393	97	08
	Corrected											
	Percentage		2.00	1.38	0.89	0.56	0.36	0.26	0.21	0.19	0.17	0.14

Table 29. Wall DE, Medium Sand to Coarse Sand Sizes.

Sample Name	Run	Reading	275.4228 7	316.22776 6	363.07805 5	416.86938 3	478.63009 2
DE-1	A	1	5.485503	3.553031	1.6013	0.112352	0
		2	5.485015	3.557668	1.615264	0.114379	0
		3	5.431489	3.505384	1.549075	0.105992	0
	B	1	5.425958	3.513357	1.580365	0.110631	0
		2	5.341055	3.431831	1.479405	0.097907	0
		3	5.437269	3.526272	1.599823	0.113189	0
	C	1	5.218648	3.2908	1.266507	0.069851	0
		2	5.202003	3.280119	1.261804	0.069536	0
		3	5.223052	3.297904	1.279989	0.0717	0
	Average		5.36	3.44	1.47	0.10	0.00
	Standard						
	Deviation		0.117717	0.118216	0.155955	0.019977	0
	Corrected						
	Percentage		4.71	3.02	1.29	0.08	0.00
DE-2	A	1	4.881171	2.991757	0.936764	0.029603	0

	2	4.846969	2.970154	0.928167	0.029108	0
	3	4.840947	2.959553	0.907173	0.026211	0
B	1	4.903833	3.020041	0.982468	0.035703	0
	2	4.811608	2.926694	0.859029	0.019897	0
	3	4.86299	2.986254	0.949464	0.031827	0
C	1	4.947892	3.057111	1.019808	0.040135	0
	2	4.983657	3.099558	1.085533	0.048842	0
	3	4.920079	3.043533	1.024258	0.041383	0
Average Standard Deviation Corrected Percentage		4.89	3.01	0.97	0.03	0.00
		0.055246	0.053963	0.069202	0.008815	0
		4.12	2.53	0.81	0.03	0.00
DE-3	1	4.691967	2.825374	0.755518	0.007427	0
	A 2	4.703324	2.854836	0.823635	0.015324	0
	3	4.70659	2.848506	0.799844	0.012439	0
	1	5.120729	3.222625	1.223693	0.06581	0
	B 2	5.176326	3.271594	1.277264	0.072329	0
	3	5.212616	3.320044	1.359483	0.0834	0
	1	5.095372	3.207306	1.219502	0.065752	0
	C 2	5.101651	3.202118	1.194886	0.062063	0
	3	5.14178	3.253644	1.279824	0.073446	0
	Average	4.99	3.11	1.10	0.05	0.00
	Standard					
	Deviation	0.22336	0.204931	0.238403	0.030054	0
	Corrected					
	Percentage	4.80	2.99	1.06	0.05	0.00
DE-4	1	4.476128	2.710286	0.764085	0.012241	0
	A 2	4.483225	2.725743	0.797984	0.016146	0
	3	4.44235	2.675481	0.716179	0.007142	0
	1	4.652478	2.87475	0.958756	0.037733	0
	B 2	4.635381	2.858386	0.938619	0.035198	0
	3	4.688251	2.926723	1.051921	0.050393	0
	1	4.768245	3.004898	1.15103	0.062954	0
	C 2	4.719307	2.96034	1.099707	0.056614	0
	3	4.692464	2.93755	1.076353	0.053827	0
	Average	4.62	2.85	0.95	0.04	0.00
	Standard					
	Deviation	0.119347	0.120288	0.158795	0.020809	0
	Corrected					
	Percentage	4.48	2.77	0.92	0.04	0.00
DE-5	1	3.628602	2.163696	0.518791	0	0
	A 2	3.550367	2.089824	0.418181	0	0
	3	3.602206	2.151155	0.525492	0	0
	1	3.725029	2.252476	0.626168	0.009053	0
	B 2	3.642098	2.162851	0.491581	0	0

	C	3	3.644261	2.169547	0.509653	0	0
		1	3.583933	2.120381	0.457546	0	0
		2	3.579064	2.128486	0.49294	0	0
		3	3.593408	2.132744	0.481045	0	0
	Average		3.62	2.15	0.50	0.00	0.00
	Standard						
	Deviation		0.051142	0.045341	0.056943	0.003018	0
	Corrected						
	Percentage		3.48	2.07	0.48	0.00	0.00
DE-6	A	1	3.410512	2.045869	0.106433	0	0
		2	3.419559	2.039874	0.105765	0	0
		3	3.410998	2.017996	0.202031	0	0
	B	1	3.725651	2.262752	0.655208	0.012495	0
		2	3.72716	2.257234	0.636625	0.01026	0
		3	3.621422	2.149237	0.484133	0	0
	C	1	3.630729	2.167145	0.526056	0	0
		2	3.583142	2.120765	0.460118	0	0
		3	3.64543	2.169687	0.507929	0	0
	Average		3.57	2.14	0.41	0.00	0.00
	Standard						
	Deviation		0.129543	0.089833	0.215207	0.005048	0
	Corrected						
	Percentage		3.49	2.09	0.40	0.00	0.00
DE-7	A	1	2.362923	1.437433	0.420959	0.008599	0
		2	2.440248	1.491175	0.455348	0.011309	0
		3	2.233524	1.338784	0.180257	0.006733	0
	B	1	2.475419	1.57746	0.645072	0.039609	0
		2	2.366983	1.478787	0.532164	0.02566	0
		3	2.393608	1.536032	0.93037	0.088766	0
	C	1	2.44978	1.543238	0.587188	0.031811	0
		2	2.438551	1.602302	0.987251	0.189425	0.014013
		3	2.518346	1.626963	0.719763	0.049455	0
	Average		2.41	1.51	0.61	0.05	0.00
	Standard						
	Deviation		0.082763	0.089614	0.252248	0.058156	0.004671
	Corrected						
	Percentage		2.26	1.42	0.57	0.05	0.00
DE-8	A	1	2.491071	1.510081	0.429163	0.007306	0
		2	2.594216	1.601173	0.528371	0.020173	0
		3	2.546668	1.574834	0.527137	0.021027	0
	B	1	2.590653	1.670043	1.016722	0.09725	0
		2	2.638858	1.678737	0.680962	0.041214	0
		3	2.708888	1.815917	0.962922	0.080417	0
	C	1	2.663631	1.701064	0.706154	0.044313	0
		2	2.768813	1.872986	1.032582	0.089173	0
		3	2.646566	1.678654	0.668664	0.039273	0

Average	2.63	1.68	0.73	0.05	0.00
Standard					
Deviation	0.083668	0.113125	0.225563	0.032515	0
Corrected					
Percentage	2.45	1.56	0.68	0.05	0.00

Table 30. Wall FG, Medium Sand to Coarse Sand Sizes.

Sample Name	Run	Reading	275.42287	316.227766	363.078055	416.869383
FG-1	A	1	4.522848	2.768634	0.857745	0.025957
		2	4.483745	2.746502	0.855342	0.02646
		3	4.456201	2.734104	0.86273	0.028127
	B	1	4.319485	2.590782	0.668382	0
		2	4.3045	2.577537	0.65215	0
		3	4.32165	2.591341	0.666438	0
	C	1	4.372752	2.652189	0.759631	0.013526
		2	4.391981	2.669099	0.778348	0.015413
		3	4.361259	2.651373	0.775529	0.015621
	Average		4.39	2.66	0.76	0.01
	Standard Deviation		0.07813	0.071682	0.085446	0.011676
	Corrected Percentage		4.04	2.45	0.70	0.01
FG-2	A	1	4.093843	2.463732	0.654585	0.005938
		2	4.116671	2.499733	0.723438	0.013722
		3	4.098985	2.475499	0.680813	0.008966
	B	1	4.097206	2.489798	0.725305	0.014291
		2	4.091603	2.463416	0.657014	0.006272
		3	4.049794	2.43043	0.63075	0
	C	1	4.235847	2.605535	0.838859	0.029452
		2	4.187343	2.567212	0.804753	0.025586
		3	4.163611	2.565245	0.836138	0.030629
	Average		4.13	2.51	0.73	0.01
	Standard Deviation		0.058003	0.058845	0.080635	0.011108
	Corrected Percentage		3.88	2.36	0.68	0.01
FG-3	A	1	4.153791	2.458937	0.535623	0
		2	4.229725	2.549126	0.686628	0.007368
		3	4.15808	2.474601	0.579284	0
	B	1	4.233386	2.544117	0.671004	0
		2	4.152609	2.475486	0.592004	0
		3	4.169015	2.479885	0.576855	0
	C	1	4.117776	2.43909	0.535826	0

	2	4.104264	2.426798	0.519867	0
	3	4.159683	2.482167	0.601208	0
	Average	4.16	2.48	0.59	0.00
	Standard				
	Deviation	0.043519	0.041653	0.058214	0.002456
	Corrected				
	Percentage	3.98	2.37	0.56	0.00
FG-4	1	3.774835	2.236681	0.493073	0
	A 2	3.7792	2.237365	0.48737	0
	3	3.808565	2.28161	0.579226	0
	1	3.723466	2.231504	0.298422	0.01376
	B 2	3.83432	2.287222	0.551274	0
	3	3.772156	2.225117	0.460031	0
	1	3.832587	2.278488	0.525617	0
	C 2	3.773947	2.220989	0.44336	0
	3	3.837263	2.281083	0.525857	0
	Average	3.79	2.25	0.48	0.00
	Standard				
	Deviation	0.038126	0.027843	0.082028	0.004587
	Corrected				
	Percentage	3.61	2.15	0.46	0.00
FG-5	1	3.207164	1.912826	0.459753	0
	A 2	3.163752	1.879177	0.427824	0
	3	3.155378	1.877533	0.437736	0
	1	3.232335	1.931729	0.476143	0
	B 2	3.236312	1.937038	0.486265	0
	3	3.297318	1.991664	0.547835	0.00725
	1	3.224263	1.943568	0.523947	0.005695
	C 2	3.2387	1.974852	0.59246	0.013585
	3	3.230107	1.942389	0.515285	0
	Average	3.22	1.93	0.50	0.00
	Standard				
	Deviation	0.042379	0.038385	0.053606	0.004891
	Corrected				
	Percentage	3.10	1.86	0.48	0.00
FG-6	1	2.878494	1.711539	0.197399	0
	A 2	2.873211	1.709435	0.200438	0
	3	2.951754	1.795377	0.304711	0.025674
	1	2.911985	1.753989	0.255665	0.015591
	B 2	2.83673	1.69868	0.088265	0
	3	2.836594	1.705215	0.088808	0
	1	2.834493	1.667249	0.085682	0
	C 2	2.852418	1.72115	0.08983	0
	3	2.790452	1.640278	0.084247	0
	Average	2.86	1.71	0.16	0.00

FG-7	Standard Deviation Corrected Percentage		0.047692	0.044962	0.086097	0.009441
			2.79	1.67	0.15	0.00
	A	1	2.663105	1.724808	0.773502	0.054082
		2	2.60039	1.680849	1.042979	0.101024
		3	2.607406	1.656313	0.664441	0.039552
	B	1	2.589341	1.591501	0.508112	0.017361
		2	2.503751	1.523083	0.446925	0.009195
		3	2.553441	1.566845	0.493563	0.01604
	C	1	2.511616	1.518736	0.421491	0.006036
		2	2.587594	1.65465	0.6907	0.043767
		3	2.537601	1.629423	0.990647	0.094757
	Average Standard Deviation Corrected Percentage		2.57	1.62	0.67	0.04
			0.050906	0.07111	0.229662	0.035481
			2.42	1.52	0.63	0.04



Table 31. GRADISTAT (Blott and Pye 2001) Results for AB-1, AB-2, and AB-3.

		AB-1	AB-2	AB-3
Sample Type		Unimodal, Poorly Sorted	Unimodal, Moderately Sorted	Unimodal, Moderately Sorted
Textural Group		Muddy Sand	Sand	Muddy Sand
Sediment Name		Coarse Silty Fine Sand	Moderately Sorted Fine Sand	Coarse Silty Fine Sand
Method of Moments [Arithmetic ( $\mu\text{m}$ )]	Mean	160.6	164.6	163.5
	Sorting	87.34	84.34	85.30
	Skewness	0.381	0.390	0.391
	Kurtosis	2.860	2.948	2.922
Method of Moments [Geometric ( $\mu\text{m}$ )]	Mean	124.3	132.2	130.0
	Sorting	2.492	2.311	2.363
	Skewness	-2.215	-2.417	-2.373
	Kurtosis	9.290	10.99	10.62
Method of Moments [Logarithmic ( $\phi$ )]	Mean	3.008	2.919	2.944
	Sorting	1.317	1.209	1.240
	Skewness	2.215	2.417	2.373
	Kurtosis	9.290	10.99	10.62
Folk and Ward Method ( $\mu\text{m}$ )	Mean	143.1	149.7	147.8
	Sorting	2.070	1.951	1.981
	Skewness	-0.324	-0.287	-0.296
	Kurtosis	1.568	1.548	1.551
Folk and Ward Method ( $\phi$ )	Mean	2.804	2.740	2.758
	Sorting	1.049	0.964	0.987
	Skewness	0.324	0.287	0.296
	Kurtosis	1.568	1.548	1.551
Folk and Ward Method (Description)	Mean	Fine Sand	Fine Sand	Fine Sand
	Sorting	Poorly Sorted	Moderately Sorted	Moderately Sorted
	Skewness	Very Fine Skewed	Fine Skewed	Fine Skewed
	Kurtosis	Very Leptokurtic	Very Leptokurtic	Very Leptokurtic
Mode ( $\mu\text{m}$ )		170.2	170.2	170.2
Mode ( $\phi$ )		2.558	2.558	2.558
D <sub>10</sub> ( $\mu\text{m}$ )		40.94	63.83	58.38
D <sub>50</sub> ( $\mu\text{m}$ )		152.5	155.7	154.8
D <sub>90</sub> ( $\mu\text{m}$ )		279.9	280.2	280.3
(D <sub>90</sub> / D <sub>10</sub> ) ( $\mu\text{m}$ )		6.837	4.389	4.801
(D <sub>90</sub> - D <sub>10</sub> ) ( $\mu\text{m}$ )		239.0	216.3	221.9
(D <sub>75</sub> / D <sub>25</sub> ) ( $\mu\text{m}$ )		2.118	2.020	2.046
(D <sub>75</sub> - D <sub>25</sub> ) ( $\mu\text{m}$ )		113.5	109.4	110.5
D <sub>10</sub> ( $\phi$ )		1.837	1.836	1.835
D <sub>50</sub> ( $\phi$ )		2.713	2.683	2.692
D <sub>90</sub> ( $\phi$ )		4.610	3.970	4.098
(D <sub>90</sub> / D <sub>10</sub> ) ( $\phi$ )		2.510	2.162	2.234
(D <sub>90</sub> - D <sub>10</sub> ) ( $\phi$ )		2.773	2.134	2.263
(D <sub>75</sub> / D <sub>25</sub> ) ( $\phi$ )		1.488	1.460	1.467
(D <sub>75</sub> - D <sub>25</sub> ) ( $\phi$ )		1.083	1.015	1.033
Total Sand		87.3%	90.2%	89.4%

Total Mud (Silt & Clay)	12.7%	9.8%	10.6%
Very Coarse Sand	0.0%	0.0%	0.0%
Coarse Sand	0.0%	0.0%	0.0%
Medium Sand	15.7%	15.9%	15.9%
Fine Sand	48.0%	50.0%	49.3%
Very Fine Sand	23.6%	24.3%	24.2%
Very Coarse Silt	4.2%	3.0%	3.5%
Coarse Silt	4.2%	3.3%	3.6%
Medium Silt	1.9%	1.4%	1.5%
Fine Silt	1.1%	0.9%	0.9%
Very Fine Silt	0.7%	0.6%	0.6%
Clay	0.6%	0.5%	0.5%

Table 32. GRADISTAT (Blott and Pye 2001) Results for AB-4, AB-5, and AB-6.

		AB-4	AB-5	AB-6
Sample Type		Unimodal, Poorly Sorted	Unimodal, Poorly Sorted	Unimodal, Poorly Sorted
Textural Group		Muddy Sand	Muddy Sand	Muddy Sand
Sediment Name		Very Coarse Silty Fine Sand	Very Coarse Silty Fine Sand	Very Coarse Silty Fine Sand
Method of Moments [Arithmetic ( $\mu\text{m}$ )]	Mean	155.5	156.2	130.2
	Sorting	87.66	88.48	88.87
	Skewness	0.424	0.454	0.614
	Kurtosis	2.859	2.875	2.853
Method of Moments [Geometric ( $\mu\text{m}$ )]	Mean	118.1	119.2	87.63
	Sorting	2.584	2.533	3.090
	Skewness	-2.163	-2.090	-1.634
	Kurtosis	8.991	8.678	6.023
Method of Moments [Logarithmic ( $\phi$ )]	Mean	3.082	3.068	3.512
	Sorting	1.369	1.341	1.628
	Skewness	2.163	2.090	1.634
	Kurtosis	8.991	8.678	6.023
Folk and Ward Method ( $\mu\text{m}$ )	Mean	135.8	136.0	95.71
	Sorting	2.137	2.132	2.778
	Skewness	-0.337	-0.327	-0.425
	Kurtosis	1.531	1.495	1.268
Folk and Ward Method ( $\phi$ )	Mean	2.880	2.879	3.385
	Sorting	1.096	1.092	1.474
	Skewness	0.337	0.327	0.425
	Kurtosis	1.531	1.495	1.268
Folk and Ward Method (Description)	Mean	Fine Sand	Fine Sand	Very Fine Sand
	Sorting	Poorly Sorted	Poorly Sorted	Poorly Sorted
	Skewness	Very Fine Skewed	Very Fine Skewed	Very Fine Skewed
	Kurtosis	Very Leptokurtic	Leptokurtic	Leptokurtic
Mode ( $\mu\text{m}$ )		170.2	170.2	148.3
Mode ( $\phi$ )		2.558	2.558	2.757
D <sub>10</sub> ( $\mu\text{m}$ )		35.48	37.27	19.72
D <sub>50</sub> ( $\mu\text{m}$ )		147.1	147.0	119.9
D <sub>90</sub> ( $\mu\text{m}$ )		275.2	277.8	255.2
(D <sub>90</sub> / D <sub>10</sub> ) ( $\mu\text{m}$ )		7.756	7.453	12.94
(D <sub>90</sub> - D <sub>10</sub> ) ( $\mu\text{m}$ )		239.7	240.5	235.5
(D <sub>75</sub> / D <sub>25</sub> ) ( $\mu\text{m}$ )		2.202	2.224	3.202
(D <sub>75</sub> - D <sub>25</sub> ) ( $\mu\text{m}$ )		114.5	115.9	128.0

D <sub>10</sub> (φ)	1.862	1.848	1.970
D <sub>50</sub> (φ)	2.765	2.766	3.060
D <sub>90</sub> (φ)	4.817	4.746	5.664
(D <sub>90</sub> / D <sub>10</sub> ) (φ)	2.587	2.568	2.875
(D <sub>90</sub> - D <sub>10</sub> ) (φ)	2.955	2.898	3.694
(D <sub>75</sub> / D <sub>25</sub> ) (φ)	1.505	1.513	1.692
(D <sub>75</sub> - D <sub>25</sub> ) (φ)	1.139	1.153	1.679
Total Sand	85.6%	85.7%	73.5%
Total Mud (Silt & Clay)	14.4%	14.3%	26.5%
Very Coarse Sand	0.0%	0.0%	0.0%
Coarse Sand	0.0%	0.0%	0.0%
Medium Sand	14.8%	15.1%	10.8%
Fine Sand	46.1%	45.6%	37.0%
Very Fine Sand	24.8%	25.0%	25.8%
Very Coarse Silt	5.2%	5.5%	11.2%
Coarse Silt	4.4%	4.3%	7.1%
Medium Silt	2.0%	2.0%	3.3%
Fine Silt	1.2%	1.2%	2.1%
Very Fine Silt	0.8%	0.7%	1.3%
Clay	0.8%	0.6%	1.4%

Table 33. GRADISTAT (Blott and Pye 2001) Results for AB-7, AB-8, and AB-9.

