The Effect of the Mixing Ratio of Fly Ash and Paper Industry Sludge on Hydraulic Conductivity

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THE EFFECT OF THE MIXING RATIO OF FLY ASH AND PAPER INDUSTRY SLUDGE ON HYDRAULIC CONDUCTIVITY

BY

CHRISTINE J. LUPU

A Thesis submitted in partial fulfillment for The Bachelor of Science Degree

Western Michigan University
Kalamazoo, Michigan
April, 1991
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INTRODUCTION

Groundwater contamination is a large concern for everyone. Because of this many precautions are being taken to protect the groundwater. In addition, the availability of landfill area is decreasing because of the difficulty in siting new landfills due to the latest legislation. Therefore, landfill and/or design alternatives must be created to reduce the increasing cost of landfilling.

Two of the major sources of waste produced by the pulp and paper industry are wastewater treatment sludge and fly ash from the combustion of wood waste and coal. The current disposal method of these two wastes are in landfills. Alternatives are being looked at for disposing of the sludge including spreading on agricultural land or using it as a hydraulic barrier material for landfills.

Clay is the most common hydraulic barrier material because of its low hydraulic conductivity. Hydraulic conductivity is the measure of the ability of a material to transmit water(1). Research has been conducted showing that certain sludge could also be used as a hydraulic barrier(1,2). This could be economically beneficial to pulp and paper companies knowing that if clay is not readily available, waste generated on site could potentially be used as an alternative. A variation to this would be the use of a mixture of fly ash and sludge as a hydraulic barrier. Research has been
conducted describing some of the properties of pulp and paper industry sludge mixed with fly ash but the effect of this mixing on hydraulic conductivity has not been studied. This design project was proposed to do that.

BACKGROUND INFORMATION

Fly Ash

Fly ash is the finer portion of the residue from the combustion of sludge, wood wastes and coal. One typical collection device for fly ash is electrostatic precipitators. Disposal has been a great concern. Only 20% of it is being used and the remaining 80% is now disposed of on land(3). One use of fly ash has been as a pozzolanic material in cement. Research has also been conducted on the feasibility of using fly ash alone as a liner material(4). According to Edil, development of fly ash as a chemically resistant waste liner material may provide a new and cost-effective alternative to soil and synthetic liners. Fly ash or fly ash-stabilized soils if effective would have potential for use as a liner at fly ash and/or scrubber sludge landfill sites, non hazardous waste lagoons, industrial, mining and hazardous waste facilities, and in slurry trenches.

Fly ash physical and chemical characteristics can affect its strength, durability and hydraulic conductivity properties. Bowders found average hydraulic conductivities of
ash/stabilizer mixtures higher than the maximum value of 1x10^{-7} \text{ cm/s} established by most regulatory agencies (3).

A study of fly ash used as liner material was conducted by Edil et al. (4). During the set up of the permeability test it was noticed that there were constraints on the time available for compaction after the fly ash and water was mixed. After 30 minutes the material began to set and harden. Since this would pose difficulties in field construction, a study was run to examine the effect of compaction conditions on the resulting density and permeability. Results from this study showed that to obtain permeabilities less than the maximum would require careful selection of compaction conditions and perhaps the use of set retarders. Another test conducted showed the effect of wet/dry cycles and freeze/thaw cycles on the permeability of the fly ash. It was determined that the permeability was not significantly effected by those cycles which are typical of northern climates.

In an attempt to learn the hydraulic conductivity values, Vesperman et al. studied the effect of combining fly ash and sand (5). Some of the results of fly ash and sand included (a) moisture content at compaction had a greater effect on density and permeability, (b) compaction had only a small effect on density and the effect on permeability was not noticeable, (c) at the 40% fly ash-60% sand level, the permeability of the sample was essentially identical to the 100% fly ash sample.
**Sludge**

Pulp and paper mill sludges are a mixture of organic and inorganic solids and water. Wood fibers and bio-mass are the organic materials. Fillers such as clay and calcium carbonate are examples of the inorganic materials. Traditionally, paper mill sludge has been disposed of in landfills. Recently though, alternatives for sludge disposal have been tried. These include land spreading for soil conditioning and containment barriers(2).

The National Council of the Paper Industry for Air and Stream Improvement (NCASI) studied 15 sludges and 8 fly ashes from the pulp and paper industry to predict their ability to be used as a hydraulic barrier(1). It was found that the sludges had hydraulic conductivities between $10^{-4}$ and $10^{-8}$ cm/sec. NCASI concluded that several of the sludges would be suitable as a hydraulic barrier material.

Helm (6) studied the possibility of the use of combined fly ash and wastewater sludge for use in structural fill. Desirable permeabilities for the mixtures were below $20 \times 10^{-7}$ cm/sec. Some biological decomposition occurred with mixtures containing more than 20% sludge. A decrease in permeability and strength was observed as the sludge content increased.
PROCEDURE

There are two common types of permeameters, rigid-wall and flexible-wall, that are used for the determination of hydraulic conductivity. The difference in these are that flexible-wall permeameters minimize the effect of side-wall flow but are costly and difficult to operate. Rigid-wall permeameters may simulate the worst case scenario for liner material tests(3). Cracking is an undesirable property. Even though a high strength, high durability and low permeability liner is preferred, a certain amount of flexibility is desired to avoid cracking(5). A rigid-wall permeameter will be used because it will give the most accurate example of true operating conditions. A procedure modified by NCASI for running the permeameters was used.

To minimize changes in hydraulic conductivity which can result from biological activity within the samples, the hydraulic conductivity determinations were run at 10 degrees Celsius. Back pressure was also applied at approximately 60 psi to maximize sample saturation. In an attempt to simulate compactive stress on typical landfill cover materials twenty-five pounds of lead weights which is equivalent to two and a half feet of overburden was applied to each sample.

The fly ash was obtained from a local paper mill burning pulverized coal in the boiler. The fly ash is sprayed down with water for dust control before being transported to a
local type III landfill. Combined sludge was also obtained from a local mill. Primary and secondary treatment are used in the wastewater treatment plant. The combined sludge is dewatered by a belt filter press and then transported to a landfill. The sludge and fly ash were placed in double lined and sealed plastic bags and stored at 10 degrees Celsius until testing began.

Seven permeameters were assembled to determine hydraulic conductivity. Tap water was used as the permeant for all permeameters. The organization of the seven permeameters according to sample and ratio are listed in Table 1.

**TABLE 1** SUMMARY OF PERMEAMETER SAMPLES

<table>
<thead>
<tr>
<th>PERMEAMETER</th>
<th>RATIOS USED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2</td>
<td>30% FLY ASH/70% SLUDGE</td>
</tr>
<tr>
<td>3, 4</td>
<td>50% FLY ASH/50% SLUDGE</td>
</tr>
<tr>
<td>5, 6</td>
<td>70% FLY ASH/30% SLUDGE</td>
</tr>
<tr>
<td>7</td>
<td>100% SLUDGE</td>
</tr>
</tbody>
</table>

**Figure 1** presents a schematic of a rigid-wall permeameter. Clear acrylic cylinders of approximately 4 inch inner diameter and 3/4 inch wall thickness were used for the permeameters and the influent and effluent burettes. The influent and effluent burettes were long enough to allow for
FIGURE 1  RIGID-WALL PERMEAMETER DESIGN
large time delays before refilling and good visual inspection during the course of testing.

Before the fly ash and sludge samples were compacted, a moisture-density relationship was performed to determine the optimum moisture content of the fly ash. Dry bulk density of a soil upon compaction is a function of its water content. Usually the dry bulk density increases with increasing moisture content until a maximum dry bulk density is reached. This moisture content is referred to as the optimum moisture content. This relationship is significant because the minimum hydraulic conductivity for soils usually occurs at or near the maximum density(7). All fly ash samples were adjusted to this optimum point. The test was performed according to ASTM method D698. Unexplained errors occurred in the first trial of that test. Procedures were reviewed and it was performed again.

The fly ash and sludge were cured in double plastic bags for 24 hours. Following curing the fly ash and sludge were mixed at the respective ratios: 70/30, 50/50 and 30/70. The samples were then allowed to cure another 48 hours. Compaction into the permeameters was accomplished following the NCASI version of ASTM D698. The inside wall of the chamber was coated with silicone grease to minimize side-wall flow. Silicone coated rubber gaskets were also used to seal the ends of the cylinders preventing leakage. The permeameters and the influent burette were then filled with
permeant and connections were made to the nitrogen gas tank, the back pressure supply source. The influent and effluent burettes water levels were marked for date and time to establish a reference point. Over the next two months, the flow of permeant through each sample was monitored.

**Hydraulic Conductivity**

The hydraulic conductivity in the rigid-wall permeameters were calculated using Darcy's Law:

\[ Q = KA_i \]

where

- \( Q \) = the average flow rate, ml/sec
- \( K \) = hydraulic conductivity, cm/sec
- \( A \) = sample cross sectional area, cm\(^2\)
- \( i \) = hydraulic gradient, unitless

the average flow rate was determined by:

\[ Q = (h_ia_i + h_ea_e)/2t \]

where

- \( h_i \) = change in permeant level in influent burette, cm
- \( a_i \) = cross-sectional area of influent burette, cm\(^2\)
- \( h_e \) = change in permeant level in effluent burette, cm
- \( a_e \) = cross-sectional area of effluent burette, cm\(^2\)

Hydraulic conductivity values were then corrected to the reference temperature of 20 degrees Celsius to account for changes in permeant viscosity and density due to temperature.
Pore volume, or the total void volume in a sample, was determined. The calculation for pore volume is as follows:

\[ V_p = V - \left( \frac{W S_c}{100 G_s q_o} \right) \]

where

- \( V_p \) = pore volume, cc
- \( V' \) = sample volume, cc
- \( W \) = weight of sample, g
- \( S_c \) = solids content of sample
- \( G_s \) = specific gravity, unitless
- \( q_o \) = density of water at 4 degrees C

The calculation for the pore volumes of permeant passed into the sample at a given time is:

\[ P_v = \frac{Q_T}{V_p} \]

where

- \( P_v \) = pore volumes passed, unitless
- \( Q_T \) = cumulative volume of flow of permeant into sample, cc
- \( V_p \) = pore volume, cc

A NCASI computer program was used to calculate hydraulic conductivities for each of the permeameters. Appendix A contains statistics to determine steady state. Linear regression was used to find the slope of the line of best fit through the last five points. A steady state was obtained if the slope was not statistically different from zero at the 95-percent confidence level. This was found by determining the R value and comparing it to a significant value table. If the slope was statistically different the test was run again using the last ten points. The last reading was reported if steady state was not obtained.
RESULTS

The testing for hydraulic conductivity was run performed over a two month period. Table 2 lists each permeameter sample and its final hydraulic conductivity. Appendix A contains the linear regression and R values to determine steady state. Figures 2a, 3a and 4a represent typical trends for hydraulic conductivity with respect to pore volume. Figures 2b, 3b and 4b show trends with sample length with respect to pore volume.

Hydraulic conductivity values and sample length measurements were plotted against pore volume data for each permeameter and can be found in Appendix B. Appendix C contains computer generated data from original raw data.

The sample with the ratio of 30% fly ash/70% sludge in permeameters 1 and 2 shown conductivities in the range of \(0.93 \times 10^{-7}\) to \(1.2 \times 10^{-7}\) cm/sec. Permeameters 3 and 4 containing the 50% fly ash/50% sludge ratio, shown conductivities in the range of \(4.0 \times 10^{-7}\) to \(4.5 \times 10^{-7}\) cm/sec. Conductivities ranging from \(3.74 \times 10^{-8}\) to \(21.3 \times 10^{-8}\) were found in permeameters 5 and 6, which contained the 70% fly ash/30% sludge ratio. The final permeameter, number 7, contained a 100% sludge sample and had a conductivity of \(2.1 \times 10^{-8}\) cm/sec.
FIGURE 2a  HYDRAULIC CONDUCTIVITY OF 30/70 RATIO, PERMEAMETER 2

FIGURE 2b  SAMPLE LENGTH OF 30/70 RATIO, PERMEAMETER 2
FIGURE 3a  HYDRAULIC CONDUCTIVITY OF 50/50 RATIO, PERMEAMETER 3

HYDRAULIC CONDUCTIVITY - v - PORE VOLUME

50% Fly Ash, 50% Sludge (a)

FIGURE 3b  SAMPLE LENGTH OF 50/50 RATIO, PERMEAMETER 3

SAMPLE LENGTH - v - PORE VOLUME

50% Fly Ash, 50% Sludge (a)
FIGURE 4a HYDRAULIC CONDUCTIVITY OF 50/50 RATIO, PERMEAMETER 4

HYDRAULIC CONDUCTIVITY - v - PORE VOLUME

FIGURE 4b SAMPLE LENGTH OF 50/50 RATIO, PERMEAMETER 4

SAMPLE LENGTH - v - PORE VOLUME
TABLE 2 SUMMARY OF HYDRAULIC CONDUCTIVITIES, (cm/sec)

<table>
<thead>
<tr>
<th>PERMEAMETER</th>
<th>SAMPLE</th>
<th>STEADY STATE H.C. READING (TIMES 10E-6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30% Fly Ash/70% Sludge</td>
<td>.12</td>
</tr>
<tr>
<td>2</td>
<td>30% Fly Ash/70% Sludge</td>
<td>.09</td>
</tr>
<tr>
<td>3</td>
<td>50% Fly Ash/50% Sludge</td>
<td>.40</td>
</tr>
<tr>
<td>4</td>
<td>50% Fly Ash/50% Sludge</td>
<td>.45</td>
</tr>
<tr>
<td>5</td>
<td>70% Fly Ash/30% Sludge</td>
<td>3.74 (1)</td>
</tr>
<tr>
<td>6</td>
<td>70% Fly Ash/30% Sludge</td>
<td>21.30</td>
</tr>
<tr>
<td>7</td>
<td>100% Sludge</td>
<td>.02</td>
</tr>
</tbody>
</table>

(1) Hydraulic conductivity values not at steady state. Last reading reported.

DISCUSSION

The ratios tested in permeameters 1 and 2 exhibited lower hydraulic conductivity than those in permeameters 3, 4, 5, and 6. Permeameter 7 containing the 100% sludge achieved the lowest hydraulic conductivity.

Typical results in Figures 2a, 3a and 4a show a decrease in hydraulic conductivity with respect to pore volume. This decrease may be caused by sample consolidation or biological activity.

As represented in Figures 2b, 3b and 4b, sample length decreased (7% to 26% of original sample length) with respect
to pore volume for all samples. With the available pore volume decreased by sample consolidation, the resistance to flow increases. This is the most probable cause for decreasing hydraulic conductivity.

CONCLUSIONS

The results of the hydraulic conductivity determination indicate that the ratio of sludge in a sample does effect the hydraulic conductivity. The hydraulic conductivity increased during the early portion of the test followed by a decrease over time. The reduction in hydraulic conductivity appeared to be caused by the consolidation due to overburden stress on the sample. In comparing the hydraulic conductivity results with those of 100% sludge it would not be advantageous to use this sludge in a fly ash/sludge mixture for hydraulic barrier material.

