# DETERMINATION OF HYDRAULIC CONDUCTIVITIES OF LOW PERMEABILITY MATERIALS IN THE SIERRA LADRONES FORMATION, ALBUQUERQUE BASIN

by

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ABSTRACT

Low permeability materials in the Sierra Ladrones Formation were sampled and analyzed to determine their hydraulic conductivities using the falling head centrifugation method (fc) as described by Nimmo et al, (1991). The method is similar to the traditional falling head method, only it uses greatly increased centrifugal forces, allowing measurements to made in a relatively short amount of time. Using these measurements, variations in saturated hydraulic conductivities between different sediment types were analyzed using Analysis of Variance (ANOVA).

The purpose of using this experimental method was to reduce the time necessary to obtain hydraulic conductivity measurements on low permeability materials, and yield large numbers of data. While, the accuracy of the fc method is not as high as that for other methods such as a triaxial cell, it has the potential to produce large numbers of soft data. For this study large numbers of data were desirable so that the variability over the large region of the Sierra Ladrones Formation could be quantified. Additionally, many stochastic models used for ground water transport rely upon large numbers of data for their input.

The falling head centrifuge method overall, provided soft data with accuracy not as high as that of more traditional methods such as the triaxial cell. However, once samples were retrieved from the field, data was obtainable within the order of a week. Sources of experimental error associated with the fc method were identified and attempts made to quantify them. This method allowed over one hundred useable data points to be obtained for the study region. The falling head centrifuge method saved considerable time and expense while providing relatively consistent hydraulic conductivity data.

Sampling resulted in useable data chiefly from the clay and silt facies of the formation. The range of conductivities determined are representative of brown and red clays, and silts which make up the overbank deposits of this region. Hydraulic conductivities for these overbank fines were found to range from approximately log K = -9 m/s to log K = -7 m/s. The upper measurement limit of the centrifuge apparatus was determined to be approximately $1.43 \times 10^{-7}$ m/s and the lower limit was approximately $7.6 \times 10^{-12}$ m/s.

Within each of these distinct lithologies a hierarchical, unbalanced Analysis of Variance (ANOVA) was performed on the data to better quantify the variability associated with the distinct sources of variation. This indicated that there was no significant difference between variabilities associated with each hierarchical level. The data was quite uniform within the lithologies, indicating good precision of the centrifugation method.

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| | |
|---|---|
| a | cross sectional area of tubing |
| A | cross sectional area of sample tube |
| c | correction factor |
| d | distance from axis of rotation to top of metal tubing |
| dp | change in pressure |
| dr | change in radius |
| fc | falling-head centrifuge method |
| g | grams |
| G | Gravity |
| $H_o$ | initial head |
| $H_1$ | head after elapsed time |
| K | conductivity |
| kPa | kilo Pascals |
| kg | kilogram |
| km | kilometer |
| L | length of sample |
| M | meters |
| $\omega$ | angular velocity |
| p | pressure |
| q | flow rate |
| $\rho$ | density of water |
| r | radius |
| $r_b$ | distance from the axis of rotation to the bottom of the sample |
| $r_i$ | $r_{wa}$ at time $t_i$ |
| $r_o$ | distance from the axis of rotation to the free water surface at screen |
| rpm | rotations per minute |

$r_t$ distance from the axis of rotation to the top of the sample

$r_{wa}$ distance from the axis of rotation to the top of water surface

s seconds

t elapsed time

$t_i$ initial time

# CHAPTER 1. INTRODUCTION

Ground water contamination is of increasing concern due to the world's growing population and the resultant increased dependence on ground water as a source of potable water. Industrial and nuclear practices of the past 40 to 50 years have contaminated the air, soil and water. Among these, ground water is often the most difficult and costly to remediate. Today federal and state agencies are facing the problem of cleaning up these waste sites. Thus, industry and the scientific community have begun to focus their resources on the understanding of their hydrogeologic environment. Characterizing aquifer transport properties and developing models are of increasing interest to contaminant experts both to remediate present ground water contamination and to safely dispose of both hazardous and municipal waste such that ground water resources are not contaminated in the future.

It is the general consensus of the scientific community that variability in aquifer hydraulic conductivity is the dominant medium-dependent factor controlling the transport of solutes in ground water. Natural geologic formations are heterogeneous with regard to their hydraulic transport properties, in particular hydraulic conductivity. This heterogeneity in hydraulic conductivity results in spatially varying velocities causing a field-scale dispersion also termed macroscopic dispersion. This differs from the pore-scale dispersion which results from varying pore size, friction within a pore and path length. Characterizing aquifer heterogeneity is a key tool in models which predict contaminant transport.

Quantifying the spatial variability between different sediments will allow a greater understanding of solute transport in ground water systems. While hydraulic conductivity is intrinsically deterministic, it is impractical to make a sufficient number of discrete measurements to create a reliable, field-scale deterministic model. Therefore, modeling in this field has been largely limited to stochastic models where hydraulic conductivity is considered to be a spatially random function.

Laboratory methods which measure hydraulic conductivity are generally applicable in small-scale situations, but they may not be representative of the bulk properties of the formation. However, if a sufficient number of measurements are taken, the mean, variance and other large scale statistical properties of the formation can be estimated. Large numbers of measurements have been used to calculate the mean and variance of aquifer hydraulic conductivity and to quantify the macroscopic scale dispersivity.

Sophisticated flow and transport models require abundant hydraulic conductivity data for parameter estimation for either spatial statistical models or deterministic numerical models. Often, however it is not economically feasible to obtain the required quantity of data. These models are increasingly used as decision making tools in the environmental restoration field, and thus time also often becomes a constraining factor in data collection. Regulatory, public interest and budgetary considerations often require short time frames in which to model contaminant transport. Thus, it is desirable to obtain large numbers of data within a reasonably short time. When many measurements can be made in the order of one week, it allows many more data points to be collected, thus increasing the accuracy and reliability of the geostatistical models in which they are used.

In the field, two kinds of information are available: hard data, data with a low degree of uncertainty; and soft data, data with a high degree of uncertainty. Hard data is data that is considered to be highly accurate and in general, such data is usually expensive, time intensive and may require equipment not readily available. Soft data is data having greater uncertainty associated with it, but is generally less expensive, less time intensive and is easier to obtain. It is thus often more feasible to obtain larger numbers of soft data than hard data. Studies using parametric and nonparametric geostatistical approaches to characterize solute transport, have concluded that using a relatively large number of soft data greatly improve transport simulation results over using a limited number of hard data (Wen and Kung, 1993).

Characterizing the hydraulic properties of low permeability materials presents a special problem in terms of making a large number of measurements. The obvious restrictive factor is time. Most means of measurement are limited to laboratory methods and the soils themselves conduct water at such low velocities that, even under "large" natural hydraulic gradients, it is often difficult to measure their hydraulic conductivity with the smaller pressure gradients used in traditional laboratory methods. These traditional methods include the falling and constant head permeameters, and the strain gage pressure cell .

The falling head and constant head permeameters are relatively simple to construct in a laboratory using standard hoses, tubing and a packed column. The falling head permeameter involves subjecting one end of a packed soil column to a known hydraulic head and allowing head at the other end, imposed by a water reservoir, to fall over time. The constant head permeameter is slightly more complicated than the falling head apparatus in its construction, since it must apply a constant head to each end of the sample, which requires some means of regulating the applied heads. Darcy's Law is applied to either of these apparatus to determine saturated hydraulic conductivity. Falling-head tests work best for soils with conductivities in the range of $10^{-5}$ to $10^{-9}$ m/s while constant-head tests work best for soils with conductivities in the range of $10^{-2}$ to $10^{-7}$ m/s (Freeze & Cherry, 1979).

Strain gage pressure cell experiments have been conducted to determine conductivity of low permeability materials in the laboratory. The equipment used is basically a falling head permeameter where water is displaced through the core as a pressure-stressed metal diaphragm relaxes (Bianchi and Haskell, 1963). This method produces good results, however the apparatus requires somewhat specialized components not readily available in most laboratories.

Traditional methods of low permeability measurements such as the falling and constant head permeameters, the Darcy column, and the strain gage pressure cell may require substantial investments of time and money to produce useful results. One other method of measurement uses a centrifuge, avoiding some of these liabilities. Centrifugation has several distinct advantages in the laboratory, the most important of which are that the method requires only a simple apparatus without regulators, valves, transducers, or complicated plumbing, and the results are obtainable within a few days at relatively low cost.

Centrifugation has already been well documented as a research tool in the petroleum engineering field. Petroleum engineers have used various modifications to measure liquid-retention curves and the method was used to develop the theoretical basis for measuring relative permeabilities in unsaturated and saturated porous media

(Firoozabadi and Aziz, 1991). Centrifugation could offer similar advantages to hydrologists when time and economic considerations make more traditional methods unfeasible for large numbers of permeability measurements.

Permeability measurements using centrifugation methods have been used to determine hydraulic properties for both saturated and unsaturated states (Nimmo et al, 1987; Nimmo and Mello, 1991). Nimmo et al (1987) used a centrifuge to establish steady state flow of water in unsaturated soil samples. Their experiments established that flow can be effectively one-dimensional and that steady state flow can be achieved using this method. The experiments tested Darcy's law by measuring the hydraulic conductivity, K, for different centrifugal forces with the same water content. For accurate measurement of K in unsaturated media, it is usually preferable to obtain steady state rather than transient conditions. Later experiments were conducted to measure saturated conductivities using a method similar to that for the unsaturated conditions (Nimmo and Mello, 1991). Calculated results were found to be within approximately 20% of those obtained by the more traditional falling head permeability methods. Equations for K were derived for both constant head and falling head conditions.

The objectives of this study are to apply and evaluate the methods and equations for centrifugation by Nimmo and Mello (1991) to make hydraulic conductivity measurements. This method will be used to obtain soft data on the Sierra Ladrones Formation where permeability measurements on low permeability facies have been sparse in previous studies. Data on the low permeability facies has been sparse due to the intrinsic problems with sampling these units as described earlier. The data will be analyzed to better quantify the variability between distinct data groups, such as lithology, sampling point and measurement intervals. Previous studies in the Formation have been conducted using a portable air-minipermeameter which uses a small applied pressure source, that makes in situ field measurements (Davis et al, 1993). Specific limitations of this air-minipermeameter which restrict its application to clay facies are: 1) the device exerts small applied pressures, between 500 and 1250 Pascals; 2) the tip seal is designed specifically for loosely lithified sands; and 3) the clay facies often have cracks within them in the field.

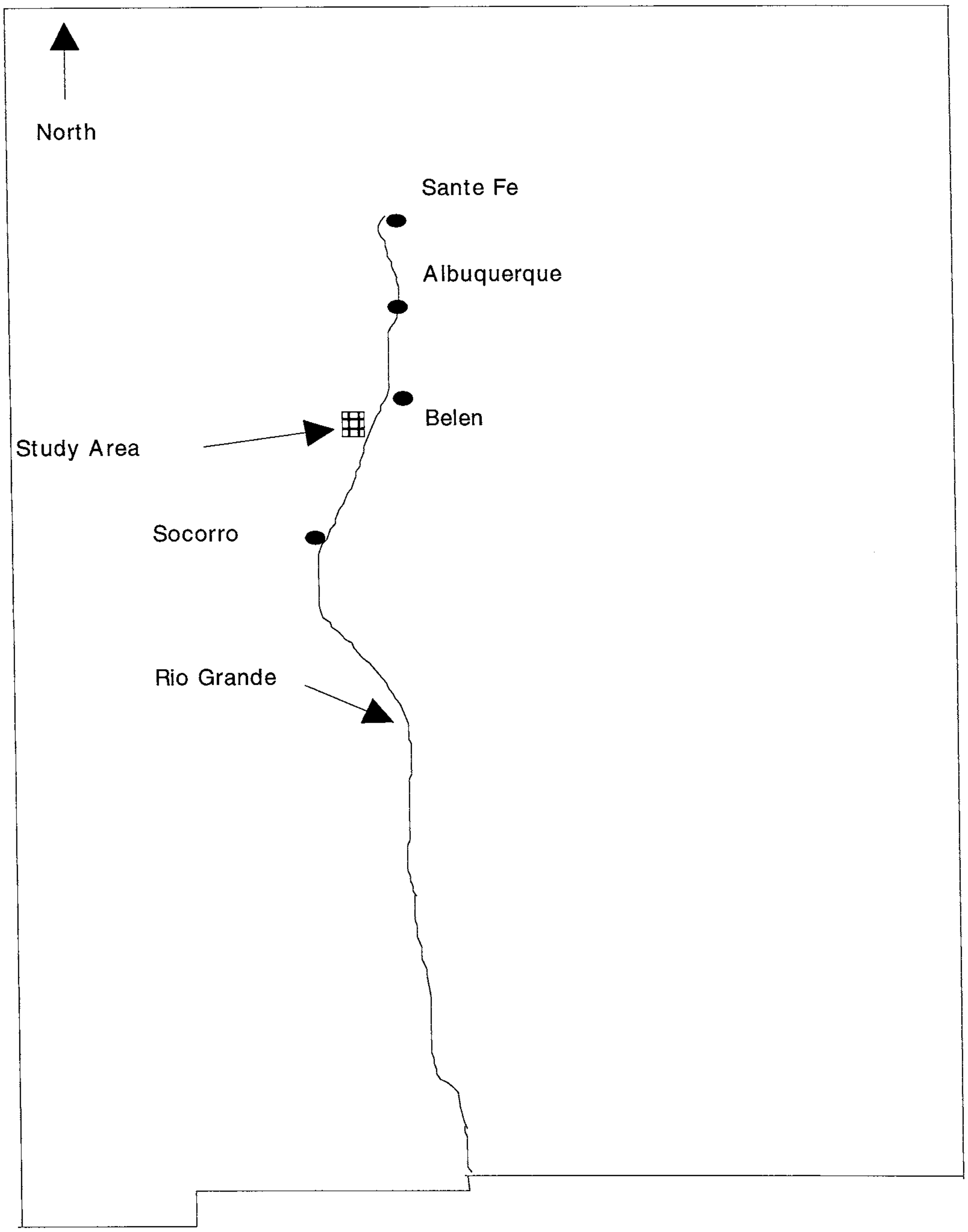
While other earlier version of the air-minipermeameter were designed for use on consolidated petroleum reservoirs using high pressure devices as the pressure source, the apparatus designed by Davis et al (1993) is not designed to produce enough air pressure to penetrate the clay facies. This device is designed for use on aquifer materials which are usually loosely lithified, and exhibit greater permeabilities than sedimentary rocks of petroleum reservoirs. To prevent grain movement and extremely high flow rates, air permeability measurements on aquifer material require smaller applied pressures than those used to measure lithified sedimentary rocks typical of petroleum reservoirs. To do this the air-minipermeameter used by Davis et al (1993) uses a small mechanical pressure source instead of a compressed air source. Also an increased diameter stopper is used to distribute the force over a larger surface area to prevent disturbing the material being sampled. Clay facies in arid environments present an additional problem in that they are often cracked, making the air-minipermeameter difficult to obtain accurate readings, due to these preferential pathways. Such unconsolidated materials such as the gravels and sands proved more successful for the air-minipermeameter than for very tight clays.

## CHAPTER 2. SITE DESCRIPTION

### 2.1 FIELD SITE

The field site is located within the Albuquerque Basin of central New Mexico, southwest of Albuquerque, New Mexico as shown in Figure 2.1. The Albuquerque Basin is an en echelon basin resulting from the extension of the Rio Grande Rift and consists of the lower Popotosa Formation (Miocene) and the upper Sierra Ladrones Formation of Pliocene and Pleistocene age (Davis et al, 1993). It is approximately 1000 km long and 30 - 50 km wide. The Popotosa Formation consists of playa deposits with alluvial fan and eolian sediments. The Sierra Ladrones Formation consists of alluvial fan fill and fluvial sediments of the Pliocene-Pleistocene era and resulted from the infilling of the Albuquerque Basin (Davis et al, 1993).

It is presumed that basin filling ceased at approximately 0.5 Ma (Davis et al 1993) and the Rio Grande and its tributaries entrenched. This left a large part of the upper basin fill isolated from deposition or erosion, creating a broad flat geomorphic surface. This surface is known as the Llano de Albuquerque. Tributaries in the region include the Rio Puerco and Rio Salado, as well as the smaller arroyos which feed them. This surface was then cut down by the rivers revealing outcrops of the upper basin fill, creating a west facing and east facing escarpment. The west facing escarpment was formed by downcutting of the Rio Puerco into these basin fill deposits and is called the




Not to Scale

**Figure 2.1** Regional Map

Ceja del Rio Puerco. The east facing escarpment is the result of incision of the Rio Grande and is called the Cejita Blanca. The Rio Puerco drains the west side of the San Pedro and Naciemento Mountains in New Mexico. It forms a confluence with the Rio Grande just south of Bernardo, New Mexico. (See Figure 2.1) Previous studies suggest that the Rio Grande and its tributaries, the Rio San Jose and Rio Puerco, were in similar locations as present day (Davis et al, 1993). The outcrops at the site are at an angle of repose or steeper.

The specific area of this study is along the east-facing Cejita Blanca located just west of Interstate 25, south of Albuquerque, near Belen, New Mexico. The deposits in this region consist of gravels, sands, silts and overbank clays. Most of the sediments are uncemented, however, some overbank clays and paleosols and cemented sand and gravel lenses exist, providing structural integrity to the formation. Slope wash is commonly present as a thin layer. Previous studies on permeability distribution have been conducted on the region. Davis et al (1993) used an air-minipermeameter to take measurements on the sandy deposits of the Sierra Ladrones.

In the study by Davis et al (1993), the lithologic units are divided into a number of classifications: channel elements (CH), paleosols (P), and overbank fines (OF). The CH-I elements are characterized by coarse sand and gravel, are usually 1 to 3m thick, and pinch out abruptly. The CH-II element is characterized by fine to medium sand with clay lenses. This element ranges in thickness from 0.5 to 9m. Studies using an air-minipermeameter measured a mean log permeability of 1.32 for the CH-I element, and a mean log permeability of 0.84 for the CH-II element (Davis et al, 1993).

Overbank fines (OF) are composed of dark brown clays and silt elements. The clays are characterized as highly plastic, clean clays. The clay units found in the lower part of the formation are characterized by a dark brown color, with occasional sand-filled polygonal cracks. These strata appear commonly and range in thickness from 1 to 7 meters. Higher up in the unit these clays are commonly observed to be interlayered with immature paleosols.

The paleosol elements consist of three different sub-elements, Ps, Pgs and Pc. The elements Ps and Pgs consist of primarily sand and gravely-sand parent material, respectively, resulting from pedogenesis of these materials. These elements were generally difficult to sample due to their consistency. Integrity of the sample was hard to maintain during transport to the laboratory, and these samples often dried out during centrifugation. The element Pc is distinct from the previous two, in that they are the result of overbank fines parent material. These clay paleosol elements are characterized as a red-brown paleosol consisting of clay and sandy clay. Most of the samples taken from the paleosol elements were limited to this sub-element classification due to the sampling method. A certain amount of clay was necessary in order to obtain a sample in the tube, transport it back to the laboratory and remain intact during the centrifugation.

The presence of these and other elements have been interpreted as recording specific geologic events in the region. Sand elements, CH-II, are considered to signify the nearby presence of a channel system. Clay and silt elements, OF, represent the river having moved some distance away, leaving fine-grained flood plain deposits. The paleosols, Ps, Pc and Pgs, are more characteristic of a region that has no sediment influx, implying that the river channel is some large distance from the region. The identification of commonly observed cycles in the region lend information about the alluvial character of the field site.

Several different sedimentary cycles were observed in this region by Davis et al (1993). Some of these cycles are CH-OF-P-OF-CH, CH-OF-CH, and CH-P-OF-CH. Each cycle represents a river moving from one place to another and back. The presence of the overbank clays, silts and paleosols implies that the river was located some distance from the region for much of the time that these deposits were laid down.

# CHAPTER 3. MATERIALS AND METHODS

Traditional methods of measuring permeability such as the Darcy column and falling head permeameter require significant investments of time, and substantial head in laboratory apparatus, in order to produce acceptable results for low permeability materials. This makes it difficult to run large numbers of samples in a relatively short amount of time. Thus, a laboratory method was sought to measure saturated conductivities of low permeability materials with a relatively small investment of time and materials. A centrifuge was utilized to measure conductivities based on the methods described by Nimmo and Mello (1991). They studied constant and falling head centrifuge conditions and derived equations for saturated conductivities. For this study, the falling head centrifuge method was used. It is analogous to the more traditional falling head permeameter method for saturated conductivity measurement. Thus it is worthwhile to review the basic principles of a falling head permeameter.

## 3.1 FALLING HEAD PERMEAMETER

In a falling head permeameter, a sample is placed in an apparatus such that a column of water is on top of it exerting a force equal to the gravitational acceleration times the mass of the water. Atmospheric pressure is maintained at the top and bottom of the apparatus. The water is allowed to fall without replenishment over a known time interval and a conductivity is calculated from this observed change in head. Applying Darcy's law, the equation for conductivity is the following:

$$K = \frac{aL}{At} \ln(\frac{H_o}{H_1})$$

| | | |
|---|---|---|
| where a | = | cross sectional area of water supply reservoir tubing |
| A | = | cross sectional area of sample tube |
| L | = | length of sample |
| t | = | elapsed time |
| $H_o$ | = | initial head |
| $H_1$ | = | head after elapsed time |

## 3.2 CENTRIFUGE METHOD

The measurement method used for this study is based upon the falling-head centrifuge method (fc) as developed by Nimmo and Mello (1991). This method is similar in principle to the falling head permeameter, except that it uses centrifugal forces to impose large pressure gradients on a saturated soil sample. Hydraulic conductivity can therefore usually be measured in 5 - 6 days. The experiment can be modified to accommodate either constant or falling head conditions. Due to the simpler apparatus required, only the falling head centrifuge method was used here.

### 3.2.1 DESCRIPTION

The basic premise behind centrifugal permeability measurement is that centrifugal forces drive water through a sample from a reservoir above the sample. Figure 3.1 is a schematic diagram of the sample placed in a centrifugal field, as modified from Nimmo and Mello (1991).

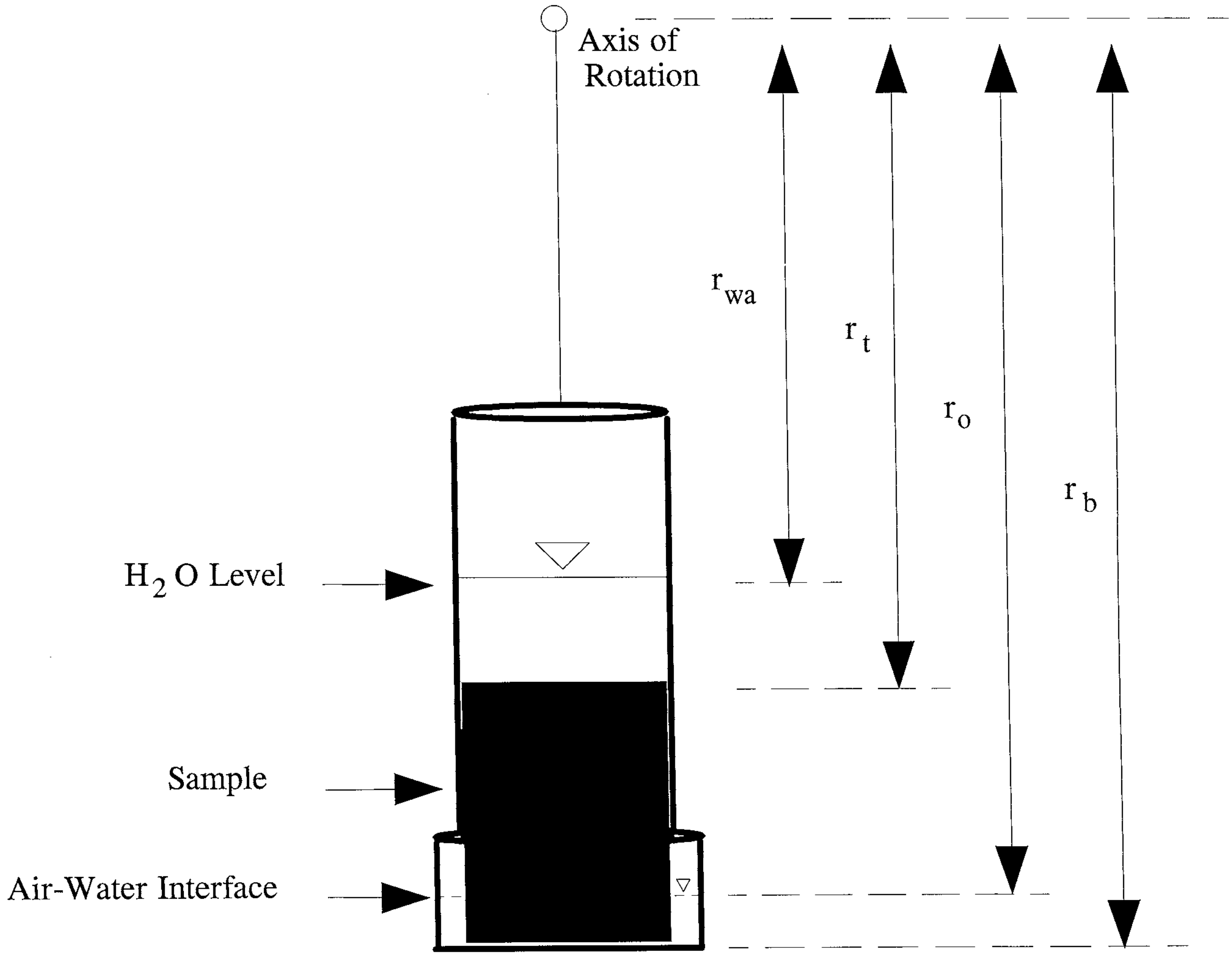



**Figure 3.1** Sample Tube in Centrifugal Field

Distances relative to the axis of rotation are designated an "r" with a subscript indicating the radius to which it refers. The distance from the axis of rotation to the air-water interface at the top of the water reservoir is designated $r_{wa}$. The distance from the axis of rotation to the top of the clay sample is designated $r_t$. The distance from the axis of rotation to the air-water interface at the lower water reservoir is designated $r_o$. The distance from the axis of rotation to the bottom of the clay sample is designated $r_b$. The upper pressure boundary is defined by atmospheric pressure at $r_{wa}$. In general, the lower pressure boundary condition is determined by the air-water interface at $r_o$. For the falling head method, $r_o$ is in effect $r_b$ since the water drains freely from the apparatus. Thus, the pressure at $r_b$, under falling head conditions is also defined as atmospheric pressure.

Using the general boundaries where $r_o$ is the lower boundary, Darcy's Law can be expressed in terms of q, the flux density, as follows (Nimmo and Mello, 1991):

$$q = -\frac{K_{sat}}{\rho g}\left(\frac{dp}{dr} - \rho\omega^2 r\right) \qquad (1)$$

where $\rho$ is the density of water (taken to be 1000 $kg/m^3$), g is gravitational acceleration, and $\omega$ is the frequency in radians per second.

Integration of this over the whole sample, from $r_b$ to $r_t$ yields

$$\int_{P_b}^{P_t} dp = \int_{r_b}^{r_t} \left(\rho\omega^2 r - \frac{q(\rho g)}{K_{sat}}\right) dr \qquad (2)$$

where $P_b$ is the pressure at the bottom of the sample and $P_t$ is the pressure at the top of the sample.

The pressure at $r_b$, the bottom of the sample, results from the centrifugal forces acting upon the bottom water reservoir, from $r_b$ to $r_o$. Similarly, the pressure at $r_t$, the top of the sample, results from the centrifugal forces acting upon the top reservoir, from $r_t$ to $r_{wa}$. These pressures can be expressed as follows:

$$P_t = \left(\frac{\rho\omega^2}{2}\right)(r_t^2 - r_{wa}^2) \qquad (3)$$

similarly,

$$P_b = \left(\frac{\rho\omega^2}{2}\right)(r_b^2 - r_o^2) \qquad (4)$$

Substitution of (3) and (4) into (2) and integrating yields

$$K_{sat} = \frac{2\,q\,L\,(\rho\,g)}{\rho\omega^2(r_o^2 - r_{wa}^2)} \qquad (5)$$

where L is the length of the porous medium and equal to the quantity $(r_b - r_t)$.

In the special case of the falling head method the instantaneous flux can be expressed as:

$$q = \frac{a}{A}\,\frac{dr_{wa}}{dt} \qquad (6)$$

where a is the cross-sectional area of the falling-head reservoir, A is the cross-sectional area of the sample and t is time.

Substitution into (5) yields

$$K = \frac{2a\,L\,(\rho g)}{A\,\rho\omega^2(r_o^2 - r_{wa}^2)} \quad \frac{dr_{wa}}{dt} \qquad (7)$$

Eliminating time dependence, this is integrated from $t_i$ to t to obtain an expression for K for the falling head conditions. Based upon the derivations by Nimmo and Mello (1991), the equation from which saturated hydraulic conductivity under falling head conditions is calculated, is as follows:

$$K = \frac{aL\,(\rho\,g)}{Ar_o\rho\omega^2(t - t_i)} \log\left[\frac{(r_o + r_{wa})(r_o - r_i)}{(r_o - r_{wa})(r_o + r_i)}\right] \qquad (8)$$

where $r_i = r_{wa}$ at time $t_i$.

The angular velocity, ω, is calculated by multiplying the measured rpm's by $(\frac{min}{60\ sec})(\frac{2\pi r}{min})$ yielding units of $\frac{radian}{sec^2}$, which is also equivalent to $\frac{1}{sec^2}$. Dimensional analysis on the right hand side of equation 8 yields the units m/s when SI units of meters, kilograms and seconds are used. Thus, under falling head conditions, by measuring $r_{wa} - r_t$ and the rpm, for a given time interval, a conductivity can be calculated using equation 8.

A small correction factor is also presented to account for the non-one-dimensional effect, due to the curvature of the air-water interface in the reservoir above the sample. The curvature increases the depth of the water in the reservoir, and hence the pressure of the water at the outer edges of the radius of the tube. Thus, considering only geometry, the correction factor is as follows (Nimmo and Mello, 1991):

$$c = 1 + \frac{R^2}{4(r_b^2 - r_{wa}^2)}$$

where R is the radius of the sample, and $r_b$ and $r_{wa}$ are as previously defined. The calculated $K_{sat}$ is divided by this factor to obtain a corrected $K_{sat}$ value.

## 3.3 SPECIFIC METHOD USED IN THIS EXPERIMENT

### Sample Collection

Samples were taken from the field site in 7/8" diameter steel pipes approximately 3 and 10/32" long. At a selected sampling point a flat surface was dug out either parallel or perpendicular to the layering. Anywhere from 2 to 6 sampling tubes were driven into the face using a hammer. On average, approximately 25% of the duplicate samples retrieved from a location were taken in a horizontal direction, or parallel to the layering. Each was driven down far enough so that a 1 - 2" sample was obtained. The samples were then retrieved by digging them out with a trowel, being careful to minimize cracking or disturbing the sample further. This left a section of the empty pipe above the clay providing a reservoir for water during centrifugation of the sample.

Due to the arid environment of the Sierra Ladrones site, the samples were obtained in an unsaturated state and had to be saturated in the laboratory. Samples collected during particularly dry months such as the latter portion of April, and the months of May, June and July, had to be partially saturated in the field to improve the collection success rate. A small water atomizer was used to dampen the soil as much as possible before the sampler was pounded into the soil.

The samples were then returned to the laboratory where copper screens were cut and placed in caps which were then secured onto each tube. The samples were placed with the screened end standing in water to wet the material utilizing capillary forces. Wetting generally took approximately 12 to 24 hours. If, after the "wetting-up" time interval, any water was observed ponded on the top of the clays, those samples were discarded. It is assumed that at such low permeabilities, any ponded water would result from poor sealing of the clay sample to the sides of the steel core sampler and thus the sample might produce erroneous data. Samples collected during particularly dry seasons required additional saturation time.

### 3.3.1 APPARATUS

Figure 3.2 illustrates the details and dimensions of the tubes. Samples were analyzed in the same tube in which they were retrieved from the field. The 3 and 10/32" long sections of 1/8" wall thickness steel pipe have an outer diameter of 7/8" and an inner diameter of 3/4". One end of the tube is threaded to fit a similarly threaded aluminum cap which has a removable copper screen.

The depth of water in the reservoir on the top of the sample was measured with a metal depth gauge. A small dusting of blue line chalk was applied to the gauge so

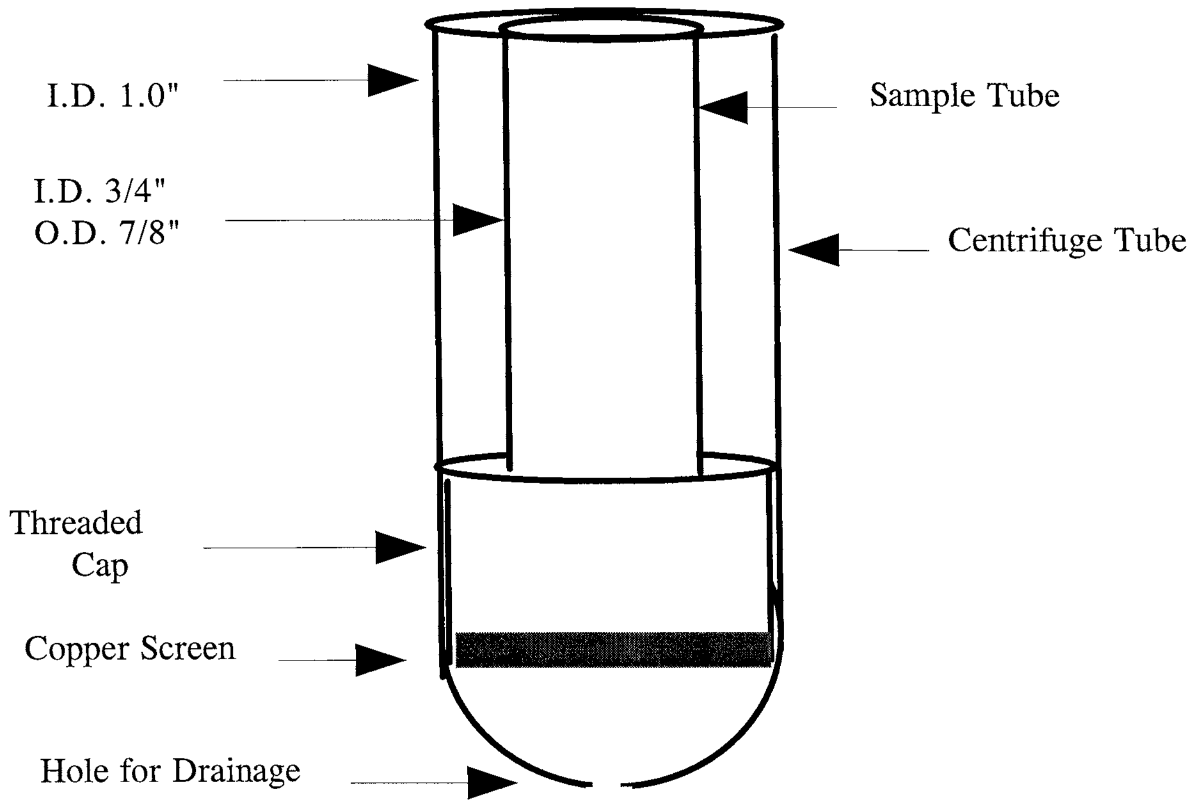



**Figure 3.2** Details of Sampling Tube Apparatus

that the water line was clearly visible. An attempt was made to make measurements at the same location on the tube to increase precision between successive measurements. The metal sampling tube was then placed in a plastic centrifuge tube with an inner diameter of 1". Each plastic centrifuge tube had a hole drilled into the bottom of it to maintain free drainage of water from the sample. Two washers sat in the bottom of the metal centrifuge buckets to keep the tubes from resting on the bottom, ensuring free drainage from the bottom of the plastic centrifuge tubes. The reservoir at the top of the sample was filled with water, and the depth measured with the depth gauge. The tubes were then placed in a centrifuge and run for varying lengths of time to obtain a needed number of measurements. Each time the centrifuge was stopped and the depth of the water reservoir was remeasured, constituted one “run”, for which a $K_{sat}$ was calculated. Samples were subjected to a number of runs. An average $K_{sat}$ for the sample was calculated from the runs. The centrifuge used for this experiment was a International Equipment Company, 3/4 HP model K free standing centrifuge. The rotor arm used measured 4 8/32” from the axis of rotation to the top of the centrifuge bucket.

### 3.3.2. TAKING A MEASUREMENT

When a measurement was taken, the centrifuge speed was first determined using a strobe light meter, and then the machine was stopped and the run time was recorded. Using the metal depth gauge, the water depth was measured in order to calculate the quantities $r_{wa}$ and $r_o$ for use in the equation for hydraulic conductivity. Before starting the centrifuge again for another run, the water reservoirs were replenished.

Figure 3.3 depicts the various dimensions used for calculation of $r_{wa}$ and $r_o$, as well as for the general dimensions of the centrifuge rotor with respect to the sampling tube, the free water surface, and the axis of rotation. The quantity $r_b$ was calculated by adding the length of the metal tube (l) to the distance from the axis of rotation to the top of the metal tubing, (d). The quantity $r_t$ was calculated by adding the depth to the sample (ds) to the distance from the axis of rotation to the top of the metal tube, (d). The quantity $r_{wa}$ was calculated by adding the distance from the top of the tube to the axis of rotation (d), to the quantity (ds-dw) where ds is the measured depth to the top of the sample, and dw is the depth of water on the top of the sample. The quantity $r_i$ was calculated in the same manner as that of $r_{wa}$ except that it represents the distance from the axis of rotation to the free water surface at the beginning of the time interval. From this measured data, hydraulic conductivity was calculated using equation 8.

Measurement intervals were determined to some extent arbitrarily. However, for lower permeabilities it was desirable to allow the samples to run for longer intervals, often up to 5 hours. This was done to make sure that the drop in the water reservoir was substantial enough to minimize errors. It was beneficial to allow very low permeability clays to run for 3 or more hours so that the drop in the water reservoir was substantially greater than the estimated precision of the depth gauge.

Conversely, for higher permeability materials it was beneficial to run the samples for shorter times and take measurements more frequently so that the drop in the water reservoir was "captured". Running these samples too long resulted in the samples drying out, making it hard to distinguish between higher permeability samples and those which simply dried out due to cracking or poor sealing of the sample to the sides of the tubes.

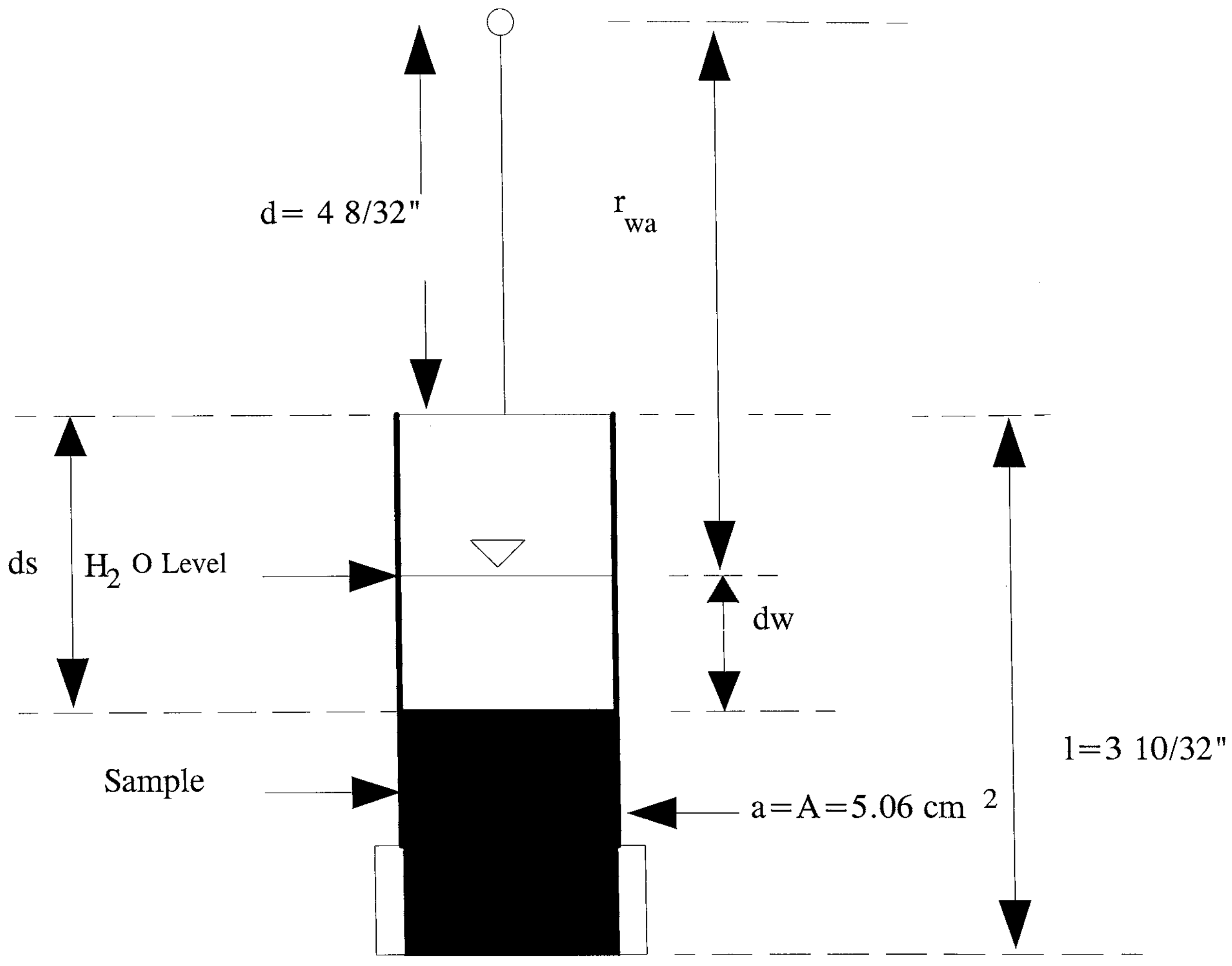



**Figure 3.3** Sample Tube and Measured Parameters

## 3.4 ANALYSIS OF METHOD

To minimize the effects of calculated conductivities being the result of experimentally induced errors, a number of possible sources for error were identified and an attempt made to quantify them.

First is the concern that evaporation may contribute to error by making calculated conductivities greater than actual conductivities due to the extra water loss from the system. This evaporation effect was estimated by running "blank" tubes without holes drilled into the bottom, which contained only water to see what, if any, water loss resulted during centrifugation. These runs were performed during the early to late spring. This factor would result in calculated conductivities being faster than actual conductivities due to the extra water loss from the system.

Empty tubes containing just water were run during a number of typical measurement runs with other samples. Each time the centrifuge was stopped, the tubes were weighed to determine actual water loss. It was found that on average, 0.10 g water were lost per hour due to evaporation. Using the cross sectional area of the tube of 5.06 $cm^2$, the equivalent drop in the water level is calculated using the ratio of the volume of water lost to the cross sectional area of the water reservoir, $\frac{0.10\ cm^3}{5.06\ cm^2}$. This translates to approximately $2.00 \times 10^{-4}$ m/hr. In an experimental run for an impervious sample, assuming a sample length of approximately 1", a speed of 1800 rpm's, and a run time of 3 hours, this could be mistaken for a low permeability value of $7.6 \times 10^{-12}$ m/s.

The upper limit of conductivity for the method was estimated considering the minimum practical sample length, and corresponding maximum reservoir volume. Assuming a minimum sample length of 0.25 inches, a centrifuge speed of 500 rpm, and a minimum run time of 10 minutes, the upper boundary was estimated. The minimum run time was approximately 10 minutes due to slight fluctuations in the centrifuge speed during a run and the variation encountered when the centrifuge is turned on and off. During this time if such a sample lost all of the water in its reservoir, or $7.78 \times 10^{-2}$ m of water, the resultant calculated conductivity would be on the order of $1.43 \times 10^{-7}$ m/s.

Another source of possible error is the small amount of water that adheres to the depth meter with each reading. This too, would result in calculated conductivities being higher than actual conductivity. To estimate this amount of water, a series of experiments were conducted to determine experimentally how much water was being removed from the system with each reading.

A kimwipe was weighed on a Mettler PJ3600 Delta Range electronic scale to two decimal places. The depth gauge was submerged in water 1" deep and removed. The kimwipe was then used to completely wipe the depth gauge so that all of the water was absorbed onto the kimwipe. The kimwipe was reweighed to determine the mass of water on the depth gauge. This was repeated for a total of 6 trials and on average, 0.04 g of water adhered to the gauge. Using the cross sectional area of the water reservoir, an equivalent drop in the water level was calculated using the ratio of the volume of water adhering to the depth gauge, to the cross sectional area of the water reservoir $\frac{0.04\ \text{cm}^3}{5.06\ \text{cm}^2}$. Therefore, $7.9 \times 10^{-5}$ m depth of water was removed from the water reservoir per inch of gauge submerged in the water reservoir. Expressed in the units used for calculations this is 0.0031 m of water removed from the water reservoir per m of gauge submerged in the water reservoir. This means that 0.3% of any water drop observed was the result of water on the measuring gauge, and that 99.7% was the result of water moving through the sample. Thus, for each run the measured drop in the water reservoir level is multiplied by a factor of 0.99.

The line chalk applied to the depth gauge also presented a possible source of error in the experimentation. There was concern that the line chalk might essentially "clog" the pores of the soil sample causing computed conductivities to be erroneously low. To experimentally estimate the effects of the line chalk we deliberately added line chalk to a sample where hydraulic conductivity had been previously calculated with the centrifuge. Chalk was added to the top of the soil sample creating a layer of chalk approximately 1/4" deep. This amount is many orders of magnitude greater than the amount that would actually be present in the water reservoir at the top of the soil sample. A fine screen was placed on the top to minimize dispersion into the water reservoir and to provide a surface with enough firmness to use the depth gauge. More centrifugation was performed and readings taken to determine the conductivity. Subsequent calculations showed no significant change in conductivity than before the layer of chalk was added. The chalk probably has a permeability much higher than the samples so that it does not measurably affect the permeability of the samples.

For purposes of comparing our results to an independent standard, several tubes containing bentonite were prepared and run in the centrifuge. The material used was Wyoming bentonite, supplied by Baroid Inc., a well service company. This was done in part, to compare the calculated conductivities of the clean clays obtained from the experimental method with published data. Calculated hydraulic conductivities were similar to the clay, in the low 1 x $10^{-9}$ m/s range. Table 3.1 presents the results of the tubes which were run on the centrifuge.

**Table 3.1 Results of Prepared Bentonite Samples**

| Sample | Hydraulic Conductivity (m/s) |
|---|---|
| Bentonite #1 | 1.70 x $10^{-9}$ |
| Bentonite #2 | 1.73 x $10^{-9}$ |
| Bentonite #3 | 8.00 x $10^{-10}$ |
| Bentonite #4 | 6.33 x $10^{-10}$ |
| Bentonite #5 | 8.67 x $10^{-10}$ |
| Bentonite #6 | 1.56 x $10^{-9}$ |
| Mean | 1.22 x $10^{-9}$ |

Data from the Claymax Corporation cite maximum obtainable conductivities on the order of 1 x $10^{-11}$ m/s (Claymax, 1992). This value is lower than the average value of 1.22 x $10^{-9}$ m/s obtained by the fc method, and may be due to the inherent difference in making hard permeability measurements versus soft permeability measurements. There are also data in the literature to suggest that the clay results are reasonable. For example, data collected from clay soils used as landfill liners are similar to the clay conductivities calculated for the Sierra Ladrones region. Data from one such soil used to line landfills in Wisconsin average 4 x $10^{-10}$ m/s (Gordon et al, 1989).

# CHAPTER 4. DATA AND RESULTS

## 4.1 INTRODUCTION

Approximately 200 samples were taken from the field site, and of these approximately 115 produced useable data. A range of 2 - 6 cores were taken at any given sampling location. The samples were taken from the low permeability units of the Sierra Ladrones Formation, with an emphasis being placed on the clay facies. The sampling locations are indicated on the site map located at Appendix A. The analyses of these samples produced information about the testing apparatus, the applicability of the method to this field site, and the relative hydraulic conductivities of these units to one another.

## 4.2 FIELD METHODS ANALYSIS

Section 3 describes in detail the field methods, laboratory methods, and equations used to determine saturated hydraulic conductivities using the falling head centrifugation method (fc). Samples which did not produce useable data were categorized as being the result of one of three problems: 1) the sample was damaged during transportation from the field site to the laboratory; 2) the sample was poorly sealed to the sides of the tube or had cracks which allowed preferential flow during centrifugation, making measurement impossible, or 3) the saturated hydraulic conductivity was out of the range of this apparatus.

The majority of the samples which were damaged during transportation from the field site to the laboratory were composed of silty or uncemented coarse-grained materials. It was found that in order for a sample to remain intact within the tube, that the grains must be contained chiefly within a clay, or fine-grained silt matrix. Weather played a role as well in determining the success rate of obtaining a given sample. Even samples with a high clay or fine-grained silt content were more subject to damage during sampling and transportation when they were collected during dry months, when the in-situ moisture content of the facies was low. During such months the effects of the low moisture content was mitigated somewhat by spraying the sampling location with an atomizer before driving the tube into the material. Using the sampling method described in Chapter 3, it is clear that those samples with high in-situ moisture contents ranging from a fine-grained silt to a clay, are best suited to the sampling method used in this experiment.

## 4.3 LABORATORY ANALYSIS

Of those that were successfully transported back to the laboratory many did not produce data for analysis. These were samples which did not retain any water in the reservoir above the sample to measure a head drop after centrifuging the sample. When this would occur over several hours worth of centrifugation, the sample was considered not to be useable. The majority of the samples which comprised this group were from coarse-grained silts or paleosol locations. A minor portion of this group was comprised of clean clay samples which were likely cracked, had poor seals to the inner edges of the tube or may have had organic matter, or roots, or pebbles within them, creating preferential flow paths during centrifugation. For the coarser-grained silts and paleosols it is unclear which of these were in fact unusable because of poor sampling techniques or damage to the sample, and which had saturated hydraulic conductivities that were out of the range of measurement of the apparatus used.

Further experimentation using longer cores and different sized centrifuge rotors could be employed at some future date to extend the limits for measurement with this method.

## 4.4 STRATIGRAPHY

Several of the low permeability units were sampled including tight clays, silts, and paleosols. The clays and silts of the overbank fines (OF) architectural element, comprised the samples which produced the majority of the useable data. Out of approximately 30 paleosol samples, only 3 actually ran successfully on the centrifuge, due to the reasons listed in the previous section. Lithologic categorization was based on field determination and visual inspection of the samples. The easiest samples to identify were those from the clay facies. These were characterized by highly plastic clean clays. The silts were composed of coarse-grained clayey materials. This identification required more subjective interpretation of the materials than for the clay facies, but was not as subjective as for the paleosols. The paleosols were identified by their grainy texture and relative location to other units in the formation using the depositional sequence data from Davis et al (1993). This identification resulted in a more subjective interpretation than for the clay facies. Table 4.1 summarizes the results for the data.

## 4.5 DATA RESULTS

Table 4.2 presents the mean saturated hydraulic conductivities for the clay facies and silt facies of the OF element in the Sierra Ladrones Formation using the falling head centrifuge method (fc). Generally, the mean hydraulic conductivity values

**Table 4.1 Summary of Sampling Results**

| Facies | Number of Sample Sites | Number of Successful Samples | Number of Unsuccessful Samples | Total Number of Samples |
|---|---|---|---|---|
| **Clay** | 25 | 82 | 22 | 104 |
| **Silt** | 19 | 30 | 51 | 81 |
| **Paleosol** | 6 | 3 | 27 | 30 |
| **Total** | 50 | 115 | 100 | 215 |

**Table 4.2 Average Hydraulic Conductivity Values for Clay and Silt Facies of the OF Architectural Element**

| Classification (# of samples) | Average Hydraulic Conductivity (m/s) | Standard Deviation |
|---|---|---|
| | | |
| Clays (82) | $2.19 \times 10^{-9}$ | $1.88 \times 10^{-9}$ |
| Silts (30) | $2.10 \times 10^{-8}$ | $2.28 \times 10^{-8}$ |

for the clay and silt facies differ by approximately one to one and a half orders of magnitude, representing a relatively tight range of saturated hydraulic conductivities. The paleosol samples which did run on the centrifuge produced data in the range of the silts. Previously Davis et al (1993) collected data on the gravel, sand and paleosol units within this formation. Their mean log permeability values were as follows: CH-I = 1.32 Darcy ($2 \times 10^{-4}$ m/s), CH-II = 0.84 Darcy ($6.68 \times 10^{-5}$ m/s) and P = 0.44 Darcy ($2.66 \times 10^{-5}$ m/s). The paleosol data using the fc method is approximately 3 orders of magnitude lower that that found by Davis et al (1993). This may be due to any combination of the following: the difference in accuracy between the two testing methods, the small number of data points obtained in the fc method versus the air-minipermeameter method or the paleosol samples used in the fc method were of much higher clay parent material than those in previous studies. Overall, the results of low permeability facies testing from this experiment for the clay and silt facies provide a low end to the distribution of hydraulic conductivity in the formation, not previously collected before.