		<b>AB-7</b>	<b>AB-8</b>	<b>AB-9</b>
Sample Type		Unimodal,	Unimodal,	Unimodal,
Textural Group		Poorly Sorted	Poorly Sorted	Poorly Sorted
Sediment Name		Muddy Sand	Muddy Sand	Muddy Sand
		Very Coarse Silty Fine Sand	Very Coarse Silty Fine Sand	Very Coarse Silty Very Fine Sand
Method of Moments [Arithmetic (μm)]	Mean	129.1	106.6	111.7
	Sorting	88.11	90.27	89.45
	Skewness	0.633	1.065	1.150
	Kurtosis	2.879	3.788	4.430
Method of Moments [Geometric (μm)]	Mean	87.59	62.14	69.57
	Sorting	3.035	3.594	3.347
	Skewness	-1.632	-1.159	-1.364
	Kurtosis	6.129	4.185	5.018
Method of Moments [Logarithmic (φ)]	Mean	3.513	4.008	3.845
	Sorting	1.602	1.846	1.743
	Skewness	1.632	1.159	1.364
	Kurtosis	6.129	4.185	5.018
Folk and Ward Method (μm)	Mean	95.62	68.02	76.88
	Sorting	2.721	3.390	3.079
	Skewness	-0.408	-0.352	-0.352
	Kurtosis	1.235	1.086	1.230
Folk and Ward Method (φ)	Mean	3.387	3.878	3.701
	Sorting	1.444	1.761	1.623
	Skewness	0.408	0.352	0.352
	Kurtosis	1.235	1.086	1.230

Folk and Ward Method (Description)	Mean Sorting Skewness Kurtosis	Very Fine Sand Poorly Sorted Very Fine Skewed Leptokurtic	Very Fine Sand Poorly Sorted Very Fine Skewed Mesokurtic	Very Fine Sand Poorly Sorted Very Fine Skewed Leptokurtic
Mode ( $\mu\text{m}$ )		148.3	148.3	129.1
Mode ( $\phi$ )		2.757	2.757	2.957
D <sub>10</sub> ( $\mu\text{m}$ )		20.55	10.45	13.81
D <sub>50</sub> ( $\mu\text{m}$ )		118.3	85.10	92.63
D <sub>90</sub> ( $\mu\text{m}$ )		253.3	235.2	235.1
(D <sub>90</sub> / D <sub>10</sub> ) ( $\mu\text{m}$ )		12.33	22.50	17.02
(D <sub>90</sub> - D <sub>10</sub> ) ( $\mu\text{m}$ )		232.7	224.7	221.2
(D <sub>75</sub> / D <sub>25</sub> ) ( $\mu\text{m}$ )		3.202	4.838	3.795
(D <sub>75</sub> - D <sub>25</sub> ) ( $\mu\text{m}$ )		126.8	124.9	117.1
D <sub>10</sub> ( $\phi$ )		1.981	2.088	2.089
D <sub>50</sub> ( $\phi$ )		3.080	3.555	3.432
D <sub>90</sub> ( $\phi$ )		5.605	6.580	6.178
(D <sub>90</sub> / D <sub>10</sub> ) ( $\phi$ )		2.829	3.151	2.957
(D <sub>90</sub> - D <sub>10</sub> ) ( $\phi$ )		3.624	4.492	4.089
(D <sub>75</sub> / D <sub>25</sub> ) ( $\phi$ )		1.688	1.853	1.725
(D <sub>75</sub> - D <sub>25</sub> ) ( $\phi$ )		1.679	2.275	1.924
Total Sand		73.2%	59.7%	64.6%
Total Mud (Silt & Clay)		26.8%	40.3%	35.4%
Very Coarse Sand		0.0%	0.0%	0.0%
Coarse Sand		0.0%	0.0%	0.1%
Medium Sand		10.5%	8.3%	8.2%
Fine Sand		36.6%	26.6%	28.0%
Very Fine Sand		26.2%	24.8%	28.3%
Very Coarse Silt		11.8%	16.1%	16.0%
Coarse Silt		7.2%	10.5%	8.5%
Medium Silt		3.2%	5.8%	4.3%
Fine Silt		1.9%	3.5%	2.8%
Very Fine Silt		1.3%	2.1%	1.9%
Clay		1.4%	2.4%	2.1%

Table 34. GRADISTAT (Blott and Pye 2001) Results for AB-10, AB-11, and DE-1.

		<b>AB-10</b>	<b>AB-11</b>	<b>DE-1</b>
Sample Type		Unimodal, Poorly Sorted	Unimodal, Poorly Sorted	Unimodal, Poorly Sorted
Textural Group		Muddy Sand	Muddy Sand	Muddy Sand
Sediment Name		Very Coarse Silty Very Fine Sand	Very Coarse Silty Very Fine Sand	Coarse Silty Fine Sand
Method of Moments [Arithmetic ( $\mu\text{m}$ )]	Mean	112.2	118.0	160.2
	Sorting	90.16	108.0	87.11
	Skewness	1.341	2.487	0.326
	Kurtosis	6.197	13.47	2.862
Method of Moments [Geometric ( $\mu\text{m}$ )]	Mean	70.08	73.57	120.8
	Sorting	3.349	3.237	2.700
	Skewness	-1.397	-1.345	-2.326
	Kurtosis	5.115	5.434	9.292

Method of Moments [Logarithmic ( $\phi$ )]	Mean	3.833	3.749	3.049
	Sorting	1.743	1.684	1.433
	Skewness	1.393	1.305	2.326
	Kurtosis	5.112	5.382	9.292
Folk and Ward Method ( $\mu\text{m}$ )	Mean	77.84	81.50	144.4
	Sorting	3.065	2.893	2.145
	Skewness	-0.359	-0.291	-0.346
	Kurtosis	1.268	1.294	1.767
Folk and Ward Method ( $\phi$ )	Mean	3.683	3.617	2.792
	Sorting	1.616	1.532	1.101
	Skewness	0.359	0.291	0.346
	Kurtosis	1.268	1.294	1.767
Folk and Ward Method (Description)	Mean	Very Fine Sand	Very Fine Sand	Fine Sand
	Sorting	Poorly Sorted	Poorly Sorted	Poorly Sorted
	Skewness	Very Fine Skewed	Fine Skewed	Very Fine Skewed
	Kurtosis	Leptokurtic	Leptokurtic	Leptokurtic
Mode ( $\mu\text{m}$ )		129.1	112.5	170.2
Mode ( $\phi$ )		2.957	3.156	2.558
D <sub>10</sub> ( $\mu\text{m}$ )		14.01	17.10	34.82
D <sub>50</sub> ( $\mu\text{m}$ )		93.65	92.99	153.0
D <sub>90</sub> ( $\mu\text{m}$ )		233.8	240.9	278.0
(D <sub>90</sub> / D <sub>10</sub> ) ( $\mu\text{m}$ )		16.69	14.09	7.985
(D <sub>90</sub> - D <sub>10</sub> ) ( $\mu\text{m}$ )		219.8	223.8	243.2
(D <sub>75</sub> / D <sub>25</sub> ) ( $\mu\text{m}$ )		3.680	3.394	2.083
(D <sub>75</sub> - D <sub>25</sub> ) ( $\mu\text{m}$ )		115.6	111.2	111.4
D <sub>10</sub> ( $\phi$ )		2.097	2.053	1.847
D <sub>50</sub> ( $\phi$ )		3.417	3.427	2.709
D <sub>90</sub> ( $\phi$ )		6.158	5.870	4.844
(D <sub>90</sub> / D <sub>10</sub> ) ( $\phi$ )		2.937	2.858	2.623
(D <sub>90</sub> - D <sub>10</sub> ) ( $\phi$ )		4.061	3.816	2.997
(D <sub>75</sub> / D <sub>25</sub> ) ( $\phi$ )		1.708	1.662	1.476
(D <sub>75</sub> - D <sub>25</sub> ) ( $\phi$ )		1.880	1.763	1.058
Total Sand		65.3%	66.2%	87.6%
Total Mud (Silt & Clay)		34.7%	33.8%	12.4%
Very Coarse Sand		0.0%	0.0%	0.0%
Coarse Sand		0.2%	1.4%	0.0%
Medium Sand		7.9%	7.8%	15.5%
Fine Sand		28.3%	26.7%	48.7%
Very Fine Sand		28.8%	30.3%	23.4%
Very Coarse Silt		15.8%	16.9%	2.9%
Coarse Silt		8.1%	7.6%	3.9%
Medium Silt		4.0%	3.6%	2.1%
Fine Silt		2.8%	2.4%	1.5%
Very Fine Silt		1.9%	1.6%	1.1%
Clay		2.1%	1.7%	0.9%

Table 35. GRADISTAT (Blott and Pye 2001) Results for DE-2, DE-3, and DE-4.

DE-2	DE-3	DE-4
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Sample Type		Unimodal, Poorly Sorted Muddy Sand	Unimodal, Poorly Sorted Muddy Sand	Unimodal, Poorly Sorted Muddy Sand
Textural Group		Coarse Silty Fine Sand	Coarse Silty Fine Sand	Coarse Silty Fine Sand
Sediment Name				
Method of Moments [Arithmetic ( $\mu\text{m}$ )]	Mean	153.7	155.2	148.1
	Sorting	85.00	85.87	86.76
	Skewness	0.333	0.318	0.356
	Kurtosis	2.818	2.844	2.777
Method of Moments [Geometric ( $\mu\text{m}$ )]	Mean	115.5	114.8	105.8
	Sorting	2.690	2.815	2.975
	Skewness	-2.231	-2.270	-2.076
	Kurtosis	8.856	8.719	7.607
Method of Moments [Logarithmic ( $\phi$ )]	Mean	3.114	3.122	3.241
	Sorting	1.428	1.493	1.573
	Skewness	2.231	2.270	2.076
	Kurtosis	8.856	8.719	7.607
Folk and Ward Method ( $\mu\text{m}$ )	Mean	136.4	138.7	126.2
	Sorting	2.164	2.231	2.419
	Skewness	-0.357	-0.368	-0.414
	Kurtosis	1.692	1.849	1.815
Folk and Ward Method ( $\phi$ )	Mean	2.874	2.850	2.986
	Sorting	1.114	1.158	1.275
	Skewness	0.357	0.368	0.414
	Kurtosis	1.692	1.849	1.815
Folk and Ward Method (Description)	Mean	Fine Sand	Fine Sand	Fine Sand
	Sorting	Poorly Sorted	Poorly Sorted	Poorly Sorted
	Skewness	Very Fine Skewed	Very Fine Skewed	Very Fine Skewed
	Kurtosis	Very Leptokurtic	Very Leptokurtic	Very Leptokurtic
Mode ( $\mu\text{m}$ )		170.2	170.2	170.2
Mode ( $\phi$ )		2.558	2.558	2.558
D <sub>10</sub> ( $\mu\text{m}$ )		31.13	29.06	23.37
D <sub>50</sub> ( $\mu\text{m}$ )		146.9	148.4	141.7
D <sub>90</sub> ( $\mu\text{m}$ )		269.3	271.4	266.4
(D <sub>90</sub> / D <sub>10</sub> ) ( $\mu\text{m}$ )		8.651	9.339	11.40
(D <sub>90</sub> - D <sub>10</sub> ) ( $\mu\text{m}$ )		238.2	242.3	243.1
(D <sub>75</sub> / D <sub>25</sub> ) ( $\mu\text{m}$ )		2.130	2.109	2.246
(D <sub>75</sub> - D <sub>25</sub> ) ( $\mu\text{m}$ )		109.7	109.6	112.4
D <sub>10</sub> ( $\phi$ )		1.893	1.882	1.908
D <sub>50</sub> ( $\phi$ )		2.767	2.752	2.819
D <sub>90</sub> ( $\phi$ )		5.005	5.105	5.419
(D <sub>90</sub> / D <sub>10</sub> ) ( $\phi$ )		2.645	2.713	2.840
(D <sub>90</sub> - D <sub>10</sub> ) ( $\phi$ )		3.113	3.223	3.511
(D <sub>75</sub> / D <sub>25</sub> ) ( $\phi$ )		1.480	1.476	1.507
(D <sub>75</sub> - D <sub>25</sub> ) ( $\phi$ )		1.091	1.076	1.167
Total Sand		86.1%	86.7%	83.5%
Total Mud (Silt & Clay)		13.9%	13.3%	16.5%
Very Coarse Sand		0.0%	0.0%	0.0%
Coarse Sand		0.0%	0.0%	0.0%
Medium Sand		13.7%	14.1%	13.0%

Fine Sand	47.6%	47.9%	45.4%
Very Fine Sand	24.9%	24.6%	25.2%
Very Coarse Silt	3.8%	3.0%	4.5%
Coarse Silt	4.4%	3.9%	4.6%
Medium Silt	2.3%	2.3%	2.6%
Fine Silt	1.5%	1.7%	2.0%
Very Fine Silt	1.0%	1.3%	1.5%
Clay	0.9%	1.1%	1.3%

Table 36. GRADISTAT (Blott and Pye 2001) Results for DE-5, DE-6, and DE-7.

		DE-5	DE-6	DE-7
Sample Type		Unimodal, Poorly Sorted	Unimodal, Poorly Sorted	Unimodal, Poorly Sorted
Textural Group		Muddy Sand	Muddy Sand	Muddy Sand
Sediment Name		Very Coarse Silty Fine Sand	Very Coarse Silty Fine Sand	Very Coarse Silty Fine Sand
Method of Moments [Arithmetic ( $\mu\text{m}$ )]	Mean	129.0	129.0	99.54
	Sorting	86.37	85.51	86.45
	Skewness	0.502	0.498	0.979
	Kurtosis	2.715	2.715	3.457
Method of Moments [Geometric ( $\mu\text{m}$ )]	Mean	84.53	85.41	53.54
	Sorting	3.326	3.279	4.042
	Skewness	-1.694	-1.735	-1.074
	Kurtosis	5.803	6.022	3.560
Method of Moments [Logarithmic ( $\phi$ )]	Mean	3.564	3.549	4.223
	Sorting	1.734	1.713	2.015
	Skewness	1.694	1.735	1.074
	Kurtosis	5.803	6.022	3.560
Folk and Ward Method ( $\mu\text{m}$ )	Mean	92.76	94.19	57.66
	Sorting	2.998	2.938	3.916
	Skewness	-0.488	-0.481	-0.415
	Kurtosis	1.490	1.508	1.071
Folk and Ward Method ( $\phi$ )	Mean	3.430	3.408	4.116
	Sorting	1.584	1.555	1.969
	Skewness	0.488	0.481	0.415
	Kurtosis	1.490	1.508	1.071
Folk and Ward Method (Description)	Mean	Very Fine Sand	Very Fine Sand	Very Coarse Silt
	Sorting	Poorly Sorted	Poorly Sorted	Poorly Sorted
	Skewness	Very Fine Skewed	Very Fine Skewed	Very Fine Skewed
	Kurtosis	Leptokurtic	Leptokurtic	Mesokurtic
Mode ( $\mu\text{m}$ )		148.3	148.3	148.3
Mode ( $\phi$ )		2.757	2.757	2.757
D <sub>10</sub> ( $\mu\text{m}$ )		15.87	16.87	6.221
D <sub>50</sub> ( $\mu\text{m}$ )		121.6	121.6	79.92
D <sub>90</sub> ( $\mu\text{m}$ )		249.1	247.9	224.2
(D <sub>90</sub> / D <sub>10</sub> ) ( $\mu\text{m}$ )		15.70	14.69	36.04
(D <sub>90</sub> - D <sub>10</sub> ) ( $\mu\text{m}$ )		233.2	231.1	218.0

(D <sub>75</sub> / D <sub>25</sub> ) (μm)	2.992	2.920	5.745
(D <sub>75</sub> - D <sub>25</sub> ) (μm)	122.6	120.6	124.4
D <sub>10</sub> (φ)	2.005	2.012	2.157
D <sub>50</sub> (φ)	3.040	3.040	3.645
D <sub>90</sub> (φ)	5.978	5.889	7.329
(D <sub>90</sub> / D <sub>10</sub> ) (φ)	2.981	2.927	3.398
(D <sub>90</sub> - D <sub>10</sub> ) (φ)	3.973	3.877	5.172
(D <sub>75</sub> / D <sub>25</sub> ) (φ)	1.648	1.632	1.924
(D <sub>75</sub> - D <sub>25</sub> ) (φ)	1.581	1.546	2.522
Total Sand	74.7%	75.1%	57.2%
Total Mud (Silt & Clay)	25.3%	24.9%	42.8%
Very Coarse Sand	0.0%	0.0%	0.0%
Coarse Sand	0.0%	0.0%	0.0%
Medium Sand	9.9%	9.7%	6.9%
Fine Sand	38.5%	38.7%	26.0%
Very Fine Sand	26.3%	26.8%	24.2%
Very Coarse Silt	8.9%	9.1%	14.9%
Coarse Silt	6.5%	6.4%	9.8%
Medium Silt	3.5%	3.3%	6.4%
Fine Silt	2.6%	2.4%	4.9%
Very Fine Silt	1.9%	1.9%	3.4%
Clay	1.9%	1.9%	3.4%

Table 37. GRADISTAT (Blott and Pye 2001) Results for DE-8, FG-1, and FG-2.

		DE-8	FG-1	FG-2
Sample Type		Unimodal,	Unimodal,	Unimodal,
		Poorly Sorted	Poorly Sorted	Poorly Sorted
Textural Group		Muddy Sand	Muddy Sand	Muddy Sand
Sediment Name		Very Coarse	Coarse Silty	Very Coarse
		Silty Fine Sand	Fine Sand	Silty Fine Sand
Method of Moments [Arithmetic (μm)]	Mean	102.9	143.4	137.6
	Sorting	88.47	87.11	88.25
	Skewness	0.929	0.348	0.396
	Kurtosis	3.310	2.700	2.670
Method of Moments [Geometric (μm)]	Mean	55.27	98.78	90.71
	Sorting	4.074	3.160	3.361
	Skewness	-1.085	-1.937	-1.768
	Kurtosis	3.555	6.734	5.881
Method of Moments [Logarithmic (φ)]	Mean	4.177	3.340	3.463
	Sorting	2.026	1.660	1.749
	Skewness	1.085	1.937	1.768
	Kurtosis	3.555	6.734	5.881
Folk and Ward Method (μm)	Mean	59.46	113.3	98.49
	Sorting	3.941	2.681	3.005
	Skewness	-0.430	-0.478	-0.520
	Kurtosis	1.063	1.821	1.717
Folk and Ward Method (φ)	Mean	4.072	3.142	3.344
	Sorting	1.979	1.423	1.588
	Skewness	0.430	0.478	0.520



Folk and Ward Method (Description)	Kurtosis	1.063	1.821	1.717
	Mean	Very Coarse Silt	Very Fine Sand	Very Fine Sand
	Sorting	Poorly Sorted	Poorly Sorted	Poorly Sorted
	Skewness	Very Fine Skewed	Very Fine Skewed	Very Fine Skewed
	Kurtosis	Mesokurtic	Very Leptokurtic	Very Leptokurtic
Mode ( $\mu\text{m}$ )		148.3	170.2	170.2
Mode ( $\phi$ )		2.757	2.558	2.558
D <sub>10</sub> ( $\mu\text{m}$ )		6.278	18.66	14.82
D <sub>50</sub> ( $\mu\text{m}$ )		83.93	138.0	131.9
D <sub>90</sub> ( $\mu\text{m}$ )		230.4	262.4	258.7
(D <sub>90</sub> / D <sub>10</sub> ) ( $\mu\text{m}$ )		36.70	14.06	17.45
(D <sub>90</sub> - D <sub>10</sub> ) ( $\mu\text{m}$ )		224.1	243.7	243.9
(D <sub>75</sub> / D <sub>25</sub> ) ( $\mu\text{m}$ )		5.832	2.365	2.611
(D <sub>75</sub> - D <sub>25</sub> ) ( $\mu\text{m}$ )		129.4	114.8	119.8
D <sub>10</sub> ( $\phi$ )		2.118	1.930	1.951
D <sub>50</sub> ( $\phi$ )		3.575	2.858	2.923
D <sub>90</sub> ( $\phi$ )		7.315	5.744	6.076
(D <sub>90</sub> / D <sub>10</sub> ) ( $\phi$ )		3.454	2.976	3.115
(D <sub>90</sub> - D <sub>10</sub> ) ( $\phi$ )		5.198	3.814	4.125
(D <sub>75</sub> / D <sub>25</sub> ) ( $\phi$ )		1.950	1.533	1.585
(D <sub>75</sub> - D <sub>25</sub> ) ( $\phi$ )		2.544	1.242	1.385
Total Sand		58.5%	81.3%	78.3%
Total Mud (Silt & Clay)		41.5%	18.7%	21.7%
Very Coarse Sand		0.0%	0.0%	0.0%
Coarse Sand		0.0%	0.0%	0.0%
Medium Sand		15.7%	12.2%	11.4%
Fine Sand		48.0%	44.1%	41.8%
Very Fine Sand		23.6%	25.0%	25.0%
Very Coarse Silt		4.2%	4.9%	5.9%
Coarse Silt		4.2%	4.9%	5.5%
Medium Silt		1.9%	3.2%	3.7%
Fine Silt		1.1%	2.4%	2.9%
Very Fine Silt		0.7%	1.7%	2.0%
Clay		0.6%	1.5%	1.8%

Table 38. GRADISTAT (Blott and Pye 2001) Results for FG-3, FG-4, and FG-5.