RECOMMENDATIONS

Further research should be done to determine the effect of the mixing ratio on leachate. Also, the measurement of hydraulic conductivity should be conducted for a greater period of time. Another possible avenue of research could be noting the effect of different types of sludge/fly ash mixtures and their effect on hydraulic conductivity.
REFERENCES


APPENDIX A

STATISTICAL ANALYSIS RESULTS
<table>
<thead>
<tr>
<th></th>
<th>sample 1</th>
<th>sample 2</th>
<th>sample 3</th>
<th>sample 4</th>
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<tbody>
<tr>
<td>Constant</td>
<td>0.0000000137</td>
<td>0.00000000345</td>
<td>0.00000000505</td>
<td>0.00000002238</td>
</tr>
<tr>
<td>Std Err of Y Est</td>
<td>0.00000000104</td>
<td>0.00000000038</td>
<td>0.000000002286</td>
<td>0.00000001661</td>
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<tr>
<td>R Squared</td>
<td>0.2885942631</td>
<td>0.6442816828</td>
<td>0.730856519</td>
<td>0.6235055119</td>
</tr>
<tr>
<td>No. of Observations</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Degrees of Freedom</td>
<td>3</td>
<td>3</td>
<td>3</td>
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</tr>
<tr>
<td>X Coefficient(s)</td>
<td>-0.000000076</td>
<td>0.00000002758</td>
<td>0.0000000691</td>
<td>0.00000002297</td>
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<tr>
<td>Std Err of Coef.</td>
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<td>0.0000001183</td>
<td>0.0000002286</td>
<td>0.0000001031</td>
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<tr>
<td>R</td>
<td>0.5372097013</td>
<td>0.8026715909</td>
<td>0.8549014674</td>
<td>0.7896236521</td>
</tr>
<tr>
<td>Regression Output:</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>-------------------------</td>
<td>----------------------------------------------</td>
<td></td>
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<td>Constant</td>
<td>0.00000004485</td>
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<td>Std Err of Y Est</td>
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<td>No. of Observations</td>
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<td>Degrees of Freedom</td>
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<td>X Coefficient(s)</td>
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<td>Std Err of Coef.</td>
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<tr>
<td>R</td>
<td>0.9232881999</td>
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<td>Std Err of Y Est</td>
<td>0.0000146836</td>
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<td>R Squared</td>
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<td>No. of Observations</td>
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<tr>
<td>Degrees of Freedom</td>
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<td>X Coefficient(s)</td>
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<td>0.0000062525</td>
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<td>R</td>
<td>0.0091561147</td>
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</table>

<table>
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<th>Regression Output:</th>
<th>sample 7</th>
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<tbody>
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<td>Constant</td>
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<td>Std Err of Y Est</td>
<td>0.0000000023</td>
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<tr>
<td>R Squared</td>
<td>0.5160702053</td>
</tr>
<tr>
<td>No. of Observations</td>
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<tr>
<td>Degrees of Freedom</td>
<td>3</td>
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<tr>
<td>X Coefficient(s)</td>
<td>0.0000000087</td>
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<tr>
<td>Std Err of Coef.</td>
<td>0.0000000049</td>
</tr>
<tr>
<td>R</td>
<td>0.7183802651</td>
</tr>
</tbody>
</table>
APPENDIX B

FIGURES OF FLY ASH/SLUDGE HYDRAULIC CONDUCTIVITY RESULTS
HYDRAULIC CONDUCTIVITY - v - PORE VOLUME

30% Fly Ash, 70% Sludge (b)

SAMPLE LENGTH - v - PORE VOLUME

30% Fly Ash, 70% Sludge (b)
HYDRAULIC CONDUCTIVITY vs PORE VOLUME

50% Fly Ash, 50% Sludge (b)

SAMPLE LENGTH vs PORE VOLUME

50% Fly Ash, 50% Sludge (b)
HYDRAULIC CONDUCTIVITY $\text{v}$ PORE VOLUME

70% Fly Ash, 30% Sludge (b)

SAMPLE LENGTH $\text{v}$ PORE VOLUME

70% Fly Ash, 30% Sludge (b)
APPENDIX C

COMPUTER GENERATED DATA
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 1
RUN: T-RW-L-003-A
READING NO: 1

START OF READING (MONTH/DAY/HOUR/MINUTE): 1 / 22 / 13 / 16
END OF READING: 1 / 23 / 16 / 55

SAMPLE CHAMBER NO: 8
INFLUENT STANDPIPE NO: 53
EFFLUENT STANDPIPE NO: 53

AREA (cm²): 80.35
AREA (cm²): 80.36
AREA (cm²): 80.36

BACK PRESSURE (psi): 60

INFLUENT LEVEL CHANGE (cm): .2900009
EFFLUENT LEVEL CHANGE (cm): .3699989

INFLOW (cm³): 23.30448
OUTFLOW (cm³): 29.73312

PERCENT FLOW DIFF (IN & OUT): 24.24183
AVERAGE FLOWRATE (cm³/sec): 2.664135E-04

ELAPSED TIME (sec): 99540

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm²/sec): 3.356179E-06

SAMPLE LENGTH AT START (cm): 5.283334
SAMPLE LENGTH AT END (cm): 5.083334
AVG SAMPLE LENGTH OVER READING (cm): 5.183334

HYDRAULIC GRADIENT: 15.31447

VIScosITY CORRECTION FACTOR: 1.267959
HYDRAULIC CONDUCTIVITY @ 11 °C = 2.165052E-07 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C = 2.745198E-07 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 1
RUN: T-RW-L-003-A  READING NO: 2

START OF READING (MONTH/DAY/HOUR/MINUTE): 1/23/16/55
END OF READING: 1/24/15/30

SAMPLE CHAMBER NO : 8  AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53  AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53  AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): .2899971
EFFLUENT LEVEL CHANGE (cm): .3900013
INFLOW (cm³): 23.30417
OUTFLOW (cm³): 31.3405
PERCENT FLOW DIFF (IN & OUT): 29.41307
AVERAGE FLOWRATE (cm³/sec): 3.360681E-04

ELAPSED TIME (sec): 81300

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm²/sec): 4.233662E-06

SAMPLE LENGTH AT START (cm) : 5.083334
SAMPLE LENGTH AT END (cm) : 4.95
AVG SAMPLE LENGTH OVER READING (cm): 5.016667

HYDRAULIC GRADIENT: 15.82326
VISCOSEITY CORRECTION FACTOR: 1.323589
HYDRAULIC CONDUCTIVITY @ 9.5 °C= 2.643294E-07 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C= 3.498635E-07 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 1
RUN: T-RW-L-003-A READING NO: 3

START OF READING (MONTH/DAY/HOUR/MINUTE): 1 / 24 / 15 / 30
END OF READING : 1 / 25 / 17 / 40

SAMPLE CHAMBER NO : 8     AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53 AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53 AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 0
EFFLUENT LEVEL CHANGE (cm): 0
INFLOW (cm³): 0
OUTFLOW (cm³): 0
PERCENT FLOW DIFF (IN & OUT): 1.701412E+38
AVERAGE FLOWRATE (cm³/sec): 0

ELAPSED TIME (sec): 94200

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm²/sec): 0

SAMPLE LENGTH AT START (cm) : 4.95
SAMPLE LENGTH AT END (cm) : 4.85
AVG SAMPLE LENGTH OVER READING (cm): 4.9

HYDRAULIC GRADIENT: 16.2
VISCOSITY CORRECTION FACTOR: 1.304629
HYDRAULIC CONDUCTIVITY @ 10 °C = 0 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C= 0 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 1
RUN: T-AW-L-003-A  READING NO: 4

START OF READING (MONTH/DAY/HOUR/MINUTE): 1 / 26 / 12 / 40
END OF READING : 1 / 28 / 8 / 35

SAMPLE CHAMBER NO : 8  AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53  AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53  AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): .2299996
EFFLUENT LEVEL CHANGE (cm): 0
INFLOW (cm³): 18.48276
OUTFLOW (cm³): 0
PERCENT FLOW DIFF (IN & OUT): 200
AVERAGE FLOWRATE (cm³/sec): 5.845276E-05

ELAPSED TIME (sec): 158100

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm²/sec): 7.363664E-07

SAMPLE LENGTH AT START (cm) : 4.85
SAMPLE LENGTH AT END (cm) : 4.783334
AVG SAMPLE LENGTH OVER READING (cm): 4.816667

HYDRAULIC GRADIENT: 16.48028
VISCOSITY CORRECTION FACTOR: 1.342982
HYDRAULIC CONDUCTIVITY @ 9 °C = 4.414227E-08 cm/sec

HYDRAULIC CONDUCTIVITY @ 20 °C = 5.928228E-08 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 1
RUN: T-RW-L-003-A
READING NO: 5

START OF READING (MONTH/DAY/HOUR/MINUTE): 1 / 28 / 8 / 35
END OF READING: 2 / 5 / 15 / 20

SAMPLE CHAMBER NO: 8
INFLUENT STANDPIPE NO: 53
EFFLUENT STANDPIPE NO: 53

AREA (cm²): 80.35
AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 0
EFFLUENT LEVEL CHANGE (cm): 0
INFLOW (cm³): 0
OUTFLOW (cm³): 0
PERCENT FLOW DIFF (IN & OUT): 1.701412E+38
AVERAGE FLOWRATE (cm³/sec): 0

ELAPSED TIME (sec): 715500

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm²/sec): 0

SAMPLE LENGTH AT START (cm): 4.783334
SAMPLE LENGTH AT END (cm): 4.783334
AVG SAMPLE LENGTH OVER READING (cm): 4.783334

HYDRAULIC GRADIENT: 16.5951
VISCOSITY CORRECTION FACTOR: 1.323589
HYDRAULIC CONDUCTIVITY @ 9.5 °C = 0 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C = 0 cm/sec
SAMPLE: FLY ASH/SLUDGE 1
RUN: T-RW-L-003-A READING NO: 6

START OF READING (MONTH/DAY/HOUR/MINUTE): 2 / 5 / 15 / 20
END OF READING: 2 / 10 / 11 / 30

SAMPLE CHAMBER NO : 8 AREA (cm$^2$): 80.35
INFLUENT STANDPIPE NO: 53 AREA (cm$^2$): 80.36
EFFLUENT STANDPIPE NO: 53 AREA (cm$^2$): 80.36
BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 0
EFFLUENT LEVEL CHANGE (cm): 0
INFLOW (cm$^3$): 0
OUTFLOW (cm$^3$): 0
PERCENT FLOW DIFF (IN & OUT): 1.701412E+38
AVERAGE FLOWRATE (cm$^3$/sec): 0

ELAPSED TIME (sec): 418200

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm$^2$/sec): 0

SAMPLE LENGTH AT START (cm) : 4.783334
SAMPLE LENGTH AT END (cm) : 4.65
AVG SAMPLE LENGTH OVER READING (cm): 4.716667

HYDRAULIC GRADIENT: 16.82968
VISCOSITY CORRECTION FACTOR: 1.304629
HYDRAULIC CONDUCTIVITY @ 10 °C = 0 cm/sec

HYDRAULIC CONDUCTIVITY @ 20 °C = 0 cm/sec
SAMPLE: FLY ASH/SLUDGE 1
RUN: T-RW-L-003-A READING NO: 7

START OF READING (MONTH/DAY/HOUR/MINUTE): 2 / 10 / 11 / 30
END OF READING: 2 / 25 / 11 / 35

SAMPLE CHAMBER NO: 8 AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53 AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53 AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 1.5
EFFLUENT LEVEL CHANGE (cm): 2.24
INFLOW (cm³): 120.54
OUTFLOW (cm³): 180.0064
PERCENT FLOW DIFF (IN & OUT): 39.57218
AVERAGE FLOWRATE (cm³/sec): 1.159247E-04

ELAPSED TIME (sec): 1296300

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm²/sec): 1.460377E-06

SAMPLE LENGTH AT START (cm): 4.65
SAMPLE LENGTH AT END (cm): 4.783334
AVG SAMPLE LENGTH OVER READING (cm): 4.716667

HYDRAULIC GRADIENT: 16.82968
VISCOSITY CORRECTION FACTOR: 1.304629
HYDRAULIC CONDUCTIVITY @ 10 °C = 8.572632E-08 cm/sec

HYDRAULIC CONDUCTIVITY @ 20 °C = 1.11841E-07 cm/sec
SAMPLE: FLY ASH/SLUDGE 1
RUN: T-RW-L-003-A  READING NO: 8

START OF READING (MONTH/DAY/HOUR/MINUTE): 2 / 25 / 11 / 35
END OF READING: 2 / 28 / 12 / 10

SAMPLE CHAMBER NO: 8  AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53  AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53  AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): .2799988
EFFLUENT LEVEL CHANGE (cm): .1700001
INFLOW (cm³): 22.5007
OUTFLOW (cm³): 13.66121
PERCENT FLOW DIFF (IN & OUT): 48.88844
AVERAGE FLOW RATE (cm³/sec): 6.919615E-05

ELAPSED TIME (sec): 261300

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm²/sec): 8.717076E-07

SAMPLE LENGTH AT START (cm): 4.783334
SAMPLE LENGTH AT END (cm): 4.783334
AVG SAMPLE LENGTH OVER READING (cm): 4.783334

HYDRAULIC GRADIENT: 16.59512
VISCOSITY CORRECTION FACTOR: 1.304629
HYDRAULIC CONDUCTIVITY @ 10 °C: 5.189382E-08 cm/sec

HYDRAULIC CONDUCTIVITY @ 20 °C: 6.770218E-08 cm/sec
SAMPLE: FLY ASH/SLUDGE 1
RUN: T-RW-L-003-A READING NO: 9

START OF READING (MONTH/DAY/HOUR/MINUTE): 2 / 28 / 12 / 10
END OF READING : 3 / 7 / 19 / 10

SAMPLE CHAMBER NO : 8    AREA (cm²):  80.35
INFLUENT STANDPIPE NO: 53  AREA (cm²):  80.36
EFFLUENT STANDPIPE NO: 53  AREA (cm²):  80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): .7700005
EFFLUENT LEVEL CHANGE (cm): .9600001
INFLOW (cm³): 61.87724
OUTFLOW (cm³): 77.14568
PERCENT FLOW DIFF (IN & OUT): 21.96536
AVERAGE FLOWRATE (cm³/sec): 1.103357E-04

ELAPSED TIME (sec): 630000

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm²/sec): 1.389968E-06

SAMPLE LENGTH AT START (cm) : 4.783334
SAMPLE LENGTH AT END (cm) : 4.683333
AVG SAMPLE LENGTH OVER READING (cm): 4.733333

HYDRAULIC GRADIENT: 16.77042
VISCOOSITY CORRECTION FACTOR: 1.267959
HYDRAULIC CONDUCTIVITY @ 11 ° C= 8.188154E-08 cm/sec

HYDRAULIC CONDUCTIVITY @ 20 ° C= 1.038225E-07 cm/sec
SAMPLE: FLY ASH/SLUDGE 1
RUN: T-RW-L-003-A
READING NO: 10

START OF READING (MONTH/DAY/HOUR/MINUTE): 3 / 7 / 19 / 10
END OF READING : 3 / 11 / 10 / 40

SAMPLE CHAMBER NO : 8   AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53   AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53   AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): .6000004
EFFLUENT LEVEL CHANGE (cm): .4599991
INFLOW (cm³): 48.21603
OUTFLOW (cm³): 36.96553
PERCENT FLOW DIFF (IN & OUT): 26.41535
AVERAGE FLOWRATE (cm³/sec): 1.352088E-04

ELAPSED TIME (sec): 315000

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm²/sec): 1.703311E-06

SAMPLE LENGTH AT START (cm) : 4.683333
SAMPLE LENGTH AT END (cm) : 4.683333
AVG SAMPLE LENGTH OVER READING (cm): 4.683333

HYDRAULIC GRADIENT: 16.94947
VISCOSITY CORRECTION FACTOR: 1.267959
HYDRAULIC CONDUCTIVITY @ 11 ° C= 9.92803E-08 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C= 1.258834E-07 cm/sec
SAMPLE: FLY ASH/SLUDGE 1
RUN: T-RW-L-003-A
READING NO: 11

START OF READING (MONTH/DAY/HOUR/ MINUTE): 3 / 11 / 10 / 40
END OF READING: 3 / 18 / 15 / 15

SAMPLE CHAMBER NO: 8
AREA (cm^2): 80.35
INFLUENT STANDPIPE NO: 53
AREA (cm^2): 80.36
EFFLUENT STANDPIPE NO: 53
AREA (cm^2): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 1
EFFLUENT LEVEL CHANGE (cm): 1.02
INFLOW (cm^3): 80.36
OUTFLOW (cm^3): 81.96724
PERCENT FLOW DIFF (IN & OUT): 1.980245
AVERAGE FLOWRATE (cm^3/sec): 1.306352E-04

ELAPSED TIME (sec): 621300

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm^2/sec): 1.645694E-06

SAMPLE LENGTH AT START (cm): 4.683333
SAMPLE LENGTH AT END (cm): 4.65
AVG SAMPLE LENGTH OVER READING (cm): 4.666667

HYDRAULIC GRADIENT: 17.01
VISCOSITY CORRECTION FACTOR: 1.28609
HYDRAULIC CONDUCTIVITY @ 10.5 °C = 9.558062E-08 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C = 1.229253E-07 cm/sec
SAMPLE: FLY ASH/SLUDGE 1
RUN: T-RW-L-003-A

