AN EXPERIMENTAL STUDY
OF AXIAL AND CROSS FLOW VELOCITY
IN A 7-PIN WIRE WRAPPED BUNDLE

C. L. Wheeler, D. S. Rowe and J. D. Smith

Battelle

Pacific Northwest Laboratories
Richland, Washington 99352

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By

C. L. Wheeler

D. S. Rowe

J. D. Smith

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1.0 INTRODUCTION

The objective of this report is to present the results of an experimental study of axial and crossflow velocity in a 7-pin wire wrapped bundle and to compare these measurements with the forced crossflow model presently contained in the COBRA-III C⁽¹⁾ computer program.

Considerable interest in wire wrap spacers has developed over the past several years since this type of spacer has been selected for the liquid metal cooled Fast Flux Test Facility (FFTF) fuel bundles. The inclusion of wire wraps not only provides spacing support for the fuel pins, but also induces crossflow mixing between the subchannels of the fuel bundle. The amount of crossflow mixing has become an important design parameter because it has an important influence on the temperature gradients in the fuel assembly. Several computational schemes have been developed to determine the influence of intersubchannel crossflow mixing on the coolant temperatures. They can be divided into two general categories. In the first, the flow and crossflow solution is assumed or specified empirically. The computation of coolant temperatures is performed directly as an initial value problem by using the flow and crossflow as input. The computations are very fast even for large FFTF fuel bundles. Computer programs in this category include COTEC,⁽²⁾ and FULMIX.⁽³⁾

In the second category, the flow and crossflow solution is computed from a derived set of flow momentum equations by using appropriate assumptions concerning the flow and selection of flow subchannels. This method is quite complex and tedious to perform as it requires a very large digital computer and several hours of computer time to achieve a solution for large

bundles. The computer programs in this category include COBRA-III C and THI-3D.⁽⁴⁾ While it may appear attractive to use a more rigorous approach to subchannel analysis by using a code such as COBRA, the computation time becomes excessive. There is greater incentive to use the simpler but less rigorous method to reduce the computation time.

A suitable alternate approach to the analysis of large bundles is to develop flow solutions from the more rigorous method and use this as input to the simpler method. To accomplish this it is necessary to verify that the rigorous method can predict the proper flow solutions. Unfortunately, there has heretofore been no direct measurements of axial and crossflow velocity in wire wrapped rod bundles to provide this verification. Most of what is known has been inferred from crossflow mixing studies and from computations using assumed mixing models. Direct measurements of axial and crossflow velocities in wire wrapped rod bundles would be of significant value to verify computer programs and to assist in the interpretation of crossflow mixing studies in wire wrapped bundles.

2.0 SUMMARY

Local fluid axial velocity, transverse velocity, and axial turbulence intensity distributions were measured in a 7-rod spirally wrapped rod bundle. The experiments were performed in water over the Reynolds number range of 70,000 to 150,000.

The experimental results show that the wrap significantly alters the intra subchannel velocity and turbulence distributions as compared to unwrapped assemblies. The velocity and turbulence distribution show no symmetry and the location of maximum velocities are shifted well away from the subchannel centerline. The average turbulence intensities were found to be slightly higher (0.06-0.07) than those occurring in clean bundles (0.04-0.05)

The transverse velocity measurements in the peripheral subchannels showed a strong swirl flow with the minimum and maximum average gap velocity being 12% and 28% of the bundle average axial velocity respectively.

The measured transverse gap velocities were compared to those calculated by COBRA III C. It was found that COBRA does an excellent job of predicting the location and magnitude of the maximum gap velocity and the location of the minimum gap velocity, but that it always under-predicted the magnitude of the minimum gap velocity.

The two input parameters which showed a significant effect on the solution were the normalized forcing pulse width parameter $\frac{\delta P}{\Delta X}$ and the crossflow resistance parameter K_{ij} . The best agreement with the data

was achieved using values of 1.0 to 1.5 for $\delta P/\Delta X$ and values less than 0.1 for K_{ij} . The parameters which were examined and found to have little effect were: the transverse momentum parameter (S/ℓ), the turbulent mixing parameter (β), the inlet flow boundary condition (equal mass flux or equal dP/dx across the first node), and the type of geometric model (including or omitting the small corner subchannels).