		FG-3	FG-4	FG-5
Sample Type		Unimodal, Poorly Sorted	Unimodal, Poorly Sorted	Unimodal, Poorly Sorted
Textural Group		Muddy Sand	Muddy Sand	Muddy Sand
Sediment Name		Very Coarse Silty Fine Sand	Very Coarse Silty Fine Sand	Very Coarse Silty Fine Sand
Method of Moments [Arithmetic ( $\mu\text{m}$ )]	Mean	139.8	132.2	117.9
	Sorting	86.40	86.86	88.24
	Skewness	0.355	0.427	0.610
	Kurtosis	2.676	2.654	2.744
Method of Moments	Mean	94.70	85.85	69.39
	Sorting	3.251	3.417	3.798
	Skewness	-1.886	-1.705	-1.362

[Geometric ( $\mu\text{m}$ )]	Kurtosis	6.422	5.626	4.312
Method of Moments	Mean	3.401	3.542	3.849
[Logarithmic ( $\phi$ )]	Sorting	1.701	1.773	1.925
	Skewness	1.886	1.705	1.362
	Kurtosis	6.422	5.626	4.312
Folk and Ward Method ( $\mu\text{m}$ )	Mean	106.6	93.03	74.84
	Sorting	2.810	3.083	3.547
	Skewness	-0.498	-0.519	-0.511
	Kurtosis	1.825	1.629	1.198
Folk and Ward Method ( $\phi$ )	Mean	3.230	3.426	3.740
	Sorting	1.491	1.624	1.826
	Skewness	0.498	0.519	0.511
	Kurtosis	1.825	1.629	1.198
Folk and Ward Method (Description)	Mean	Very Fine Sand	Very Fine Sand	Very Fine Sand
	Sorting	Poorly Sorted	Poorly Sorted	Poorly Sorted
	Skewness	Very Fine	Very Fine	Very Fine
	Kurtosis	Skewed	Skewed	Skewed
		Very Leptokurtic	Very Leptokurtic	Very Leptokurtic
Mode ( $\mu\text{m}$ )		148.3	148.3	148.3
Mode ( $\phi$ )		2.757	2.757	2.757
D <sub>10</sub> ( $\mu\text{m}$ )		16.73	13.75	8.765
D <sub>50</sub> ( $\mu\text{m}$ )		134.4	126.2	108.7
D <sub>90</sub> ( $\mu\text{m}$ )		258.2	252.0	241.4
(D <sub>90</sub> / D <sub>10</sub> ) ( $\mu\text{m}$ )		15.44	18.33	27.54
(D <sub>90</sub> - D <sub>10</sub> ) ( $\mu\text{m}$ )		241.4	238.3	232.6
(D <sub>75</sub> / D <sub>25</sub> ) ( $\mu\text{m}$ )		2.419	2.785	4.433
(D <sub>75</sub> - D <sub>25</sub> ) ( $\mu\text{m}$ )		114.4	120.5	135.4
D <sub>10</sub> ( $\phi$ )		1.954	1.988	2.051
D <sub>50</sub> ( $\phi$ )		2.896	2.987	3.202
D <sub>90</sub> ( $\phi$ )		5.902	6.185	6.834
(D <sub>90</sub> / D <sub>10</sub> ) ( $\phi$ )		3.021	3.110	3.332
(D <sub>90</sub> - D <sub>10</sub> ) ( $\phi$ )		3.948	4.196	4.783
(D <sub>75</sub> / D <sub>25</sub> ) ( $\phi$ )		1.540	1.613	1.854
(D <sub>75</sub> - D <sub>25</sub> ) ( $\phi$ )		1.274	1.478	2.148
Total Sand		80.3%	76.4%	67.9%
Total Mud (Silt & Clay)		19.7%	23.6%	32.1%
Very Coarse Sand		0.0%	0.0%	0.0%
Coarse Sand		0.0%	0.0%	0.0%
Medium Sand		11.4%	10.3%	8.8%
Fine Sand		43.2%	40.3%	34.3%
Very Fine Sand		25.7%	25.8%	24.8%
Very Coarse Silt		5.2%	6.9%	10.1%
Coarse Silt		5.0%	5.8%	7.7%
Medium Silt		3.4%	3.9%	5.1%
Fine Silt		2.6%	3.0%	3.9%
Very Fine Silt		1.9%	2.1%	2.7%
Clay		1.7%	1.9%	2.6%

Table 39. GRADISTAT (Blott and Pye 2001) Results for FG-6, FG-7.

		FG-6	FG-7
Sample Type		Unimodal, Poorly Sorted	Unimodal, Poorly Sorted
Textural Group		Muddy Sand	Muddy Sand
Sediment Name		Very Coarse Silty Fine Sand	Very Coarse Silty Fine Sand
Method of Moments [Arithmetic ( $\mu\text{m}$ )]	Mean	113.0	103.4
	Sorting	84.56	87.31
	Skewness	0.657	0.920
	Kurtosis	2.787	3.317
Method of Moments [Geometric ( $\mu\text{m}$ )]	Mean	68.46	57.24
	Sorting	3.603	3.925
	Skewness	-1.386	-1.131
	Kurtosis	4.589	3.763
Method of Moments [Logarithmic ( $\phi$ )]	Mean	3.869	4.127
	Sorting	1.849	1.973
	Skewness	1.386	1.131
	Kurtosis	4.589	3.763
Folk and Ward Method ( $\mu\text{m}$ )	Mean	75.34	62.24
	Sorting	3.337	3.754
	Skewness	-0.468	-0.422
	Kurtosis	1.193	1.081
Folk and Ward Method ( $\phi$ )	Mean	3.730	4.006
	Sorting	1.738	1.908
	Skewness	0.468	0.422
	Kurtosis	1.193	1.081
Folk and Ward Method (Description)	Mean	Very Fine Sand	Very Coarse Silt
	Sorting	Poorly Sorted	Poorly Sorted
	Skewness	Very Fine Skewed	Very Fine Skewed
	Kurtosis	Leptokurtic	Mesokurtic
Mode ( $\mu\text{m}$ )		148.3	148.3
Mode ( $\phi$ )		2.757	2.757
D <sub>10</sub> ( $\mu\text{m}$ )		10.47	7.217
D <sub>50</sub> ( $\mu\text{m}$ )		102.2	85.31
D <sub>90</sub> ( $\mu\text{m}$ )		233.0	228.9
(D <sub>90</sub> / D <sub>10</sub> ) ( $\mu\text{m}$ )		22.25	31.72
(D <sub>90</sub> - D <sub>10</sub> ) ( $\mu\text{m}$ )		222.5	221.7
(D <sub>75</sub> / D <sub>25</sub> ) ( $\mu\text{m}$ )		4.246	5.446
(D <sub>75</sub> - D <sub>25</sub> ) ( $\mu\text{m}$ )		127.8	127.3
D <sub>10</sub> ( $\phi$ )		2.102	2.127
D <sub>50</sub> ( $\phi$ )		3.291	3.551
D <sub>90</sub> ( $\phi$ )		6.578	7.114
(D <sub>90</sub> / D <sub>10</sub> ) ( $\phi$ )		3.130	3.344
(D <sub>90</sub> - D <sub>10</sub> ) ( $\phi$ )		4.476	4.987
(D <sub>75</sub> / D <sub>25</sub> ) ( $\phi$ )		1.808	1.912
(D <sub>75</sub> - D <sub>25</sub> ) ( $\phi$ )		2.086	2.445
Total Sand		66.3%	59.3%
Total Mud (Silt & Clay)		33.7%	40.7%
Very Coarse Sand		0.0%	0.0%
Coarse Sand		0.0%	0.0%
Medium Sand		7.6%	7.4%
Fine Sand		32.6%	27.5%
Very Fine Sand		26.0%	24.4%

Very Coarse Silt	12.2%	14.3%
Coarse Silt	8.4%	9.8%
Medium Silt	4.7%	6.1%
Fine Silt	3.4%	4.4%
Very Fine Silt	2.4%	3.0%
Clay	2.4%	3.1%

---

APPENDIX D:  
AGE-DEPTH MODELS

## AGE-DEPTH MODEL R CODE

```

#Set up for BChron

library(Bchron)

#Load Tables

C14_WallAB =
read.csv("BchronTables/C14_WallAB_BchronTable.csv")
OSL_SG_WallAB =
read.csv("BchronTables/OSL_SG_WallAB_BchronTable.csv")
OSL_SG_WallDE =
read.csv("BchronTables/OSL_SG_WallDE_BchronTable.csv")
OSL_SG_WallFG =
read.csv("BchronTables/OSL_SG_WallFG_BchronTable.csv")
OSL_SA_WallAB =
read.csv("BchronTables/OSL_SA_WallAB_BchronTable.csv")
OSL_SA_WallDE =
read.csv("BchronTables/OSL_SA_WallDE_BchronTable.csv")
OSL_SA_WallFG =
read.csv("BchronTables/OSL_SA_WallFG_BchronTable.csv")

Combined_C14_SG_OSL_WallAB =
read.csv("BchronTables/Combined_C14_OSL_SG_WallAB_BchronTable.csv")

#Create expanded "Normal" calibration curve2

ExpandedNormalData =
read.csv('ExpandedNormalCalibration.csv')
CreateCalCurve(name='ExpandedNormal',
               cal_ages =
ExpandedNormalData$CalibratedDate,
               uncal_ages =
ExpandedNormalData$UncalibratedDate,
               one_sigma = ExpandedNormalData$Error)

#Calibrate C14 Ages

agesLCC_C14_WallAB = BchronCalibrate(ages=C14$Age,
                                     ageSds=C14$Error,

```

---

<sup>2</sup> The normal distribution calibration curve included with BChron did not cover the ages produced by some of the older OSL samples. In order to include the OSL ages in the BChron model, I created a calibration curve for normally distributed data, called "ExpandedNormal" that would allow for the inclusion of ages up to 100,000 yr BP.

[illegible]

```

        ids=OSL_SG_WallDE$ID,
        predictPositions=seq(0,140,by=1))

#Wall FG (Single Grain)

LCCmod_OSL_SG_WallFG = Bchronology(ages=OSL_SG_WallFG$Age,
        ageSds=OSL_SG_WallFG$Error,
        calCurves=OSL_SG_WallFG$CalCurve,
        positions=OSL_SG_WallFG$Depth,
        positionThicknesses
        =OSL_SG_WallFG$Thickness,
        ids=OSL_SG_WallFG$ID,
        predictPositions=seq(0,140,by=1))

#Plot Single-Grain OSL Age-Depth Models

#Wall AB (Single Grain)

plot(LCCmod_OSL_SG_WallAB,
    main="Last Canyon Cave, Wall AB, Single-Grain OSL",
    xlab='Age (years BP)',
    ylab='Depth (cm)',
    las=1,
    xlim=c(250000,0))

#Wall DE (Single Grain)

plot(LCCmod_OSL_SG_WallDE,
    main="Last Canyon Cave, Wall DE, Single-Grain OSL",
    xlab='Age (years BP)',
    ylab='Depth (cm)',
    las=1,
    xlim=c(250000,0))

#Wall FG (Single Grain)

plot(LCCmod_OSL_SG_WallFG,
    main="Last Canyon Cave, Wall FG, Single-Grain OSL",
    xlab='Age (years BP)',
    ylab='Depth (cm)',
    las=1,
    xlim=c(250000,0))

#Create Small Aliquot OSL Age-Depth Models

#Wall AB (Small Aliquot)

LCCmod_OSL_SA_WallAB = Bchronology(ages=OSL_SA_WallAB$Age,

```



```

        ageSds=OSL_SA_WallAB$Error,
        calCurves=OSL_SA_WallAB$CalCurve,
        positions=OSL_SA_WallAB$Depth,
        positionThicknesses
        OSL_SA_WallAB$Thickness,
        ids=OSL_SA_WallAB$ID,
        predictPositions=seq(0,140,by=1))

#Wall DE (Small Aliquot)

LCCmod_OSL_SA_WallDE = Bchronology(ages=OSL_SA_WallDE$Age,
        ageSds=OSL_SA_WallDE$Error,
        calCurves=OSL_SA_WallDE$CalCurve,
        positions=OSL_SA_WallDE$Depth,
        positionThicknesses =
        OSL_SA_WallDE$Thickness,
        ids=OSL_SA_WallDE$ID,
        predictPositions=seq(0,140,by=1))

#Wall FG (Small Aliquot)
LCCmod_OSL_SA_WallFG = Bchronology(ages=OSL_SA_WallFG$Age,
        ageSds=OSL_SA_WallFG$Error,
        calCurves=OSL_SA_WallFG$CalCurve,
        positions=OSL_SA_WallFG$Depth,
        positionThicknesses =
        OSL_SA_WallFG$Thickness,
        ids=OSL_SA_WallFG$ID,
        predictPositions=seq(0,140,by=1))

#Plot Small Aliquot OSL Age-Depth Models

#Wall AB (Small Aliquot)
plot(LCCmod_OSL_SA_WallAB,
     main="Last Canyon Cave, Wall AB, Small Aliquot OSL",
     xlab='Age (years BP)',
     ylab='Depth (cm)',
     las=1,
     xlim=c(250000,0))

#Wall DE (Small Aliquot)
plot(LCCmod_OSL_SA_WallDE,
     main="Last Canyon Cave, Wall DE, Small Aliquot OSL",
     xlab='Age (years BP)',
     ylab='Depth (cm)',
     las=1,
     xlim=c(250000,0))

#Wall FG (Small Aliquot)

```

```

plot(LCCmod_OSL_SA_WallFG,
     main="Last Canyon Cave, Wall FG, Small Aliquot OSL",
     xlab='Age (years BP)',
     ylab='Depth (cm)',
     las=1,
     xlim=c(250000,0))

#Export CSVs of model results
write.csv(summary(LCCmod_C14_WallAB), file =
"ModelResults/GranulometryAges_C14_WallAB_REVISIED.csv")
write.csv(summary(LCCmod_OSL_SG_WallAB), file =
"ModelResults/GranulometryAges_OSL_SG_WallAB_REVISIED.csv")
write.csv(summary(LCCmod_OSL_SG_WallDE), file =
"ModelResults/GranulometryAges_OSL_SG_WallDE_REVISIED.csv")
write.csv(summary(LCCmod_OSL_SG_WallFG), file =
"ModelResults/GranulometryAges_OSL_SG_WallFG_REVISIED.csv")
write.csv(summary(LCCmod_OSL_SA_WallAB), file =
"ModelResults/GranulometryAges_OSL_SA_WallAB_REVISIED.csv")
write.csv(summary(LCCmod_OSL_SA_WallDE), file =
"ModelResults/GranulometryAges_OSL_SA_WallDE_REVISIED.csv")
write.csv(summary(LCCmod_OSL_SA_WallFG), file =
"ModelResults/GranulometryAges_OSL_SA_WallFG_REVISIED.csv")

#Calculate sedimentation rates
sedrate_AB_14C = summary(LCCmod_C14_WallAB, type =
'sed_rate', useExisting = FALSE)
sedrate_AB_SGOSL = summary(LCCmod_OSL_SG_WallAB, type =
'sed_rate', useExisting = FALSE)
sedrate_DE_SGOSL = summary(LCCmod_OSL_SG_WallDE, type =
'sed_rate', useExisting = FALSE)
sedrate_FG_SGOSL = summary(LCCmod_OSL_SG_WallFG, type =
'sed_rate', useExisting = FALSE)

#Export CSV of sedimentation rates
write.csv(sedrate_AB_14C, file =
"ModelResults/SedimentationRatesWallAB_14C.csv")
write.csv(sedrate_AB_SGOSL, file =
"ModelResults/SedimentationRatesWallAB_SGOSL.csv")
write.csv(sedrate_DE_SGOSL, file =
"ModelResults/SedimentationRatesWallDE_SGOSL.csv")
write.csv(sedrate_FG_SGOSL, file =
"ModelResults/SedimentationRatesWallFG_SGOSL.csv")

#Plot sedimentation rates

#Wall AB Radiocarbon
plot(sedrate_AB_14C[, 'position_grid'],
     sedrate_AB_14C[, '50%'], type='l', ylab = 'Years per cm',

```

```

xlab = 'Depth (cm)', ylim = range(sedrate_AB_14C[,-1], xlim
= 10000))
lines(sedrate_AB_14C[, 'position_grid'],
sedrate_AB_14C[, '2.5%'], lty='dashed')
lines(sedrate_AB_14C[, 'position_grid'],
sedrate_AB_14C[, '97.5%'], lty='dotted')
title(main = 'Sedimentation Rates in Wall AB, Radiocarbon')

#Wall AB Single-Grain OSL
plot(sedrate_AB_SGOSL[, 'position_grid'],
sedrate_AB_SGOSL[, '50%'], type='l', ylab = 'Years per cm',
xlab = 'Depth (cm)', ylim = range(sedrate_AB_SGOSL[,-1]))
lines(sedrate_AB_SGOSL[, 'position_grid'],
sedrate_AB_SGOSL[, '2.5%'], lty='dashed')
lines(sedrate_AB_SGOSL[, 'position_grid'],
sedrate_AB_SGOSL[, '97.5%'], lty='dotted')
title(main = 'Sedimentation Rates in Wall AB, SG OSL')

#Wall DE Single-Grain OSL
plot(sedrate_DE_SGOSL[, 'position_grid'],
sedrate_DE_SGOSL[, '50%'], type='l', ylab = 'Years per cm',
xlab = 'Depth (cm)', ylim = range(sedrate_DE_SGOSL[,-1]))
lines(sedrate_DE_SGOSL[, 'position_grid'],
sedrate_DE_SGOSL[, '2.5%'], lty='dashed')
lines(sedrate_DE_SGOSL[, 'position_grid'],
sedrate_DE_SGOSL[, '97.5%'], lty='dotted')
title(main = 'Sedimentation Rates in Wall DE, SG OSL')

#Wall FG Single-Grain OSL
plot(sedrate_FG_SGOSL[, 'position_grid'],
sedrate_FG_SGOSL[, '50%'], type='l', ylab = 'Years per cm',
xlab = 'Depth (cm)', ylim = range(sedrate_FG_SGOSL[,-1]))
lines(sedrate_FG_SGOSL[, 'position_grid'],
sedrate_FG_SGOSL[, '2.5%'], lty='dashed')
lines(sedrate_FG_SGOSL[, 'position_grid'],
sedrate_FG_SGOSL[, '97.5%'], lty='dotted')
title(main = 'Sedimentation Rates in Wall FG, SG OSL')

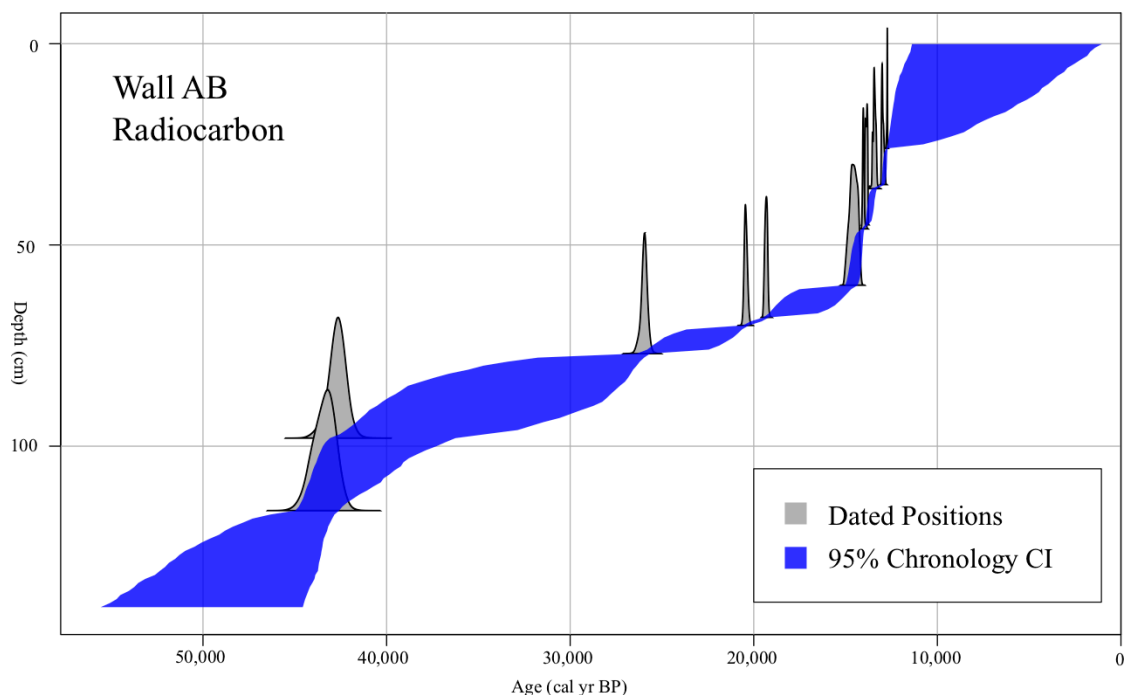
```

### “EXPANDEDNORMAL” CALIBRATION CURVE

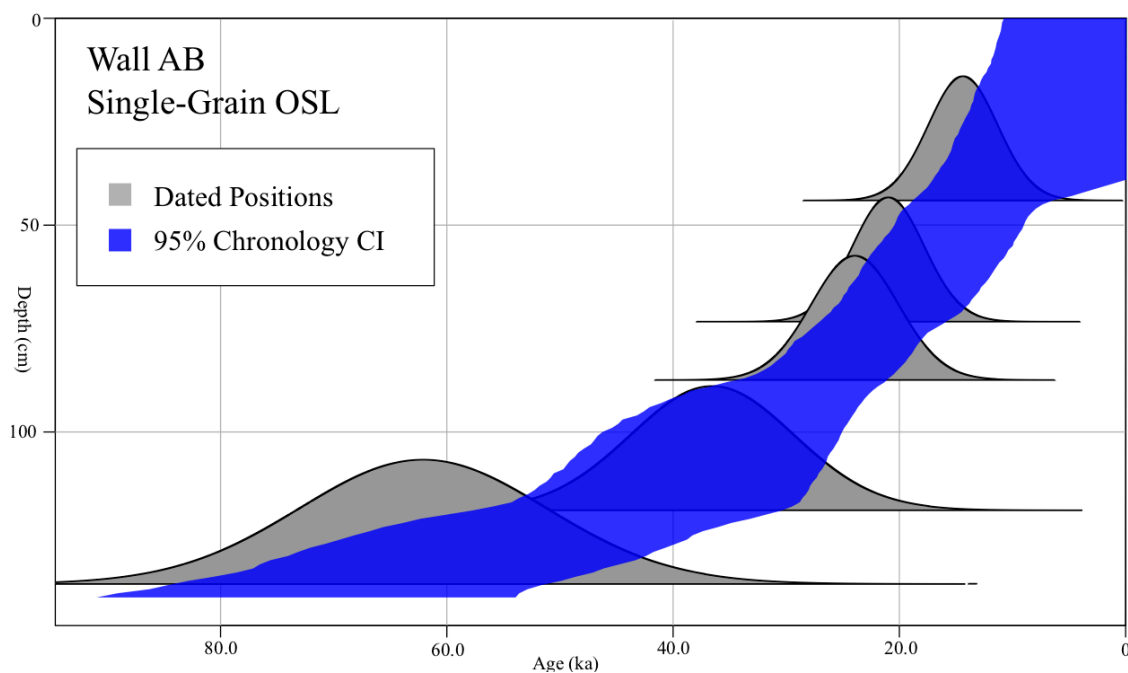
Table 40. “ExpandedNormalCalibration.csv” Table Used for “ExpandedNormal” Calibration Curve.