Figure 4.1 graphically presents the distribution of the clay data over the log hydraulic conductivity range of the data, expressed in meters per second. It illustrates the tendency for the data to lie within a very tight range from log K = -9 to log K = - 8. Figure 4.2 presents a similar distribution of the silt data. It displays a wider range of permeabilities, with a wider central distribution of the data from log K = -9 to log K = -7. The values in the log K = -8 range are close to the upper limit of the methodology. It is probable that the silt log K distribution is broader than plotted in this figure. Overall, these graphs represent a range of log permeabilities for the OF group that span 2 orders of magnitude.

The standard deviations for the clay and silt samples differ by approximately one order of magnitude. This correlates well with the field sampling information which indicated that clean, rootless clays may be selectively obtained due to the sampling method used. The silts, due their grainier composition often exhibited a wider range of textures and thus their hydraulic conductivity.

Figure 4.3 depicts the cumulative distribution curves for the clay and silt data. The curves reveal different distribution patterns for the facies. The clay data exhibits a relatively steady increase in data density from log K = -9 to log K = -8. This is consistent with the histogram in Figure 4.1. The silt curve has a tail extending slightly

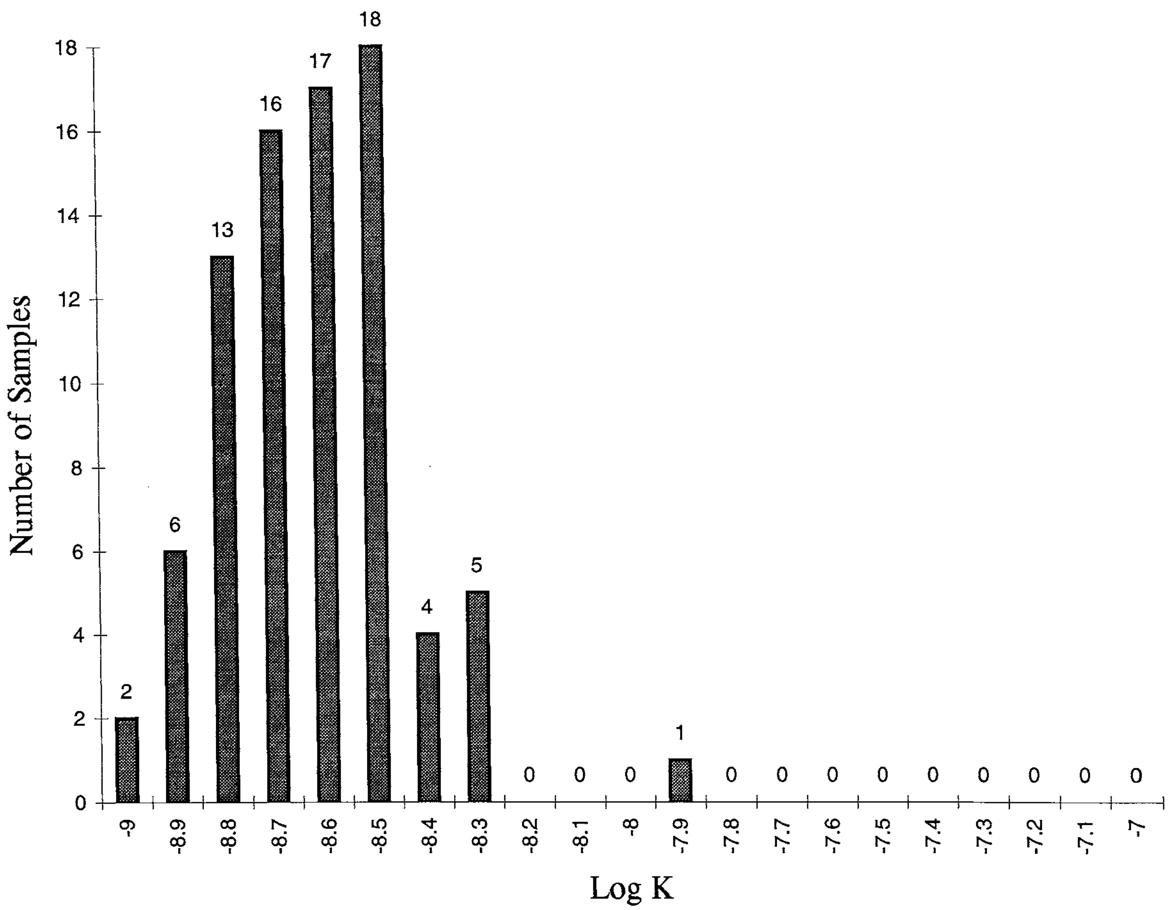



Figure 4.1 Distribution of Clay Data

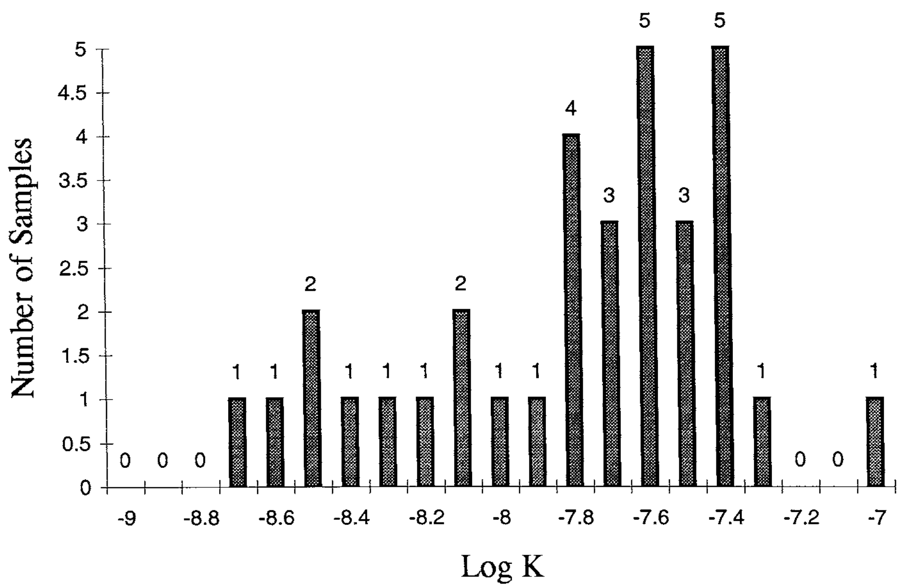



Figure 4.2 Distribution of Silt Data

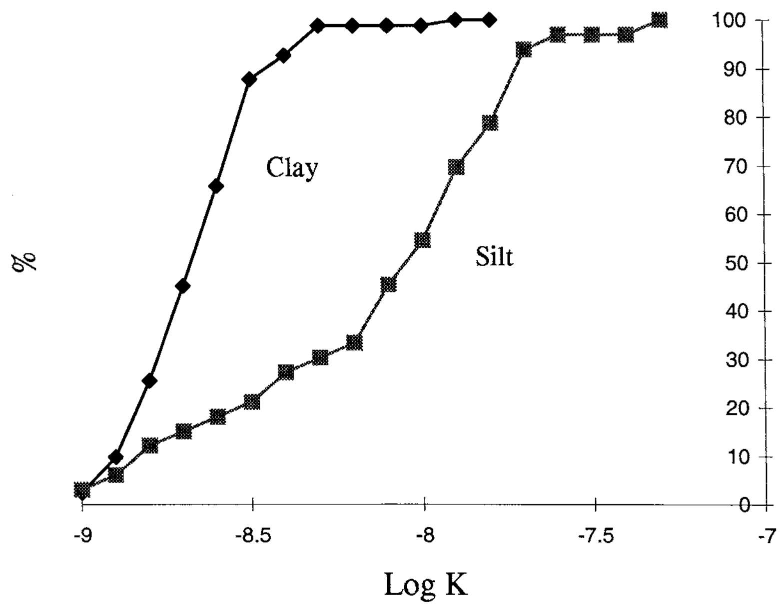



Figure 4.3 Cumulative Distribution of Clay and Silt Data

toward the high range of log K values, with a more gradual increase in data density from log K = -8.72 to log K = -8.30. A sharp increase is observed between log K = -8.3 to log K = -7.4. This is consistent with the data distribution displayed in Figure 4.2.

As discussed in Chapter 3, approximately 25% of the samples taken in the field were sampled in a horizontal direction, parallel to the formation layering. This was done in an attempt to characterize any anisotropy in the low permeable units of the formation. These horizontal samples were compared with vertical duplicate samples taken at the same sampling location. Figure 4.4 shows the data for the clay and silt samples where more than one sampling direction produced results.

The data obtained using the fc method are thus treated as soft data to attempt to quantify the degree of variability that exists within natural formations. For purposes of this study the mean hydraulic conductivities in Table 4.2 only the average value for a particular lithology. However, the individual sample data represent the means of several other sources of variability, among them sample interval, duplication, and sampling location. Statistical methods are applied to the data to quantify the different sources of variability among samples.

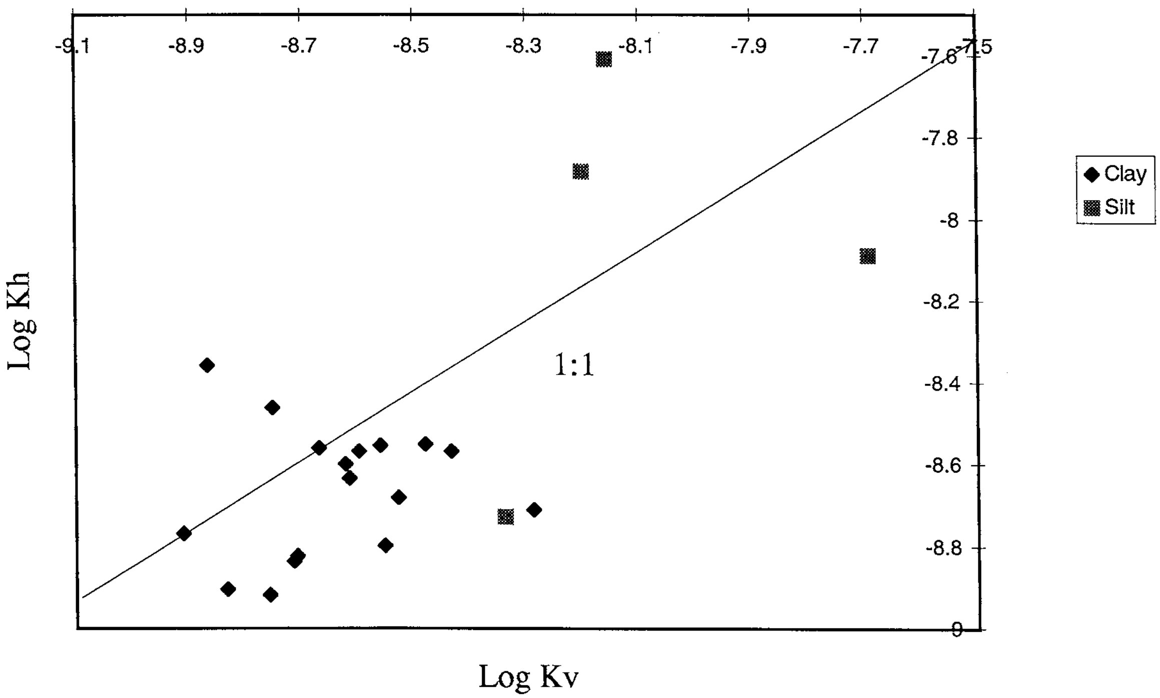



Figure 4.4 Comparison of Vertical vs. Horizontal Data

# CHAPTER 5. GEOSTATISTICAL INTERPRETATION

## 5.1 INTRODUCTION

The statistical method Analysis of Variance (ANOVA) was selected to attempt to analyze the sources of variability of the permeability measurements. Chapter 2 summarizes the depositional environment of the Sierra Ladrones Formation, and Chapter 4 summarizes the results of the low permeability testing using the fc method. This chapter will attempt to relate the statistical properties of the element-scale heterogeneity to the depositional properties.

## 5.2 ANALYSIS OF VARIANCE (ANOVA)

Steel and Torrie (1960) define Analysis of Variance as "...an arithmetic process for partitioning a total sum of squares into components associated with recognized sources of variation." The exact method chosen for this analysis is the unbalanced hierarchical method, "hierarchy" referring to the nested nature of the data. In this method the observations are partitioned into subgroups within larger groups. Figure 5.1 depicts the generalized tree diagram for such a hierarchical ANOVA experiment.

The hierarchical approach provides for both a "balanced" and an "unbalanced" model. In a "balanced" model the "branches" on the tree are symmetric, as shown in the general diagram in Figure 5.1. That is, at any given level, each member has the same number of sub-members in it. In the "unbalanced" approach, each member of a hierarchical level does not necessarily have the same number of sub-members in it. In this experiment, for example, the number of discrete measurements varied among

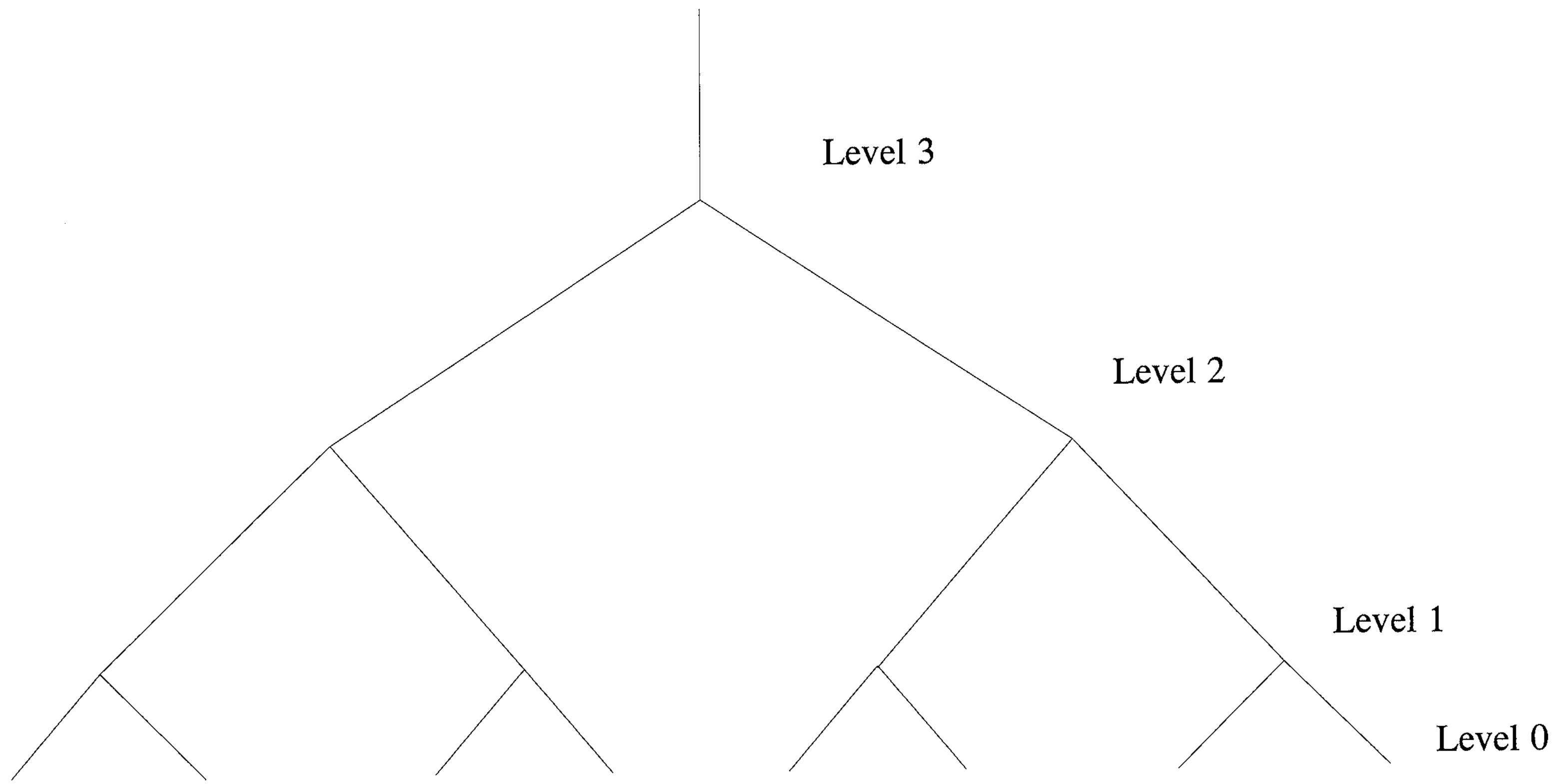



Figure 5.1 Conceptual Model for Balanced Hierarchical ANOVA Experiment

samples. For each sampling location there may have been different numbers of tubes averaged for that particular location. Figure 5.2 is a generalized diagram representing the "unbalanced" version of the hierarchical ANOVA model, like that used in this experiment.

### 5.2.1 PRESENTATION OF DATA

Two ANOVA tables were produced from the data. The primary data used to generate the ANOVA tables is presented in Appendix C. The data in this appendix are laid out by hierarchical level, beginning with the lowest level 0, runs, on the furthest left column. Within each level there are column headings denoted $X_{ik}$ and $N_{ik}$, where $X_{ik}$ denotes the measurement value for level $i$ at data value number $k$, and $N_{ik}$ denotes the number of measurements contained in that $X_{ik}$ value from the previous lower level. Thus, for example, at level 0, each $X_{0k}$ represents one discrete measurement on the centrifuge, and since it is the lowest level on the hierarchy, each corresponding $N_{ik}$ will have a value of 1. The $X_{0k}$ and $N_{0k}$ are added to give the totals, $X_{1k}$ and $N_{1k}$, at the next highest level, tubes. Similarly, the $X_{1k}$ and $N_{1k}$ are added to give the totals $X_{2k}$ and $N_{2k}$. Finally, the $X_{2k}$ and $N_{2k}$ are added to obtain $X_{3k}$ and $N_{3k}$.

At the bottom of each level, several parameters are calculated for use in the construction of the ANOVA tables. The values $C_i$ and $S_i$ are the number of classes in level $i$, and the sum of the squares of the data, divided by the number of classes for level $i$ , respectively. That is, $C_i$ = total number of entries in level $i$, and $S_i = \Sigma X_{ik}^2/N_{ik}$. These values are used to calculate the degrees of freedom (d.o.f.), and the sums of squares (s.o.sqr.), in the analysis of variance. The degrees of freedom is calculated from the equation: degrees of freedom of level $i$ = $C_i - C_{i+1}$. The sum of

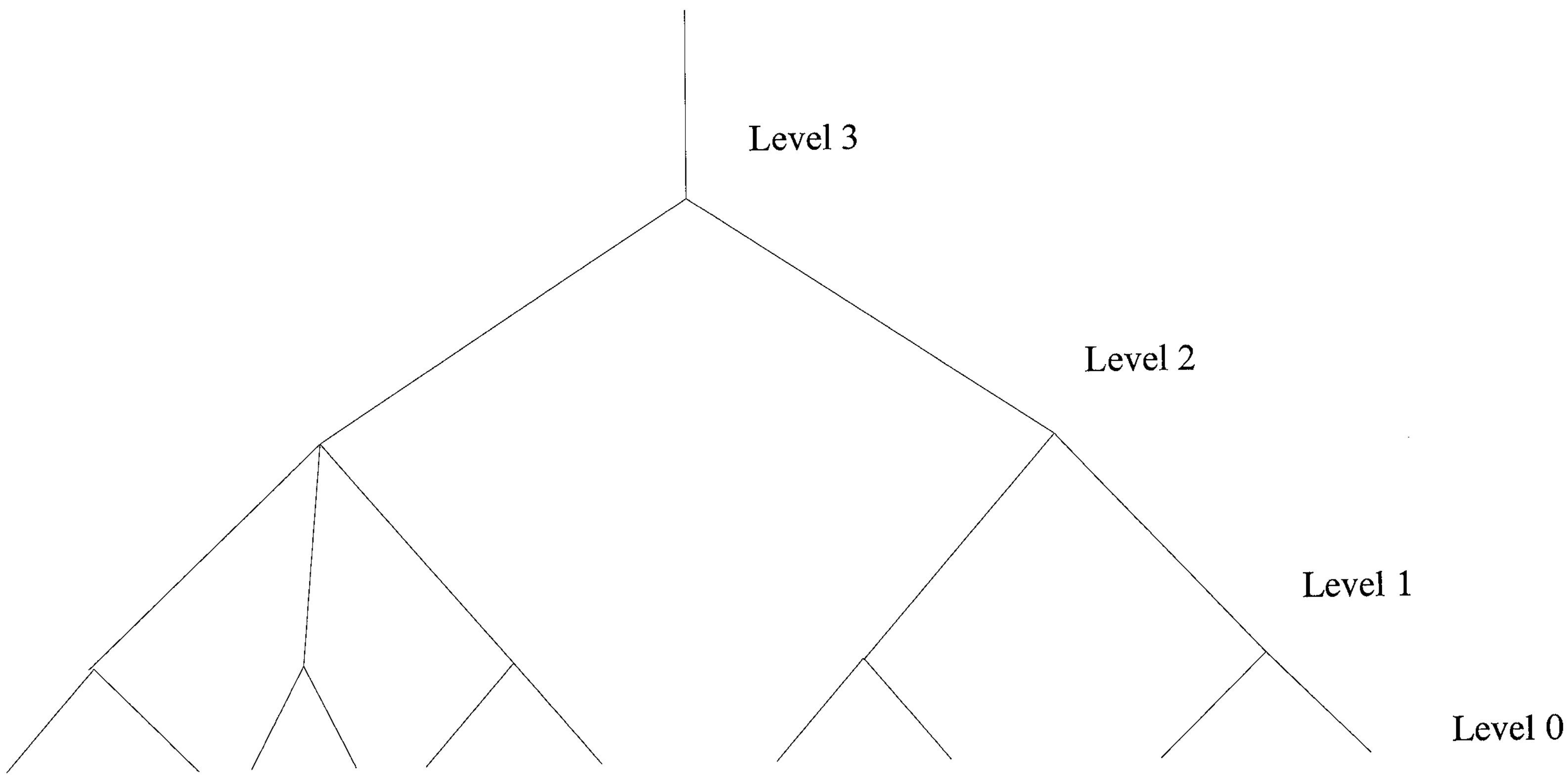



Figure 5.2  Conceptual Model For Unbalanced Hierarchical ANOVA Experiment

squares is calculated from the equation: sum of squares of level $i$ = $S_i$-$S_{i+1}$. The mean squares is equal to the sum of squares divided by the degrees of freedom. These three quantities comprise the first three entries in the ANOVA table. The fourth entry in the table is the expected value. The expected value entry is expressed in terms of the components of variance for the locations ($\sigma_2^2$), tubes ($\sigma_1^2$), and runs ($\sigma_0^2$). To do this, two sets of auxiliary quantities, $\gamma_{ij}$ and $k_{ij}$, are calculated.

For the $\gamma_{ij}$, $i$ and $j$ take the values 0, 1, 2, and 3 where $i \geq j$. On the diagonal, $\gamma_{ii}$ always equals the total number of observations. In column $\gamma_{io}$ the values are equal to the total number of observations for each level, or $\gamma_{io} = C_i$. For the remaining $\gamma_{ij}$ values in the table, the following rule is observed: sum the squares of the $N_{jk}$, each square divided by the next entry $N_{ik}$ at level $i$. That is, $\gamma_{ij} = \Sigma N_{jk}^2/N_{ik}$.

For the $k_{ij}$, $i$ and $j$ take the values 0, 1, 2, 3 with $i \geq j$ and $k_{ij}=\gamma_{ij}-\gamma_{i+1,j}$. That is, to compute any $k_{ij}$, start with $\gamma_{ij}$ and subtract the number immediately above it. The $k_{ij}$'s are used to calculate the expected values of the mean squares as follows: The coefficient of $\sigma_j^2$ at the level $i$ is $k_{ij}$ divided by the degrees of freedom at level $i$. The fifth column in the ANOVA table is the estimated variance. This is the estimate of the variance associated with a given source of variation in the experiment.

Tables 5.1 and 5.2 present the auxiliary quantities $\gamma_{ij}$ and $k_{ij}$ for this experiment, for the clay facies of the OF architectural element of the Sierra Ladrones Formation. Table 5.3 presents the results of the ANOVA application to the clay data using these auxiliary values. Tables 5.4 and 5.5 present auxiliary values $\gamma_{ij}$ and $k_{ij}$ respectively, for the silt data, and Table 5.6 presents the results of the ANOVA application to the silt data. Tables 5.3 and 5.6 present, from left to right, the source of variation, degrees of freedom, sum of squares, mean squares, expected value and estimated variance.

Table 5.1 Auxiliary Table for $\gamma_{ij}$ Values for Clays

| $\gamma_{ij}$ | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| 3 | 1 | 11.80 | 41.12 | 810 |
| 2 | 24 | 242.93 | 810 | |
| 1 | 82 | 810 | | |
| 0 | 810 | | | |

Table 5.2 Auxiliary Table for $k_{ij}$ Values for Clays

| $k_{ij}$ | 0 | 1 | 2 |
|---|---|---|---|
| 2 | 23 | 231.12 | 768.88 |
| 1 | 58 | 567.07 | |
| 0 | 728 | | |

Table 5.3 ANOVA Table for Clays

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN SQUARES | EXPECTED VALUE | ESTIMATED VARIANCE |
|---|---|---|---|---|---|
| **Location ($i$ = 2)** | 23 | 3.25E-16 | 1.41E-17 | $\sigma_0^2 + 10.05\sigma_1^2 + 33.43\sigma_2^2$ | $\sigma_2^2$ = 1.58E-19 |
| **Tubes ($i$ = 1)** | 58 | 5.19E-16 | 8.95E-18 | $\sigma_0^2 + 9.76\sigma_1^2$ | $\sigma_1^2$ = 5.67E-19 |
| **Runs ($i$ = 0)** | 728 | 2.28E-15 | 3.12E-18 | $\sigma_0^2$ | $\sigma_0^2$ = 3.12E-18 |

Table 5.4 Auxiliary Table for $\gamma_{ij}$ Values for Silts

| $\gamma_{ij}$ | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| 3 | 1 | 6.48 | 15.67 | 227 |
| 2 | 16 | 105.48 | 227 | |
| 1 | 33 | 227 | | |
| 0 | 227 | | | |

Table 5.5 Auxiliary Table for $k_{ij}$ Values Silts

| $k_{ij}$ | 0 | 1 | 2 |
|---|---|---|---|
| 2 | 15 | 99.00 | 210 |
| 1 | 17 | 121.52 | |
| 0 | 194 | | |

Table 5.6 ANOVA Table for Silts

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN SQUARES | EXPECTED VALUE | ESTIMATED VARIANCE |
|---|---|---|---|---|---|
| **Location ($i$ = 2)** | 15 | 6.25E-14 | 4.16E-15 | $\sigma_0^2 + 6.60\sigma_1^2 + 14.00\sigma_2^2$ | $\sigma_2^2$ = 2.46E-16 |
| **Tubes ($i$ = 1)** | 17 | 1.27E-14 | 7.49E-16 | $\sigma_0^2 + 7.15\sigma_1^2$ | $\sigma_1^2$ =7.88E-17 |
| **Runs ($i$ = 0)** | 194 | 3.59E-14 | 1.85E-16 | $\sigma_0^2$ | $\sigma_0^2$ = 1.85E-16 |

Analysis of Variance tables 5.3 and 5.6 reveal that for both the clays and the silty materials, the estimated variance is not significantly different among hierarchical classes. That is, the variability was on approximately the same order of magnitude from run to run as it was from tube to tube as it was from sample location to sample location. However, the estimated variance associated with each level in the silts is approximately 2 orders of magnitude larger than for the clays. This could be the result of actual heterogeneities within the silt facies, or the result of experimental errors. For example, grainier samples were more likely to have preferential flow paths within them. Thus, the likelihood of preferential flow in the samples was larger than for the clays, and may account for a greater variance in the data. Also, because clean brown clays provided the best samples, they may have been preferentially selected in the field resulting in highly uniform data, and lower estimated variances between data.

This result can mean several things. Given the permeability distribution among higher permeability units in the formation as documented by Davis et al (1993), there appears to be about two orders of magnitude difference in hydraulic conductivities between the silts tested in this experiment and paleosols tested with the air-minipermeameter. The estimate made of the "upper limit" of the apparatus assumes a perfect sample is being tested. Field experience suggests that samples in this higher upper testing limit of the apparatus may have been selectively excluded due to the sampling method rendering the samples unusable.

### 5.2.2 ANALYSIS

In general, the clay and silt facies which comprise the OF element group each exhibit relatively tightly spaced log permeability distributions, as illustrated in Figures 5 and 6. However, as a group, the data span 3 orders of magnitude of permeabilities. Other architectural elements in the formation, the CH-II, CH-I and P, have been characterized by Davis et al, (1993), using an air-minipermeameter. Each of these elements appear to exhibit different mean log permeabilities. This is interpreted as indicating that these elements may serve as suitable hydrogeologic units. Geostatistical analysis of this data indicated that the external geometries of the elements may exhibit a significant control on the spatial correlation structures of the log-permeability.

The OF architectural elements range in thickness from 1 to 7 meters thick within the formation. In general, statistics from the fc study indicate a lower overall variability in permeability than for the CH-I, CH-II or P elements. Davis et al (1993) cite a possible explanation for this as being attributable to the proportional effect. This refers to smaller-volume fraction deposits having lower indicator means.

Data from the fc method on the OF element can be used in conjunction with the conclusions by Davis et al (1993) on other elements in the formation, to describe the relationship between large-scale trends in heterogeneity and large-scale depositional processes. For example, it was found that the distribution of the elements was related to the variability in permeability. This theory would be consistent with data on the OF element where generally lower variability was observed.

The implications of this theory are that understanding the depositional processes involved in aquifer material deposition provide another input parameter to quantifying spatial variability in transport models. Models which previously only incorporated pore-scale processes such as dispersion into flow equations, can incorporate depositional data as well to quantify aquifer heterogeneity. With further characterization on other aquifer deposits, it may be possible to quantify aquifer heterogeneity more accurately with less hard data, using more readily available depositional data. Improvements in the area of large-scale heterogeneity quantification is probably the single-most important factor to improving contaminant transport predictions using modeling.

# CHAPTER 6 SUMMARY AND CONCLUSIONS

Samples were taken from bands of brown clays, and silty materials, with some being reddish soils and paleosols or combinations of these. The samples taken from the "clean" brown clays produced the lowest permeability data with an average permeability of $2.29 \times 10^{-9}$ m/s . The silts and paleosols tended to be less consolidated and as expected, produced the largest number of unusable data. They also produced higher hydraulic conductivity data for these sets with an average permeability of $2.41 \times 10^{-8}$ m/s. These data imply a tight range of permeabilities for the facies comprising the OF architectural element of the Sierra Ladrones Formation.

The method used to obtain these measurements was the falling head centrifuge method (fc) as presented by Nimmo and Mello (1991). The method produced results which were quite uniform, however as a whole the low permeability materials in the Sierra Ladrones region did produce data ranging over two orders of magnitude. Potential sources of experimental error suggest that both field sampling methods and laboratory methods could be refined in future studies to attempt to extend the range of data produced in this type of experiment.

The falling head centrifuge method is clearly useful in determining aquifer characteristics on a large scale. It is relatively simple to apply and requires very little in the way of expensive or complicated equipment. Further, it allows a greater number of samples to be run than with other conventional methods. There are several improvements to this method which could be made including developing a procedure to measure water levels in the tubes without chalk, improving sample collection success rates, and extending both the lower and upper measurement boundaries with modified apparatus. The fact that this method does not make hydraulic conductivity measurements in-situ remains a limitation.

Geostatistical analysis conducted using the Analysis of Variance (ANOVA) method indicated similar variances between identified sources of variability for both the clay and silt facies of the OF architectural element group. The relatively small range in permeability distribution of the OF element exhibited may be controlled by the spatial distribution of the element within the formation. Studies on higher permeability material within the formation were conducted on the CH-II, CH-I and P elements by Davis et al (1993). The permeability measurements were made using an air-minipermeameter and the data was analyzed using correlation structure data and variograms. They concluded that depositional processes can be correlated to the element-scale heterogeneities in permeability. If this is the case, then depositional information may provide a key to quantifying the dispersive behavior of solute transport in porous media in numerical models.

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# Appendix A

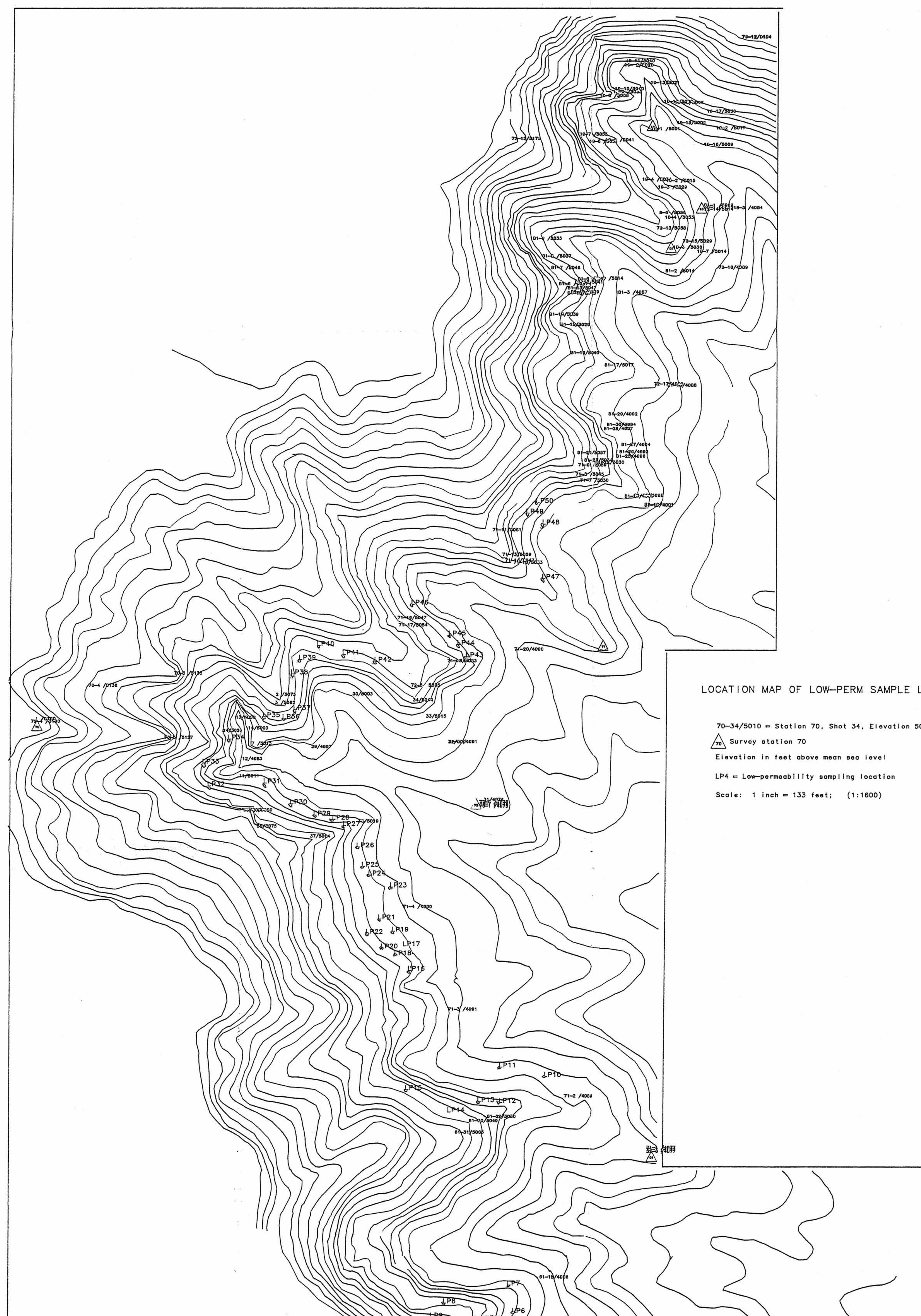
## Base Map of the Sierra Ladrones Formation

This appendix contains the base map of the Sierra Ladrones Formation, from which the samples for this study were taken. Each sampling location is designated with a label of the form "LP1". Each location is indicated with a point. There were a total of 50 sampling locations recorded for the formation. The following table indicates from which location the sample tubes came.

**Table A.1 Sample Locations Index**

| | |
|---|---|
| LP1 | 13C |
| LP2 | 1C,2C,3C,4C |
| LP3 | 5C,8C |
| LP4 | 9B,10B,11B,12B |
| LP5 | 9C |
| LP6 | 5B,6B,7B,8B |
| LP7 | 1B,2B,3B,4B |
| LP8 | 13B,14B,15B,16B |
| LP9 | 1E,2E,3E,4E |
| LP10 | 5E,6E,7E,8E |
| LP11 | 9E,10E,11E,12E |
| LP12 | 13E,14E,15E,16E |
| LP15 | 15K |
| LP16 | 23G,24G |
| LP17 | 28G,29G |
| LP18 | 10K |
| LP19 | 1J,2J,3J |
| LP20 | 32G,34G,37G,38G |
| LP21 | 25G |
| LP22 | 28G,29G |
| LP25 | 35G,36G,50J,51J |
| LP27 | 1F,2F,3F,4F |
| LP28 | 5F,6F,7J,8F |
| LP29 | 9F,10F,11F,12F |
| LP30 | 13F,14F,15F,16F |
| LP35 | 74G,76G,77G |
| LP36 | 70G,71G,72G,73G |
| LP37 | 55J,58J |
| LP39 | 62G,63J |
| LP40 | 78G,79G |

| | |
|---|---|
| LP41 | 79J |
| LP42 | 78J |
| LP43 | 1D,2D |
| LP44 | 5D,6D,7D,8D |
| LP45 | 9D,10D,11D,12D |
| LP46 | 13D |
| LP47 | 1A,2A,3A,4A |
| LP48 | 9A,10A,11A,12A |
| LP49 | 13A,14A,15A,16A |
| LP50 | 5A,6A,7A,8A |




LOCATION MAP OF LOW–PERM SAMPLE LOCATIONS

70–34/5010 = Station 70, Shot 34, Elevation 5010

(70) Survey station 70

Elevation in feet above mean sea level

LP4 = Low–permeability sampling location

Scale: 1 inch = 133 feet; (1:1600)

# Appendix B

# Hydraulic Conductivity Data

| 2A | A | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor ( m/sec) |
| 2 | | | | | | | | | | | |
| 3 | sample id | 2A | 1 | 400 | 41.8895 | 7800 | 0.03493 | 0.02858 | 7.59E-09 | 1.00437 | 7.56E-09 |
| 4 | length (m) | 0.0413 | | | | | | | | | |
| 5 | R-o (m) | 0.1889 | | | | | | | | | |
| 6 | dist cent (m) | 0.1683 | | | | | | | | | |
| 7 | meters/rev | 1.0575 | | | | | | | | | |
| 8 | R-b (m) | 0.1889 | | | | | | | | | |
| 9 | R-t (m) | 0.1508 | | | | | | | | | |
| 10 | Direction | V | | | | | | | | | |
| 11 | Element | OF | | | | | | | | | |
| 12 | Texture | Clay | | | | | | | | | |
| 13 | | | | | | | | | | | |
| 14 | | | | | | | | | | | |
| 15 | | | | | | | | | | | |
| 16 | | | | | | | | | | | |
| 17 | | | | | | | | | | | |
| 18 | | | | | | | | | | | |
| 19 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |
| 21 | | | | | | | | | | | |
| 22 | | | | | | | | | | | |
| 23 | | | | | | | | | | | |

```
2A:A1:    'constants
2A:C1:    'run #
2A:D1:    'rpm
2A:E1:    'omega
2A:F1:    't-elapsed (s)
2A:G1:    'depth i (m)
2A:H1:    'depth-wa (m)
2A:I1:    'k-sat (m/sec)
2A:J1:    '  c
2A:K1:    'K-cor ( m/sec)
2A:A3:    'sample id
2A:B3:    '2A
2A:C3:    1
2A:D3:    400
2A:E3:    +D3/60*$2A:$B$7/$2A:$B$6
2A:F3:    2*(60*60)+(10*60
2A:G3:    0.03493
2A:H3:    0.02858
2A:I3:    ($2A:$B$4/($2A:$B$5*1000*(E3^2)*F3))*(@LOG((($2A:$B$8+$2A:$B$9-H3)*($2A:$B$8-($2A:$B$9-G3)))/(($2A:$B$8-($2A:$B$9-H3))*($2A:$B$8+$2A:$B$9-G3))))*9.80665*1000
2A:J3:    1+(((3/4)*2.54/100)^2)/(4*($B$8^2-(($B$9-H3)^2))
2A:K3:    +I3/J3
2A:A4:    'length (m)
2A:B4:    0.0413
2A:A5:    'R-o (m)
2A:B5:    0.1889
2A:A6:    'dist cent (m)
2A:B6:    0.1683
2A:A7:    'meters/rev
2A:B7:    1.0575
2A:A8:    'R-b (m)
2A:B8:    0.1889
2A:A9:    'R-t (m)
2A:B9:    0.1508
2A:A10:   'Direction
2A:B10:   'V
2A:A11:   'Element
2A:B11:   'OF
2A:A12:   'Texture
2A:B12:   'Clay
```

This appendix contains the hydraulic conductivity data for the clay and silt samples. Each table represents centrifuge runs for one sample tube. The format for the table is laid out by centrifuge run. For each tube, a number of constants are recorded in the furthest left column. These constants are as follows: Sample id is the name of the sample; length is the length of the clay sample in meters; R-o, R-b, and R-t are as defined in Section 3.2.1, the distance from the axis of rotation to the bottom water reservoir, to the bottom of the sample, and to the top of the sample, respectively; dist cent is the distance from the center of the sample to the axis of rotation in meters, and meters/rev is the number of meters per revolution, which is the circumference in meters of the path the rotor arm travels in one complete revolution.

A number of parameters are recorded and calculated for each run on the centrifuge. A run consists of a timed interval, at a given speed that a sample is subjected to centrifugal forces in the centrifuge. The hydraulic conductivity of a sample is measured by a number a runs on the centrifuge. For each run, the revolutions per minute (rpm) is recorded, and the angular velocity is calculated in the next column under, omega. Next, the elapsed time of the run is recorded in seconds. Using the methods described in Chapter 3, the initial depth of the water in the water reservoir is recorded under the column, depth i (m), in meters. The next column records the depth of the water remaining in the water reservoir at the end of the time interval, under the column heading, depth-wa (m), in meters. From this, a k-sat value is calculated in m/s, and a corresponding correction factor is calculated in the next column. The correction factor is calculated using the equation, $c = 1 + \frac{R^2}{4(r_b^2 - r_{wa}^2)}$.

The corrected K-sat value is recorded in the next column using the equation

$$K = \frac{aL\,(\rho\ g)}{Ar_o\rho\omega^2(t - t_i)}\log[\frac{(r_o + r_{wa})(r_o - r_i)}{(r_o - r_{wa})(r_o + r_i)}]$$

where $r_i = r_{wa}$ at time $t_i$.

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat m/sec | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 1A | 1 | 400 | 41.888 | 7800 | 0.05715 | 0.05080 | 4.00E-09 | 1.00386 | 3.99E-09 |
| length (m) | 0.0254 | 2 | 550 | 57.596 | 8100 | 0.05080 | 0.03969 | 3.96E-09 | 1.00436 | 3.95E-09 |
| R-o (m) | 0.192088 | 3 | 550 | 57.596 | 15000 | 0.03969 | 0.02937 | 2.26E-09 | 1.00501 | 2.25E-09 |
| dist cent (m) | 0.179388 | 4 | 700 | 73.304 | 4200 | 0.02778 | 0.02381 | 2.11E-09 | 1.00548 | 2.10E-09 |
| meters/rev | 1.127125 | 5 | 1000 | 104.720 | 7200 | 0.02381 | 0.01667 | 1.23E-09 | 1.00628 | 1.22E-09 |
| R-b (m) | 0.192088 | 6 | 1000 | 104.720 | 3600 | 0.01667 | 0.01429 | 8.43E-10 | 1.00660 | 8.38E-10 |
| R-t (m) | 0.166688 | 7 | 850 | 89.012 | 9000 | 0.01429 | 0.00516 | 2.21E-09 | 1.00834 | 2.19E-09 |
| Direction | V | 8 | 619 | 64.822 | 8640 | 0.02540 | 0.00635 | 8.04E-09 | 1.00806 | 7.97E-09 |
| Element | OF | 9 | 610 | 63.879 | 7860 | 0.02302 | 0.00635 | 8.13E-09 | 1.00806 | 8.06E-09 |
| Texture | Clay | 10 | 550 | 57.596 | 3600 | 0.02064 | 0.01111 | 1.19E-08 | 1.00711 | 1.18E-08 |
| | | 11 | 748 | 78.330 | 7500 | 0.01786 | 0.00635 | 4.10E-09 | 1.00806 | 4.07E-09 |
| | | 12 | 555 | 58.119 | 6900 | 0.03254 | 0.02540 | 3.58E-09 | 1.00534 | 3.56E-09 |
| | | 13 | 488 | 51.103 | 8580 | 0.02540 | 0.01310 | 7.72E-09 | 1.00678 | 7.67E-09 |
| | | 14 | 491 | 51.417 | 4740 | 0.01310 | 0.01032 | 3.42E-09 | 1.00725 | 3.40E-09 |
| | | 15 | 385 | 40.317 | 7200 | 0.01032 | 0.00635 | 5.85E-09 | 1.00806 | 5.81E-09 |

AVERAGE: 4.51E-09
STANDARD DEVIATION: 3.07E-09

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor ( m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 2A | 1 | 400 | 41.8879 | 7800 | 0.03493 | 0.02858 | 7.59E-09 | 1.00437 | 7.55E-09 |
| length (m) | 0.041275 | 2 | 550 | 57.5959 | 8100 | 0.02858 | 0.02699 | 1.01E-09 | 1.00446 | 1.01E-09 |
| R-o (m) | 0.188913 | 3 | 550 | 57.5959 | 15000 | 0.02699 | 0.02223 | 1.70E-09 | 1.00474 | 1.70E-09 |
| dist cent (m) | 0.168275 | 4 | 700 | 73.3038 | 4200 | 0.02223 | 0.02064 | 1.31E-09 | 1.00484 | 1.30E-09 |
| meters/rev | 1.057303 | 5 | 1000 | 104.72 | 7200 | 0.02064 | 0.01826 | 5.75E-10 | 1.00501 | 5.72E-10 |
| R-b (m) | 0.188913 | 6 | 1000 | 104.72 | 3600 | 0.01826 | 0.01667 | 7.90E-10 | 1.00513 | 7.86E-10 |
| R-t (m) | 0.150813 | 7 | 850 | 89.0118 | 9000 | 0.01667 | 0.01191 | 1.38E-09 | 1.00553 | 1.37E-09 |
| Direction | V | 8 | 619 | 64.8215 | 8640 | 0.02540 | 0.02143 | 1.98E-09 | 1.00479 | 1.97E-09 |
| Element | OF | 9 | 646 | 67.649 | 7860 | 0.02143 | 0.01667 | 2.54E-09 | 1.00513 | 2.53E-09 |
| Texture | Clay | 10 | 610 | 63.8791 | 7860 | 0.01667 | 0.01151 | 3.33E-09 | 1.00557 | 3.31E-09 |
| | | 11 | 492 | 51.5221 | 3600 | 0.01349 | 0.00953 | 8.97E-09 | 1.00577 | 8.92E-09 |
| | | 12 | 576 | 60.3186 | 7800 | 0.00953 | 0.00794 | 1.27E-09 | 1.00594 | 1.26E-09 |
| | | 13 | 555 | 58.1195 | 6900 | 0.01032 | 0.00953 | 7.56E-10 | 1.00577 | 7.52E-10 |
| | | 14 | 488 | 51.1032 | 8640 | 0.00953 | 0.00476 | 4.94E-09 | 1.00632 | 4.90E-09 |

AVERAGE: 2.71E-09
STANDARD DEVIATION: 2.53E-09

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 3A | 1 | 400 | 41.888 | 7800 | 0.03493 | 0.03175 | 3.91E-09 | 1.00399 | 3.89E-09 |
| length (m) | 0.045640625 | 2 | 550 | 57.596 | 8100 | 0.03175 | 0.02858 | 2.06E-09 | 1.00413 | 2.05E-09 |
| R-o (m) | 0.1920875 | 3 | 550 | 57.596 | 15000 | 0.02858 | 0.02381 | 1.74E-09 | 1.00437 | 1.73E-09 |
| dist cent (m) | 0.1692671875 | 4 | 700 | 73.304 | 4200 | 0.02223 | 0.02064 | 1.36E-09 | 1.00455 | 1.35E-09 |
| meters/rev | 1.063537105488 | 5 | 1000 | 104.720 | 7200 | 0.02064 | 0.01826 | 5.97E-10 | 1.00469 | 5.94E-10 |
| R-b (m) | 0.1920875 | 6 | 1000 | 104.720 | 3600 | 0.01826 | 0.01667 | 8.18E-10 | 1.00480 | 8.14E-10 |
| R-t (m) | 0.1508125 | 7 | 850 | 89.012 | 9000 | 0.01667 | 0.01191 | 1.42E-09 | 1.00515 | 1.42E-09 |
| Direction | V | 8 | 619 | 64.822 | 8640 | 0.02540 | 0.02223 | 1.64E-09 | 1.00446 | 1.63E-09 |
| Element | OF | 9 | 646 | 67.649 | 7860 | 0.02223 | 0.01826 | 2.16E-09 | 1.00469 | 2.15E-09 |
| Texture | Clay | 10 | 610 | 63.879 | 7860 | 0.01826 | 0.01230 | 3.90E-09 | 1.00512 | 3.88E-09 |
| | | 11 | 492 | 51.522 | 3600 | 0.01349 | 0.00953 | 9.23E-09 | 1.00536 | 9.18E-09 |
| | | 12 | 576 | 60.319 | 7800 | 0.00953 | 0.00635 | 2.64E-09 | 1.00566 | 2.62E-09 |
| | | 13 | 555 | 58.119 | 6900 | 0.01032 | 0.00953 | 7.77E-10 | 1.00536 | 7.73E-10 |
| | | 14 | 488 | 51.103 | 8640 | 0.00953 | 0.00476 | 5.05E-09 | 1.00583 | 5.02E-09 |