3.0 EXPERIMENTAL PROGRAM

Axial and crossflow velocities were measured in a 7-pin wire-wrapped bundle with geometric parameters similar to those of the FFTF fuel. An approximately 4x flow model was used for the study. The pins were 0.866" O.D. with a pitch of 1.102" giving $p/d = 1.27$. The wire wrap pitch was 48" giving a pitch-to-pin diameter of 55.75. The experiments were performed in water with a Reynolds number range from 70,000 to 145,000.

All velocity measurements were performed with a two component Laser-Doppler velocimeter.

3.1 Description of Test Section

Figure 3.1 shows a view of the test section used for the experimental program. Flow entered the bottom of the flow housing, flowed vertically up through the test, emerged at the top of the flow housing, and returned to the flow loop. Rubber expansion bellows were used to help isolate the flow housing from the normal vibrations of the flow loop.

Figure 3.2 shows a cross section view of the test section construction. It consisted of a front and back plate and flow housing body. The back plate contained the inlet and outlet nozzles and was permanently installed in the flow facility. The front plate was bolted to the back plate with the flow housing body placed between them. A continuous "O-ring" sealed the joint between the plates and the flow housing body. Dimensions of the test section (4.00 x 1.25 inches) were maintained by the restraining shoulder next to the "O-ring" groove on the front and back plates.

The front and back plate each contained 5 window ports 2 inches high by 4 inches wide located at 1 foot intervals for the entrance and exit of

FIGURE 3.1. Flow Housing Arrangement

FIGURE 3.2. Test Section Construction Details

the laser beam. Optically flat ($\lambda/4$) view windows were fabricated from quartz. Each window was sealed by an "O-ring" and was held in place by a thick cover plate. A shim was placed between the window and cover plate to position the window to be "flush" with the inner surface of the flow housing (± 0.001 inch).

An 8-inch long flow straightening section was placed at the inlet of the flow channel. It consisted of 4 eccentric screens (60% open) with 1/4 inch holes in a triangular array followed by a bank of 1/4 inch 0.020 inch thick wall tubes 3 1/4 inch long. The screens tended to equalize the inlet velocity distribution and the tubes helped to establish a fixed scale of turbulence and straighten the flow.

Figure 3.2 also shows a cross section of the flow channel and bundle assembly placed within the flow housing. Solid fillers were used to form the hexagonal flow channel. They were full length from the top of the flow straightening section to the top of the bundle just below the flow housing outlet nozzle.

The 7-pin bundle had nominal dimensions of 0.866" pin-diameter, 1.102" pin-pitch, 0.241 wrap-diameter and 48" wrap-pitch. The wire wrap rotation was counter clockwise in the plan view of Figure 3.2 with the flow out of the figure. The wrap rotation is clockwise with respect to the flow direction.

The bundle was fabricated from solid aluminum rods 60 inches long except for a 14-inch long segment of glass tubing in the 5 central rods spanning the 3rd and 4th window of the flow housing. The glass segments were placed in the rods to allow passage of the laser beam. The inside of the tubes were filled with distilled water to reduce the refractive index change at the inner surface of the tube.

The rods were supported at the ends only by top and bottom tie plates. The bottom of each rod was cut with a 60° taper to a $3/8$ " hexagonal tip to $1/2$ inch long. This hexagonal tip was fit into a 12-point, $3/8$ " socket attached to the bottom tie plate. The top of each rod was also cut with a 60° taper, but with a $1/2$ " diameter tip $3/4$ " long. This tip was fit into the upper tie plate and held in place by a screw. An "O-ring" was placed between the bottom of the tie plate and the top of the rod to provide a "soft" axial load on the rods. The tie plates also were fastened to the ends of the inserts used to form the hexagonal flow channel. Complete construction details of the flow channel and bundle are shown in Appendix A.

The 12-point sockets were used to provide different wire wrap start positions during the experiments. This could be done by removing the top tie plate and moving the rods in 30° increments to the desired position. By using various start positions of the wire wrap, positions could be established at the available measurement window locations. Since the wire wraps blocked the rod gaps for some wrap start positions, all wrap positions could not be investigated. Those that were considered are shown in Figure 3.3. The shaded area in Figure 3.3 shows the regions in which data were taken.