START OF READING (MONTH/DAY/HOUR/ MINUTE): 3/18/15/15
END OF READING : 3/22/16/10

SAMPLE CHAMBER NO : 8
AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53
AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53
AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): .58
EFFLUENT LEVEL CHANGE (cm): .5200005
INFLOW (cm³): 46.6088
OUTFLOW (cm³): 41.78724
PERCENT FLOW DIFF (IN & OUT): 10.909
AVERAGE FLOWRATE (cm³/sec): 1.266782E-04

ELAPSED TIME (sec): 348900

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm²/sec): 1.595845E-06

SAMPLE LENGTH AT START (cm) : 4.65
SAMPLE LENGTH AT END (cm) : 4.65
AVG SAMPLE LENGTH OVER READING (cm): 4.65

HYDRAULIC GRADIENT: 17.07097
VISCOSITY CORRECTION FACTOR: 1.28609
HYDRAULIC CONDUCTIVITY @ 10.5 ° C= 9.235445E-08 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C= 1.187761E-07 cm/sec
SAMPLE: FLY ASH/SLUDGE 1
RUN: T-RW-L-003-A      READING NO: 13

START OF READING (MONTH/DAY/HOUR/ MINUTE):  3 / 22 / 16 / 10
END OF READING:  3 / 25 / 14 / 35

SAMPLE CHAMBER NO : 8     AREA (cm²):  80.35
INFLUENT STANDPIPE NO: 53   AREA (cm²):  80.36
EFFLUENT STANDPIPE NO: 53   AREA (cm²):  80.36

BACK PRESSURE (psi):  60
INFLUENT LEVEL CHANGE (cm): .4400006
EFFLUENT LEVEL CHANGE (cm): .4699974
INFLOW (cm³):  35.35845
OUTFLOW (cm³):  37.76899
PERCENT FLOW DIFF (IN & OUT):  6.592726
AVERAGE FLOWRATE (cm³/sec):  1.442356E-04

ELAPSED TIME (sec):  253500

HYDRAULIC HEAD (cm):  79.38
SYSTEM RESISTANCE (cm²/sec):  1.817027E-06

SAMPLE LENGTH AT START (cm) :  4.65
SAMPLE LENGTH AT END (cm) :  4.583334
AVG SAMPLE LENGTH OVER READING (cm):  4.616667

HYDRAULIC GRADIENT:  17.19422
VISCOITY CORRECTION FACTOR:  1.267959
HYDRAULIC CONDUCTIVITY @ 11 °C= 1.044008E-07 cm/sec

HYDRAULIC CONDUCTIVITY @ 20 °C= 1.32376E-07 cm/sec
SAMPLE: FLY ASH/SLUDGE 2
RUN: T-RW-L-003-B
READING NO: 1

START OF READING (MONTH/DAY/HOUR/MINUTE): 1 / 22 / 13 / 16
END OF READING: 1 / 23 / 16 / 55

SAMPLE CHAMBER NO: 8
INFLUENT STANDPIPE NO: 53
EFFLUENT STANDPIPE NO: 53

AREA (cm²): 80.35
AREA (cm²): 80.36
AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 0.8400001
EFFLUENT LEVEL CHANGE (cm): 1.24
INFLOW (cm³): 67.5024
OUTFLOW (cm³): 99.64642
PERCENT FLOW DIFF (IN & OUT): 38.46155
AVERAGE FLOWRATE (cm³/sec): 8.396063E-04

ELAPSED TIME (sec): 99540
HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm²/sec): 1.057705E-05

SAMPLE LENGTH AT START (cm): 4.716667
SAMPLE LENGTH AT END (cm): 4.583334
AVG SAMPLE LENGTH OVER READING (cm): 4.65

HYDRAULIC GRADIENT: 17.07097
VISCOSITY CORRECTION FACTOR: 1.267959
HYDRAULIC CONDUCTIVITY @ 11 °C = 6.121132E-07 cm/sec

HYDRAULIC CONDUCTIVITY @ 20 °C = 7.761346E-07 cm/sec
SAMPLE: FLY ASH/SLUDGE 2
RUN: T-RW-L-003-B
READING NO: 2

START OF READING (MONTH/DAY/HOUR/MINUTE): 1 / 23 / 16 / 55
END OF READING: 1 / 24 / 15 / 30

SAMPLE CHAMBER NO: 8
AREA (cm^2): 80.35

INFLUENT STANDPIPE NO: 53
AREA (cm^2): 80.36

EFFLUENT STANDPIPE NO: 53
AREA (cm^2): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): .8999999
EFFLUENT LEVEL CHANGE (cm): .6199999
INFLOW (cm^3): 72.32397
OUTFLOW (cm^3): 49.8232
PERCENT FLOW DIFF (IN & OUT): 36.84208
AVERAGE FLOWRATE (cm^3/sec): 7.512126E-04

ELAPSED TIME (sec): 81300

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm^2/sec): 9.4634999E-06

SAMPLE LENGTH AT START (cm): 4.583334
SAMPLE LENGTH AT END (cm): 4.383333
AVG SAMPLE LENGTH OVER READING (cm): 4.483334

HYDRAULIC GRADIENT: 17.70557
VISCOSITY CORRECTION FACTOR: 1.323589
HYDRAULIC CONDUCTIVITY @ 9.5 °C = 5.280402E-07 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C = 6.989081E-07 cm/sec
**FIXED-WALL PERMEABILITY RESULT**

SAMPLE: FLY ASH/SLUDGE 2  
RUN: T-RW-L-003-B  
READING NO: 3

START OF READING (MONTH/DAY/HOUR/MINUTE): 1 / 24 / 15 / 30  
END OF READING: 1 / 25 / 17 / 40

<table>
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<tr>
<th>SAMPLE CHAMBER NO</th>
<th>AREA (cm²)</th>
<th>INFLUENT STANDPIPE NO</th>
<th>AREA (cm²)</th>
<th>EFFLUENT STANDPIPE NO</th>
<th>AREA (cm²)</th>
</tr>
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<td>80.35</td>
<td>53</td>
<td>80.36</td>
<td>53</td>
<td>80.36</td>
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BACK PRESSURE (psi): 60  
INFLUENT LEVEL CHANGE (cm): 2.98  
EFFLUENT LEVEL CHANGE (cm): .7700005  
INFLOW (cm³): 239.4728  
OUTFLOW (cm³): 61.87724  
PERCENT FLOW DIFF (IN & OUT): 117.8666  
AVERAGE FLOWRATE (cm³/sec): 1.599522E-03

ELAPSED TIME (sec): 94200

HYDRAULIC HEAD (cm): 79.38  
SYSTEM RESISTANCE (cm²/sec): 2.015019E-05

SAMPLE LENGTH AT START (cm): 4.383333  
SAMPLE LENGTH AT END (cm): 4.25  
AVG SAMPLE LENGTH OVER READING (cm): 4.316667

HYDRAULIC GRADIENT: 18.38919  
VIScosity CORRECTION FACTOR: 1.304629  
HYDRAULIC CONDUCTIVITY @ 10 ° C= 1.082535E-06 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C= 1.412306E-06 cm/sec
SAMPLE: FLY ASH/SLUDGE 2
RUN: T-RW-L-003-B  READING NO: 4

START OF READING (MONTH/DAY/HOUR/MINUTE): 1 / 26 / 12 / 40
END OF READING : 1 / 28 / 8 / 35

SAMPLE CHAMBER NO : 8  AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53  AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53  AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 1.709999
EFFLUENT LEVEL CHANGE (cm): 1.709999
INFLOW (cm³): 137.4155
OUTFLOW (cm³): 137.4155
PERCENT FLOW DIFF (IN & OUT): 0
AVERAGE FLOWRATE (cm³/sec): 8.691684E-04

ELAPSED TIME (sec): 158100

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm²/sec): 1.094946E-05

SAMPLE LENGTH AT START (cm) : 4.25
SAMPLE LENGTH AT END (cm) : 4.216667
AVG SAMPLE LENGTH OVER READING (cm): 4.233334

HYDRAULIC GRADIENT: 18.75118
VISCOSITY CORRECTION FACTOR: 1.342982
HYDRAULIC CONDUCTIVITY @ 9 °C= 5.768854E-07 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C= 7.747467E-07 cm/sec
SAMPLE: FLY ASH/SLUDGE 2
RUN: T-RW-L-003-B READING NO: 5

START OF READING (MONTH/DAY/HOUR/MINUTE): 1/31/11/5
END OF READING: 2/5/15/20

SAMPLE CHAMBER NO: 8
INFLUENT STANDPIPE NO: 53
EFFLUENT STANDPIPE NO: 53

INFLUENT LEVEL CHANGE (cm): 3.32
EFFLUENT LEVEL CHANGE (cm): 2.16
INFLOW (cm³): 266.7952
OUTFLOW (cm³): 173.5776

PERCENT FLOW DIFF (IN & OUT): 42.33576
AVERAGE FLOW RATE (cm³/sec): 4.922566E-04

ELAPSED TIME (sec): 447300

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm²/sec): 6.201268E-06

SAMPLE LENGTH AT START (cm): 4.216667
SAMPLE LENGTH AT END (cm): 4.05
AVG SAMPLE LENGTH OVER READING (cm): 4.133333

HYDRAULIC GRADIENT: 19.20484
VISCOUSITY CORRECTION FACTOR: 1.304629
HYDRAULIC CONDUCTIVITY @ 10 °C = 3.190032E-07 cm/sec

HYDRAULIC CONDUCTIVITY @ 20°C = 4.161808E-07 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 2
RUN: T-RW-L-003-B READING NO: 6

START OF READING (MONTH/DAY/HOUR/ MINUTE): 2 / 5 / 15 / 20
END OF READING : 2 / 10 / 11 / 30

SAMPLE CHAMBER NO : 8 AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53 AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53 AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 2.610001
EFFLUENT LEVEL CHANGE (cm): 2.69
INFLOW (cm³): 209.7397
OUTFLOW (cm³): 216.1684
PERCENT FLOW DIFF (IN & OUT): 3.018826
AVERAGE FLOWRATE (cm³/sec): 5.092157E-04

ELAPSED TIME (sec): 418200

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm²/sec): 6.414912E-06

SAMPLE LENGTH AT START (cm) : 4.05
SAMPLE LENGTH AT END (cm) : 4.05
AVG SAMPLE LENGTH OVER READING (cm): 4.05

HYDRAULIC GRADIENT: 19.6
VISCOSITY CORRECTION FACTOR: 1.304629
HYDRAULIC CONDUCTIVITY @ 10 °C = 3.233403E-07 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C = 4.218391E-07 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 2
RUN: T-RW-L-003-B READING NO: 7

START OF READING (MONTH/DAY/HOUR/MINUTE): 2 / 10 / 11 / 30
END OF READING: 2 / 25 / 11 / 35

SAMPLE CHAMBER NO : 8 AREA (cm^2): 80.35
INFLUENT STANDPIPE NO: 53 AREA (cm^2): 80.36
EFFLUENT STANDPIPE NO: 53 AREA (cm^2): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 1.74
EFFLUENT LEVEL CHANGE (cm): 4.600001
INFLOW (cm^3): 139.8264
OUTFLOW (cm^3): 369.656
PERCENT FLOW DIFF (IN & OUT): 90.22083
AVERAGE FLOWRATE (cm^3/sec): 1.965141E-04

ELAPSED TIME (sec): 1296300

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm^2/sec): 2.475612E-06

SAMPLE LENGTH AT START (cm) : 4.05
SAMPLE LENGTH AT END (cm) : 4.016667
AVG SAMPLE LENGTH OVER READING (cm): 4.033334

HYDRAULIC GRADIENT: 19.68099
VISCOSITY CORRECTION FACTOR: 1.304629
HYDRAULIC CONDUCTIVITY @ 10 ° C= 1.242685E-07 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C= 1.621242E-07 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 2
RUN: T-RW-L-003-B READING NO: 8

START OF READING (MONTH/DAY/HOUR/MINUTE): 2 / 25 / 11 / 35
END OF READING : 2 / 28 / 12 / 10

SAMPLE CHAMBER NO : 8
INFLUENT STANDPIPE NO: 53
EFFLUENT STANDPIPE NO: 53

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): .5900001
EFFLUENT LEVEL CHANGE (cm): .9899998
INFLOW (cm³): 47.41241
OUTFLOW (cm³): 79.55638
PERCENT FLOW DIFF (IN & OUT): 50.63287
AVERAGE FLOWRATE (cm³/sec): 2.42956E-04

ELAPSED TIME (sec): 261300

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm²/sec): 3.06067E-06

SAMPLE LENGTH AT START (cm) : 4.016667
SAMPLE LENGTH AT END (cm) : 4.016667
AVG SAMPLE LENGTH OVER READING (cm): 4.016667

HYDRAULIC GRADIENT: 19.76265
VISCOOSITY CORRECTION FACTOR: 1.304629
HYDRAULIC CONDUCTIVITY @ 10 °C = 1.530018E-07 cm/sec

HYDRAULIC CONDUCTIVITY @ 20 °C = 1.996105E-07 cm/sec
SAMPLE: FLY ASH/SLUDGE 2
RUN: T-RW-L-003-B          READING NO: 9

START OF READING (MONTH/DAY/HOUR/Minute): 2 / 28 / 12 / 10
END OF READING          : 3 / 7 / 19 / 10

SAMPLE CHAMBER NO : 8          AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53          AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53          AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 1.35
EFFLUENT LEVEL CHANGE (cm): 1.35
INFLOW (cm³): 108.486
OUTFLOW (cm³): 108.486
PERCENT FLOW DIFF (IN & OUT): 0
AVERAGE FLOWRATE (cm³/sec): 1.722001E-04

ELAPSED TIME (sec): 630000

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm²/sec): 2.169313E-06

SAMPLE LENGTH AT START (cm) : 4.016667
SAMPLE LENGTH AT END (cm) : 3.916667
AVG SAMPLE LENGTH OVER READING (cm): 3.966667

HYDRAULIC GRADIENT: 20.01177
VISCOUSITY CORRECTION FACTOR: 1.28609
HYDRAULIC CONDUCTIVITY @ 10.5 °C= 1.070932E-07 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C= 1.377315E-07 cm/sec
SAMPLE: FLY ASH/SLUDGE 2
RUN: T-RW-L-003-B READING NO: 10

START OF READING (MONTH/DAY/HOUR/MINUTE): 3 / 7 / 19 / 10
END OF READING : 3 / 11 / 10 / 40

SAMPLE CHAMBER NO : 8 AREA (cm\(^2\)): 80.35
INFLUENT STANDPIPE NO: 53 AREA (cm\(^2\)): 80.36
EFFLUENT STANDPIPE NO: 53 AREA (cm\(^2\)): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): .719993
EFFLUENT LEVEL CHANGE (cm): .8500004
INFLOW (cm\(^3\)): 57.85915
OUTFLOW (cm\(^3\)): 68.30603
PERCENT FLOW DIFF (IN & OUT): 16.56065
AVERAGE FLOWRATE (cm\(^3\)/sec): 2.002622E-04

ELAPSED TIME (sec): 315000

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm\(^2\)/sec): 2.52283E-06

SAMPLE LENGTH AT START (cm) : 3.916667
SAMPLE LENGTH AT END (cm) : 3.816667
AVG SAMPLE LENGTH OVER READING (cm): 3.866667

HYDRAULIC GRADIENT: 20.52931
VISCOSITY CORRECTION FACTOR: 1.267959
HYDRAULIC CONDUCTIVITY @ 11 ° C= 1.214056E-07 cm/sec
HYDRAULIC CONDUCTIVITY @ 20° C= 1.539374E-07 cm/sec
SAMPLE: FLY ASH/SLUDGE 2
RUN: T-RW-L-003-B
READING NO: 11

START OF READING (MONTH/DAY/HOUR/MINUTE): 3 / 11 / 10 / 40
END OF READING: 3 / 18 / 15 / 15

SAMPLE CHAMBER NO: 8
INFLUENT STANDPIPE NO: 53
EFFLUENT STANDPIPE NO: 53

AREA (cm²): 80.35
AREA (cm²): 80.36
AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): .4300003
EFFLUENT LEVEL CHANGE (cm): 0