UncalibratedDate	CalibratedDate	Error
-100	-100	0
500000	500000	0

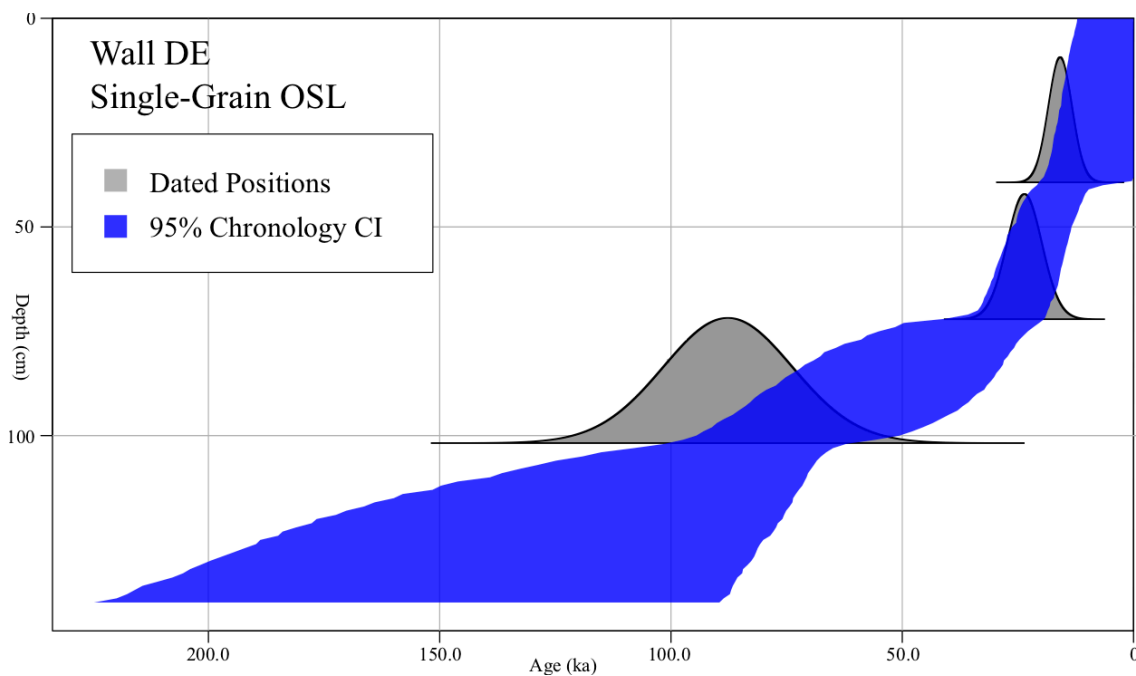
## DETAILED PLOTS OF AGE-DEPTH MODELS



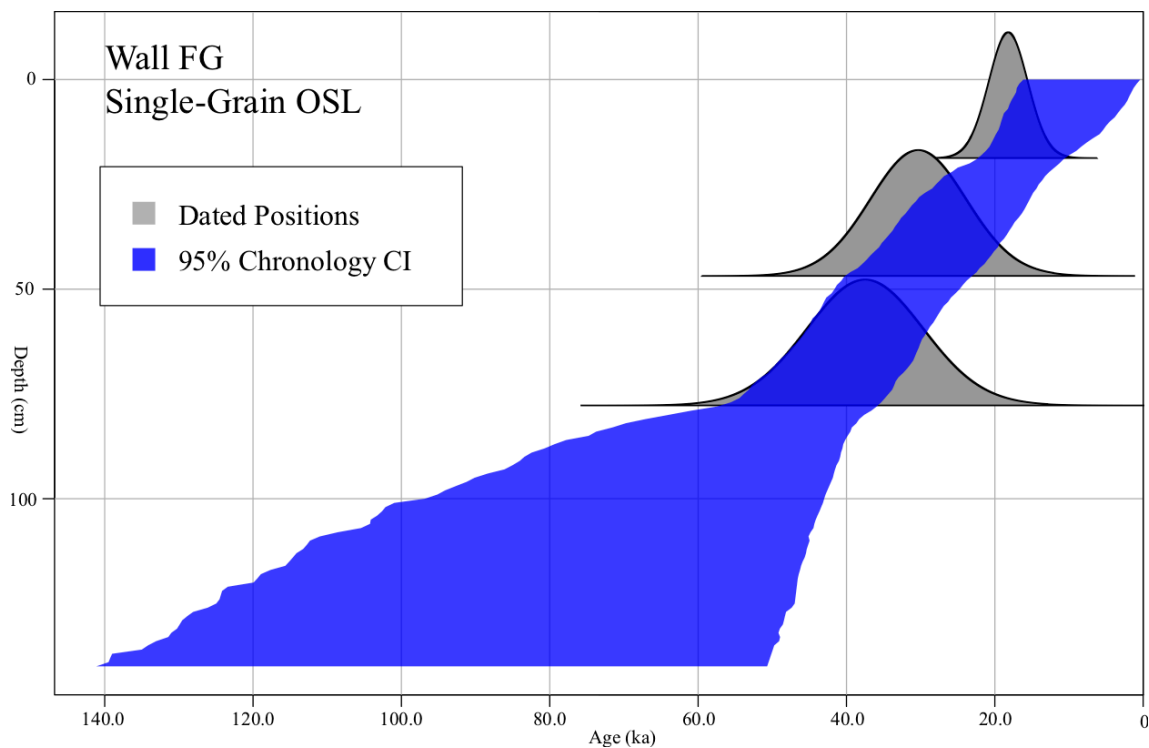
**Figure 40. Detailed view of the radiocarbon age-depth model for Wall AB.**



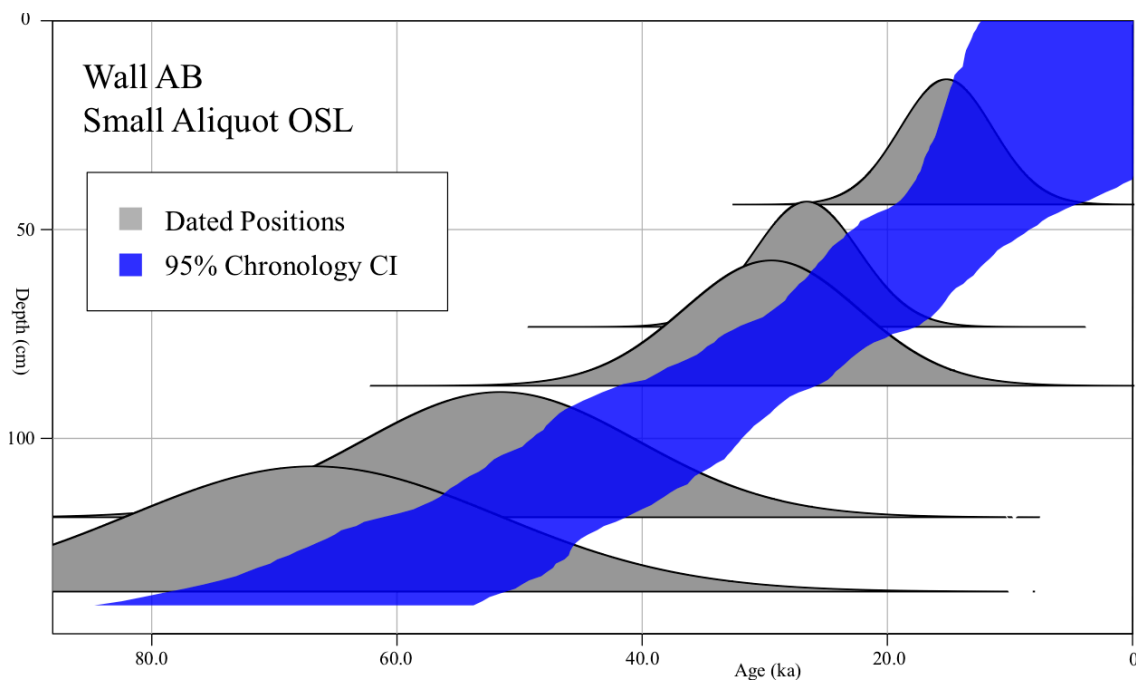
**Figure 41. Detailed view of the single-grain OSL age-depth model for Wall AB.**



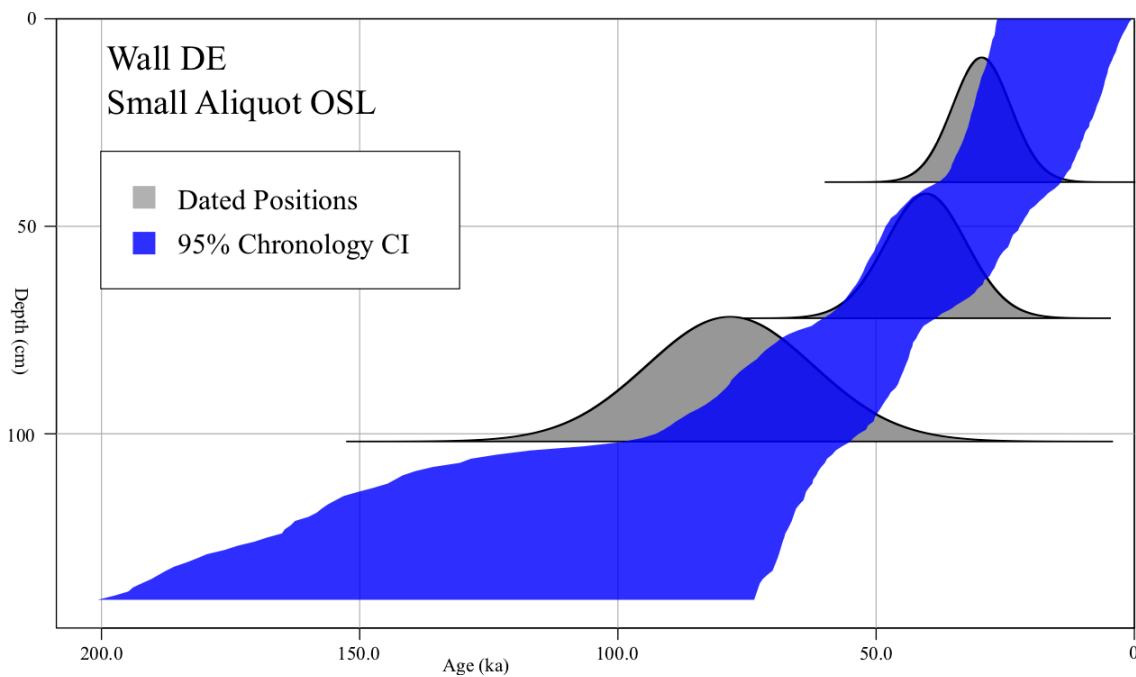
**Figure 42. Detailed view of the single-grain OSL age-depth model for Wall DE.**



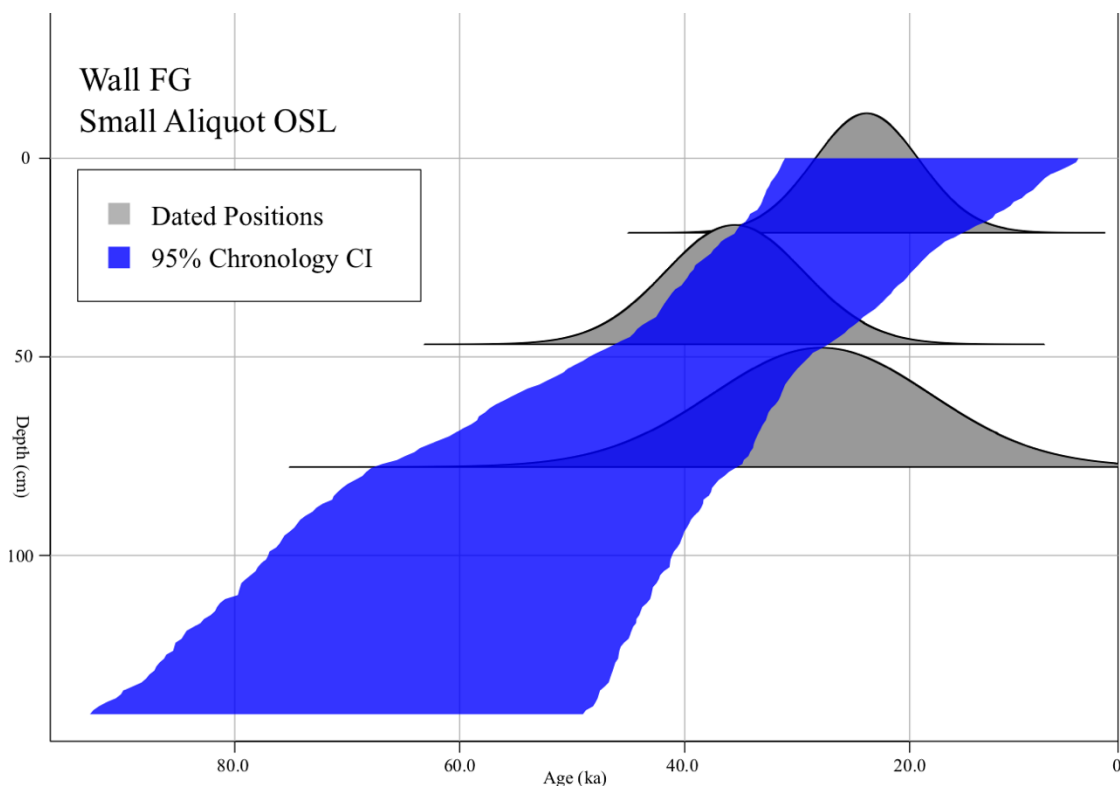
**Figure 43. Detailed view of the single-grain OSL age-depth model for Wall FG.**



**Figure 44. Detailed view of the small aliquot OSL age-depth model for Wall AB.**



**Figure 45. Detailed view of the small aliquot OSL age-depth model for Wall DE.**



**Figure 46. Detailed view of the small aliquot OSL age-depth model for Wall FG.**

#### TABLES OF AGE-DEPTH MODEL RESULTS

**Table 41. Results of Radiocarbon Age-Depth Model in Wall AB**

Depth (cm)	2.5% Quantile	10% Quantile	50% Quantile	90% Quantile	97.50% Quantile
0	371.7	1385.6	4847.5	8451.4	9900.375
1	650	1766.9	5155	8689.1	10108.225
2	1016.85	2150.9	5444	8900.7	10285.2
3	1289.95	2475.7	5776.5	9164.6	10431.275
4	1529.875	2804.8	6071	9335.7	10491.325
5	1708.3	3173.6	6424	9552	10671.9
6	2004.475	3493.1	6731.5	9720.2	10745.425
7	2266.65	3740.4	7046	9928.1	10907.15
8	2582.95	4076.5	7391	10109.5	11035.25
9	2737	4338	7637.5	10317.7	11256.125
10	3165.1	4662.4	7944	10514.3	11457.325
11	3602.675	4972.1	8231.5	10709.6	11563.3
12	3945.775	5342	8498	10876.4	11702.2
13	4337.4	5747.8	8802	11010.6	11779.625
14	4783.1	6160.1	9070.5	11213	11923.3
15	5244.925	6561.3	9365.5	11355.6	12090.25
16	5579.875	7021	9678.5	11610	12146.8
17	6076.975	7448.4	9946.5	11753.4	12240.225

18	6337.925	7742.7	10234.5	11867.1	12303.1
19	6553.85	8187.4	10521.5	11989.3	12361.125
20	7110	8617.4	10821	12104.4	12422.025
21	7544.65	9002.6	11089.5	12217.3	12472.1
22	8162.85	9410.5	11380.5	12325.1	12520.1
23	8592.625	9921.3	11697.5	12432.7	12574.025
24	9302.975	10446.9	12054	12543	12632.025
25	10110.325	11151.6	12375	12634	12687
26	12583.725	12713	12730	12761	12780.025
27	12604.475	12733	12763	12831.1	12878
28	12633.725	12747	12796	12869	12917.025
29	12721.175	12758.9	12821	12900.1	12947
30	12731.95	12774.9	12847	12927	12973
31	12738	12789.9	12870	12947.1	12991
32	12745.9	12807	12895.5	12970	13006
33	12768.95	12825.9	12924	12988	13020.025
34	12795	12857	12953	13009	13033.025
35	12877	12921	12999	13046	13063
36	13289.925	13330.9	13421	13520.1	13554.025
37	13346.975	13391.9	13485	13602.2	13689.025
38	13372.95	13431	13531	13665	13729.075
39	13403.95	13464	13574	13707	13764.025
40	13431.95	13491.8	13611	13741.1	13794
41	13460.975	13527.9	13652	13771	13820.025
42	13489	13569.9	13693	13796.1	13845.075
43	13545	13617	13739	13827	13874
44	13608.975	13681	13780	13862	13903
45	13774	13788	13838	13912.1	13946
46	13976.975	14003	14049	14092	14110.025
47	14008.975	14047	14107	14238.1	14339.15
48	14033	14067.9	14151.5	14319.1	14446.025
49	14049.975	14091.9	14194.5	14393	14520.025
50	14066.925	14110.9	14235	14460.1	14597.025
51	14077.975	14131	14279	14515.1	14667.05
52	14089	14153	14317	14562.1	14723.025
53	14112.925	14180.9	14363	14602.2	14769.1
54	14124	14204.7	14404.5	14648.2	14804.025
55	14149	14232.9	14445.5	14692.2	14840.175
56	14173.975	14267.9	14487.5	14746	14877.025
57	14209.975	14303.8	14529	14786	14908.15
58	14244.95	14345	14574	14825.1	14947.125
59	14278.975	14387.9	14625.5	14881	14990.05
60	14335	14461	14720	14959	15066.025
61	14701.875	14903.8	15361	16732	17690.4
62	14910.75	15177.5	15959	17471.6	18262.025