3.2 Laser-Doppler Velocimeter

A two-component Laser-Doppler velocimeter manufactured by Laser Systems and Electronics was used to perform measurements of turbulent velocities. A detailed description of this system is presented in Reference 5.

Most velocity measurements were performed with the two-component optical system shown in Figure 3.4. This was essentially two single-component

(a) -30° POSITION WINDOW

(b) $+30^\circ$ POSITION WINDOW

(c) $+150^\circ$ POSITION WINDOW

(d) $+210^\circ$ POSITION WINDOW

FIGURE 3.3. Wire Wrap Position Designation At Selected Measurement Planes

FIGURE 3.4. Two-Component Laser-Doppler Velocimeter Optical Arrangement

optical arrangements located at right angles to each other. The position of the optics was rotated 45° about the laser beam axis for two-component measurement: therefore, the Doppler signals corresponded to the 2 velocity components each located 45° from vertical. These 2 velocities were resolved into the axial and lateral velocity components.

The measurement point was positioned within the flow channel by using a traversing system that moved the laser and receiving optics as an integral unit. The traversing system was supported on precision linear ball bearings and was driven by variable-speed servo-motors. The motor speed control and position readout could locate the measurement point to within 0.001 inch in both the z and y directions in a horizontal plane. The entire system was positioned vertically with a hydraulic lift system.

A Laser Systems and Electronics readout system was used to measure local instantaneous velocity consisting of the time average value plus the fluctuating component. The basic elements of the readout system discussed in Reference 5. In addition to the readout system, auxiliary readout instrumentation was used to measure the "rms" voltage of the turbulence velocity. This consisted of an amplifier, low pass filter and time rms meter.

3.3 Method of Data Acquisition and Reduction

The flow loop was operated according to standard laboratory procedures. The loop had a very stable flow, pressure, and temperature control and did not require adjustment during data acquisition.

Once the loop was operating at the selected conditions, the optical system was adjusted to give an optimum Doppler signal. A small amount of milk was injected into the loop to provide sufficient scattering centers.

The geometry of the regions in which data were to be taken was then measured by noting the fadeout of the Doppler signal in the x directions and by observing the y coordinates where the laser just touched the rod surfaces. Surface locations were measured at locations x_1 through x_{11} and y_1 through y_4 as shown in Figure 3.5.

The two component velocity data was obtained from two traverses through the test section. Each traverse used alternate optical channel, but a common electronic readout channel. In this way the same velocity detection circuit was used to provide a more accurate lateral velocity measurement than if two independent circuits were used.

FIGURE 3.5. Locations of Geometry Measurements

A digital computer program (5) was written to reduce the recorded data. For each data point it was necessary to (1) shift the measurement location to a consistent set of coordinates and correct for refractive index; (2) convert the Doppler frequency to velocity; and (3) convert the rms voltage to turbulence intensity.

4.0 EXPERIMENTAL RESULTS

Measurements of local axial and transverse velocities and axial turbulent intensities were obtained in the shaded regions shown in Figure 3.3. In general these results show the following:

1. The wire wrap significantly changes the location of the maximum and minimum velocities as compared to an unwrapped bundle where the maximum velocity occurs near the center of a subchannel and the minimum occurs in the gap. For some locations this is reversed for the wrapped bundle.
2. The subchannel center axial turbulence intensities $(\frac{U^1}{U})$ range from 0.035 to 0.08 for the wrapped bundle as compared to approximately 0.04 for an unwrapped assembly.
3. The maximum transverse velocities in the peripheral gaps occur 180° out of phase with the wire wrap. The maximum transverse velocity is approximately 28% of the bundle average axial velocity. The average gap velocity around the periphery is approximately 18% of the bundle average axial velocity.
4. The minimum peripheral transverse velocity occurs near the gaps containing the wire wrap. The magnitude of the minimum transverse velocity is approximately 12% of the bundle average axial velocity. This minimum velocity is approximately twice as large as would be predicted by assuming that the transverse velocity is equal to the slope of the wire wrap times the axial velocity.
5. The normalized axial velocity, turbulent intensities and transverse velocities showed no observable Reynolds number dependence for the range of Reynold number from 70,000 to 150,000.

The following sections discuss the experimental results in greater detail.