INFLOW (cm³): 34.55483
OUTFLOW (cm³): 0
PERCENT FLOW DIFF (IN & OUT): 200

AVERAGE FLOWRATE (cm³/sec): 2.780849E-05

ELAPSED TIME (sec): 621300

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm²/sec): 3.503211E-07

SAMPLE LENGTH AT START (cm): 3.816667
SAMPLE LENGTH AT END (cm): 3.816667
AVG SAMPLE LENGTH OVER READING (cm): 3.816667

HYDRAULIC GRADIENT: 20.79825
VISCOSITY CORRECTION FACTOR: 1.28609

HYDRAULIC CONDUCTIVITY @ 10.5 °C = 1.664043E-08 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C = 2.140109E-08 cm/sec
**FIXED-WALL PERMEABILITY RESULT**

**SAMPLE:** FLY ASH/SLUDGE 2  
**RUN:** T-RW-L-003-B  
**READING NO:** 12

<table>
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<th>START OF READING (MONTH/DAY/HOUR/MINUTE):</th>
<th>END OF READING</th>
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<tr>
<td>3 / 18 / 15 / 15</td>
<td>3 / 22 / 16 / 10</td>
</tr>
</tbody>
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**SAMPLE CHAMBER NO:** 8  
**AREA (cm²):** 80.35

**INFLUENT STANDPIPE NO:** 53  
**AREA (cm²):** 80.36

**EFFLUENT STANDPIPE NO:** 53  
**AREA (cm²):** 80.36

**BACK PRESSURE (psi):** 60

**INFLUENT LEVEL CHANGE (cm):** 0.2399998

**EFFLUENT LEVEL CHANGE (cm):** 0.3999996

**INFLOW (cm³):** 19.28638

**OUTFLOW (cm³):** 32.14397

**PERCENT FLOW DIFF (IN & OUT):** 50.00001

**AVERAGE FLOWRATE (cm³/sec):** 7.370358E-05

**ELAPSED TIME (sec):** 348900

**HYDRAULIC HEAD (cm):** 79.38

**SYSTEM RESISTANCE (cm²/sec):** 9.284905E-07

**SAMPLE LENGTH AT START (cm):** 3.816667

**SAMPLE LENGTH AT END (cm):** 3.816667

**AVG SAMPLE LENGTH OVER READING (cm):** 3.816667

**HYDRAULIC GRADIENT:** 20.79825

**VISCOSITY CORRECTION FACTOR:** 1.28609

**HYDRAULIC CONDUCTIVITY @ 10.5 °C:** 4.410378E-08 cm/sec

**HYDRAULIC CONDUCTIVITY @ 20° C:** 5.672142E-08 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 2
RUN: T-RW-L-003-B          READING NO: 13

START OF READING (MONTH/DAY/HOUR/MINUTE): 3 / 22 / 16 / 10
END OF READING : 3 / 25 / 14 / 35

SAMPLE CHAMBER NO : 8        AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53    AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53    AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): .3600006
EFFLUENT LEVEL CHANGE (cm): .4200001
INFLOW (cm³): 28.92965
OUTFLOW (cm³): 33.75121
PERCENT FLOW DIFF (IN & OUT): 15.38446
AVERAGE FLOW RATE (cm³/sec): 1.236309E-04

ELAPSED TIME (sec): 253500

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm²/sec): 1.557456E-06

SAMPLE LENGTH AT START (cm) : 3.816667
SAMPLE LENGTH AT END (cm) : 3.816667
AVG SAMPLE LENGTH OVER READING (cm): 3.816667

HYDRAULIC GRADIENT: 20.79825
VISCOSITY CORRECTION FACTOR: 1.267959
HYDRAULIC CONDUCTIVITY @ 11 °C = 7.397998E-08 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C = 9.38036E-08 cm/sec
SAMPLE: FLY ASH/SLUDGE 3
RUN: T-RW-L-005-A
READING NO: 1

START OF READING (MONTH/DAY/HOUR/MINUTE): 1 / 22 / 13 / 16
END OF READING: 1 / 23 / 16 / 55

SAMPLE CHAMBER NO: 8
AREA (cm²): 80.35

INFLUENT STANDPIPE NO: 53
AREA (cm²): 80.36

EFFLUENT STANDPIPE NO: 53
AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 7.619999
EFFLUENT LEVEL CHANGE (cm): 7.66
INFLOW (cm³): 612.3431
OUTFLOW (cm³): 615.5576
PERCENT FLOW DIFF (IN & OUT): 0.5235729
AVERAGE FLOWRATE (cm³/sec): 6.167876E-03

ELAPSED TIME (sec): 99540

HYDRAULIC HEAD (cm): 80.01
SYSTEM RESISTANCE (cm²/sec): 7.708881E-05

SAMPLE LENGTH AT START (cm): 4.616667
SAMPLE LENGTH AT END (cm): 4.55
AVG SAMPLE LENGTH OVER READING (cm): 4.583333

HYDRAULIC GRADIENT: 17.45673
VISCOITY CORRECTION FACTOR: 1.267959
HYDRAULIC CONDUCTIVITY @ 11 ° C= 4.397308E-06 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C= 5.575607E-06 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 3
RUN: T-RW-L-005-A
READING NO: 2

START OF READING (MONTH/DAY/HOUR/ MINUTE): 1 / 23 / 16 / 55
END OF READING: 1 / 24 / 15 / 30

SAMPLE CHAMBER NO: 8
INFLUENT STANDPIPE NO: 53
EFFLUENT STANDPIPE NO: 53

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 6.270001
EFFLUENT LEVEL CHANGE (cm): 6.299999
INFLOW (cm³): 503.8573
OUTFLOW (cm³): 506.268
PERCENT FLOW DIFF (IN & OUT): .4773083
AVERAGE FLOWRATE (cm³/sec): 6.212332E-03

ELAPSED TIME (sec): 81300
HYDRAULIC HEAD (cm): 80.01
SYSTEM RESISTANCE (cm²/sec): 7.764445E-05

SAMPLE LENGTH AT START (cm): 4.55
SAMPLE LENGTH AT END (cm): 4.416667
AVG SAMPLE LENGTH OVER READING (cm): 4.483333

HYDRAULIC GRADIENT: 17.8461
VISCOITY CORRECTION FACTOR: 1.323589
HYDRAULIC CONDUCTIVITY @ 9.5 °C = 4.33237E-06 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C= 5.734276E-06 cm/sec
F I X E D - W A L L  P E R M E A B I L I T Y  R E S U L T

S A M P L E :  F L Y  A S H / S L U D G E  3
R U N :  T - R W - L - 0 0 5 - A
R E A D I N G  N O :  3

S T A R T  O F  R E A D I N G  ( M O N T H / D A Y / H O U R / M I N U T E ) :  1 / 2 4 / 1 5 / 3 0
E N D  O F  R E A D I N G :  1 / 2 6 / 9 / 5

S A M P L E  C H A M B E R  N O :  8
I N F L U E N T  S T A N D P I P E  N O :  5 3
E F F L U E N T  S T A N D P I P E  N O :  5 3

A R E A ( c m ^ 2 ) :  8 0 . 3 5
A R E A ( c m ^ 2 ) :  8 0 . 3 6
A R E A ( c m ^ 2 ) :  8 0 . 3 6

B A C K  P R E S S U R E  ( p s i ) :  6 0
I N F L U E N T  L E V E L  C H A N G E  ( c m ) :  1 0 . 3 6
E F F L U E N T  L E V E L  C H A N G E  ( c m ) :  9 . 6 8
I N F L O W ( c m ^ 3 ) :  8 3 2 . 5 2 9 6
O U T F L O W ( c m ^ 3 ) :  7 7 7 . 8 8 4 8
P E R C E N T  F L O W  D I F F  ( I N  &  O U T ) :  6 . 7 8 6 4 1 7
A V E R A G E  F L O W R A T E  ( c m ^ 3 / s e c ) :  5 . 3 7 8 8 0 5 E - 0 3

E L A P S E D  T I M E  ( s e c ) :  1 4 9 7 0 0

H Y D R A U L I C  H E A D  ( c m ) :  8 0 . 0 1
S Y S T E M  R E S I S T A N C E  ( c m ^ 2 / s e c ) :  6 . 7 2 2 6 6 6 6 E - 0 5

S A M P L E  L E N G T H  A T  S T A R T  ( c m ) :  4 . 4 1 6 6 6 7
S A M P L E  L E N G T H  A T  E N D  ( c m ) :  4 . 3 5
A V G  S A M P L E  L E N G T H  O V E R  R E A D I N G  ( c m ) :  4 . 3 8 3 3 3 3

H Y D R A U L I C  G R A D I E N T :  1 8 . 2 5 3 2 3
V I S C O S I T Y  C O R R E C T I O N  F A C T O R :  1 . 3 2 3 5 8 9
H Y D R A U L I C  C O N D U C T I V I T Y  @ 9 . 5 ° C = 3 . 6 6 7 4 1 6 E - 0 6  c m / s e c
H Y D R A U L I C  C O N D U C T I V I T Y  @ 2 0 ° C = 4 . 8 5 4 1 5 1 E - 0 6  c m / s e c
SAMPLE: FLY ASH/SLUDGE 3
RUN: T-RW-L-005-A
READING NO: 4

START OF READING (MONTH/DAY/HOUR/ MINUTE): 1/ 26/ 12/ 40
END OF READING : 1/ 28/ 8/ 35

SAMPLE CHAMBER NO : 8
INFLUENT STANDPIPE NO: 53
EFFLUENT STANDPIPE NO: 53

AREA (cm²): 80.35
AREA (cm²): 80.36
AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 8.32
EFFLUENT LEVEL CHANGE (cm): 6.63
INFLOW (cm³): 668.5951
OUTFLOW (cm³): 532.7868
PERCENT FLOW DIFF (IN & OUT): 22.6086
AVERAGE FLOW RATE (cm³/sec): 3.799437E-03

ELAPSED TIME (sec): 158100

HYDRAULIC HEAD (cm): 80.01
SYSTEM RESISTANCE (cm²/sec): 4.748703E-05

SAMPLE LENGTH AT START (cm) : 4.35
SAMPLE LENGTH AT END (cm) : 4.15
AVG SAMPLE LENGTH OVER READING (cm): 4.25

HYDRAULIC GRADIENT: 18.82588
VISCOSITY CORRECTION FACTOR: 1.342982
HYDRAULIC CONDUCTIVITY @ 9 °C= 2.51176E-06 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C= 3.373248E-06 cm/sec
SAMPLE: FLY ASH/SLUDGE 3  
RUN: T-AW-L-005-A  
READING NO: 5

START OF READING (MONTH/DAY/HOUR/MINUTE):  2 / 6 / 15 / 30
END OF READING:  2 / 10 / 11 / 30

SAMPLE CHAMBER NO:  8  
INFLUENT STANDPIPE NO:  53  
EFFLUENT STANDPIPE NO:  53

AREA (cm²):  80.35  
AREA (cm²):  80.36  
AREA (cm²):  80.36

BACK PRESSURE (psi):  60

INFLUENT LEVEL CHANGE (cm):  .3600006
EFFLUENT LEVEL CHANGE (cm):  0

INFLOW (cm³):  28.92965
OUTFLOW (cm³):  0

PERCENT FLOW DIFF (IN & OUT):  200

AVERAGE FLOWRATE (cm³/sec):  4.367399E-05

ELAPSED TIME (sec):  331200

HYDRAULIC HEAD (cm):  80.01
SYSTEM RESISTANCE (cm²/sec):  5.458566E-07

SAMPLE LENGTH AT START (cm):  4.15
SAMPLE LENGTH AT END (cm):  4.05
AVG SAMPLE LENGTH OVER READING (cm):  4.1

HYDRAULIC GRADIENT:  19.51464
VISCOSITY CORRECTION FACTOR:  1.304629

HYDRAULIC CONDUCTIVITY @ 10 °C = 2.785329E-08 cm/sec

HYDRAULIC CONDUCTIVITY @ 20 °C = 3.633821E-08 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 3
RUN: T-RW-L-005-A
READING NO: 6

START OF READING (MONTH/DAY/HOUR/MINUTE): 2 / 10 / 11 / 30
END OF READING: 2 / 25 / 11 / 35

SAMPLE CHAMBER NO: 8
AREA (cm²): 80.35

INFLUENT STANDPIPE NO: 53
AREA (cm²): 80.36

EFFLUENT STANDPIPE NO: 53
AREA (cm²): 80.36

BACK PRESSURE (psi): 60

INFLUENT LEVEL CHANGE (cm): -0.3499985
EFFLUENT LEVEL CHANGE (cm): -0.48

INFLOW (cm³): 28.12588
OUTFLOW (cm³): 38.5728

PERCENT FLOW DIFF (IN & OUT): 31.32573
AVERAGE FLOWRATE (cm³/sec): 2.572656E-05

ELAPSED TIME (sec): 1296300

HYDRAULIC HEAD (cm): 80.01
SYSTEM RESISTANCE (cm²/sec): 3.215418E-07

SAMPLE LENGTH AT START (cm): 4.05
SAMPLE LENGTH AT END (cm): 4.183334
AVG SAMPLE LENGTH OVER READING (cm): 4.116667

HYDRAULIC GRADIENT: 19.43563
VISCOSITY CORRECTION FACTOR: 1.3046

HYDRAULIC CONDUCTIVITY @ 10 °C = 1.647393E-08 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C = 2.149237E-08 cm/sec
SAMPLE: FLY ASH/SLUDGE 3
RUN: T-RW-L-005-A READING NO: 7

START OF READING (MONTH/DAY/HOUR/MINUTE): 2 / 25 / 11 / 35
END OF READING: 2 / 28 / 12 / 10

SAMPLE CHAMBER NO : 8 AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53 AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53 AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 0
EFFLUENT LEVEL CHANGE (cm): 0
INFLOW (cm³): 0
OUTFLOW (cm³): 0
PERCENT FLOW DIFF (IN & OUT): 1.701412E+38
AVERAGE FLOWRATE (cm³/sec): 0

ELAPSED TIME (sec): 261300

HYDRAULIC HEAD (cm): 80.01
SYSTEM RESISTANCE (cm²/sec): 0

SAMPLE LENGTH AT START (cm): 4.183334
SAMPLE LENGTH AT END (cm): 4.016667
AVG SAMPLE LENGTH OVER READING (cm): 4.1

HYDRAULIC GRADIENT: 19.51464
VISCOITY CORRECTION FACTOR: 1.304629
HYDRAULIC CONDUCTIVITY @ 10°C = 0 cm/sec

HYDRAULIC CONDUCTIVITY @ 20°C = 0 cm/sec
SAMPLE: FLY ASH/SLUDGE 3
RUN: T-RW-L-005-A
READING NO: 8

START OF READING (MONTH/DAY/HOUR/MINUTE): 2 / 28 / 12 / 10
END OF READING: 3 / 7 / 19 / 10

SAMPLE CHAMBER NO: 8
AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53
AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53
AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 1.000214E-02
EFFLUENT LEVEL CHANGE (cm): 0
INFLOW (cm³): 8037717
OUTFLOW (cm³): 0
PERCENT FLOW DIFF (IN & OUT): 200
AVERAGE FLOWRATE (cm³/sec): 6.37914E-07

ELAPSED TIME (sec): 630000

HYDRAULIC HEAD (cm): 80.01
SYSTEM RESISTANCE (cm²/sec): 7.972928E-09

SAMPLE LENGTH AT START (cm): 4.016667
SAMPLE LENGTH AT END (cm): 4.05
AVG SAMPLE LENGTH OVER READING (cm): 4.033333

HYDRAULIC GRADIENT: 19.83719
VISCOSITY CORRECTION FACTOR: 1.28609
HYDRAULIC CONDUCTIVITY @ 10.5 °C: 4.002175E-10 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C: 5.147157E-10 cm/sec
SAMPLE: FLY ASH/SLUDGE 3  
RUN: T-RW-L-005-A  
READING NO: 9  