63	15100.675	15479.6	16505.5	17922.6	18503.025
64	15335.6	15816	17049	18276	18713
65	15609.85	16230.8	17602.5	18578.5	18880.175
66	16061.325	16675	18165.5	18859.1	19047
67	16669.975	17429.8	18733	19099.1	19201.05
68	19197.925	19231	19319	19419	19456
69	19527	19704.8	19887	20056	20227
70	20270.95	20333	20447	20539	20594.025
71	20611.675	20769.9	21275	22891.4	24181.825
72	20836.75	21092.8	22055	23789.3	24676.475
73	21039.9	21478.8	22830.5	24463.7	24996.525
74	21349.7	21951	23582	24932.5	25331.625
75	21833.45	22519.7	24343	25326.9	25620.15
76	22542.6	23337.9	25141	25677	25873.05
77	25586.875	25745.3	25959	26193	26355.125
78	25962.875	26173	26884.5	29287.2	31068.5
79	26129.725	26446.8	27748.5	30776.2	33508.95
80	26284.925	26734.9	28528	31833.7	34585.225
81	26403	27001	29167.5	33280.5	35615.225
82	26584.7	27319.7	29932.5	34311.3	36618.5
83	26752.9	27672.9	30581	34972.3	37324.95
84	26999.95	28083.7	31271.5	35680.8	38188.525
85	27280.775	28512.8	32029	36235.1	38874.375
86	27634.225	28835.9	32727.5	36980.2	39308.4
87	27987.375	29373.5	33407.5	37656.2	39755.25
88	28390.325	29855.5	34075	38315.1	40045.075
89	28742.625	30410	34893	38981.8	40463.6
90	29109.45	31021.4	35641.5	39395.5	40711.6
91	29578.875	31574.6	36352	39865.8	40967.525
92	30100.875	32130.1	37062	40294.7	41186.425
93	30819.5	32752	37798	40689.1	41512.45
94	31510	33519.9	38502.5	41036.6	41754.2
95	31876.5	34375.3	39300	41393.4	41947.175
96	32262.75	35251.6	40127	41745.1	42155.025
97	32826.55	36223.3	41082	42128.8	42464.15
98	33560.25	37471.7	42192.5	42781	43085.125
99	34611.8	38033.1	42354.5	42961.1	43255
100	35156.725	38384.5	42454.5	43059	43373.15
101	35556.85	38870.4	42542.5	43152.3	43501.05
102	36052.825	39206.2	42643	43238.1	43624.325
103	36443.25	39384.4	42711	43346.6	43808.075
104	36653.85	39658	42788	43456	43958.475
105	36950.25	40175	42859	43558.5	44109.2
106	37369.25	40620.3	42933	43672.3	44220.45
107	37661.575	40903.2	42999	43759.3	44270.475

108	38138.5	41055.1	43083.5	43873.5	44333.175
109	38574.625	41309.6	43152	43971.1	44423.9
110	38833	41593.4	43234.5	44053.3	44606.25
111	39485.525	41859.3	43308	44161	44698.225
112	39991.225	42078.4	43378	44249.6	44898.15
113	40531.7	42379.7	43474.5	44336	45004.95
114	41098.175	42566.4	43566	44430.5	45117.1
115	41887.875	42750.9	43664.5	44590.1	45200.075
116	42707.875	43047.9	43843	44770.1	45452.9
117	43031.8	43404.4	44471	45878.7	46890.025
118	43148.85	43675.5	44839	46609.4	47669.275
119	43294.8	43894	45184.5	47245.1	48660.125
120	43384.525	44069.7	45515	47900.5	49449.325
121	43488.75	44235.9	45803.5	48488.2	50413.6
122	43599.875	44432.6	46088	48988	51138.5
123	43705.875	44585.6	46392	49512	51708.325
124	43847.25	44829	46706	49943.4	52066.325
125	44067.025	44965.9	47057	50387.2	53147.875
126	44217.35	45126.8	47384	50819.8	53712.35
127	44349.875	45278.9	47678	51304	53892.525
128	44440.975	45490.7	47985.5	51821.3	54357.55
129	44603.95	45670.4	48355	52390.1	54969.475
130	44787.925	45875.1	48692.5	52750.6	55560.8
131	44921.4	46041.3	48968.5	53338.5	56216.775
132	44989.4	46260.9	49294.5	53792.5	56664.125
133	45073.725	46543.2	49658.5	54099.3	57315.475
134	45119.4	46685	50012.5	54680.4	57916.575
135	45208.65	46936.9	50263	55165.4	58439.175
136	45440.725	47076.9	50619.5	55650.7	58888.675
137	45643.85	47289.9	50888.5	56073.9	59348.1
138	45703.575	47514.5	51183.5	56530.9	59876.975
139	45778.95	47747.2	51579	56930.2	60555.3
140	45837.85	47976.8	51961.5	57388.4	60901.475

Table 42. Results from Single-Grain OSL Age-Depth Model in Wall AB

Depth (cm)	2.5% Quantile	10% Quantile	50% Quantile	90% Quantile	97.50% Quantile
0	-69	-69	1378.5	6778.2	9868.6
1	-69	-69	1595	7039.4	10070.9
2	-69	-69	1854.5	7373.1	10310.4
3	-69	-69	2103	7563.1	10413.375
4	-69	-69	2294	7707	10572.2
5	-69	-69	2554.5	8004.2	10738.225
6	-69	-69	2790	8257.3	11080.775

7	-69	-69	3014.5	8447	11257.25
8	-69	-69	3198	8694.6	11414.225
9	-69	-69	3436	8976.7	11668.1
10	-69	-69	3610.5	9148.4	11846.425
11	-69	-69	3838.5	9313.7	12020.6
12	-69	-69	4039.5	9547.7	12120.3
13	-69	-69	4214.5	9761.9	12179.35
14	-69	-69	4426	9981.1	12315.925
15	-69	-69	4647.5	10132.5	12420.2
16	-69	-69	4811	10209.5	12573.475
17	-69	-69	5009.5	10299.8	12789.325
18	-69	-69	5194	10425.2	12970.75
19	-69	-69	5361	10660	13314.15
20	-69	-69	5633.5	10824.9	13417.525
21	-69	-69	5833.5	10945.5	13520.9
22	-69	-69	6014	11242.4	13658.4
23	-69	-69	6195	11424	13792.325
24	-69	-69	6377.5	11652.5	13911.725
25	-69	-69	6553	11837.5	14083.4
26	-69	-69	6733.5	12051.5	14195.75
27	-69	-69	6977	12225	14323.575
28	-69	-69	7182	12363	14583.275
29	-69	-69	7377.5	12555.9	14704.3
30	-69	-69	7581	12693	14867.05
31	-69	-69	7805	12837.6	14977.4
32	-69	-69	8082.5	13006.9	15160.025
33	-69	-69	8315.5	13237.1	15345.7
34	-69	419.2	8557.5	13467	15698
35	-69	1197.5	8851.5	13658.3	16105.675
36	-69	1905.7	9183	13923.8	16388.9
37	-69	2488.1	9469	14134	16556.875
38	-69	3112.6	9766.5	14308.5	16788.075
39	-69	3726.7	10043	14558.6	16883.175
40	79.575	4271.9	10289.5	14769.1	17067.475
41	1165.75	4792.8	10556.5	15011.5	17467.375
42	2273.65	5395.6	10932	15383.7	17665.15
43	3368.2	6362.4	11413	15785.4	18156.275
44	4503.4	7162.3	11958	16371.5	18565.975
45	5502.35	7874.6	12528.5	16784	18806.35
46	6459.275	8490.4	12951.5	17115.4	19130.125
47	6904.925	8860	13266.5	17407.1	19415.25
48	7252.45	9251.4	13501.5	17665.6	19631.45
49	7685.4	9495.5	13799.5	17900.8	19974.425
50	7908.25	9909.7	14115	18129.1	20226.025
51	8176.45	10221.9	14354	18457	20473.375

52	8479.525	10503.6	14611.5	18757.8	20578.175
53	8743.25	10743.8	14818	19036.6	20741.875
54	9043.975	11106.6	15060	19280.3	21158.975
55	9240.525	11351.6	15394	19469.2	21399.8
56	9522.975	11581.5	15725.5	19658.9	21653.25
57	9846.7	11814.7	15986	19885.8	21747.325
58	9988.475	12137.9	16233	20146.4	21916.725
59	10454.475	12494.9	16514.5	20379	22179.625
60	10751.65	12781.6	16759.5	20612	22443.55
61	11032.65	12996.7	16992.5	20871.1	22732
62	11294.75	13262.7	17265.5	21047.3	22828.075
63	11587.075	13640.9	17495	21177.3	23154.275
64	12019.55	14055.6	17745	21361.9	23186.025
65	12616.3	14521.1	18022.5	21631.7	23453.7
66	13006	14774.8	18282.5	21975.1	23646.35
67	13505.65	14951.6	18514.5	22286.1	23936.7
68	13815.6	15283.8	18779.5	22533.3	24215.825
69	14125.025	15594.9	19086	22755.9	24508.175
70	14488.925	15990.1	19386.5	22993.3	24927.25
71	14954.125	16340.7	19798.5	23313.8	25346.125
72	15537.85	16925.9	20257.5	23757.6	25907.025
73	15884.6	17327.9	20779	24341.7	26556.2
74	16406.675	17889.7	21198.5	24751	26973.3
75	16841.925	18367	21706.5	25324.6	27547.225
76	17240.725	18827.7	22082.5	25666.2	27932.675
77	17523.775	19131.7	22418	26027.5	28102.05
78	17814.5	19561.1	22710	26336.7	28552.175
79	17984.9	19892.8	22996	26639.1	28787.425
80	18270.575	20163.7	23376.5	27011.9	29283.625
81	18651.475	20410.6	23654.5	27372.4	29679.975
82	19066.575	20720.1	23976.5	27776.7	30187.375
83	19434.875	20976.9	24256	28162.4	30455.25
84	19834.225	21245	24598.5	28543.4	30874.075
85	20047.725	21552.7	25041	28945.6	31167.925
86	20362.575	21795.5	25557.5	29413	31662.225
87	20663.475	22241.8	26069	30213.4	32721.025
88	21205.625	22770.5	26684.5	31044.7	33220.45
89	21698.975	23154.2	27211	31732.3	33764.6
90	22032.875	23600.6	27687	32321.4	34605.725
91	22355.725	23971	28145	32924	35380.275
92	22567.85	24338.3	28564	33375.2	35990.4
93	22786.85	24587	28952	33764.7	36736.95
94	23006.275	24852.6	29290	34312.5	37377.675
95	23156.625	25050.8	29697	34920.9	37939.25
96	23423.15	25279.9	30019.5	35479.1	38543.8

97	23675.6	25508.5	30312	36018.1	39203.45
98	23984.5	25875	30676	36473.1	39791.425
99	24171.975	26262.4	31079.5	36804.8	40125.925
100	24363.45	26556.1	31482	37354	40475.5
101	24750.825	26906.9	31860	37724.9	41458.15
102	25013.05	27231.8	32180.5	38161.1	42031.55
103	25197.05	27540	32567.5	38619.4	42460.95
104	25459.1	27850	32973	39060.2	43090
105	25639.825	28183.1	33368.5	39620.3	43289.575
106	25862.7	28438.5	33765.5	40156.3	44045
107	26034.25	28840.9	34077	40486.6	44245.45
108	26212.975	29060.5	34376.5	41097.5	44561.325
109	26412.525	29469.3	34734.5	41578.2	45146.925
110	26509.55	29802.1	35096	42056.8	45586.65
111	26665.925	30113.9	35448.5	42504.8	45952.8
112	26945.875	30431.2	35749.5	43000.7	46313.525
113	27253.8	30726.6	36182.5	43418.3	46853.35
114	27706.8	31035.7	36594	43940.9	47269.2
115	28279.175	31335.3	37080	44463	48067.825
116	29117.575	31737.9	37445	44940.5	48687.25
117	29652.8	32104.4	37914	45546.4	49499.4
118	30026.6	32635.8	38637.5	46388	50484.5
119	30436.8	33111.8	39470	47375.6	51506.725
120	31016.575	34030.4	40549.5	48803.5	52680.725
121	31885.85	35137.7	41814	49992.3	54350.55
122	32437.8	35815.4	42922	51482.1	55711.625
123	32860.075	36352.6	43924	52529.2	57406.6
124	33222.75	37159.1	44831.5	53368.1	58596.05
125	33580.3	37748.9	45526.5	54542.7	60423.35
126	33905.875	38422.1	46291.5	55322.1	61509.075
127	34488.15	39025.8	46831	56302.9	62796.775
128	34557.525	39506.6	47537	57369.9	63859.25
129	35011.725	40003.1	48314	58319	64610.5
130	36080.325	40490.8	48992	59302.9	65972.35
131	36717.825	41052.6	49651.5	60276.3	67276.15
132	37494.625	41649.5	50370	61606.7	68761.85
133	38173.175	42193.7	51197	62676.8	69733.625
134	38598.325	42942.7	52010.5	63974.9	71209.825
135	39265.975	43884.6	53158	65689.5	72541.225
136	40025	44893.2	54622	67669.2	74702.675
137	41124.625	46171.6	55738.5	69803.8	76416.4
138	41949.2	47139.3	56673.5	71689	78314.75
139	42510.2	48118.2	57600.5	72726.9	80264.15
140	43267.25	48681	58254.5	73494	80958.35

Table 43. Results from Single-Grain OSL Age-Depth Model in Wall DE

Depth (cm)	2.5% Quantile	10% Quantile	50% Quantile	90% Quantile	97.50% Quantile
0	-69	628.8	4486.5	9921.1	12876.8
1	-69	1054.7	4868	10104.8	13030.375
2	-69	1383.8	5132.5	10277.1	13215.15
3	-69	1649.6	5368	10400.3	13481.825
4	-69	1878.7	5614	10608.6	13651.2
5	-69	2213.4	5879.5	10811.3	13748.325
6	-69	2502.8	6116.5	10956.8	13824.55
7	-69	2805.6	6330.5	11114.4	13956.9
8	-69	3085.3	6589	11258.6	14188.95
9	-69	3406.7	6837	11485.7	14380.25
10	-69	3685.5	7054.5	11693.8	14555.475
11	-69	4001.7	7344	11847.4	14733.925
12	-69	4266.7	7588	12051.6	14935.45
13	-69	4504.7	7839.5	12237.1	15052.95
14	-69	4736.7	8094.5	12409.4	15199.425
15	-69	4973.9	8370	12528	15342.325
16	83.1	5214.4	8592	12707.4	15424.125
17	535.5	5438.2	8817	12827.1	15594.15
18	896.25	5702.5	9064.5	13090.2	15731.175
19	1260.35	5913	9278.5	13301.1	15899.7
20	1636.825	6114.1	9531.5	13523.7	15981.775
21	1808.575	6321.6	9778.5	13745.6	16166.95
22	1882.8	6533.6	10056	13978.3	16486.15
23	2413.975	6711.2	10273.5	14247.6	16624.25
24	2607.575	6912.7	10524.5	14420.4	16768.05
25	2725.4	7127.7	10749	14526	16981.2
26	3057.675	7333	10958.5	14708.7	17113.875
27	3641.575	7601.2	11192	14961.5	17303.75
28	3861.825	7845.6	11431	15187.1	17562.2
29	3982.625	8073.8	11669.5	15363.1	17848.75
30	4103.425	8301	11919	15699.7	18066.425
31	4232.65	8521.4	12180	15953.3	18283
32	4835	8768.9	12443	16195.6	18599.3
33	5258.025	8898.8	12675.5	16475	18846.4
34	5689.45	9112	12957.5	16719.1	19097.4
35	5969.625	9272.5	13246.5	16933.7	19539.875
36	6420.325	9595.4	13490	17173.4	19790.925
37	6826.75	9839	13736.5	17446.9	20093.925
38	7419.625	10231.8	14046	17838.5	20691.375
39	7883.725	10506.9	14354.5	18235	21102.5
40	8347	10870.9	14730.5	18831.3	21594.9
41	8894.825	11390.1	15189	19545.3	22135.7

42	9199.75	11893.4	15579	20067.4	22826.025
43	9735.675	12155.4	15859.5	20471.1	23266.35
44	10207.8	12501.8	16098.5	20766.3	23786.55
45	10668.875	12754.3	16312.5	21113.8	24020.45
46	10969.625	13021.6	16573	21392	24273.125
47	11355.75	13333.5	16904.5	21772.3	24524.775
48	11625.1	13622.7	17169.5	21938.1	24894.8
49	11900.85	13824.2	17476	22224.7	25092.75
50	12149.85	14086.2	17746.5	22472.7	25364.475
51	12297.425	14295	18023	22619.1	25433.45
52	12588.275	14469.7	18304.5	22850.4	25576.125
53	12840.025	14716.3	18530	23129	25861.525
54	13101.925	15033.6	18757	23364.7	26068.35
55	13290.875	15259.9	19085	23670.7	26234.15
56	13615.475	15493.3	19349	23849.1	26438.125
57	13685.525	15746.6	19618	24131	26837.625
58	14044.625	15945	19915	24421.7	27214.5
59	14175.7	16125	20167	24718.9	27783.35
60	14408.425	16316.2	20381	24917.3	28028.4
61	14629.85	16566.8	20657.5	25185.3	28546.925
62	14842.5	16875.7	20953.5	25478.6	28914
63	15107.925	17074.4	21185.5	25691.6	29124.375
64	15289.675	17361.8	21473	25974.1	29467.625
65	15622.325	17558	21703.5	26240.2	30279.25
66	15956.575	17789	21984.5	26482.8	30600.425
67	16188.425	18090.1	22254.5	26678.1	31201.35
68	16385.675	18424.5	22488.5	26858	31866.45
69	16508.775	18761.2	22800.5	27178.3	32374.1
70	17048.55	19082.7	23222.5	27455	32997.8
71	17490.925	19648.8	23878	28347.8	36496.625
72	18378.425	20585	24889.5	31651	40833.475
73	19733.3	21706	26529.5	36989.1	47395.125
74	21219.7	23383.1	28930.5	41840.5	56000
75	22847.625	25014.3	31150	46143.2	63908.4
76	24194.95	26385.2	33355.5	49923	67613.8
77	25339.7	27766.4	35261	53639.5	71173.925
78	26353.95	28991.4	37203.5	56383	74131.625
79	27034.5	30449.2	39242	59120.3	75774.975
80	27820.425	31454.8	41256.5	61855.6	79105.2
81	28426.825	32510.8	43206.5	63960	79703.825
82	29151.625	33474.4	45361.5	66195.1	81987.875
83	29931.85	34770.3	47239	68417.5	83400.525
84	30865.9	35876.8	49210	70205.5	85017.75
85	31935.2	37056.8	51281.5	72167.9	87649.025
86	32785.625	38212.6	53132.5	74019.2	89648.8

87	33852.375	39689.1	54989.5	76031.3	90596
88	34525.375	41147.9	56834.5	78050.7	92020.15
89	35841.55	42482.6	58879	79742.1	93386
90	36733.225	43820.8	60645.5	81328.8	94804.5
91	37818.975	45499.6	62238.5	83296.6	96160.6
92	39527.45	47563	63948	85896.4	97988.125
93	40144.525	49403.9	65533.5	87275.7	100165.8
94	41731.55	51422	67205.5	88804.7	102524.6
95	43209.75	53684.2	68927.5	90986.7	105172.4
96	44288.95	56066.7	70654.5	93276.3	108143.05
97	46160.8	58661.7	72304	96188.8	110493.7
98	48899.175	60721.9	74076	98479.8	112808.35
99	51884.5	62944.9	75999.5	102098.6	115308.5
100	56919.15	66074.8	78086.5	105565.8	118370
101	61437.7	68925.8	80863	109342.3	120776.525
102	65708.45	71744.3	83824	113410.5	125188.9
103	67580.55	73618.4	87374.5	117310	127585.05
104	69722.475	75325	89887.5	120930.1	132166.6
105	71055.025	76373.8	91908	122761.9	136304.4
106	71825.8	77158.9	93219.5	124644.5	140741.55
107	72863.95	78094.8	94725.5	125814	143809.425
108	73688.925	78725.3	95840	127886.5	146578.375
109	74026.125	79256.2	97215.5	130322.7	151192.7
110	74568.525	79794.2	98485.5	131687.3	155744.075
111	75104.375	80296.6	99803	133204	159102.4
112	75313.325	80800.7	101051.5	134308.8	161639.575
113	75748.575	81498.7	102672.5	135730.8	164076.8
114	76302.7	81979.6	103731	136822.8	170366.35
115	77079.2	82508.2	105130.5	138307.1	171664.325
116	77644.3	83254.1	106325	139427.2	172234.25
117	78038.825	83826.9	107214	141470.6	174158.05
118	78429.9	84510.6	108261	142735.4	178375.325
119	78655.25	84904.1	109176	144550.4	178568.25
120	79263.55	85283.2	110543	147176.7	179611.675
121	80075.95	85932.7	111569.5	148966.4	181244.875
122	80264.35	86545	112529.5	149824.9	184473.425
123	80856.5	86874.5	113185.5	152490.4	185796.625
124	80995.05	87630.9	114212.5	153528	186663.35
125	81236.3	88615.9	115366.5	155204.7	188736.275
126	81634.625	88980.6	116821	156928.5	190622.125
127	81936.525	89470.3	117935	158042.6	192735.325
128	82403.15	90122.4	119016.5	160056.5	194164.525
129	82797.3	90875.7	120012	161934.7	195426.775
130	83157.45	91325.8	121073.5	163494.2	196671.7
131	83266.05	91688.7	122135	165119.4	200872.375