4.1 Axial Velocity Distributions

As shown in Figures 4.1 through 4.4, the axial velocity distributions in the test assembly are nonuniform and nonsymmetric. Figure 4.1 shows a comparison of centerline velocity distributions for the four sections in which data could be taken. The data shown were taken along a traverse from the wall to the edge of the center rod on a line which bisects the gap between the two peripheral rods. The data plotted in this figure shows that the velocities on lines of symmetry in a wrapped assembly may vary by as much as 15% when comparing geometrically similar positions in different subchannels.

Estimates of the velocity contours in the 30° , 150° and 210° sections are shown in Figures 4.2 through 4.4 respectively. The figures show that the wire wrap significantly alters the symmetric flow distribution found in clean rod bundle subchannels. The shape of the Isovals (lines of constant velocity) shown in these figures show a strong crossflow from the interior subchannel to the peripheral subchannel in the 30° section, a strong crossflow from the periphery subchannel to the interior subchannel in the 210° section and that the crossflow from the interior to the periphery subchannel is small in the 150° section. In both the 30° and 150° section the location of the maximum velocity in the interior subchannel is shifted away from the subchannel center towards the gap and toward the rod which is opposite the gap containing the wire wrap.

Figure 4.1 Comparison of Centerline Axial Velocity Distributions.

FIGURE 4.2. Normalized Axial Velocity Map ($\frac{U}{U_B}$) for the +30° Subsector (Data Set 1)

FIGURE 4.3. Normalized Axial Velocity Map ($\frac{U}{U_B}$) for the 150° Sector

FIGURE 4.4. Normalized Axial Velocity Map ($\frac{U}{U_B}$) for the 210° Sector

The data taken in the -30° substation is not mapped because most of the axial velocity data taken in this section was acquired using a faulty electronic processing system. The only valid data is the center-line traverse data shown in Figure 4.1 which was taken after the system was repaired. All of the data presented for the other sectors was acquired using the repaired electronic processing equipment.

After the completion of the data acquisition, the rod array was disassembled and examined. It was found that the wire wrap had slipped by up to 10° on two of the rods and that the positioning socket of the central rod had rotated by approximately 10 degrees. The two rods with the loose wrap wire were replaced and the positioning socket was realigned. A second set of data in the $+30^\circ$ sector was then acquired. The axial velocity contour map resulting from the rerun is shown in Figure 4.5. These results show the same trends as the previous run, but the higher subchannel velocities in the interior subchannel are not being pushed into the gap as far as in the previous set, and the maximum velocities in the peripheral subchannel is 9% lower.

It is believed that much of the observed differences is the result of geometric differences that existed between the two runs.

The differences in the subchannel geometry were estimated from the geometry measurements discussed in Section 3.3 and by visual observation of the two assemblies. The major differences were:

1. The gap between the periphery and the internal subchannel was approximately 2% smaller for the second set.
2. The area of the internal subchannel was approximately 8% smaller in the second set.

FIGURE 4.5. Normalized Axial Velocity Map ($\frac{U}{U_B}$) for the $+30^\circ$ Sector (Second Data Set)

3. The area of the periphery subchannel is 13% smaller in the second set.
4. The wrap in the interior subchannel was displaced approximately 0.050 inches toward the subchannel center for the first data set.

4.2 Axial Turbulence Intensities

The measured turbulence intensity distributions are given in Figures 4.6, 4.7, and 4.8 for the 30°, 150° and 210° configuration respectively. The measurement grid structure was finer for the second set and resultant turbulent intensity contour lines are given for the 30° configuration in Figure 4.9. For all data sets the turbulence intensities range from 0.03 to 0.08 in the regions removed from the rods or channel wall. This compares to values, of 0.04 to 0.05 for an unwrapped triangular assemblies⁽⁶⁾ with a rod pitch to diameter ratio of 1.217, and to values ranging from 0.04 to 0.06 in square array⁽⁵⁾.