AVERAGE: 2.65E-09
STANDARD DEVIATION: 2.21E-09

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 4A | 1 | 400 | 41.888 | 7800 | 0.03413 | 0.02778 | 7.59E-09 | 1.00401 | 7.56E-09 |
| **length (m)** | 0.0448469 | 2 | 550 | 57.596 | 8100 | 0.02778 | 0.02619 | 1.01E-09 | 1.00408 | 1.00E-09 |
| **R-o (m)** | 0.1920875 | 3 | 550 | 57.596 | 15000 | 0.02619 | 0.01905 | 2.57E-09 | 1.00443 | 2.56E-09 |
| **dist cent (m)** | 0.1696641 | 4 | 700 | 73.304 | 4200 | 0.01826 | 0.01508 | 2.71E-09 | 1.00467 | 2.70E-09 |
| **meters/rev** | 1.0660307 | 5 | 1000 | 104.720 | 7200 | 0.01508 | 0.00635 | 2.32E-09 | 1.00532 | 2.31E-09 |
| **R-b (m)** | 0.1920875 | 6 | 1000 | 104.720 | 3600 | 0.00635 | 0.00159 | 2.82E-09 | 1.00579 | 2.80E-09 |
| **R-t (m)** | 0.1472406 | 7 | 850 | 89.012 | 9000 | 0.01191 | 0.00794 | 1.18E-09 | 1.00519 | 1.17E-09 |
| **Direction** | H | 8 | 619 | 64.822 | 8640 | 0.02183 | 0.01905 | 1.40E-09 | 1.00443 | 1.40E-09 |
| **Element** | OF | 9 | 646 | 67.649 | 7860 | 0.01905 | 0.01349 | 2.99E-09 | 1.00477 | 2.98E-09 |
| **Texture** | Clay | 10 | 610 | 63.879 | 7860 | 0.01349 | 0.00953 | 2.56E-09 | 1.00506 | 2.55E-09 |
| | | 11 | 492 | 51.522 | 3600 | 0.01032 | 0.00873 | 3.54E-09 | 1.00512 | 3.52E-09 |
| | | 12 | 576 | 60.319 | 7800 | 0.00873 | 0.00635 | 1.84E-09 | 1.00532 | 1.83E-09 |
| | | 13 | 555 | 58.119 | 6900 | 0.01826 | 0.01667 | 1.30E-09 | 1.00457 | 1.29E-09 |
| | | 14 | 488 | 51.103 | 8640 | 0.01667 | 0.01191 | 4.20E-09 | 1.00488 | 4.18E-09 |
| | | 15 | 491 | 51.417 | 4860 | 0.01191 | 0.01032 | 2.57E-09 | 1.00500 | 2.56E-09 |
| | | 16 | 385 | 40.317 | 7200 | 0.01032 | 0.00794 | 4.36E-09 | 1.00519 | 4.34E-09 |
| | | 17 | 640 | 67.021 | 2520 | 0.00794 | 0.00635 | 3.10E-09 | 1.00532 | 3.09E-09 |

AVERAGE: 2.81E-09
STANDARD DEVIATION: 1.51E-09

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 5A | 1 | 400 | 41.888 | 7800 | 0.03651 | 0.03016 | 7.61E-09 | 1.00391 | 7.58E-09 |
| **length (m)** | 0.0460375 | 2 | 550 | 57.596 | 8100 | 0.03016 | 0.02778 | 1.52E-09 | 1.00401 | 1.51E-09 |
| **R-o (m)** | 0.1920875 | 3 | 550 | 57.596 | 15000 | 0.02778 | 0.01905 | 3.19E-09 | 1.00443 | 3.18E-09 |
| **dist cent (m)** | 0.1690688 | 4 | 700 | 73.304 | 4200 | 0.01826 | 0.01508 | 2.78E-09 | 1.00467 | 2.77E-09 |
| **meters/rev** | 1.0622903 | 5 | 1000 | 104.720 | 7200 | 0.01508 | 0.00794 | 1.92E-09 | 1.00519 | 1.91E-09 |
| **R-b (m)** | 0.1920875 | 6 | 1000 | 104.720 | 3600 | 0.00794 | 0.00397 | 2.33E-09 | 1.00554 | 2.32E-09 |
| **R-t (m)** | 0.1472406 | 7 | 850 | 89.012 | 9000 | 0.01191 | 0.00794 | 1.21E-09 | 1.00519 | 1.20E-09 |
| **Direction** | V | 8 | 619 | 64.822 | 8640 | 0.02183 | 0.02143 | 2.03E-10 | 1.00431 | 2.02E-10 |
| **Element** | OF | 9 | 646 | 67.649 | 7860 | 0.02143 | 0.01588 | 2.98E-09 | 1.00462 | 2.96E-09 |
| **Texture** | Clay | 10 | 610 | 63.879 | 7860 | 0.01588 | 0.00953 | 4.13E-09 | 1.00506 | 4.11E-09 |
| | | 11 | 492 | 51.522 | 3600 | 0.01032 | 0.00953 | 1.81E-09 | 1.00506 | 1.80E-09 |
| | | 12 | 576 | 60.319 | 7800 | 0.00953 | 0.00794 | 1.24E-09 | 1.00519 | 1.23E-09 |
| | | 13 | 555 | 58.119 | 6900 | 0.01826 | 0.01667 | 1.33E-09 | 1.00457 | 1.33E-09 |
| | | 14 | 488 | 51.103 | 8640 | 0.01667 | 0.01429 | 2.12E-09 | 1.00472 | 2.11E-09 |
| | | 15 | 491 | 51.417 | 4860 | 0.01429 | 0.01111 | 5.16E-09 | 1.00494 | 5.13E-09 |
| | | 16 | 385 | 40.317 | 7200 | 0.01111 | 0.00953 | 2.93E-09 | 1.00506 | 2.92E-09 |
| | | 17 | 640 | 67.021 | 2520 | 0.00953 | 0.00794 | 3.11E-09 | 1.00519 | 3.09E-09 |

AVERAGE: 2.67E-09
STANDARD DEVIATION: 1.68E-09

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 7A | 1 | 400 | 41.888 | 7800 | 0.03016 | 0.02858 | 1.88E-09 | 1.00008 | 1.88E-09 |
| **length (m)** | 0.0428625 | 2 | 550 | 57.596 | 8100 | 0.02858 | 0.02461 | 2.47E-09 | 1.00008 | 2.47E-09 |
| **R-o (m)** | 0.1920875 | 3 | 550 | 57.596 | 15000 | 0.02461 | 0.01826 | 2.27E-09 | 1.00008 | 2.27E-09 |
| **dist cent (m)** | 0.1706563 | 4 | 700 | 73.304 | 4200 | 0.01667 | 0.01508 | 1.34E-09 | 1.00008 | 1.34E-09 |
| **meters/rev** | 1.0722648 | 5 | 1000 | 104.720 | 7200 | 0.01508 | 0.01429 | 1.95E-10 | 1.00008 | 1.95E-10 |
| **R-b (m)** | 0.1920875 | 6 | 1000 | 104.720 | 3600 | 0.01429 | 0.01191 | 1.20E-09 | 1.00008 | 1.20E-09 |
| **R-t (m)** | 0.149225 | 7 | 850 | 89.012 | 9000 | 0.01191 | 0.00794 | 1.16E-09 | 1.00008 | 1.16E-09 |
| **Direction** | V | 8 | 619 | 64.822 | 8640 | 0.02143 | 0.01905 | 1.18E-09 | 1.00008 | 1.18E-09 |
| **Element** | OF | 9 | 646 | 67.649 | 7860 | 0.01905 | 0.01627 | 1.44E-09 | 1.00008 | 1.44E-09 |
| **Texture** | Clay | 10 | 610 | 63.879 | 7860 | 0.01627 | 0.01349 | 1.68E-09 | 1.00008 | 1.68E-09 |
| | | 11 | 492 | 51.522 | 3600 | 0.01191 | 0.01191 | 0.00E+00 | 1.00008 | 0.00E+00 |
| | | 12 | 576 | 60.319 | 7800 | 0.01191 | 0.01032 | 1.15E-09 | 1.00008 | 1.15E-09 |
| | | 13 | 748 | 78.330 | 7440 | 0.01032 | 0.00794 | 1.10E-09 | 1.00008 | 1.10E-09 |
| | | 14 | 555 | 58.119 | 6900 | 0.01945 | 0.01905 | 3.11E-10 | 1.00008 | 3.11E-10 |
| | | 15 | 488 | 51.103 | 8640 | 0.01905 | 0.01588 | 2.63E-09 | 1.00008 | 2.63E-09 |
| | | 16 | 491 | 51.417 | 4860 | 0.01588 | 0.01508 | 1.19E-09 | 1.00008 | 1.19E-09 |
| | | 17 | 385 | 40.317 | 7200 | 0.01508 | 0.01349 | 2.65E-09 | 1.00008 | 2.65E-09 |
| | | 18 | 640 | 67.021 | 2520 | 0.01349 | 0.01270 | 1.39E-09 | 1.00008 | 1.39E-09 |

AVERAGE: 1.40E-09
STANDARD DEVIATION: 7.53E-10

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 8A | 1 | 400 | 41.88790 | 7800 | 0.03572 | 0.03334 | 2.62E-09 | 1.00393 | 2.61E-09 |
| length (m) | 0.041275 | 2 | 550 | 57.59587 | 8100 | 0.03334 | 0.03016 | 1.83E-09 | 1.00406 | 1.82E-09 |
| R-o (m) | 0.1920875 | 3 | 550 | 57.59587 | 15000 | 0.03016 | 0.02461 | 1.81E-09 | 1.00433 | 1.81E-09 |
| dist cent (m) | 0.17145 | 4 | 700 | 73.30383 | 4200 | 0.02461 | 0.02302 | 1.19E-09 | 1.00441 | 1.19E-09 |
| meters/rev | 1.0772521 | 5 | 1000 | 104.71976 | 7200 | 0.02302 | 0.02064 | 5.23E-10 | 1.00455 | 5.21E-10 |
| R-b (m) | 0.1920875 | 6 | 1000 | 104.71976 | 3600 | 0.02064 | 0.01905 | 7.16E-10 | 1.00464 | 7.13E-10 |
| R-t (m) | 0.1508125 | 7 | 850 | 89.01179 | 9000 | 0.01905 | 0.01508 | 1.03E-09 | 1.00491 | 1.02E-09 |
| Direction | H | 8 | 619 | 64.82153 | 8640 | 0.02937 | 0.02699 | 1.06E-09 | 1.00421 | 1.05E-09 |
| Element | OF | 9 | 646 | 67.64896 | 7860 | 0.02699 | 0.02381 | 1.47E-09 | 1.00437 | 1.46E-09 |
| Texture | Clay | 10 | 610 | 63.87905 | 7860 | 0.02381 | 0.02143 | 1.28E-09 | 1.00450 | 1.27E-09 |
| | | 11 | 492 | 51.52212 | 3600 | 0.01984 | 0.01945 | 7.41E-10 | 1.00462 | 7.38E-10 |
| | | 12 | 576 | 60.31858 | 7800 | 0.01945 | 0.01746 | 1.27E-09 | 1.00475 | 1.26E-09 |
| | | 13 | 748 | 78.33038 | 7440 | 0.01746 | 0.01508 | 9.76E-10 | 1.00491 | 9.71E-10 |
| | | 14 | 555 | 58.11946 | 6900 | 0.02699 | 0.02540 | 1.12E-09 | 1.00429 | 1.12E-09 |
| | | 15 | 488 | 51.10324 | 8640 | 0.02540 | 0.02302 | 1.78E-09 | 1.00441 | 1.77E-09 |
| | | 16 | 491 | 51.41740 | 4860 | 0.02302 | 0.02143 | 2.13E-09 | 1.00450 | 2.12E-09 |
| | | 17 | 385 | 40.31711 | 7200 | 0.02143 | 0.02064 | 1.19E-09 | 1.00455 | 1.18E-09 |
| | | 18 | 640 | 67.02064 | 2520 | 0.02064 | 0.02024 | 6.19E-10 | 1.00457 | 6.17E-10 |
| | | | | | | | AVERAGE: | | | 1.29E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 5.38E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 9A | 1 | 400 | 41.8879 | 7800 | 0.05159 | 0.04921 | 1.76E-09 | 1.00381 | 1.75E-09 |
| length (m) | 0.028575 | 2 | 550 | 57.59587 | 8100 | 0.04921 | 0.04604 | 1.23E-09 | 1.00393 | 1.22E-09 |
| R-o (m) | 0.192088 | 3 | 550 | 57.59587 | 15000 | 0.04604 | 0.03969 | 1.39E-09 | 1.00421 | 1.39E-09 |
| dist cent (m) | 0.1778 | 4 | 700 | 73.30383 | 4200 | 0.03969 | 0.03889 | 3.99E-10 | 1.00425 | 3.97E-10 |
| meters/rev | 1.11715 | 5 | 1000 | 104.7198 | 7200 | 0.03889 | 0.03334 | 8.29E-10 | 1.00455 | 8.25E-10 |
| R-b (m) | 0.192088 | 6 | 1000 | 104.7198 | 3600 | 0.03334 | 0.03175 | 4.96E-10 | 1.00464 | 4.93E-10 |
| R-t (m) | 0.163513 | 7 | 850 | 89.01179 | 9000 | 0.03175 | 0.02858 | 5.67E-10 | 1.00485 | 5.64E-10 |
| Direction | V | 8 | 619 | 64.82153 | 8640 | 0.02699 | 0.02381 | 1.19E-09 | 1.00522 | 1.19E-09 |
| Element | OF | 9 | 646 | 67.64896 | 7860 | 0.02381 | 0.01905 | 1.93E-09 | 1.00566 | 1.92E-09 |
| Texture | Clay | 10 | 610 | 63.87905 | 7860 | 0.01905 | 0.01667 | 1.15E-09 | 1.00592 | 1.15E-09 |
| | | 11 | 492 | 51.52212 | 3600 | 0.01667 | 0.01667 | 0.00E+00 | 1.00592 | 0.00E+00 |
| | | 12 | 576 | 60.31858 | 7800 | 0.01667 | 0.01270 | 2.31E-09 | 1.00641 | 2.29E-09 |
| | | 13 | 748 | 78.33038 | 7440 | 0.01270 | 0.01032 | 9.21E-10 | 1.00676 | 9.15E-10 |
| | | 14 | 555 | 58.11946 | 6900 | 0.03175 | 0.03016 | 8.58E-10 | 1.00475 | 8.54E-10 |
| | | 15 | 488 | 51.10324 | 8640 | 0.03016 | 0.02778 | 1.37E-09 | 1.00491 | 1.36E-09 |
| | | 16 | 491 | 51.4174 | 4860 | 0.02778 | 0.02461 | 3.33E-09 | 1.00515 | 3.32E-09 |
| | | 17 | 385 | 40.31711 | 7200 | 0.02461 | 0.02302 | 1.90E-09 | 1.00529 | 1.89E-09 |
| | | 18 | 640 | 67.02064 | 2520 | 0.02302 | 0.02223 | 1.00E-09 | 1.00536 | 9.96E-10 |
| | | | | | | | AVERAGE: | | | 1.25E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 7.59E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 10A | 1 | 400 | 41.888 | 7800 | 0.04921 | 0.04842 | 6.53E-10 | 1.00370 | 6.50E-10 |
| length (m) | 0.032544 | 2 | 550 | 57.596 | 8100 | 0.04842 | 0.04524 | 1.35E-09 | 1.00381 | 1.35E-09 |
| R-o (m) | 0.192088 | 3 | 550 | 57.596 | 15000 | 0.04524 | 0.03889 | 1.53E-09 | 1.00406 | 1.53E-09 |
| dist cent (m) | 0.175816 | 4 | 700 | 73.304 | 4200 | 0.03889 | 0.03731 | 8.80E-10 | 1.00413 | 8.77E-10 |
| meters/rev | 1.104682 | 5 | 1000 | 104.720 | 7200 | 0.03731 | 0.03413 | 5.17E-10 | 1.00429 | 5.15E-10 |
| R-b (m) | 0.192088 | 6 | 1000 | 104.720 | 3600 | 0.03413 | 0.03334 | 2.65E-10 | 1.00433 | 2.63E-10 |
| R-t (m) | 0.159544 | 7 | 850 | 89.012 | 9000 | 0.03334 | 0.02858 | 9.10E-10 | 1.00459 | 9.05E-10 |
| Direction | V | 8 | 619 | 64.822 | 8640 | 0.02699 | 0.02540 | 6.34E-10 | 1.00480 | 6.31E-10 |
| Element | OF | 9 | 646 | 67.649 | 7860 | 0.02540 | 0.02223 | 1.32E-09 | 1.00503 | 1.32E-09 |
| Texture | Clay | 10 | 610 | 63.879 | 7860 | 0.02223 | 0.02064 | 7.70E-10 | 1.00515 | 7.66E-10 |
| | | 11 | 492 | 51.522 | 3600 | 0.01905 | 0.01865 | 6.73E-10 | 1.00532 | 6.70E-10 |
| | | 12 | 576 | 60.319 | 7800 | 0.01865 | 0.01746 | 6.89E-10 | 1.00543 | 6.85E-10 |
| | | 13 | 748 | 78.330 | 7440 | 0.01746 | 0.01508 | 8.83E-10 | 1.00566 | 8.78E-10 |
| | | 14 | 555 | 58.119 | 6900 | 0.03572 | 0.03473 | 5.50E-10 | 1.00426 | 5.48E-10 |
| | | 15 | 488 | 51.103 | 8640 | 0.03473 | 0.03334 | 8.07E-10 | 1.00433 | 8.04E-10 |
| | | 16 | 491 | 51.417 | 4860 | 0.03334 | 0.03235 | 1.03E-09 | 1.00438 | 1.02E-09 |
| | | 17 | 385 | 40.317 | 7200 | 0.03235 | 0.03016 | 2.53E-09 | 1.00450 | 2.52E-09 |
| | | 18 | 640 | 67.021 | 2520 | 0.03016 | 0.02937 | 9.69E-10 | 1.00455 | 9.65E-10 |
| | | | | | | | AVERAGE: | | | 9.384E-10 |
| | | | | | | | STANDARD DEVIATION: | | | 4.899E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 11A | 1 | 400 | 41.8879 | 7800 | 0.05636 | 0.05477 | 9.73E-10 | 1.00378 | 9.69E-10 |
| length (m) | 0.023813 | 2 | 550 | 57.59587 | 8100 | 0.05477 | 0.05239 | 7.57E-10 | 1.00387 | 7.54E-10 |
| R-o (m) | 0.192088 | 3 | 550 | 57.59587 | 15000 | 0.05239 | 0.04643 | 1.07E-09 | 1.00411 | 1.06E-09 |
| dist cent (m) | 0.180181 | 4 | 700 | 73.30383 | 4200 | 0.04564 | 0.04445 | 4.93E-10 | 1.00421 | 4.91E-10 |
| meters/rev | 1.132112 | 5 | 1000 | 104.7198 | 7200 | 0.04445 | 0.03493 | 1.20E-09 | 1.00475 | 1.20E-09 |
| R-b (m) | 0.192088 | 6 | 1000 | 104.7198 | 3600 | 0.03493 | 0.03175 | 8.73E-10 | 1.00497 | 8.69E-10 |
| R-t (m) | 0.168275 | 7 | 850 | 89.01179 | 9000 | 0.03175 | 0.02778 | 6.38E-10 | 1.00529 | 6.34E-10 |
| Direction | V | 8 | 619 | 64.82153 | 8640 | 0.04167 | 0.03889 | 7.57E-10 | 1.00450 | 7.53E-10 |
| Element | OF | 9 | 646 | 67.64896 | 7860 | 0.03889 | 0.03572 | 9.07E-10 | 1.00469 | 9.03E-10 |
| Texture | Clay | 10 | 610 | 63.87905 | 7860 | 0.03572 | 0.03175 | 1.34E-09 | 1.00497 | 1.33E-09 |
| | | 11 | 492 | 51.52212 | 3600 | 0.03135 | 0.02818 | 3.81E-09 | 1.00525 | 3.79E-09 |
| | | 12 | 576 | 60.31858 | 7800 | 0.02818 | 0.02778 | 1.65E-10 | 1.00529 | 1.64E-10 |
| | | 13 | 748 | 78.33038 | 7440 | 0.02778 | 0.02540 | 6.29E-10 | 1.00550 | 6.26E-10 |
| | | 14 | 555 | 58.11946 | 6900 | 0.03175 | 0.03016 | 7.66E-10 | 1.00509 | 7.62E-10 |
| | | 15 | 488 | 51.10324 | 8640 | 0.03016 | 0.02778 | 1.22E-09 | 1.00529 | 1.22E-09 |
| | | 16 | 491 | 51.4174 | 4860 | 0.02778 | 0.02699 | 7.35E-10 | 1.00536 | 7.31E-10 |
| | | 17 | 385 | 40.31711 | 7200 | 0.02699 | 0.02540 | 1.65E-09 | 1.00550 | 1.64E-09 |
| | | 18 | 640 | 67.02064 | 2520 | 0.02540 | 0.02461 | 8.69E-10 | 1.00558 | 8.64E-10 |

AVERAGE: 1.04161E-09
STANDARD DEVIATION: 7.40217E-10

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 12A | 1 | 400 | 41.88790 | 7800 | 0.03572 | 0.03572 | 0.00E+00 | 1.00390 | 0.00E+00 |
| length (m) | 0.0396875 | 2 | 550 | 57.59587 | 8100 | 0.03572 | 0.03334 | 1.30E-09 | 1.00399 | 1.30E-09 |
| R-o (m) | 0.1920875 | 3 | 550 | 57.59587 | 15000 | 0.03334 | 0.02461 | 2.74E-09 | 1.00441 | 2.73E-09 |
| dist cent (m) | 0.17224375 | 4 | 700 | 73.30383 | 4200 | 0.02540 | 0.02461 | 5.75E-10 | 1.00441 | 5.73E-10 |
| meters/rev | 1.0822394 | 5 | 1000 | 104.71976 | 7200 | 0.02461 | 0.02223 | 5.03E-10 | 1.00455 | 5.01E-10 |
| R-b (m) | 0.1920875 | 6 | 1000 | 104.71976 | 3600 | 0.02223 | 0.01746 | 2.11E-09 | 1.00485 | 2.10E-09 |
| R-t (m) | 0.1524 | 7 | 850 | 89.01179 | 9000 | 0.01746 | 0.01508 | 6.15E-10 | 1.00503 | 6.12E-10 |
| Direction | H | 8 | 619 | 64.82153 | 8640 | 0.03175 | 0.02937 | 1.01E-09 | 1.00417 | 1.00E-09 |
| Element | OF | 9 | 646 | 67.64896 | 7860 | 0.02937 | 0.02540 | 1.75E-09 | 1.00437 | 1.75E-09 |
| Texture | Clay | 10 | 610 | 63.87905 | 7860 | 0.02540 | 0.02064 | 2.49E-09 | 1.00464 | 2.48E-09 |
| | | 11 | 492 | 51.52212 | 3600 | 0.02143 | 0.01984 | 2.87E-09 | 1.00469 | 2.86E-09 |
| | | 12 | 576 | 60.31858 | 7800 | 0.01984 | 0.01667 | 2.00E-09 | 1.00491 | 1.99E-09 |
| | | 13 | 748 | 78.33038 | 7440 | 0.01667 | 0.01429 | 9.72E-10 | 1.00509 | 9.67E-10 |
| | | 14 | 555 | 58.11946 | 6900 | 0.02223 | 0.02064 | 1.17E-09 | 1.00464 | 1.16E-09 |
| | | 15 | 488 | 51.10324 | 8640 | 0.02064 | 0.01826 | 1.86E-09 | 1.00480 | 1.85E-09 |
| | | 16 | 491 | 51.41740 | 4860 | 0.01826 | 0.01746 | 1.11E-09 | 1.00485 | 1.11E-09 |
| | | 17 | 385 | 40.31711 | 7200 | 0.01746 | 0.01667 | 1.23E-09 | 1.00491 | 1.23E-09 |
| | | 18 | 640 | 67.02064 | 2520 | 0.01667 | 0.01508 | 2.60E-09 | 1.00503 | 2.58E-09 |

AVERAGE: 1.49E-09
STANDARD DEVIATION: 8.20E-10

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 13A | 1 | 400 | 41.88790 | 7800 | 0.04445 | 0.04445 | 0.00E+00 | 1.00370 | 0.00E+00 |
| length (m) | 0.0365125 | 2 | 550 | 57.59587 | 8100 | 0.04445 | 0.03969 | 2.30E-09 | 1.00387 | 2.29E-09 |
| R-o (m) | 0.1920875 | 3 | 550 | 57.59587 | 15000 | 0.03969 | 0.03651 | 8.59E-10 | 1.00399 | 8.56E-10 |
| dist cent (m) | 0.1738313 | 4 | 700 | 73.30383 | 4200 | 0.03572 | 0.03334 | 1.48E-09 | 1.00413 | 1.47E-09 |
| meters/rev | 1.092214 | 5 | 1000 | 104.71976 | 7200 | 0.03334 | 0.03175 | 2.87E-10 | 1.00421 | 2.86E-10 |
| R-b (m) | 0.1920875 | 6 | 1000 | 104.71976 | 3600 | 0.03175 | 0.02699 | 1.79E-09 | 1.00446 | 1.78E-09 |
| R-t (m) | 0.155575 | 7 | 850 | 89.01179 | 9000 | 0.02699 | 0.02302 | 8.72E-10 | 1.00469 | 8.68E-10 |
| Direction | V | 8 | 619 | 64.82153 | 8640 | 0.04445 | 0.04286 | 5.58E-10 | 1.00375 | 5.56E-10 |
| Element | OF | 9 | 646 | 67.64896 | 7860 | 0.04286 | 0.03889 | 1.45E-09 | 1.00390 | 1.44E-09 |
| Texture | Clay | 10 | 610 | 63.87905 | 7860 | 0.03889 | 0.03572 | 1.34E-09 | 1.00403 | 1.34E-09 |
| | | 11 | 492 | 51.52212 | 3600 | 0.03572 | 0.03493 | 1.15E-09 | 1.00406 | 1.15E-09 |
| | | 12 | 576 | 60.31858 | 7800 | 0.03493 | 0.03215 | 1.38E-09 | 1.00419 | 1.38E-09 |
| | | 13 | 748 | 78.33038 | 7440 | 0.03215 | 0.03016 | 6.31E-10 | 1.00429 | 6.29E-10 |
| | | 14 | 555 | 58.11946 | 6900 | 0.03731 | 0.03651 | 4.64E-10 | 1.00399 | 4.62E-10 |
| | | 15 | 488 | 51.10324 | 8640 | 0.03651 | 0.03413 | 1.46E-09 | 1.00410 | 1.46E-09 |
| | | 16 | 491 | 51.41740 | 4860 | 0.03413 | 0.03175 | 2.64E-09 | 1.00421 | 2.63E-09 |
| | | 17 | 385 | 40.31711 | 7200 | 0.03175 | 0.03016 | 1.97E-09 | 1.00429 | 1.97E-09 |
| | | 18 | 640 | 67.02064 | 2520 | 0.03016 | 0.02937 | 1.04E-09 | 1.00433 | 1.03E-09 |

AVERAGE: 1.20E-09
STANDARD DEVIATION: 6.75E-10

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 14A | 1 | 400 | 41.888 | 7800 | 0.04286 | 0.04048 | 2.39E-09 | 1.00372 | 2.38E-09 |
| length (m) | 0.0396875 | 2 | 550 | 57.596 | 8100 | 0.04048 | 0.03651 | 2.09E-09 | 1.00387 | 2.08E-09 |
| R-o (m) | 0.1920875 | 3 | 550 | 57.596 | 15000 | 0.03651 | 0.03096 | 1.66E-09 | 1.00410 | 1.65E-09 |
| dist cent (m) | 0.17224375 | 4 | 700 | 73.304 | 4200 | 0.03651 | 0.02937 | 4.73E-09 | 1.00417 | 4.71E-09 |
| meters/rev | 1.082239399254 | 5 | 1000 | 104.720 | 7200 | 0.02937 | 0.02699 | 4.75E-10 | 1.00429 | 4.73E-10 |
| R-b (m) | 0.1920875 | 6 | 1000 | 104.720 | 3600 | 0.02699 | 0.02461 | 9.77E-10 | 1.00441 | 9.73E-10 |
| R-t (m) | 0.1524 | 7 | 850 | 89.012 | 9000 | 0.02461 | 0.02064 | 9.38E-10 | 1.00464 | 9.34E-10 |
| Direction | V | 8 | 619 | 64.822 | 8640 | 0.04286 | 0.03969 | 1.20E-09 | 1.00375 | 1.20E-09 |
| Element | OF | 9 | 646 | 67.649 | 7860 | 0.03969 | 0.03572 | 1.57E-09 | 1.00390 | 1.57E-09 |
| Texture | Clay | 10 | 610 | 63.879 | 7860 | 0.03572 | 0.03175 | 1.83E-09 | 1.00406 | 1.83E-09 |
| | | 11 | 492 | 51.522 | 3600 | 0.03175 | 0.03096 | 1.26E-09 | 1.00410 | 1.26E-09 |
| | | 12 | 576 | 60.319 | 7800 | 0.03096 | 0.02858 | 1.30E-09 | 1.00421 | 1.29E-09 |
| | | 13 | 748 | 78.330 | 7440 | 0.02858 | 0.02540 | 1.11E-09 | 1.00437 | 1.11E-09 |
| | | 14 | 555 | 58.119 | 6900 | 0.03334 | 0.03096 | 1.54E-09 | 1.00410 | 1.53E-09 |
| | | 15 | 488 | 51.103 | 8640 | 0.03096 | 0.02858 | 1.63E-09 | 1.00421 | 1.63E-09 |
| | | 16 | 491 | 51.417 | 4860 | 0.02858 | 0.02858 | 0.00E+00 | 1.00421 | 0.00E+00 |
| | | 17 | 385 | 40.317 | 7200 | 0.02858 | 0.02540 | 4.33E-09 | 1.00437 | 4.31E-09 |
| | | 18 | 640 | 67.021 | 2520 | 0.02540 | 0.02302 | 3.48E-09 | 1.00450 | 3.46E-09 |
| | | | | | | | AVERAGE: | | | 1.80E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 1.20E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 15A | 1 | 400 | 41.888 | 7800 | 0.03493 | 0.03175 | 3.55E-09 | 1.00398 | 3.54E-09 |
| length (m) | 0.0416719 | 2 | 550 | 57.596 | 8100 | 0.03175 | 0.03016 | 9.27E-10 | 1.00404 | 9.23E-10 |
| R-o (m) | 0.1920875 | 3 | 550 | 57.596 | 15000 | 0.03016 | 0.02461 | 1.82E-09 | 1.00431 | 1.81E-09 |
| dist cent (m) | 0.1712516 | 4 | 700 | 73.304 | 4200 | 0.02381 | 0.02223 | 1.21E-09 | 1.00443 | 1.20E-09 |
| meters/rev | 1.0760053 | 5 | 1000 | 104.720 | 7200 | 0.02223 | 0.01905 | 7.12E-10 | 1.00462 | 7.09E-10 |
| R-b (m) | 0.1920875 | 6 | 1000 | 104.720 | 3600 | 0.01905 | 0.01746 | 7.35E-10 | 1.00472 | 7.31E-10 |
| R-t (m) | 0.1504156 | 7 | 850 | 89.012 | 9000 | 0.01746 | 0.01349 | 1.06E-09 | 1.00500 | 1.05E-09 |
| Direction | V | 8 | 619 | 64.822 | 8640 | 0.02699 | 0.02381 | 1.46E-09 | 1.00435 | 1.45E-09 |
| Element | OF | 9 | 646 | 67.649 | 7860 | 0.02381 | 0.02223 | 7.58E-10 | 1.00443 | 7.55E-10 |
| Texture | Clay | 10 | 610 | 63.879 | 7860 | 0.02223 | 0.01826 | 2.20E-09 | 1.00467 | 2.19E-09 |
| | | 11 | 492 | 51.522 | 3600 | 0.01746 | 0.01588 | 3.10E-09 | 1.00483 | 3.09E-09 |
| | | 12 | 576 | 60.319 | 7800 | 0.01588 | 0.01508 | 5.31E-10 | 1.00488 | 5.29E-10 |
| | | 13 | 748 | 78.330 | 7440 | 0.01508 | 0.01270 | 1.01E-09 | 1.00506 | 1.01E-09 |
| | | 14 | 555 | 58.119 | 6900 | 0.01905 | 0.01826 | 6.19E-10 | 1.00467 | 6.16E-10 |
| | | 15 | 488 | 51.103 | 8640 | 0.01826 | 0.01548 | 2.29E-09 | 1.00485 | 2.28E-09 |
| | | 16 | 491 | 51.417 | 4860 | 0.01548 | 0.01429 | 1.78E-09 | 1.00494 | 1.77E-09 |
| | | 17 | 385 | 40.317 | 7200 | 0.01429 | 0.01349 | 1.32E-09 | 1.00500 | 1.31E-09 |
| | | 18 | 640 | 67.021 | 2520 | 0.01349 | 0.01310 | 6.88E-10 | 1.00503 | 6.84E-10 |
| | | | | | | | AVERAGE: | | | 1.43E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 8.46E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 16A | 1 | 400 | 41.888 | 7800 | 0.04445 | 0.04048 | 3.90E-09 | 1.00375 | 3.89E-09 |
| length (m) | 0.03889375 | 2 | 550 | 57.596 | 8100 | 0.04048 | 0.03572 | 2.48E-09 | 1.00393 | 2.47E-09 |
| R-o (m) | 0.1920875 | 3 | 550 | 57.596 | 15000 | 0.03572 | 0.03016 | 1.65E-09 | 1.00417 | 1.64E-09 |
| dist cent (m) | 0.172640625 | 4 | 700 | 73.304 | 4200 | 0.03016 | 0.02937 | 5.38E-10 | 1.00421 | 5.36E-10 |
| meters/rev | 1.084733038 | 5 | 1000 | 104.720 | 7200 | 0.02937 | 0.02699 | 4.70E-10 | 1.00433 | 4.68E-10 |
| R-b (m) | 0.1920875 | 6 | 1000 | 104.720 | 3600 | 0.02699 | 0.02461 | 9.67E-10 | 1.00446 | 9.63E-10 |
| R-t (m) | 0.15319375 | 7 | 850 | 89.012 | 9000 | 0.02461 | 0.01905 | 1.32E-09 | 1.00480 | 1.31E-09 |
| Direction | H | 8 | 619 | 64.822 | 8640 | 0.03413 | 0.03096 | 1.30E-09 | 1.00413 | 1.29E-09 |
| Element | OF | 9 | 646 | 67.649 | 7860 | 0.03096 | 0.02699 | 1.70E-09 | 1.00433 | 1.70E-09 |
| Texture | Clay | 10 | 610 | 63.879 | 7860 | 0.02699 | 0.02381 | 1.59E-09 | 1.00450 | 1.59E-09 |
| | | 11 | 492 | 51.522 | 3600 | 0.02381 | 0.02342 | 6.84E-10 | 1.00452 | 6.81E-10 |
| | | 12 | 576 | 60.319 | 7800 | 0.02342 | 0.01984 | 2.13E-09 | 1.00475 | 2.12E-09 |
| | | 13 | 748 | 78.330 | 7440 | 0.01984 | 0.01588 | 1.55E-09 | 1.00503 | 1.54E-09 |
| | | 14 | 555 | 58.119 | 6900 | 0.02461 | 0.02302 | 1.12E-09 | 1.00455 | 1.11E-09 |
| | | 15 | 488 | 51.103 | 8640 | 0.02302 | 0.02024 | 2.08E-09 | 1.00472 | 2.07E-09 |
| | | 16 | 491 | 51.417 | 4860 | 0.02024 | 0.01905 | 1.61E-09 | 1.00480 | 1.60E-09 |
| | | 17 | 385 | 40.317 | 7200 | 0.01905 | 0.01746 | 2.40E-09 | 1.00491 | 2.39E-09 |
| | | 18 | 640 | 67.021 | 2520 | 0.01746 | 0.01667 | 1.26E-09 | 1.00497 | 1.26E-09 |
| | | | | | | | AVERAGE: | | | 1.59E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 7.93E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 1B | 1 | 439 | 45.972 | 4680 | 0.02540 | 0.02461 | 1.08E-09 | 1.00441 | 1.07E-09 |
| length (m) | 0.0325438 | 2 | 705 | 73.827 | 3900 | 0.02461 | 0.02223 | 1.53E-09 | 1.00455 | 1.53E-09 |
| R-o (m) | 0.1920875 | 3 | 680 | 71.209 | 4980 | 0.02223 | 0.01826 | 2.24E-09 | 1.00480 | 2.23E-09 |
| dist cent (m) | 0.1758156 | 4 | 885 | 92.677 | 7200 | 0.01905 | 0.01508 | 9.58E-10 | 1.00503 | 9.53E-10 |
| meters/rev | 1.1046822 | 5 | 1108 | 116.029 | 6600 | 0.02302 | 0.02024 | 4.38E-10 | 1.00467 | 4.36E-10 |
| R-b (m) | 0.1920875 | 6 | 1148 | 120.218 | 5460 | 0.02024 | 0.01667 | 6.62E-10 | 1.00491 | 6.59E-10 |
| R-t (m) | 0.1524 | 7 | 515 | 53.931 | 7200 | 0.01667 | 0.01191 | 3.54E-09 | 1.00529 | 3.52E-09 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 1.49E-09 |
| Texture | Clay | | | | | | STANDARD DEVIATION: | | | 9.96E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 2B | 1 | 439 | 45.972 | 4680 | 0.04564 | 0.04445 | 1.28E-09 | 1.00399 | 1.28E-09 |
| length (m) | 0.02858 | 2 | 705 | 73.827 | 3900 | 0.04445 | 0.04366 | 4.02E-10 | 1.00403 | 4.00E-10 |
| R-o (m) | 0.19209 | 3 | 680 | 71.209 | 4980 | 0.04366 | 0.02349 | 9.78E-09 | 1.00525 | 9.73E-09 |
| dist cent (m) | 0.1778 | 4 | 885 | 92.677 | 7200 | 0.03889 | 0.03731 | 2.95E-10 | 1.00433 | 2.94E-10 |
| meters/rev | 1.11715 | 5 | 1108 | 116.029 | 6600 | 0.02746 | 0.02349 | 6.09E-10 | 1.00525 | 6.06E-10 |
| R-b (m) | 0.19209 | 6 | 1148 | 120.218 | 5460 | 0.02349 | 0.02111 | 4.33E-10 | 1.00546 | 4.31E-10 |
| R-t (m) | 0.16351 | 7 | 515 | 53.931 | 7200 | 0.02111 | 0.01635 | 3.48E-09 | 1.00595 | 3.46E-09 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 2.31E-09 |
| Texture | Clay | | | | | | STANDARD DEVIATION: | | | 3.20E-09 |

| constants | | run | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 3B | 1 | 439 | 45.972 | 4680 | 0.03381 | 0.02905 | 5.82E-09 | 1.00493 | 5.79E-09 |
| length (m) | 0.026988 | 2 | 705 | 73.827 | 3900 | 0.02905 | 0.02540 | 2.21E-09 | 1.00522 | 2.20E-09 |
| R-o (m) | 0.192088 | 3 | 680 | 71.209 | 4980 | 0.02540 | 0.01429 | 6.43E-09 | 1.00641 | 6.39E-09 |
| dist cent (m) | 0.178594 | 4 | 885 | 92.677 | 7200 | 0.01349 | 0.00873 | 1.34E-09 | 1.00729 | 1.33E-09 |
| meters/rev | 1.122138 | 5 | 1108 | 116.029 | 6600 | 0.00794 | 0.00238 | 1.27E-09 | 1.00871 | 1.26E-09 |
| R-b (m) | 0.192088 | 6 | 515 | 53.931 | 7200 | 0.01349 | 0.00873 | 3.97E-09 | 1.00729 | 3.94E-09 |
| R-t (m) | 0.1651 | | | | | | | | | |
| Direction | V | | | | | | AVERAGE: | | | 3.49E-09 |
| Element | OF | | | | | | STANDARD DEVIATION: | | | 2.05E-09 |
| Texture | Clay | | | | | | | | | |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/se |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 4B | 1 | 439 | 45.972 | 4680 | 0.04564 | 0.04445 | 1.07E-09 | 1.00429 | 1.06E-09 |
| **length (m)** | 0.02223 | 2 | 705 | 73.827 | 3900 | 0.04445 | 0.04366 | 3.36E-10 | 1.00433 | 3.34E-10 |
| **R-o (m)** | 0.19209 | 3 | 680 | 71.209 | 4980 | 0.04366 | 0.02349 | 8.33E-09 | 1.00586 | 8.28E-09 |
| **dist cent (m)** | 0.18098 | 4 | 885 | 92.677 | 7200 | 0.03889 | 0.03731 | 2.49E-10 | 1.00469 | 2.48E-10 |
| **meters/rev** | 1.1371 | 5 | 1108 | 116.029 | 6600 | 0.02746 | 0.02349 | 5.27E-10 | 1.00586 | 5.24E-10 |
| **R-b (m)** | 0.19209 | 6 | 1148 | 120.218 | 5460 | 0.02349 | 0.02111 | 3.78E-10 | 1.00614 | 3.76E-10 |
| **R-t (m)** | 0.16986 | 7 | 515 | 53.931 | 7200 | 0.02111 | 0.01635 | 3.07E-09 | 1.00681 | 3.05E-09 |
| **Direction** | H | | | | | | | | | |
| **Element** | OF | | | | | | AVERAGE: | | | 1.98E-09 |
| **Texture** | Clay | | | | | | STANDARD DEVIATION: | | | 2.73E-09 |

| constants | | run # | rpm | omega | t-elapsed | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 5B | 1 | 439 | 45.972 | 4680 | 0.02858 | 0.02699 | 2.82E-09 | 1.00390 | 2.81E-09 |
| **length (m)** | 0.048419 | 2 | 705 | 73.827 | 3900 | 0.02699 | 0.02262 | 3.72E-09 | 1.00408 | 3.71E-09 |
| **R-o (m)** | 0.192088 | 3 | 680 | 71.209 | 4980 | 0.02262 | 0.02024 | 1.77E-09 | 1.00419 | 1.76E-09 |
| **dist cent (m)** | 0.167878 | 4 | 885 | 92.677 | 7200 | 0.02143 | 0.01667 | 1.49E-09 | 1.00437 | 1.48E-09 |
| **meters/rev** | 1.054809 | 5 | 1108 | 116.029 | 6600 | 0.01508 | 0.01111 | 9.28E-10 | 1.00469 | 9.24E-10 |
| **R-b (m)** | 0.192088 | 6 | 1148 | 120.218 | 5460 | 0.01111 | 0.00873 | 6.55E-10 | 1.00485 | 6.52E-10 |
| **R-t (m)** | 0.143669 | 7 | 515 | 53.931 | 7200 | 0.00873 | 0.00635 | 2.55E-09 | 1.00503 | 2.54E-09 |
| **Direction** | V | | | | | | | | | |
| **Element** | OF | | | | | | AVERAGE: | | | 1.98E-09 |
| **Texture** | Clay | | | | | | STANDARD DEVIATION: | | | 1.01E-09 |