START OF READING (MONTH/DAY/HOUR/MINUTE): 3 / 7 / 19 / 10  
END OF READING: 3 / 11 / 10 / 40  

SAMPLE CHAMBER NO: 8  
INFLUENT STANPIPE NO: 53  
EFFLUENT STANPIPE NO: 53  

AREA (cm$^2$): 80.35  
AREA (cm$^2$): 80.36  
AREA (cm$^2$): 80.36  

BACK PRESSURE (psi): 60  
INFLUENT LEVEL CHANGE (cm): 7.999802E-02  
EFFLUENT LEVEL CHANGE (cm): 0  
INFLOW (cm$^3$): 6.428641  
OUTFLOW (cm$^3$): 0  
PERCENT FLOW DIFF (IN & OUT): 200  
AVERAGE FLOWRATE (cm$^3$/sec): 1.020419E-05  

ELAPSED TIME (sec): 315000  
HYDRAULIC HEAD (cm): 80.01  
SYSTEM RESISTANCE (cm$^2$/sec): 1.275365E-07  

SAMPLE LENGTH AT START (cm): 4.05  
SAMPLE LENGTH AT END (cm): 4.05  
AVG SAMPLE LENGTH OVER READING (cm): 4.05  

HYDRAULIC GRADIENT: 19.75555  
VISCOITY CORRECTION FACTOR: 1.267959  
HYDRAULIC CONDUCTIVITY @ 11 °C = 6.428409E-09 cm/sec  

HYDRAULIC CONDUCTIVITY @ 20 °C = 8.150961E-09 cm/sec
**FIXED-WALL PERMEABILITY RESULT**

**SAMPLE:** FLY ASH/SLUDGE 3  
**RUN:** T-RW-L-005-A  
**READING NO:** 10

**START OF READING (MONTH/DAY/HOUR/MINUTE):** 3 / 11 / 10 / 40  
**END OF READING:** 3 / 18 / 15 / 15

**SAMPLE CHAMBER NO:** 8  
**AREA (cm²):** 80.35

**INFLUENT STANDPIPE NO:** 53  
**AREA (cm²):** 80.36

**EFFLUENT STANDPIPE NO:** 53  
**AREA (cm²):** 80.36

**BACK PRESSURE (psi):** 60

**INFLUENT LEVEL CHANGE (cm):** 4.780001  
**EFFLUENT LEVEL CHANGE (cm):** 4.310001

**INFLOW (cm³):** 384.1209  
**OUTFLOW (cm³):** 346.3516

**PERCENT FLOW DIFF (IN & OUT):** 10.34104

**AVERAGE FLOWRATE (cm³/sec):** 5.878581E-04

**ELAPSED TIME (sec):** 621300

**HYDRAULIC HEAD (cm):** 80.01  
**SYSTEM RESISTANCE (cm²/sec):** 7.347308E-06

**SAMPLE LENGTH AT START (cm):** 4.05  
**SAMPLE LENGTH AT END (cm):** 4.083334  
**AVG SAMPLE LENGTH OVER READING (cm):** 4.066667

**HYDRAULIC GRADIENT:** 19.67459

**VISCOSITY CORRECTION FACTOR:** 1.28609

**HYDRAULIC CONDUCTIVITY @ 10.5 °C = 3.71861E-07 cm/sec**

**HYDRAULIC CONDUCTIVITY @ 20° C = 4.78247E-07 cm/sec**
SAMPLE: FLY ASH/SLUDGE 3
RUN: T-RW-L-005-A
READING NO: 11

START OF READING (MONTH/DAY/HOUR/MINUTE): 3/18/15/15
END OF READING: 3/22/16/10

SAMPLE CHAMBER NO: 8
INFLUENT STANDPIPE NO: 53
EFFLUENT STANDPIPE NO: 53

AREA (cm²): 80.35
AREA (cm²): 80.36
AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 3.949999
EFFLUENT LEVEL CHANGE (cm): 3.699999

INFLOW (cm³): 317.4219
OUTFLOW (cm³): 297.3319

PERCENT FLOW DIFF (IN & OUT): 6.535349
AVERAGE FLOWRATE (cm³/sec): 8.809885E-04

ELAPSED TIME (sec): 348900

HYDRAULIC HEAD (cm): 80.01
SYSTEM RESISTANCE (cm²/sec): 1.101098E-05

SAMPLE LENGTH AT START (cm): 4.083334
SAMPLE LENGTH AT END (cm): 4.083334
AVG SAMPLE LENGTH OVER READING (cm): 4.083334

HYDRAULIC GRADIENT: 19.59429
VISCOSITY CORRECTION FACTOR: 1.28609
HYDRAULIC CONDUCTIVITY @ 10.5 °C = 5.595707E-07 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C = 7.196581E-07 cm/sec
SAMPLE: FLY ASH/SLUDGE 3
RUN: T-RW-L-005-A
READING NO: 12

START OF READING (MONTH/DAY/HOUR/ MINUTE): 3 / 22 / 16 / 10
END OF READING:

SAMPLE CHAMBER NO: 8
AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53
AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53
AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 3.190001
EFFLUENT LEVEL CHANGE (cm): 3.09
INFLOW (cm³): 256.3485
OUTFLOW (cm³): 248.3124
PERCENT FLOW DIFF (IN & OUT): 3.184729
AVERAGE FLOWRATE (cm³/sec): 9.953862E-04

ELAPSED TIME (sec): 253300

HYDRAULIC HEAD (cm): 80.01
SYSTEM RESISTANCE (cm²/sec): 1.244077E-05

SAMPLE LENGTH AT START (cm): 4.083334
SAMPLE LENGTH AT END (cm): 4.083334
AVG SAMPLE LENGTH OVER READING (cm): 4.083334

HYDRAULIC GRADIENT: 19.59429
VISCOSITY CORRECTION FACTOR: 1.267959
HYDRAULIC CONDUCTIVITY @ 11 °C = 6.322318E-07 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C = 8.016441E-07 cm/sec
**FIXED-WALL PERMEABILITY RESULT**

**SAMPLE:** FLY ASH/SLUDGE 4  
**RUN:** T-RW-L-005-B  
**READING NO.:** 1

**START OF READING (MONTH/DAY/HOUR/MINUTE):** 1 / 22 / 13 / 16  
**END OF READING:** 1 / 23 / 16 / 55

<table>
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<th>Parameter</th>
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<tbody>
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<td>SAMPLE CHAMBER NO.</td>
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<tr>
<td>AREA (cm²)</td>
<td>80.35</td>
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<tr>
<td>INFLUENT STANDPIPE NO.</td>
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<tr>
<td>AREA (cm²)</td>
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<td>EFFLUENT STANDPIPE NO.</td>
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<tr>
<td>AREA (cm²)</td>
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<td>BACK PRESSURE (psi)</td>
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<tr>
<td>INFLUENT LEVEL CHANGE (cm)</td>
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<td>EFFLUENT LEVEL CHANGE (cm)</td>
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<td>INFLOW (cm³)</td>
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<td>OUTFLOW (cm³)</td>
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<td>AVERAGE FLOWRATE (cm³/sec)</td>
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<td>ELAPSED TIME (sec)</td>
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<td>HYDRAULIC HEAD (cm)</td>
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<tr>
<td>SYSTEM RESISTANCE (cm²/sec)</td>
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<td>SAMPLE LENGTH AT END (cm)</td>
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<td>AVG SAMPLE LENGTH OVER READING (cm)</td>
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<td>HYDRAULIC CONDUCTIVITY @ 11 ° C</td>
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<tr>
<td>HYDRAULIC CONDUCTIVITY @ 20 ° C</td>
<td>4.947403E-06 cm/sec</td>
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## FIXED-WALL PERMEABILITY RESULT

**SAMPLE:** FLY ASH/SLUDGE 4  
**RUN:** T-RW-L-005-B  
**READING NO:** 2

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<td>End of Reading</td>
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<tr>
<td>Sample Chamber No</td>
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<tr>
<td>Area ( \text{(cm}^2) )</td>
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<tr>
<td>Influent Standpipe No</td>
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<tr>
<td>Area ( \text{(cm}^2) )</td>
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<td>Effluent Standpipe No</td>
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<tr>
<td>Area ( \text{(cm}^2) )</td>
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<tr>
<td>Back Pressure (psi)</td>
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<td>Influent Level Change (cm)</td>
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<td>Effluent Level Change (cm)</td>
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<td>Inflow ( \text{(cm}^3) )</td>
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<td>Outflow ( \text{(cm}^3) )</td>
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<td>Percent Flow Diff (In &amp; Out)</td>
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<td>Average Flowrate ( \text{(cm}^3/\text{sec}) )</td>
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<td>Elapsed Time (sec)</td>
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<td>Hydraulic Head (cm)</td>
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<tr>
<td>System Resistance ( \text{(cm}^2/\text{sec}) )</td>
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<td>Sample Length at Start (cm)</td>
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<td>Sample Length at End (cm)</td>
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<td>Avg Sample Length Over Reading (cm)</td>
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<td>Hydraulic Gradient</td>
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<td>Viscosity Correction Factor</td>
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<td>Hydraulic Conductivity @ 9.5 °C</td>
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<tr>
<td>Hydraulic Conductivity @ 20° C</td>
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</table>
SAMPLE: FLY ASH/SLUDGE 4
RUN: T-RW-L-005-B READING NO: 3

START OF READING (MONTH/DAY/HOUR/MINUTE): 1/24/15/30
END OF READING: 1/26/9/5

SAMPLE CHAMBER NO : 8 AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53 AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53 AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 8.950001
EFFLUENT LEVEL CHANGE (cm): 9.34
INFLOW (cm³): 719.2221
OUTFLOW (cm³): 750.5625
PERCENT FLOW DIFF (IN & OUT): 4.264625
AVERAGE FLOWRATE (cm³/sec): .0049091

ELAPSED TIME (sec): 149700

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm²/sec): 6.184303E-05

SAMPLE LENGTH AT START (cm) : 4.516667
SAMPLE LENGTH AT END (cm) : 4.350001
AVG SAMPLE LENGTH OVER READING (cm): 4.433334

HYDRAULIC GRADIENT: 17.90526
VISCOSITY CORRECTION FACTOR: 1.28609
HYDRAULIC CONDUCTIVITY @ 10.5 °C = 3.412207E-06 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C = 4.388404E-06 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 4
RUN: T-RW-L-005-B  READING NO: 4

START OF READING (MONTH/DAY/HOUR/MINUTE): 1/26/12/40
END OF READING: 1/28/8/35

SAMPLE CHAMBER NO: 8  AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53  AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53  AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 5.640001
EFFLUENT LEVEL CHANGE (cm): 4.93
INFLOW (cm³): 453.2305
OUTFLOW (cm³): 396.1748
PERCENT FLOW DIFF (IN & OUT): 13.43427
AVERAGE FLOWRATE (cm³/sec): 2.686291E-03

ELAPSED TIME (sec): 158100

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm²/sec): 3.384091E-05

SAMPLE LENGTH AT START (cm): 4.350001
SAMPLE LENGTH AT END (cm): 4.316667
AVG SAMPLE LENGTH OVER READING (cm): 4.333334

HYDRAULIC GRADIENT: 18.31846
VISCOSITY CORRECTION FACTOR: 1.342982
HYDRAULIC CONDUCTIVITY @ 9 °C = 1.825065E-06 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C = 2.451029E-06 cm/sec
SAMPLE: FLY ASH/SLUDGE 4
RUN: T-RW-L-005-B
READING NO: 5

START OF READING (MONTH/DAY/HOUR/MINUTE): 1/28/12/30
END OF READING: 2/5/15/20

SAMPLE CHAMBER NO: 8
INFLUENT STANDPIPE NO: 53
EFFLUENT STANDPIPE NO: 53

AREA (cm²): 80.35
AREA (cm²): 80.36
AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): .3499994
EFFLUENT LEVEL CHANGE (cm): .3499994

INFLOW (cm³): 87.59241
OUTFLOW (cm³): 28.12595
PERCENT FLOW DIFF (IN & OUT): 102.7779
AVERAGE FLOWRATE (cm³/sec): 8.2491E-05

ELAPSED TIME (sec): 701400

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm²/sec): 1.039191E-06

SAMPLE LENGTH AT START (cm): 4.316667
SAMPLE LENGTH AT END (cm): 4.216667
AVG SAMPLE LENGTH OVER READING (cm): 4.266667

HYDRAULIC GRADIENT: 18.60469
VISCOITY CORRECTION FACTOR: 1.323589
HYDRAULIC CONDUCTIVITY @ 9.5 °C = 5.518211E-08 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C = 7.303842E-08 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 4
RUN: T-RW-L-005-B          READING NO: 6

START OF READING (MONTH/DAY/HOUR/MINUTE): 2 / 5 / 15 / 20
END OF READING: 2 / 10 / 11 / 30

SAMPLE CHAMBER NO: 8    AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53    AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53    AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 3.440003
EFFLUENT LEVEL CHANGE (cm): 4.08
INFLOW (cm³): 276.4386
OUTFLOW (cm³): 327.8688
PERCENT FLOW DIFF (IN & OUT): 17.02121
AVERAGE FLOWRATE (cm³/sec): 7.2251E-04

ELAPSED TIME (sec): 418200

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm²/sec): 9.101914E-06

SAMPLE LENGTH AT START (cm): 4.216667
SAMPLE LENGTH AT END (cm): 4.083334
AVG SAMPLE LENGTH OVER READING (cm): 4.15

HYDRAULIC GRADIENT: 19.12771
VISCOSITY CORRECTION FACTOR: 1.304629
HYDRAULIC CONDUCTIVITY @ 10 ° C= 4.701052E-07 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C= 6.133128E-07 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 4
RUN: T-RW-L-005-B
READING NO: 7

START OF READING (MONTH/DAY/HOUR/MINUTE): 2 / 10 / 11 / 30
END OF READING: 2 / 25 / 11 / 35

SAMPLE CHAMBER NO: 8
INFLUENT STANDPIPE NO: 53
EFFLUENT STANDPIPE NO: 53

AREA (cm²): 80.35
AREA (cm²): 80.36
AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 15.3
EFFLUENT LEVEL CHANGE (cm): 14.26
INFLOW (cm³): 1229.508
OUTFLOW (cm³): 1145.934
PERCENT FLOW DIFF (IN & OUT): 7.036521
AVERAGE FLOWRATE (cm³/sec): 9.162392E-04

ELAPSED TIME (sec): 1296300

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm²/sec): 1.154244E-05

SAMPLE LENGTH AT START (cm): 4.083334
SAMPLE LENGTH AT END (cm): 4.15
AVG SAMPLE LENGTH OVER READING (cm): 4.116667

HYDRAULIC GRADIENT: 19.28259
VISCOSITY CORRECTION FACTOR: 1.304629
HYDRAULIC CONDUCTIVITY @ 10 °C= 5.913678E-07 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C= 7.715155E-07 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 4
RUN: T-RW-L-005-B READING NO: 8

START OF READING (MONTH/DAY/HOUR/MINUTE): 2 / 25 / 11 / 35
END OF READING: 2 / 28 / 12 / 10

SAMPLE CHAMBER NO: 8 AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53 AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53 AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 2.329999
EFFLUENT LEVEL CHANGE (cm): 2.57
INFLOW (cm³): 187.2387
OUTFLOW (cm³): 206.5252
PERCENT FLOW DIFF (IN & OUT): 9.795947
AVERAGE FLOWRATE (cm³/sec): 7.53471E-04

ELAPSED TIME (sec): 261300

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm²/sec): 9.491949E-06

SAMPLE LENGTH AT START (cm): 4.15
SAMPLE LENGTH AT END (cm): 4.15
AVG SAMPLE LENGTH OVER READING (cm): 4.15

HYDRAULIC GRADIENT: 19.12771
VISCOSITY CORRECTION FACTOR: 1.304629
HYDRAULIC CONDUCTIVITY @ 10 °C = 4.902501E-07 cm/sec

HYDRAULIC CONDUCTIVITY @ 20 °C = 6.395944E-07 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 4
RUN: T-RW-L-005-B       READING NO: 9

START OF READING (MONTH/DAY/HOUR/MINUTE): 2 / 28 / 12 / 10
END OF READING: 3 / 7 / 19 / 10

SAMPLE CHAMBER NO: 8
INFLUENT STANDPIPE NO: 53
EFFLUENT STANDPIPE NO: 53

INFLUENT STANDPIPE AREA (cm²): 80.35
EFFLUENT STANDPIPE AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 6.63
EFFLUENT LEVEL CHANGE (cm): 6.09