4.3 Transverse Velocity Distributions

Transverse velocities were measured in the peripheral gaps and along a traverse, which bisected the gap between the peripheral rods, from the shroud wall to the edge of the central rod. The transverse velocity components were obtained by taking two traverses through the test section. During the first traverse the velocity component oriented at 45° from the vertical was obtained. In the second set the velocity component oriented at -45° from the vertical was obtained. The two component axial and transverse velocities were then obtained by adding the axial and transverse components of the measured velocities, or:

$$U = V_1 \cos (45^\circ) + V_2 \cos (-45^\circ)$$

$$V = V_1 \sin (45^\circ) + V_2 \sin (-45^\circ)$$

FIGURE 4.6. Measured Turbulent Intensities ($\frac{U^1}{U}$) for the 30° Sector (First Data Set)

FIGURE 4.7. Measured Turbulent Intensities ($\frac{U^1}{U}$) for the 150° Sector

FIGURE 4.8. Measured Turbulent Intensities $\left(\frac{U^1}{U}\right)$
for the 210° Sector

FIGURE 4.9. Measured Turbulent Intensities ($\frac{U^1}{U}$) in the +30° Sector (Second Set of Data)

The measured transverse velocity components are shown in Figures 4.10, 4.11 and 4.12 for bundle average velocity of approximately 15, 20, and 28 ft/second respectively. The arrows depicted in these figures are scaled vector representations of the transverse velocity as a percentage of the bundle average axial velocity.

As shown in these figures, the maximum gap velocity occurs on the side of the bundle which is opposite of the gaps containing the wrap. The magnitude of the maximum gap velocity (averaged across the gap) is approximately 28% of the bundle average axial velocity while the minimum is approximately 12% and it occurs in the vicinity of the wrap. This minimum velocity (gap average) is approximately twice that predicted by the slope of the wire wrap angle.

The peripheral gap velocities show the same general trends with respect to the direction of flow from the periphery to inter subchannel as those inferred from the shape of the axial contour lines, i.e., in the 30° sector the crossflow velocity increases with the direction of the crossflow, it remains approximately constant in the 150° , and -30° sector and decreases in the 210° sector. This implies an outward flow movement in the $+30^\circ$ sector, an inward flow in the 210° sector and an indeterminate flow direction in the -30° and 150° sectors.

Comparison of this data and the data acquired from recent die injection tests on a 91-pin bundle at Argonne National Laboratory⁽⁷⁾ show the same results with respect to the location of the maximum and minimum transverse peripheral gap velocities as observed in this study. Kahn,⁽⁸⁾ et al manipulated the Argonne data and arrived at an estimate for the normalized bundle

FIGURE 4.10. Map of Measured Transverse Velocity Vectors (V) for a Bundle Average Velocity (UB) of Approximately 15 ft/sec

FIGURE 4.11. Map of Measured Transverse Velocity Vectors (V) for a Bundle Average Velocity (UB) of Approximately 20 ft/sec

FIGURE 4.12. Map of Measured Transverse Velocity Vectors (V) for a Bundle Average Velocity (UB) of Approximately 28 ft/sec

average transverse gap velocity of $0.11 < \frac{\bar{V}}{UB} < 0.176$. Where $\bar{V}$ is the peripheral gap velocity averaged around the entire bundle. The value of $\bar{V}$ from this study can be estimated by $\frac{\bar{V}}{UB} \approx \sum_{i=1}^8 (\bar{V}_i/UB)/8 = 0.18$. This is not a true average because data from four of the gaps are missing, however two of the missing points are on the high velocity side of the bundle and two are on the low side, therefore, the above value is a reasonable estimate of the average.

5.0 COMPARISON OF DATA WITH COBRA PREDICTIONS

The results from the experimental program were compared to calculations with the Cobra III C program. This comparison was made in order to determine the ability of the COBRA program model to predict forced diversion flowrates in fuel assemblies using wire wrapped spacers, and to assess the sensitivity and magnitude of the input parameter which effect the COBRA calculation. In order to make meaningful comparisons, it was necessary to make a minor modification to the Cobra model. This modification was necessary because at the axial plane where data was taken, a large percentage of the wraps lie in the rod gaps and are thus changing the area of two adjacent subchannels at the same time. Therefore, the existing model was changed so that if a wrap crossing was found to lie on a node boundary the areas of both adjacent subchannels are reduced by an amount equal to $1/2$ the area of the wrap. This modification reduced the calculated maximum peripheral gap velocity by approximately 18%, but it had little effect on the minimum transverse gap velocity. The program changes necessary to make this modification are given in Appendix B.