| constants | | run | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 6B | 1 | 439 | 45.972 | 4680 | 0.02540 | 0.02223 | 4.94E-09 | 1.00491 | 4.91E-09 |
| **length (m)** | 0.034131 | 2 | 705 | 73.827 | 3900 | 0.02223 | N/A | 2.02E-08 | 1.00759 | 2.00E-08 |
| **R-o (m)** | 0.192088 | 3 | 680 | 71.209 | 4980 | 0.01032 | N/A | 8.81E-09 | 1.00759 | 8.75E-09 |
| **dist cent (m)** | 0.175022 | 4 | 885 | 92.677 | 7200 | N/A | N/A | 0.00E+00 | 1.00759 | 0.00E+00 |
| **meters/rev** | 1.099695 | 5 | 1108 | 116.029 | 6600 | N/A | N/A | 0.00E+00 | 1.00759 | 0.00E+00 |
| **R-b (m)** | 0.192088 | 6 | 1148 | 120.218 | 5460 | N/A | N/A | 0.00E+00 | 1.00759 | 0.00E+00 |
| **R-t (m)** | 0.157956 | 7 | 515 | 53.931 | 7200 | N/A | N/A | 0.00E+00 | 1.00759 | 0.00E+00 |
| **Direction** | V | | | | | | | | | |
| **Element** | OF | | | | | | AVERAGE: | | | 4.81E-09 |
| **Texture** | Clay | | | | | | STANDARD DEVIATION: | | | 6.97E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/se |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 7B | 1 | 439 | 45.972 | 4680 | 0.04286 | 0.04207 | 8.61E-10 | 1.00413 | 8.58E-10 |
| length (m) | 0.0277813 | 2 | 705 | 73.827 | 3900 | 0.04207 | 0.03572 | 3.34E-09 | 1.00446 | 3.33E-09 |
| R-o (m) | 0.1920875 | 3 | 680 | 71.209 | 4980 | 0.03572 | 0.02858 | 3.45E-09 | 1.00491 | 3.43E-09 |
| dist cent (m) | 0.1781969 | 4 | 885 | 92.677 | 7200 | 0.02858 | 0.02540 | 6.74E-10 | 1.00515 | 6.70E-10 |
| meters/rev | 1.119644 | 5 | 1108 | 116.029 | 6600 | 0.01191 | 0.01032 | 3.15E-10 | 1.00688 | 3.13E-10 |
| R-b (m) | 0.1920875 | 6 | 1148 | 120.218 | 5460 | 0.01032 | 0.00635 | 9.48E-10 | 1.00759 | 9.41E-10 |
| R-t (m) | 0.1643063 | 7 | 515 | 53.931 | 7200 | 0.00635 | N/A | 6.58E-09 | 1.00916 | 6.52E-09 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 1.59E-09 |
| Texture | Clay | | | | | | STANDARD DEVIATION: | | | 1.28E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 8B | 1 | 439 | 45.972 | 4680 | 0.02699 | 0.02619 | 1.23E-09 | 1.00450 | 1.23E-09 |
| length (m) | 0.036513 | 2 | 705 | 73.827 | 3900 | 0.02619 | 0.02302 | 2.35E-09 | 1.00469 | 2.34E-09 |
| R-o (m) | 0.192088 | 3 | 680 | 71.209 | 4980 | 0.02302 | 0.02024 | 1.81E-09 | 1.00488 | 1.80E-09 |
| dist cent (m) | 0.173831 | 4 | 885 | 92.677 | 7200 | 0.02024 | 0.01826 | 5.45E-10 | 1.00503 | 5.42E-10 |
| meters/rev | 1.092214 | 5 | 1108 | 116.029 | 6600 | 0.01667 | N/A | 3.87E-09 | 1.00715 | 3.85E-09 |
| R-b (m) | 0.192088 | 6 | 1148 | 120.218 | 5460 | N/A | N/A | 0.00E+00 | 1.00715 | 0.00E+00 |
| R-t (m) | 0.155575 | 7 | 515 | 53.931 | 7200 | N/A | N/A | 0.00E+00 | 1.00715 | 0.00E+00 |
| Direction | H | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 1.39E-09 |
| Texture | Clay | | | | | | STANDARD DEVIATION: | | | 1.29E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/se |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 9B | 1 | 439 | 45.972 | 4680 | 0.01826 | 0.01746 | 1.44E-09 | 1.00485 | 1.44E-09 |
| length (m) | 0.03969 | 2 | 705 | 73.827 | 3900 | 0.01746 | 0.01429 | 2.77E-09 | 1.00509 | 2.75E-09 |
| R-o (m) | 0.19209 | 3 | 680 | 71.209 | 4980 | 0.01429 | 0.01032 | 3.08E-09 | 1.00543 | 3.06E-09 |
| dist cent (m) | 0.17224 | 4 | 885 | 92.677 | 7200 | 0.00953 | 0.00794 | 5.34E-10 | 1.00566 | 5.31E-10 |
| meters/rev | 1.08224 | 5 | 1108 | 116.029 | 6600 | 0.00635 | 0.00318 | 8.00E-10 | 1.00620 | 7.95E-10 |
| R-b (m) | 0.19209 | 6 | 515 | 53.931 | 7200 | 0.01746 | 0.01349 | 3.53E-09 | 1.00515 | 3.51E-09 |
| R-t (m) | 0.1524 | | | | | | | | | |
| Direction | V | | | | | | AVERAGE: | | | 2.01E-09 |
| Element | OF | | | | | | STANDARD DEVIATION: | | | 1.15E-09 |
| Texture | Clay | | | | | | | | | |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 10B | 1 | 439 | 45.972 | 4680 | 0.03175 | 0.03096 | 1.06E-09 | 1.00455 | 1.05E-09 |
| length (m) | 0.0309563 | 2 | 705 | 73.827 | 3900 | 0.03096 | 0.02699 | 2.53E-09 | 1.00480 | 2.52E-09 |
| R-o (m) | 0.1920875 | 3 | 680 | 71.209 | 4980 | 0.02699 | 0.02381 | 1.79E-09 | 1.00503 | 1.79E-09 |
| dist cent (m) | 0.1766094 | 4 | 885 | 92.677 | 7200 | 0.02223 | 0.01984 | 5.88E-10 | 1.00536 | 5.85E-10 |
| meters/rev | 1.1096694 | 5 | 1108 | 116.029 | 6600 | 0.01905 | 0.01746 | 2.86E-10 | 1.00558 | 2.84E-10 |
| R-b (m) | 0.1920875 | 6 | 1148 | 120.218 | 5460 | 0.01746 | 0.01191 | 1.20E-09 | 1.00620 | 1.20E-09 |
| R-t (m) | 0.1611313 | 7 | 515 | 53.931 | 7200 | 0.01191 | 0.00794 | 3.56E-09 | 1.00676 | 3.54E-09 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 1.57E-09 |
| Texture | Clay | | | | | | STANDARD DEVIATION: | | | 1.06E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 11B | 1 | 439 | 45.972 | 4680 | 0.04842 | 0.04445 | 3.78E-09 | 1.00417 | 3.77E-09 |
| length (m) | 0.024606 | 2 | 705 | 73.827 | 3900 | 0.04445 | 0.04366 | 3.61E-10 | 1.00421 | 3.60E-10 |
| R-o (m) | 0.192088 | 3 | 680 | 71.209 | 4980 | 0.04366 | 0.03731 | 2.54E-09 | 1.00455 | 2.53E-09 |
| dist cent (m) | 0.179784 | 4 | 885 | 92.677 | 7200 | 0.02540 | 0.02302 | 4.93E-10 | 1.00566 | 4.90E-10 |
| meters/rev | 1.129619 | 5 | 1108 | 116.029 | 6600 | 0.02223 | 0.01826 | 6.16E-10 | 1.00620 | 6.12E-10 |
| R-b (m) | 0.192088 | 6 | 1148 | 120.218 | 5460 | 0.01826 | 0.01429 | 7.52E-10 | 1.00676 | 7.47E-10 |
| R-t (m) | 0.167481 | 7 | 515 | 53.931 | 7200 | 0.01429 | 0.00794 | 5.12E-09 | 1.00793 | 5.08E-09 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 1.94E-09 |
| Texture | Clay | | | | | | STANDARD DEVIATION: | | | 1.74E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 12B | 1 | 439 | 45.972 | 4680 | 0.01349 | 0.01191 | 3.19E-09 | 1.00509 | 3.17E-09 |
| length (m) | 0.0420688 | 2 | 705 | 73.827 | 3900 | 0.01191 | 0.01032 | 1.52E-09 | 1.00522 | 1.51E-09 |
| R-o (m) | 0.1920875 | 3 | 680 | 71.209 | 4980 | 0.01032 | 0.00873 | 1.31E-09 | 1.00536 | 1.31E-09 |
| dist cent (m) | 0.1710531 | 4 | 885 | 92.677 | 7200 | 0.01667 | 0.01429 | 7.34E-10 | 1.00491 | 7.31E-10 |
| meters/rev | 1.0747585 | 5 | 1108 | 116.029 | 6600 | 0.01349 | 0.01032 | 7.19E-10 | 1.00522 | 7.15E-10 |
| R-b (m) | 0.1920875 | 6 | 1148 | 120.218 | 5460 | 0.01032 | 0.00635 | 1.07E-09 | 1.00558 | 1.07E-09 |
| R-t (m) | 0.1500188 | 7 | 515 | 53.931 | 7200 | 0.00635 | 0.00476 | 1.69E-09 | 1.00574 | 1.69E-09 |
| Direction | H | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 1.46E-09 |
| Texture | Clay | | | | | | STANDARD DEVIATION: | | | 7.79E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/se |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 13B | 1 | 439 | 45.972 | 4680 | 0.04286 | 0.04207 | 8.78E-10 | 1.00410 | 8.75E-10 |
| length (m) | 0.02858 | 2 | 705 | 73.827 | 3900 | 0.04207 | 0.03889 | 1.67E-09 | 1.00425 | 1.66E-09 |
| R-o (m) | 0.19209 | 3 | 680 | 71.209 | 4980 | 0.03889 | 0.03334 | 2.59E-09 | 1.00455 | 2.58E-09 |
| dist cent (m) | 0.1778 | 4 | 885 | 92.677 | 7200 | 0.03334 | 0.03016 | 6.40E-10 | 1.00475 | 6.37E-10 |
| meters/rev | 1.11715 | 5 | 1108 | 116.029 | 6600 | 0.02858 | 0.02381 | 7.24E-10 | 1.00522 | 7.20E-10 |
| R-b (m) | 0.19209 | 6 | 1148 | 120.218 | 5460 | 0.02381 | 0.01826 | 1.03E-09 | 1.00574 | 1.03E-09 |
| R-t (m) | 0.16351 | 7 | 515 | 53.931 | 7200 | 0.01826 | 0.01349 | 3.67E-09 | 1.00630 | 3.65E-09 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 1.59E-09 |
| Texture | Clay | | | | | | STANDARD DEVIATION: | | | 1.05E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 14B | 1 | 439 | 45.972 | 4680 | 0.04604 | 0.04445 | 1.67E-09 | 1.00403 | 1.66E-09 |
| length (m) | 0.0277813 | 2 | 705 | 73.827 | 3900 | 0.04445 | 0.04048 | 2.00E-09 | 1.00421 | 2.00E-09 |
| R-o (m) | 0.1920875 | 3 | 680 | 71.209 | 4980 | 0.04048 | 0.03572 | 2.13E-09 | 1.00446 | 2.12E-09 |
| dist cent (m) | 0.1781969 | 4 | 885 | 92.677 | 7200 | 0.03572 | 0.03175 | 7.65E-10 | 1.00469 | 7.62E-10 |
| meters/rev | 1.119644 | 5 | 1108 | 116.029 | 6600 | 0.03334 | 0.02540 | 1.13E-09 | 1.00515 | 1.13E-09 |
| R-b (m) | 0.1920875 | 6 | 1148 | 120.218 | 5460 | 0.02540 | 0.02064 | 8.44E-10 | 1.00558 | 8.39E-10 |
| R-t (m) | 0.1643063 | 7 | 515 | 53.931 | 7200 | 0.02064 | 0.01667 | 2.86E-09 | 1.00601 | 2.84E-09 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 1.62E-09 |
| Texture | Clay | | | | | | STANDARD DEVIATION: | | | 7.05E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 15B | 1 | 439 | 45.972 | 4680 | 0.03889 | 0.03731 | 1.91E-09 | 1.00425 | 1.90E-09 |
| length (m) | 0.0301625 | 2 | 705 | 73.827 | 3900 | 0.03731 | 0.03572 | 9.06E-10 | 1.00433 | 9.03E-10 |
| R-o (m) | 0.1920875 | 3 | 680 | 71.209 | 4980 | 0.03572 | 0.03096 | 2.38E-09 | 1.00459 | 2.37E-09 |
| dist cent (m) | 0.1770063 | 4 | 885 | 92.677 | 7200 | 0.03016 | 0.02778 | 5.15E-10 | 1.00480 | 5.12E-10 |
| meters/rev | 1.1121631 | 5 | 1108 | 116.029 | 6600 | 0.02937 | 0.02540 | 6.11E-10 | 1.00497 | 6.08E-10 |
| R-b (m) | 0.1920875 | 6 | 1148 | 120.218 | 5460 | 0.02540 | 0.02143 | 7.30E-10 | 1.00529 | 7.26E-10 |
| R-t (m) | 0.161925 | 7 | 515 | 53.931 | 7200 | 0.03651 | 0.03413 | 1.40E-09 | 1.00441 | 1.39E-09 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 1.20E-09 |
| Texture | Clay | | | | | | STANDARD DEVIATION: | | | 6.59E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 16B | 1 | 439 | 45.972 | 4680 | 0.03731 | 0.03651 | 1.00E-09 | 1.00421 | 9.98E-10 |
| **length (m)** | 0.03175 | 2 | 705 | 73.827 | 3900 | 0.03651 | 0.03334 | 1.91E-09 | 1.00437 | 1.90E-09 |
| **R-o (m)** | 0.192088 | 3 | 680 | 71.209 | 4980 | 0.03334 | 0.02858 | 2.53E-09 | 1.00464 | 2.52E-09 |
| **dist cent (m)** | 0.176213 | 4 | 885 | 92.677 | 7200 | 0.02937 | 0.02540 | 9.03E-10 | 1.00485 | 8.99E-10 |
| **meters/rev** | 1.107176 | 5 | 1108 | 116.029 | 6600 | 0.02381 | 0.01746 | 1.11E-09 | 1.00550 | 1.11E-09 |
| **R-b (m)** | 0.192088 | 6 | 1148 | 120.218 | 5460 | 0.01746 | 0.01349 | 8.55E-10 | 1.00592 | 8.50E-10 |
| **R-t (m)** | 0.160338 | 7 | 515 | 53.931 | 7200 | 0.01349 | 0.00873 | 4.21E-09 | 1.00652 | 4.18E-09 |
| **Direction** | H | | | | | | | | | |
| **Element** | OF | | | | | | AVERAGE: | | | 1.78E-09 |
| **Texture** | Clay | | | | | | STANDARD DEVIATION: | | | 1.14E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 1c | 1 | 635 | 66.497 | 7440 | 0.04445 | 0.04207 | 7.55E-10 | 1.00417 | 7.51E-10 |
| **length (m)** | 0.0269875 | 2 | 641 | 67.125 | 9000 | 0.04207 | 0.03731 | 1.28E-09 | 1.00441 | 1.27E-09 |
| **R-o (m)** | 0.1920875 | 3 | 524 | 54.873 | 9600 | 0.03731 | 0.03334 | 1.57E-09 | 1.00464 | 1.57E-09 |
| **dist cent (m)** | 0.13573125 | 4 | 455 | 47.647 | 7440 | 0.03334 | 0.03016 | 2.26E-09 | 1.00485 | 2.25E-09 |
| **meters/rev** | 0.8528246 | 5 | 572 | 59.900 | 5040 | 0.03016 | 0.02699 | 2.21E-09 | 1.00509 | 2.20E-09 |
| **R-b (m)** | 0.1920875 | 6 | 645 | 67.544 | 4680 | 0.02699 | 0.02540 | 9.71E-10 | 1.00522 | 9.66E-10 |
| **R-t (m)** | 0.1651 | 7 | 537 | 56.235 | 9600 | 0.02540 | 0.02024 | 2.35E-09 | 1.00570 | 2.33E-09 |
| **Direction** | V | 8 | 541 | 56.653 | 5400 | 0.02024 | 0.01905 | 1.00E-09 | 1.00583 | 9.97E-10 |
| **Element** | OF | 9 | 1000 | 104.720 | 3600 | 0.01905 | 0.01667 | 9.11E-10 | 1.00610 | 9.06E-10 |
| **Texture** | Clay | 10 | 565 | 59.167 | 5400 | 0.01667 | 0.01349 | 2.68E-09 | 1.00652 | 2.67E-09 |
| | | | | | | | AVERAGE: | | | 1.59E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 6.73E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 2c | 1 | 635 | 66.497 | 7440 | 0.04207 | 0.03572 | 2.12E-09 | 1.00450 | 2.11E-09 |
| **length (m)** | 0.0269875 | 2 | 641 | 67.125 | 9000 | 0.03572 | 0.02937 | 1.86E-09 | 1.00491 | 1.85E-09 |
| **R-o (m)** | 0.1920875 | 3 | 524 | 54.873 | 9600 | 0.02937 | 0.02540 | 1.76E-09 | 1.00522 | 1.75E-09 |
| **dist cent (m)** | 0.1500188 | 4 | 455 | 47.647 | 7440 | 0.02540 | 0.02381 | 1.26E-09 | 1.00536 | 1.25E-09 |
| **meters/rev** | 0.9425956 | 5 | 572 | 59.900 | 5040 | 0.02381 | 0.01746 | 5.04E-09 | 1.00601 | 5.01E-09 |
| **R-b (m)** | 0.1920875 | 6 | 645 | 67.544 | 4680 | 0.01746 | 0.01667 | 5.70E-10 | 1.00610 | 5.67E-10 |
| **R-t (m)** | 0.1651 | 7 | 537 | 56.235 | 9600 | 0.01667 | 0.01111 | 3.00E-09 | 1.00688 | 2.98E-09 |
| **Direction** | V | 8 | 541 | 56.653 | 5400 | 0.01111 | 0.00873 | 2.46E-09 | 1.00729 | 2.45E-09 |
| **Element** | OF | 9 | 1000 | 104.720 | 3600 | 0.00873 | 0.00794 | 3.75E-10 | 1.00744 | 3.72E-10 |
| **Texture** | Clay | 10 | 565 | 59.167 | 5400 | 0.00794 | 0.00318 | 5.07E-09 | 1.00850 | 5.03E-09 |
| | | | | | | | AVERAGE: | | | 2.34E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 1.54E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 3C | 1 | 635 | 66.497 | 7440 | 0.04286 | 0.03969 | 9.65E-10 | 1.00441 | 9.61E-10 |
| **length (m)** | 0.0246063 | 2 | 641 | 67.125 | 9000 | 0.03969 | 0.03413 | 1.45E-09 | 1.00475 | 1.44E-09 |
| **R-o (m)** | 0.1920875 | 3 | 524 | 54.873 | 9600 | 0.03413 | 0.03016 | 1.55E-09 | 1.00503 | 1.54E-09 |
| **dist cent (m)** | 0.1797844 | 4 | 455 | 47.647 | 7440 | 0.03016 | 0.02778 | 1.67E-09 | 1.00522 | 1.66E-09 |
| **meters/rev** | 1.1296185 | 5 | 572 | 59.900 | 5040 | 0.02778 | 0.02540 | 1.62E-09 | 1.00543 | 1.61E-09 |
| **R-b (m)** | 0.1920875 | 6 | 645 | 67.544 | 4680 | 0.02540 | 0.02302 | 1.43E-09 | 1.00566 | 1.42E-09 |
| **R-t (m)** | 0.1674813 | 7 | 537 | 56.235 | 9600 | 0.02302 | 0.02024 | 1.23E-09 | 1.00596 | 1.22E-09 |
| **Direction** | V | 8 | 541 | 56.653 | 5400 | 0.02024 | 0.01905 | 9.57E-10 | 1.00610 | 9.51E-10 |
| **Element** | OF | 9 | 1000 | 104.720 | 3600 | 0.01905 | 0.01746 | 5.76E-10 | 1.00630 | 5.73E-10 |
| **Texture** | Clay | 10 | 565 | 59.167 | 5400 | 0.01746 | 0.01429 | 2.53E-09 | 1.00676 | 2.51E-09 |
| | | | | | | | AVERAGE: | | | 1.39E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 4.99E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 4C | 1 | 635 | 66.497 | 7440 | 0.03572 | 0.02381 | 5.09E-09 | 1.00485 | 5.06E-09 |
| **length (m)** | 0.0333375 | 2 | 641 | 67.125 | 9000 | 0.02381 | 0.01032 | 5.65E-09 | 1.00610 | 5.61E-09 |
| **R-o (m)** | 0.1920875 | 3 | 524 | 54.873 | 9600 | 0.01032 | 0.00556 | 3.31E-09 | 1.00676 | 3.29E-09 |
| **dist cent (m)** | 0.17541875 | | | | | | | | | |
| **meters/rev** | 1.10218851 | 5 | 572 | 59.900 | 5040 | 0.01032 | 0.00397 | 7.18E-09 | 1.00701 | 7.13E-09 |
| **R-b (m)** | 0.1920875 | | | | | | | | | |
| **R-t (m)** | 0.15875 | 7 | 537 | 56.235 | 9600 | 0.01032 | 0.00556 | 3.15E-09 | 1.00676 | 3.13E-09 |
| **Direction** | H | | | | | | | | | |
| **Element** | OF | | | | | | AVERAGE: | | | 4.84E-09 |
| **Texture** | Clay | | | | | | STANDARD DEVIATION: | | | 1.50E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 5C | 1 | 635 | 66.497 | 7440 | 0.02619 | 0.02461 | 8.09E-10 | 1.00455 | 8.06E-10 |
| **length (m)** | 0.0396875 | 2 | 641 | 67.125 | 9000 | 0.02461 | 0.01826 | 2.77E-09 | 1.00497 | 2.76E-09 |
| **R-o (m)** | 0.1920875 | 3 | 524 | 54.873 | 9600 | 0.01826 | 0.01746 | 5.11E-10 | 1.00503 | 5.09E-10 |
| **dist cent (m)** | 0.1722438 | 4 | 455 | 47.647 | 7440 | 0.01746 | 0.01548 | 2.24E-09 | 1.00519 | 2.22E-09 |
| **meters/rev** | 1.0822394 | 5 | 572 | 59.900 | 5040 | 0.01548 | 0.01429 | 1.28E-09 | 1.00529 | 1.28E-09 |
| **R-b (m)** | 0.1920875 | 6 | 645 | 67.544 | 4680 | 0.01429 | 0.01349 | 7.37E-10 | 1.00536 | 7.33E-10 |
| **R-t (m)** | 0.1547813 | 7 | 537 | 56.235 | 9600 | 0.01349 | 0.00873 | 3.26E-09 | 1.00583 | 3.25E-09 |
| **Direction** | V | 8 | 541 | 56.653 | 5400 | 0.00873 | 0.00635 | 3.05E-09 | 1.00610 | 3.03E-09 |
| **Element** | OF | 9 | 1000 | 104.720 | 3600 | 0.00635 | 0.00318 | 1.89E-09 | 1.00652 | 1.88E-09 |
| **Texture** | Clay | 10 | 565 | 59.167 | 5400 | 0.00318 | 0.00079 | 3.14E-09 | 1.00688 | 3.12E-09 |
| | | | | | | | AVERAGE: | | | 1.96E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 9.87E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 8C | 1 | 635 | 66.497 | 7440 | 0.03651 | 0.03175 | 1.90E-09 | 1.00441 | 1.89E-09 |
| length (m) | 0.032544 | 2 | 641 | 67.125 | 9000 | 0.03175 | 0.02699 | 1.63E-09 | 1.00469 | 1.62E-09 |
| R-o (m) | 0.192088 | 3 | 524 | 54.873 | 9600 | 0.02699 | 0.02461 | 1.20E-09 | 1.00485 | 1.20E-09 |
| dist cent (m) | 0.175816 | 4 | 455 | 47.647 | 7440 | 0.02461 | 0.02302 | 1.41E-09 | 1.00497 | 1.40E-09 |
| meters/rev | 1.104682 | 5 | 572 | 59.900 | 5040 | 0.02302 | 0.01945 | 3.08E-09 | 1.00525 | 3.07E-09 |
| R-b (m) | 0.192088 | 6 | 645 | 67.544 | 4680 | 0.01945 | 0.01905 | 2.99E-10 | 1.00529 | 2.98E-10 |
| R-t (m) | 0.159544 | 7 | 537 | 56.235 | 9600 | 0.01905 | 0.01667 | 1.29E-09 | 1.00550 | 1.29E-09 |
| Direction | H | 8 | 541 | 56.653 | 5400 | 0.01667 | 0.01429 | 2.36E-09 | 1.00574 | 2.35E-09 |
| Element | OF | 9 | 1000 | 104.720 | 3600 | 0.01429 | 0.01191 | 1.08E-09 | 1.00601 | 1.08E-09 |
| Texture | Clay | 10 | 565 | 59.167 | 5400 | 0.01191 | 0.01111 | 7.77E-10 | 1.00610 | 7.72E-10 |
| | | | | | | | AVERAGE: | | | 1.50E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 7.51E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 9C | 1 | 635 | 66.497 | 7440 | 0.02699 | 0.02461 | 1.07E-09 | 1.00480 | 1.06E-09 |
| length (m) | 0.0333375 | 2 | 641 | 67.125 | 9000 | 0.02461 | 0.01905 | 2.15E-09 | 1.00522 | 2.13E-09 |
| R-o (m) | 0.1920875 | 3 | 524 | 54.873 | 9600 | 0.01905 | 0.01746 | 9.09E-10 | 1.00536 | 9.04E-10 |
| dist cent (m) | 0.17541875 | 4 | 455 | 47.647 | 7440 | 0.01746 | 0.01429 | 3.24E-09 | 1.00566 | 3.22E-09 |
| meters/rev | 1.10218851 | 5 | 572 | 59.900 | 5040 | 0.01429 | 0.01389 | 3.90E-10 | 1.00570 | 3.88E-10 |
| R-b (m) | 0.1920875 | 6 | 645 | 67.544 | 4680 | 0.01389 | 0.01191 | 1.69E-09 | 1.00592 | 1.68E-09 |
| R-t (m) | 0.15875 | 7 | 537 | 56.235 | 9600 | 0.01191 | 0.01111 | 4.88E-10 | 1.00601 | 4.85E-10 |
| Direction | V | 8 | 541 | 56.653 | 5400 | 0.01111 | 0.01032 | 8.68E-10 | 1.00610 | 8.63E-10 |
| Element | OF | 9 | 1000 | 104.720 | 3600 | 0.01032 | 0.00635 | 2.00E-09 | 1.00664 | 1.99E-09 |
| Texture | Clay | 10 | 565 | 59.167 | 5400 | 0.00635 | 0.00476 | 1.78E-09 | 1.00688 | 1.76E-09 |
| | | | | | | | AVERAGE: | | | 1.45E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 8.30E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 13C | 1 | 635 | 66.497 | 7440 | 0.04763 | 0.04445 | 9.13E-10 | 1.00417 | 9.10E-10 |
| length (m) | 0.0246063 | 2 | 641 | 67.125 | 9000 | 0.04445 | 0.03969 | 1.16E-09 | 1.00441 | 1.16E-09 |
| R-o (m) | 0.1920875 | 3 | 524 | 54.873 | 9600 | 0.03969 | 0.03770 | 7.08E-10 | 1.00452 | 7.05E-10 |
| dist cent (m) | 0.1797844 | 4 | 455 | 47.647 | 7440 | 0.03770 | 0.03651 | 7.42E-10 | 1.00459 | 7.39E-10 |
| meters/rev | 1.1296185 | 5 | 572 | 59.900 | 5040 | 0.03651 | 0.03334 | 1.90E-09 | 1.00480 | 1.90E-09 |
| R-b (m) | 0.1920875 | 6 | 645 | 67.544 | 4680 | 0.03334 | 0.03175 | 8.34E-10 | 1.00491 | 8.30E-10 |
| R-t (m) | 0.1674813 | 7 | 537 | 56.235 | 9600 | 0.03175 | 0.02858 | 1.22E-09 | 1.00515 | 1.21E-09 |
| Direction | V | 8 | 541 | 56.653 | 5400 | 0.02858 | 0.02778 | 5.49E-10 | 1.00522 | 5.46E-10 |
| Element | OF | 9 | 1000 | 104.720 | 3600 | 0.02778 | 0.02540 | 7.42E-10 | 1.00543 | 7.38E-10 |
| Texture | Clay | 10 | 565 | 59.167 | 5400 | 0.02540 | 0.02461 | 5.30E-10 | 1.00550 | 5.27E-10 |
| | | | | | | | AVERAGE: | | | 9.26E-10 |
| | | | | | | | STANDARD DEVIATION: | | | 3.88E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 1D | 1 | 490 | 51.313 | 6780 | 0.02540 | 0.02223 | 2.53E-09 | 1.00529 | 2.51E-09 |
| length (m) | 0.02936875 | 2 | 480 | 50.265 | 10440 | 0.02223 | 0.01429 | 4.71E-09 | 1.00610 | 4.68E-09 |
| R-o (m) | 0.1920875 | 3 | 440 | 46.077 | 5820 | 0.01429 | 0.01191 | 3.32E-09 | 1.00641 | 3.30E-09 |
| dist cent (m) | 0.17740313 | 4 | 410 | 42.935 | 5880 | 0.01191 | 0.00794 | 6.76E-09 | 1.00701 | 6.72E-09 |
| meters/rev | 1.11465671 | 5 | 445 | 46.600 | 8220 | 0.00794 | 0.00476 | 3.58E-09 | 1.00759 | 3.55E-09 |
| R-b (m) | 0.1920875 | 6 | 678 | 71.000 | 4500 | 0.01429 | 0.01032 | 3.07E-09 | 1.00664 | 3.05E-09 |
| R-t (m) | 0.16271875 | 7 | 493 | 51.627 | 6720 | 0.01032 | 0.00873 | 1.65E-09 | 1.00688 | 1.64E-09 |
| Direction | V | 8 | 515 | 53.931 | 3720 | 0.01667 | 0.01508 | 2.39E-09 | 1.00601 | 2.38E-09 |
| Element | OF | 9 | 545 | 57.072 | 9540 | 0.01508 | 0.00873 | 3.62E-09 | 1.00688 | 3.59E-09 |
| Texture | Clay | | | | | | | | | |
| | | | | | | | AVERAGE: | | | 3.49E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 1.40E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 2D | 1 | 490 | 51.313 | 6780 | 0.02699 | 0.02381 | 2.57E-09 | 1.00497 | 2.56E-09 |
| length (m) | 0.03175 | 2 | 480 | 50.265 | 10440 | 0.02381 | 0.01905 | 2.78E-09 | 1.00536 | 2.76E-09 |
| R-o (m) | 0.1920875 | 3 | 440 | 46.077 | 5820 | 0.01905 | 0.01746 | 2.08E-09 | 1.00550 | 2.07E-09 |
| dist cent (m) | 0.1762125 | 4 | 410 | 42.935 | 5880 | 0.01746 | 0.01508 | 3.68E-09 | 1.00574 | 3.66E-09 |
| meters/rev | 1.1071758 | 5 | 445 | 46.600 | 8220 | 0.01508 | 0.01429 | 7.67E-10 | 1.00583 | 7.62E-10 |
| R-b (m) | 0.1920875 | 6 | 678 | 71.000 | 4500 | 0.01191 | 0.00953 | 1.96E-09 | 1.00641 | 1.94E-09 |
| R-t (m) | 0.1603375 | 7 | 493 | 51.627 | 6720 | 0.00953 | 0.00794 | 1.72E-09 | 1.00664 | 1.71E-09 |
| Direction | V | 8 | 483 | 50.580 | 8280 | 0.00794 | 0.00318 | 4.70E-09 | 1.00744 | 4.67E-09 |
| Element | OF | 8 | 515 | 53.931 | 3720 | 0.01191 | 0.01191 | 0.00E+00 | 1.00610 | 0.00E+00 |
| Texture | Clay | 9 | 545 | 57.072 | 9540 | 0.01191 | 0.01032 | 9.45E-10 | 1.00630 | 9.39E-10 |
| | | | | | | | AVERAGE: | | | 2.11E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 1.32E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 5D | 1 | 490 | 51.313 | 6780 | 0.02699 | 0.02223 | 3.63E-09 | 1.00543 | 3.61E-09 |
| length (m) | 0.02778125 | 2 | 480 | 50.265 | 10440 | 0.02223 | 0.01746 | 2.67E-09 | 1.00592 | 2.65E-09 |
| R-o (m) | 0.1920875 | 3 | 440 | 46.077 | 5820 | 0.01746 | 0.01508 | 3.04E-09 | 1.00620 | 3.03E-09 |
| dist cent (m) | 0.17819688 | 4 | 410 | 42.935 | 5880 | 0.01508 | 0.01429 | 1.19E-09 | 1.00630 | 1.19E-09 |
| meters/rev | 1.11964399 | 5 | 445 | 46.600 | 8220 | 0.01429 | 0.00953 | 4.62E-09 | 1.00701 | 4.59E-09 |
| R-b (m) | 0.1920875 | 6 | 678 | 71.000 | 4500 | 0.01746 | 0.01508 | 1.66E-09 | 1.00620 | 1.65E-09 |
| R-t (m) | 0.16430625 | 7 | 493 | 51.627 | 6720 | 0.01508 | 0.01191 | 2.97E-09 | 1.00664 | 2.95E-09 |
| Direction | V | 8 | 483 | 50.580 | 4680 | 0.01191 | 0.00873 | 4.76E-09 | 1.00715 | 4.73E-09 |
| Element | OF | 9 | 515 | 53.931 | 3720 | 0.01746 | 0.01667 | 1.14E-09 | 1.00601 | 1.13E-09 |
| Texture | Clay | 10 | 545 | 57.072 | 9540 | 0.01667 | 0.01111 | 2.97E-09 | 1.00676 | 2.95E-09 |
| | | | | | | | AVERAGE: | | | 2.70E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 1.19E-09 |

| constants | | run # | rpm | omega | t-elapsed ( | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 6D | 1 | 490 | 51.313 | 6780 | 0.02619 | 0.02540 | 6.57E-10 | 1.00475 | 6.54E-10 |
| **length (m)** | 0.0333375 | 2 | 480 | 50.265 | 10440 | 0.02540 | 0.02223 | 1.83E-09 | 1.00497 | 1.82E-09 |
| **R-o (m)** | 0.1920875 | 3 | 440 | 46.077 | 5820 | 0.02223 | 0.02143 | 1.01E-09 | 1.00503 | 1.00E-09 |
| **dist cent (m)** | 0.1754188 | 4 | 410 | 42.935 | 5880 | 0.02143 | 0.01508 | 9.71E-09 | 1.00558 | 9.65E-09 |
| **meters/rev** | 1.1021885 | 5 | 445 | 46.600 | 8220 | 0.01508 | 0.01429 | 7.82E-10 | 1.00566 | 7.78E-10 |
| **R-b (m)** | 0.1920875 | 6 | 678 | 71.000 | 4500 | 0.01032 | 0.00953 | 6.74E-10 | 1.00620 | 6.70E-10 |
| **R-t (m)** | 0.15875 | 7 | 493 | 51.627 | 6720 | 0.00953 | 0.00873 | 8.67E-10 | 1.00630 | 8.62E-10 |
| **Direction** | V | 8 | 483 | 50.580 | 4680 | 0.00873 | 0.00476 | 6.83E-09 | 1.00688 | 6.78E-09 |
| **Element** | OF | 9 | 515 | 53.931 | 3720 | 0.01826 | 0.01746 | 1.22E-09 | 1.00536 | 1.22E-09 |
| **Texture** | Clay | 10 | 545 | 57.072 | 9540 | 0.01746 | 0.01429 | 1.76E-09 | 1.00566 | 1.75E-09 |
| | | | | | | | AVERAGE: | | | 2.53E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 2.69E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 7D | 1 | 490 | 51.313 | 6780 | 0.03334 | 0.03096 | 1.79E-09 | 1.00446 | 1.78E-09 |
| **length (m)** | 0.03254375 | 2 | 480 | 50.265 | 10440 | 0.03096 | 0.02461 | 3.42E-09 | 1.00485 | 3.40E-09 |
| **R-o (m)** | 0.1920875 | 3 | 440 | 46.077 | 5820 | 0.02461 | 0.02381 | 9.58E-10 | 1.00491 | 9.54E-10 |
| **dist cent (m)** | 0.17581563 | 4 | 410 | 42.935 | 5880 | 0.02381 | 0.02223 | 2.22E-09 | 1.00503 | 2.21E-09 |
| **meters/rev** | 1.10468215 | 5 | 445 | 46.600 | 8220 | 0.02223 | 0.01746 | 4.26E-09 | 1.00543 | 4.23E-09 |
| **R-b (m)** | 0.1920875 | 6 | 678 | 71.000 | 4500 | 0.01905 | 0.01746 | 1.15E-09 | 1.00543 | 1.14E-09 |
| **R-t (m)** | 0.15954375 | 7 | 493 | 51.627 | 6720 | 0.01746 | 0.01429 | 3.02E-09 | 1.00574 | 3.01E-09 |
| **Direction** | V | 8 | 483 | 50.580 | 4680 | 0.01429 | 0.01032 | 6.04E-09 | 1.00620 | 6.00E-09 |
| **Element** | OF | 9 | 515 | 53.931 | 3720 | 0.01032 | 0.00794 | 4.28E-09 | 1.00652 | 4.25E-09 |
| **Texture** | Clay | 10 | 545 | 57.072 | 9540 | 0.00794 | 0.00476 | 2.11E-09 | 1.00701 | 2.10E-09 |
| | | | | | | | AVERAGE: | | | 2.77E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 1.44E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 8D | 1 | 490 | 51.313 | 6780 | 0.02778 | 0.02778 | 0.00E+00 | 1.00441 | 0.00E+00 |
| **length (m)** | 0.0365125 | 2 | 480 | 50.265 | 10440 | 0.02778 | 0.02381 | 2.33E-09 | 1.00464 | 2.32E-09 |
| **R-o (m)** | 0.1920875 | 3 | 440 | 46.077 | 5820 | 0.02381 | 0.02223 | 2.07E-09 | 1.00475 | 2.06E-09 |
| **dist cent (m)** | 0.17383125 | 4 | 410 | 42.935 | 5880 | 0.02223 | 0.01746 | 7.40E-09 | 1.00509 | 7.36E-09 |
| **meters/rev** | 1.0922139559 | 5 | 445 | 46.600 | 8220 | 0.01746 | 0.01191 | 5.68E-09 | 1.00558 | 5.65E-09 |
| **R-b (m)** | 0.1920875 | 6 | 678 | 71.000 | 4500 | 0.01191 | 0.00953 | 2.05E-09 | 1.00583 | 2.04E-09 |
| **R-t (m)** | 0.155575 | 7 | 493 | 51.627 | 6720 | 0.00953 | 0.00635 | 3.65E-09 | 1.00620 | 3.63E-09 |
| **Direction** | H | 8 | 483 | 50.580 | 4680 | N/A | N/A | 0.00E+00 | 1.00715 | 0.00E+00 |
| **Element** | OF | 9 | 515 | 53.931 | 3720 | 0.02540 | 0.02381 | 2.31E-09 | 1.00464 | 2.30E-09 |
| **Texture** | Clay | 10 | 545 | 57.072 | 9540 | 0.02381 | 0.01905 | 2.52E-09 | 1.00497 | 2.51E-09 |
| | | | | | | | AVERAGE: | | | 2.72E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 1.99E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 9D | 1 | 490 | 51.313 | 6780 | 0.03572 | 0.02778 | 6.09E-09 | 1.00459 | 6.06E-09 |
| length (m) | 0.0333375 | 2 | 480 | 50.265 | 10440 | 0.02778 | 0.02699 | 4.35E-10 | 1.00464 | 4.33E-10 |
| R-o (m) | 0.1920875 | 3 | 440 | 46.077 | 5820 | 0.02699 | 0.02540 | 1.89E-09 | 1.00475 | 1.88E-09 |
| dist cent (m) | 0.17541875 | 4 | 410 | 42.935 | 5880 | 0.02540 | 0.02223 | 4.45E-09 | 1.00497 | 4.43E-09 |
| meters/rev | 1.10218851 | 5 | 445 | 46.600 | 8220 | 0.02223 | 0.01746 | 4.31E-09 | 1.00536 | 4.28E-09 |
| R-b (m) | 0.1920875 | 6 | 678 | 71.000 | 4500 | 0.01746 | 0.01508 | 1.80E-09 | 1.00558 | 1.79E-09 |
| R-t (m) | 0.15875 | 7 | 493 | 51.627 | 6720 | 0.01508 | 0.01429 | 7.80E-10 | 1.00566 | 7.75E-10 |
| Direction | V | 8 | 483 | 50.580 | 4680 | 0.01429 | 0.01191 | 3.60E-09 | 1.00592 | 3.58E-09 |
| Element | OF | 9 | 515 | 53.931 | 3720 | 0.01191 | 0.00953 | 4.17E-09 | 1.00620 | 4.15E-09 |
| Texture | Clay | 10 | 545 | 57.072 | 9540 | 0.00953 | 0.00397 | 3.69E-09 | 1.00701 | 3.66E-09 |
| | | | | | | | AVERAGE: | | | 2.97E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 1.62E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 10D | 1 | 490 | 51.313 | 6780 | 0.03969 | 0.03572 | 2.22E-09 | 1.00475 | 2.21E-09 |
| length (m) | 0.02301875 | 2 | 480 | 50.265 | 10440 | 0.03572 | 0.03175 | 1.59E-09 | 1.00503 | 1.58E-09 |
| R-o (m) | 0.1920875 | 3 | 440 | 46.077 | 5820 | 0.03175 | 0.03016 | 1.41E-09 | 1.00515 | 1.41E-09 |
| dist cent (m) | 0.18057813 | 4 | 410 | 42.935 | 5880 | 0.03016 | 0.02699 | 3.35E-09 | 1.00543 | 3.33E-09 |
| meters/rev | 1.13460582 | 5 | 445 | 46.600 | 8220 | 0.02699 | 0.02540 | 1.06E-09 | 1.00558 | 1.05E-09 |
| R-b (m) | 0.1920875 | 6 | 678 | 71.000 | 4500 | 0.02381 | 0.02223 | 8.82E-10 | 1.00592 | 8.76E-10 |
| R-t (m) | 0.16906875 | 7 | 493 | 51.627 | 6720 | 0.02223 | 0.01905 | 2.34E-09 | 1.00630 | 2.32E-09 |
| Direction | V | 8 | 483 | 50.580 | 4680 | 0.01905 | 0.01746 | 1.84E-09 | 1.00652 | 1.83E-09 |
| Element | OF | 9 | 515 | 53.931 | 3720 | 0.01746 | 0.01508 | 3.19E-09 | 1.00688 | 3.16E-09 |
| Texture | Clay | 10 | 545 | 57.072 | 9540 | 0.01508 | 0.01429 | 3.83E-10 | 1.00701 | 3.81E-10 |
| | | | | | | | AVERAGE: | | | 1.73E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 8.70E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 11D | 1 | 490 | 51.313 | 6780 | 0.03969 | 0.03493 | 3.04E-09 | 1.00450 | 3.03E-09 |
| length (m) | 0.02778125 | 2 | 480 | 50.265 | 10440 | 0.03493 | 0.03175 | 1.44E-09 | 1.00469 | 1.44E-09 |
| R-o (m) | 0.1920875 | 3 | 440 | 46.077 | 5820 | 0.03175 | 0.02937 | 2.40E-09 | 1.00485 | 2.39E-09 |
| dist cent (m) | 0.17819688 | 4 | 410 | 42.935 | 5880 | 0.02937 | 0.02937 | 0.00E+00 | 1.00485 | 0.00E+00 |
| meters/rev | 1.11964399 | 5 | 445 | 46.600 | 8220 | 0.02937 | 0.02302 | 4.73E-09 | 1.00536 | 4.70E-09 |
| R-b (m) | 0.1920875 | 6 | 678 | 71.000 | 4500 | 0.02302 | 0.01905 | 2.53E-09 | 1.00574 | 2.52E-09 |
| R-t (m) | 0.16430625 | 7 | 493 | 51.627 | 6720 | 0.01905 | 0.01746 | 1.35E-09 | 1.00592 | 1.34E-09 |
| Direction | V | 8 | 483 | 50.580 | 4680 | 0.01746 | 0.01429 | 4.22E-09 | 1.00630 | 4.20E-09 |
| Element | OF | 9 | 515 | 53.931 | 3720 | 0.01429 | 0.01191 | 3.71E-09 | 1.00664 | 3.69E-09 |
| Texture | Clay | 10 | 545 | 57.072 | 9540 | 0.01191 | 0.00635 | 3.31E-09 | 1.00759 | 3.28E-09 |
| | | | | | | | AVERAGE: | | | 2.53E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 1.30E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 12D | 1 | 490 | 51.313 | 6780 | 0.03334 | 0.02858 | 3.47E-09 | 1.00475 | 3.46E-09 |
| length (m) | 0.030163 | 2 | 480 | 50.265 | 10440 | 0.02858 | 0.02540 | 1.66E-09 | 1.00497 | 1.65E-09 |
| R-o (m) | 0.192088 | 3 | 440 | 46.077 | 5820 | 0.02540 | 0.02381 | 1.83E-09 | 1.00509 | 1.82E-09 |
| dist cent (m) | 0.177006 | 4 | 410 | 42.935 | 5880 | 0.02381 | 0.02302 | 1.06E-09 | 1.00515 | 1.06E-09 |
| meters/rev | 1.112163 | 5 | 445 | 46.600 | 8220 | 0.02302 | 0.01905 | 3.35E-09 | 1.00550 | 3.33E-09 |
| R-b (m) | 0.192088 | 6 | 678 | 71.000 | 4500 | 0.01746 | 0.01508 | 1.72E-09 | 1.00592 | 1.71E-09 |
| R-t (m) | 0.161925 | 7 | 493 | 51.627 | 6720 | 0.01508 | 0.01349 | 1.51E-09 | 1.00610 | 1.50E-09 |
| Direction | H | 8 | 483 | 50.580 | 4680 | 0.01349 | 0.00953 | 5.97E-09 | 1.00664 | 5.93E-09 |
| Element | OF | 9 | 515 | 53.931 | 3720 | 0.00953 | 0.00794 | 2.81E-09 | 1.00688 | 2.79E-09 |
| Texture | Clay | 10 | 545 | 57.072 | 9540 | 0.00794 | 0.00238 | 3.74E-09 | 1.00793 | 3.71E-09 |
| | | | | | | | AVERAGE: | | | 2.57E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 1.33E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 13D | 1 | 490 | 51.313 | 6780 | 0.04921 | 0.02858 | 1.15E-08 | 1.00529 | 1.14E-08 |
| length (m) | 0.0230188 | 2 | 480 | 50.265 | 10440 | 0.02858 | 0.02540 | 1.41E-09 | 1.00558 | 1.40E-09 |
| R-o (m) | 0.1920875 | 3 | 440 | 46.077 | 5820 | 0.02540 | 0.02381 | 1.57E-09 | 1.00574 | 1.56E-09 |
| dist cent (m) | 0.1805781 | 4 | 410 | 42.935 | 5880 | 0.02381 | 0.02302 | 9.16E-10 | 1.00583 | 9.10E-10 |
| meters/rev | 1.1346058 | 5 | 445 | 46.600 | 8220 | 0.02302 | 0.01905 | 2.91E-09 | 1.00630 | 2.89E-09 |
| R-b (m) | 0.1920875 | 6 | 678 | 71.000 | 4500 | 0.01746 | 0.01508 | 1.52E-09 | 1.00688 | 1.51E-09 |
| R-t (m) | 0.1690688 | 7 | 493 | 51.627 | 6720 | 0.01508 | 0.01349 | 1.34E-09 | 1.00715 | 1.33E-09 |
| Direction | V | 8 | 483 | 50.580 | 4680 | 0.01349 | 0.00953 | 5.39E-09 | 1.00793 | 5.35E-09 |
| Element | OF | 9 | 515 | 53.931 | 3720 | 0.00953 | 0.00794 | 2.57E-09 | 1.00830 | 2.55E-09 |
| Texture | Clay | 10 | 545 | 57.072 | 9540 | 0.00794 | 0.00238 | 3.51E-09 | 1.00996 | 3.47E-09 |
| | | | | | | | AVERAGE: | | | 3.19E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 2.74E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 1e | 1 | 490 | 51.313 | 6780 | 0.02540 | 0.02223 | 2.53E-09 | 1.00529 | 2.51E-09 |
| length (m) | 0.029369 | 2 | 480 | 50.265 | 10440 | 0.02223 | 0.01429 | 4.71E-09 | 1.00610 | 4.68E-09 |
| R-o (m) | 0.192088 | 3 | 440 | 46.077 | 5820 | 0.01429 | 0.01191 | 3.32E-09 | 1.00641 | 3.30E-09 |
| dist cent (m) | 0.177403 | 4 | 410 | 42.935 | 5880 | 0.01191 | 0.00794 | 6.76E-09 | 1.00701 | 6.72E-09 |
| meters/rev | 1.114657 | 5 | 445 | 46.600 | 8220 | 0.00794 | 0.00476 | 3.58E-09 | 1.00759 | 3.55E-09 |
| R-b (m) | 0.192088 | 6 | 569 | 59.586 | 4500 | 0.01429 | 0.01032 | 4.36E-09 | 1.00664 | 4.33E-09 |
| R-t (m) | 0.162719 | 7 | 493 | 51.627 | 6660 | 0.01032 | 0.00635 | 4.29E-09 | 1.00729 | 4.25E-09 |
| Direction | V | 8 | 483 | 50.580 | 8280 | 0.00635 | N/A | 6.57E-09 | | |
| Element | OF | 9 | 515 | 53.931 | 3720 | 0.01667 | 0.01508 | 2.39E-09 | 1.00601 | 2.38E-09 |
| Texture | Clay | 10 | 545 | 57.072 | 9540 | 0.01508 | 0.00873 | 3.62E-09 | 1.00688 | 3.59E-09 |
| | | | | | | | AVERAGE: | | | 3.92E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 1.34E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 2E | 1 | 490 | 51.313 | 6780 | 0.02699 | 0.02381 | 2.57E-09 | 1.00497 | 2.56E-09 |
| **length (m)** | 0.03175 | 2 | 480 | 50.265 | 10440 | 0.02381 | 0.01905 | 2.78E-09 | 1.00536 | 2.76E-09 |
| **R-o (m)** | 0.192088 | 3 | 440 | 46.077 | 5820 | 0.01905 | 0.01746 | 2.08E-09 | 1.00550 | 2.07E-09 |
| **dist cent (m)** | 0.176213 | 4 | 410 | 42.935 | 5880 | 0.01746 | 0.01508 | 3.68E-09 | 1.00574 | 3.66E-09 |
| **meters/rev** | 1.107176 | 5 | 445 | 46.600 | 8220 | 0.01508 | 0.01429 | 7.67E-10 | 1.00583 | 7.62E-10 |
| **R-b (m)** | 0.192088 | 6 | 569 | 59.586 | 4500 | 0.01191 | 0.00953 | 2.78E-09 | 1.00641 | 2.76E-09 |
| **R-t (m)** | 0.160338 | 7 | 493 | 51.627 | 6660 | 0.00953 | 0.00794 | 1.74E-09 | 1.00664 | 1.73E-09 |
| **Direction** | V | 8 | 483 | 50.580 | 8280 | 0.00794 | 0.00318 | 4.70E-09 | 1.00744 | 4.67E-09 |
| **Element** | OF | 9 | 515 | 53.931 | 3720 | 0.01191 | 0.01111 | 1.35E-09 | 1.00620 | 1.34E-09 |
| **Texture** | Clay | 10 | 545 | 57.072 | 9540 | 0.01111 | 0.00635 | 2.98E-09 | 1.00688 | 2.96E-09 |
| | | | | | | | AVERAGE: | | | 2.53E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 1.06E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 3E | 1 | 490 | 51.313 | 6780 | 0.04048 | 0.03651 | 2.64E-09 | 1.00429 | 2.63E-09 |
| **length (m)** | 0.0301625 | 2 | 480 | 50.265 | 10440 | 0.03651 | 0.03096 | 2.65E-09 | 1.00459 | 2.63E-09 |
| **R-o (m)** | 0.1920875 | 3 | 440 | 46.077 | 5820 | 0.03096 | 0.02858 | 2.55E-09 | 1.00475 | 2.54E-09 |
| **dist cent (m)** | 0.17700625 | 4 | 410 | 42.935 | 5880 | 0.02858 | 0.02699 | 1.99E-09 | 1.00485 | 1.98E-09 |
| **meters/rev** | 1.11216307 | 5 | 445 | 46.600 | 8220 | 0.02699 | 0.02223 | 3.80E-09 | 1.00522 | 3.78E-09 |
| **R-b (m)** | 0.1920875 | 6 | 569 | 59.586 | 4500 | 0.01746 | 0.01508 | 2.44E-09 | 1.00592 | 2.43E-09 |
| **R-t (m)** | 0.161925 | 7 | 493 | 51.627 | 6660 | 0.01508 | 0.01349 | 1.52E-09 | 1.00610 | 1.51E-09 |
| **Direction** | V | 8 | 483 | 50.580 | 8280 | 0.02064 | 0.01508 | 4.18E-09 | 1.00592 | 4.15E-09 |
| **Element** | OF | 9 | 515 | 53.931 | 3720 | 0.01508 | 0.01389 | 1.87E-09 | 1.00606 | 1.85E-09 |
| **Texture** | Clay | 10 | 545 | 57.072 | 9540 | 0.01389 | 0.00953 | 2.52E-09 | 1.00664 | 2.50E-09 |
| | | | | | | | AVERAGE: | | | 2.60E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 8.55E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 4E | 1 | 490 | 51.313 | 6780 | 0.04048 | 0.03810 | 1.17E-09 | 1.00480 | 1.17E-09 |
| **length (m)** | 0.0198438 | 2 | 480 | 50.265 | 10440 | 0.03810 | 0.03413 | 1.39E-09 | 1.00509 | 1.38E-09 |
| **R-o (m)** | 0.1920875 | 3 | 440 | 46.077 | 5820 | 0.03413 | 0.03175 | 1.86E-09 | 1.00529 | 1.85E-09 |
| **dist cent (m)** | 0.1821656 | 4 | 410 | 42.935 | 5880 | 0.03175 | 0.03016 | 1.46E-09 | 1.00543 | 1.45E-09 |
| **meters/rev** | 1.1445804 | 5 | 445 | 46.600 | 8220 | 0.03016 | 0.02540 | 2.82E-09 | 1.00592 | 2.80E-09 |
| **R-b (m)** | 0.1920875 | 6 | 569 | 59.586 | 4500 | 0.01746 | 0.01588 | 1.32E-09 | 1.00729 | 1.31E-09 |
| **R-t (m)** | 0.1722438 | 7 | 493 | 51.627 | 6660 | 0.02302 | 0.02223 | 5.21E-10 | 1.00630 | 5.18E-10 |
| **Direction** | H | 8 | 483 | 50.580 | 8280 | 0.02937 | 0.02540 | 1.99E-09 | 1.00592 | 1.98E-09 |
| **Element** | OF | 9 | 515 | 53.931 | 3720 | 0.02540 | 0.02381 | 1.64E-09 | 1.00610 | 1.63E-09 |
| **Texture** | Clay | 10 | 545 | 57.072 | 9540 | 0.02381 | 0.01905 | 1.83E-09 | 1.00676 | 1.82E-09 |
| | | | | | | | AVERAGE: | | | 1.59E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 5.87E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 5E | 1 | 490 | 51.313 | 6780 | 0.04842 | 0.04763 | 4.50E-10 | 1.00390 | 4.48E-10 |
| length (m) | 0.027781 | 2 | 480 | 50.265 | 10440 | 0.04763 | 0.04286 | 1.88E-09 | 1.00410 | 1.87E-09 |
| R-o (m) | 0.192088 | 3 | 440 | 46.077 | 5820 | 0.04286 | 0.04048 | 2.09E-09 | 1.00421 | 2.08E-09 |
| dist cent (m) | 0.178197 | 4 | 410 | 42.935 | 5880 | 0.04048 | 0.03969 | 8.07E-10 | 1.00425 | 8.04E-10 |
| meters/rev | 1.119644 | 5 | 445 | 46.600 | 8220 | 0.03969 | 0.03493 | 3.04E-09 | 1.00450 | 3.03E-09 |
| R-b (m) | 0.192088 | 6 | 569 | 59.586 | 4500 | 0.04048 | 0.03731 | 2.22E-09 | 1.00437 | 2.21E-09 |
| R-t (m) | 0.164306 | 7 | 493 | 51.627 | 6660 | 0.03731 | 0.02223 | 1.07E-08 | 1.00543 | 1.07E-08 |
| Direction | V | 8 | 483 | 50.580 | 8280 | 0.02937 | 0.00873 | 1.48E-08 | 1.00715 | 1.47E-08 |
| Element | OF | 9 | 515 | 53.931 | 3720 | 0.01826 | 0.01667 | 2.26E-09 | 1.00601 | 2.25E-09 |
| Texture | Clay | 10 | 545 | 57.072 | 9540 | 0.01667 | 0.01111 | 2.97E-09 | 1.00676 | 2.95E-09 |
| | | | | | | | AVERAGE: | | | 4.10E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 4.07E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 6E | 1 | 490 | 51.313 | 6780 | 0.02619 | 0.02540 | 6.57E-10 | 1.00475 | 6.54E-10 |
| length (m) | 0.0333375 | 2 | 480 | 50.265 | 10440 | 0.02540 | 0.02223 | 1.83E-09 | 1.00497 | 1.82E-09 |
| R-o (m) | 0.1920875 | 3 | 440 | 46.077 | 5820 | 0.02223 | 0.01905 | 4.10E-09 | 1.00522 | 4.07E-09 |
| dist cent (m) | 0.17541875 | 4 | 410 | 42.935 | 5880 | 0.01905 | 0.01508 | 6.18E-09 | 1.00558 | 6.15E-09 |
| meters/rev | 1.10218851 | 5 | 445 | 46.600 | 8220 | 0.01508 | 0.01191 | 3.20E-09 | 1.00592 | 3.18E-09 |
| R-b (m) | 0.1920875 | 6 | 569 | 59.586 | 4500 | 0.01032 | 0.00953 | 9.57E-10 | 1.00620 | 9.51E-10 |
| R-t (m) | 0.15875 | 7 | 493 | 51.627 | 6660 | 0.00953 | 0.00794 | 1.76E-09 | 1.00641 | 1.75E-09 |
| Direction | V | 8 | 483 | 50.580 | 8280 | 0.01826 | 0.00476 | 1.20E-08 | 1.00688 | 1.19E-08 |
| Element | OF | 9 | 515 | 53.931 | 3720 | 0.01826 | 0.01508 | 4.99E-09 | 1.00558 | 4.96E-09 |
| Texture | Clay | 10 | 545 | 57.072 | 9540 | 0.01508 | 0.00476 | 6.42E-09 | 1.00688 | 6.38E-09 |
| | | | | | | | AVERAGE: | | | 4.18E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 2.96E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 7E | 1 | 490 | 51.313 | 6780 | 0.03334 | 0.03096 | 1.79E-09 | 1.00446 | 1.78E-09 |
| length (m) | 0.032544 | 2 | 480 | 50.265 | 10440 | 0.03096 | 0.02461 | 3.42E-09 | 1.00485 | 3.40E-09 |
| R-o (m) | 0.192088 | 3 | 440 | 46.077 | 5820 | 0.02461 | 0.02461 | 0.00E+00 | 1.00485 | 0.00E+00 |
| dist cent (m) | 0.175816 | 4 | 410 | 42.935 | 5880 | 0.02461 | 0.02143 | 4.45E-09 | 1.00509 | 4.43E-09 |
| meters/rev | 1.104682 | 5 | 445 | 46.600 | 8220 | 0.02143 | 0.01746 | 3.57E-09 | 1.00543 | 3.55E-09 |
| R-b (m) | 0.192088 | 6 | 569 | 59.586 | 4500 | 0.01905 | 0.01508 | 4.15E-09 | 1.00566 | 4.13E-09 |
| R-t (m) | 0.159544 | 7 | 493 | 51.627 | 6660 | 0.01508 | 0.01349 | 1.57E-09 | 1.00583 | 1.56E-09 |
| Direction | V | 8 | 483 | 50.580 | 8280 | 0.01349 | 0.01032 | 2.75E-09 | 1.00620 | 2.74E-09 |
| Element | OF | 9 | 515 | 53.931 | 3720 | 0.01032 | 0.00794 | 4.28E-09 | 1.00652 | 4.25E-09 |
| Texture | Clay | 10 | 545 | 57.072 | 9540 | 0.00794 | 0.00476 | 2.11E-09 | 1.00701 | 2.10E-09 |
| | | | | | | | AVERAGE: | | | 2.79E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 1.30E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 8E | 1 | 490 | 51.313 | 6780 | 0.02778 | 0.02778 | 0.00E+00 | 1.00441 | 0.00E+00 |
| **length (m)** | 0.0365125 | 2 | 480 | 50.265 | 10440 | 0.02778 | 0.02381 | 2.33E-09 | 1.00464 | 2.32E-09 |
| **R-o (m)** | 0.1920875 | 3 | 440 | 46.077 | 5820 | 0.02381 | 0.01905 | 6.34E-09 | 1.00497 | 6.31E-09 |
| **dist cent (m)** | 0.17383125 | 4 | 410 | 42.935 | 5880 | 0.01905 | 0.01667 | 3.81E-09 | 1.00515 | 3.79E-09 |
| **meters/rev** | 1.09221396 | 5 | 445 | 46.600 | 8220 | 0.01667 | 0.01349 | 3.22E-09 | 1.00543 | 3.21E-09 |
| **R-b (m)** | 0.1920875 | 6 | 569 | 59.586 | 4500 | 0.01191 | 0.00953 | 2.91E-09 | 1.00583 | 2.90E-09 |
| **R-t (m)** | 0.155575 | 7 | 493 | 51.627 | 6660 | 0.00953 | 0.00635 | 3.69E-09 | 1.00620 | 3.66E-09 |
| **Direction** | H | 8 | 483 | 50.580 | 8280 | 0.00635 | N/A | 6.83E-09 | 1.00715 | |
| **Element** | OF | 9 | 515 | 53.931 | 3720 | 0.02540 | 0.02381 | 2.31E-09 | 1.00464 | 2.30E-09 |
| **Texture** | Clay | 10 | 545 | 57.072 | 9540 | 0.02381 | 0.01905 | 2.52E-09 | 1.00497 | 2.51E-09 |
| | | | | | | | AVERAGE: | | | 3.00E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 1.49E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 9E | 1 | 490 | 51.313 | 6780 | 0.03572 | 0.03096 | 3.58E-09 | 1.00441 | 3.56E-09 |
| **length (m)** | 0.0333375 | 2 | 480 | 50.265 | 10440 | 0.03096 | 0.02699 | 2.13E-09 | 1.00464 | 2.12E-09 |
| **R-o (m)** | 0.1920875 | 3 | 440 | 46.077 | 5820 | 0.02699 | 0.02540 | 1.89E-09 | 1.00475 | 1.88E-09 |
| **dist cent (m)** | 0.17541875 | 4 | 410 | 42.935 | 5880 | 0.02540 | 0.02223 | 4.45E-09 | 1.00497 | 4.43E-09 |
| **meters/rev** | 1.10218851 | 5 | 445 | 46.600 | 8220 | 0.02223 | 0.01746 | 4.31E-09 | 1.00536 | 4.28E-09 |
| **R-b (m)** | 0.1920875 | 6 | 569 | 59.586 | 4500 | 0.01746 | 0.01508 | 2.55E-09 | 1.00558 | 2.54E-09 |
| **R-t (m)** | 0.15875 | 7 | 493 | 51.627 | 6660 | 0.01508 | 0.01349 | 1.58E-09 | 1.00574 | 1.58E-09 |
| **Direction** | V | 8 | 483 | 50.580 | 8280 | 0.01349 | 0.01111 | 2.07E-09 | 1.00601 | 2.05E-09 |
| **Element** | OF | 9 | 515 | 53.931 | 3720 | 0.01111 | 0.00953 | 2.80E-09 | 1.00620 | 2.79E-09 |
| **Texture** | Clay | 10 | 545 | 57.072 | 9540 | 0.00953 | 0.00397 | 3.69E-09 | 1.00701 | 3.66E-09 |
| | | | | | | | AVERAGE: | | | 2.89E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 1.03E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 10E | 1 | 490 | 51.313 | 6780 | 0.03969 | 0.03572 | 2.22E-09 | 1.00475 | 2.21E-09 |
| **length (m)** | 0.023019 | 2 | 480 | 50.265 | 10440 | 0.03572 | 0.03175 | 1.59E-09 | 1.00503 | 1.58E-09 |
| **R-o (m)** | 0.192088 | 3 | 440 | 46.077 | 5820 | 0.03175 | 0.03016 | 1.41E-09 | 1.00515 | 1.41E-09 |
| **dist cent (m)** | 0.180578 | 4 | 410 | 42.935 | 5880 | 0.03016 | 0.02699 | 3.35E-09 | 1.00543 | 3.33E-09 |
| **meters/rev** | 1.134606 | 5 | 445 | 46.600 | 8220 | 0.02699 | 0.02540 | 1.06E-09 | 1.00558 | 1.05E-09 |
| **R-b (m)** | 0.192088 | 6 | 569 | 59.586 | 4500 | 0.02381 | 0.02223 | 1.25E-09 | 1.00592 | 1.24E-09 |
| **R-t (m)** | 0.169069 | 7 | 493 | 51.627 | 6660 | 0.02223 | 0.01905 | 2.36E-09 | 1.00630 | 2.35E-09 |
| **Direction** | V | 8 | 483 | 50.580 | 8280 | 0.01905 | 0.01826 | 5.15E-10 | 1.00641 | 5.12E-10 |
| **Element** | OF | 9 | 515 | 53.931 | 3720 | 0.01826 | 0.01508 | 4.21E-09 | 1.00688 | 4.18E-09 |
| **Texture** | Clay | 10 | 545 | 57.072 | 9540 | 0.01508 | 0.01191 | 1.58E-09 | 1.00744 | 1.57E-09 |
| | | | | | | | AVERAGE: | | | 1.94E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 9.95E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 11E | 1 | 490 | 51.313 | 6780 | 0.03969 | 0.03493 | 3.04E-09 | 1.00450 | 3.03E-09 |
| **length (m)** | 0.02778125 | 2 | 480 | 50.265 | 10440 | 0.03493 | 0.03175 | 1.44E-09 | 1.00469 | 1.44E-09 |
| **R-o (m)** | 0.1920875 | 3 | 440 | 46.077 | 5820 | 0.03175 | 0.02937 | 2.40E-09 | 1.00485 | 2.39E-09 |
| **dist cent (m)** | 0.17819688 | 4 | 410 | 42.935 | 5880 | 0.02937 | 0.02937 | 0.00E+00 | 1.00485 | 0.00E+00 |
| **meters/rev** | 1.11964399 | 5 | 445 | 46.600 | 8220 | 0.02937 | 0.02302 | 4.73E-09 | 1.00536 | 4.70E-09 |
| **R-b (m)** | 0.1920875 | 6 | 569 | 59.586 | 4500 | 0.02302 | 0.01984 | 2.85E-09 | 1.00566 | 2.84E-09 |
| **R-t (m)** | 0.16430625 | 7 | 493 | 51.627 | 6660 | 0.01984 | 0.01905 | 6.65E-10 | 1.00574 | 6.61E-10 |
| **Direction** | V | 8 | 483 | 50.580 | 8280 | 0.01905 | 0.01349 | 4.15E-09 | 1.00641 | 4.12E-09 |
| **Element** | OF | 9 | 515 | 53.931 | 3720 | 0.01349 | 0.01191 | 2.50E-09 | 1.00664 | 2.48E-09 |
| **Texture** | Clay | 10 | 545 | 57.072 | 9540 | 0.01191 | 0.00873 | 1.83E-09 | 1.00715 | 1.82E-09 |
| | | | | | | | AVERAGE: | | | 2.35E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 1.29E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 12E | 1 | 490 | 51.313 | 6780 | 0.03334 | 0.02858 | 3.47E-09 | 1.00475 | 3.46E-09 |
| **length (m)** | 0.0301625 | 2 | 480 | 50.265 | 10440 | 0.02858 | 0.02540 | 1.66E-09 | 1.00497 | 1.65E-09 |
| **R-o (m)** | 0.1920875 | 3 | 440 | 46.077 | 5820 | 0.02540 | 0.02381 | 1.83E-09 | 1.00509 | 1.82E-09 |
| **dist cent (m)** | 0.17700625 | 4 | 410 | 42.935 | 5880 | 0.02381 | 0.02302 | 1.06E-09 | 1.00515 | 1.06E-09 |
| **meters/rev** | 1.11216307 | 5 | 445 | 46.600 | 8220 | 0.02302 | 0.01905 | 3.35E-09 | 1.00550 | 3.33E-09 |
| **R-b (m)** | 0.1920875 | 6 | 569 | 59.586 | 4500 | 0.01746 | 0.01508 | 2.44E-09 | 1.00592 | 2.43E-09 |
| **R-t (m)** | 0.161925 | 7 | 493 | 51.627 | 6660 | 0.01508 | 0.01349 | 1.52E-09 | 1.00610 | 1.51E-09 |
| **Direction** | H | 8 | 483 | 50.580 | 8280 | 0.01349 | 0.00953 | 3.37E-09 | 1.00664 | 3.35E-09 |
| **Element** | OF | 9 | 515 | 53.931 | 3720 | 0.00953 | 0.00794 | 2.81E-09 | 1.00688 | 2.79E-09 |
| **Texture** | Clay | 10 | 545 | 57.072 | 9540 | 0.00794 | 0.00238 | 3.74E-09 | 1.00793 | 3.71E-09 |
| | | | | | | | AVERAGE: | | | 2.51E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 9.31E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 13E | 1 | 490 | 51.313 | 6780 | 0.04921 | 0.04445 | 2.38E-09 | 1.00425 | 2.37E-09 |
| **length (m)** | 0.02301875 | 2 | 480 | 50.265 | 10440 | 0.04445 | 0.03969 | 1.71E-09 | 1.00450 | 1.70E-09 |
| **R-o (m)** | 0.1920875 | 3 | 440 | 46.077 | 5820 | 0.03969 | 0.03651 | 2.55E-09 | 1.00469 | 2.54E-09 |
| **dist cent (m)** | 0.18057813 | 4 | 410 | 42.935 | 5880 | 0.03651 | 0.03493 | 1.50E-09 | 1.00480 | 1.50E-09 |
| **meters/rev** | 1.13460582 | 5 | 445 | 46.600 | 8220 | 0.03493 | 0.03016 | 2.87E-09 | 1.00515 | 2.85E-09 |
| **R-b (m)** | 0.1920875 | 6 | 569 | 59.586 | 4500 | 0.03096 | 0.02778 | 2.24E-09 | 1.00536 | 2.23E-09 |
| **R-t (m)** | 0.16906875 | 7 | 493 | 51.627 | 6660 | 0.02778 | 0.02461 | 2.13E-09 | 1.00566 | 2.12E-09 |
| **Direction** | V | 8 | 483 | 50.580 | 8280 | 0.02461 | 0.02143 | 1.89E-09 | 1.00601 | 1.88E-09 |
| **Element** | OF | 9 | 515 | 53.931 | 3720 | 0.03731 | 0.03651 | 7.40E-10 | 1.00469 | 7.37E-10 |
| **Texture** | Clay | 10 | 545 | 57.072 | 9540 | 0.03651 | 0.03175 | 1.61E-09 | 1.00503 | 1.60E-09 |
| | | | | | | | AVERAGE: | | | 1.95E-09 |
| | | | | | | | STANDARD DEVIATION: | | | 6.39E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 14E | 1 | 490 | 51.313 | 6780 | 0.04763 | 0.04445 | 1.80E-09 | 1.00406 | 1.79E-09 |
| **length (m)** | 0.0269875 | 2 | 480 | 50.265 | 10440 | 0.04445 | 0.03731 | 2.90E-09 | 1.00441 | 2.89E-09 |
| **R-o (m)** | 0.1920875 | 3 | 440 | 46.077 | 5820 | 0.03731 | 0.03572 | 1.45E-09 | 1.00450 | 1.44E-09 |
| **dist cent (m)** | 0.17859375 | 4 | 410 | 42.935 | 5880 | 0.03572 | 0.03413 | 1.69E-09 | 1.00459 | 1.68E-09 |
| **meters/rev** | 1.12213763 | 5 | 445 | 46.600 | 8220 | 0.03413 | 0.03016 | 2.66E-09 | 1.00485 | 2.65E-09 |
| **R-b (m)** | 0.1920875 | 6 | 569 | 59.586 | 4500 | 0.02858 | 0.02619 | 1.91E-09 | 1.00515 | 1.90E-09 |
| **R-t (m)** | 0.1651 | 7 | 493 | 51.627 | 6660 | 0.02619 | 0.02381 | 1.79E-09 | 1.00536 | 1.78E-09 |
| **Direction** | V | 8 | 483 | 50.580 | 8280 | 0.02381 | 0.02064 | 2.09E-09 | 1.00566 | 2.08E-09 |
| **Element** | OF | 9 | 515 | 53.931 | 3720 | 0.02064 | 0.01984 | 1.06E-09 | 1.00574 | 1.05E-09 |
| **Texture** | Clay | 10 | 545 | 57.072 | 9540 | 0.01984 | 0.01667 | 1.53E-09 | 1.00610 | 1.52E-09 |