INFLOW (cm³): 532.7868
OUTFLOW (cm³): 489.3325

PERCENT FLOW DIFF (IN & OUT): 8.490562
AVERAGE FLOWRATE (cm³/sec): 8.112534E-04

ELAPSED TIME (sec): 630000

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm²/sec): 1.021987E-05

SAMPLE LENGTH AT START (cm): 4.15
SAMPLE LENGTH AT END (cm): 4.016667
AVG SAMPLE LENGTH OVER READING (cm): 4.083334

HYDRAULIC GRADIENT: 19.44
VISCOSITY CORRECTION FACTOR: 1.28609
HYDRAULIC CONDUCTIVITY @ 10.5 °C = 5.19367E-07 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C = 6.679526E-07 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 4
RUN: T-RW-L-005-B READING NO: 10

START OF READING (MONTH/DAY/HOUR/ MINUTE): 3 / 7 / 19 / 10
END OF READING : 3 / 11 / 10 / 40

SAMPLE CHAMBER NO : 8 AREA (cm^2): 80.35
INFLUENT STANDPIPE NO: 53 AREA (cm^2): 80.36
EFFLUENT STANDPIPE NO: 53 AREA (cm^2): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 2.35
EFFLUENT LEVEL CHANGE (cm): 2.669398
INFLOW (cm^3): 188.846
OUTFLOW (cm^3): 214.5611
PERCENT FLOW DIFF (IN & OUT): 12.74894
AVERAGE FLOWRATE (cm^3/sec): 6.403286E-04

ELAPSED TIME (sec): 315000

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm^2/sec): 8.066625E-06

SAMPLE LENGTH AT START (cm) : 4.016667
SAMPLE LENGTH AT END (cm) : 4.016667
AVG SAMPLE LENGTH OVER READING (cm): 4.016667

HYDRAULIC GRADIENT: 19.76265
VISCOSITY CORRECTION FACTOR: 1.267959
HYDRAULIC CONDUCTIVITY @ 11 ° C= 4.032476E-07 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C= 5.113015E-07 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 4
RUN: T-RW-L-005-B
READING NO: 11

START OF READING (MONTH/DAY/HOUR/MINUTE): 3 / 18 / 15 / 15
END OF READING: 3 / 22 / 16 / 10

SAMPLE CHAMBER NO: 8
INFLUENT STANDPIPE NO: 53
EFFLUENT STANDPIPE NO: 53

AREA (cm²): 80.35
AREA (cm²): 80.36
AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 1.46
EFFLUENT LEVEL CHANGE (cm): 1.820002

INFLOW (cm³): 117.3256
OUTFLOW (cm³): 146.2553

PERCENT FLOW DIFF (IN & OUT): 21.9513
AVERAGE FLOWRATE (cm³/sec): 3.777314E-04

ELAPSED TIME (sec): 348900

HYDRAULIC HEAD (cm): 79.38
SYSTEM RESISTANCE (cm²/sec): 4.758521E-06

SAMPLE LENGTH AT START (cm): 4.016667
SAMPLE LENGTH AT END (cm): 4.016667
AVG SAMPLE LENGTH OVER READING (cm): 4.016667

HYDRAULIC GRADIENT: 19.76265
VISCOSITY CORRECTION FACTOR: 1.28609

HYDRAULIC CONDUCTIVITY @ 10.5 °C = 2.378767E-07 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C = 3.059308E-07 cm/sec
## FIXED-WALL PERMEABILITY RESULT

**SAMPLE**: FLY ASH/SLUDGE 4  
**RUN**: T-RW-L-005-B  
**READING NO**: 12

**START OF READING** (MONTH/DAY/HOUR/MINUTE): 3 / 22 / 16 / 10  
**END OF READING**: 3 / 25 / 14 / 35

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<th>AREA (cm²)</th>
<th>EFFLUENT STANDPIPE NO</th>
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**BACK PRESSURE (psi)**: 60  
**INFLUENT LEVEL CHANGE (cm)**: 0.8600001  
**EFFLUENT LEVEL CHANGE (cm)**: 5.999947E-02  
**INFLOW (cm³)**: 69.10961  
**OUTFLOW (cm³)**: 4.821557  
**PERCENT FLOW DIFF (IN & OUT)**: 173.9133  
**AVERAGE FLOWRATE (cm³/sec)**: 1.458208E-04

**ELAPSED TIME (sec)**: 253500

**HYDRAULIC HEAD (cm)**: 79.38  
**SYSTEM RESISTANCE (cm²/sec)**: 1.836997E-06

<table>
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<tr>
<th>SAMPLE LENGTH AT START (cm)</th>
<th>SAMPLE LENGTH AT END (cm)</th>
<th>AVG SAMPLE LENGTH OVER READING (cm)</th>
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**HYDRAULIC GRADIENT**: 19.92803  
**VISCOUSITY CORRECTION FACTOR**: 1.267959  
**HYDRAULIC CONDUCTIVITY @ 11 °C**: 9.106874E-08 cm/sec

**HYDRAULIC CONDUCTIVITY @ 20 °C**: 1.154715E-07 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 5
RUN: T-RW-L-007-A
READING NO: 1

START OF READING (MONTH/DAY/HOUR/MINUTE): 1 / 22 / 13 / 16
END OF READING : 1 / 22 / 19 / 15

SAMPLE CHAMBER NO : 8     AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53   AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53   AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 12.37
EFFLUENT LEVEL CHANGE (cm): 13.35
INFLOW (cm³): 994.0531
OUTFLOW (cm³): 1072.806
PERCENT FLOW DIFF (IN & OUT): 7.620531
AVERAGE FLOWRATE (cm³/sec): 4.797723E-02

ELAPSED TIME (sec): 21540

HYDRAULIC HEAD (cm): 78.74
SYSTEM RESISTANCE (cm²/sec): 6.09312E-04

SAMPLE LENGTH AT START (cm) : 5.983334
SAMPLE LENGTH AT END (cm) : 6.016667
AVG SAMPLE LENGTH OVER READING (cm): 6

HYDRAULIC GRADIENT: 13.12333
VISCOSITY CORRECTION FACTOR: 1.1993
HYDRAULIC CONDUCTIVITY @ 13 ° C= 4.549934E-05 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C= 5.456735E-05 cm/sec
SAMPLE: FLY ASH/SLUDGE 5
RUN: T-RW-L-007-A       READING NO: 2

START OF READING (MONTH/DAY/HOUR/MINUTE): 1/23/8/35
END OF READING: 1/23/16/55

SAMPLE CHAMBER NO: 8       AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53   AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53   AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 14.67
EFFLUENT LEVEL CHANGE (cm): 14.74
INFLOW (cm³): 1178.881
OUTFLOW (cm³): 1184.507
PERCENT FLOW DIFF (IN & OUT): .476053
AVERAGE FLOW RATE (cm³/sec): .0393898

ELAPSED TIME (sec): 30000

HYDRAULIC HEAD (cm): 78.74
SYSTEM RESISTANCE (cm²/sec): 5.002514E-04

SAMPLE LENGTH AT START (cm): 6.016667
SAMPLE LENGTH AT END (cm): 6.05
AVG SAMPLE LENGTH OVER READING (cm): 6.033333

HYDRAULIC GRADIENT: 13.05083
VISCOSITY CORRECTION FACTOR: 1.342982
HYDRAULIC CONDUCTIVITY @ 9 °C: 3.756295E-05 cm/sec

HYDRAULIC CONDUCTIVITY @ 20 °C: 5.044637E-05 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 5
RUN: T-RW-L-007-A  READING NO: 3

START OF READING (MONTH/DAY/HOUR/MINUTE): 1 / 25 / 17 / 42
END OF READING: 1 / 26 / 9 / 5

SAMPLE CHAMBER NO: 8  INFLUENT STANDPIPE NO: 53  AREA (cm²): 80.35
EFFLUENT STANDPIPE NO: 53  AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 37.33
EFFLUENT LEVEL CHANGE (cm): 38.57
INFLOW (cm³): 2999.839
OUTFLOW (cm³): 3099.485
PERCENT FLOW DIFF (IN & OUT): 3.267452
AVERAGE FLOWRATE (cm³/sec): 5.506794E-02

ELAPSED TIME (sec): 55380

HYDRAULIC HEAD (cm): 78.74
SYSTEM RESISTANCE (cm²/sec): 6.933642E-04

SAMPLE LENGTH AT START (cm): 6.05
SAMPLE LENGTH AT END (cm): 6.05
AVG SAMPLE LENGTH OVER READING (cm): 6.05

HYDRAULIC GRADIENT: 13.01488
VISCOSITY CORRECTION FACTOR: 1.342982
HYDRAULIC CONDUCTIVITY @ 9 °C: 5.265904E-05 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C: 7.072014E-05 cm/sec
SAMPLE: FLY ASH/SLUDGE 5
RUN: T-RW-L-007-A
READING NO: 4

START OF READING (MONTH/DAY/HOUR/MINUTE): 1 / 26 / 12 / 40
END OF READING: 1 / 28 / 8 / 35

SAMPLE CHAMBER NO: 8
INFLUENT STANDPIPE NO: 53
EFFLUENT STANDPIPE NO: 53

AREA (cm²): 80.35
AREA (cm²): 80.36
AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 3.84
EFFLUENT LEVEL CHANGE (cm): 3.9

INFLOW (cm³): 308.5824
OUTFLOW (cm³): 313.404

PERCENT FLOW DIFF (IN & OUT): 1.550386

AVERAGE FLOW RATE (cm³/sec): 1.967066E-03

ELAPSED TIME (sec): 158100

HYDRAULIC HEAD (cm): 78.74
SYSTEM RESISTANCE (cm²/sec): 2.49818E-05

SAMPLE LENGTH AT START (cm): 6.05
SAMPLE LENGTH AT END (cm): 5.85
AVG SAMPLE LENGTH OVER READING (cm): 5.95

HYDRAULIC GRADIENT: 13.23361
VISCOSITY CORRECTION FACTOR: 1.342982
HYDRAULIC CONDUCTIVITY @ 9 ° C= 1.849928E-06 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C= 2.48442E-06 cm/sec
SAMPLE: FLY ASH/SLUDGE 5
RUN: T-RW-L-007-A  READING NO: 5

START OF READING (MONTH/DAY/HOUR/MINUTE): 1 / 28 / 12 / 30
END OF READING: 2 / 4 / 10 / 40

SAMPLE CHAMBER NO: 8  AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53  AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53  AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 34.58
EFFLUENT LEVEL CHANGE (cm): 40.13
INFLOW (cm³): 2778.849
OUTFLOW (cm³): 3224.847
PERCENT FLOW DIFF (IN & OUT): 14.85744
AVERAGE FLOW RATE (cm³/sec): 5.018134E-03

ELAPSED TIME (sec): 598200

HYDRAULIC HEAD (cm): 78.74
SYSTEM RESISTANCE (cm²/sec): 6.373043E-05

SAMPLE LENGTH AT START (cm): 5.85
SAMPLE LENGTH AT END (cm): 5.65
AVG SAMPLE LENGTH OVER READING (cm): 5.75

HYDRAULIC GRADIENT: 13.69391
VISCOITY CORRECTION FACTOR: 1.323589
HYDRAULIC CONDUCTIVITY @ 9.5 °C = 4.560671E-06 cm/sec

HYDRAULIC CONDUCTIVITY @ 20 °C = 6.036454E-06 cm/sec
SAMPLE: FLY ASH/SLUDGE 5
RUN: T-RW-L-007-A          READING NO: 6

START OF READING (MONTH/DAY/HOUR/MINUTE): 2 / 5 / 15 / 20
END OF READING: 2 / 10 / 11 / 30

SAMPLE CHAMBER NO : 8     AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53     AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53     AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): .8800011
EFFLUENT LEVEL CHANGE (cm): .6999998
INFLOW (cm³): 70.71689
OUTFLOW (cm³): 56.25199
PERCENT FLOW DIFF (IN & OUT): 22.78496
AVERAGE FLOWRATE (cm³/sec): 1.51804E-04

ELAPSED TIME (sec): 418200

HYDRAULIC HEAD (cm): 78.74
SYSTEM RESISTANCE (cm²/sec): 1.927915E-06

SAMPLE LENGTH AT START (cm) : 5.65
SAMPLE LENGTH AT END (cm) : 5.383333
AVG SAMPLE LENGTH OVER READING (cm): 5.516667

HYDRAULIC GRADIENT: 14.27311
VISCOITY CORRECTION FACTOR: 1.304629
HYDRAULIC CONDUCTIVITY @ 10 °C= 1.323667E-07 cm/sec

HYDRAULIC CONDUCTIVITY @ 20 °C= 1.726894E-07 cm/sec
Fixed-Wall Permeability Result

Sample: Fly Ash/Sludge 5
Run: T-RW-L-007-A
Reading No: 7

Start of Reading (Month/Day/Hour/Minute): 2 / 10 / 11 / 30
End of Reading: 2 / 25 / 11 / 35

Sample Chamber No: 8
Influent Standpipe No: 53
Effluent Standpipe No: 53

Back Pressure (psi): 60
Influent Level Change (cm): 1.139999
Effluent Level Change (cm): 1.87
Inflow (cm³): 91.61035
Outflow (cm³): 150.2732
Percent Flow Diff (In & Out): 48.50503
Average Flowrate (cm³/sec): 9.323767E-05

Elapsed Time (sec): 1296300

Hydraulic Head (cm): 78.74
System Resistance (cm²/sec): 1.184883E-06

Sample Length at Start (cm): 5.383333
Sample Length at End (cm): 5.550001
Avg Sample Length over Reading (cm): 5.466667

Hydraulic Gradient: 14.40366
Viscosity Correction Factor: 1.304629
Hydraulic Conductivity @ 10 °C = 8.061432E-08 cm/sec

Hydraulic Conductivity @ 20 °C = 1.051718E-07 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 5
RUN: T-RW-L-007-A  READING NO: 8

START OF READING (MONTH/DAY/HOUR/MINUTE): 2 / 25 / 11 / 35
END OF READING: 2 / 28 / 12 / 10

SAMPLE CHAMBER NO: 8  AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53  AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53  AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 0
EFFLUENT LEVEL CHANGE (cm): 0
INFLOW (cm³): 0
OUTFLOW (cm³): 0
PERCENT FLOW DIFF (IN & OUT): 1.701412E+38
AVERAGE FLOWRATE (cm³/sec): 0

ELAPSED TIME (sec): 261300

HYDRAULIC HEAD (cm): 78.74
SYSTEM RESISTANCE (cm²/sec): 0

SAMPLE LENGTH AT START (cm): 5.550001
SAMPLE LENGTH AT END (cm): 5.550001
AVG SAMPLE LENGTH OVER READING (cm): 5.550001

HYDRAULIC GRADIENT: 14.18739
VISCOSITY CORRECTION FACTOR: 1.304629
HYDRAULIC CONDUCTIVITY @ 10 °C = 0 cm/sec

HYDRAULIC CONDUCTIVITY @ 20 °C = 0 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 5
RUN: T-RW-L-007-A       READING NO: 9

START OF READING (MONTH/DAY/HOUR/MINUTE): 2 / 28 / 12 / 10
END OF READING: 3 / 7 / 19 / 10

SAMPLE CHAMBER NO : 8     AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53      AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53      AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 0.2399979
EFFLUENT LEVEL CHANGE (cm): 0
INFLOW (cm³): 19.28623
OUTFLOW (cm³): 0
PERCENT FLOW DIFF (IN & OUT): 200
AVERAGE FLOWRATE (cm³/sec): 1.530653E-05

ELAPSED TIME (sec): 630000

HYDRAULIC HEAD (cm): 78.74
SYSTEM RESISTANCE (cm²/sec): 1.943933E-07

SAMPLE LENGTH AT START (cm) : 5.550001
SAMPLE LENGTH AT END (cm) : 5.550001
AVG SAMPLE LENGTH OVER READING (cm): 5.550001

HYDRAULIC GRADIENT: 14.18739
VISCOSITY CORRECTION FACTOR: 1.323589
HYDRAULIC CONDUCTIVITY @ 9.5 °C= 1.342729E-08 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C= 1.777222E-08 cm/sec
SAMPLE: FLY ASH/SLUDGE 5
RUN: T-RW-L-007-A   READING NO: 10