The geometric model and subchannel notation used to make the COBRA calculation is shown in Figure 5.1.

The results of the COBRA calculations are shown in Figures 5.2 through 5.6. The calculated gap velocities followed the same trends as exhibited by the experimental data. The calculated gap velocities in the gaps removed from those containing wraps showed good agreement with the measured velocities. However, the COBRA code always underpredicted the transverse gap

velocity in the regions near to where the wrap crossed the gap regardless of the choice of input parameters. It is believed that the inability of the code to predict the measured transverse velocities near the gaps containing the wraps is the result of omitting the $\frac{\partial v^2}{\partial y}$ term in the transverse momentum equation.

FIGURE 5.1. COBRA Subchannel Geometry at Measurement Plane

Figure 5.2 shows the effect of the forcing pulse width δ on the COBRA calculations. In COBRA this parameter is used to specify the crossflow in a gap through which a wrap is crossing. The forced crossflow is defined as:

$$W_{\text{forced}} = \pi (D+t) \frac{s_{ij}}{A_i} \frac{\delta}{\Delta X} m_i$$

where

D = rod diameter

t = wrap diameter

s_{ij} = gap width

A_i = flow area of channel from which forced flow is leaving

δ = pulse width

ΔX = axial node length

m_i = flow rate in channel from which forced flow is leaving,

For a calculational increment ΔX of 2 inches it was found that a δ in the range of 0.042 to 0.063 resulted in good agreement with the measured gap velocities except in the gaps near the wrap crossings. However, as shown in Figure 5.3 and in the above definition of W_{forced} the choice of δ by itself does not result in a unique solution to the flow field. A better parameter would be the product of δ times the wrap pitch divided by ΔX . Figure 5.3 shows that the calculated crossflow for a typical gap remains approximately constant as long as the parameter $\delta P / \Delta X$ remains constant even though δ varies from 0.021 to 0.084.

FIGURE 5.2. Effect of Forcing Pulse Width δ on Calculated Peripheral Gap Velocities

FIGURE 5.3 Calculated Transverse Gap Velocity for a Typical Peripheral Gap Showing the Effect of the Choice of δ and ΔX on the Calculation

Next to the crossflow forcing parameter the crossflow resistance parameter K_{ij} has the largest effect on the calculated crossflows. As shown in Figure 5.4 values of K_{ij} less than 0.1 produced the best agreement with the data. The calculated gap velocities remained relatively constant for values of K_{ij} less than 0.1 but showed large variations as K_{ij} was increased to values greater than 0.1. This result implies that form and friction crossflow resistances are small in rod bundles with pitch to diameter ratios similar to the FFTF fuel.

The value of the transverse momentum parameter (S/ρ) was varied from 0.25 to 0.75 and this parameter showed no significant effect on the crossflow solution. This comparison is shown in Figure 5.5

The effect of omitting or including the small corner subchannel was also examined and as shown in Figure 5.6 the choice of geometric models had little effect on the calculated crossflows. The turbulent mixing parameter β and the inlet flow boundary specifications were found to have no effect on the calculated values of the peripheral gap velocities.

FIGURE 5.4. Effect of Crossflow Resistance Factor K_{ij} on Calculated Peripheral Gap Velocities

FIGURE 5.5. Effect of the Transverse Momentum Parameter (S/l) on Calculated Peripheral Gap Velocities

FIGURE 5.6. Comparison of COBRA Geometric Models

6.0 CONCLUSIONS AND RECOMMENDATIONS

Several conclusions can be drawn from this study.

1. The laser-Doppler velocimeter in the forward scatter mode used in conjunction with glass rods proved to be an effective tool to measure velocity and turbulence in small rod bundles. However, due to slight misalignments in the rod centerlines the acquisition of data in regions that had more than one rod between the measurement point and the receiving optics was extremely difficult. It is therefore doubtful that this method could be easily applied to larger bundles.

Also, as the number of rods between the laser and receiving optics increase, the width of the region (normal to the laser beam) in which data can be taken decreases.