AVERAGE: 1.88E-09
STANDARD DEVIATION: 5.93E-10

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 15E | 1 | 490 | 51.313 | 6780 | 0.02381 | 0.02024 | 2.52E-09 | 1.00625 | 2.50E-09 |
| **length (m)** | 0.022225 | 2 | 480 | 50.265 | 10440 | 0.02024 | 0.01667 | 1.84E-09 | 1.00676 | 1.82E-09 |
| **R-o (m)** | 0.1920875 | 3 | 440 | 46.077 | 5820 | 0.01667 | 0.01429 | 2.79E-09 | 1.00715 | 2.77E-09 |
| **dist cent (m)** | 0.180975 | 4 | 410 | 42.935 | 5880 | 0.01429 | 0.01270 | 2.23E-09 | 1.00744 | 2.21E-09 |
| **meters/rev** | 1.1370995 | 5 | 445 | 46.600 | 8220 | 0.01270 | 0.01032 | 2.14E-09 | 1.00793 | 2.12E-09 |
| **R-b (m)** | 0.1920875 | 6 | 569 | 59.586 | 4500 | 0.00635 | 0.00476 | 1.90E-09 | 1.00941 | 1.88E-09 |
| **R-t (m)** | 0.1698625 | 7 | 493 | 51.627 | 6660 | 0.00476 | 0.00318 | 1.81E-09 | 1.00996 | 1.79E-09 |
| **Direction** | V | 8 | 483 | 50.580 | 8280 | 0.01111 | 0.00635 | 3.90E-09 | 1.00893 | 3.87E-09 |
| **Element** | OF | 9 | 515 | 53.931 | 3720 | 0.00635 | 0.00556 | 1.38E-09 | 1.00916 | 1.37E-09 |
| **Texture** | Clay | 10 | 545 | 57.072 | 9540 | 0.00556 | N/A | | 1.01128 | |

AVERAGE: 2.26E-09
STANDARD DEVIATION: 7.58E-10

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 16E | 1 | 490 | 51.313 | 6780 | 0.02143 | 0.01905 | 2.01E-09 | 1.00558 | 2.00E-09 |
| **length (m)** | 0.029369 | 2 | 480 | 50.265 | 10440 | 0.01905 | 0.01746 | 9.39E-10 | 1.00574 | 9.34E-10 |
| **R-o (m)** | 0.192088 | 3 | 440 | 46.077 | 5820 | 0.01746 | 0.01429 | 4.19E-09 | 1.00610 | 4.17E-09 |
| **dist cent (m)** | 0.177403 | 4 | 410 | 42.935 | 5880 | 0.01429 | 0.01191 | 3.79E-09 | 1.00641 | 3.76E-09 |
| **meters/rev** | 1.114657 | 5 | 445 | 46.600 | 8220 | 0.01191 | 0.01111 | 7.93E-10 | 1.00652 | 7.88E-10 |
| **R-b (m)** | 0.192088 | 6 | 569 | 59.586 | 4500 | 0.00635 | 0.00556 | 1.01E-09 | 1.00744 | 1.00E-09 |
| **R-t (m)** | 0.162719 | 7 | 493 | 51.627 | 6660 | 0.00556 | 0.00159 | 4.84E-09 | 1.00830 | 4.80E-09 |
| **Direction** | H | 8 | 483 | 50.580 | 8280 | 0.01349 | 0.00953 | 3.34E-09 | 1.00676 | 3.32E-09 |
| **Element** | OF | 9 | 515 | 53.931 | 3720 | 0.00953 | 0.00953 | 0.00E+00 | 1.00676 | 0.00E+00 |
| **Texture** | Clay | 10 | 545 | 57.072 | 9540 | 0.00953 | 0.00397 | 3.56E-09 | 1.00776 | 3.54E-09 |

AVERAGE: 2.43E-09
STANDARD DEVIATION: 1.48E-09

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 1F | 1 | 805 | 84.299 | 9720 | 0.01905 | 0.01508 | 1.12E-09 | 1.00455 | 1.12E-09 |
| length (m) | 0.0468313 | 2 | 1000 | 104.720 | 10560 | 0.01508 | 0.00953 | 9.96E-10 | 1.00491 | 9.92E-10 |
| R-o (m) | 0.1920875 | 3 | 542 | 56.758 | 11880 | 0.01111 | 0.00397 | 4.16E-09 | 1.00536 | 4.14E-09 |
| dist cent (m) | 0.1686719 | 4 | 572 | 59.900 | 13920 | 0.02461 | 0.02143 | 1.16E-09 | 1.00421 | 1.15E-09 |
| meters/rev | 1.0597966 | 5 | 507 | 53.093 | 11880 | 0.02143 | 0.01905 | 1.33E-09 | 1.00433 | 1.33E-09 |
| R-b (m) | 0.1920875 | 6 | 492 | 51.522 | 11100 | 0.01746 | 0.01349 | 2.68E-09 | 1.00464 | 2.67E-09 |
| R-t (m) | 0.1452563 | 7 | 482 | 50.475 | 8280 | 0.01349 | 0.01032 | 3.14E-09 | 1.00485 | 3.13E-09 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 1.95E-09 |
| Texture | Clay | | | | | | STANDARD DEVIATION: | | | 1.06E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 2F | 1 | 805 | 84.299 | 9720 | 0.02461 | 0.01746 | 1.43E-09 | 1.00620 | 1.42E-09 |
| length (m) | 0.0254 | 2 | 1000 | 104.720 | 10560 | 0.01746 | 0.00953 | 1.11E-09 | 1.00744 | 1.10E-09 |
| R-o (m) | 0.19209 | 3 | 542 | 56.758 | 11880 | 0.01746 | 0.01429 | 1.27E-09 | 1.00664 | 1.26E-09 |
| dist cent (m) | 0.17939 | 4 | 572 | 59.900 | 13920 | 0.02461 | 0.02143 | 8.46E-10 | 1.00574 | 8.41E-10 |
| meters/rev | 1.12712 | 5 | 507 | 53.093 | 11880 | 0.02143 | 0.01905 | 9.96E-10 | 1.00601 | 9.90E-10 |
| R-b (m) | 0.19209 | 6 | 492 | 51.522 | 11100 | 0.01746 | 0.01349 | 2.08E-09 | 1.00676 | 2.06E-09 |
| R-t (m) | 0.16669 | 7 | 482 | 50.475 | 8280 | 0.01349 | 0.01032 | 2.52E-09 | 1.00729 | 2.50E-09 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 1.26E-09 |
| Texture | Clay | | | | | | STANDARD DEVIATION: | | | 5.69E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 3F | 1 | 805 | 84.299 | 9720 | 0.02461 | 0.01984 | 1.11E-09 | 1.00497 | 1.10E-09 |
| length (m) | 0.0357188 | 2 | 1000 | 104.720 | 10560 | 0.01984 | 0.01508 | 7.11E-10 | 1.00536 | 7.07E-10 |
| R-o (m) | 0.1920875 | 3 | 542 | 56.758 | 11880 | 0.01349 | 0.00953 | 1.98E-09 | 1.00592 | 1.97E-09 |
| dist cent (m) | 0.1742281 | 4 | 572 | 59.900 | 13920 | 0.01945 | 0.01508 | 1.52E-09 | 1.00536 | 1.51E-09 |
| meters/rev | 1.0947076 | 5 | 507 | 53.093 | 11880 | 0.01508 | 0.01032 | 2.66E-09 | 1.00583 | 2.65E-09 |
| R-b (m) | 0.1920875 | 6 | 492 | 51.522 | 11100 | 0.01508 | 0.01191 | 1.99E-09 | 1.00566 | 1.98E-09 |
| R-t (m) | 0.1563688 | 7 | 482 | 50.475 | 8280 | 0.01191 | 0.00953 | 2.19E-09 | 1.00592 | 2.18E-09 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 1.26E-09 |
| Texture | Clay | | | | | | STANDARD DEVIATION: | | | 6.47E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 4F | 1 | 805 | 84.299 | 9720 | 0.02223 | 0.01905 | 7.33E-10 | 1.00522 | 7.29E-10 |
| length (m) | 0.03334 | 2 | 1000 | 104.720 | 10560 | 0.01905 | 0.01667 | 3.43E-10 | 1.00543 | 3.41E-10 |
| R-o (m) | 0.19209 | 3 | 542 | 56.758 | 11880 | 0.01429 | 0.01111 | 1.51E-09 | 1.00601 | 1.50E-09 |
| dist cent (m) | 0.17542 | 4 | 572 | 59.900 | 13920 | 0.01032 | 0.00754 | 1.09E-09 | 1.00647 | 1.09E-09 |
| meters/rev | 1.10219 | 5 | 507 | 53.093 | 11880 | 0.00754 | 0.00635 | 7.29E-10 | 1.00664 | 7.24E-10 |
| R-b (m) | 0.19209 | 6 | 492 | 51.522 | 11100 | 0.01111 | 0.00953 | 1.03E-09 | 1.00620 | 1.02E-09 |
| R-t (m) | 0.15875 | 7 | 482 | 50.475 | 8280 | 0.00953 | 0.00635 | 3.02E-09 | 1.00664 | 3.00E-09 |
| Direction | H | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 9.01E-10 |
| Texture | Clay | | | | | | STANDARD DEVIATION: | | | 7.31E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 5F | 1 | 805 | 84.299 | 9720 | 0.02381 | 0.00159 | 6.25E-09 | 0.99992 | 6.25E-09 |
| length (m) | 0.0381 | 2 | 1000 | 104.720 | 10560 | 0.02699 | 0.00476 | 3.54E-09 | 0.99992 | 3.54E-09 |
| R-o (m) | 0.192088 | 3 | 542 | 56.758 | 11880 | 0.02223 | 0.01111 | 5.24E-09 | 0.99992 | 5.24E-09 |
| dist cent (m) | 0.173038 | | | | | | | | | |
| meters/rev | 1.087227 | | | | | | AVERAGE: | | | 5.01E-09 |
| R-b (m) | 0.192088 | | | | | | STANDARD DEVIATION: | | | 1.12E-09 |
| R-t (m) | 0.153988 | | | | | | | | | |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | | | | |
| Texture | Clay | | | | | | | | | |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 6F | 1 | 805 | 84.299 | 9720 | 0.02223 | 0.00159 | 5.06E-09 | 1.00968 | 5.01E-09 |
| length (m) | 0.024606 | 2 | 1000 | 104.720 | 10560 | 0.02064 | 0.01508 | 6.94E-10 | 1.00664 | 6.89E-10 |
| R-o (m) | 0.192088 | 3 | 542 | 56.758 | 11880 | 0.01349 | 0.00953 | 1.73E-09 | 1.00759 | 1.72E-09 |
| dist cent (m) | 0.179784 | 4 | 572 | 59.900 | 13920 | 0.01945 | 0.01508 | 1.28E-09 | 1.00664 | 1.27E-09 |
| meters/rev | 1.129619 | 5 | 507 | 53.093 | 11880 | 0.01508 | 0.01032 | 2.31E-09 | 1.00744 | 2.29E-09 |
| R-b (m) | 0.192088 | 6 | 492 | 51.522 | 11100 | 0.01508 | 0.01191 | 1.71E-09 | 1.00715 | 1.70E-09 |
| R-t (m) | 0.167481 | 7 | 482 | 50.475 | 8280 | 0.01191 | 0.00953 | 1.92E-09 | 1.00759 | 1.91E-09 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 2.47E-09 |
| Texture | Clay | | | | | | STANDARD DEVIATION: | | | 1.18E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 7F | 1 | 805 | 84.299 | 9720 | 0.02937 | 0.00397 | 6.51E-09 | 1.00893 | 6.46E-09 |
| **length (m)** | 0.028575 | 2 | 1000 | 104.720 | 10560 | 0.02143 | 0.01508 | 9.14E-10 | 1.00664 | 9.08E-10 |
| **R-o (m)** | 0.192088 | 3 | 542 | 56.758 | 11880 | 0.01429 | 0.01191 | 1.16E-09 | 1.00715 | 1.15E-09 |
| **dist cent (m)** | 0.1778 | 4 | 572 | 59.900 | 13920 | 0.01984 | 0.01429 | 1.90E-09 | 1.00676 | 1.89E-09 |
| **meters/rev** | 1.11715 | 5 | 507 | 53.093 | 11880 | 0.01429 | 0.01111 | 1.78E-09 | 1.00729 | 1.77E-09 |
| **R-b (m)** | 0.192088 | 6 | 492 | 51.522 | 11100 | 0.01588 | 0.01349 | 1.45E-09 | 1.00688 | 1.44E-09 |
| **R-t (m)** | 0.167481 | 7 | 482 | 50.475 | 8280 | 0.01349 | 0.01270 | 7.01E-10 | 1.00701 | 6.96E-10 |
| **Direction** | V | | | | | | | | | |
| **Element** | OF | | | | | | AVERAGE: | | | 2.84E-09 |
| **Texture** | Clay | | | | | | STANDARD DEVIATION: | | | 1.65E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 8F | 1 | 805 | 84.299 | 9720 | 0.03334 | 0.02937 | 6.14E-10 | 1.00529 | 6.11E-10 |
| **length (m)** | 0.022225 | 2 | 1000 | 104.720 | 10560 | 0.05080 | 0.04286 | 5.97E-10 | 1.00437 | 5.94E-10 |
| **R-o (m)** | 0.192088 | 3 | 542 | 56.758 | 11880 | 0.04286 | 0.03969 | 7.71E-10 | 1.00455 | 7.68E-10 |
| **dist cent (m)** | 0.180975 | 4 | 572 | 59.900 | 13920 | 0.03413 | 0.02778 | 1.37E-09 | 1.00543 | 1.36E-09 |
| **meters/rev** | 1.137099 | 5 | 507 | 53.093 | 11880 | 0.02778 | 0.02500 | 9.63E-10 | 1.00570 | 9.57E-10 |
| **R-b (m)** | 0.192088 | 6 | 492 | 51.522 | 11100 | 0.02064 | 0.01746 | 1.44E-09 | 1.00664 | 1.43E-09 |
| **R-t (m)** | 0.169863 | 7 | 482 | 50.475 | 8280 | 0.01746 | 0.01191 | 3.90E-09 | 1.00759 | 3.87E-09 |
| **Direction** | H | | | | | | | | | |
| **Element** | OF | | | | | | AVERAGE: | | | 1.37E-09 |
| **Texture** | Clay | | | | | | STANDARD DEVIATION: | | | 9.49E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 9F | 1 | 805 | 84.299 | 9720 | 0.02143 | 0.01667 | 9.73E-10 | 1.00641 | 9.67E-10 |
| **length (m)** | 0.02461 | 2 | 1000 | 104.720 | 10560 | 0.01667 | 0.01429 | 3.13E-10 | 1.00676 | 3.10E-10 |
| **R-o (m)** | 0.19209 | 3 | 542 | 56.758 | 11880 | 0.01429 | 0.01111 | 1.34E-09 | 1.00729 | 1.33E-09 |
| **dist cent (m)** | 0.17978 | 4 | 572 | 59.900 | 13920 | 0.03969 | 0.03175 | 1.71E-09 | 1.00491 | 1.70E-09 |
| **meters/rev** | 1.12962 | 5 | 507 | 53.093 | 11880 | 0.03175 | 0.02540 | 2.26E-09 | 1.00543 | 2.25E-09 |
| **R-b (m)** | 0.19209 | 6 | 492 | 51.522 | 11100 | 0.02381 | 0.02064 | 1.43E-09 | 1.00592 | 1.42E-09 |
| **R-t (m)** | 0.16748 | 7 | 482 | 50.475 | 8280 | 0.02064 | 0.01746 | 2.12E-09 | 1.00630 | 2.11E-09 |
| **Direction** | V | | | | | | | | | |
| **Element** | OF | | | | | | AVERAGE: | | | 1.44E-09 |
| **Texture** | Clay | | | | | | STANDARD DEVIATION: | | | 6.06E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 10F | 1 | 805 | 84.299 | 9720 | 0.02858 | 0.02540 | 6.32E-10 | 1.00497 | 6.29E-10 |
| length (m) | 0.0301625 | 2 | 1000 | 104.720 | 10560 | 0.02540 | 0.02381 | 1.95E-10 | 1.00509 | 1.94E-10 |
| R-o (m) | 0.1920875 | 3 | 542 | 56.758 | 11880 | 0.01905 | 0.01508 | 1.68E-09 | 1.00592 | 1.67E-09 |
| dist cent (m) | 0.17700625 | 4 | 572 | 59.900 | 13920 | 0.03334 | 0.02858 | 1.24E-09 | 1.00475 | 1.24E-09 |
| meters/rev | 1.11216307 | 5 | 507 | 53.093 | 11880 | 0.02858 | 0.02540 | 1.30E-09 | 1.00497 | 1.30E-09 |
| R-b (m) | 0.1920875 | 6 | 492 | 51.522 | 11100 | 0.02381 | 0.02223 | 7.86E-10 | 1.00522 | 7.82E-10 |
| R-t (m) | 0.161925 | 7 | 482 | 50.475 | 8280 | 0.02223 | 0.01905 | 2.28E-09 | 1.00550 | 2.27E-09 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 1.15E-09 |
| Texture | Clay | | | | | | STANDARD DEVIATION: | | | 5.92E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 11F | 1 | 805 | 84.299 | 9720 | 0.04286 | 0.03572 | 1.01E-09 | 1.00475 | 1.01E-09 |
| length (m) | 0.023019 | 2 | 1000 | 104.720 | 10560 | 0.03572 | 0.02699 | 8.26E-10 | 1.00543 | 8.21E-10 |
| R-o (m) | 0.192088 | 3 | 542 | 56.758 | 11880 | 0.03413 | 0.02858 | 1.59E-09 | 1.00529 | 1.58E-09 |
| dist cent (m) | 0.180578 | 4 | 572 | 59.900 | 13920 | 0.02699 | 0.02103 | 1.48E-09 | 1.00606 | 1.47E-09 |
| meters/rev | 1.134606 | 5 | 507 | 53.093 | 11880 | 0.02103 | 0.01746 | 1.45E-09 | 1.00652 | 1.44E-09 |
| R-b (m) | 0.192088 | 6 | 492 | 51.522 | 11100 | 0.01905 | 0.01429 | 2.32E-09 | 1.00701 | 2.30E-09 |
| R-t (m) | 0.169069 | 7 | 482 | 50.475 | 8280 | 0.01429 | 0.01191 | 1.76E-09 | 1.00744 | 1.75E-09 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 1.48E-09 |
| Texture | Clay | | | | | | STANDARD DEVIATION: | | | 5.02E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 12F | 1 | 805 | 84.299 | 9720 | 0.02223 | 0.00794 | 4.36E-09 | 1.00459 | 4.34E-09 |
| length (m) | 0.05318 | 2 | 1000 | 104.720 | 10560 | 0.00794 | 0.00159 | 1.32E-09 | 1.00503 | 1.31E-09 |
| R-o (m) | 0.19209 | 3 | 542 | 56.758 | 11880 | 0.01905 | 0.00873 | 5.75E-09 | 1.00455 | 5.73E-09 |
| dist cent (m) | 0.1655 | 4 | 572 | 59.900 | 13920 | 0.02699 | 0.02103 | 2.28E-09 | 1.00394 | 2.27E-09 |
| meters/rev | 1.03985 | 5 | 507 | 53.093 | 11880 | 0.02103 | 0.01746 | 2.14E-09 | 1.00410 | 2.13E-09 |
| R-b (m) | 0.19209 | 6 | 492 | 51.522 | 11100 | 0.00873 | 0.00159 | 5.78E-09 | 1.00503 | 5.75E-09 |
| R-t (m) | 0.13891 | 7 | 482 | 50.475 | 8280 | 0.01508 | 0.00635 | 9.17E-09 | 1.00469 | 9.13E-09 |
| Direction | H | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 4.38E-09 |
| Texture | Clay | | | | | | STANDARD DEVIATION: | | | 2.33E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 13F | 1 | 805 | 84.299 | 9720 | 0.02461 | 0.01826 | 1.75E-09 | 1.00421 | 1.75E-09 |
| length (m) | 0.050006 | 2 | 1000 | 104.720 | 10560 | 0.01826 | 0.01508 | 5.52E-10 | 1.00437 | 5.49E-10 |
| R-o (m) | 0.192088 | 3 | 542 | 56.758 | 11880 | 0.02461 | 0.02064 | 1.95E-09 | 1.00410 | 1.94E-09 |
| dist cent (m) | 0.167084 | 4 | 572 | 59.900 | 13920 | 0.02024 | 0.01349 | 2.71E-09 | 1.00446 | 2.70E-09 |
| meters/rev | 1.049822 | 5 | 507 | 53.093 | 11880 | 0.01349 | 0.00635 | 4.68E-09 | 1.00491 | 4.66E-09 |
| R-b (m) | 0.192088 | 6 | 492 | 51.522 | 11100 | 0.00794 | 0.00238 | 4.43E-09 | 1.00522 | 4.41E-09 |
| R-t (m) | 0.142081 | | | | | | | | | |
| Direction | V | | | | | | AVERAGE: | | | 2.67E-09 |
| Element | OF | | | | | | STANDARD DEVIATION: | | | 1.34E-09 |
| Texture | Clay | | | | | | | | | |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 14F | 1 | 805 | 84.299 | 9720 | 0.02540 | 0.01905 | 1.88E-09 | 1.00417 | 1.87E-09 |
| length (m) | 0.053975 | 2 | 1000 | 104.720 | 10560 | 0.01905 | 0.01667 | 4.40E-10 | 1.00429 | 4.39E-10 |
| R-o (m) | 0.192088 | 3 | 542 | 56.758 | 11880 | 0.02540 | 0.01746 | 4.27E-09 | 1.00425 | 4.25E-09 |
| dist cent (m) | 0.1651 | 4 | 572 | 59.900 | 13920 | 0.02103 | 0.01429 | 2.90E-09 | 1.00441 | 2.89E-09 |
| meters/rev | 1.037354 | 5 | 507 | 53.093 | 11880 | 0.01429 | 0.00794 | 4.42E-09 | 1.00480 | 4.40E-09 |
| R-b (m) | 0.192088 | 6 | 492 | 51.522 | 11100 | 0.00794 | 0.00476 | 2.68E-09 | 1.00503 | 2.67E-09 |
| R-t (m) | 0.142081 | | | | | | | | | |
| Direction | V | | | | | | AVERAGE: | | | 2.75E-09 |
| Element | OF | | | | | | STANDARD DEVIATION: | | | 1.28E-09 |
| Texture | Clay | | | | | | | | | |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 15F | 1 | 805 | 84.299 | 9720 | 0.02143 | 0.01746 | 1.07E-09 | 1.00450 | 1.07E-09 |
| length (m) | 0.0452438 | 2 | 687 | 71.942 | 10560 | 0.01746 | 0.01429 | 1.13E-09 | 1.00469 | 1.13E-09 |
| R-o (m) | 0.1920875 | 3 | 542 | 56.758 | 11880 | 0.01111 | 0.00635 | 2.69E-09 | 1.00529 | 2.68E-09 |
| dist cent (m) | 0.1694656 | 4 | 572 | 59.900 | 13920 | 0.01508 | 0.01191 | 1.28E-09 | 1.00485 | 1.28E-09 |
| meters/rev | 1.0647839 | 5 | 507 | 53.093 | 11880 | 0.01191 | 0.00873 | 2.00E-09 | 1.00509 | 1.99E-09 |
| R-b (m) | 0.1920875 | 6 | 492 | 51.522 | 11100 | 0.01191 | 0.00794 | 2.86E-09 | 1.00515 | 2.85E-09 |
| R-t (m) | 0.1468438 | 7 | 482 | 50.475 | 8280 | 0.00794 | 0.00476 | 3.38E-09 | 1.00543 | 3.36E-09 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 2.05E-09 |
| Texture | Clay | | | | | | STANDARD DEVIATION: | | | 8.47E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | K-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 16F | 1 | 805 | 84.299 | 9720 | 0.02540 | 0.01905 | 1.71E-09 | 1.00425 | 1.71E-09 |
| **length (m)** | 0.04842 | 2 | 687 | 71.942 | 10560 | 0.01905 | 0.01667 | 8.53E-10 | 1.00437 | 8.49E-10 |
| **R-o (m)** | 0.19209 | 3 | 542 | 56.758 | 11880 | 0.01429 | 0.01032 | 2.18E-09 | 1.00475 | 2.17E-09 |
| **dist cent (m)** | 0.16788 | 4 | 572 | 59.900 | 13920 | 0.01429 | 0.01111 | 1.33E-09 | 1.00469 | 1.32E-09 |
| **meters/rev** | 1.05481 | 5 | 507 | 53.093 | 11880 | 0.01111 | 0.00476 | 4.24E-09 | 1.00515 | 4.22E-09 |
| **R-b (m)** | 0.19209 | 6 | 492 | 51.522 | 11100 | 0.01508 | 0.01191 | 2.23E-09 | 1.00464 | 2.22E-09 |
| **R-t (m)** | 0.14367 | 7 | 482 | 50.475 | 8280 | 0.01191 | 0.00873 | 3.25E-09 | 1.00485 | 3.23E-09 |
| **Direction** | H | | | | | | | | | |
| **Element** | OF | | | | | | AVERAGE: | | | 2.24E-09 |
| **Texture** | Clay | | | | | | STANDARD DEVIATION: | | | 1.02E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 10K | 1 | 300 | 31.416 | 3600 | 0.03413 | 0.01746 | 8.30E-08 | 1.00441 | 8.26E-08 |
| length (m) | 0.0468313 | 2 | 350 | 36.652 | 4260 | 0.03413 | 0.00238 | 1.08E-07 | 1.00550 | 1.08E-07 |
| R-o (m) | 0.1920875 | 3 | 342 | 35.814 | 4500 | 0.02778 | 0.00238 | 8.91E-08 | 1.00550 | 8.86E-08 |
| dist cent (m) | 0.1686719 | 4 | 343 | 35.919 | 4680 | 0.03413 | 0.00476 | 9.34E-08 | 1.00529 | 9.29E-08 |
| meters/rev | 1.0597966 | 5 | 300 | 31.416 | 6300 | 0.03413 | 0.00238 | 9.98E-08 | 1.00550 | 9.92E-08 |
| R-b (m) | 0.1920875 | 6 | 370 | 38.746 | 4440 | 0.03413 | 0.00238 | 9.31E-08 | 1.00550 | 9.26E-08 |
| R-t (m) | 0.1452563 | 7 | 318 | 33.301 | 4680 | 0.03731 | 0.00873 | 1.01E-07 | 1.00497 | 1.01E-07 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 9.491E-08 |
| Texture | Silt | | | | | | STANDARD DEVIATION: | | | 2.347E-08 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/se |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 15K | 1 | 300 | 31.416 | 3600 | 0.03651 | 0.02461 | 5.69E-08 | 1.00403 | 5.67E-08 |
| length (m) | 0.047625 | 2 | 350 | 36.652 | 4260 | 0.02461 | 0.01191 | 4.30E-08 | 1.00469 | 4.28E-08 |
| R-o (m) | 0.192088 | 3 | 342 | 35.814 | 4500 | 0.03651 | 0.02461 | 3.50E-08 | 1.00403 | 3.49E-08 |
| dist cent (m) | 0.168275 | 4 | 343 | 35.919 | 4680 | 0.02461 | 0.01111 | 4.36E-08 | 1.00475 | 4.34E-08 |
| meters/rev | 1.057303 | 5 | 300 | 31.416 | 6300 | 0.03651 | 0.01746 | 5.41E-08 | 1.00437 | 5.38E-08 |
| R-b (m) | 0.192088 | 6 | 370 | 38.746 | 4440 | 0.01746 | 0.00476 | 4.06E-08 | 1.00522 | 4.04E-08 |
| R-t (m) | 0.144463 | 7 | 318 | 33.301 | 4680 | 0.03016 | 0.01032 | 7.27E-08 | 1.00480 | 7.23E-08 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 4.92E-08 |
| Texture | Silt | | | | | | STANDARD DEVIATION: | | | 1.50E-08 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 1J | 1 | 450 | 47.124 | 8100 | 0.03969 | 0.00159 | 3.96E-08 | 1.00583 | 3.94E-08 |
| length (m) | 0.04445 | 2 | 400 | 41.888 | 7200 | 0.03969 | 0.01191 | 3.82E-08 | 1.00491 | 3.80E-08 |
| R-o (m) | 0.192088 | 3 | 524 | 54.873 | 7560 | 0.03969 | 0.00159 | 3.13E-08 | 1.00583 | 3.11E-08 |
| dist cent (m) | 0.169863 | 4 | 542 | 56.758 | 7200 | 0.03969 | 0.00238 | 2.99E-08 | 1.00574 | 2.97E-08 |
| meters/rev | 1.067278 | 5 | 560 | 58.643 | 18000 | 0.03969 | N/A | 1.21E-08 | 1.00601 | |
| R-b (m) | 0.192088 | 6 | 450 | 47.124 | 7200 | 0.03969 | 0.01032 | 3.22E-08 | 1.00503 | 3.21E-08 |
| R-t (m) | 0.147638 | 7 | 470 | 49.218 | 7200 | 0.03969 | 0.00635 | 3.45E-08 | 1.00536 | 3.43E-08 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 3.41E-08 |
| Texture | Silt | | | | | | STANDARD DEVIATION: | | | 1.23E-08 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/se |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 23G | 1 | 406 | 42.516 | 5880 | 0.06191 | 0.03731 | 1.75E-08 | 1.00491 | 1.74E-08 |
| length (m) | 0.01905 | 2 | 248 | 25.970 | 4680 | 0.03731 | 0.03413 | 9.05E-09 | 1.00515 | 9.00E-09 |
| R-o (m) | 0.192088 | 3 | 303 | 31.730 | 11100 | 0.03413 | 0.02223 | 1.09E-08 | 1.00641 | 1.08E-08 |
| dist cent (m) | 0.182563 | 4 | 250 | 26.180 | 7200 | 0.05398 | 0.05318 | 1.15E-09 | 1.00403 | 1.15E-09 |
| meters/rev | 1.147074 | 5 | 318 | 33.301 | 8880 | 0.05318 | 0.05080 | 1.76E-09 | 1.00413 | 1.76E-09 |
| R-b (m) | 0.192088 | 6 | 318 | 33.301 | 13620 | 0.05318 | 0.04763 | 2.73E-09 | 1.00429 | 2.72E-09 |
| R-t (m) | 0.173038 | 7 | 380 | 39.794 | 11880 | 0.04763 | 0.04445 | 1.32E-09 | 1.00446 | 1.31E-09 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 6.17E-09 |
| Texture | Silt | | | | | | STANDARD DEVIATION: | | | 5.14E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/se |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 24G | 1 | 406 | 42.516 | 5880 | 0.00556 | 0.00159 | 9.14E-09 | 1.00497 | 9.09E-09 |
| length (m) | 0.053975 | 2 | 248 | 25.970 | 4680 | 0.03016 | 0.02540 | 2.81E-08 | 1.00375 | 2.80E-08 |
| R-o (m) | 0.1920875 | 3 | 303 | 31.730 | 11100 | 0.02540 | 0.01746 | 1.40E-08 | 1.00406 | 1.40E-08 |
| dist cent (m) | 0.1651 | 4 | 250 | 26.180 | 7200 | 0.02223 | 0.01746 | 1.94E-08 | 1.00406 | 1.93E-08 |
| meters/rev | 1.03735389 | 5 | 318 | 33.301 | 8880 | 0.01746 | 0.01032 | 1.55E-08 | 1.00441 | 1.55E-08 |
| R-b (m) | 0.1920875 | 6 | 318 | 33.301 | 13620 | 0.01905 | 0.01746 | 2.14E-09 | 1.00406 | 2.14E-09 |
| R-t (m) | 0.1381125 | 7 | 380 | 39.794 | 11880 | 0.01746 | 0.01429 | 3.53E-09 | 1.00421 | 3.52E-09 |
| Direction | H | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 1.24E-08 |
| Texture | Silt | | | | | | STANDARD DEVIATION: | | | 7.60E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 25G | 1 | 406 | 42.516 | 5880 | 0.04445 | 0.03969 | 6.13E-09 | 1.00375 | 6.10E-09 |
| length (m) | 0.039688 | 2 | 248 | 25.970 | 4680 | 0.03969 | 0.03493 | 2.16E-08 | 1.00393 | 2.15E-08 |
| R-o (m) | 0.192088 | 3 | 303 | 31.730 | 11100 | 0.03493 | 0.03175 | 4.23E-09 | 1.00406 | 4.21E-09 |
| dist cent (m) | 0.172244 | 4 | 250 | 26.180 | 7200 | 0.03175 | 0.02937 | 7.40E-09 | 1.00417 | 7.37E-09 |
| meters/rev | 1.082239 | 5 | 318 | 33.301 | 8880 | 0.02937 | 0.02778 | 2.53E-09 | 1.00425 | 2.52E-09 |
| R-b (m) | 0.192088 | 6 | 318 | 33.301 | 13620 | 0.03493 | 0.02778 | 7.19E-09 | 1.00425 | 7.16E-09 |
| R-t (m) | 0.1524 | 7 | 380 | 39.794 | 11880 | 0.02778 | 0.02143 | 5.55E-09 | 1.00459 | 5.53E-09 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 7.45E-09 |
| Texture | Silt | | | | | | STANDARD DEVIATION: | | | 5.19E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 28G | 1 | 383 | 40.108 | 12900 | 0.02540 | 0.02381 | 1.21E-09 | 1.00464 | 1.20E-09 |
| length (m) | 0.036513 | 2 | 246 | 25.761 | 13200 | 0.02381 | 0.02143 | 4.40E-09 | 1.00480 | 4.38E-09 |
| R-o (m) | 0.192088 | 3 | 300 | 31.416 | 11100 | 0.02143 | 0.02143 | 0.00E+00 | 1.00480 | 0.00E+00 |
| dist cent (m) | 0.173831 | 4 | 260 | 27.227 | 8100 | 0.02143 | 0.01984 | 4.40E-09 | 1.00491 | 4.38E-09 |
| meters/rev | 1.092214 | 5 | 300 | 31.416 | 7200 | 0.01984 | 0.01905 | 1.89E-09 | 1.00497 | 1.88E-09 |
| R-b (m) | 0.192088 | 6 | 318 | 33.301 | 13620 | 0.01468 | 0.01429 | 4.81E-10 | 1.00536 | 4.78E-10 |
| R-t (m) | 0.155575 | 7 | 380 | 39.794 | 11880 | 0.01429 | 0.01349 | 7.80E-10 | 1.00543 | 7.76E-10 |
| Direction | H | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 1.87E-09 |
| Texture | Silt | | | | | | STANDARD DEVIATION: | | | 1.68E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 29G | 1 | 383 | 40.108 | 12900 | 0.02143 | 0.01905 | 2.17E-09 | 1.00429 | 2.16E-09 |
| length (m) | 0.047625 | 2 | 246 | 25.761 | 13200 | 0.02143 | 0.01905 | 5.14E-09 | 1.00429 | 5.12E-09 |
| R-o (m) | 0.192088 | 3 | 300 | 31.416 | 11100 | 0.01905 | 0.01746 | 2.80E-09 | 1.00437 | 2.79E-09 |
| dist cent (m) | 0.168275 | 4 | 260 | 27.227 | 8100 | 0.01746 | 0.01667 | 2.59E-09 | 1.00441 | 2.58E-09 |
| meters/rev | 1.057303 | 5 | 300 | 31.416 | 7200 | 0.01667 | 0.01429 | 6.71E-09 | 1.00455 | 6.68E-09 |
| R-b (m) | 0.192088 | 6 | 312 | 32.673 | 7200 | 0.01429 | 0.01191 | 6.40E-09 | 1.00469 | 6.37E-09 |
| R-t (m) | 0.144463 | 7 | 256 | 26.808 | 7200 | 0.01191 | 0.01032 | 6.51E-09 | 1.00480 | 6.48E-09 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 4.60E-09 |
| Texture | Silt | | | | | | STANDARD DEVIATION: | | | 1.87E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 2J | 1 | 450 | 47.124 | 8100 | 0.04763 | 0.00238 | 4.10E-08 | 1.00676 | 4.08E-08 |
| length (m) | 0.036513 | 2 | 400 | 41.888 | 7200 | 0.04763 | 0.01191 | 4.26E-08 | 1.00558 | 4.24E-08 |
| R-o (m) | 0.192088 | 3 | 524 | 54.873 | 7560 | 0.04763 | N/A | 3.49E-08 | 1.00715 | 3.47E-08 |
| dist cent (m) | 0.173831 | 4 | 542 | 56.758 | 7200 | 0.04763 | 0.00159 | 3.26E-08 | 1.00688 | 3.24E-08 |
| meters/rev | 1.092214 | 5 | 560 | 58.643 | 18000 | 0.03969 | N/A | 1.12E-08 | 1.00715 | |
| R-b (m) | 0.192088 | 6 | 450 | 47.124 | 7200 | 0.04763 | 0.01191 | 3.37E-08 | 1.00558 | 3.35E-08 |
| R-t (m) | 0.155575 | 7 | 470 | 49.218 | 7200 | 0.04763 | 0.00635 | 3.73E-08 | 1.00620 | 3.71E-08 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 3.68E-08 |
| Texture | Silt | | | | | | STANDARD DEVIATION: | | | 1.33E-08 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 32G | 1 | 406 | 42.516 | 5880 | 0.02461 | 0.00238 | 4.41E-08 | 1.00522 | 4.39E-08 |
| **length (m)** | 0.050006 | 2 | 248 | 25.970 | 4680 | 0.02778 | 0.01429 | 8.21E-08 | 1.00441 | 8.17E-08 |
| **R-o (m)** | 0.192088 | 3 | 303 | 31.730 | 11100 | 0.01429 | 0.00238 | 2.39E-08 | 1.00522 | 2.38E-08 |
| **dist cent (m)** | 0.167084 | 4 | 250 | 26.180 | 7200 | 0.01746 | 0.00476 | 5.57E-08 | 1.00503 | 5.54E-08 |
| **meters/rev** | 1.049822 | 5 | 318 | 33.301 | 8880 | 0.01429 | 0.00040 | 3.22E-08 | 1.00539 | 3.20E-08 |
| **R-b (m)** | 0.192088 | 6 | 318 | 33.301 | 13620 | 0.01429 | 0.00397 | 1.52E-08 | 1.00509 | 1.51E-08 |
| **R-t (m)** | 0.142081 | 7 | 380 | 39.794 | 11880 | 0.02778 | 0.01508 | 1.29E-08 | 1.00437 | 1.28E-08 |
| **Direction** | H | | | | | | | | | |
| **Element** | OF | | | | | | AVERAGE: | | | 3.78E-08 |
| **Texture** | Silt | | | | | | STANDARD DEVIATION: | | | 2.28E-08 |

| **constants** | | **run #** | **rpm** | **omega** | **t-elapsed (s)** | **depth i (m)** | **depth-wa (m)** | **k-sat (m/sec)** | **c** | **K-cor (m/sec)** |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 34G | 1 | 406 | 42.516 | 5880 | 0.03175 | 0.02540 | 9.96E-09 | 1.00413 | 9.92E-09 |
| **length (m)** | 0.04445 | 2 | 248 | 25.970 | 4680 | 0.02540 | 0.01826 | 4.07E-08 | 1.00450 | 4.05E-08 |
| **R-o (m)** | 0.192088 | 3 | 303 | 31.730 | 11100 | 0.01826 | 0.00476 | 2.50E-08 | 1.00550 | 2.49E-08 |
| **dist cent (m)** | 0.169863 | 4 | 250 | 26.180 | 7200 | 0.02223 | 0.01826 | 1.47E-08 | 1.00450 | 1.47E-08 |
| **meters/rev** | 1.067278 | 5 | 318 | 33.301 | 8880 | 0.01826 | 0.00238 | 3.40E-08 | 1.00574 | 3.38E-08 |
| **R-b (m)** | 0.192088 | 6 | 318 | 33.301 | 13620 | 0.02461 | 0.00159 | 3.11E-08 | 1.00583 | 3.09E-08 |
| **R-t (m)** | 0.147638 | 7 | 380 | 39.794 | 11880 | 0.01746 | 0.00476 | 1.41E-08 | 1.00550 | 1.40E-08 |
| **Direction** | V | | | | | | | | | |
| **Element** | OF | | | | | | AVERAGE: | | | 2.4095E-08 |
| **Texture** | Silt | | | | | | STANDARD DEVIATION: | | | 1.0714E-08 |