START OF READING (MONTH/DAY/HOUR/MINUTE): 3 / 7 / 19 / 10
END OF READING : 3 / 11 / 10 / 40

SAMPLE CHAMBER NO: 8   AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53   AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53   AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): .5800018
EFFLUENT LEVEL CHANGE (cm): .3600006
INFLOW (cm³): 46.60895
OUTFLOW (cm³): 28.32965
PERCENT FLOW DIFF (IN & OUT): 46.80865
AVERAGE FLOWRATE (cm³/sec): 1.199025E-04

ELAPSED TIME (sec): 315000

HYDRAULIC HEAD (cm): 78.74
SYSTEM RESISTANCE (cm²/sec): 1.522765E-06

SAMPLE LENGTH AT START (cm) : 5.550001
SAMPLE LENGTH AT END (cm) : 5.550001
AVG SAMPLE LENGTH OVER READING (cm): 5.550001

HYDRAULIC GRADIENT: 14.18739
VISCOSITY CORRECTION FACTOR: 1.267353
HYDRAULIC CONDUCTIVITY @ 11 °C = 1.051817E-07 cm/sec

HYDRAULIC CONDUCTIVITY @ 20 °C = 1.333661E-07 cm/sec
**FIXED-WALL PERMEABILITY RESULT**

SAMPLE: FLY ASH/SLUDGE 5  
RUN: T-RW-L-007-A  
READING NO: 11

START OF READING (MONTH/DAY/HOUR/MINUTE): 3 / 11 / 10 / 40  
END OF READING : 3 / 18 / 15 / 15

SAMPLE CHAMBER NO : 8  AREA (cm²): 80.35  
INFLUENT STANDPIPE NO: 53  AREA (cm²): 80.36  
EFFLUENT STANDPIPE NO: 53  AREA (cm²): 80.36

BACK PRESSURE (psi): 60  
INFLUENT LEVEL CHANGE (cm): 0  
EFFLUENT LEVEL CHANGE (cm): 0  
INFLOW (cm³): 0  
OUTFLOW (cm³): 0  
PERCENT FLOW DIFF (IN & OUT): 1.701412E+38  
AVERAGE FLOWRATE (cm³/sec): 0

ELAPSED TIME (sec): 621300

HYDRAULIC HEAD (cm): 78.74  
SYSTEM RESISTANCE (cm²/sec): 0

SAMPLE LENGTH AT START (cm) : 5.550001  
SAMPLE LENGTH AT END (cm) : 5.516667  
AVG SAMPLE LENGTH OVER READING (cm): 5.533334

HYDRAULIC GRADIENT: 14.23012  
VISCOITY CORRECTION FACTOR: 1.28609  
HYDRAULIC CONDUCTIVITY @ 10.5 °C= 0 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C= 0 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 5
RUN: T-RW-L-007-A READING NO: 12

START OF READING (MONTH/DAY/HOUR/ MINUTE): 3 / 18 / 15 / 15
END OF READING: 3 / 22 / 16 / 10

SAMPLE CHAMBER NO: 8 AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53 AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53 AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 18.69
EFFLUENT LEVEL CHANGE (cm): 18.65
INFLOW (cm³): 1501.928
OUTFLOW (cm³): 1498.714
PERCENT FLOW DIFF (IN & OUT): .2142363
AVERAGE FLOWRATE (cm³/sec): 4.300147E-03

ELAPSED TIME (sec): 348900

HYDRAULIC HEAD (cm): 78.74
SYSTEM RESISTANCE (cm²/sec): 5.461198E-05

SAMPLE LENGTH AT START (cm): 5.516667
SAMPLE LENGTH AT END (cm): 5.516667
AVG SAMPLE LENGTH OVER READING (cm): 5.516667

HYDRAULIC GRADIENT: 14.27311
VISCOSITY CORRECTION FACTOR: 1.28609
HYDRAULIC CONDUCTIVITY @ 10.5 °C = 3.749547E-06 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C = 4.822253E-06 cm/sec
**FIXED-WALL PERMEABILITY RESULT**

SAMPLE: FLY ASH/SLUDGE 5  
RUN: T-RW-L-007-A  
READING NO: 13

START OF READING (MONTH/DAY/HOUR/MINUTE): 3 / 22 / 16 / 10  
END OF READING: 3 / 25 / 14 / 35

SAMPLE CHAMBER NO: 8  
AREA (cm²): 80.35

INFLUENT STANDPIPE NO: 53  
AREA (cm²): 80.36

EFFLUENT STANDPIPE NO: 53  
AREA (cm²): 80.36

BACK PRESSURE (psi): 60

INFLUENT LEVEL CHANGE (cm): 10.84

EFFLUENT LEVEL CHANGE (cm): 10.66

INFLOW (cm³): 871.1024

OUTFLOW (cm³): 856.6376

PERCENT FLOW DIFF (IN & OUT): 1.674424

AVERAGE FLOWRATE (cm³/sec): 3.407771E-03

ELAPSED TIME (sec): 253500

HYDRAULIC HEAD (cm): 78.74

SYSTEM RESISTANCE (cm²/sec): 4.327878E-05

SAMPLE LENGTH AT START (cm): 5.516667

SAMPLE LENGTH AT END (cm): 5.45

AVG SAMPLE LENGTH OVER READING (cm): 5.483333

HYDRAULIC GRADIENT: 14.35988

VISCOSITY CORRECTION FACTOR: 1.267959

HYDRAULIC CONDUCTIVITY @ 11 °C = 2.953478E-06 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C = 3.74489E-06 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 6
RUN: T-RW-L-007-B
READING NO: 1

START OF READING (MONTH/DAY/HOUR/MINUTE): 1 / 22 / 13 / 16
END OF READING : 1 / 22 / 19 / 15

SAMPLE CHAMBER NO : 8
AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53
AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53
AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 9.219999
EFFLUENT LEVEL CHANGE (cm): 9.84
INFLOW (cm³): 740.9191
OUTFLOW (cm³): 790.7425
PERCENT FLOW DIFF (IN & OUT): 6.505785
AVERAGE FLOWRATE (cm³/sec): 3.555389E-02

ELAPSED TIME (sec): 21540

HYDRAULIC HEAD (cm): 80.01
SYSTEM RESISTANCE (cm²/sec): 4.443681E-04

SAMPLE LENGTH AT START (cm) : 4.783334
SAMPLE LENGTH AT END (cm) : 4.783334
AVG SAMPLE LENGTH OVER READING (cm): 4.783334

HYDRAULIC GRADIENT: 16.72683
VISCOSITY CORRECTION FACTOR: 1.1993
HYDRAULIC CONDUCTIVITY @ 13 °C= 2.645378E-05 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C= 3.1726E-05 cm/sec
SAMPLE: FLY ASH/SLUDGE 6
RUN: T-RW-L-007-B
READING NO: 2

START OF READING (MONTH/DAY/HOUR/MINUTE): 1 / 23 / 8 / 35
END OF READING : 1 / 23 / 16 / 55

SAMPLE CHAMBER NO : 8
INFLUENT STANDPIPE NO: 53
EFFLUENT STANDPIPE NO: 53

AREA (cm²): 80.35
AREA (cm²): 80.36
AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 12.45
EFFLUENT LEVEL CHANGE (cm): 12.88
INFLOW (cm³): 1000.482
OUTFLOW (cm³): 1035.037
PERCENT FLOW DIFF (IN & OUT): 3.395184
AVERAGE FLOWRATE (cm³/sec): 3.392531E-02

ELAPSED TIME (sec): 30000

HYDRAULIC HEAD (cm): 80.01
SYSTEM RESISTANCE (cm²/sec): 4.240134E-04

SAMPLE LENGTH AT START (cm) : 4.783334
SAMPLE LENGTH AT END (cm) : 4.75
AVG SAMPLE LENGTH OVER READING (cm): 4.766667

HYDRAULIC GRADIENT: 16.78532
VISCOSITY CORRECTION FACTOR: 1.342982
HYDRAULIC CONDUCTIVITY @ 9 ° C= 2.515408E-05 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C= 3.378148E-05 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 6
RUN: T-RW-L-007-B
READING NO: 3

START OF READING (MONTH/DAY/HOUR/MINUTE): 1 / 25 / 17 / 42
END OF READING: 1 / 26 / 9 / 5

SAMPLE CHAMBER NO: 8
INFLUENT STANDPIPE NO: 53
EFFLUENT STANDPIPE NO: 53

AREA (cm$^2$): 80.35
AREA (cm$^2$): 80.36
AREA (cm$^2$): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 28.64
EFFLUENT LEVEL CHANGE (cm): 30.99
INFLOW (cm$^3$): 2301.51
OUTFLOW (cm$^3$): 2490.357
PERCENT FLOW DIFF (IN & OUT): 7.881947
AVERAGE FLOWRATE (cm$^3$/sec): 4.326352E-02

ELAPSED TIME (sec): 55380

HYDRAULIC HEAD (cm): 80.01
SYSTEM RESISTANCE (cm$^2$/sec): 5.407263E-04

SAMPLE LENGTH AT START (cm): 4.75
SAMPLE LENGTH AT END (cm): 4.716667
AVG SAMPLE LENGTH OVER READING (cm): 4.733334

HYDRAULIC GRADIENT: 16.90352
VISCOSITY CORRECTION FACTOR: 1.323589
HYDRAULIC CONDUCTIVITY @ 9.5 ° C = 3.185362E-05 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C = 4.216109E-05 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 6
RUN: T-RW-L-007-B  READING NO: 4

START OF READING (MONTH/DAY/HOUR/MINUTE): 1 / 26 / 12 / 20
END OF READING : 1 / 28 / 12 / 30

SAMPLE CHAMBER NO 8 AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53 AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53 AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 27.98
EFFLUENT LEVEL CHANGE (cm): 23.57
INFLOW (cm³): 2248.473
OUTFLOW (cm³): 1894.085
PERCENT FLOW DIFF (IN & OUT): 17.1096
AVERAGE FLOWRATE (cm³/sec): 1.194509E-02

ELAPSED TIME (sec): 173400

HYDRAULIC HEAD (cm): 80.01
SYSTEM RESISTANCE (cm²/sec): 1.49295E-04

SAMPLE LENGTH AT START (cm) : 4.716667
SAMPLE LENGTH AT END (cm) : 4.716667
AVG SAMPLE LENGTH OVER READING (cm): 4.716667

HYDRAULIC GRADIENT: 16.96325
VISCOSITY CORRECTION FACTOR: 1.342982
HYDRAULIC CONDUCTIVITY @ 9 °C= 8.763841E-06 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C= 1.176968E-05 cm/sec
**FIXED-WALL PERMEABILITY RESULT**

**SAMPLE:** FLY ASH/SLUDGE 6  
**RUN:** T-RW-L-007-B  
**READING NO:** 5

**START OF READING (MONTH/DAY/HOUR/MINUTE):** 2 / 5 / 15 / 20  
**END OF READING:** 2 / 6 / 15 / 30

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<th>SAMPLE CHAMBER NO</th>
<th>AREA (cm²)</th>
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<th>INFLUENT STANDPIPE NO</th>
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**BACK PRESSURE (psi):** 60  
**INFLUENT LEVEL CHANGE (cm):** 28.73  
**EFFLUENT LEVEL CHANGE (cm):** 28.81  
**INFLOW (cm³):** 2308.743  
**OUTFLOW (cm³):** 2315.172  
**PERCENT FLOW DIFF (IN & OUT):** 0.2780742  
**AVERAGE FLOWRATE (cm³/sec):** 2.657422E-02

**ELAPSED TIME (sec):** 87000

**HYDRAULIC HEAD (cm):** 80.01  
**SYSTEM RESISTANCE (cm²/sec):** 3.321362E-04

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<th>SAMPLE LENGTH AT START (cm)</th>
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**AVG SAMPLE LENGTH OVER READING (cm):** 4.616667

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<td>HYDRAULIC CONDUCTIVITY @ 10 ° C: 1.908354E-05 cm/sec</td>
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| HYDRAULIC CONDUCTIVITY @ 20° C: 2.489693E-05 cm/sec |
**FIXED-WALL PERMEABILITY RESULT**

SAMPLE: FLY ASH/SLUDGE 6
RUN: T-RW-L-007-B            READING NO: 6

START OF READING (MONTH/DAY/HOUR/MINUTE): 2 / 10 / 11 / 30
END OF READING: 2 / 12 / 8 / 30

SAMPLE CHAMBER NO : 8        AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53    AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53    AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 30.99
EFFLUENT LEVEL CHANGE (cm): 30.77
INFLOW (cm³): 2490.357
OUTFLOW (cm³): 2472.677
PERCENT FLOW DIFF (IN & OUT): .7124451
AVERAGE FLOWRATE (cm³/sec): .015318

ELAPSED TIME (sec): 162000

HYDRAULIC HEAD (cm): 80.01
SYSTEM RESISTANCE (cm²/sec): 1.914511E-04

SAMPLE LENGTH AT START (cm) : 4.516667
SAMPLE LENGTH AT END (cm) : 4.450001
AVG SAMPLE LENGTH OVER READING (cm): 4.483334

HYDRAULIC GRADIENT: 17.8461
VISCOSITY CORRECTION FACTOR: 1.304629
HYDRAULIC CONDUCTIVITY @ 10 °C: 1.06825E-05 cm/sec

HYDRAULIC CONDUCTIVITY @ 20 °C: 1.39367E-05 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: FLY ASH/SLUDGE 6
RUN: T-RW-L-007-B  READING NO: 7

START OF READING (MONTH/DAY/HOUR/MINUTE): 2 / 12 / 9 / 15
END OF READING: 2 / 14 / 9 / 50

SAMPLE CHAMBER NO: 8  AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 53  AREA (cm²): 80.36
EFFLUENT STANDPIPE NO: 53  AREA (cm²): 80.36

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 33.74
EFFLUENT LEVEL CHANGE (cm): 33.6
INFLOW (cm³): 2711.347
OUTFLOW (cm³): 2700.096
PERCENT FLOW DIFF (IN & OUT): .4158037
AVERAGE FLOW RATE (cm³/sec): .0154701

ELAPSED TIME (sec): 174900

HYDRAULIC HEAD (cm): 80.01
SYSTEM RESISTANCE (cm²/sec): 1.933521E-04

SAMPLE LENGTH AT START (cm): 4.450001
SAMPLE LENGTH AT END (cm): 4.450001
AVG SAMPLE LENGTH OVER READING (cm): 4.450001

HYDRAULIC GRADIENT: 17.97978
VISCOSITY CORRECTION FACTOR: 1.304629
HYDRAULIC CONDUCTIVITY @ 10 °C = 1.070836E-05 cm/sec

HYDRAULIC CONDUCTIVITY @ 20 °C = 1.397044E-05 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: SLUDGE 7
RUN: T-RW-L-001-A
READING NO: 1

START OF READING (MONTH/DAY/HOUR/MINUTE): 1 / 22 / 13 / 16
END OF READING: 1 / 23 / 16 / 55

SAMPLE CHAMBER NO: 8
AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 8
AREA (cm²): 11.4
EFFLUENT STANDPIPE NO: 8
AREA (cm²): 11.4

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 0.8500004
EFFLUENT LEVEL CHANGE (cm): 0
INFLOW (cm³): 9.690004
OUTFLOW (cm³): 0
PERCENT FLOW DIFF (IN & OUT): 200
AVERAGE FLOWRATE (cm³/sec): 4.867393E-05

ELAPSED TIME (sec): 99540

HYDRAULIC HEAD (cm): 79.06
SYSTEM RESISTANCE (cm²/sec): 6.156581E-07

SAMPLE LENGTH AT START (cm): 3.916667
SAMPLE LENGTH AT END (cm): 3.783334
AVG SAMPLE LENGTH OVER READING (cm): 3.85

HYDRAULIC GRADIENT: 20.53506
VISCOSITY CORRECTION FACTOR: 1.267959
HYDRAULIC CONDUCTIVITY @ 11 °C = 2.949948E-08 cm/sec

HYDRAULIC CONDUCTIVITY @ 20 °C = 3.740414E-08 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: SLUDGE 7
RUN: T-RW-L-001-A
READING NO: 2