132	83374.65	92318	122793	166284.8	204140.85
133	83484.225	92799.8	124026	167212.8	205232.85
134	83701.475	93400	125211.5	168755	206299.55
135	84106.85	94540.2	126125.5	170816.6	207365.65
136	84252.875	95084.9	126791.5	171670.4	210136.8
137	84397.925	95475.4	127785	173392.6	212087.65
138	84543.95	96033.8	128723	174889.6	215284.55
139	84961.4	96261.6	129800	176550.3	215418.575
140	85206.025	96758.1	130554.5	178409	215550.075

Table 44. Results from Single-Grain OSL Age-Depth Model in Wall FG

Depth (cm)	2.5% Quantile	10% Quantile	50% Quantile	90% Quantile	97.50% Quantile
0	3922.2	7853.7	14100	19181.5	21123.55
1	4161.575	8074.7	14314	19280.4	21187.6
2	4549.925	8519.2	14502	19465.8	21272.15
3	4894.775	8658	14682.5	19560.8	21348.325
4	5043.95	8865.6	14849.5	19734	21426.6
5	5805.075	9151.7	15092.5	19798.2	21519.525
6	6194.775	9413.4	15285.5	19853.2	21630.675
7	6420.9	9746.8	15499.5	19940.7	21721.9
8	6663.825	10097.6	15711	20069.5	21845.2
9	7099.7	10459.7	15903	20207.1	22022.475
10	7352.95	10936.5	16102.5	20340.7	22111.925
11	7686.675	11401.5	16339.5	20532.2	22236.925
12	8007.475	11826.9	16563	20660.9	22343.15
13	8744.625	12282.5	16772	20809.5	22498.1
14	9608.25	12815.4	16941.5	20966.1	22783.075
15	10323.175	13142.6	17179	21168.5	22973.375
16	11057.725	13585.3	17531.5	21375.8	23064.8
17	11641.425	14035.1	17946.5	21585.2	23360.125
18	12489.2	14497.7	18294.5	21914.3	23688.275
19	13346.175	15065.7	18675	22465.3	24156.25
20	13923.725	15497.5	19168	23035.9	25209.725
21	14234.675	15972.2	19550.5	23388.7	25981.725
22	14534.6	16387.3	19881	23785.6	26702.8
23	14814.65	16758.7	20277.5	24293.1	27023.8
24	15209.625	17034	20584.5	24704.2	27651.875
25	15384.875	17259.8	20901	25080.1	28124.8
26	15448.85	17481.8	21240	25446.8	28409.775
27	15606.7	17727.2	21595	25930.9	28921.05
28	15718.6	17971.2	21894.5	26287.2	29097.575
29	15903.375	18269.8	22276	26577.4	29205.725
30	15967.7	18455.9	22576.5	26994.5	29531.05
31	16179.575	18651.5	22888.5	27492.6	29711.975

32	16211.4	18948.5	23154.5	27922.1	29947.5
33	16320.1	19136.1	23443.5	28231.6	30301.425
34	16387.175	19341.6	23740	28593.2	30644.5
35	16439.15	19560.5	24074.5	28905.5	30995.825
36	16524.325	19731.5	24336.5	29296.6	31330.95
37	16591.125	19941.5	24582.5	29629	31744.35
38	16660.65	20139.9	24907.5	30068.1	32071.4
39	16804.875	20329.9	25237.5	30467.8	32547.125
40	16998.775	20468.6	25614.5	30892.2	32959.075
41	17195.725	20574.8	26036	31269.7	33407.7
42	17387.55	20699.5	26318	31648.5	33744.5
43	17796.725	20896.8	26687	32068.7	34338.275
44	18072.675	21284.2	27041.5	32509	34668.3
45	18189.725	21601.5	27563	32976.6	35353.025
46	18583.725	21849.9	28103	33584.1	35998.025
47	19061.125	22195.9	28627	34176.7	36541.1
48	19421.825	22610.6	29207	34606	36932.425
49	19796.425	23231.5	29621	35075	37597.975
50	20113	23776.8	29993.5	35406.6	38170.8
51	20697.7	24058.2	30376	35896.3	38810
52	21323.85	24449.5	30688	36296.3	39121.05
53	21687.775	24707.5	31087.5	36653.1	39779.025
54	22023.375	24975.7	31400.5	36941.3	40134
55	22245.675	25215.7	31773.5	37152.6	40581.225
56	22487.95	25469.7	32125.5	37453.1	40885.025
57	22742.15	25624.8	32441.5	37749.7	41219
58	22912.725	25929	32770.5	38081.8	41617.175
59	23094.525	26246.8	33042.5	38410.6	42043.6
60	23246.85	26534.7	33333.5	38688.3	42336.375
61	23489.35	26825.2	33528.5	38909.6	42665.225
62	23681.225	27026.1	33823	39291	43001.2
63	23816.925	27218.3	34076.5	39650.2	43352.8
64	23995.875	27461.1	34314.5	40009.3	44144.1
65	24342.75	27732.8	34498.5	40420.8	44670.225
66	24630.6	27854.9	34782.5	40905.3	45072.275
67	24969.975	28090.7	35026	41517.7	45502.075
68	25143.625	28385.8	35253.5	42068.9	45912.375
69	25431.65	28571.7	35469	42686	46117.4
70	25488.85	28755.9	35760	43185.7	46668.8
71	25597.3	28970.4	35984	43725.5	47225.375
72	25720.975	29220.1	36193.5	44328.2	47757.4
73	26080.575	29693.6	36448	44946.4	48502.25
74	26404.775	29855.3	36818.5	45621.4	49087.35
75	26791.925	30262.7	37181.5	46251.4	49365.575
76	27162.475	30530.1	37550.5	46912	50037.175

77	27448.775	31183.9	38033.5	47519.6	51142.275
78	28082.35	31503.7	38491.5	47968.1	52050.5
79	28519.475	31938.1	39036.5	48701.1	52674.95
80	28863	32377.5	39361.5	49198.9	53485.15
81	28990.55	32653.8	39651.5	49510.1	54093.275
82	29123.225	32848.3	39907	49996.6	54420.45
83	29251.6	33152.5	40201.5	50412.1	54839.575
84	29498	33242.9	40430.5	50868.3	55388.25
85	29585.025	33501.6	40633.5	51312.6	55904.1
86	29661.35	33703.6	40917.5	51755.2	56226.3
87	30081.85	33875	41061	52236.9	56546.925
88	30229.675	33969.4	41291.5	52568.5	57124.7
89	30327.075	34095.9	41428.5	52897.3	57435.775
90	30439.4	34262.6	41558.5	53117.6	57593.05
91	30476.7	34406.5	41681	53303.7	58564.8
92	30659.475	34490.3	41837.5	53824.3	59232.25
93	30770.5	34681.1	42065	54183.5	59720.975
94	30880.55	34866.1	42205.5	54548.3	60247.325
95	30990.8	35109.4	42396.5	54824	60457.325
96	31103.175	35312.9	42588	55082.4	60995.525
97	31214.6	35472.3	42759	55543.5	61394.475
98	31326.025	35597.6	42903	55677.3	61613.375
99	31690.625	35735.8	43037	55839.5	61957.6
100	31710.95	35927.5	43177	56085.4	62082.7
101	31828.575	36055.4	43409.5	56264.6	62388.525
102	31884.55	36147.9	43658	56331.2	62755.675
103	31934.775	36242.2	43803.5	56603.3	63198.375
104	32520.975	36460.2	44025	56794.1	63350.875
105	32556.575	36557.8	44096	56882	63963.35
106	32681.55	36707.1	44300	57023	64108.3
107	32904.55	36778.5	44494	57333.1	64254.3
108	33018.225	36936.9	44731	57596.2	64709.7
109	33060.425	36994.8	44915.5	57820.5	65007.7
110	33164.475	37107.6	45083.5	57969.2	65457.9
111	33498.15	37333	45184	58216.3	66033.1
112	33802.9	37478.9	45321	58558.6	66723.725
113	33840.475	37613.4	45434.5	58776.7	66769.85
114	33877.05	37766.5	45666	59002.6	66814.75
115	33913.65	37922.5	45794.5	59389.1	67051.75
116	34081.875	38061.9	46182	59652	67370.1
117	34119.45	38247.1	46385.5	59854.2	67685.95
118	34195.975	38348.8	46563	60276.1	68160.9
119	34263.175	38440.7	46727	60578.3	68306.65
120	34268	38509.3	46896	60812.2	68617.3
121	34493.9	38675.3	47125.5	61041.3	68832.525

122	34663.2	38766	47293	61279.6	68920.35
123	34726.125	38878.5	47479.5	61507.4	69141.7
124	34828.05	38957.1	47570.5	61767.8	69227.55
125	34973.825	39125.7	47781	62012.3	69482.1
126	35126.45	39238.7	47952	62258.5	69727.625
127	35182.55	39289.3	48140	62596.3	70662.925
128	35213.3	39373.2	48331	62796.5	70995.45
129	35283.95	39445.9	48558	63097.6	71239.25
130	35375.375	39557.3	48707.5	63236.4	71761.025
131	35408.3	39664.6	48848.5	63399.2	72024.225
132	35440.7	39846.3	49030	63754	72172.475
133	35515.9	39988	49202.5	63975.6	72706.1
134	35550.7	40021.6	49369	64396	73368.95
135	35655.725	40151.7	49514.5	64756.1	73540.25
136	35671.75	40234.6	49654.5	65149.5	73920.775
137	35689.35	40323.9	49864	65224.2	74209.7
138	35768.425	40500.5	50003	65564.3	75157.65
139	35918.925	40556	50202.5	65704	75704.4
140	36066.875	40636.3	50328.5	65937.1	75772.125

Table 45. Results from Small Aliquot OSL Age-Depth Model in Wall AB

Depth (cm)	2.5% Quantile	10% Quantile	50% Quantile	90% Quantile	97.50% Quantile
0	-69	-69	517.5	5599.3	9006.65
1	-69	-69	897	5898.1	9479.3
2	-69	-69	1140	6297.6	9670.175
3	-69	-69	1404.5	6637.7	10073.05
4	-69	-69	1619.5	6917	10504.175
5	-69	-69	1794.5	7259.5	10715.75
6	-69	-69	1999.5	7478.7	10876.975
7	-69	-69	2160	7685.4	11033.075
8	-69	-69	2351	7959.6	11438.05
9	-69	-69	2537	8145.8	11630.9
10	-69	-69	2697.5	8530.1	11883.525
11	-69	-69	2915.5	8806.5	12017.05
12	-69	-69	3084.5	8948	12233.275
13	-69	-69	3247	9243	12451.9
14	-69	-69	3458	9490.2	12654.55
15	-69	-69	3663.5	9697.9	12789.8
16	-69	-69	3903	9983	12913.85
17	-69	-69	4132	10189.7	13089.925
18	-69	-69	4413.5	10415.7	13256
19	-69	-69	4653.5	10731.3	13465.425
20	-69	-69	4904	10906.8	13611.6
21	-69	-69	5136.5	11076.5	13789.975

22	-69	-69	5358.5	11299.7	13943.95
23	-69	-69	5567.5	11453.4	14078.2
24	-69	-69	5800	11629.1	14347.425
25	-69	-69	6081	11804.9	14503.225
26	-69	-69	6238	12157.3	14804.775
27	-69	-69	6500	12390.4	15037.1
28	-69	-69	6829	12580.7	15204.35
29	-69	-69	7089.5	12777.4	15380.225
30	-69	-69	7311	13032.7	15545.625
31	-69	-69	7541	13277.9	15622.825
32	-69	-69	7831	13398.7	15740.675
33	-69	-69	8179.5	13704.1	15903.15
34	-69	-69	8509.5	13869.2	16099.275
35	-69	514.2	8838	14139.1	16213.15
36	-69	1253.8	9162	14383.5	16461.7
37	-69	1767	9421	14717.6	16587.475
38	-69	2611.5	9690.5	14991.3	16914.5
39	-69	3369.9	10178	15303.5	17138.6
40	-69	4304.4	10482	15563.2	17455.075
41	579.725	4829.3	10896	15857.1	17716.175
42	1592.625	5543.6	11265	16256.8	18004.925
43	2820.45	6432.4	11938.5	16626.1	18630
44	3859.325	7371	12579.5	17211.5	19362.1
45	5440.3	8314.4	13417	17965	20302.15
46	6471.775	9056.5	14101	18693	21066.775
47	6879.05	9613.6	14655.5	19305.1	21989.4
48	7235.375	10053.5	15057	19804.9	22535.35
49	7680.35	10641.5	15590	20263.8	22874.875
50	8579.775	11017.1	16162	20783	23428.575
51	9005.775	11565.4	16570	21302.6	24058.9
52	9462.475	12010.5	16945	21879.2	24460.65
53	9773.375	12412.7	17358	22441	25272.125
54	10204.55	12946.2	17774	23037.5	25738.125
55	10474.65	13303.6	18265	23446	26248.3
56	10780	13672.3	18844.5	23739.3	26482.45
57	11084.175	14045.3	19307	24103.3	26944.875
58	11517.7	14442.1	19696	24498.6	27417.925
59	12231.35	14949.8	20208	25017.2	27853.075
60	12520.375	15538.4	20693.5	25461	28291.9
61	12832.625	15917.9	21091	25925.5	28538.625
62	13375.575	16374.3	21593	26303.5	28876.125
63	13763.95	16774.7	22021.5	26759	29173.4
64	14117.6	17231.3	22473.5	27132.4	29463.1
65	14498.7	17779.7	22999	27556.1	29763.325
66	15011.75	18265	23404.5	27951.6	30188.7

67	15726.75	18647.3	23898.5	28484.3	30832.675
68	16194.975	19081.7	24395	28945.1	31289.275
69	16724	19456.6	24880	29304.5	31941.225
70	17367.85	19982.9	25422	29819.9	32489.85
71	18150.575	20575	25924	30384.6	33307.2
72	18840.25	21229.6	26663	31089.9	34032.825
73	19608.15	22098.7	27464.5	32011.5	35027
74	20354.375	22948	28268	32731.2	36033.225
75	21095.15	23864.7	29096.5	33717.1	36948.575
76	21701.625	24708.4	29566.5	34663.9	37850.5
77	22540.85	25370.9	30048.5	35289.7	38704.6
78	23440.025	25968.9	30523	36147.5	39351.825
79	24171.4	26507.5	31028.5	36737.4	40552.525
80	24541.95	27097.5	31477.5	37394.9	41162.75
81	24999.25	27584.5	31990.5	38029.3	41942.05
82	25392.725	28158.2	32421	38716.9	42956.25
83	25762.375	28641.9	32954.5	39323.9	43875.825
84	26293.45	29067.1	33427.5	40007.7	44828.15
85	26814.45	29547.6	34028.5	40693.6	45836.25
86	27555.075	30135.3	34740	41597.8	47083.75
87	28388.925	30728.6	35576.5	42737.6	48254.375
88	29185.25	31395.9	36573	44138.5	49219.775
89	30001.725	32214.6	37702.5	45477	50671.075
90	30803.125	32945.8	38701	46319	51524.95
91	31110.8	33444.5	39492.5	47481.4	52092.45
92	31675.95	34085.3	40100	48185.6	52760.375
93	31974.9	34706	40811.5	49184.8	53644.725
94	32572.1	35222.2	41519	49574.7	54202.2
95	33262.425	35943	42075.5	50250	54989.125
96	33929.925	36499.8	42752.5	50837.8	55654.95
97	34389.9	37090.4	43491.5	51680.1	56146.5
98	34797.825	37625.8	44155	52224.4	56999.575
99	35151.9	38046.8	44843	52975.5	57842.625
100	35701.675	38527.8	45489.5	53517.1	58497.275
101	36076.75	39249.5	46114	54015.4	59308.9
102	36434.7	39828.8	46675.5	54872.9	60025.15
103	36982.525	40217.2	47311	55592.3	60941.225
104	37423.45	41110.9	47859.5	56317.4	61840.75
105	38020.025	41482.2	48474	56903.6	62522.3
106	38627	41973.9	49318.5	57740.9	63114.125
107	38979.5	42507.3	49938.5	58316.6	63471.55
108	39772.925	43078.6	50487	58708.6	64472.1
109	40040.15	43491.5	51192.5	59222.3	65505.55
110	40486.1	44223.4	51722.5	59876	66044.525
111	41351.875	44949.5	52278.5	60426.4	66547.775

112	42015.325	45608.9	52929.5	60893.5	67211.225
113	42796.3	46273.9	53544.5	61423.1	67825.85
114	43439.725	46833.3	54120.5	62360.5	68908.1
115	44329.575	47505.9	54794	62742	69595.05
116	45094.5	48352.4	55421	63098.4	70328.95
117	45767.8	49147.7	56099	63568.4	71982.375
118	46501.475	49908.8	57099.5	64581.1	72758.3
119	47585.025	50787.7	58114	65326	73884.3
120	48193.25	51789.8	59303.5	65904.9	74341.775
121	48937.675	52653.7	60391.5	66975.5	74712.2
122	50080.2	53582	61093.5	67452.7	75356.85
123	50559.55	54285.6	61735.5	68025.9	75595.125
124	50903.2	54761.7	62336.5	68669	76014.6
125	51607.25	55212.3	62929	69184.4	76260.725
126	51971.575	55684.5	63536.5	69657.8	76635.2
127	52462.9	56314.8	64120	70226.4	76979.975
128	52775	56652.8	64503	70816.3	77404.625
129	53357.95	57076.9	64887	71329.1	77550.4
130	53884.5	57768.4	65457	72044.3	77652.85
131	54324.325	58319.7	65978	72677.9	78486.825
132	55031.2	58789.9	66470.5	73295.8	78867
133	55750.85	59431.9	67015.5	73930	79157.75
134	56380.425	60258.9	67607.5	74583.6	79687.725
135	56724.15	60823	68241.5	75454.9	80476.3
136	57427.95	61841.2	69145.5	76513.7	81639.625
137	58305.575	62640.8	70158	77762	82922.1
138	59196.425	63440.2	71169.5	79163.3	84522.025
139	60079.8	64532.8	72149.5	80428.1	85677.15
140	60880.325	65106.4	72907	81218.3	86438.35

Table 46. Results from Small Aliquot OSL Age-Depth Model in Wall DE

Depth (cm)	2.5% Quantile	10% Quantile	50% Quantile	90% Quantile	97.50% Quantile
0	462.125	1881.7	9842.5	21689	26830.125
1	1092.45	2749.4	10532	22099.8	27005.3
2	1553.9	3306.8	11108	22500.6	27204.6
3	1879.725	3805.8	11724.5	22713.7	27412.975
4	2166.875	4288	12362	22960.7	27620.775
5	2523.325	4722.5	12800.5	23170.8	27799.775
6	2760.375	5255.1	13201	23572.3	27999.05
7	3013.875	5623.6	13863	23911	28197.35
8	3287.175	6093	14343.5	24143	28396.6
9	3568.25	6486.5	14951.5	24423.4	28596.075
10	3811.775	6805.6	15288	24708.2	28873.15
11	3936.45	7220.4	15625	25093.2	29091.95

12	4388.675	7626.7	15981	25426.1	29364.6
13	4674.575	8157.6	16371	25667.3	29512.1
14	4957.975	8634.4	16813.5	25899.8	29840.65
15	5182.85	9075	17206	26170.1	30097.075
16	5387.8	9468.6	17648.5	26401.7	30279.475
17	5593.575	9945.3	18053.5	26668.6	30567.15
18	5972.525	10424.3	18462	26939.1	30684.125
19	6192.775	10838.8	18872.5	27202.1	30872.425
20	6497.375	11348.3	19355.5	27535.8	31070.175
21	6898.675	11794	19768.5	27775.4	31283.025
22	7087.475	12077.1	20192	28008.1	31495.625
23	7258.325	12566	20618.5	28310	31700.95
24	7626.025	12945.5	21105	28560.3	31906.375
25	7880.475	13494.6	21578.5	28868	32110.85
26	8359.9	13893.7	22093	29112.2	32314.825
27	8649.325	14365.5	22553	29361.3	32520.95
28	9379.675	14770.1	23084	29679.2	32710.425
29	9657.95	15219.4	23598.5	30032.2	32933.125
30	10452.975	15627.3	24051.5	30372.5	33171.8
31	11326.425	15936.8	24500	30657.3	33448.05
32	11559.65	16424.9	25009.5	31004	33783.225
33	12695.6	16992.2	25561.5	31427.8	34197.85
34	13659.925	17512.7	26083.5	31738.4	34583.15
35	14372.95	18084.9	26586	32141.6	34852.75
36	14712.875	18656.7	27235	32693.1	35342.8
37	15678.375	19095.4	27892	33225.5	35838.075
38	16672.2	19909	28672	33822.2	36665.5
39	17337.925	21111.4	29518	34632.7	37516.225
40	18494.4	22395.4	30273	35529.7	38614.275
41	19642.325	23384.2	30978.5	36412.1	39512.225
42	20634.025	24131	31661.5	37254.8	40299.05
43	21395.275	24987.9	32223	38031.5	41332.475
44	22069.675	25728.2	32837	38755.8	42586.125
45	22890.95	26500.4	33405.5	39344.8	43302.925
46	23527.925	27104	33863.5	39903.8	43951.4
47	23950.75	27648	34357	40361.5	44553.65
48	24356.65	28238	34843.5	40918.8	45144.125
49	24744.725	28706.7	35297.5	41251.7	45853.35
50	25081.75	29239.4	35725.5	41977.1	46352.725
51	25355.95	29723.9	36137.5	42626.7	46765.325
52	25786.425	30318.9	36668	43054.1	47372.2
53	26163.275	30779.2	37170	43752.2	47932.2
54	26540.125	31303.4	37576	44260.3	48318.075
55	27084.75	31717.3	38054	44730.6	48714.925
56	27475.4	32270.1	38467	45361.2	49253.375