| **constants** | | **run #** | **rpm** | **omega** | **t-elapsed (s)** | **depth i (m)** | **depth-wa (m)** | **k-sat (m/sec)** | **c** | **K-cor (m/se** |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 35G | 1 | 406 | 42.516 | 5880 | 0.02778 | 0.02461 | 5.55E-09 | 1.00384 | 5.53E-09 |
| **length (m)** | 0.052388 | 2 | 248 | 25.970 | 4680 | 0.02461 | 0.02381 | 4.76E-09 | 1.00387 | 4.74E-09 |
| **R-o (m)** | 0.192088 | 3 | 303 | 31.730 | 11100 | 0.02381 | 0.01905 | 8.30E-09 | 1.00406 | 8.27E-09 |
| **dist cent (m)** | 0.165894 | 4 | 250 | 26.180 | 7200 | 0.03334 | 0.02778 | 2.01E-08 | 1.00372 | 2.00E-08 |
| **meters/rev** | 1.042341 | 5 | 318 | 33.301 | 8880 | 0.02778 | 0.02540 | 4.48E-09 | 1.00381 | 4.46E-09 |
| **R-b (m)** | 0.192088 | 6 | 318 | 33.301 | 13620 | 0.02461 | 0.02143 | 4.03E-09 | 1.00396 | 4.01E-09 |
| **R-t (m)** | 0.1397 | 7 | 380 | 39.794 | 11880 | 0.02143 | 0.01508 | 6.80E-09 | 1.00425 | 6.78E-09 |
| **Direction** | V | | | | | | | | | |
| **Element** | OF | | | | | | AVERAGE: | | | 7.69E-09 |
| **Texture** | Silt | | | | | | STANDARD DEVIATION: | | | 5.223E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/se |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 36G | 1 | 406 | 42.516 | 5880 | 0.01746 | 0.00794 | 1.98E-08 | 1.00441 | 1.97E-08 |
| length (m) | 0.056356 | 2 | 248 | 25.970 | 4680 | 0.00794 | 0.00238 | 4.26E-08 | 1.00475 | 4.24E-08 |
| R-o (m) | 0.192088 | 3 | 303 | 31.730 | 11100 | 0.01191 | 0.00159 | 2.19E-08 | 1.00480 | 2.18E-08 |
| dist cent (m) | 0.163909 | 4 | 250 | 26.180 | 7200 | 0.01905 | 0.00159 | 8.06E-08 | 1.00480 | 8.02E-08 |
| meters/rev | 1.029873 | 5 | 318 | 33.301 | 8880 | 0.02461 | 0.00397 | 4.57E-08 | 1.00464 | 4.55E-08 |
| R-b (m) | 0.192088 | 6 | 318 | 33.301 | 13620 | 0.01191 | 0.00238 | 1.49E-08 | 1.00475 | 1.48E-08 |
| R-t (m) | 0.135731 | 7 | 380 | 39.794 | 11880 | 0.01349 | 0.00238 | 1.38E-08 | 1.00475 | 1.38E-08 |
| Direction | H | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 3.40E-08 |
| Texture | Silt | | | | | | STANDARD DEVIATION: | | | 2.23E-08 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 37G | 1 | 406 | 42.516 | 5880 | 0.01746 | 0.01746 | 0.00E+00 | 1.00455 | 0.00E+00 |
| length (m) | 0.04445 | 2 | 248 | 25.970 | 4680 | 0.01746 | 0.01667 | 4.80E-09 | 1.00459 | 4.77E-09 |
| R-o (m) | 0.192088 | 3 | 303 | 31.730 | 11100 | 0.01667 | 0.01508 | 2.75E-09 | 1.00469 | 2.74E-09 |
| dist cent (m) | 0.169863 | 4 | 250 | 26.180 | 7200 | 0.01826 | 0.01746 | 3.04E-09 | 1.00455 | 3.02E-09 |
| meters/rev | 1.067278 | 5 | 318 | 33.301 | 8880 | 0.01746 | 0.01508 | 4.66E-09 | 1.00469 | 4.64E-09 |
| R-b (m) | 0.192088 | 6 | 318 | 33.301 | 13620 | 0.03493 | 0.03334 | 1.66E-09 | 1.00381 | 1.65E-09 |
| R-t (m) | 0.147638 | 7 | 380 | 39.794 | 11880 | 0.03334 | 0.03175 | 1.35E-09 | 1.00387 | 1.35E-09 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 2.60E-09 |
| Texture | Silt | | | | | | STANDARD DEVIATION: | | | 1.62E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 38G | 1 | 406 | 42.516 | 5880 | 0.02223 | 0.01508 | 1.30E-09 | 1.00450 | 1.29E-09 |
| length (m) | 0.047625 | 2 | 248 | 25.970 | 4680 | 0.01508 | 0.01508 | 0.00E+00 | 1.00450 | 0.00E+00 |
| R-o (m) | 0.192088 | 3 | 303 | 31.730 | 11100 | 0.01508 | 0.01429 | 1.44E-10 | 1.00455 | 1.43E-10 |
| dist cent (m) | 0.168275 | 4 | 250 | 26.180 | 7200 | 0.01508 | 0.01429 | 3.25E-10 | 1.00455 | 3.24E-10 |
| meters/rev | 1.057303 | 5 | 318 | 33.301 | 8880 | 0.01429 | 0.01349 | 1.65E-10 | 1.00459 | 1.64E-10 |
| R-b (m) | 0.192088 | 6 | 318 | 33.301 | 13620 | 0.01468 | 0.01429 | 5.33E-11 | 1.00455 | 5.30E-11 |
| R-t (m) | 0.144463 | 7 | 380 | 39.794 | 11880 | 0.01429 | 0.01349 | 8.62E-11 | 1.00459 | 8.58E-11 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 2.94E-10 |
| Texture | Silt | | | | | | STANDARD DEVIATION: | | | 4.17E-10 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/se |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 3J | 1 | 450 | 47.124 | 8100 | 0.05080 | 0.00238 | 4.14E-08 | 1.00729 | 4.11E-08 |
| **length (m)** | 0.03334 | 2 | 400 | 41.888 | 7200 | 0.05080 | 0.01429 | 4.00E-08 | 1.00566 | 3.98E-08 |
| **R-o (m)** | 0.19209 | 3 | 524 | 54.873 | 7560 | 0.05080 | N/A | 3.51E-08 | 1.00776 | 3.49E-08 |
| **dist cent (m)** | 0.17542 | 4 | 542 | 56.758 | 7200 | 0.05080 | N/A | 3.45E-08 | 1.00776 | 3.42E-08 |
| **meters/rev** | 1.10219 | 5 | 560 | 58.643 | 18000 | 0.03969 | N/A | 1.08E-08 | 1.00776 | |
| **R-b (m)** | 0.19209 | 6 | 450 | 47.124 | 7200 | 0.05080 | 0.00476 | 4.32E-08 | 1.00688 | 4.29E-08 |
| **R-t (m)** | 0.15875 | 7 | 470 | 49.218 | 7200 | 0.05080 | 0.00476 | 3.96E-08 | 1.00688 | 3.94E-08 |
| **Direction** | V | | | | | | | | | |
| **Element** | OF | | | | | | AVERAGE: | | | 3.87E-08 |
| **Texture** | Silt | | | | | | STANDARD DEVIATION: | | | 1.39E-08 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 50J | 1 | 450 | 47.124 | 8100 | 0.03016 | 0.00476 | 2.84E-08 | 1.00503 | 2.83E-08 |
| **length (m)** | 0.050006 | 2 | 400 | 41.888 | 7200 | 0.02778 | 0.01429 | 2.05E-08 | 1.00441 | 2.04E-08 |
| **R-o (m)** | 0.192088 | 3 | 524 | 54.873 | 7560 | 0.01429 | 0.00238 | 1.18E-08 | 1.00522 | 1.17E-08 |
| **dist cent (m)** | 0.167084 | 4 | 542 | 56.758 | 7200 | 0.02540 | 0.01111 | 1.22E-08 | 1.00459 | 1.21E-08 |
| **meters/rev** | 1.049822 | 5 | 560 | 58.643 | 18000 | 0.02778 | 0.00159 | 8.82E-09 | 1.00529 | 8.78E-09 |
| **R-b (m)** | 0.192088 | 6 | 450 | 47.124 | 7200 | 0.02223 | 0.00635 | 2.07E-08 | 1.00491 | 2.06E-08 |
| **R-t (m)** | 0.142081 | 7 | 600 | 62.832 | 7200 | 0.02778 | 0.00873 | 1.33E-08 | 1.00475 | 1.32E-08 |
| **Direction** | V | | | | | | | | | |
| **Element** | OF | | | | | | AVERAGE: | | | 1.64E-08 |
| **Texture** | Silt | | | | | | STANDARD DEVIATION: | | | 6.36E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 51J | 1 | 450 | 47.124 | 8100 | 0.03016 | 0.00159 | 3.33E-08 | 1.00509 | 3.31E-08 |
| **length (m)** | 0.052388 | 2 | 400 | 41.888 | 7200 | 0.03016 | 0.01191 | 2.84E-08 | 1.00441 | 2.83E-08 |
| **R-o (m)** | 0.192088 | 3 | 524 | 54.873 | 7560 | 0.03016 | 0.00238 | 2.54E-08 | 1.00503 | 2.53E-08 |
| **dist cent (m)** | 0.165894 | 4 | 542 | 56.758 | 7200 | 0.03096 | 0.00476 | 2.31E-08 | 1.00485 | 2.30E-08 |
| **meters/rev** | 1.042341 | 5 | 560 | 58.643 | 18000 | 0.03096 | N/A | 1.06E-08 | 1.00522 | |
| **R-b (m)** | 0.192088 | 6 | 450 | 47.124 | 7200 | 0.02778 | 0.00873 | 2.41E-08 | 1.00459 | 2.40E-08 |
| **R-t (m)** | 0.1397 | 7 | 600 | 62.832 | 7200 | 0.03016 | 0.00238 | 2.04E-08 | 1.00503 | 2.03E-08 |
| **Direction** | V | | | | | | | | | |
| **Element** | OF | | | | | | AVERAGE: | | | 2.57E-08 |
| **Texture** | Silt | | | | | | STANDARD DEVIATION: | | | 4.11E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 55J | 1 | 450 | 47.124 | 8100 | 0.03572 | 0.00159 | 3.75E-08 | 1.00543 | 3.73E-08 |
| **length (m)** | 0.048419 | 2 | 400 | 41.888 | 7200 | 0.03572 | 0.01032 | 3.74E-08 | 1.00475 | 3.73E-08 |
| **R-o (m)** | 0.192088 | 3 | 524 | 54.873 | 7560 | 0.03413 | 0.00238 | 2.76E-08 | 1.00536 | 2.75E-08 |
| **dist cent (m)** | 0.167878 | 4 | 542 | 56.758 | 7200 | 0.03413 | 0.00159 | 2.79E-08 | 1.00543 | 2.78E-08 |
| **meters/rev** | 1.054809 | 5 | 560 | 58.643 | 18000 | 0.03096 | N/A | 1.02E-08 | 1.00558 | |
| **R-b (m)** | 0.192088 | 6 | 450 | 47.124 | 7200 | 0.03572 | 0.01032 | 2.96E-08 | 1.00475 | 2.94E-08 |
| **R-t (m)** | 0.143669 | 7 | 470 | 49.218 | 7200 | 0.03572 | 0.00635 | 3.22E-08 | 1.00503 | 3.20E-08 |
| **Direction** | V | | | | | | | | | |
| **Element** | OF | | | | | | AVERAGE: | | | 3.19E-08 |
| **Texture** | Silt | | | | | | STANDARD DEVIATION: | | | 4.09E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 58J | 1 | 450 | 47.124 | 8100 | 0.03969 | 0.00159 | 3.68E-08 | 1.00583 | 3.65E-08 |
| **length (m)** | 0.04128 | 2 | 400 | 41.888 | 7200 | 0.03969 | 0.01111 | 3.66E-08 | 1.00497 | 3.65E-08 |
| **R-o (m)** | 0.19209 | 3 | 524 | 54.873 | 7560 | 0.03731 | 0.00159 | 2.76E-08 | 1.00583 | 2.74E-08 |
| **dist cent (m)** | 0.17145 | 4 | 542 | 56.758 | 7200 | 0.03969 | 0.00238 | 2.77E-08 | 1.00574 | 2.76E-08 |
| **meters/rev** | 1.07725 | 5 | 560 | 58.643 | 18000 | 0.03969 | N/A | 1.13E-08 | 1.00601 | |
| **R-b (m)** | 0.19209 | 6 | 450 | 47.124 | 7200 | 0.03969 | 0.01111 | 2.90E-08 | 1.00497 | 2.88E-08 |
| **R-t (m)** | 0.14764 | 7 | 470 | 49.218 | 7200 | 0.03969 | 0.00873 | 2.92E-08 | 1.00515 | 2.91E-08 |
| **Direction** | V | | | | | | | | | |
| **Element** | OF | | | | | | AVERAGE: | | | 3.10E-08 |
| **Texture** | Silt | | | | | | STANDARD DEVIATION: | | | 1.14E-08 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 62G | 1 | 428 | 44.820 | 4500 | 0.03969 | 0.01905 | 2.55E-08 | 1.00641 | 2.53E-08 |
| **length (m)** | 0.022225 | 2 | 400 | 41.888 | 11400 | 0.01905 | 0.01746 | 1.08E-09 | 1.00664 | 1.07E-09 |
| **R-o (m)** | 0.192088 | 3 | 532 | 55.711 | 7800 | 0.01746 | 0.00476 | 8.59E-09 | 1.00941 | 8.51E-09 |
| **dist cent (m)** | 0.180975 | 4 | 278 | 29.112 | 4500 | 0.02223 | 0.00635 | 6.30E-08 | 1.00893 | 6.24E-08 |
| **meters/rev** | 1.137099 | 5 | 285 | 29.845 | 7200 | 0.03493 | 0.01429 | 3.91E-08 | 1.00715 | 3.88E-08 |
| **R-b (m)** | 0.192088 | 6 | 338 | 35.395 | 4680 | 0.01429 | 0.00159 | 3.89E-08 | 1.01057 | 3.85E-08 |
| **R-t (m)** | 0.169863 | | | | | | | | | |
| **Direction** | V | | | | | | AVERAGE: | | | 2.91E-08 |
| **Element** | OF | | | | | | STANDARD DEVIATION: | | | 2.05E-08 |
| **Texture** | Silt | | | | | | | | | |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/se |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 63J | 1 | 383 | 40.108 | 12900 | 0.03572 | 0.01905 | 1.23E-08 | 1.00497 | 1.22E-08 |
| length (m) | 0.036513 | 2 | 246 | 25.761 | 13200 | 0.03572 | 0.01746 | 3.22E-08 | 1.00509 | 3.20E-08 |
| R-o (m) | 0.192088 | 3 | 300 | 31.416 | 11100 | 0.01746 | 0.01191 | 9.26E-09 | 1.00558 | 9.21E-09 |
| dist cent (m) | 0.173831 | 4 | 260 | 27.227 | 8100 | 0.03572 | 0.02381 | 2.93E-08 | 1.00464 | 2.92E-08 |
| meters/rev | 1.092214 | 5 | 300 | 31.416 | 7200 | 0.02381 | 0.01508 | 2.08E-08 | 1.00529 | 2.07E-08 |
| R-b (m) | 0.192088 | 6 | 312 | 32.673 | 7200 | 0.01508 | 0.01032 | 1.17E-08 | 1.00574 | 1.16E-08 |
| R-t (m) | 0.155575 | 7 | 256 | 26.808 | 7200 | 0.01032 | 0.00873 | 6.13E-09 | 1.00592 | 6.09E-09 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 1.73E-08 |
| Texture | Silt | | | | | | STANDARD DEVIATION: | | | 9.40E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/se |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 70G | 1 | 428 | 44.82006 | 4500 | 0.04763 | 0.03334 | 1.71E-08 | 1.00464 | 1.70E-08 |
| length (m) | 0.026988 | 2 | 400 | 41.8879 | 11400 | 0.03334 | 0.03175 | 9.44E-10 | 1.00475 | 9.40E-10 |
| R-o (m) | 0.192088 | 3 | 853 | 89.32595 | 7800 | 0.03175 | 0.03096 | 1.54E-10 | 1.00480 | 1.53E-10 |
| dist cent (m) | 0.178594 | 4 | 278 | 29.11209 | 4500 | 0.03016 | 0.02937 | 2.57E-09 | 1.00491 | 2.56E-09 |
| meters/rev | 1.122138 | 5 | 285 | 29.84513 | 7200 | 0.02937 | 0.02778 | 3.12E-09 | 1.00503 | 3.10E-09 |
| R-b (m) | 0.192088 | 6 | 338 | 35.39528 | 4680 | 0.02778 | 0.02699 | 1.74E-09 | 1.00509 | 1.73E-09 |
| R-t (m) | 0.1651 | | | | | | | | | |
| Direction | V | | | | | | AVERAGE: | | | 4.24E-09 |
| Element | OF | | | | | | STANDARD DEVIATION: | | | 5.78E-09 |
| Texture | Silt | | | | | | | | | |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 71G | 1 | 428 | 44.820 | 4500 | 0.02937 | 0.02778 | 2.40E-09 | 1.00475 | 2.38E-09 |
| length (m) | 0.030956 | 2 | 400 | 41.888 | 11400 | 0.02778 | 0.02738 | 2.74E-10 | 1.00477 | 2.73E-10 |
| R-o (m) | 0.192088 | 3 | 532 | 55.711 | 7800 | 0.02738 | 0.02461 | 1.62E-09 | 1.00497 | 1.62E-09 |
| dist cent (m) | 0.176609 | 4 | 278 | 29.112 | 4500 | 0.03413 | 0.03175 | 8.05E-09 | 1.00450 | 8.01E-09 |
| meters/rev | 1.109669 | 5 | 285 | 29.845 | 7200 | 0.03175 | 0.03016 | 3.27E-09 | 1.00459 | 3.26E-09 |
| R-b (m) | 0.192088 | 6 | 338 | 35.395 | 4680 | 0.03016 | 0.03016 | 0.00E+00 | 1.00459 | 0.00E+00 |
| R-t (m) | 0.161131 | | | | | | | | | |
| Direction | V | | | | | | AVERAGE: | | | 2.59E-09 |
| Element | OF | | | | | | STANDARD DEVIATION: | | | 2.67E-09 |
| Texture | Silt | | | | | | | | | |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 72G | 1 | 428 | 44.820 | 4500 | 0.04683 | 0.02858 | 2.59E-08 | 1.00455 | 2.58E-08 |
| **length (m)** | 0.033338 | 2 | 400 | 41.888 | 11400 | 0.02858 | 0.02699 | 1.14E-09 | 1.00464 | 1.14E-09 |
| **R-o (m)** | 0.192088 | 3 | 532 | 55.711 | 7800 | 0.02699 | 0.00476 | 1.61E-08 | 1.00688 | 1.59E-08 |
| **dist cent (m)** | 0.175419 | 4 | 278 | 29.112 | 4500 | 0.03334 | 0.00635 | 1.16E-07 | 1.00664 | 1.16E-07 |
| **meters/rev** | 1.102189 | 5 | 285 | 29.845 | 7200 | 0.00635 | 0.00397 | 7.93E-09 | 1.00701 | 7.87E-09 |
| **R-b (m)** | 0.192088 | 6 | 338 | 35.395 | 4680 | 0.00397 | 0.00238 | 6.06E-09 | 1.00729 | 6.01E-09 |
| **R-t (m)** | 0.15875 | | | | | | | | | |
| **Direction** | H | | | | | | AVERAGE: | | | 2.87E-08 |
| **Element** | OF | | | | | | STANDARD DEVIATION: | | | 3.96E-08 |
| **Texture** | Silt | | | | | | | | | |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/se |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 73G | 1 | 406 | 42.516 | 5880 | 0.00635 | 0.00159 | 1.08E-08 | 1.00522 | 1.07E-08 |
| **length (m)** | 0.0508 | 2 | 248 | 25.970 | 4680 | 0.03334 | 0.02223 | 6.35E-08 | 1.00399 | 6.33E-08 |
| **R-o (m)** | 0.192088 | 3 | 303 | 31.730 | 11100 | 0.04128 | 0.03969 | 2.30E-09 | 1.00341 | 2.29E-09 |
| **dist cent (m)** | 0.166688 | 4 | 250 | 26.180 | 7200 | 0.04683 | 0.04048 | 2.04E-08 | 1.00339 | 2.03E-08 |
| **meters/rev** | 1.047328 | 5 | 318 | 33.301 | 8880 | 0.04048 | 0.03969 | 1.31E-09 | 1.00341 | 1.30E-09 |
| **R-b (m)** | 0.192088 | 6 | 318 | 33.301 | 13620 | 0.03731 | 0.03413 | 3.53E-09 | 1.00357 | 3.52E-09 |
| **R-t (m)** | 0.141288 | 7 | 380 | 39.794 | 11880 | 0.03413 | 0.03016 | 3.65E-09 | 1.00370 | 3.64E-09 |
| **Direction** | V | | | | | | | | | |
| **Element** | OF | | | | | | AVERAGE: | | | 1.50E-08 |
| **Texture** | Silt | | | | | | STANDARD DEVIATION: | | | 2.07E-08 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/se |
|---|---|---|---|---|---|---|---|---|---|---|
| **sample id** | 74G | 1 | 428 | 44.820 | 4500 | 0.02778 | 0.00159 | 6.15E-08 | 1.00509 | 6.11E-08 |
| **length (m)** | 0.052388 | 2 | 400 | 41.888 | 11400 | 0.02778 | 0.00238 | 2.68E-08 | 1.00503 | 2.67E-08 |
| **R-o (m)** | 0.192088 | 3 | 532 | 55.711 | 7800 | 0.02381 | 0.00397 | 1.75E-08 | 1.00491 | 1.74E-08 |
| **dist cent (m)** | 0.165894 | 4 | 278 | 29.112 | 4500 | 0.01191 | 0.00079 | 6.82E-08 | 1.00515 | 6.78E-08 |
| **meters/rev** | 1.042341 | 5 | 285 | 29.845 | 7200 | 0.03016 | 0.00635 | 7.54E-08 | 1.00475 | 7.50E-08 |
| **R-b (m)** | 0.192088 | 6 | 338 | 35.395 | 4680 | 0.00635 | 0.00476 | 6.39E-09 | 1.00485 | 6.36E-09 |
| **R-t (m)** | 0.1397 | | | | | | | | | |
| **Direction** | V | | | | | | AVERAGE: | | | 4.24E-08 |
| **Element** | OF | | | | | | STANDARD DEVIATION: | | | 2.66E-08 |
| **Texture** | Silt | | | | | | | | | |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 76G | 1 | 428 | 44.820 | 4500 | 0.02699 | 0.02223 | 1.03E-08 | 1.00378 | 1.03E-08 |
| length (m) | 0.056356 | 2 | 400 | 41.888 | 11400 | 0.02223 | 0.01905 | 3.22E-09 | 1.00390 | 3.21E-09 |
| R-o (m) | 0.192088 | 3 | 532 | 55.711 | 7800 | 0.02381 | 0.01429 | 8.12E-09 | 1.00410 | 8.09E-09 |
| dist cent (m) | 0.163909 | 4 | 278 | 29.112 | 4500 | 0.01905 | 0.01508 | 2.19E-08 | 1.00406 | 2.18E-08 |
| meters/rev | 1.029873 | 5 | 285 | 29.845 | 7200 | 0.01508 | 0.01191 | 1.08E-08 | 1.00421 | 1.08E-08 |
| R-b (m) | 0.192088 | 6 | 338 | 35.395 | 4680 | 0.01191 | 0.01111 | 3.03E-09 | 1.00425 | 3.01E-09 |
| R-t (m) | 0.135731 | | | | | | | | | |
| Direction | H | | | | | | AVERAGE: | | | 9.53E-09 |
| Element | OF | | | | | | STANDARD DEVIATION: | | | 6.29E-09 |
| Texture | Silt | | | | | | | | | |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 77G | 1 | 428 | 44.820 | 4500 | 0.03334 | 0.03175 | 2.84E-09 | 1.00384 | 2.83E-09 |
| length (m) | 0.045244 | 2 | 400 | 41.888 | 11400 | 0.03175 | 0.03175 | 0.00E+00 | 1.00384 | 0.00E+00 |
| R-o (m) | 0.192088 | 3 | 532 | 55.711 | 7800 | 0.03175 | 0.01429 | 1.29E-08 | 1.00469 | 1.29E-08 |
| dist cent (m) | 0.169466 | 4 | 278 | 29.112 | 4500 | 0.01905 | 0.01508 | 2.00E-08 | 1.00464 | 1.99E-08 |
| meters/rev | 1.064784 | 5 | 285 | 29.845 | 7200 | 0.02540 | 0.02381 | 4.35E-09 | 1.00417 | 4.33E-09 |
| R-b (m) | 0.192088 | 6 | 338 | 35.395 | 4680 | 0.02699 | 0.02461 | 7.04E-09 | 1.00413 | 7.01E-09 |
| R-t (m) | 0.146844 | | | | | | | | | |
| Direction | V | | | | | | AVERAGE: | | | 7.8271E-09 |
| Element | OF | | | | | | STANDARD DEVIATION: | | | 6.718E-09 |
| Texture | Silt | | | | | | | | | |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 78G | 1 | 428 | 44.820 | 4500 | 0.01508 | 0.00238 | 3.31E-08 | 1.00455 | 3.30E-08 |
| length (m) | 0.059531 | 2 | 400 | 41.888 | 11400 | 0.03334 | 0.00556 | 2.95E-08 | 1.00437 | 2.93E-08 |
| R-o (m) | 0.192088 | 3 | 532 | 55.711 | 7800 | 0.02937 | 0.00238 | 2.45E-08 | 1.00455 | 2.44E-08 |
| dist cent (m) | 0.162322 | 4 | 278 | 29.112 | 4500 | 0.03175 | 0.01349 | 9.82E-08 | 1.00399 | 9.78E-08 |
| meters/rev | 1.019898 | 5 | 285 | 29.845 | 7200 | 0.02699 | 0.01429 | 4.13E-08 | 1.00396 | 4.11E-08 |
| R-b (m) | 0.192088 | 6 | 338 | 35.395 | 4680 | 0.01429 | 0.00476 | 3.79E-08 | 1.00441 | 3.77E-08 |
| R-t (m) | 0.132556 | | | | | | | | | |
| Direction | V | | | | | | AVERAGE: | | | 4.39E-08 |
| Element | OF | | | | | | STANDARD DEVIATION: | | | 2.47E-08 |
| Texture | Silt | | | | | | | | | |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 78J | 1 | 383 | 40.108 | 12900 | 0.03334 | 0.01905 | 1.02E-08 | 1.00522 | 1.01E-08 |
| length (m) | 0.033338 | 2 | 246 | 25.761 | 13200 | 0.02223 | 0.01746 | 8.78E-09 | 1.00536 | 8.73E-09 |
| R-o (m) | 0.192088 | 3 | 300 | 31.416 | 11100 | 0.01746 | 0.01032 | 1.17E-08 | 1.00610 | 1.16E-08 |
| dist cent (m) | 0.175419 | 4 | 260 | 27.227 | 8100 | 0.03175 | 0.02223 | 2.31E-08 | 1.00497 | 2.30E-08 |
| meters/rev | 1.102189 | 5 | 300 | 31.416 | 7200 | 0.02223 | 0.01349 | 2.05E-08 | 1.00574 | 2.04E-08 |
| R-b (m) | 0.192088 | 6 | 312 | 32.673 | 7200 | 0.01349 | 0.00873 | 1.17E-08 | 1.00630 | 1.16E-08 |
| R-t (m) | 0.15875 | 7 | 256 | 26.808 | 7200 | 0.00873 | 0.00635 | 9.31E-09 | 1.00664 | 9.25E-09 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 1.35E-08 |
| Texture | Silt | | | | | | STANDARD DEVIATION: | | | 5.31E-09 |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 79G | 1 | 428 | 44.820 | 4500 | 0.02778 | 0.00794 | 3.45E-08 | 1.00715 | 3.43E-08 |
| length (m) | 0.028575 | 2 | 400 | 41.888 | 11400 | 0.00794 | 0.00238 | 5.73E-09 | 1.00830 | 5.68E-09 |
| R-o (m) | 0.192088 | 3 | 532 | 55.711 | 7800 | 0.02461 | 0.00397 | 1.44E-08 | 1.00793 | 1.43E-08 |
| dist cent (m) | 0.1778 | 4 | 278 | 29.112 | 4500 | 0.01429 | 0.00238 | 5.98E-08 | 1.00830 | 5.93E-08 |
| meters/rev | 1.11715 | 5 | 285 | 29.845 | 7200 | 0.01746 | 0.00635 | 3.05E-08 | 1.00744 | 3.03E-08 |
| R-b (m) | 0.192088 | 6 | 338 | 35.395 | 4680 | 0.00635 | 0.00397 | 8.37E-09 | 1.00793 | 8.30E-09 |
| R-t (m) | 0.163513 | | | | | | | | | |
| Direction | V | | | | | | AVERAGE: | | | 2.54E-08 |
| Element | OF | | | | | | STANDARD DEVIATION: | | | 1.85E-08 |
| Texture | Silt | | | | | | | | | |

| constants | | run # | rpm | omega | t-elapsed (s) | depth i (m) | depth-wa (m) | k-sat (m/sec) | c | K-cor (m/sec |
|---|---|---|---|---|---|---|---|---|---|---|
| sample id | 79J | 1 | 383 | 40.108 | 12900 | 0.03096 | 0.02381 | 6.33E-09 | 1.00387 | 6.31E-09 |
| length (m) | 0.052388 | 2 | 246 | 25.761 | 13200 | 0.03493 | 0.01905 | 3.35E-08 | 1.00406 | 3.34E-08 |
| R-o (m) | 0.192088 | 3 | 300 | 31.416 | 11100 | 0.01905 | 0.01397 | 9.53E-09 | 1.00430 | 9.49E-09 |
| dist cent (m) | 0.165894 | 4 | 260 | 27.227 | 8100 | 0.02937 | 0.02461 | 1.46E-08 | 1.00384 | 1.46E-08 |
| meters/rev | 1.042341 | 5 | 300 | 31.416 | 7200 | 0.02461 | 0.01508 | 2.66E-08 | 1.00425 | 2.65E-08 |
| R-b (m) | 0.192088 | 6 | 312 | 32.673 | 7200 | 0.01508 | 0.01032 | 1.33E-08 | 1.00450 | 1.33E-08 |
| R-t (m) | 0.1397 | 7 | 256 | 26.808 | 7200 | 0.01032 | 0.00635 | 1.74E-08 | 1.00475 | 1.73E-08 |
| Direction | V | | | | | | | | | |
| Element | OF | | | | | | AVERAGE: | | | 1.73E-08 |
| Texture | Silt | | | | | | STANDARD DEVIATION: | | | 8.85E-09 |

# Appendix C

# Calculation Tables for Construction of ANOVA Tables

The data in this appendix was produced from a Microsoft Excel spreadsheet, and was used to calculate the parameters described in Chapter 5 of this document. These parameters were then used to construct the ANOVA tables for the data.

On the furthest left column of the appendix is a reference line number, followed in the second column by the sample identification. All samples are assumed to have been taken vertical to the layering unless the identification is followed by an "h", denoting horizontal sampling. The hydraulic conductivity data in this appendix is laid out by hierarchical level, beginning with the lowest level 0, runs, on the left side of the page. Thus, the data presented in the first column are the hydraulic conductivities calculated for each run on the centrifuge for a given sample according to the calculations presented by Nimmo and Mello (1991) for the falling head centrifuge method. The following columns represent calculations of this data, by hierarchical level, for the hierarchical, unbalanced Analysis of Variance model.

Within each level there are column headings denoted $X_{ik}$ and $N_{ik}$, where $X_{ik}$ denotes the measurement value for level $i$ at data value number $k$, and $N_{ik}$ denotes the number of measurements contained in that $X_{ik}$ value from the previous lower level. Thus, for example, at level 0, each $X_{0k}$ represents one discrete measurement on the centrifuge, and since it is the lowest level on the hierarchy, each corresponding $N_{ik}$ will have a value of 1. The $X_{0k}$ and $N_{0k}$ are added to give the totals, $X_{1k}$ and $N_{1k}$, at the next highest level, tubes. Similarly, the $X_{1k}$ and $N_{1k}$ are added to give the totals $X_{2k}$ and $N_{2k}$. Finally, the $X_{2k}$ and $N_{2k}$ are added to obtain $X_{3k}$ and $N_{3k}$. These main values appear under bold column headings, while subsequent columns for each level have unbolded column headings containing calculations used at the bottom of the spreadsheet, such as the quantities $\Sigma X_{ik}^2/N_{ik}$, $N_{ik}^2$, and $N_{ik} / N_j$.

At the bottom of each level, several parameters are calculated for use in the construction of the ANOVA tables. The values $C_i$ and $S_i$ are the number of classes in level *i,* and the squares of the sums of the data for level *i*, divided by the number of classes for level *i* , respectively. That is, $C_i$ = total number of entries in level *i*, and $S_i = \Sigma X_{ik}^2/N_{ik}$. These values are used to calculate the degrees of freedom (d.o.f.), and the sums of squares (s.o.sqr.), in the analysis of variance. The degrees of freedom is calculated from the equation: degrees of freedom of level $i = C_i - C_{i+1}$. The sum of squares is calculated from the equation: sum of squares of level $i = S_i - S_{i+1}$. The mean squares is equal to the sum of squares divided by the degrees of freedom. These three quantities comprise the first three entries in the ANOVA table. The fourth entry in the table is the expected value. The expected value entry is expressed in terms of the components of variance for the locations ($\sigma_2^2$), tubes ($\sigma_1^2$), and runs ($\sigma_0^2$). To do this, two sets of auxiliary quantities, $\gamma_{ij}$ and $k_{ij}$, are calculated.

For the $\gamma_{ij}$, *i* and *j* take the values 0, 1, 2, and 3 where $i \geq j$. On the diagonal, $\gamma_{ij}$ always equals the total number of observations. In column $\gamma_{i0}$ the values are equal to the total number of observations for each level, or $\gamma_{i0} = C_i$. For the remaining $\gamma_{ij}$ values in the table, the following rule is observed: sum the squares of the $N_{jk}$, each square divided by the next entry $N_{ik}$ at level *i*. That is, $\gamma_{ij} = \Sigma N_{jk}^2/N_{ik}$.

For the $k_{ij}$, *i* and *j* take the values 0, 1, 2, 3 with $i \geq j$ and $k_{ij} = \gamma_{ij} - \gamma_{i+1,j}$. That is, to compute any $k_{ij}$, start with $\gamma_{ij}$ and subtract the number immediately above it.

The quantity $k_{ij}$ is the coefficient of $\sigma_j^2$ in the expected value of the sum of squares at level *i* in the analysis of variance. To find the expected values of the corresponding mean squares, divide by the number of degrees of freedom at level *i*.

The following is a description of all parameters appearing the ANOVA calculation tables.

| | |
|---|---|
| X0 | = hydraulic conductivity measurement for a run on the centrifuge (m/s) |
| N0 | = the number of data summed for each X0 |
| $X0^2$ | = hydraulic conductivity measurement squared $(m/s)^2$ |
| X1 | = sum of hydraulic conductivity measurements on a centrifuge for a particular sample tube (m/s) |
| N1 | = the number of data summed for each X1 |
| $X1^2$ | = sum of hydraulic conductivity measurements on a centrifuge for a particular sample tube squared $(m/s)^2$ |
| $X1^2/N1$ | = sum of hydraulic conductivity measurements on a centrifuge for a particular sample tube squared, divided by the number of data summed for X1 |
| $N1^2$ | = the number of data summed for each X1 squared |
| X2 | = sum of the hydraulic conductivity data for duplicate samples at a given location (m/s) |
| N2 | = the number of data summed for each X2 |
| $N2^2$ | = the number of data summed for each X2 squared |
| $N1^2/N2$ | = the number of data summed for each X1 squared, divided by the number of data items in |

| | |
|---|---|
| $X2^2$ | = sum of hydraulic conductivity measurements on a centrifuge for a particular sampling location squared (m/s)^2 |
| $X2^2/N2$ | = the number of data summed for each X2 squared, divided by |
| X3 | = sum of hydraulic conductivity data for the lithologic group |
| N3 | = the total number of data summed for X3 |

## Appendix C-i

## Calculation Tables for Construction of Clay ANOVA Tables

| Line | Sample | Runs | | | Tubes | | | | | Location | | | | | | Lithology | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | ID | X0 | N0 | X0^2 | X1 | N1 | X1^2 | X1^2/N1 | N1^2 | X2 | N2 | N2^2 | N1^2/N2 | X2^2 | X2^2/N2 | X3 | N3 |
| 1 | | 3.99E-09 | 1 | 1.59E-17 | | | | | | | | | | | | | |
| 2 | | 3.95E-09 | 1 | 1.56E-17 | | | | | | | | | | | | | |
| 3 | | 2.25E-09 | 1 | 5.06E-18 | | | | | | | | | | | | | |
| 4 | | 2.10E-09 | 1 | 4.39E-18 | | | | | | | | | | | | | |
| 5 | | 1.22E-09 | 1 | 1.49E-18 | | | | | | | | | | | | | |
| 6 | | 8.38E-10 | 1 | 7.02E-19 | | | | | | | | | | | | | |
| 7 | | 2.19E-09 | 1 | 4.80E-18 | | | | | | | | | | | | | |
| 8 | | 7.97E-09 | 1 | 6.36E-17 | | | | | | | | | | | | | |
| 9 | | 8.06E-09 | 1 | 6.50E-17 | | | | | | | | | | | | | |
| 10 | | 1.18E-08 | 1 | 1.40E-16 | | | | | | | | | | | | | |
| 11 | | 4.07E-09 | 1 | 1.65E-17 | | | | | | | | | | | | | |
| 12 | | 3.56E-09 | 1 | 1.27E-17 | | | | | | | | | | | | | |
| 13 | | 7.67E-09 | 1 | 5.89E-17 | | | | | | | | | | | | | |
| 14 | | 3.40E-09 | 1 | 1.16E-17 | | | | | | | | | | | | | |
| 15 | 1A | 5.81E-09 | 1 | 3.38E-17 | 6.89E-08 | 15 | 4.75E-15 | 3.17E-16 | 225 | | | | | | | | |
| 16 | | 7.55E-09 | 1 | 5.70E-17 | | | | | | | | | | | | | |
| 17 | | 1.01E-09 | 1 | 1.02E-18 | | | | | | | | | | | | | |
| 18 | | 1.70E-09 | 1 | 2.89E-18 | | | | | | | | | | | | | |
| 19 | | 1.30E-09 | 1 | 1.69E-18 | | | | | | | | | | | | | |
| 20 | | 5.72E-10 | 1 | 3.27E-19 | | | | | | | | | | | | | |
| 21 | | 7.06E-10 | 1 | 4.98E-19 | | | | | | | | | | | | | |
| 22 | | 1.37E-09 | 1 | 1.88E-18 | | | | | | | | | | | | | |
| 23 | | 1.97E-09 | 1 | 3.88E-18 | | | | | | | | | | | | | |
| 24 | | 2.53E-09 | 1 | 6.40E-18 | | | | | | | | | | | | | |
| 25 | | 3.31E-09 | 1 | 1.10E-17 | | | | | | | | | | | | | |
| 26 | | 8.92E-09 | 1 | 7.96E-17 | | | | | | | | | | | | | |
| 27 | | 1.26E-09 | 1 | 1.59E-18 | | | | | | | | | | | | | |
| 28 | | 7.52E-10 | 1 | 5.66E-19 | | | | | | | | | | | | | |
| 29 | 2A | 4.90E-09 | 1 | 2.40E-17 | 3.79E-08 | 15 | 1.43E-15 | 9.55E-17 | 225 | | | | | | | | |
| 30 | | 3.89E-09 | 1 | 1.51E-17 | | | | | | | | | | | | | |
| 31 | | 2.05E-09 | 1 | 4.20E-18 | | | | | | | | | | | | | |
| 32 | | 1.73E-09 | 1 | 2.99E-18 | | | | | | | | | | | | | |
| 33 | | 1.35E-09 | 1 | 1.82E-18 | | | | | | | | | | | | | |
| 34 | | 5.94E-10 | 1 | 3.53E-19 | | | | | | | | | | | | | |
| 35 | | 8.14E-10 | 1 | 6.63E-19 | | | | | | | | | | | | | |
| 36 | | 1.42E-09 | 1 | 2.02E-18 | | | | | | | | | | | | | |
| 37 | | 1.63E-09 | 1 | 2.66E-18 | | | | | | | | | | | | | |
| 38 | | 2.15E-09 | 1 | 4.62E-18 | | | | | | | | | | | | | |
| 39 | | 3.88E-09 | 1 | 1.51E-17 | | | | | | | | | | | | | |
| 40 | | 9.18E-09 | 1 | 8.43E-17 | | | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 41 | | 2.62E-09 | 1 | 6.86E-18 | | | | | | | | | | | | | |
| 42 | | 7.73E-10 | 1 | 5.98E-19 | | | | | | | | | | | | | |
| 43 | 3A | 5.02E-09 | 1 | 2.52E-17 | 3.71E-08 | 15 | 1.38E-15 | 9.18E-17 | 225 | | | | | | | | |
| 44 | | 7.56E-09 | 1 | 5.72E-17 | | | | | | | | | | | | | |
| 45 | | 1.01E-09 | 1 | 1.02E-18 | | | | | | | | | | | | | |
| 46 | | 2.56E-09 | 1 | 6.55E-18 | | | | | | | | | | | | | |
| 47 | | 2.70E-09 | 1 | 7.29E-18 | | | | | | | | | | | | | |
| 48 | | 2.31E-09 | 1 | 5.34E-18 | | | | | | | | | | | | | |
| 49 | | 2.80E-09 | 1 | 7.84E-18 | | | | | | | | | | | | | |
| 50 | | 1.17E-09 | 1 | 1.37E-18 | | | | | | | | | | | | | |
| 51 | | 1.40E-09 | 1 | 1.96E-18 | | | | | | | | | | | | | |
| 52 | | 2.98E-09 | 1 | 8.88E-18 | | | | | | | | | | | | | |
| 53 | | 2.55E-09 | 1 | 6.50E-18 | | | | | | | | | | | | | |
| 54 | | 3.52E-09 | 1 | 1.24E-17 | | | | | | | | | | | | | |
| 55 | | 1.83E-09 | 1 | 3.35E-18 | | | | | | | | | | | | | |
| 56 | | 1.29E-09 | 1 | 1.66E-18 | | | | | | | | | | | | | |
| 57 | | 4.18E-09 | 1 | 1.75E-17 | | | | | | | | | | | | | |
| 58 | | 2.56E-09 | 1 | 6.55E-18 | | | | | | | | | | | | | |
| 59 | | 4.34E-09 | 1 | 1.88E-17 | | | | | | | | | | | | | |
| 60 | 4Ah | 3.09E-09 | 1 | 9.55E-18 | 4.78E-08 | 17 | 2.29E-15 | 1.35E-16 | 289 | 1.92E-07 | 62 | 3844 | 15.55 | 3.68E-14 | 5.93E-16 | | |
| 61 | | 7.58E-09 | 1 | 5.75E-17 | | | | | | | | | | | | | |
| 62 | | 1.51E-09 | 1 | 2.28E-18 | | | | | | | | | | | | | |
| 63 | | 3.18E-09 | 1 | 1.01E-17 | | | | | | | | | | | | | |
| 64 | | 1.91E-09 | 1 | 3.65E-18 | | | | | | | | | | | | | |
| 65 | | 2.32E-09 | 1 | 5.38E-18 | | | | | | | | | | | | | |
| 66 | | 1.20E-09 | 1 | 1.44E-18 | | | | | | | | | | | | | |
| 67 | | 2.02E-10 | 1 | 4.08E-20 | | | | | | | | | | | | | |
| 68 | | 2.96E-09 | 1 | 8.76E-18 | | | | | | | | | | | | | |
| 69 | | 4.11E-09 | 1 | 1.69E-17 | | | | | | | | | | | | | |
| 70 | | 1.80E-09 | 1 | 3.24E-18 | | | | | | | | | | | | | |
| 71 | | 1.23E-09 | 1 | 1.51E-18 | | | | | | | | | | | | | |
| 72 | | 1.33E-09 | 1 | 1.77E-18 | | | | | | | | | | | | | |
| 73 | | 2.10E-09 | 1 | 4.41E-18 | | | | | | | | | | | | | |
| 74 | | 5.13E-09 | 1 | 2.63E-17 | | | | | | | | | | | | | |
| 75 | | 2.92E-09 | 1 | 8.53E-18 | | | | | | | | | | | | | |
| 76 | 5A | 3.09E-09 | 1 | 9.55E-18 | 4.26E-08 | 16 | 1.81E-15 | 1.13E-16 | 256 | | | | | | | | |
| 77 | | 1.88E-09 | 1 | 3.53E-18 | | | | | | | | | | | | | |
| 78 | | 2.47E-09 | 1 | 6.11E-18 | | | | | | | | | | | | | |
| 79 | | 2.27E-09 | 1 | 5.16E-18 | | | | | | | | | | | | | |
| 80 | | 1.34E-09 | 1 | 1.80E-18 | | | | | | | | | | | | | |
| 81 | | 1.95E-10 | 1 | 3.80E-20 | | | | | | | | | | | | | |
| 82 | | 1.20E-09 | 1 | 1.44E-18 | | | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 83 | | 1.16E-09 | 1 | 1.36E-18 | | | | | | | | | | | | | |
| 84 | | 1.18E-09 | 1 | 1.40E-18 | | | | | | | | | | | | | |
| 85 | | 1.44E-09 | 1 | 2.08E-18 | | | | | | | | | | | | | |
| 86 | | 1.68E-09 | 1 | 2.83E-18 | | | | | | | | | | | | | |
| 87 | | 0.00E+00 | 1 | 0.00E+00 | | | | | | | | | | | | | |
| 88 | | 1.15E-09 | 1 | 1.32E-18 | | | | | | | | | | | | | |
| 89 | | 1.10E-09 | 1 | 1.21E-18 | | | | | | | | | | | | | |
| 90 | | 3.11E-10 | 1 | 9.70E-20 | | | | | | | | | | | | | |
| 91 | | 2.63E-09 | 1 | 6.92E-18 | | | | | | | | | | | | | |
| 92 | | 1.19E-09 | 1 | 1.41E-18 | | | | | | | | | | | | | |
| 93 | | 2.65E-09 | 1 | 7.02E-18 | | | | | | | | | | | | | |
| 94 | 7A | 1.40E-09 | 1 | 1.95E-18 | 2.53E-08 | 18 | 6.38E-16 | 3.54E-17 | 324 | | | | | | | | |
| 95 | | 2.62E-09 | 1 | 6.86E-18 | | | | | | | | | | | | | |
| 96 | | 1.82E-09 | 1 | 3.31E-18 | | | | | | | | | | | | | |
| 97 | | 1.81E-09 | 1 | 3.28E-18 | | | | | | | | | | | | | |
| 98 | | 1.19E-09 | 1 | 1.42E-18 | | | | | | | | | | | | | |
| 99 | | 5.21E-10 | 1 | 2.71E-19 | | | | | | | | | | | | | |
| 100 | | 7.13E-10 | 1 | 5.08E-19 | | | | | | | | | | | | | |
| 101 | | 1.02E-09 | 1 | 1.04E-18 | | | | | | | | | | | | | |
| 102 | | 1.05E-09 | 1 | 1.10E-18 | | | | | | | | | | | | | |
| 103 | | 1.46E-09 | 1 | 2.13E-18 | | | | | | | | | | | | | |
| 104 | | 1.28E-09 | 1 | 1.63E-18 | | | | | | | | | | | | | |
| 105 | | 7.38E-10 | 1 | 5.45E-19 | | | | | | | | | | | | | |
| 106 | | 1.26E-09 | 1 | 1.59E-18 | | | | | | | | | | | | | |
| 107 | | 9.71E-10 | 1 | 9.43E-19 | | | | | | | | | | | | | |
| 108 | | 1.77E-09 | 1 | 3.13E-18 | | | | | | | | | | | | | |
| 109 | | 2.12E-09 | 1 | 4.49E-18 | | | | | | | | | | | | | |
| 110 | | 2.14E-09 | 1 | 4.57E-18 | | | | | | | | | | | | | |
| 111 | | 1.19E-09 | 1 | 1.42E-18 | | | | | | | | | | | | | |
| 112 | 8A | 6.17E-10 | 1 | 3.81E-19 | 2.17E-08 | 17 | 4.70E-16 | 2.76E-17 | 289 | 4.69E-08 | 35 | 1225 | 17.51 | 2.20E-15 | 6.29E-17 | | |
| 113 | | 1.75E-09 | 1 | 3.06E-18 | | | | | | | | | | | | | |
| 114 | | 1.22E-09 | 1 | 1.49E-18 | | | | | | | | | | | | | |
| 115 | | 1.39E-09 | 1 | 1.94E-18 | | | | | | | | | | | | | |
| 116 | | 3.97E-10 | 1 | 1.58E-19 | | | | | | | | | | | | | |
| 117 | | 8.25E-10 | 1 | 6.81E-19 | | | | | | | | | | | | | |
| 118 | | 4.93E-10 | 1 | 2.43E-19 | | | | | | | | | | | | | |
| 119 | | 5.64E-10 | 1 | 3.18E-19 | | | | | | | | | | | | | |
| 120 | | 1.19E-09 | 1 | 1.42E-18 | | | | | | | | | | | | | |
| 121 | | 1.92E-09 | 1 | 3.69E-18 | | | | | | | | | | | | | |
| 122 | | 1.15E-09 | 1 | 1.33E-18 | | | | | | | | | | | | | |
| 123 | | 0.00E+00 | 1 | 0.00E+00 | | | | | | | | | | | | | |
| 124 | | 2.29E-09 | 1 | 5.24E-18 | | | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 125 | | 9.15E-10 | 1 | 8.37E-19 | | | | | | | | | | | | | |
| 126 | | 8.54E-10 | 1 | 7.29E-19 | | | | | | | | | | | | | |
| 127 | | 1.36E-09 | 1 | 1.85E-18 | | | | | | | | | | | | | |
| 128 | | 3.32E-09 | 1 | 1.10E-17 | | | | | | | | | | | | | |
| 129 | | 1.89E-09 | 1 | 3.57E-18 | | | | | | | | | | | | | |
| 130 | 9A | 9.96E-10 | 1 | 9.92E-19 | 2.25E-08 | 18 | 5.08E-16 | 2.82E-17 | 324 | | | | | | | | |
| 131 | | 6.50E-10 | 1 | 4.23E-19 | | | | | | | | | | | | | |
| 132 | | 1.35E-09 | 1 | 1.82E-18 | | | | | | | | | | | | | |
| 133 | | 1.53E-09 | 1 | 2.34E-18 | | | | | | | | | | | | | |
| 134 | | 8.77E-10 | 1 | 7.69E-19 | | | | | | | | | | | | | |
| 135 | | 5.15E-10 | 1 | 2.65E-19 | | | | | | | | | | | | | |
| 136 | | 2.65E-10 | 1 | 7.02E-20 | | | | | | | | | | | | | |
| 137 | | 9.05E-10 | 1 | 8.19E-19 | | | | | | | | | | | | | |
| 138 | | 6.31E-10 | 1 | 3.98E-19 | | | | | | | | | | | | | |
| 139 | | 1.32E-09 | 1 | 1.74E-18 | | | | | | | | | | | | | |
| 140 | | 7.66E-10 | 1 | 5.87E-19 | | | | | | | | | | | | | |
| 141 | | 6.70E-10 | 1 | 4.49E-19 | | | | | | | | | | | | | |
| 142 | | 6.85E-10 | 1 | 4.69E-19 | | | | | | | | | | | | | |
| 143 | | 8.78E-10 | 1 | 7.71E-19 | | | | | | | | | | | | | |
| 144 | | 5.48E-10 | 1 | 3.00E-19 | | | | | | | | | | | | | |
| 145 | | 8.04E-10 | 1 | 6.46E-19 | | | | | | | | | | | | | |
| 146 | | 1.02E-09 | 1 | 1.04E-18 | | | | | | | | | | | | | |
| 147 | | 2.52E-09 | 1 | 6.35E-18 | | | | | | | | | | | | | |
| 148 | 10A | 9.65E-10 | 1 | 9.31E-19 | 1.69E-08 | 18 | 2.86E-16 | 1.59E-17 | 324 | | | | | | | | |
| 149 | | 9.69E-10 | 1 | 9.39E-19 | | | | | | | | | | | | | |
| 150 | | 7.54E-10 | 1 | 5.69E-19 | | | | | | | | | | | | | |
| 151 | | 1.06E-09 | 1 | 1.12E-18 | | | | | | | | | | | | | |
| 152 | | 4.91E-10 | 1 | 2.41E-19 | | | | | | | | | | | | | |
| 153 | | 1.20E-09 | 1 | 1.44E-18 | | | | | | | | | | | | | |
| 154 | | 8.69E-10 | 1 | 7.55E-19 | | | | | | | | | | | | | |
| 155 | | 6.34E-10 | 1 | 4.02E-19 | | | | | | | | | | | | | |
| 156 | | 7.53E-10 | 1 | 5.67E-19 | | | | | | | | | | | | | |
| 157 | | 9.03E-09 | 1 | 8.15E-17 | | | | | | | | | | | | | |
| 158 | | 1.33E-09 | 1 | 1.77E-18 | | | | | | | | | | | | | |
| 159 | | 3.79E-09 | 1 | 1.44E-17 | | | | | | | | | | | | | |
| 160 | | 1.64E-10 | 1 | 2.69E-20 | | | | | | | | | | | | | |
| 161 | | 6.26E-10 | 1 | 3.92E-19 | | | | | | | | | | | | | |
| 162 | | 7.62E-10 | 1 | 5.81E-19 | | | | | | | | | | | | | |
| 163 | | 1.22E-09 | 1 | 1.49E-18 | | | | | | | | | | | | | |
| 164 | | 7.31E-10 | 1 | 5.34E-19 | | | | | | | | | | | | | |
| 165 | | 1.64E-09 | 1 | 2.69E-18 | | | | | | | | | | | | | |
| 166 | 11A | 8.64E-10 | 1 | 7.46E-19 | 2.69E-08 | 18 | 7.23E-16 | 4.02E-17 | 324 | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 167 | | 1.30E-09 | 1 | 1.69E-18 | | | | | | | | | | | | | |
| 168 | | 2.73E-09 | 1 | 7.45E-18 | | | | | | | | | | | | | |
| 169 | | 5.76E-10 | 1 | 3.32E-19 | | | | | | | | | | | | | |
| 170 | | 5.01E-10 | 1 | 2.51E-19 | | | | | | | | | | | | | |
| 171 | | 2.10E-09 | 1 | 4.41E-18 | | | | | | | | | | | | | |
| 172 | | 6.12E-10 | 1 | 3.75E-19 | | | | | | | | | | | | | |
| 173 | | 4.00E-09 | 1 | 1.60E-17 | | | | | | | | | | | | | |
| 174 | | 1.75E-09 | 1 | 3.06E-18 | | | | | | | | | | | | | |
| 175 | | 2.48E-09 | 1 | 6.15E-18 | | | | | | | | | | | | | |
| 176 | | 2.86E-09 | 1 | 8.18E-18 | | | | | | | | | | | | | |
| 177 | | 1.99E-09 | 1 | 3.96E-18 | | | | | | | | | | | | | |
| 178 | | 9.67E-10 | 1 | 9.35E-19 | | | | | | | | | | | | | |
| 179 | | 1.16E-09 | 1 | 1.35E-18 | | | | | | | | | | | | | |
| 180 | | 1.85E-09 | 1 | 3.42E-18 | | | | | | | | | | | | | |
| 181 | | 1.11E-09 | 1 | 1.24E-18 | | | | | | | | | | | | | |
| 182 | | 1.23E-09 | 1 | 1.51E-18 | | | | | | | | | | | | | |
| 183 | 12Ah | 2.58E-09 | 1 | 6.66E-18 | 2.98E-08 | 18 | 8.88E-16 | 4.93E-17 | 324 | 9.61E-08 | 72 | 5184 | 18.00 | 9.24E-15 | 1.28E-16 | | |
| 184 | | 0.00E+00 | 1 | 0.00E+00 | | | | | | | | | | | | | |
| 185 | | 2.29E-09 | 1 | 5.24E-18 | | | | | | | | | | | | | |
| 186 | | 8.56E-10 | 1 | 7.33E-19 | | | | | | | | | | | | | |
| 187 | | 1.47E-09 | 1 | 2.16E-18 | | | | | | | | | | | | | |
| 188 | | 2.86E-10 | 1 | 8.18E-20 | | | | | | | | | | | | | |
| 189 | | 1.78E-09 | 1 | 3.17E-18 | | | | | | | | | | | | | |
| 190 | | 8.68E-10 | 1 | 7.53E-19 | | | | | | | | | | | | | |
| 191 | | 5.56E-10 | 1 | 3.09E-19 | | | | | | | | | | | | | |
| 192 | | 1.44E-09 | 1 | 2.07E-18 | | | | | | | | | | | | | |
| 193 | | 1.34E-09 | 1 | 1.80E-18 | | | | | | | | | | | | | |
| 194 | | 1.15E-09 | 1 | 1.32E-18 | | | | | | | | | | | | | |
| 195 | | 1.38E-09 | 1 | 1.90E-18 | | | | | | | | | | | | | |
| 196 | | 6.29E-10 | 1 | 3.96E-19 | | | | | | | | | | | | | |
| 197 | | 4.62E-10 | 1 | 2.13E-19 | | | | | | | | | | | | | |
| 198 | | 1.46E-09 | 1 | 2.13E-18 | | | | | | | | | | | | | |
| 199 | | 2.63E-09 | 1 | 6.92E-18 | | | | | | | | | | | | | |
| 200 | | 1.97E-09 | 1 | 3.88E-18 | | | | | | | | | | | | | |
| 201 | 13A | 1.03E-09 | 1 | 1.06E-18 | 2.16E-08 | 18 | 4.66E-16 | 2.59E-17 | 324 | | | | | | | | |
| 202 | | 2.38E-09 | 1 | 5.66E-18 | | | | | | | | | | | | | |
| 203 | | 2.08E-09 | 1 | 4.33E-18 | | | | | | | | | | | | | |
| 204 | | 1.65E-09 | 1 | 2.72E-18 | | | | | | | | | | | | | |
| 205 | | 4.71E-09 | 1 | 2.22E-17 | | | | | | | | | | | | | |
| 206 | | 4.73E-10 | 1 | 2.24E-19 | | | | | | | | | | | | | |
| 207 | | 9.73E-10 | 1 | 9.47E-19 | | | | | | | | | | | | | |
| 208 | | 9.34E-10 | 1 | 8.72E-19 | | | | | | | | | | | | | |