2. The use of spirally wound spacers significantly alters the intra subchannel velocity and turbulence distribution as compared to a clean or unwrapped assembly and the current analytical and empirical method of estimating intra sub-channel transport properties may not be applicable to wire wrapped bundles.
3. The wrap increased the magnitude of the turbulence intensities in the wrapped assembly only slightly. It is therefore difficult to assess the effect of the wrap on turbulent mixing without turbulence scale measurements.

4. The average transverse velocity in the peripheral gaps varies from 12% of the bundle average axial velocity to 28%. The minimum peripheral gap velocity occurs in the gaps which are in the proximity of the wrap.
5. The wire wrap forced mixing model in the COBRA III C computer program predicts the general trends of the peripheral crossflow. However, the model always underpredicts the crossflows near regions where the wrap crosses the gap.
6. Comparison of this data and the data acquired from recent die injection tests on a 91-pin bundle at Argonne National Laboratory⁽⁷⁾ gives support to the belief that peripheral gap velocities may be relatively independent of bundle size.

The following recommendations are offered in the use of and for future development of the COBRA III C code.

1. The lateral momentum equations used in COBRA should be examined and improvements formulated to include the rate of change transverse momentum in the transverse direction.
2. The current COBRA III C model should be further evaluated by comparison to the data generated at other laboratories. However, since much of the current data and most of the future data will be acquired on larger bundles (91 to 217 rods) an effort should be made to improve the efficiency of the numeral methods with respect to both running time and storage requirements.

3. This study was limited to one axial plane since the wraps block the laser beam in all but a few locations. Therefore, this study should be extended to include the measurement of the peripheral axial and transverse velocity and pressure distributions as a function of axial location. This could be accomplished using the laser in the backscatter mode. Further data from small bundles are needed to further evaluate and improve the COBRA models because the computing time for model development becomes prohibitive as the bundle size increases. Since the COBRA code calculates axial and transverse flow distribution from a fundamental set of momentum equations the results should be less dependent on model size and geometry than the methods which empirically specify or assume axial and crossflow solutions.

Once the credibility of the COBRA solution has been firmly established on small bundles, a minimum number of computations will be required to compare the calculations with the data from larger bundles.

7.0 NOMENCLATURE

A	flow area
D	rod diameter
K_{ij}	crossflow resistance factor
M	subchannel flowrate
P	wrap pitch
S	rod gap spacing
S/λ	transverse momentum parameter
Re	Reynolds number
t	wrap diameter
U	local point velocity
U^1	Turbulent velocity
UB	bundle average velocity
V	local transverse velocity
$\bar{V}$	average velocity across a gap
$\overline{\bar{V}}$	average gap velocity around periphery of bundle
W	crossflow per unit length
ΔX	axial calculating increment
β	turbulent mixing parameter
δ	forced flow pulse width parameter

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APPENDIX A

APPENDIX B

APPENDIX B

```

SUBROUTINE AREA(J)
  INCLUDE SPEC1
  INCLUDE SPEC2
  COMMON /NWRAP/ XCROSS(MG*6),DUR(MG),DIA,THICK,NWRAP(MC),PITCH
  DIMENSION AFAC(ML), GFAC(ML)
  COMMON /EFFECT/ EFACT(MG)
C
C  CALCULATE CHANNEL AREA IF REQUIRED.
  DO 5 I=1,NCHANL
    A(I) = AN(I)
    5  DHYD(I) = DHYDN(I)
    IF(MAXL.EQ.0) GO TO 101
    DO 100 I=1,NCHANL
      JJ = IDAREA(I)
      IF(JJ.LT.1) GO TO 100
      DO 10 K=1,NAXL
        10  AFAC(K) = EFACT(JJ,K)
        CALL CURVE (FF,X(J)/Z,AFAC*AXL*NAXL,IEPPOR,1)
        IF(IEPPOR.GT.1) GO TO 1000
        IF(JT.LT.100.) GO TO 20
        DUMY = FLOAT(ITERAT)/FLOAT(NRAMP)
        IF(DUMY.GT.1.) DUMY = 1.
        IF(FF.LE.0.) GO TO 1000
        FF = 1.-(1.-FF)*DUMY
      20  A(I) = A(I)+FF
          DHYD(I) = DHYDN(I)+FF
    100 CONTINUE
    101 IF(JJ.NE.1) GO TO 110
C  MODIFY AREA AND HYDRAULIC DIAMETER FOR WIRE WRAPS IN SUBCHANNELS.
    DO 102 I=1,NCHANL
      DUMY=FLOAT(ITERAT)/NRAMP
      IF(DUMY.GT.1.) DUMY=1.
      A(I)=A(I)-(FLOAT(NWRAP(I))*EFACT(I))*PI*THICK**2*.25 *DUMY
      EFACT(I)=0.
    102 DHYD(I) = 4.*A(I)/(PERIM(I)+FLOAT(NWRAP(I))*PI*THICK)
C
C  CALCULATE GAP SPACING IF REQUIRED.
    110 IF(MGXL.EQ.0) GO TO 210
    DO 200 K=1,NGX
      GAP(K) = GAPD(K)
      I = I0GAP(K)
      IF(I.LT.1) GO TO 200
      DO 120 I=1,NAXL
        120  GFAC(I) = GFAC(I,I)
        CALL CURVE (FF,X(J)/Z,GFAC*GAPXL*NGXL,IEPPOR,1)
        IF(IEPPOR.GT.1) GO TO 1000
        IF(FF.LE.0.) GO TO 1000
      200  GAP(K) = GAPD(K)*FF
    200 CONTINUE
    210 RETURN
  1000 IEPPOR = 9
    RETURN
  END