57	27936.3	32689.9	38881.5	46049.5	49520.675
58	28187.925	33051.5	39439.5	46624.2	50362.075
59	28426.625	33491.8	39910	47124.5	50969.8
60	28692.85	33765.6	40422	47598.6	51377.8
61	29177.175	34210.9	40980.5	48147.3	51739.375
62	29818.975	34655.1	41547	48742.9	52121.175
63	30710.375	35109.4	41960.5	49333.9	52835.65
64	31201.9	35439	42637	49903.9	53201.075
65	32300.025	35941.4	43187	50365.7	53721.175
66	33408.475	36540.4	43679	50844	54267.8
67	34000.3	37051.1	44114.5	51458	55031.425
68	34560.875	37540.3	44696	52174.2	55557.875
69	35362.4	38247.2	45360.5	52773.2	56175.075
70	35918.475	39198.4	46046.5	53396.3	57230.05
71	36428.75	40023.8	46994	54505.5	58594.725
72	37649.375	41118.6	48414	56268.1	60929.325
73	38992.975	42317.5	49831.5	57793.4	63335.9
74	40648.675	43848	51401.5	59494.7	65365.15
75	42043.175	45093.3	53046	61852.7	68253.1
76	42859.125	46321	54477.5	63941.2	70716.35
77	43579.725	47437.2	55771.5	65447.4	72779.275
78	44282.35	48490.8	56922.5	67051.9	76113.925
79	45269.675	49404.7	58185.5	68563	78026.175
80	45870.925	50263.7	59279	70005	78516.5
81	46589.9	51401.3	60353	71511.3	79994
82	47086.275	52435.8	61506	72774.3	81254.325
83	47459.025	53405	62660	74288.1	81750.55
84	48073.925	54376.7	63745.5	75554.2	82858.15
85	49185.575	55318.3	64649	76702.3	84107.075
86	49684.425	56218.1	65575.5	77918.8	85622.375
87	50765.925	56872.3	66643	78902.5	86522.775
88	51327.575	57700.9	67653	79978.6	87417.35
89	52009.475	58782.3	68746.5	81070	88288
90	52885.6	59862.5	69929	82078.4	89730.875
91	54101	60668.5	70879	82983.3	90692.225
92	54636.475	61569.1	71920	84046.2	91419.525
93	55126.15	62515.3	72988	85193.4	92456.95
94	55903.875	63675.8	74040	86439.5	93444.7
95	57475.65	64571	75289.5	87543.4	95954.525
96	58494.875	65654.1	76435.5	88720.1	97200.675
97	59343.5	67203.5	77714.5	89892.1	99014
98	60693.525	68229.1	79183.5	91198.9	100041.475
99	62318.7	69464.3	80656.5	92386.2	102187.075
100	65044.05	70862.6	82308.5	93797.3	104215.1
101	68430.85	72981	84631	95996.4	108912.525

102	70519.65	74429.5	87392.5	99452.7	112314.7
103	71697.875	76100.1	89741.5	104879.2	121877.025
104	72712.375	77457.3	91542.5	108760.1	124539
105	73986.65	78501.1	92720.5	110789.5	128489.7
106	74986.025	79546.5	93695	113203.6	132392.4
107	75651.9	80421.5	94919	115804.7	134336.875
108	75882.85	81059.2	96050	118537.1	137356.75
109	76418.125	81813.1	97213.5	120517.4	139902.975
110	76669.5	82437.1	98143.5	122117.6	140654.4
111	76748.775	83251.7	98896.5	123938.9	142611.65
112	77106.475	83780.5	99977	126213.8	144544.85
113	77530.025	84532.2	100852	128939.7	146510.45
114	77698.675	85179.9	101763	130746.4	149828.8
115	78039.075	85892.3	102594	132522	151724.475
116	78459.1	86334.2	103408.5	134225.2	155352.1
117	78699.025	87012.5	104276	136342	157497.275
118	78990.8	87502.3	105545.5	137883.3	160985.775
119	79184.875	88022.6	106453.5	139983.2	163944.625
120	79563.475	88445.4	107536	140796.8	164886.3
121	79917.025	88904.3	108507.5	142218.8	166773.8
122	80246.15	89489.8	109398.5	144188.9	169104
123	80509.9	89895.5	110438.5	145805.3	170482.25
124	80773.625	90217.8	111858	148147.9	173152.85
125	81039.075	90677.6	112724.5	148945.3	175073.275
126	81477.6	91366.6	114088.5	150747.5	177439.2
127	81954.875	91979.6	114907.5	153220.7	179899.75
128	82455.625	92358.6	116061	154489.2	181373.425
129	82913.625	93441.7	116952	155564.6	182682
130	83347.85	93863.5	117707.5	156620.1	183933.575
131	83869.975	94459.6	118859.5	158121.4	185199.85
132	84357.3	94864.1	119679	160438.2	185923.125
133	84578.225	95229.4	120513.5	162416.5	187752.15
134	84719.025	95609.5	121356.5	164427.6	189033
135	85170.075	95869	122009	165869.6	191008.525
136	85540.725	96421	123061.5	167125.6	192815.25
137	86244.025	96722.9	124026	168897	198399.325
138	86494.25	97149.4	124829.5	170592.9	200380.375
139	87140.925	97940.1	125855	171986.2	201246.775
140	87371.575	98158.8	126993.5	173256	201706.35

Table 47. Results from Small Aliquot OSL Age-Depth Model in Wall FG

Depth (cm)	2.5% Quantile	10% Quantile	50% Quantile	90% Quantile	97.50% Quantile
0	13328.575	17578.8	22521.5	27285.1	30688.7

1	13388.9	17624.6	22588.5	27324.2	30748.2
2	13402.4	17673.9	22648	27371.3	30804.15
3	13509.6	17700.8	22704	27435.3	30881.525
4	13521.1	17749.1	22740.5	27500.9	30995.325
5	13819	17817	22808.5	27571.4	31136.3
6	14016.55	17910.5	22824.5	27593.7	31209.4
7	14118.625	18029.3	22839.5	27657.3	31319.85
8	14136.225	18102.2	22861	27697.8	31461.5
9	14146	18161	22936.5	27744.3	31505.65
10	14154.825	18180.1	22982.5	27772.3	31646.075
11	14235.225	18236.8	23058.5	27795.8	31684.1
12	14551.8	18306.7	23130.5	27802.2	31718.475
13	14667.975	18480.9	23171	27905.2	31752.85
14	14681.85	18662	23227.5	27968	31877.25
15	15115.8	18693.8	23303	28016.9	32083.825
16	15143.875	18818.1	23369.5	28065	32127
17	15186.625	18987.8	23478.5	28343.2	32320.2
18	15412.925	19201.7	23561.5	28477.2	32475.05
19	15693.45	19406	23674.5	28557.1	32876.575
20	16196.2	19535.5	23808	28737.9	33072.525
21	16549.95	19676.1	24009.5	28950.1	33222.45
22	16737.25	19894.7	24170.5	29165	33396.775
23	17143.2	20085.9	24372	29330.8	33549.15
24	17410.325	20245.8	24569.5	29547.3	33665.125
25	17612.325	20455.5	24744	29750.2	33730.775
26	17945.975	20605.4	24912	29909.4	33809.875
27	18188.95	20809.9	25105.5	29996.1	33895.55
28	18345.15	20981.5	25290.5	30123.5	33980.6
29	18557.875	21208.7	25445.5	30266.3	34065.175
30	18824.25	21349.4	25616.5	30380.4	34102.05
31	18904.4	21581.6	25777	30571.4	34191.025
32	18995.875	21792.8	25967	30766.8	34272.275
33	19128.425	21945.2	26107.5	30957.4	34478.65
34	19296.125	22134.4	26278.5	31143.5	34740.875
35	19385.225	22219.9	26429	31344.4	34942.75
36	19429.875	22338	26559	31451.4	35070.9
37	19543.65	22531.5	26696.5	31573	35167.775
38	19794.925	22685.7	26868	31835	35330.35
39	19910.175	22929.4	27007	32008.8	35491.025
40	20040.25	23058.2	27135.5	32134	35634.5
41	20222.625	23213.7	27286	32341.8	35757.5
42	20378.725	23395.6	27499	32522.4	35979.2
43	20587.825	23529.8	27692	32735.8	36120.525
44	20769.075	23671.1	27867.5	32959.4	36303.475
45	20862.425	23792.8	28052	33151.7	36409.875

46	20980.2	23945.8	28191.5	33439.3	36594.375
47	21107.025	24165.8	28373.5	33712.7	36731.5
48	21233.625	24379.9	28548.5	33887.1	36923.725
49	21360.225	24620.2	28721	34014.4	37065.525
50	21485.875	24855.6	28920.5	34135.1	37193.225
51	21612.475	25026.6	29075	34238	37395.225
52	21671.875	25206.9	29211.5	34356.3	37489.975
53	21728.9	25361.7	29352	34532.3	37615.225
54	21785.9	25449.3	29521	34725.3	37769.7
55	21842.9	25576.9	29703	34833	37925.175
56	21899.9	25698	29826	35033	38066.375
57	21956.925	25792.6	29994.5	35108.7	38299.35
58	22013.925	25887.5	30151	35302	38479.575
59	22070.925	25978.2	30311.5	35483.6	38601.4
60	22201.075	26071.5	30476	35608.2	38756.525
61	22334.075	26243.1	30656.5	35738	38880.1
62	22471.525	26362.2	30797.5	35842.9	38990.625
63	22608.75	26541.8	30959.5	35939.1	39128.1
64	22741.25	26680.6	31145	36036.1	39305.55
65	22873.725	26802.2	31304	36158.4	39445.925
66	23007.2	26914.3	31467.5	36258.4	39655.05
67	23142.025	27020.1	31624.5	36451.7	39837.025
68	23279.325	27108.8	31778.5	36544.4	39951.625
69	23414.7	27209.5	31898.5	36667.9	40108.175
70	23487.85	27314.5	32047	36898.3	40263.75
71	23563.625	27416.3	32189	37212.2	40420.025
72	23792.45	27556.1	32357.5	37369.1	40645.075
73	23959.35	27638.8	32515.5	37566.6	40753.225
74	24094.625	27727.7	32679.5	37743.4	40884.125
75	24246.6	27828.4	32817	37916	41088.55
76	24422.575	27985.8	32977	38110.1	41297.55
77	24500.95	28182.5	33118	38340	41484.6
78	24562.275	28190.7	33242.5	38493.2	41552.95
79	24566.325	28365.7	33352.5	38677.3	41646.65
80	24570.375	28515.9	33416.5	38769.6	41947.35
81	24574.425	28580.6	33528	38850.9	42019.325
82	24578.45	28594	33585	38915.7	42091.05
83	24582.5	28619.5	33650	39125.1	42124.625
84	24586.55	28652.1	33687	39249.7	42188.3
85	24589.625	28680.1	33743.5	39438.3	42430.85
86	24593.675	28684.8	33775.5	39597	42543.2
87	24597.725	28690.4	33828	39661	42718.125
88	24601.775	28695.1	33898.5	39743.3	42894.725
89	24605.825	28699.8	33948	39821.1	43015.4
90	24609.875	28705.4	33990	39959.2	43139.725

91	24612.95	28711.6	34071	40038.5	43179.225
92	24617	28734.8	34124	40093.6	43600.75
93	24622.95	28763.5	34200.5	40138.3	43734.05
94	24628.9	28794.8	34209.5	40240.8	43865.05
95	24634.85	28818.4	34214	40295.3	43900.925
96	24640.8	28846	34233.5	40383.9	44101.375
97	24646.75	28865	34246.5	40578.6	44201.925
98	24651.7	28901.1	34256	40628	44392.925
99	24657.65	28926.5	34291.5	40683.6	44526.425
100	24663.6	28930.5	34314.5	40736.7	44661.125
101	24669.625	28936.5	34379.5	40853.2	44795.55
102	24686.725	28971.4	34450.5	40894	44914.375
103	24710.275	29014.4	34493.5	40970.7	45013.3
104	24723.7	29059	34524.5	41152	45114.15
105	24752.95	29102	34575.5	41177.5	45228.65
106	24753.925	29142.6	34599.5	41218.6	45343.175
107	24756	29158.4	34622.5	41284.8	45457.675
108	24766.775	29186.1	34655.5	41328.9	45569.7
109	24814.575	29214	34687.5	41431.1	45682.425
110	24862.375	29239.7	34711.5	41526.9	45801.025
111	24910.175	29250.9	34793.5	41577.9	45867.075
112	24918.025	29254.9	34841.5	41622.6	45935.3
113	24920.975	29258.1	34868.5	41637.6	46015.975
114	24924.9	29262.1	34888	41707.3	46083.3
115	24927.85	29273.5	34929	41787.7	46180.875
116	24930.8	29310.8	34961	41827.3	46278.45
117	24933.775	29314.8	35006	41903.1	46376.975
118	24937.725	29317.8	35049.5	41919.2	46474.55
119	24940.8	29332.3	35087.5	41963.3	46572.1
120	24943.875	29388.4	35115	41982.1	46850.625
121	24946.95	29444.6	35135	41997.2	46931.025
122	24951	29462.5	35175.5	42112.7	47017.875
123	24954.075	29478	35187.5	42241.3	47103.725
124	24957.15	29498.4	35195	42334.9	47231.175
125	24961.2	29530	35214	42433.5	47276.125
126	24964.275	29534.7	35220.5	42522.2	47380.55
127	24967.35	29539.4	35250.5	42569.1	47483.625
128	24970.425	29544.1	35273	42591.6	47526.125
129	24974.475	29548.8	35291	42636.5	47549.475
130	24977.525	29557.6	35317.5	42665.5	47636.075
131	24979.625	29567.9	35343.5	42729.4	47655.025
132	24980.75	29578.2	35390	42818.5	47698.675
133	24980.9	29588.5	35459	42862.9	47740.9
134	24982.025	29597.9	35480.5	42902.4	47782.15
135	24983.15	29608.2	35504.5	42939.7	47824.4

136	24983.3	29615	35539.5	42976.1	47866.975
137	24984.425	29632.9	35580	43037.7	47998.05
138	24985.55	29643.1	35615	43078.3	48223.7
139	24985.7	29653.9	35649	43138.8	48240.45
140	24986.825	29666.1	35669.5	43262.5	48256.625

### TABLES OF SEDIMENTATION RATES

Table 48. Sedimentation Rates in Wall AB According to the Radiocarbon Age-Depth Model

Depth (cm)	2.5% Quantile	10% Quantile	50% Quantile	90% Quantile	97.50% Quantile
1	19	34	106	447.2	994.025
2	19	34.9	105	439.5	988.1
3	18.975	34	105.5	424.2	868.6
4	19.95	34	106	430	876.45
5	19.975	34	106	427.1	972.1
6	19.975	34	106.5	441	929.075
7	20	34	106	442.2	910.55
8	20	34	107	404.3	821.025
9	20	34	109	392.2	882.1
10	20	35	109	398.1	837.45
11	20.975	35.9	112	417.6	952.05
12	20	36	110	415	1003.475
13	20	35.9	110	385.3	847.125
14	20	36	107	402.1	922.675
15	20	36	106	398.5	770.125
16	20.975	36	108.5	409.6	887.275
17	20	36	108	436.1	923.525
18	21	38	116	404	847.225
19	22	40	117	419.4	1078.35
20	23	42	121	404.3	914.725
21	23.975	43	126	415.2	1109.325
22	24.975	44.9	137.5	392.3	889.025
23	25	47	148	463	889.025
24	25.975	50.9	165.5	551.2	923.625
25	26	56	194.5	668.2	1107.775
26	31	61	247.5	1255.4	2352.275
27	8	13	30	96	158.15
28	5	11	26	51	78
29	5	9.9	24	38	68.05

30	5	9	22	36	54.175
31	5	9	22	37	60.025
32	4	9	22	36	60
33	5	9	23	39	58.025
34	6	11	26	51	80
35	7	13	29.5	84.2	161.025
36	282	332	435	543	604
37	12	21	47	149	233.075
38	10	17	42	78	122
39	10	15	37.5	62	94
40	9	14	35	57	81.025
41	9	14	35	57	82.05
42	8	14	35	57	86.025
43	9	15	37	63	92.05
44	9	16	40	78	119.025
45	11	19	47	144	256.125
46	87.975	125	206	272	298.05
47	9	16	48	197.1	321
48	8	14	40	106	173.025
49	7.975	13	35	77.1	132.025
50	8	12	31	66	124
51	7	12	29	61.1	95.1
52	6	12	29	61.1	110.05
53	7	12	29	60	106.025
54	6	12	29	61	103.075
55	6	12	30	62	109.05
56	6	12	30.5	64	119
57	7	12	32	69	120
58	8	13	35	85	145
59	7.975	14	39	103.1	157
60	11	17	48	197.2	376
61	158.975	269.9	580.5	1660.3	2732.35
62	141.95	230.9	553	834.2	1513.025
63	132.825	214.9	505	660.3	1057.1
64	124.925	205	474	623	1018.1
65	126.975	202.9	492.5	627.3	1120.075
66	134.975	208	505	677.3	964.075
67	139.975	227.9	554	928.1	1306.025
68	164.975	286	585	1928.2	2834.025
69	221.8	389.9	550	673	878.025
70	224.9	406.8	557	710.3	909.025
71	246.95	378.9	789	2259.1	3451.975
72	216.975	322.7	760.5	1040.6	1577.55
73	189.975	298.8	705.5	856.1	1372.35
74	182	281.9	685.5	835	1197.375

75	177	307.7	727.5	886.3	1535.175
76	180.95	327	766	1145.5	1607.125
77	215.975	401.7	795	2092.3	3270.275
78	159	294	795.5	3153	6776.875
79	150.95	270.8	724	1815.8	3009.075
80	142.975	249	632.5	1448	2451.475
81	131	229	579	1300.2	2257.425
82	122	207.8	542.5	1304.1	2119.8
83	121	205	518	1229.3	2185.35
84	117.975	195.7	503	1194.7	2179.525
85	114.9	194.9	490	1105.2	1953
86	106.975	192	483	1140	2317.05
87	104.95	190	462.5	1037.1	1720.825
88	104.975	189	472.5	1056.1	1988.05
89	101.975	188.9	474.5	1050.1	2380.425
90	101.975	186.8	477.5	1071	2060.225
91	106.95	188.9	471	1012.7	1950.1
92	113.925	193.9	479	1023.2	2044.25
93	121.9	202	509.5	1165.6	2187.95
94	128	210	520	1209.4	2272.725
95	132	234.9	559.5	1293.4	2633.175
96	138.975	243.9	603	1462.6	2393.325
97	147	274	725.5	2039.4	3477.475
98	165.75	301.8	806	3536.7	5972.375
99	13.975	27	87.5	407.1	843.25
100	11	23	70.5	249.8	464.275
101	10	19	61	211.1	399.025
102	10	18	56	181	346.125
103	10	18	54	165.2	325.05
104	9	17	53	155	312.25
105	8	17	53	154.1	325.1
106	9	17	53.5	150	333.075
107	8	16	53	173.1	382.05
108	9	17	52	163.4	360.05
109	9	17	51	150.1	308.05
110	9	17	51	153.1	333.175
111	10	17	52	155.1	321.3
112	9	17.9	56	167	345.125
113	10	19	59	174	334.225
114	11	20.9	64	196.2	382.15
115	12	24	74	246.1	504.375
116	13	28	92	431.9	1067.15
117	31	59.9	266.5	1282.5	2172
118	30	55	206.5	688.1	1460.3
119	30	54	178	505.9	1049.675



120	29	50.9	158	462.1	1002.05
121	27.975	48.9	147	482.1	1010.65
122	26.975	44	137	421.1	970.4
123	24.975	42	131	426.2	868.175
124	24	41	127	424.3	1071.35
125	23.975	40	123.5	444.2	1025.05
126	23	39.9	122	471.1	1066.05
127	23	39	120	449	999.125
128	23	39	118	434.2	995.1
129	23	38	113	390.2	758.15
130	23	38	112	393	822.125
131	23	37	109	396.1	905.375
132	23	38	111	417.4	1145.55
133	22.975	37.9	111	431.2	1050.1
134	23	37	109	441	1032.4
135	22	37	107	424.4	1036.225
136	22	38	107.5	406.8	1093.55
137	21.975	38	105.5	428.7	894.025
138	22	37	107	390.3	1219.225
139	21.975	37	108.5	399.7	1218.5
140	22	36	108	399.2	861.5