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| 209 | | 1.20E-09 | 1 | 1.44E-18 | | | | | | | | | | | | | |
| 210 | | 1.57E-09 | 1 | 2.48E-18 | | | | | | | | | | | | | |
| 211 | | 1.83E-09 | 1 | 3.35E-18 | | | | | | | | | | | | | |
| 212 | | 1.26E-09 | 1 | 1.60E-18 | | | | | | | | | | | | | |
| 213 | | 1.29E-09 | 1 | 1.66E-18 | | | | | | | | | | | | | |
| 214 | | 1.11E-09 | 1 | 1.24E-18 | | | | | | | | | | | | | |
| 215 | | 1.53E-09 | 1 | 2.34E-18 | | | | | | | | | | | | | |
| 216 | | 1.63E-09 | 1 | 2.66E-18 | | | | | | | | | | | | | |
| 217 | | 0.00E+00 | 1 | 0.00E+00 | | | | | | | | | | | | | |
| 218 | | 4.31E-09 | 1 | 1.86E-17 | | | | | | | | | | | | | |
| 219 | 14A | 3.46E-09 | 1 | 1.20E-17 | 3.24E-08 | 18 | 1.05E-15 | 5.83E-17 | 324 | | | | | | | | |
| 220 | | 3.54E-09 | 1 | 1.25E-17 | | | | | | | | | | | | | |
| 221 | | 9.23E-10 | 1 | 8.52E-19 | | | | | | | | | | | | | |
| 222 | | 1.81E-09 | 1 | 3.28E-18 | | | | | | | | | | | | | |
| 223 | | 1.20E-09 | 1 | 1.44E-18 | | | | | | | | | | | | | |
| 224 | | 7.09E-10 | 1 | 5.03E-19 | | | | | | | | | | | | | |
| 225 | | 7.31E-10 | 1 | 5.34E-19 | | | | | | | | | | | | | |
| 226 | | 1.05E-09 | 1 | 1.10E-18 | | | | | | | | | | | | | |
| 227 | | 1.45E-09 | 1 | 2.10E-18 | | | | | | | | | | | | | |
| 228 | | 7.55E-10 | 1 | 5.70E-19 | | | | | | | | | | | | | |
| 229 | | 2.19E-09 | 1 | 4.80E-18 | | | | | | | | | | | | | |
| 230 | | 3.09E-09 | 1 | 9.55E-18 | | | | | | | | | | | | | |
| 231 | | 5.29E-10 | 1 | 2.80E-19 | | | | | | | | | | | | | |
| 232 | | 1.01E-09 | 1 | 1.02E-18 | | | | | | | | | | | | | |
| 233 | | 6.16E-10 | 1 | 3.79E-19 | | | | | | | | | | | | | |
| 234 | | 2.28E-09 | 1 | 5.20E-18 | | | | | | | | | | | | | |
| 235 | | 1.77E-09 | 1 | 3.13E-18 | | | | | | | | | | | | | |
| 236 | | 1.31E-09 | 1 | 1.72E-18 | | | | | | | | | | | | | |
| 237 | 15A | 6.84E-10 | 1 | 4.68E-19 | 2.56E-08 | 18 | 6.58E-16 | 3.65E-17 | 324 | | | | | | | | |
| 238 | | 3.89E-09 | 1 | 1.51E-17 | | | | | | | | | | | | | |
| 239 | | 2.47E-09 | 1 | 6.10E-18 | | | | | | | | | | | | | |
| 240 | | 1.64E-09 | 1 | 2.69E-18 | | | | | | | | | | | | | |
| 241 | | 5.36E-10 | 1 | 2.87E-19 | | | | | | | | | | | | | |
| 242 | | 4.68E-10 | 1 | 2.19E-19 | | | | | | | | | | | | | |
| 243 | | 9.63E-10 | 1 | 9.27E-19 | | | | | | | | | | | | | |
| 244 | | 1.31E-09 | 1 | 1.72E-18 | | | | | | | | | | | | | |
| 245 | | 1.29E-09 | 1 | 1.66E-18 | | | | | | | | | | | | | |
| 246 | | 1.70E-09 | 1 | 2.89E-18 | | | | | | | | | | | | | |
| 247 | | 1.59E-09 | 1 | 2.53E-18 | | | | | | | | | | | | | |
| 248 | | 6.81E-10 | 1 | 4.64E-19 | | | | | | | | | | | | | |
| 249 | | 2.12E-09 | 1 | 4.49E-18 | | | | | | | | | | | | | |
| 250 | | 1.54E-09 | 1 | 2.37E-18 | | | | | | | | | | | | | |

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| 251 | | 1.10E-09 | 1 | 1.21E-18 | | | | | | | | | | | | | |
| 252 | | 2.07E-09 | 1 | 4.28E-18 | | | | | | | | | | | | | |
| 253 | | 1.60E-09 | 1 | 2.56E-18 | | | | | | | | | | | | | |
| 254 | | 2.39E-09 | 1 | 5.71E-18 | | | | | | | | | | | | | |
| 255 | 16A | 1.26E-09 | 1 | 1.59E-18 | 2.86E-08 | 18 | 8.19E-16 | 4.55E-17 | 324 | 1.08E-07 | 72 | 5184 | 18.00 | | 1.63E-16 | | |
| 256 | | 1.07E-09 | 1 | 1.14E-18 | | | | | | | | | | | | | |
| 257 | | 1.53E-09 | 1 | 2.34E-18 | | | | | | | | | | | | | |
| 258 | | 2.23E-09 | 1 | 4.97E-18 | | | | | | | | | | | | | |
| 259 | | 9.53E-10 | 1 | 9.08E-19 | | | | | | | | | | | | | |
| 260 | | 4.36E-10 | 1 | 1.90E-19 | | | | | | | | | | | | | |
| 261 | | 6.59E-10 | 1 | 4.34E-19 | | | | | | | | | | | | | |
| 262 | 1B | 3.52E-09 | 1 | 1.24E-17 | 1.04E-08 | 7 | 1.08E-16 | 1.54E-17 | 49 | | | | | | | | |
| 263 | | 1.28E-09 | 1 | 1.65E-18 | | | | | | | | | | | | | |
| 264 | | 4.00E-10 | 1 | 1.60E-19 | | | | | | | | | | | | | |
| 265 | | 9.73E-09 | 1 | 9.47E-17 | | | | | | | | | | | | | |
| 266 | | 2.94E-10 | 1 | 8.64E-20 | | | | | | | | | | | | | |
| 267 | | 6.06E-10 | 1 | 3.67E-19 | | | | | | | | | | | | | |
| 268 | | 4.31E-10 | 1 | 1.86E-19 | | | | | | | | | | | | | |
| 269 | 2B | 3.46E-09 | 1 | 1.20E-17 | 1.62E-08 | 7 | 2.63E-16 | 3.75E-17 | 49 | | | | | | | | |
| 270 | | 5.79E-09 | 1 | 3.35E-17 | | | | | | | | | | | | | |
| 271 | | 2.20E-09 | 1 | 4.84E-18 | | | | | | | | | | | | | |
| 272 | | 6.39E-09 | 1 | 4.08E-17 | | | | | | | | | | | | | |
| 273 | | 1.33E-09 | 1 | 1.77E-18 | | | | | | | | | | | | | |
| 274 | | 1.26E-09 | 1 | 1.59E-18 | | | | | | | | | | | | | |
| 275 | 3B | 3.94E-09 | 1 | 1.55E-17 | 2.09E-08 | 6 | 4.37E-16 | 7.29E-17 | 36 | | | | | | | | |
| 276 | | 1.06E-09 | 1 | 1.12E-18 | | | | | | | | | | | | | |
| 277 | | 3.34E-10 | 1 | 1.12E-19 | | | | | | | | | | | | | |
| 278 | | 8.27E-09 | 1 | 6.84E-17 | | | | | | | | | | | | | |
| 279 | | 2.48E-10 | 1 | 6.15E-20 | | | | | | | | | | | | | |
| 280 | | 5.24E-10 | 1 | 2.75E-19 | | | | | | | | | | | | | |
| 281 | | 3.76E-10 | 1 | 1.41E-19 | | | | | | | | | | | | | |
| 282 | 4Bh | 3.05E-09 | 1 | 9.30E-18 | 1.39E-08 | 7 | 1.92E-16 | 2.75E-17 | 49 | 6.14E-08 | 27 | 729 | 6.78 | 3.77E-15 | 1.40E-16 | | |
| 283 | | 2.81E-09 | 1 | 7.90E-18 | | | | | | | | | | | | | |
| 284 | | 3.71E-09 | 1 | 1.38E-17 | | | | | | | | | | | | | |
| 285 | | 1.76E-09 | 1 | 3.10E-18 | | | | | | | | | | | | | |
| 286 | | 1.48E-09 | 1 | 2.19E-18 | | | | | | | | | | | | | |
| 287 | | 9.24E-10 | 1 | 8.54E-19 | | | | | | | | | | | | | |
| 288 | | 6.52E-10 | 1 | 4.25E-19 | | | | | | | | | | | | | |
| 289 | 5B | 2.54E-09 | 1 | 6.45E-18 | 1.39E-08 | 7 | 1.93E-16 | 2.75E-17 | 49 | | | | | | | | |
| 290 | | 4.91E-09 | 1 | 2.41E-17 | | | | | | | | | | | | | |
| 291 | | 2.00E-08 | 1 | 4.00E-16 | | | | | | | | | | | | | |
| 292 | 6B | 8.75E-09 | 1 | 7.66E-17 | 3.37E-08 | 6 | 1.13E-15 | 1.89E-16 | 36 | | | | | | | | |

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| 293 | | 8.58E-10 | 1 | 7.36E-19 | | | | | | | | | | | | | |
| 294 | | 3.33E-09 | 1 | 1.11E-17 | | | | | | | | | | | | | |
| 295 | | 3.43E-09 | 1 | 1.18E-17 | | | | | | | | | | | | | |
| 296 | | 6.70E-10 | 1 | 4.49E-19 | | | | | | | | | | | | | |
| 297 | | 3.13E-10 | 1 | 9.80E-20 | | | | | | | | | | | | | |
| 298 | | 9.41E-10 | 1 | 8.85E-19 | | | | | | | | | | | | | |
| 299 | 7B | 6.52E-09 | 1 | 4.25E-17 | 1.61E-08 | 7 | 2.58E-16 | 3.69E-17 | 49 | | | | | | | | |
| 300 | | 1.23E-09 | 1 | 1.52E-18 | | | | | | | | | | | | | |
| 301 | | 2.30E-09 | 1 | 5.29E-18 | | | | | | | | | | | | | |
| 302 | | 1.80E-09 | 1 | 3.24E-18 | | | | | | | | | | | | | |
| 303 | | 5.42E-10 | 1 | 2.94E-19 | | | | | | | | | | | | | |
| 304 | 8Bh | 3.85E-09 | 1 | 1.48E-17 | 9.73E-09 | 5 | 9.46E-17 | 1.89E-17 | 25 | 7.33E-08 | 25 | 625 | 6.36 | 5.38E-15 | 2.15E-16 | | |
| 305 | | 1.44E-09 | 1 | 2.07E-18 | | | | | | | | | | | | | |
| 306 | | 2.75E-09 | 1 | 7.56E-18 | | | | | | | | | | | | | |
| 307 | | 3.06E-09 | 1 | 9.36E-18 | | | | | | | | | | | | | |
| 308 | | 5.31E-10 | 1 | 2.82E-19 | | | | | | | | | | | | | |
| 309 | | 7.95E-10 | 1 | 6.32E-19 | | | | | | | | | | | | | |
| 310 | 9B | 3.51E-09 | 1 | 1.23E-17 | 1.21E-08 | 6 | 1.46E-16 | 2.43E-17 | 36 | | | | | | | | |
| 311 | | 1.05E-09 | 1 | 1.10E-18 | | | | | | | | | | | | | |
| 312 | | 2.52E-09 | 1 | 6.35E-18 | | | | | | | | | | | | | |
| 313 | | 1.79E-09 | 1 | 3.20E-18 | | | | | | | | | | | | | |
| 314 | | 5.85E-10 | 1 | 3.42E-19 | | | | | | | | | | | | | |
| 315 | | 2.84E-10 | 1 | 8.07E-20 | | | | | | | | | | | | | |
| 316 | | 1.20E-09 | 1 | 1.44E-18 | | | | | | | | | | | | | |
| 317 | 10B | 3.54E-09 | 1 | 1.25E-17 | 1.10E-08 | 7 | 1.20E-16 | 1.72E-17 | 49 | | | | | | | | |
| 318 | | 5.77E-09 | 1 | 3.33E-17 | | | | | | | | | | | | | |
| 319 | | 3.60E-10 | 1 | 1.30E-19 | | | | | | | | | | | | | |
| 320 | | 2.53E-09 | 1 | 6.40E-18 | | | | | | | | | | | | | |
| 321 | | 4.90E-10 | 1 | 2.40E-19 | | | | | | | | | | | | | |
| 322 | | 6.12E-10 | 1 | 3.75E-19 | | | | | | | | | | | | | |
| 323 | | 7.47E-10 | 1 | 5.58E-19 | | | | | | | | | | | | | |
| 324 | 11B | 5.08E-09 | 1 | 2.58E-17 | 1.56E-08 | 7 | 2.43E-16 | 3.47E-17 | 49 | | | | | | | | |
| 325 | | 3.17E-09 | 1 | 1.00E-17 | | | | | | | | | | | | | |
| 326 | | 1.51E-09 | 1 | 2.28E-18 | | | | | | | | | | | | | |
| 327 | | 1.31E-09 | 1 | 1.72E-18 | | | | | | | | | | | | | |
| 328 | | 7.31E-10 | 1 | 5.34E-19 | | | | | | | | | | | | | |
| 329 | | 7.15E-10 | 1 | 5.11E-19 | | | | | | | | | | | | | |
| 330 | | 1.07E-09 | 1 | 1.15E-18 | | | | | | | | | | | | | |
| 331 | 12Bh | 1.69E-09 | 1 | 2.86E-18 | 1.02E-08 | 7 | 1.04E-16 | 1.49E-17 | 49 | 4.88E-08 | 27 | 729 | 6.78 | 2.39E-15 | 8.84E-17 | | |
| 332 | | 8.75E-10 | 1 | 7.66E-19 | | | | | | | | | | | | | |
| 333 | | 1.66E-09 | 1 | 2.76E-18 | | | | | | | | | | | | | |
| 334 | | 2.58E-09 | 1 | 6.66E-18 | | | | | | | | | | | | | |

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| 335 | | 6.37E-10 | 1 | 4.06E-19 | | | | | | | | | | | | | |
| 336 | | 7.20E-10 | 1 | 5.18E-19 | | | | | | | | | | | | | |
| 337 | | 1.03E-09 | 1 | 1.06E-18 | | | | | | | | | | | | | |
| 338 | 13B | 3.65E-09 | 1 | 1.33E-17 | 1.12E-08 | 7 | 1.24E-16 | 1.78E-17 | 49 | | | | | | | | |
| 339 | | 1.66E-09 | 1 | 2.76E-18 | | | | | | | | | | | | | |
| 340 | | 2.00E-09 | 1 | 4.00E-18 | | | | | | | | | | | | | |
| 341 | | 2.12E-09 | 1 | 4.49E-18 | | | | | | | | | | | | | |
| 342 | | 7.62E-10 | 1 | 5.81E-19 | | | | | | | | | | | | | |
| 343 | | 1.13E-09 | 1 | 1.29E-18 | | | | | | | | | | | | | |
| 344 | | 8.39E-10 | 1 | 7.04E-19 | | | | | | | | | | | | | |
| 345 | 14B | 2.84E-09 | 1 | 8.07E-18 | 1.14E-08 | 7 | 1.29E-16 | 1.84E-17 | 49 | | | | | | | | |
| 346 | | 1.90E-09 | 1 | 3.61E-18 | | | | | | | | | | | | | |
| 347 | | 9.03E-10 | 1 | 8.15E-19 | | | | | | | | | | | | | |
| 348 | | 2.37E-09 | 1 | 5.62E-18 | | | | | | | | | | | | | |
| 349 | | 5.12E-10 | 1 | 2.62E-19 | | | | | | | | | | | | | |
| 350 | | 6.08E-10 | 1 | 3.70E-19 | | | | | | | | | | | | | |
| 351 | | 7.26E-10 | 1 | 5.27E-19 | | | | | | | | | | | | | |
| 352 | 15B | 1.39E-09 | 1 | 1.93E-18 | 8.41E-09 | 7 | 7.07E-17 | 1.01E-17 | 49 | | | | | | | | |
| 353 | | 9.98E-10 | 1 | 9.96E-19 | | | | | | | | | | | | | |
| 354 | | 1.90E-09 | 1 | 3.61E-18 | | | | | | | | | | | | | |
| 355 | | 2.52E-09 | 1 | 6.35E-18 | | | | | | | | | | | | | |
| 356 | | 8.99E-10 | 1 | 8.08E-19 | | | | | | | | | | | | | |
| 357 | | 1.10E-09 | 1 | 1.21E-18 | | | | | | | | | | | | | |
| 358 | | 8.50E-10 | 1 | 7.23E-19 | | | | | | | | | | | | | |
| 359 | 16Bh | 4.18E-10 | 1 | 1.75E-19 | 8.69E-09 | 7 | 7.54E-17 | 1.08E-17 | 49 | 3.96E-08 | 28 | 784 | 7.00 | 1.57E-15 | 5.60E-17 | | |
| 360 | | 7.51E-10 | 1 | 5.64E-19 | | | | | | | | | | | | | |
| 361 | | 1.27E-09 | 1 | 1.61E-18 | | | | | | | | | | | | | |
| 362 | | 1.57E-09 | 1 | 2.46E-18 | | | | | | | | | | | | | |
| 363 | | 2.25E-09 | 1 | 5.06E-18 | | | | | | | | | | | | | |
| 364 | | 2.20E-09 | 1 | 4.84E-18 | | | | | | | | | | | | | |
| 365 | | 9.66E-10 | 1 | 9.33E-19 | | | | | | | | | | | | | |
| 366 | | 2.33E-09 | 1 | 5.43E-18 | | | | | | | | | | | | | |
| 367 | | 9.97E-10 | 1 | 9.94E-19 | | | | | | | | | | | | | |
| 368 | | 9.06E-10 | 1 | 8.21E-19 | | | | | | | | | | | | | |
| 369 | 1C | 2.67E-09 | 1 | 7.13E-18 | 1.59E-08 | 10 | 2.53E-16 | 2.53E-17 | 100 | | | | | | | | |
| 370 | | 2.10E-09 | 1 | 4.41E-18 | | | | | | | | | | | | | |
| 371 | | 1.85E-09 | 1 | 3.42E-18 | | | | | | | | | | | | | |
| 372 | | 1.75E-09 | 1 | 3.06E-18 | | | | | | | | | | | | | |
| 373 | | 1.25E-09 | 1 | 1.56E-18 | | | | | | | | | | | | | |
| 374 | | 5.01E-09 | 1 | 2.51E-17 | | | | | | | | | | | | | |
| 375 | | 5.67E-10 | 1 | 3.21E-19 | | | | | | | | | | | | | |
| 376 | | 2.98E-09 | 1 | 8.88E-18 | | | | | | | | | | | | | |

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| 377 | | 2.45E-09 | 1 | 6.00E-18 | | | | | | | | | | | | | |
| 378 | | 3.72E-10 | 1 | 1.38E-19 | | | | | | | | | | | | | |
| 379 | 2C | 5.03E-09 | 1 | 2.53E-17 | 2.34E-08 | 10 | 5.46E-16 | 5.46E-17 | 100 | | | | | | | | |
| 380 | | 9.61E-10 | 1 | 9.24E-19 | | | | | | | | | | | | | |
| 381 | | 1.44E-09 | 1 | 2.07E-18 | | | | | | | | | | | | | |
| 382 | | 1.54E-09 | 1 | 2.37E-18 | | | | | | | | | | | | | |
| 383 | | 1.66E-09 | 1 | 2.76E-18 | | | | | | | | | | | | | |
| 384 | | 1.61E-09 | 1 | 2.59E-18 | | | | | | | | | | | | | |
| 385 | | 1.42E-09 | 1 | 2.02E-18 | | | | | | | | | | | | | |
| 386 | | 1.22E-09 | 1 | 1.49E-18 | | | | | | | | | | | | | |
| 387 | | 9.51E-10 | 1 | 9.04E-19 | | | | | | | | | | | | | |
| 388 | | 5.73E-10 | 1 | 3.28E-19 | | | | | | | | | | | | | |
| 389 | 3C | 2.51E-09 | 1 | 6.30E-18 | 1.39E-08 | 10 | 1.93E-16 | 1.93E-17 | 100 | | | | | | | | |
| 390 | | 5.06E-09 | 1 | 2.56E-17 | | | | | | | | | | | | | |
| 391 | | 5.61E-09 | 1 | 3.15E-17 | | | | | | | | | | | | | |
| 392 | | 3.29E-09 | 1 | 1.08E-17 | | | | | | | | | | | | | |
| 393 | | 0.00E+00 | 1 | 0.00E+00 | | | | | | | | | | | | | |
| 394 | | 7.13E-09 | 1 | 5.08E-17 | | | | | | | | | | | | | |
| 395 | | 0.00E+00 | 1 | 0.00E+00 | | | | | | | | | | | | | |
| 396 | 4Ch | 3.10E-09 | 1 | 9.61E-18 | 2.42E-08 | 7 | 5.85E-16 | 8.36E-17 | 49 | 7.73E-08 | 37 | 1369 | 9.43 | 5.98E-15 | 1.62E-16 | | |
| 397 | | 8.06E-10 | 1 | 6.50E-19 | | | | | | | | | | | | | |
| 398 | | 2.76E-09 | 1 | 7.62E-18 | | | | | | | | | | | | | |
| 399 | | 5.09E-10 | 1 | 2.59E-19 | | | | | | | | | | | | | |
| 400 | | 2.22E-09 | 1 | 4.93E-18 | | | | | | | | | | | | | |
| 401 | | 1.28E-09 | 1 | 1.64E-18 | | | | | | | | | | | | | |
| 402 | | 7.33E-10 | 1 | 5.37E-19 | | | | | | | | | | | | | |
| 403 | | 3.25E-09 | 1 | 1.06E-17 | | | | | | | | | | | | | |
| 404 | | 3.03E-09 | 1 | 9.18E-18 | | | | | | | | | | | | | |
| 405 | | 1.88E-09 | 1 | 3.53E-18 | | | | | | | | | | | | | |
| 406 | 5C | 3.12E-09 | 1 | 9.73E-18 | 1.96E-08 | 10 | 3.84E-16 | 3.84E-17 | 100 | | | | | | | | |
| 407 | | 1.89E-09 | 1 | 3.57E-18 | | | | | | | | | | | | | |
| 408 | | 1.62E-09 | 1 | 2.62E-18 | | | | | | | | | | | | | |
| 409 | | 1.20E-09 | 1 | 1.45E-18 | | | | | | | | | | | | | |
| 410 | | 1.40E-09 | 1 | 1.96E-18 | | | | | | | | | | | | | |
| 411 | | 3.07E-09 | 1 | 9.42E-18 | | | | | | | | | | | | | |
| 412 | | 2.98E-10 | 1 | 8.88E-20 | | | | | | | | | | | | | |
| 413 | | 1.29E-09 | 1 | 1.66E-18 | | | | | | | | | | | | | |
| 414 | | 2.35E-09 | 1 | 5.52E-18 | | | | | | | | | | | | | |
| 415 | | 1.08E-09 | 1 | 1.18E-18 | | | | | | | | | | | | | |
| 416 | 8Ch | 7.72E-10 | 1 | 5.96E-19 | 1.50E-08 | 10 | 2.24E-16 | 2.24E-17 | 100 | 3.46E-08 | 20 | 400 | 10.00 | 1.19E-15 | 5.97E-17 | | |
| 417 | | 1.06E-09 | 1 | 1.12E-18 | | | | | | | | | | | | | |
| 418 | | 2.13E-09 | 1 | 4.54E-18 | | | | | | | | | | | | | |

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| 419 | | 9.04E-10 | 1 | 8.17E-19 | | | | | | | | | | | | |
| 420 | | 3.22E-09 | 1 | 1.04E-17 | | | | | | | | | | | | |
| 421 | | 3.88E-10 | 1 | 1.51E-19 | | | | | | | | | | | | |
| 422 | | 1.68E-09 | 1 | 2.82E-18 | | | | | | | | | | | | |
| 423 | | 4.85E-10 | 1 | 2.35E-19 | | | | | | | | | | | | |
| 424 | | 8.63E-10 | 1 | 7.45E-19 | | | | | | | | | | | | |
| 425 | | 1.99E-09 | 1 | 3.96E-18 | | | | | | | | | | | | |
| 426 | 9C | 1.76E-09 | 1 | 3.10E-18 | 1.45E-08 | 10 | 2.10E-16 | 2.10E-17 | 100 | 1.45E-08 | 10 | 100 | 10.00 | 2.10E-16 | 2.10E-17 | |
| 427 | | 9.10E-10 | 1 | 8.28E-19 | | | | | | | | | | | | |
| 428 | | 1.16E-09 | 1 | 1.35E-18 | | | | | | | | | | | | |
| 429 | | 7.05E-10 | 1 | 4.97E-19 | | | | | | | | | | | | |
| 430 | | 7.39E-10 | 1 | 5.46E-19 | | | | | | | | | | | | |
| 431 | | 1.90E-09 | 1 | 3.61E-18 | | | | | | | | | | | | |
| 432 | | 8.30E-10 | 1 | 6.89E-19 | | | | | | | | | | | | |
| 433 | | 1.21E-09 | 1 | 1.46E-18 | | | | | | | | | | | | |
| 434 | | 5.46E-10 | 1 | 2.98E-19 | | | | | | | | | | | | |
| 435 | | 7.38E-10 | 1 | 5.45E-19 | | | | | | | | | | | | |
| 436 | 13C | 5.27E-10 | 1 | 2.78E-19 | 9.27E-09 | 10 | 8.58E-17 | 8.58E-18 | 100 | 9.27E-09 | 10 | 100 | 10.00 | 8.58E-17 | 8.58E-18 | |
| 437 | | 2.51E-09 | 1 | 6.30E-18 | | | | | | | | | | | | |
| 438 | | 4.68E-09 | 1 | 2.19E-17 | | | | | | | | | | | | |
| 439 | | 3.30E-09 | 1 | 1.09E-17 | | | | | | | | | | | | |
| 440 | | 6.72E-09 | 1 | 4.52E-17 | | | | | | | | | | | | |
| 441 | | 3.55E-09 | 1 | 1.26E-17 | | | | | | | | | | | | |
| 442 | | 3.05E-09 | 1 | 9.30E-18 | | | | | | | | | | | | |
| 443 | | 1.64E-09 | 1 | 2.69E-18 | | | | | | | | | | | | |
| 444 | | 2.38E-09 | 1 | 5.66E-18 | | | | | | | | | | | | |
| 445 | 1D | 3.59E-09 | 1 | 1.29E-17 | 3.14E-08 | 9 | 9.87E-16 | 1.10E-16 | 81 | | | | | | | |
| 446 | | 2.56E-09 | 1 | 6.55E-18 | | | | | | | | | | | | |
| 447 | | 2.76E-09 | 1 | 7.62E-18 | | | | | | | | | | | | |
| 448 | | 2.07E-09 | 1 | 4.28E-18 | | | | | | | | | | | | |
| 449 | | 3.66E-09 | 1 | 1.34E-17 | | | | | | | | | | | | |
| 450 | | 7.62E-10 | 1 | 5.81E-19 | | | | | | | | | | | | |
| 451 | | 1.94E-09 | 1 | 3.76E-18 | | | | | | | | | | | | |
| 452 | | 1.71E-09 | 1 | 2.92E-18 | | | | | | | | | | | | |
| 453 | | 4.67E-09 | 1 | 2.18E-17 | | | | | | | | | | | | |
| 454 | | 0.00E+00 | 1 | 0.00E+00 | | | | | | | | | | | | |
| 455 | 2D | 9.39E-10 | 1 | 8.82E-19 | 2.11E-08 | 10 | 4.44E-16 | 4.44E-17 | 100 | 5.25E-08 | 19 | 361 | 9.53 | 2.76E-15 | 1.45E-16 | |
| 456 | | 3.61E-09 | 1 | 1.30E-17 | | | | | | | | | | | | |
| 457 | | 2.65E-09 | 1 | 7.02E-18 | | | | | | | | | | | | |
| 458 | | 3.03E-09 | 1 | 9.18E-18 | | | | | | | | | | | | |
| 459 | | 1.19E-09 | 1 | 1.42E-18 | | | | | | | | | | | | |
| 460 | | 4.59E-09 | 1 | 2.11E-17 | | | | | | | | | | | | |

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| 461 | | 1.65E-09 | 1 | 2.72E-18 | | | | | | | | | | | | | |
| 462 | | 2.95E-09 | 1 | 8.70E-18 | | | | | | | | | | | | | |
| 463 | | 4.73E-09 | 1 | 2.24E-17 | | | | | | | | | | | | | |
| 464 | | 1.12E-09 | 1 | 1.25E-18 | | | | | | | | | | | | | |
| 465 | 5D | 2.95E-09 | 1 | 8.70E-18 | 2.85E-08 | 10 | 8.11E-16 | 8.11E-17 | 100 | | | | | | | | |
| 466 | | 6.50E-10 | 1 | 4.23E-19 | | | | | | | | | | | | | |
| 467 | | 1.82E-09 | 1 | 3.31E-18 | | | | | | | | | | | | | |
| 468 | | 1.00E-09 | 1 | 1.00E-18 | | | | | | | | | | | | | |
| 469 | | 9.65E-09 | 1 | 9.31E-17 | | | | | | | | | | | | | |
| 470 | | 7.78E-10 | 1 | 6.05E-19 | | | | | | | | | | | | | |
| 471 | | 6.70E-10 | 1 | 4.49E-19 | | | | | | | | | | | | | |
| 472 | | 8.62E-10 | 1 | 7.43E-19 | | | | | | | | | | | | | |
| 473 | | 6.78E-09 | 1 | 4.60E-17 | | | | | | | | | | | | | |
| 474 | | 1.22E-09 | 1 | 1.50E-18 | | | | | | | | | | | | | |
| 475 | 6D | 1.75E-09 | 1 | 3.06E-18 | 2.52E-08 | 10 | 6.34E-16 | 6.34E-17 | 100 | | | | | | | | |
| 476 | | 1.78E-09 | 1 | 3.17E-18 | | | | | | | | | | | | | |
| 477 | | 3.40E-09 | 1 | 1.16E-17 | | | | | | | | | | | | | |
| 478 | | 9.54E-10 | 1 | 9.10E-19 | | | | | | | | | | | | | |
| 479 | | 2.21E-09 | 1 | 4.88E-18 | | | | | | | | | | | | | |
| 480 | | 4.23E-09 | 1 | 1.79E-17 | | | | | | | | | | | | | |
| 481 | | 1.14E-09 | 1 | 1.30E-18 | | | | | | | | | | | | | |
| 482 | | 3.01E-09 | 1 | 9.06E-18 | | | | | | | | | | | | | |
| 483 | | 6.00E-09 | 1 | 3.60E-17 | | | | | | | | | | | | | |
| 484 | | 4.25E-09 | 1 | 1.81E-17 | | | | | | | | | | | | | |
| 485 | 7D | 2.10E-09 | 1 | 4.41E-18 | 2.91E-08 | 10 | 8.45E-16 | 8.45E-17 | 100 | | | | | | | | |
| 486 | | 0.00E+00 | 1 | 0.00E+00 | | | | | | | | | | | | | |
| 487 | | 2.32E-09 | 1 | 5.38E-18 | | | | | | | | | | | | | |
| 488 | | 2.06E-09 | 1 | 4.24E-18 | | | | | | | | | | | | | |
| 489 | | 7.36E-09 | 1 | 5.42E-17 | | | | | | | | | | | | | |
| 490 | | 5.65E-09 | 1 | 3.19E-17 | | | | | | | | | | | | | |
| 491 | | 2.04E-09 | 1 | 4.16E-18 | | | | | | | | | | | | | |
| 492 | | 3.63E-09 | 1 | 1.32E-17 | | | | | | | | | | | | | |
| 493 | | 0.00E+00 | 1 | 0.00E+00 | | | | | | | | | | | | | |
| 494 | | 2.30E-09 | 1 | 5.29E-18 | | | | | | | | | | | | | |
| 495 | 8Dh | 2.51E-09 | 1 | 6.30E-18 | 2.79E-08 | 10 | 7.77E-16 | 7.77E-17 | 100 | 1.11E-07 | 40 | 1600 | 10.00 | 1.22E-14 | 3.06E-16 | | |
| 496 | | 6.06E-09 | 1 | 3.67E-17 | | | | | | | | | | | | | |
| 497 | | 4.33E-10 | 1 | 1.87E-19 | | | | | | | | | | | | | |
| 498 | | 1.88E-09 | 1 | 3.53E-18 | | | | | | | | | | | | | |
| 499 | | 4.43E-09 | 1 | 1.96E-17 | | | | | | | | | | | | | |
| 500 | | 4.28E-09 | 1 | 1.83E-17 | | | | | | | | | | | | | |
| 501 | | 1.79E-09 | 1 | 3.20E-18 | | | | | | | | | | | | | |
| 502 | | 7.75E-10 | 1 | 6.01E-19 | | | | | | | | | | | | | |

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| 503 | | 3.58E-09 | 1 | 1.28E-17 | | | | | | | | | | | | | |
| 504 | | 4.15E-09 | 1 | 1.72E-17 | | | | | | | | | | | | | |
| 505 | 9D | 3.66E-09 | 1 | 1.34E-17 | 3.10E-08 | 10 | 9.63E-16 | 9.63E-17 | 100 | | | | | | | | |
| 506 | | 2.21E-09 | 1 | 4.88E-18 | | | | | | | | | | | | | |
| 507 | | 1.58E-09 | 1 | 2.50E-18 | | | | | | | | | | | | | |
| 508 | | 1.41E-09 | 1 | 1.99E-18 | | | | | | | | | | | | | |
| 509 | | 3.33E-09 | 1 | 1.11E-17 | | | | | | | | | | | | | |
| 510 | | 1.05E-09 | 1 | 1.10E-18 | | | | | | | | | | | | | |
| 511 | | 8.76E-10 | 1 | 7.67E-19 | | | | | | | | | | | | | |
| 512 | | 2.32E-09 | 1 | 5.38E-18 | | | | | | | | | | | | | |
| 513 | | 1.83E-09 | 1 | 3.35E-18 | | | | | | | | | | | | | |
| 514 | | 3.16E-09 | 1 | 9.99E-18 | | | | | | | | | | | | | |
| 515 | 10D | 3.81E-10 | 1 | 1.45E-19 | 1.81E-08 | 10 | 3.29E-16 | 3.29E-17 | 100 | | | | | | | | |
| 516 | | 3.03E-09 | 1 | 9.18E-18 | | | | | | | | | | | | | |
| 517 | | 1.44E-09 | 1 | 2.07E-18 | | | | | | | | | | | | | |
| 518 | | 2.39E-09 | 1 | 5.71E-18 | | | | | | | | | | | | | |
| 519 | | 0.00E+00 | 1 | 0.00E+00 | | | | | | | | | | | | | |
| 520 | | 4.70E-09 | 1 | 2.21E-17 | | | | | | | | | | | | | |
| 521 | | 2.52E-09 | 1 | 6.35E-18 | | | | | | | | | | | | | |
| 522 | | 1.34E-09 | 1 | 1.80E-18 | | | | | | | | | | | | | |
| 523 | | 4.20E-09 | 1 | 1.76E-17 | | | | | | | | | | | | | |
| 524 | | 3.69E-09 | 1 | 1.36E-17 | | | | | | | | | | | | | |
| 525 | 11D | 3.27E-09 | 1 | 1.07E-17 | 2.66E-08 | 10 | 7.06E-16 | 7.06E-17 | 100 | | | | | | | | |
| 526 | | 3.46E-09 | 1 | 1.20E-17 | | | | | | | | | | | | | |
| 527 | | 1.65E-09 | 1 | 2.72E-18 | | | | | | | | | | | | | |
| 528 | | 1.82E-09 | 1 | 3.31E-18 | | | | | | | | | | | | | |
| 529 | | 1.06E-09 | 1 | 1.13E-18 | | | | | | | | | | | | | |
| 530 | | 3.33E-09 | 1 | 1.11E-17 | | | | | | | | | | | | | |
| 531 | | 1.71E-09 | 1 | 2.92E-18 | | | | | | | | | | | | | |
| 532 | | 1.50E-09 | 1 | 2.25E-18 | | | | | | | | | | | | | |
| 533 | | 5.93E-09 | 1 | 3.52E-17 | | | | | | | | | | | | | |
| 534 | | 2.79E-09 | 1 | 7.78E-18 | | | | | | | | | | | | | |
| 535 | 12Dh | 3.71E-09 | 1 | 1.38E-17 | 2.70E-08 | 10 | 7.27E-16 | 7.27E-17 | 100 | 1.03E-07 | 40 | 1600 | 10.00 | 1.06E-14 | 2.64E-16 | | |
| 536 | | 1.14E-09 | 1 | 1.30E-18 | | | | | | | | | | | | | |
| 537 | | 1.40E-09 | 1 | 1.96E-18 | | | | | | | | | | | | | |
| 538 | | 1.56E-09 | 1 | 2.43E-18 | | | | | | | | | | | | | |
| 539 | | 9.10E-10 | 1 | 8.28E-19 | | | | | | | | | | | | | |
| 540 | | 2.89E-09 | 1 | 8.35E-18 | | | | | | | | | | | | | |
| 541 | | 1.51E-09 | 1 | 2.28E-18 | | | | | | | | | | | | | |
| 542 | | 1.33E-09 | 1 | 1.77E-18 | | | | | | | | | | | | | |
| 543 | | 5.35E-09 | 1 | 2.86E-17 | | | | | | | | | | | | | |
| 544 | | 2.55E-09 | 1 | 6.50E-18 | | | | | | | | | | | | | |

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| 545 | 13D | 3.47E-09 | 1 | 1.20E-17 | 2.21E-08 | 10 | 4.89E-16 | 4.89E-17 | 100 | 2.21E-08 | 10 | 100 | 10.00 | 4.89E-16 | 4.89E-17 | | |
| 546 | | 2.51E-09 | 1 | 6.30E-18 | | | | | | | | | | | | | |
| 547 | | 4.68E-09 | 1 | 2.19E-17 | | | | | | | | | | | | | |
| 548 | | 3.30E-09 | 1 | 1.09E-17 | | | | | | | | | | | | | |
| 549 | | 6.72E-09 | 1 | 4.52E-17 | | | | | | | | | | | | | |
| 550 | | 3.55E-09 | 1 | 1.26E-17 | | | | | | | | | | | | | |
| 551 | | 4.33E-09 | 1 | 1.87E-17 | | | | | | | | | | | | | |
| 552 | | 4.25E-09 | 1 | 1.81E-17 | | | | | | | | | | | | | |
| 553 | | 0.00E+00 | 1 | 0.00E+00 | | | | | | | | | | | | | |
| 554 | | 2.38E-09 | 1 | 5.66E-18 | | | | | | | | | | | | | |
| 555 | 1E | 3.59E-09 | 1 | 1.29E-17 | 3.53E-08 | 10 | 1.25E-15 | 1.25E-16 | 100 | | | | | | | | |
| 556 | | 2.56E-09 | 1 | 6.55E-18 | | | | | | | | | | | | | |
| 557 | | 2.76E-09 | 1 | 7.62E-18 | | | | | | | | | | | | | |
| 558 | | 2.07E-09 | 1 | 4.28E-18 | | | | | | | | | | | | | |
| 559 | | 3.66E-09 | 1 | 1.34E-17 | | | | | | | | | | | | | |
| 560 | | 7.62E-10 | 1 | 5.81E-19 | | | | | | | | | | | | | |
| 561 | | 2.76E-09 | 1 | 7.62E-18 | | | | | | | | | | | | | |
| 562 | | 1.73E-09 | 1 | 2.99E-18 | | | | | | | | | | | | | |
| 563 | | 1.67E-09 | 1 | 2.79E-18 | | | | | | | | | | | | | |
| 564 | | 1.34E-09 | 1 | 1.80E-18 | | | | | | | | | | | | | |
| 565 | 2E | 2.96E-09 | 1 | 8.76E-18 | 2.23E-08 | 10 | 4.96E-16 | 4.96E-17 | 100 | | | | | | | | |
| 566 | | 2.63E-09 | 1 | 6.92E-18 | | | | | | | | | | | | | |
| 567 | | 2.63E-09 | 1 | 6.92E-18 | | | | | | | | | | | | | |
| 568 | | 2.54E-09 | 1 | 6.45E-18 | | | | | | | | | | | | | |
| 569 | | 1.98E-09 | 1 | 3.92E-18 | | | | | | | | | | | | | |
| 570 | | 3.78E-09 | 1 | 1.43E-17 | | | | | | | | | | | | | |
| 571 | | 2.43E-09 | 1 | 5.90E-18 | | | | | | | | | | | | | |
| 572 | | 1.51E-09 | 1 | 2.28E-18 | | | | | | | | | | | | | |
| 573 | | 4.15E-09 | 1 | 1.72E-17 | | | | | | | | | | | | | |
| 574 | | 1.85E-09 | 1 | 3.42E-18 | | | | | | | | | | | | | |
| 575 | 3E | 2.50E-09 | 1 | 6.25E-18 | 2.60E-08 | 13 | 6.76E-16 | 5.20E-17 | 169 | | | | | | | | |
| 576 | | 1.17E-09 | 1 | 1.37E-18 | | | | | | | | | | | | | |
| 577 | | 1.38E-09 | 1 | 1.90E-18 | | | | | | | | | | | | | |
| 578 | | 1.85E-09 | 1 | 3.42E-18 | | | | | | | | | | | | | |
| 579 | | 1.45E-09 | 1 | 2.10E-18 | | | | | | | | | | | | | |
| 580 | | 2.80E-09 | 1 | 7.84E-18 | | | | | | | | | | | | | |
| 581 | | 1.31E-09 | 1 | 1.72E-18 | | | | | | | | | | | | | |
| 582 | | 5.18E-10 | 1 | 2.68E-19 | | | | | | | | | | | | | |
| 583 | | 1.98E-09 | 1 | 3.92E-18 | | | | | | | | | | | | | |
| 584 | | 1.63E-09 | 1 | 2.66E-18 | | | | | | | | | | | | | |
| 585 | 4Eh | 1.82E-09 | 1 | 3.31E-18 | 1.59E-08 | 10 | 2.53E-16 | 2.53E-17 | 100 | 6.42E-08 | 33 | 1089 | 11.18 | 4.12E-15 | 1.25E-16 | | |
| 586 | | 4.48E-10 | 1 | 2.01E-19 | | | | | | | | | | | | | |

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| 587 | | 1.87E-09 | 1 | 3.50E-18 | | | | | | | | | | | | | |
| 588 | | 2.08E-09 | 1 | 4.33E-18 | | | | | | | | | | | | | |
| 589 | | 8.04E-10 | 1 | 6.46E-19 | | | | | | | | | | | | | |
| 590 | | 3.03E-09 | 1 | 9.18E-18 | | | | | | | | | | | | | |
| 591 | | 2.21E-09 | 1 | 4.88E-18 | | | | | | | | | | | | | |
| 592 | | 1.07E-08 | 1 | 1.14E-16 | | | | | | | | | | | | | |
| 593 | | 1.47E-08 | 1 | 2.16E-16 | | | | | | | | | | | | | |
| 594 | | 2.25E-09 | 1 | 5.06E-18 | | | | | | | | | | | | | |
| 595 | 5E | 2.95E-09 | 1 | 8.70E-18 | 4.10E-08 | 10 | 1.68E-15 | 1.68E-16 | 100 | | | | | | | | |
| 596 | | 6.54E-10 | 1 | 4.28E-19 | | | | | | | | | | | | | |
| 597 | | 1.82E-09 | 1 | 3.31E-18 | | | | | | | | | | | | | |
| 598 | | 4.07E-09 | 1 | 1.66E-17 | | | | | | | | | | | | | |
| 599 | | 6.15E-09 | 1 | 3.78E-17 | | | | | | | | | | | | | |
| 600 | | 3.18E-09 | 1 | 1.01E-17 | | | | | | | | | | | | | |
| 601 | | 9.51E-10 | 1 | 9.04E-19 | | | | | | | | | | | | | |
| 602 | | 1.75E-09 | 1 | 3.06E-18 | | | | | | | | | | | | | |
| 603 | | 1.19E-08 | 1 | 1.42E-16 | | | | | | | | | | | | | |
| 604 | | 4.96E-09 | 1 | 2.46E-17 | | | | | | | | | | | | | |
| 605 | 6E | 6.38E-09 | 1 | 4.07E-17 | 4.18E-08 | 10 | 1.75E-15 | 1.75E-16 | 100 | | | | | | | | |
| 606 | | 1.78E-09 | 1 | 3.17E-18 | | | | | | | | | | | | | |
| 607 | | 3.40E-09 | 1 | 1.16E-17 | | | | | | | | | | | | | |
| 608 | | 0.00E+00 | 1 | 0.00E+00 | | | | | | | | | | | | | |
| 609 | | 4.43E-09 | 1 | 1.96E-17 | | | | | | | | | | | | | |
| 610 | | 3.55E-09 | 1 | 1.26E-17 | | | | | | | | | | | | | |
| 611 | | 4.13E-09 | 1 | 1.71E-17 | | | | | | | | | | | | | |
| 612 | | 1.56E-09 | 1 | 2.43E-18 | | | | | | | | | | | | | |
| 613 | | 2.74E-09 | 1 | 7.51E-18 | | | | | | | | | | | | | |
| 614 | | 4.25E-09 | 1 | 1.81E-17 | | | | | | | | | | | | | |
| 615 | 7E | 2.10E-09 | 1 | 4.41E-18 | 2.79E-08 | 10 | 7.81E-16 | 7.81E-17 | 100 | | | | | | | | |
| 616 | | 0.00E+00 | 1 | 0.00E+00 | | | | | | | | | | | | | |
| 617 | | 2.32E-09 | 1 | 5.38E-18 | | | | | | | | | | | | | |
| 618 | | 6.31E-09 | 1 | 3.98E-17 | | | | | | | | | | | | | |
| 619 | | 3.79E-09 | 1 | 1.44E-17 | | | | | | | | | | | | | |
| 620 | | 3.21E-09 | 1 | 1.03E-17 | | | | | | | | | | | | | |
| 621 | | 2.90E-09 | 1 | 8.41E-18 | | | | | | | | | | | | | |
| 622 | | 3.66E-09 | 1 | 1.34E-17 | | | | | | | | | | | | | |
| 623 | | 0.00E+00 | 1 | 0.00E+00 | | | | | | | | | | | | | |
| 624 | | 2.30E-09 | 1 | 5.29E-18 | | | | | | | | | | | | | |
| 625 | 8Eh | 2.51E-09 | 1 | 6.30E-18 | 2.70E-08 | 10 | 7.29E-16 | 7.29E-17 | 100 | 1.38E-07 | 40 | 1600 | 10.00 | 1.90E-14 | 4.75E-16 | | |
| 626 | | 3.56E-09 | 1 | 1.27E-17 | | | | | | | | | | | | | |
| 627 | | 2.12E-09 | 1 | 4.49E-18 | | | | | | | | | | | | | |
| 628 | | 1.88E-09 | 1 | 3.53E-18 | | | | | | | | | | | | | |