START OF READING (MONTH/DAY/HOUR/MINUTE): 1 / 23 / 16 / 55
END OF READING: 1 / 24 / 15 / 30

SAMPLE CHAMBER NO: 8
AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 8
AREA (cm²): 11.4
EFFLUENT STANDPIPE NO: 8
AREA (cm²): 11.4

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 1.040001
EFFLUENT LEVEL CHANGE (cm): 0.7700005
INFLOW (cm³): 11.85601
OUTFLOW (cm³): 8.778004
PERCENT FLOW DIFF (IN & OUT): 23.83429
AVERAGE FLOWRATE (cm³/sec): 1.269005E-04

ELAPSED TIME (sec): 81300

HYDRAULIC HEAD (cm): 79.06
SYSTEM RESISTANCE (cm²/sec): 1.605116E-06

SAMPLE LENGTH AT START (cm): 3.783334
SAMPLE LENGTH AT END (cm): 3.416667
AVG SAMPLE LENGTH OVER READING (cm): 3.6

HYDRAULIC GRADIENT: 21.96111
VISCOITY CORRECTION FACTOR: 1.323589
HYDRAULIC CONDUCTIVITY @ 9.5 °C = 7.191559E-08 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C = 9.518666E-08 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: SLUDGE 7
RUN: T-RW-L-001-A READING NO: 3

START OF READING (MONTH/DAY/HOUR/MINUTE): 1 / 24 / 15 / 30
END OF READING: 1 / 26 / 12 / 40

SAMPLE CHAMBER NO: 8 AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 8 AREA (cm²): 11.4
EFFLUENT STANDPIPE NO: 8 AREA (cm²): 11.4

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 1.4
EFFLUENT LEVEL CHANGE (cm): 1.179999
INFLOW (cm³): 15.96
OUTFLOW (cm³): 13.45199
PERCENT FLOW DIFF (IN & OUT): 17.05429
AVERAGE FLOWRATE (cm³/sec): 9.044276E-05

ELAPSED TIME (sec): 162600

HYDRAULIC HEAD (cm): 79.06
SYSTEM RESISTANCE (cm²/sec): 1.143976E-06

SAMPLE LENGTH AT START (cm): 3.416667
SAMPLE LENGTH AT END (cm): 3.283334
AVG SAMPLE LENGTH OVER READING (cm): 3.35

HYDRAULIC GRADIENT: 23.6
VISCOSITY CORRECTION FACTOR: 1.28609
HYDRAULIC CONDUCTIVITY @ 10.5 ° C= 4.769535E-08 cm/sec
HYDRAULIC CONDUCTIVITY @ 20° C= 6.13405E-08 cm/sec
SAMPLE: SLUDGE 7
RUN: T-RW-L-001-A
READING NO: 4

START OF READING (MONTH/DAY/HOUR/MINUTE): 1 / 26 / 12 / 40
END OF READING: 1 / 28 / 8 / 35

SAMPLE CHAMBER NO: 8
INFLUENT STANDPIPE NO: 8
EFFLUENT STANDPIPE NO: 8

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): .54
EFFLUENT LEVEL CHANGE (cm): .54
INFLOW (cm³): 8.892008
OUTFLOW (cm³): 6.155999
PERCENT FLOW DIFF (IN & OUT): 36.36374
AVERAGE FLOWRATE (cm³/sec): 4.759016E-05

ELAPSED TIME (sec): 158100

HYDRAULIC HEAD (cm): 79.06
SYSTEM RESISTANCE (cm²/sec): 6.019499E-07

SAMPLE LENGTH AT START (cm): 3.283334
SAMPLE LENGTH AT END (cm): 3.15
AVG SAMPLE LENGTH OVER READING (cm): 3.216667

HYDRAULIC GRADIENT: 24.57824
VISCOSITY CORRECTION FACTOR: 1.342982
HYDRAULIC CONDUCTIVITY @ 9 °C = 2.409797E-08 cm/sec

HYDRAULIC CONDUCTIVITY @ 20 °C = 3.236315E-08 cm/sec
SAMPLE: SLUDGE 7
RUN: T-RW-L-001-A  READING NO: 5

START OF READING (MONTH/DAY/HOUR/MINUTE): 1 / 28 / 8 / 35
END OF READING : 2 / 5 / 15 / 20

SAMPLE CHAMBER NO : 8  AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 8  AREA (cm²): 11.4
EFFLUENT STANDPIPE NO: 8  AREA (cm²): 11.4

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 2.630001
EFFLUENT LEVEL CHANGE (cm): .1900005
INFLOW (cm³): 29.98201
OUTFLOW (cm³): 2.166006
PERCENT FLOW DIFF (IN & OUT): 173.0496
AVERAGE FLOWRATE (cm³/sec): 2.246542E-05

ELAPSED TIME (sec): 715500

HYDRAULIC HEAD (cm): 79.06
SYSTEM RESISTANCE (cm²/sec): 2.841566E-07

SAMPLE LENGTH AT START (cm) : 3.15
SAMPLE LENGTH AT END (cm) : 2.95
AVG SAMPLE LENGTH OVER READING (cm): 3.05

HYDRAULIC GRADIENT: 25.92131
VISCOSITY CORRECTION FACTOR: 1.323589
HYDRAULIC CONDUCTIVITY @ 9.5 °C = 1.078628E-08 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C = 1.42766E-08 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: SLUDGE 7
RUN: T-RW-L-001-A
READING NO: 6

START OF READING (MONTH/DAY/HOUR/MINUTE): 2 / 5 / 15 / 20
END OF READING: 2 / 10 / 11 / 30

SAMPLE CHAMBER NO: 8
AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 8
AREA (cm²): 11.4
EFFLUENT STANDPIPE NO: 8
AREA (cm²): 11.4

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): .8199997
EFFLUENT LEVEL CHANGE (cm): .3800001
INFLOW (cm³): 9.347995
OUTFLOW (cm³): 4.332001
PERCENT FLOW DIFF (IN & OUT): 73.33328
AVERAGE FLOWRATE (cm³/sec): 1.635581E-05

ELAPSED TIME (sec): 418200

HYDRAULIC HEAD (cm): 79.06
SYSTEM RESISTANCE (cm²/sec): 2.068784E-07

SAMPLE LENGTH AT START (cm): 2.95
SAMPLE LENGTH AT END (cm): 3.083333
AVG SAMPLE LENGTH OVER READING (cm): 3.016667

HYDRAULIC GRADIENT: 26.20774
VISCOSITY CORRECTION FACTOR: 1.304629
HYDRAULIC CONDUCTIVITY @ 10 ° C= 7.767059E-09 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C= 1.013313E-08 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: SLUDGE 7
RUN: T-RW-L-001-A  READING NO: 7

START OF READING (MONTH/DAY/HOUR/MINUTE): 2 / 10 / 11 / 30
END OF READING: 2 / 25 / 11 / 35

SAMPLE CHAMBER NO : 8  AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 8  AREA (cm²): 11.4
EFFLUENT STANDPIPE NO: 8  AREA (cm²): 11.4

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 2.440001
EFFLUENT LEVEL CHANGE (cm): 2.39
INFLOW (cm³): 27.81601
OUTFLOW (cm³): 27.24599
PERCENT FLOW DIFF (IN & OUT): 2.070441
AVERAGE FLOWRATE (cm³/sec): 2.123814E-05

ELAPSED TIME (sec): 1296300

HYDRAULIC HEAD (cm): 79.06
SYSTEM RESISTANCE (cm²/sec): 2.686332E-07

SAMPLE LENGTH AT START (cm) : 3.083333
SAMPLE LENGTH AT END (cm) : 3.016667
AVG SAMPLE LENGTH OVER READING (cm): 3.05

HYDRAULIC GRADIENT: 25.92131
VISCOSITY CORRECTION FACTOR: 1.304629
HYDRAULIC CONDUCTIVITY @ 10 ° C = 1.019703E-08 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C = 1.330334E-08 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: SLUDGE 7
RUN: T-RW-L-001-A READING NO: 8

START OF READING (MONTH/DAY/HOUR/MINUTE): 2 / 25 / 11 / 35
END OF READING: 2 / 28 / 12 / 10

SAMPLE CHAMBER NO: 8 AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 8 AREA (cm²): 11.4
EFFLUENT STANDPIPE NO: 8 AREA (cm²): 11.4

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): .9799996
EFFLUENT LEVEL CHANGE (cm): .6800003
INFLOW (cm³): 11.17199
OUTFLOW (cm³): 7.752003
PERCENT FLOW DIFF (IN & OUT): 36.14449
AVERAGE FLOWRATE (cm³/sec): 3.621125E-05

ELAPSED TIME (sec): 261300

HYDRAULIC HEAD (cm): 79.06
SYSTEM RESISTANCE (cm²/sec): 4.580224E-07

SAMPLE LENGTH AT START (cm): 3.016667
SAMPLE LENGTH AT END (cm): 3.016667
AVG SAMPLE LENGTH OVER READING (cm): 3.016667

HYDRAULIC GRADIENT: 26.20774
VISCOSITY CORRECTION FACTOR: 1.304629
HYDRAULIC CONDUCTIVITY @ 10 ° C= 1.719603E-08 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C= 2.243443E-08 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: SLUDGE 7
RUN: T-RW-L-001-A READING NO: 9

START OF READING (MONTH/DAY/HOUR/MINUTE): 2/28/12/10
END OF READING: 3/7/19/10

SAMPLE CHAMBER NO: 8
INFLUENT STANDPIPE NO: 8
EFFLUENT STANDPIPE NO: 8

AREA (cm²): 80.35
AREA (cm²): 11.4
AREA (cm²): 11.4

BACK PRESSURE (psi): 60

INFLUENT LEVEL CHANGE (cm): 1.81
EFFLUENT LEVEL CHANGE (cm): 1.639999

INFLOW (cm³): 20.63399
OUTFLOW (cm³): 18.69599
PERCENT FLOW DIFF (IN & OUT): 9.855084
AVERAGE FLOW RATE (cm³/sec): 3.121428E-05

ELAPSED TIME (sec): 630000

HYDRAULIC HEAD (cm): 79.06
SYSTEM RESISTANCE (cm²/sec): 3.948176E-07

SAMPLE LENGTH AT START (cm): 3.016667
SAMPLE LENGTH AT END (cm): 2.983333
AVG SAMPLE LENGTH OVER READING (cm): 3

HYDRAULIC GRADIENT: 26.35333
VISCOSITY CORRECTION FACTOR: 1.28609
HYDRAULIC CONDUCTIVITY @ 10.5 ° C= 1.474117E-08 cm/sec
HYDRAULIC CONDUCTIVITY @ 20° C= 1.895846E-08 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: SLUDGE 7
RUN: T-RW-L-001-A READING NO: 10

START OF READING (MONTH/DAY/HOUR/MINUTE): 3 / 7 / 19 / 10
END OF READING : 3 / 11 / 10 / 40

SAMPLE CHAMBER NO : 8 AREA (cm²): .80.35
INFLUENT STANDPIPE NO: 8 AREA (cm²): 11.4
EFFLUENT STANDPIPE NO: 8 AREA (cm²): 11.4

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): .6499996
EFFLUENT LEVEL CHANGE (cm): 1.060001
INFLOW (cm³): 7.409996
OUTFLOW (cm³): 12.8402
PERCENT FLOW DIFF (IN & OUT): 47.95339
AVERAGE FLOWRATE (cm³/sec): 3.94288E-05

ELAPSED TIME (sec): 315000

HYDRAULIC HEAD (cm): 79.06
SYSTEM RESISTANCE (cm²/sec): 3.913847E-07

SAMPLE LENGTH AT START (cm) : 2.983333
SAMPLE LENGTH AT END (cm) : 2.983333
AVG SAMPLE LENGTH OVER READING (cm) : 2.983333

HYDRAULIC GRADIENT: 26.50056
VISCOSITY CORRECTION FACTOR: 1.267959
HYDRAULIC CONDUCTIVITY @ 11 ° C= 1.453181E-08 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C= 1.842575E-08 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: SLUDGE 7
RUN: T-RW-L-001-A  READING NO: 11

START OF READING (MONTH/DAY/HOUR/MINUTE): 3 / 11 / 10 / 40
END OF READING: 3 / 18 / 15 / 15

SAMPLE CHAMBER NO: 8 AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 8 AREA (cm²): 11.4
EFFLUENT STANDPIPE NO: 8 AREA (cm²): 11.4

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 2.51
EFFLUENT LEVEL CHANGE (cm): 2.189999
INFLOW (cm³): 28.614
OUTFLOW (cm³): 24.96599
PERCENT FLOW DIFF (IN & OUT): 13.61709
AVERAGE FLOWRATE (cm³/sec): 4.311926E-05

ELAPSED TIME (sec): 621300

HYDRAULIC HEAD (cm): 79.06
SYSTEM RESISTANCE (cm²/sec): 5.453992E-07

SAMPLE LENGTH AT START (cm): 2.983333
SAMPLE LENGTH AT END (cm): 2.883333
AVG SAMPLE LENGTH OVER READING (cm): 2.933334

HYDRAULIC GRADIENT: 26.95227
VISCOITY CORRECTION FACTOR: 1.28609
HYDRAULIC CONDUCTIVITY @ 10.5 °C = 1.991086E-08 cm/sec

HYDRAULIC CONDUCTIVITY @ 20°C = 2.560716E-08 cm/sec
FIXED-WALL PERMEABILITY RESULT

SAMPLE: SLUDGE 7
RUN: T-RW-L-001-A READING NO: 12

START OF READING (MONTH/DAY/HOUR/MINUTE): 3 / 18 / 15 / 15
END OF READING: 3 / 22 / 16 / 10

SAMPLE CHAMBER NO: 8 AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 8 AREA (cm²): 11.4
EFFLUENT STANDPIPE NO: 8 AREA (cm²): 11.4

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): 1.290001
EFFLUENT LEVEL CHANGE (cm): 1
INFLOW (cm³): 14.70601
OUTFLOW (cm³): 11.4
PERCENT FLOW DIFF (IN & OUT): 25.32758
AVERAGE FLOWRATE (cm³/sec): 3.74118E-05

ELAPSED TIME (sec): 348900

HYDRAULIC HEAD (cm): 79.06
SYSTEM RESISTANCE (cm²/sec): 4.732087E-07

SAMPLE LENGTH AT START (cm): 2.883333
SAMPLE LENGTH AT END (cm): 2.883333
AVG SAMPLE LENGTH OVER READING (cm): 2.883333

HYDRAULIC GRADIENT: 27.41965
VISCOITY CORRECTION FACTOR: 1.28609
HYDRAULIC CONDUCTIVITY @ 10.5 °C = 1.698094E-08 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C = 2.183901E-08 cm/sec
SAMPLE: SLUDGE 7
RUN: T-RW-L-001-A
READING NO: 13

START OF READING (MONTH/DAY/HOUR/MINUTE): 3 / 22 / 16 / 10
END OF READING: 3 / 25 / 14 / 35

SAMPLE CHAMBER NO: 8
AREA (cm²): 80.35
INFLUENT STANDPIPE NO: 8
AREA (cm²): 11.4
EFFLUENT STANDPIPE NO: 8
AREA (cm²): 11.4

BACK PRESSURE (psi): 60
INFLUENT LEVEL CHANGE (cm): .83
EFFLUENT LEVEL CHANGE (cm): .7200013
INFLOW (cm³): 9.461999
OUTFLOW (cm³): 8.208014
PERCENT FLOW DIFF (IN & OUT): 14.19337
AVERAGE FLOWRATE (cm³/sec): 3.48521E-05

ELAPSED TIME (sec): 253500
HYDRAULIC HEAD (cm): 79.06
SYSTEM RESISTANCE (cm²/sec): 4.40831E-07

SAMPLE LENGTH AT START (cm): 2.883333
SAMPLE LENGTH AT END (cm): 2.85
AVG SAMPLE LENGTH OVER READING (cm): 2.866667

HYDRAULIC GRADIENT: 27.57907
VISCOSITY CORRECTION FACTOR: 1.267959
HYDRAULIC CONDUCTIVITY @ 11 °C = 1.572764E-08 cm/sec

HYDRAULIC CONDUCTIVITY @ 20° C = 1.9942E-08 cm/sec