Table 49. Sedimentation Rates in Wall AB According to the Single-Grain OSL Age-Depth Model

Depth (cm)	2.5% Quantile	10% Quantile	50% Quantile	90% Quantile	97.50% Quantile
1	0	0	150	547.3	1109.775
2	0	0	145	475.1	976.525
3	0	0	143	467.2	935.025
4	0	0	140	426.2	872.275
5	0	0	135	379.2	788.35
6	0	0	133	336.4	690.1
7	0	0	131	319.1	663.375
8	0	0	127.5	307.1	636.4
9	0	0	126	301.1	576.05
10	0	0	124.5	286.1	579.5
11	0	0	124	273.5	473.075
12	0	0	125	271	482.025
13	0	0	124	271	497.25
14	0	0	123.5	269.1	483.15
15	0	0	123	265	420.55
16	0	0	123	268.1	475.175
17	0	0	124	274	473.075
18	0	0	125	281.1	482.025

19	0	0	125	270	466.175
20	0	0	128	284	490.025
21	0	0	129	286	495.1
22	0	0	131	300.1	499.125
23	0	0	132	306.1	578.05
24	0	0	135	316.1	581.075
25	0	0	137	315.1	565.325
26	0	0	141	326.2	580.025
27	0	0	143	330	582.025
28	0	0	146	335.1	616.275
29	0	15.3	150	351.1	854.025
30	0	35.8	154	356.1	834.325
31	0	39	158	380.7	741.75
32	0	42	160.5	399.1	730.825
33	0	48	164.5	404.1	775.05
34	0	53	167	431	752.075
35	0	60	171	449.1	856.25
36	0	65	177	495	931.525
37	0	66.9	179	512.7	1059.2
38	0	74	189	577.2	1628.475
39	21.975	78.9	196.5	673.2	1392.675
40	36.925	80.9	202	695.7	1263.975
41	43.975	86	210.5	794.7	1458.025
42	46.975	87	221	931.4	1623.85
43	54	88	233.5	1094.3	2243.225
44	55.975	90	243	1550.6	4309.15
45	39	81.9	301.5	1430.8	2830.95
46	38.975	75	252	845.3	1579.95
47	37.975	69.8	224.5	661.8	1343.8
48	33.975	63	199	573	1056.05
49	33	61	183	502.2	971.025
50	30.975	58	173	466.1	797.1
51	31	58	169	473.1	872.125
52	30	55	168	466	877.05
53	27.975	54	159.5	466	936.35
54	26.975	52.9	151	441.3	783.15
55	27	53	150.5	432.1	809.225
56	26.975	53	151	463.2	981.575
57	27	53	147	441	905.075
58	27.975	53	147	441.6	966.35
59	26.975	51	143	440	862.15
60	27.975	52.9	148	441	991.9
61	27	52	150	440.1	907.225
62	28	53	149.5	467.2	1129.85
63	28	53	153.5	463.2	895

64	28	53	155.5	429	908.1
65	28	52	157	445.5	908.4
66	28	52.9	164	464.2	1106.725
67	27.975	52	172	463	1010.875
68	28	54	176	479.1	854.05
69	31	60	187.5	502.1	981.225
70	33	61.9	199	552.4	1153
71	33.975	66.9	214	610	1067.25
72	36.975	72	231.5	707.1	1392.15
73	40	77	276	1088.3	2108.3
74	97.975	167.9	458	1762.3	3502.975
75	54.95	114	374.5	1105.9	1876.425
76	53	104.9	324	819.1	1388.6
77	51.975	95	296	707	1212.1
78	50	92.8	281.5	661.1	1171.325
79	49.95	87.9	275	639.2	1051.55
80	47	87	265.5	643.4	980.25
81	47.975	88.9	259.5	619.2	928.2
82	47.975	90.9	260	622.1	1027.9
83	48.975	93.9	262	630.4	1062.025
84	49.95	99	273	643.4	1062.55
85	56.95	108	293	713.2	1200.675
86	58.975	112	325.5	789.2	1287.85
87	76.95	126	373.5	1046.5	2126.1
88	144	233.9	598.5	2478.6	5216.825
89	64	126.9	529	1816.4	4051.65
90	60.975	115.9	452.5	1300.3	2531.725
91	59.975	108.9	408.5	1139.5	2208.875
92	56.95	103	383.5	1092.8	2137.325
93	53.975	100.9	376	1007	1779.925
94	52.975	94	356.5	949.2	1705.125
95	51	93.9	344	928.9	1784.05
96	51.975	93.9	331.5	900.3	1652.9
97	52.95	93	322	881.1	1672.875
98	50	93	325.5	861.9	1630.075
99	50	93.9	326	861.4	1792.3
100	49	91.9	314	892	1835.75
101	48.95	87.8	303	836.1	1726.05
102	44	89.9	302.5	877.1	1964.4
103	41.975	85	306	832.1	1816.4
104	40.95	84	309	835.1	1653.075
105	41.95	84.9	310	880.2	1744.2
106	41.975	85	303	832	1836.375
107	40.95	85	302	849.3	1820.55
108	41.95	87.9	301	854.1	1610.075

109	41.975	90	292	836.4	1805.55
110	41.95	91.9	301	854.2	1560.225
111	41.975	92.9	307.5	862.4	1641.425
112	42.95	92	317.5	911.6	1940.125
113	44	96	324.5	960.4	2019.35
114	44	97	347	1031.3	1874.375
115	43.975	100.8	378	1095	2131.725
116	51.975	109	403	1168.1	2184.6
117	57.975	115.9	433.5	1346.7	2495.15
118	62.95	133.9	491	1692	3250.25
119	164.95	266.9	744	3511.6	6256.3
120	160.85	331	1152.5	4154.6	8120.45
121	159.9	310.7	995	2598	4656.075
122	148.9	283.9	914	2223.3	3553.475
123	143.925	260	858	2041.9	3213
124	130.875	248	837	1919.8	3034.075
125	132	241.7	807	1890.4	3040.025
126	124.9	231	789.5	1889.4	3047.95
127	120.975	221	776	1811.1	2753.225
128	118.975	220	749	1727.2	2608.025
129	111.975	221	737	1725.3	2670.9
130	107.95	229.5	746	1748.4	2595.325
131	106.9	231.9	783	1781	3211.625
132	111.975	238.9	798.5	1817.3	2743.375
133	117.875	248	834	1903.5	3484.325
134	116.875	253.9	867.5	2062.4	3844.125
135	121.975	256.9	924.5	2368.3	4002.625
136	131.975	301.9	1059.5	2952.9	5505.65
137	279.95	476.8	1392.5	5507.4	10814.95
138	115	246	876.5	3979.6	7018.65
139	114	217	791.5	2829.4	5048.725
140	112.975	204	698	2255.7	4270.325

Table 50. Sedimentation Rates in Wall DE According to the Single-Grain OSL Age-Depth Model

Depth (cm)	2.5% Quantile	10% Quantile	50% Quantile	90% Quantile	97.50% Quantile
1	0	0	185	517.3	1564
2	0	0	183.5	424.2	1094.175
3	0	0	179.5	396.4	833.075
4	0	0	179	391	681.025
5	0	0	179	379.1	619.7
6	0	0	177.5	373.1	609.1
7	0	0	177	368	571.075

8	0	0	178	368	525.05
9	0	0	176.5	361.1	467.075
10	0	0	176	359.2	454.175
11	0	0	176	358.1	442.075
12	0	0	178	361	454.175
13	0	0	179.5	360.1	461.025
14	0	0	179.5	358.1	461.075
15	0	0	180	358.1	475.075
16	0	0	181	360.1	478.025
17	0	0	185	362.1	479.025
18	0	0	187.5	367.1	536.125
19	0	0	188.5	369.3	583.075
20	0	0	189	376	557.675
21	0	0	193	380	553.75
22	0	0	194	385.3	627.1
23	0	0	197	394	652
24	0	0	198	395	651
25	0	0	199.5	396.1	663.025
26	0	0	203.5	417.1	687.85
27	0	0	207	422.1	749.025
28	0	0	214	442.3	841.1
29	0	0	220	480.4	1071.1
30	0	0	228	585.3	1216.3
31	0	0	237.5	663.1	1284.675
32	0	0	243	732.6	1423.225
33	0	0	250	832.4	1624.55
34	0	0	260	935.6	1945.225
35	0	55.8	269	1068.6	2220.2
36	0	88	285	1275.9	2480.325
37	0	105	293	1559.6	3213.35
38	9.75	125.9	310	2065.7	4076.3
39	79.975	142	328	3508.7	6804.425
40	108.95	166	487	2881.7	7196.05
41	51	99.9	325.5	1227.1	2304
42	48.975	92.9	292	920	1589.075
43	45.925	82	263	792.4	1364.225
44	42	77.9	247	687.2	1250.025
45	40	74.9	235.5	657.5	1250.025
46	39	73.9	228	594.4	1179.15
47	38	70.9	217	558.1	1069.825
48	37	67	210	557	1087.075
49	37	68	203.5	564	1347.35
50	36	65.9	197	564.1	1520.125
51	36	65.9	192.5	534.1	962.35
52	34.975	65.9	191	544.2	1052.125

53	34	65	189	540.1	1052.55
54	31	60.9	186	533.1	976
55	31.975	61.9	184	537.3	1138.15
56	33	65.9	187.5	537.2	1167.575
57	33	66.9	188	540	1171.025
58	33.975	67.9	188	530.4	1196.675
59	32.975	68	188	539.5	1179.325
60	32.975	69	189	544.1	948.275
61	33.975	68	191	535	1139.75
62	33.975	68	195	538.1	1239.025
63	33.975	67.9	197	545.1	1094.7
64	34	68	204.5	575.1	1293.4
65	37.975	71	208.5	589.1	1297.7
66	37.95	74.9	217	592.2	1251.05
67	38.975	75.9	222	633.2	1253.525
68	39	76.9	235	652.2	1242.3
69	39.975	82	248	675.3	1228.35
70	41.975	86.9	262.5	750.6	1512.4
71	45.975	96	295.5	1047.1	2059.9
72	49.975	105	342.5	1676.6	3380.65
73	381.775	683.8	1940	8572.3	15973.35
74	323.975	583.4	1729	5352.6	8773.325
75	296.95	538.7	1558	3997	6850.3
76	281.95	512.9	1416	3440.1	6367.725
77	282.925	488.8	1336.5	3225.4	5811.6
78	279.95	475.6	1298.5	2998.1	5661.1
79	277.925	472.7	1219.5	2639.7	5100.975
80	280.95	458.8	1183.5	2491.5	5066.325
81	278	452.9	1142	2400.4	4379.475
82	274.9	450.8	1131.5	2492.7	4956.95
83	278	458.8	1114	2539.2	5082.75
84	273.925	463.8	1095.5	2507.9	5132
85	268.975	456.9	1071.5	2456.9	4798.175
86	266.85	454.7	1064	2412.9	5966.125
87	273.9	455	1071	2392	5199.525
88	270.95	456	1057	2317.6	4357.2
89	265.875	455.9	1044.5	2391.2	4924.675
90	269.925	455	1053	2377.5	4936.225
91	266.85	456	1068	2497.2	5455.2
92	274.975	458.8	1083.5	2407.8	4265.45
93	273.925	459.9	1090.5	2424.2	4489.375
94	274.975	459.9	1105	2481.9	4548.975
95	276.925	482	1143	2543.4	4365.4
96	278	481.9	1205	2710	4410.325
97	280.925	486.9	1271	3016.6	4855.65

98	288.975	511.4	1333	3195.5	6059.575
99	293.95	521.8	1385.5	3430.1	6446.625
100	301.95	554	1545.5	4150.2	7863.55
101	321.825	633.9	1739.5	5912.4	10207.85
102	569.975	913.6	2551.5	11036.9	22979.55
103	264.925	475	1979	9359.6	18518.675
104	259.975	445.9	1642	6023.1	11417.125
105	251	407.8	1505	5032.4	9625.75
106	250	404.8	1382	4419.8	7729.925
107	249.975	401.8	1298	4035	7198.225
108	237.95	384.8	1238	3888	7635.75
109	224.975	363	1156.5	3730.5	7051.35
110	219.975	352.8	1102	3295.5	7066.325
111	214.8	340.8	1049	3188.7	7205.4
112	194.975	328	1033.5	3468.7	6960.75
113	194	325.9	1001.5	3714.3	8086.725
114	194	318	991	3558.5	8051.475
115	193	311.9	959.5	3523.3	8583.225
116	193.975	309.9	941.5	3264.5	8043.975
117	193	309.9	941	3364.4	7133.9
118	192.9	299.9	922.5	3234.1	7698.55
119	186.975	296.7	907.5	3242.7	7649.15
120	186.975	295.7	911	3253.7	7068.625
121	187	302.7	905	3262.5	7418.775
122	187.925	309	905	3510.1	7657.65
123	184.925	299.9	902.5	3524.9	7878.025
124	182.875	300.9	922.5	3559.3	7400.275
125	182	299	921.5	3571.9	7775.625
126	182.975	298.5	903	3519.4	8399.225
127	185.975	301.9	884	3239.2	7215.325
128	184.925	308.6	884	3171.7	6955.25
129	182.875	309	877.5	3057.1	6543.275
130	176.975	308.9	885.5	3155	7020.7
131	175.875	305.9	885.5	3129.6	7068.15
132	172.95	304	885	3039.6	6492.45
133	169.85	304.9	886.5	3118	6985.725
134	170.85	306.8	903.5	3214.4	8089.625
135	169.875	296.9	895	3140.7	6684.325
136	164.975	295.8	897.5	3114.3	6045.6
137	164.975	294.9	893	3277.3	8101.325
138	163.925	280	878.5	3171.2	6963.45
139	159.9	277	890.5	3141.4	6995.875
140	154.925	278	871	3181	7433.125

Table 51. Sedimentation Rates in Wall FG According to the Single-Grain OSL Age-Depth Model

Depth (cm)	2.5% Quantile	10% Quantile	50% Quantile	90% Quantile	97.50% Quantile
1	61	110	343.5	901	1819.425
2	61.975	111	341	837.1	1500.6
3	61.975	110.9	346	855.1	1533.9
4	60.95	110	343	850.9	1456.075
5	61.975	111.9	343.5	830	1334.05
6	61.975	111	340	811.2	1403.25
7	60.975	114.9	355.5	827.1	1634.725
8	61	120	360	831.7	1501.55
9	62	116	359	851.4	1582.025
10	62.95	119	364.5	850.6	1638.4
11	66	119.9	366.5	830.1	1520.125
12	67	123.9	368.5	862.2	1573.825
13	67.975	124.9	369	837.1	1366.375
14	70.925	131.9	373.5	865.8	1611.725
15	70.925	133.7	378.5	956.8	1618.4
16	71.975	135	397	969	1967.325
17	76	145	421.5	1099.6	2220.875
18	84.975	152	465	1405.9	2761.15
19	172.975	257	611	2222.9	4424.525
20	99.95	172.8	501	1734.4	3418.55
21	86.975	159	439.5	1266.2	2193.1
22	77.875	141	409.5	1083.4	1910.325
23	72.95	136.8	388.5	958.1	1510.525
24	67.975	130	380	908.1	1501.2
25	61.975	126.9	370.5	905.4	1502.2
26	59	121	355	877.1	1460.05
27	62.95	117	359	849.8	1444.45
28	59	119.9	347.5	848.3	1429.025
29	59	116	345	797.3	1299.9
30	59.975	113	331	793.5	1434.475
31	62	115.9	330	784.1	1286.125
32	66	113.9	325.5	783.2	1417.55
33	67	114.9	322	808.3	1572.125
34	66	113	322.5	782	1289.525
35	66.975	113	333.5	793.2	1234.375
36	65.95	112.9	328.5	791.1	1421.55
37	64	108.9	327	792.1	1300.075
38	63.975	108.9	333	815.1	1465.35
39	62.975	115.9	337	811.4	1340.075
40	62.95	120	353.5	828.1	1326.075
41	62.975	122.9	359	862.9	1528.275



42	64	124.9	374	897.1	1492
43	64	125	380.5	927.3	1794.5
44	67	129	398	1022.1	2111.075
45	70.95	139	420.5	1136.1	2115.2
46	78.9	148.9	460	1301.5	2680.325
47	153.975	255.9	605.5	2314.6	4692.025
48	64	132	469	1821.5	3332.65
49	63	119.9	389.5	1188.7	2160.625
50	59	112	344.5	1058.5	2042.275
51	52.975	107	319.5	997.2	1969.1
52	49.975	100.8	301.5	919.3	1868.325
53	43	90.8	288.5	919	1660.175
54	43	89.9	276.5	782.3	1389.525
55	42.975	89.9	277	793	1514.2
56	41.975	89	276.5	801.5	1550.175
57	40	84.9	266	764.2	1526.275
58	39	86.9	256.5	720	1364.1
59	39	88	256	719.2	1534.025
60	39	87.9	255	782.3	1466.775
61	40	83.9	256	771.3	1467.725
62	41	84	255	780	1587.075
63	40.975	85	254.5	748.6	1641.05
64	40	83	254.5	703.1	1499.075
65	41	80	253	749.4	1389.075
66	41.975	81.9	254	681.6	1288.275
67	41	82	254	713.5	1420.675
68	41.975	84	256.5	734.4	1409.2
69	40.975	83.9	256	721.4	1545.45
70	40.975	85	270.5	757.3	1603.5
71	43.975	86.9	270	753.1	1637.55
72	46	86.9	268	747.9	1539.6
73	46.975	92	278.5	830.8	1448.55
74	49	98.9	291.5	843.6	1602.3
75	51.975	106.9	319	961	1914.425
76	52.975	106.9	346	1072.6	2096.3
77	55	110.9	390	1302.8	2580.625
78	165.975	250.8	703.5	2824	5149.35
79	102.95	191.9	700	3062	7730.225
80	97.95	180.9	636	2397	5518.625
81	91.975	166.8	562	2008.2	3824.675
82	92.975	163.9	554.5	1936.2	3656.35
83	88.975	163.8	524	1868.2	3499.225
84	86	157.9	514	1869.8	3548.525
85	85	156.9	505	1842.1	3657
86	84	151.9	480.5	1759.5	3120.65

87	84	155.9	469.5	1612.1	3120.525
88	82.95	149.8	463.5	1506.5	3071.2
89	80	146.8	465	1385.6	2399.125
90	80	143	460.5	1407.7	2871.875
91	82.925	145.8	444	1430.1	2871.05
92	80	142.9	441.5	1386.3	2979.775
93	83	141	443	1357	2871.875
94	84	141.9	436.5	1324.2	2871.7
95	83	139	438	1383	3431.15
96	84	137.8	429	1394.3	2622.3
97	83	140	435	1433.8	2819.225
98	82.975	137	411	1395.1	2898.35
99	78	133.9	408	1319.1	2873.525
100	78.975	134.9	409	1333.1	2659.5
101	78	134.9	421.5	1359.5	3140.025
102	78	135.9	426.5	1289.1	2928.4
103	78.975	131.8	426	1306.5	3088.025
104	78	130.9	427	1311	2649.225
105	78	135	426	1305.1	2895.475
106	78	135	411	1311	2696.8
107	77.975	129.9	395	1259.6	2688.15
108	78	128.9	393	1294	2807.325
109	78	131	387	1321.3	2946.1
110	77	128.9	392.5	1367.4	3118.2
111	70.975	128	398.5	1370.1	3032.175
112	73.9	131	396	1333.3	3117.9
113	70.975	131.9	394.5	1360.1	2926.525
114	70.975	129	392	1297.3	2784.55
115	70.975	127	383	1400.6	2914.425
116	70	128.9	383.5	1335.1	2893.525
117	71.975	124.9	365	1238.4	2569.15
118	69.975	125.9	366	1289.1	2441.875
119	69.975	124	369	1357.5	3377.8
120	70.975	122.8	365	1293	2893.975
121	69.9	116	366	1246.3	2650.8
122	65	117.8	369.5	1386.6	2639.025
123	64	112.9	366	1391.4	2877.4
124	63	112	365	1358.5	3169.95
125	63	114	369.5	1389.8	3169.925
126	65	116	371	1482	2948.6
127	65.95	118	366.5	1454.5	2805.5
128	65.975	116	364.5	1357	2657.25
129	64	115	350	1358.6	2610.025
130	67.95	115.9	357	1293.6	2910.375
131	67.95	116.9	367	1355.2	2611.8

132	66	115.9	375.5	1481.4	3322.675
133	64.95	116	365.5	1400.6	2688.075
134	67.95	120	366	1292.7	2600.225
135	65.975	121.9	369.5	1362.3	2717.125
136	62	116.9	365	1292.8	3013.725
137	62.975	116.9	372.5	1370	2875.05
138	61.925	116.9	371	1361.9	2848.825
139	61.975	116.9	366	1325.7	2845.775
140	63	117	365.5	1397	3148.025