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| 629 | | 4.43E-09 | 1 | 1.96E-17 | | | | | | | | | | | | | |
| 630 | | 4.27E-09 | 1 | 1.82E-17 | | | | | | | | | | | | | |
| 631 | | 2.54E-09 | 1 | 6.45E-18 | | | | | | | | | | | | | |
| 632 | | 1.58E-09 | 1 | 2.50E-18 | | | | | | | | | | | | | |
| 633 | | 2.05E-09 | 1 | 4.20E-18 | | | | | | | | | | | | | |
| 634 | | 2.79E-09 | 1 | 7.78E-18 | | | | | | | | | | | | | |
| 635 | 9E | 3.66E-09 | 1 | 1.34E-17 | 2.89E-08 | 10 | 8.34E-16 | 8.34E-17 | 100 | | | | | | | | |
| 636 | | 2.21E-09 | 1 | 4.88E-18 | | | | | | | | | | | | | |
| 637 | | 1.58E-09 | 1 | 2.50E-18 | | | | | | | | | | | | | |
| 638 | | 1.41E-09 | 1 | 1.99E-18 | | | | | | | | | | | | | |
| 639 | | 3.33E-09 | 1 | 1.11E-17 | | | | | | | | | | | | | |
| 640 | | 1.05E-09 | 1 | 1.10E-18 | | | | | | | | | | | | | |
| 641 | | 1.24E-09 | 1 | 1.54E-18 | | | | | | | | | | | | | |
| 642 | | 2.35E-09 | 1 | 5.52E-18 | | | | | | | | | | | | | |
| 643 | | 5.12E-10 | 1 | 2.62E-19 | | | | | | | | | | | | | |
| 644 | | 4.18E-09 | 1 | 1.75E-17 | | | | | | | | | | | | | |
| 645 | 10E | 1.57E-09 | 1 | 2.46E-18 | 1.94E-08 | 10 | 3.78E-16 | 3.78E-17 | 100 | | | | | | | | |
| 646 | | 3.03E-09 | 1 | 9.18E-18 | | | | | | | | | | | | | |
| 647 | | 1.44E-09 | 1 | 2.07E-18 | | | | | | | | | | | | | |
| 648 | | 2.39E-09 | 1 | 5.71E-18 | | | | | | | | | | | | | |
| 649 | | 0.00E+00 | 1 | 0.00E+00 | | | | | | | | | | | | | |
| 650 | | 4.70E-09 | 1 | 2.21E-17 | | | | | | | | | | | | | |
| 651 | | 2.84E-09 | 1 | 8.07E-18 | | | | | | | | | | | | | |
| 652 | | 6.61E-10 | 1 | 4.37E-19 | | | | | | | | | | | | | |
| 653 | | 4.12E-09 | 1 | 1.70E-17 | | | | | | | | | | | | | |
| 654 | | 2.48E-09 | 1 | 6.15E-18 | | | | | | | | | | | | | |
| 655 | 11E | 1.82E-09 | 1 | 3.31E-18 | 2.35E-08 | 10 | 5.51E-16 | 5.51E-17 | 100 | | | | | | | | |
| 656 | | 3.46E-09 | 1 | 1.20E-17 | | | | | | | | | | | | | |
| 657 | | 1.65E-09 | 1 | 2.72E-18 | | | | | | | | | | | | | |
| 658 | | 1.82E-09 | 1 | 3.31E-18 | | | | | | | | | | | | | |
| 659 | | 1.06E-09 | 1 | 1.13E-18 | | | | | | | | | | | | | |
| 660 | | 3.33E-09 | 1 | 1.11E-17 | | | | | | | | | | | | | |
| 661 | | 2.43E-09 | 1 | 5.90E-18 | | | | | | | | | | | | | |
| 662 | | 1.51E-09 | 1 | 2.28E-18 | | | | | | | | | | | | | |
| 663 | | 3.35E-09 | 1 | 1.12E-17 | | | | | | | | | | | | | |
| 664 | | 2.79E-09 | 1 | 7.78E-18 | | | | | | | | | | | | | |
| 665 | 12Eh | 3.71E-09 | 1 | 1.38E-17 | 2.51E-08 | 10 | 6.31E-16 | 6.31E-17 | 100 | 9.69E-08 | 40 | 1600 | 10.00 | 9.39E-15 | 2.35E-16 | | |
| 666 | | 2.37E-09 | 1 | 5.62E-18 | | | | | | | | | | | | | |
| 667 | | 1.70E-09 | 1 | 2.89E-18 | | | | | | | | | | | | | |
| 668 | | 2.54E-09 | 1 | 6.45E-18 | | | | | | | | | | | | | |
| 669 | | 1.50E-09 | 1 | 2.25E-18 | | | | | | | | | | | | | |
| 670 | | 2.85E-09 | 1 | 8.12E-18 | | | | | | | | | | | | | |

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| 671 | | 2.23E-09 | 1 | 4.97E-18 | | | | | | | | | | | | | |
| 672 | | 2.12E-09 | 1 | 4.49E-18 | | | | | | | | | | | | | |
| 673 | | 1.88E-09 | 1 | 3.53E-18 | | | | | | | | | | | | | |
| 674 | | 7.37E-10 | 1 | 5.43E-19 | | | | | | | | | | | | | |
| 675 | 13E | 1.60E-09 | 1 | 2.56E-18 | 1.95E-08 | 10 | 3.81E-16 | 3.81E-17 | 100 | | | | | | | | |
| 676 | | 1.79E-09 | 1 | 3.20E-18 | | | | | | | | | | | | | |
| 677 | | 2.89E-09 | 1 | 8.35E-18 | | | | | | | | | | | | | |
| 678 | | 1.44E-09 | 1 | 2.07E-18 | | | | | | | | | | | | | |
| 679 | | 1.68E-09 | 1 | 2.82E-18 | | | | | | | | | | | | | |
| 680 | | 2.65E-09 | 1 | 7.02E-18 | | | | | | | | | | | | | |
| 681 | | 1.90E-09 | 1 | 3.61E-18 | | | | | | | | | | | | | |
| 682 | | 1.78E-09 | 1 | 3.17E-18 | | | | | | | | | | | | | |
| 683 | | 2.08E-09 | 1 | 4.33E-18 | | | | | | | | | | | | | |
| 684 | | 1.05E-09 | 1 | 1.10E-18 | | | | | | | | | | | | | |
| 685 | 14E | 1.52E-09 | 1 | 2.31E-18 | 1.88E-08 | 10 | 3.53E-16 | 3.53E-17 | 100 | | | | | | | | |
| 686 | | 2.50E-09 | 1 | 6.25E-18 | | | | | | | | | | | | | |
| 687 | | 1.82E-09 | 1 | 3.31E-18 | | | | | | | | | | | | | |
| 688 | | 2.77E-09 | 1 | 7.67E-18 | | | | | | | | | | | | | |
| 689 | | 2.21E-09 | 1 | 4.88E-18 | | | | | | | | | | | | | |
| 690 | | 2.12E-09 | 1 | 4.49E-18 | | | | | | | | | | | | | |
| 691 | | 1.88E-09 | 1 | 3.53E-18 | | | | | | | | | | | | | |
| 692 | | 1.79E-09 | 1 | 3.20E-18 | | | | | | | | | | | | | |
| 693 | | 3.87E-09 | 1 | 1.50E-17 | | | | | | | | | | | | | |
| 694 | 15E | 1.37E-09 | 1 | 1.88E-18 | 2.03E-08 | 9 | 4.13E-16 | 4.59E-17 | 81 | | | | | | | | |
| 695 | | 2.00E-09 | 1 | 4.00E-18 | | | | | | | | | | | | | |
| 696 | | 9.93E-09 | 1 | 9.87E-17 | | | | | | | | | | | | | |
| 697 | | 4.17E-10 | 1 | 1.74E-19 | | | | | | | | | | | | | |
| 698 | | 3.76E-09 | 1 | 1.41E-17 | | | | | | | | | | | | | |
| 699 | | 7.88E-10 | 1 | 6.21E-19 | | | | | | | | | | | | | |
| 700 | | 1.00E-09 | 1 | 1.00E-18 | | | | | | | | | | | | | |
| 701 | | 4.80E-09 | 1 | 2.30E-17 | | | | | | | | | | | | | |
| 702 | | 3.32E-09 | 1 | 1.10E-17 | | | | | | | | | | | | | |
| 703 | | 0.00E+00 | 1 | 0.00E+00 | | | | | | | | | | | | | |
| 704 | 16E | 3.54E-09 | 1 | 1.25E-17 | 2.96E-08 | 10 | 8.74E-16 | 8.74E-17 | 100 | 8.82E-08 | 39 | 1521 | 9.77 | 7.78E-15 | 1.99E-16 | | |
| 705 | | 1.12E-09 | 1 | 1.25E-18 | | | | | | | | | | | | | |
| 706 | | 9.92E-10 | 1 | 9.84E-19 | | | | | | | | | | | | | |
| 707 | | 4.14E-09 | 1 | 1.71E-17 | | | | | | | | | | | | | |
| 708 | | 1.15E-09 | 1 | 1.32E-18 | | | | | | | | | | | | | |
| 709 | | 1.33E-09 | 1 | 1.77E-18 | | | | | | | | | | | | | |
| 710 | | 2.67E-09 | 1 | 7.13E-18 | | | | | | | | | | | | | |
| 711 | 1F | 3.12E-09 | 1 | 9.73E-18 | 1.45E-08 | 7 | 2.11E-16 | 3.01E-17 | 49 | | | | | | | | |
| 712 | | 1.42E-09 | 1 | 2.02E-18 | | | | | | | | | | | | | |

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| 713 | | 1.10E-09 | 1 | 1.21E-18 | | | | | | | | | | | | | |
| 714 | | 1.26E-09 | 1 | 1.59E-18 | | | | | | | | | | | | | |
| 715 | | 8.41E-10 | 1 | 7.07E-19 | | | | | | | | | | | | | |
| 716 | | 9.90E-10 | 1 | 9.80E-19 | | | | | | | | | | | | | |
| 717 | | 2.06E-09 | 1 | 4.24E-18 | | | | | | | | | | | | | |
| 718 | 2F | 2.50E-09 | 1 | 6.25E-18 | 1.02E-08 | 7 | 1.03E-16 | 1.48E-17 | 49 | | | | | | | | |
| 719 | | 1.10E-09 | 1 | 1.21E-18 | | | | | | | | | | | | | |
| 720 | | 7.07E-10 | 1 | 5.00E-19 | | | | | | | | | | | | | |
| 721 | | 1.97E-09 | 1 | 3.88E-18 | | | | | | | | | | | | | |
| 722 | | 1.51E-09 | 1 | 2.28E-18 | | | | | | | | | | | | | |
| 723 | | 2.65E-09 | 1 | 7.02E-18 | | | | | | | | | | | | | |
| 724 | | 1.98E-09 | 1 | 3.92E-18 | | | | | | | | | | | | | |
| 725 | 3F | 2.18E-09 | 1 | 4.75E-18 | 1.21E-08 | 7 | 1.46E-16 | 2.09E-17 | 49 | | | | | | | | |
| 726 | | 7.27E-10 | 1 | 5.29E-19 | | | | | | | | | | | | | |
| 727 | | 3.41E-10 | 1 | 1.16E-19 | | | | | | | | | | | | | |
| 728 | | 1.50E-09 | 1 | 2.25E-18 | | | | | | | | | | | | | |
| 729 | | 1.09E-09 | 1 | 1.19E-18 | | | | | | | | | | | | | |
| 730 | | 7.24E-10 | 1 | 5.24E-19 | | | | | | | | | | | | | |
| 731 | | 1.02E-09 | 1 | 1.04E-18 | | | | | | | | | | | | | |
| 732 | 4Fh | 3.00E-09 | 1 | 9.00E-18 | 8.40E-09 | 7 | 7.06E-17 | 1.01E-17 | 49 | 4.52E-08 | 28 | 784 | 7.00 | 2.04E-15 | 7.29E-17 | | |
| 733 | | 6.25E-09 | 1 | 3.91E-17 | | | | | | | | | | | | | |
| 734 | | 3.54E-09 | 1 | 1.25E-17 | | | | | | | | | | | | | |
| 735 | 5F | 5.24E-09 | 1 | 2.75E-17 | 1.50E-08 | 3 | 2.26E-16 | 7.53E-17 | 9 | | | | | | | | |
| 736 | | 5.01E-09 | 1 | 2.51E-17 | | | | | | | | | | | | | |
| 737 | | 6.89E-10 | 1 | 4.75E-19 | | | | | | | | | | | | | |
| 738 | | 1.72E-10 | 1 | 2.96E-20 | | | | | | | | | | | | | |
| 739 | | 1.27E-09 | 1 | 1.61E-18 | | | | | | | | | | | | | |
| 740 | | 2.29E-09 | 1 | 5.24E-18 | | | | | | | | | | | | | |
| 741 | | 1.70E-09 | 1 | 2.89E-18 | | | | | | | | | | | | | |
| 742 | 6F | 1.91E-09 | 1 | 3.65E-18 | 1.30E-08 | 7 | 1.70E-16 | 2.43E-17 | 49 | | | | | | | | |
| 743 | | 6.46E-09 | 1 | 4.17E-17 | | | | | | | | | | | | | |
| 744 | | 9.08E-10 | 1 | 8.24E-19 | | | | | | | | | | | | | |
| 745 | | 1.15E-09 | 1 | 1.32E-18 | | | | | | | | | | | | | |
| 746 | | 1.89E-09 | 1 | 3.57E-18 | | | | | | | | | | | | | |
| 747 | | 1.77E-09 | 1 | 3.13E-18 | | | | | | | | | | | | | |
| 748 | | 1.44E-09 | 1 | 2.07E-18 | | | | | | | | | | | | | |
| 749 | 7F | 6.96E-10 | 1 | 4.84E-19 | 1.43E-08 | 7 | 2.05E-16 | 2.93E-17 | 49 | | | | | | | | |
| 750 | | 6.10E-10 | 1 | 3.72E-19 | | | | | | | | | | | | | |
| 751 | | 5.94E-10 | 1 | 3.53E-19 | | | | | | | | | | | | | |
| 752 | | 7.68E-10 | 1 | 5.90E-19 | | | | | | | | | | | | | |
| 753 | | 6.36E-09 | 1 | 4.04E-17 | | | | | | | | | | | | | |
| 754 | | 9.57E-10 | 1 | 9.16E-19 | | | | | | | | | | | | | |

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| 755 | | 1.43E-09 | 1 | 2.04E-18 | | | | | | | | | | | | | |
| 756 | 8Fh | 3.87E-09 | 1 | 1.50E-17 | 1.46E-08 | 7 | 2.13E-16 | 3.04E-17 | 49 | 5.70E-08 | 24 | 576 | 6.50 | 3.25E-15 | 1.35E-16 | | |
| 757 | | 9.67E-10 | 1 | 9.35E-19 | | | | | | | | | | | | | |
| 758 | | 3.10E-10 | 1 | 9.61E-20 | | | | | | | | | | | | | |
| 759 | | 1.33E-09 | 1 | 1.77E-18 | | | | | | | | | | | | | |
| 760 | | 1.70E-09 | 1 | 2.89E-18 | | | | | | | | | | | | | |
| 761 | | 2.25E-09 | 1 | 5.06E-18 | | | | | | | | | | | | | |
| 762 | | 1.42E-09 | 1 | 2.02E-18 | | | | | | | | | | | | | |
| 763 | 9F | 2.10E-09 | 1 | 4.41E-18 | 1.01E-08 | 7 | 1.02E-16 | 1.45E-17 | 49 | | | | | | | | |
| 764 | | 6.29E-10 | 1 | 3.96E-19 | | | | | | | | | | | | | |
| 765 | | 1.94E-10 | 1 | 3.76E-20 | | | | | | | | | | | | | |
| 766 | | 1.67E-09 | 1 | 2.79E-18 | | | | | | | | | | | | | |
| 767 | | 1.24E-09 | 1 | 1.55E-18 | | | | | | | | | | | | | |
| 768 | | 1.30E-09 | 1 | 1.69E-18 | | | | | | | | | | | | | |
| 769 | | 7.82E-10 | 1 | 6.12E-19 | | | | | | | | | | | | | |
| 770 | 10F | 2.27E-09 | 1 | 5.15E-18 | 8.09E-09 | 7 | 6.54E-17 | 9.35E-18 | 49 | | | | | | | | |
| 771 | | 1.01E-09 | 1 | 1.03E-18 | | | | | | | | | | | | | |
| 772 | | 8.21E-10 | 1 | 6.74E-19 | | | | | | | | | | | | | |
| 773 | | 1.58E-09 | 1 | 2.50E-18 | | | | | | | | | | | | | |
| 774 | | 1.47E-09 | 1 | 2.16E-18 | | | | | | | | | | | | | |
| 775 | | 1.44E-09 | 1 | 2.07E-18 | | | | | | | | | | | | | |
| 776 | | 2.30E-09 | 1 | 5.29E-18 | | | | | | | | | | | | | |
| 777 | 11F | 1.75E-09 | 1 | 3.06E-18 | 1.04E-08 | 7 | 1.08E-16 | 1.54E-17 | 49 | | | | | | | | |
| 778 | | 4.34E-09 | 1 | 1.88E-17 | | | | | | | | | | | | | |
| 779 | | 1.31E-09 | 1 | 1.72E-18 | | | | | | | | | | | | | |
| 780 | | 5.73E-09 | 1 | 3.28E-17 | | | | | | | | | | | | | |
| 781 | | 2.27E-09 | 1 | 5.15E-18 | | | | | | | | | | | | | |
| 782 | | 2.13E-09 | 1 | 4.54E-18 | | | | | | | | | | | | | |
| 783 | | 5.75E-09 | 1 | 3.31E-17 | | | | | | | | | | | | | |
| 784 | 12Fh | 9.13E-09 | 1 | 8.34E-17 | 3.07E-08 | 7 | 9.40E-16 | 1.34E-16 | 49 | 5.92E-08 | 28 | 784 | 7.00 | 3.50E-15 | 1.25E-16 | | |
| 785 | | 1.75E-09 | 1 | 3.06E-18 | | | | | | | | | | | | | |
| 786 | | 5.49E-10 | 1 | 3.01E-19 | | | | | | | | | | | | | |
| 787 | | 1.94E-09 | 1 | 3.76E-18 | | | | | | | | | | | | | |
| 788 | | 2.70E-09 | 1 | 7.29E-18 | | | | | | | | | | | | | |
| 789 | | 4.66E-09 | 1 | 2.17E-17 | | | | | | | | | | | | | |
| 790 | 13F | 4.41E-09 | 1 | 1.94E-17 | 1.60E-08 | 6 | 2.56E-16 | 4.27E-17 | 36 | | | | | | | | |
| 791 | | 1.87E-09 | 1 | 3.50E-18 | | | | | | | | | | | | | |
| 792 | | 4.39E-10 | 1 | 1.93E-19 | | | | | | | | | | | | | |
| 793 | | 4.25E-09 | 1 | 1.81E-17 | | | | | | | | | | | | | |
| 794 | | 2.89E-09 | 1 | 8.35E-18 | | | | | | | | | | | | | |
| 795 | | 4.40E-09 | 1 | 1.94E-17 | | | | | | | | | | | | | |
| 796 | 14Fh | 2.67E-09 | 1 | 7.13E-18 | 1.65E-08 | 6 | 2.73E-16 | 4.55E-17 | 36 | | | | | | | | |

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| 797 | | 1.07E-09 | 1 | 1.15E-18 | | | | | | | | | | | | |
| 798 | | 1.10E-09 | 1 | 1.21E-18 | | | | | | | | | | | | |
| 799 | | 2.68E-09 | 1 | 7.18E-18 | | | | | | | | | | | | |
| 800 | | 1.27E-09 | 1 | 1.61E-18 | | | | | | | | | | | | |
| 801 | | 1.99E-09 | 1 | 3.96E-18 | | | | | | | | | | | | |
| 802 | | 2.85E-09 | 1 | 8.12E-18 | | | | | | | | | | | | |
| 803 | 15F | 3.36E-09 | 1 | 1.13E-17 | 1.43E-08 | 7 | 2.05E-16 | 2.93E-17 | 49 | | | | | | | |
| 804 | | 1.71E-09 | 1 | 2.92E-18 | | | | | | | | | | | | |
| 805 | | 8.49E-10 | 1 | 7.21E-19 | | | | | | | | | | | | |
| 806 | | 2.17E-09 | 1 | 4.71E-18 | | | | | | | | | | | | |
| 807 | | 1.32E-09 | 1 | 1.74E-18 | | | | | | | | | | | | |
| 808 | | 4.22E-09 | 1 | 1.78E-17 | | | | | | | | | | | | |
| 809 | | 2.22E-09 | 1 | 4.93E-18 | | | | | | | | | | | | |
| 810 | 16F | 3.23E-09 | 1 | 1.04E-17 | 1.57E-08 | 7 | 2.47E-16 | 3.53E-17 | 49 | 6.26E-08 | 26 | 676 | 6.54 | 3.92E-15 | 1.51E-16 | 1.70E-06 | 792 |
| 811 | | | | | | | | | | | | | 242.93 | | | | |
| 812 | | | | | | 818 | | | 9344 | | 792 | 32564 | | | | | 41.116162 |
| 813 | | | | | | | | | | | | | | | | |
| 814 | | | | | | | | | | | | | | | | |
| 815 | | **S0 =** | **6.78E-15** | | **S1 =** | **4.50E-15** | | | | **S2 =** | **3.98E-15** | | | | | **S3 =** | **3.65E-15** |
| 816 | | **C0 =** | **810** | | **C1 =** | **82** | | | | **C2 =** | **24** | | | | | **C3 =** | **1** |
| 817 | | d.o.f. = | 728 | | d.o.f. = | 58 | | | | d.o.f. = | 23 | | | | | | |
| 818 | | s.o.sqr. = | 2.28E-15 | | s.o.sqr. = | 5.19E-16 | | | | s.o.sqr. = | 3.26E-16 | | | | | | |
| 819 | | m.sqr. = | 3.13E-18 | | m.sqr. = | 8.952E-18 | | | | m.sqr. = | 1.42E-17 | | | | | | |
| 820 | | | | | | | | | | | | | | | | | |
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| 837 | **Gamma i/j** | | | | |
| 838 | | **0** | **1** | **2** | **3** |
| 839 | **3** | 1 | 11.80 | 41.12 | 810 |
| 840 | **2** | 24 | 242.93 | 810 | |
| 841 | **1** | 82 | 810 | | |
| 842 | **0** | 810 | | | |
| 843 | | | | | |
| 844 | **K i/j** | | | | |
| 845 | | **0** | **1** | **2** | |
| 846 | **2** | 23 | 231.13 | 768.88 | |
| 847 | **1** | 58 | 567.07 | | |
| 848 | **0** | 728 | | | |
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# Appendix C-ii

## Calculation Tables for Construction of Silt ANOVA Tables

| Line | Sample | Runs | | | Tubes | | | | Location | | | | | | Lithology | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | ID | X0 | N0 | X0^2 | X1 | N1 | X1^2 | N1^2 | X2 | N2 | N1^2/N2 | X2^2 | X2^2/N2 | N2^2 | X3 | N3 |
| | | | | | | | | | | | | | | | | |
| 1 | | 3.94E-08 | 1 | 1.5524E-15 | | | | | | | | | | | | |
| 2 | | 3.80E-08 | 1 | 1.444E-15 | | | | | | | | | | | | |
| 3 | | 3.11E-08 | 1 | 9.6721E-16 | | | | | | | | | | | | |
| 4 | | 2.97E-08 | 1 | 8.8209E-16 | | | | | | | | | | | | |
| 5 | | 3.21E-08 | 1 | 1.0304E-15 | | | | | | | | | | | | |
| 6 | 1J | 3.43E-08 | 1 | 1.1765E-15 | 2.046E-07 | 6 | 4.1861E-14 | 36 | | | | | | | | |
| 7 | | 4.08E-08 | 1 | 1.6646E-15 | | | | | | | | | | | | |
| 8 | | 4.24E-08 | 1 | 1.7978E-15 | | | | | | | | | | | | |
| 9 | | 3.47E-08 | 1 | 1.2041E-15 | | | | | | | | | | | | |
| 10 | | 3.24E-08 | 1 | 1.0498E-15 | | | | | | | | | | | | |
| 11 | | 3.35E-08 | 1 | 1.1223E-15 | | | | | | | | | | | | |
| 12 | 2J | 3.71E-08 | 1 | 1.3764E-15 | 2.209E-07 | 6 | 4.8797E-14 | 36 | | | | | | | | |
| 13 | | 4.10E-08 | 1 | 1.681E-15 | | | | | | | | | | | | |
| 14 | | 3.98E-08 | 1 | 1.584E-15 | | | | | | | | | | | | |
| 15 | | 3.49E-08 | 1 | 1.218E-15 | | | | | | | | | | | | |
| 16 | | 3.42E-08 | 1 | 1.1696E-15 | | | | | | | | | | | | |
| 17 | | 4.29E-08 | 1 | 1.8404E-15 | | | | | | | | | | | | |
| 18 | 3J | 3.94E-08 | 1 | 1.5524E-15 | 2.322E-07 | 6 | 5.3917E-14 | 36 | 6.577E-07 | 18 | 6 | 4.3E-13 | 2.4032E-14 | 324 | | |
| 19 | | 8.26E-08 | 1 | 6.8228E-15 | | | | | | | | | | | | |
| 20 | | 1.08E-07 | 1 | 1.1664E-14 | | | | | | | | | | | | |
| 21 | | 8.86E-08 | 1 | 7.85E-15 | | | | | | | | | | | | |
| 22 | | 9.29E-08 | 1 | 8.6304E-15 | | | | | | | | | | | | |
| 23 | | 9.92E-08 | 1 | 9.8406E-15 | | | | | | | | | | | | |
| 24 | | 9.26E-08 | 1 | 8.5748E-15 | | | | | | | | | | | | |
| 25 | 10K | 1.01E-07 | 1 | 1.0201E-14 | 6.649E-07 | 7 | 4.4209E-13 | 49 | 6.649E-07 | 7 | 7 | 4.4E-13 | 6.3156E-14 | 49 | | |
| 26 | | 5.67E-08 | 1 | 3.2149E-15 | | | | | | | | | | | | |
| 27 | | 4.28E-08 | 1 | 1.8318E-15 | | | | | | | | | | | | |
| 28 | | 3.49E-08 | 1 | 1.218E-15 | | | | | | | | | | | | |
| 29 | | 4.34E-08 | 1 | 1.8836E-15 | | | | | | | | | | | | |
| 30 | | 5.38E-08 | 1 | 2.8944E-15 | | | | | | | | | | | | |
| 31 | | 4.04E-08 | 1 | 1.6322E-15 | | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32 | 15K | 7.23E-08 | 1 | 5.2273E-15 | 3.443E-07 | 7 | 1.1854E-13 | 49 | 3.443E-07 | 7 | 7 | 1.2E-13 | 1.6935E-14 | 49 | | |
| 33 | | 1.74E-08 | 1 | 3.0276E-16 | | | | | | | | | | | | |
| 34 | | 9.00E-09 | 1 | 8.1E-17 | | | | | | | | | | | | |
| 35 | | 1.08E-08 | 1 | 1.1664E-16 | | | | | | | | | | | | |
| 36 | | 1.15E-09 | 1 | 1.3225E-18 | | | | | | | | | | | | |
| 37 | | 1.76E-09 | 1 | 3.0976E-18 | | | | | | | | | | | | |
| 38 | | 2.72E-09 | 1 | 7.3984E-18 | | | | | | | | | | | | |
| 39 | 23G | 1.31E-09 | 1 | 1.7161E-18 | 4.414E-08 | 7 | 1.9483E-15 | 49 | | | | | | | | |
| 40 | | 9.09E-09 | 1 | 8.2628E-17 | | | | | | | | | | | | |
| 41 | | 2.80E-08 | 1 | 7.84E-16 | | | | | | | | | | | | |
| 42 | | 1.40E-08 | 1 | 1.96E-16 | | | | | | | | | | | | |
| 43 | | 1.93E-08 | 1 | 3.7249E-16 | | | | | | | | | | | | |
| 44 | | 1.55E-08 | 1 | 2.4025E-16 | | | | | | | | | | | | |
| 45 | | 2.14E-09 | 1 | 4.5796E-18 | | | | | | | | | | | | |
| 46 | 24Gh | 3.52E-09 | 1 | 1.239E-17 | 9.155E-08 | 7 | 8.3814E-15 | 49 | 1.3569E-07 | 14 | 7 | 1.8E-14 | 1.3151E-15 | 196 | | |
| 47 | | 6.10E-09 | 1 | 3.721E-17 | | | | | | | | | | | | |
| 48 | | 2.15E-08 | 1 | 4.6225E-16 | | | | | | | | | | | | |
| 49 | | 4.21E-09 | 1 | 1.7724E-17 | | | | | | | | | | | | |
| 50 | | 7.37E-09 | 1 | 5.4317E-17 | | | | | | | | | | | | |
| 51 | | 2.52E-09 | 1 | 6.3504E-18 | | | | | | | | | | | | |
| 52 | | 7.16E-09 | 1 | 5.1266E-17 | | | | | | | | | | | | |
| 53 | 25G | 5.53E-09 | 1 | 3.0581E-17 | 5.439E-08 | 7 | 2.9583E-15 | 49 | 5.439E-08 | 7 | 7 | 3E-15 | 4.2261E-16 | 49 | | |
| 54 | | 1.20E-09 | 1 | 1.44E-18 | | | | | | | | | | | | |
| 55 | | 4.38E-09 | 1 | 1.9184E-17 | | | | | | | | | | | | |
| 56 | | 0.00E+00 | 0 | 0 | | | | | | | | | | | | |
| 57 | | 4.38E-09 | 1 | 1.9184E-17 | | | | | | | | | | | | |
| 58 | | 1.88E-09 | 1 | 3.5344E-18 | | | | | | | | | | | | |
| 59 | | 4.78E-10 | 1 | 2.2848E-19 | | | | | | | | | | | | |
| 60 | 28Gh | 7.76E-10 | 1 | 6.0218E-19 | 1.309E-08 | 6 | 1.7145E-16 | 36 | | | | | | | | |
| 61 | | 2.16E-09 | 1 | 4.6656E-18 | | | | | | | | | | | | |
| 62 | | 5.12E-09 | 1 | 2.6214E-17 | | | | | | | | | | | | |
| 63 | | 2.79E-09 | 1 | 7.7841E-18 | | | | | | | | | | | | |
| 64 | | 2.58E-09 | 1 | 6.6564E-18 | | | | | | | | | | | | |
| 65 | | 6.68E-09 | 1 | 4.4622E-17 | | | | | | | | | | | | |

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| 66 | | 6.37E-09 | 1 | 4.0577E-17 | | | | | | | | | | | | |
| 67 | 29G | 6.48E-09 | 1 | 4.199E-17 | 3.218E-08 | 7 | 1.0356E-15 | 49 | 4.5274E-08 | 13 | 6.5384615 | 2E-15 | 1.5767E-16 | 169 | | |
| 68 | | 4.42E-08 | 1 | 1.9547E-15 | | | | | | | | | | | | |
| 69 | | 8.22E-08 | 1 | 6.7612E-15 | | | | | | | | | | | | |
| 70 | | 2.40E-08 | 1 | 5.7564E-16 | | | | | | | | | | | | |
| 71 | | 5.58E-08 | 1 | 3.1139E-15 | | | | | | | | | | | | |
| 72 | | 3.23E-08 | 1 | 1.0405E-15 | | | | | | | | | | | | |
| 73 | | 1.52E-08 | 1 | 2.3115E-16 | | | | | | | | | | | | |
| 74 | 32Gh | 1.29E-08 | 1 | 1.6707E-16 | 2.666E-07 | 7 | 7.1086E-14 | 49 | | | | | | | | |
| 75 | | 9.98E-09 | 1 | 9.9613E-17 | | | | | | | | | | | | |
| 76 | | 4.08E-08 | 1 | 1.6634E-15 | | | | | | | | | | | | |
| 77 | | 2.50E-08 | 1 | 6.2732E-16 | | | | | | | | | | | | |
| 78 | | 1.48E-08 | 1 | 2.1807E-16 | | | | | | | | | | | | |
| 79 | | 3.41E-08 | 1 | 1.1634E-15 | | | | | | | | | | | | |
| 80 | | 3.11E-08 | 1 | 9.6851E-16 | | | | | | | | | | | | |
| 81 | 34G | 1.41E-08 | 1 | 1.9826E-16 | 1.699E-07 | 7 | 2.8862E-14 | 49 | | | | | | | | |
| 82 | | 0.00E+00 | 0 | 0 | | | | | | | | | | | | |
| 83 | | 4.81E-09 | 1 | 2.3104E-17 | | | | | | | | | | | | |
| 84 | | 2.76E-09 | 1 | 7.6109E-18 | | | | | | | | | | | | |
| 85 | | 3.04E-09 | 1 | 9.2589E-18 | | | | | | | | | | | | |
| 86 | | 4.67E-09 | 1 | 2.1823E-17 | | | | | | | | | | | | |
| 87 | | 1.66E-09 | 1 | 2.7575E-18 | | | | | | | | | | | | |
| 88 | 37G | 1.35E-09 | 1 | 1.8325E-18 | 1.829E-08 | 6 | 3.3467E-16 | 36 | | | | | | | | |
| 89 | | 1.30E-08 | 1 | 1.6841E-16 | | | | | | | | | | | | |
| 90 | | 0.00E+00 | 0 | 0 | | | | | | | | | | | | |
| 91 | | 1.44E-09 | 1 | 2.0725E-18 | | | | | | | | | | | | |
| 92 | | 3.26E-09 | 1 | 1.0629E-17 | | | | | | | | | | | | |
| 93 | | 1.65E-09 | 1 | 2.7251E-18 | | | | | | | | | | | | |
| 94 | | 5.34E-10 | 1 | 2.8511E-19 | | | | | | | | | | | | |
| 95 | 38G | 8.64E-10 | 1 | 7.4669E-19 | 2.073E-08 | 6 | 4.2957E-16 | 36 | 4.7553E-07 | 26 | 6.5384615 | 2.3E-13 | 8.6973E-15 | 676 | | |
| 96 | | 5.56E-09 | 1 | 3.0944E-17 | | | | | | | | | | | | |
| 97 | | 4.77E-09 | 1 | 2.2778E-17 | | | | | | | | | | | | |
| 98 | | 8.32E-09 | 1 | 6.9218E-17 | | | | | | | | | | | | |
| 99 | | 2.02E-08 | 1 | 4.0624E-16 | | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100 | | 4.49E-09 | 1 | 2.0125E-17 | | | | | | | | | | | | |
| 101 | | 4.04E-09 | 1 | 1.6301E-17 | | | | | | | | | | | | |
| 102 | 35G | 6.82E-09 | 1 | 4.6487E-17 | 5.415E-08 | 7 | 2.9324E-15 | 49 | | | | | | | | |
| 103 | | 1.02E-08 | 1 | 1.0404E-16 | | | | | | | | | | | | |
| 104 | | 8.79E-09 | 1 | 7.7264E-17 | | | | | | | | | | | | |
| 105 | | 1.17E-08 | 1 | 1.3689E-16 | | | | | | | | | | | | |
| 106 | | 2.31E-08 | 1 | 5.3361E-16 | | | | | | | | | | | | |
| 107 | | 2.06E-08 | 1 | 4.2436E-16 | | | | | | | | | | | | |
| 108 | | 1.17E-08 | 1 | 1.3689E-16 | | | | | | | | | | | | |
| 109 | 36Gh | 9.33E-09 | 1 | 8.7049E-17 | 9.542E-08 | 7 | 9.105E-15 | 49 | 1.4957E-07 | 14 | 7 | 2.2E-14 | 1.598E-15 | 196 | | |
| 110 | | 2.83E-08 | 1 | 8.0089E-16 | | | | | | | | | | | | |
| 111 | | 2.04E-08 | 1 | 4.1616E-16 | | | | | | | | | | | | |
| 112 | | 1.17E-08 | 1 | 1.3689E-16 | | | | | | | | | | | | |
| 113 | | 1.21E-08 | 1 | 1.4641E-16 | | | | | | | | | | | | |
| 114 | | 8.78E-09 | 1 | 7.7088E-17 | | | | | | | | | | | | |
| 115 | | 2.06E-08 | 1 | 4.2436E-16 | | | | | | | | | | | | |
| 116 | 50J | 1.32E-08 | 1 | 1.7424E-16 | 1.151E-07 | 7 | 1.3243E-14 | 49 | | | | | | | | |
| 117 | | 3.31E-08 | 1 | 1.0956E-15 | | | | | | | | | | | | |
| 118 | | 2.83E-08 | 1 | 8.0089E-16 | | | | | | | | | | | | |
| 119 | | 2.53E-08 | 1 | 6.4009E-16 | | | | | | | | | | | | |
| 120 | | 2.30E-08 | 1 | 5.29E-16 | | | | | | | | | | | | |
| 121 | | 0.00E+00 | 0 | 0 | | | | | | | | | | | | |
| 122 | | 2.40E-08 | 1 | 5.76E-16 | | | | | | | | | | | | |
| 123 | 51J | 2.03E-08 | 1 | 4.1209E-16 | 1.54E-07 | 6 | 2.3716E-14 | 36 | 2.6908E-07 | 13 | 6.5384615 | 7.2E-14 | 5.5695E-15 | 169 | | |
| 124 | | 3.73E-08 | 1 | 1.3913E-15 | | | | | | | | | | | | |
| 125 | | 3.73E-08 | 1 | 1.3913E-15 | | | | | | | | | | | | |
| 126 | | 2.75E-08 | 1 | 7.5625E-16 | | | | | | | | | | | | |
| 127 | | 2.78E-08 | 1 | 7.7284E-16 | | | | | | | | | | | | |
| 128 | | 0.00E+00 | 0 | 0 | | | | | | | | | | | | |
| 129 | | 2.94E-08 | 1 | 8.6436E-16 | | | | | | | | | | | | |
| 130 | 55J | 3.20E-08 | 1 | 1.024E-15 | 1.913E-07 | 6 | 3.6596E-14 | 36 | | | | | | | | |
| 131 | | 3.65E-08 | 1 | 1.3323E-15 | | | | | | | | | | | | |
| 132 | | 3.65E-08 | 1 | 1.3323E-15 | | | | | | | | | | | | |
| 133 | | 2.74E-08 | 1 | 7.5076E-16 | | | | | | | | | | | | |

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| 134 | | 2.76E-08 | 1 | 7.6176E-16 | | | | | | | | | | | | |
| 135 | | 2.88E-08 | 1 | 8.2944E-16 | | | | | | | | | | | | |
| 136 | | 2.91E-08 | 1 | 8.4681E-16 | | | | | | | | | | | | |
| 137 | 58J | 2.93E-08 | 1 | 8.5743E-16 | 2.152E-07 | 7 | 4.6303E-14 | 49 | 4.0648E-07 | 13 | 6.5384615 | 1.7E-13 | 1.271E-14 | 169 | | |
| 138 | | 2.53E-08 | 1 | 6.4009E-16 | | | | | | | | | | | | |
| 139 | | 1.07E-09 | 1 | 1.1449E-18 | | | | | | | | | | | | |
| 140 | | 8.51E-09 | 1 | 7.242E-17 | | | | | | | | | | | | |
| 141 | | 6.24E-08 | 1 | 3.8938E-15 | | | | | | | | | | | | |
| 142 | | 3.88E-08 | 1 | 1.5054E-15 | | | | | | | | | | | | |
| 143 | | 3.85E-08 | 1 | 1.4823E-15 | | | | | | | | | | | | |
| 144 | 62G | 0.00E+00 | 0 | 0 | 1.746E-07 | 6 | 3.0478E-14 | 36 | | | | | | | | |
| 145 | | 1.22E-08 | 1 | 1.4884E-16 | | | | | | | | | | | | |
| 146 | | 3.20E-08 | 1 | 1.024E-15 | | | | | | | | | | | | |
| 147 | | 9.21E-09 | 1 | 8.4824E-17 | | | | | | | | | | | | |
| 148 | | 2.92E-08 | 1 | 8.5264E-16 | | | | | | | | | | | | |
| 149 | | 2.07E-08 | 1 | 4.2849E-16 | | | | | | | | | | | | |
| 150 | | 1.16E-08 | 1 | 1.3456E-16 | | | | | | | | | | | | |
| 151 | 63J | 6.09E-09 | 1 | 3.7088E-17 | 1.21E-07 | 7 | 1.4641E-14 | 49 | 2.9558E-07 | 13 | 6.5384615 | 8.7E-14 | 6.7206E-15 | 169 | | |
| 152 | | 1.70E-08 | 1 | 2.89E-16 | | | | | | | | | | | | |
| 153 | | 9.40E-10 | 1 | 8.836E-19 | | | | | | | | | | | | |
| 154 | | 1.53E-10 | 1 | 2.3409E-20 | | | | | | | | | | | | |
| 155 | | 2.56E-09 | 1 | 6.5536E-18 | | | | | | | | | | | | |
| 156 | | 3.10E-09 | 1 | 9.61E-18 | | | | | | | | | | | | |
| 157 | | 1.73E-09 | 1 | 2.9929E-18 | | | | | | | | | | | | |
| 158 | 70G | 0.00E+00 | 0 | 0 | 2.563E-11 | 6 | 6.5709E-22 | 36 | | | | | | | | |
| 159 | | 2.38E-09 | 1 | 5.6644E-18 | | | | | | | | | | | | |
| 160 | | 2.73E-10 | 1 | 7.4529E-20 | | | | | | | | | | | | |
| 161 | | 1.62E-09 | 1 | 2.6244E-18 | | | | | | | | | | | | |
| 162 | | 8.01E-09 | 1 | 6.416E-17 | | | | | | | | | | | | |
| 163 | | 3.26E-09 | 1 | 1.0628E-17 | | | | | | | | | | | | |
| 164 | | 0.00E+00 | 0 | 0 | | | | | | | | | | | | |
| 165 | 71G | 0.00E+00 | 0 | 0 | 1.554E-08 | 5 | 2.4158E-16 | 25 | | | | | | | | |
| 166 | | 2.58E-08 | 1 | 6.6564E-16 | | | | | | | | | | | | |
| 167 | | 1.14E-09 | 1 | 1.2996E-18 | | | | | | | | | | | | |

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| 168 | | 1.59E-08 | 1 | 2.5281E-16 | | | | | | | | | | | | |
| 169 | | 1.16E-07 | 1 | 1.3456E-14 | | | | | | | | | | | | |
| 170 | | 7.87E-09 | 1 | 6.1937E-17 | | | | | | | | | | | | |
| 171 | | 6.01E-09 | 1 | 3.612E-17 | | | | | | | | | | | | |
| 172 | 72Gh | 0.00E+00 | 0 | 0 | 1.727E-07 | 6 | 2.9832E-14 | 36 | | | | | | | | |
| 173 | | 1.07E-08 | 1 | 1.1449E-16 | | | | | | | | | | | | |
| 174 | | 6.33E-08 | 1 | 4.0069E-15 | | | | | | | | | | | | |
| 175 | | 2.29E-09 | 1 | 5.2441E-18 | | | | | | | | | | | | |
| 176 | | 2.03E-08 | 1 | 4.1209E-16 | | | | | | | | | | | | |
| 177 | | 1.30E-09 | 1 | 1.69E-18 | | | | | | | | | | | | |
| 178 | | 3.52E-09 | 1 | 1.239E-17 | | | | | | | | | | | | |
| 179 | 73G | 3.60E-09 | 1 | 1.296E-17 | 1.05E-07 | 7 | 1.1027E-14 | 49 | 2.933E-07 | 24 | 6.0833333 | 8.6E-14 | 3.5843E-15 | 576 | | |
| 180 | | 6.10E-09 | 1 | 3.721E-17 | | | | | | | | | | | | |
| 181 | | 2.67E-08 | 1 | 7.1289E-16 | | | | | | | | | | | | |
| 182 | | 1.74E-08 | 1 | 3.0276E-16 | | | | | | | | | | | | |
| 183 | | 6.78E-08 | 1 | 4.5968E-15 | | | | | | | | | | | | |
| 184 | | 7.50E-08 | 1 | 5.625E-15 | | | | | | | | | | | | |
| 185 | | 6.36E-09 | 1 | 4.045E-17 | | | | | | | | | | | | |
| 186 | 74G | 1.29E-09 | 1 | 1.6641E-18 | 2.007E-07 | 6 | 4.026E-14 | 36 | | | | | | | | |
| 187 | | 1.03E-08 | 1 | 1.0609E-16 | | | | | | | | | | | | |
| 188 | | 3.21E-09 | 1 | 1.0304E-17 | | | | | | | | | | | | |
| 189 | | 8.09E-09 | 1 | 6.5448E-17 | | | | | | | | | | | | |
| 190 | | 2.18E-08 | 1 | 4.7524E-16 | | | | | | | | | | | | |
| 191 | | 1.08E-08 | 1 | 1.1664E-16 | | | | | | | | | | | | |
| 192 | | 3.01E-09 | 1 | 9.0601E-18 | | | | | | | | | | | | |
| 193 | 76Gh | 0.00E+00 | 1 | 0 | 5.72E-08 | 6 | 3.273E-15 | 36 | | | | | | | | |
| 194 | | 2.83E-08 | 1 | 8.0089E-16 | | | | | | | | | | | | |
| 195 | | 1.29E-08 | 1 | 1.6641E-16 | | | | | | | | | | | | |
| 196 | | 1.99E-08 | 1 | 3.9601E-16 | | | | | | | | | | | | |
| 197 | | 4.33E-09 | 1 | 1.8749E-17 | | | | | | | | | | | | |
| 198 | | 7.01E-09 | 1 | 4.914E-17 | | | | | | | | | | | | |
| 199 | 77G | 0.00E+00 | 0 | 0 | 7.244E-08 | 5 | 5.2476E-15 | 25 | 3.303E-07 | 17 | 5.7058824 | 1.1E-13 | 6.4175E-15 | 289 | | |
| 200 | | 3.30E-08 | 1 | 1.089E-15 | | | | | | | | | | | | |
| 201 | | 2.93E-08 | 1 | 8.5849E-16 | | | | | | | | | | | | |

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| 202 | | 2.44E-08 | 1 | 5.9536E-16 | | | | | | | | | | | | |
| 203 | | 9.78E-08 | 1 | 9.5648E-15 | | | | | | | | | | | | |
| 204 | | 4.10E-08 | 1 | 1.681E-15 | | | | | | | | | | | | |
| 205 | | 3.77E-08 | 1 | 1.4213E-15 | | | | | | | | | | | | |
| 206 | 78G | 0.00E+00 | 0 | 0 | 2.632E-07 | 6 | 6.9274E-14 | 36 | | | | | | | | |
| 207 | | 3.43E-08 | 1 | 1.1765E-15 | | | | | | | | | | | | |
| 208 | | 5.68E-09 | 1 | 3.2262E-17 | | | | | | | | | | | | |
| 209 | | 1.43E-08 | 1 | 2.0449E-16 | | | | | | | | | | | | |
| 210 | | 5.93E-08 | 1 | 3.5165E-15 | | | | | | | | | | | | |
| 211 | | 3.03E-08 | 1 | 9.1809E-16 | | | | | | | | | | | | |
| 212 | | 8.30E-09 | 1 | 6.889E-17 | | | | | | | | | | | | |
| 213 | 79G | 0.00E+00 | 0 | 0 | 1.522E-07 | 6 | 2.3159E-14 | 36 | 4.1538E-07 | 12 | 6 | 1.7E-13 | 1.4378E-14 | 144 | | |
| 214 | | 1.01E-08 | 1 | 1.0201E-16 | | | | | | | | | | | | |
| 215 | | 8.73E-09 | 1 | 7.6213E-17 | | | | | | | | | | | | |
| 216 | | 1.16E-08 | 1 | 1.3456E-16 | | | | | | | | | | | | |
| 217 | | 2.30E-08 | 1 | 5.29E-16 | | | | | | | | | | | | |
| 218 | | 2.04E-08 | 1 | 4.1616E-16 | | | | | | | | | | | | |
| 219 | | 1.16E-08 | 1 | 1.3456E-16 | | | | | | | | | | | | |
| 220 | 78J | 9.25E-09 | 1 | 8.5563E-17 | 9.468E-08 | 7 | 8.9643E-15 | 49 | 9.468E-08 | 7 | 7 | 9E-15 | 1.2806E-15 | 49 | | |
| 221 | | 6.31E-09 | 1 | 3.9816E-17 | | | | | | | | | | | | |
| 222 | | 3.34E-08 | 1 | 1.1156E-15 | | | | | | | | | | | | |
| 223 | | 9.49E-09 | 1 | 9.006E-17 | | | | | | | | | | | | |
| 224 | | 1.46E-08 | 1 | 2.1316E-16 | | | | | | | | | | | | |
| 225 | | 2.46E-08 | 1 | 6.0516E-16 | | | | | | | | | | | | |
| 226 | | 1.33E-08 | 1 | 1.7689E-16 | | | | | | | | | | | | |
| 227 | 79J | 1.73E-08 | 1 | 2.9929E-16 | 1.19E-07 | 7 | 1.4161E-14 | 49 | 1.19E-07 | 7 | 7 | 1.4E-14 | 2.023E-15 | 49 | 4.75116E-06 | 212 |
| 228 | | | 214 | | 1.44E-07 | 212 | | 1374 | | 212 | 105.48152 | | | 3322 | | |
| 229 | | | | | | | | | | | | | | | | |
| 230 | | **S0 =** | **2.176E-13** | | **S1 =** | **1.817E-13** | | | **S2 =** | **1.69E-13** | | | | | **S3 =** | **1.06479E-13** |
| 231 | | **C0 =** | **227** | | **C1 =** | **33** | | | **C2 =** | **16** | | | | | **C3 =** | **1** |
| 232 | | d.o.f. = | 194 | | d.o.f. = | 17 | | | d.o.f. = | 15 | | | | | | |
| 233 | | s.o.sqr. = | 3.585E-14 | | s.o.sqr. = | 1.273E-14 | | | s.o.sqr. = | 6.252E-14 | | | | | | |
| 234 | | m.sqr. = | 1.848E-16 | | m.sqr. = | 7.49E-16 | | | m.sqr. = | 4.168E-15 | | | | | | |
| 235 | | | | | | | | | | | | | | | | |

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| 238 | **Gamma ij** | | | | |
| 239 | | **0** | **1** | **2** | **3** |
| 240 | **3** | 1 | 6.48 | 15.67 | 227 |
| 241 | **2** | 16 | 105.48 | 227 | |
| 242 | **1** | 33 | 227 | | |
| 243 | **0** | 227 | | | |
| 244 | | | | | |
| 245 | **kij** | | | | |
| 246 | | **0** | **1** | **2** | |
| 247 | **2** | 15 | 99.00 | 211.33 | |
| 248 | **1** | 17 | 121.52 | | |
| 249 | **0** | 194 | | | |