```

*NEW

*NEW
*NEW
*NEW
*NEW
*-1

```

SUBROUTINE FORCE(J)
  INCLUDE SPEC1
  INCLUDE SPEC2
  COMMON /DWRAP/ XCROSS(MG,6),DUR(MG),GIA,THICK,NWRAP(MG),PITCH
  COMMON /RFACT/ WFACT(MG)
  NKK = NK
  DO 10 K=1,NKK
    FDIV(K) = .FALSE.
  10 CONTINUE
    IF(J6.EQ.0) RETURN
    JM1 = J-1
    GO TO (100,200),J6
  C FORCED DIVERSION CROSSFLOW FROM WIRE WRAPS
  100 IF(PITCH.LE.0.) GO TO 1000
    NN = Z/PITCH
    NN = NN+1
    DO 115 K=1,NN
      IF(X(J).LT.PITCH*FLOAT(K)) GO TO 118
    115 CONTINUE
    118 PL = K-1
  C PL IS THE PITCH LENGTH CONTAINING X(J).
  C FIND THE WRAP CROSSINGS IN CX.
    DO 130 K=1,NK
      II = IK(K)
      JJ = JK(K)
      DO 130 L=1,6
        IF(XCROSS(K,L)) 119,130,119
    119 PLL=PL-IFIX(ABS(XCROSS(K,L)))
      IF(PLL.LT.0) GO TO 130
      XC= (ABS(XCROSS(K,L))+PLL)*PITCH
      XC=XC-THICK/2.
      XC=XC+THICK/2.
      IF(XC.GT.X(J).OR. XC.LE.X(JM1)) GO TO 130
      FDIV(K) = .TRUE.
  C ADD AND SUBSTRACT WIRE WRAPS FROM SUBCHANNEL AT EACH WRAP CROSSING.
    IF(XCROSS(K,L)) 120,130,121
    120 NWRAP(II)= NWRAP(II)+1
      NWRAP(JJ)= NWRAP(JJ)-1
      IF(XC.LT.X(J)-THICK/2. ) GO TO 123
      WFACT(II)=-.5
      WFACT(JJ)= .5
      GO TO 123
    121 NWRAP(II)= NWRAP(II)-1
      NWRAP(JJ)= NWRAP(JJ)+1
      IF(NWRAP.LE.0) GO TO 1000
      IF(XC.LT.X(J)-THICK/2. ) GO TO 123
      WFACT(II)= .5
      WFACT(JJ)=-.5
    123 DUMY = FLOAT(ITERAT)/FLOAT(NPAMP)
      IF(DUMY.GT.1.) DUMY = 1.
      W(K,J) = GAP(K)*PI*(GIA+THICK)*DUR(K)/DX*DUMY
      IF(XCROSS(K,L)) 124,130,125
    124 W(K,J) = W(K,J)*F(JJ,J)/A(JJ)
      W(K,J) = W(K,J)*FACTOR(K)
      GO TO 130
    125 W(K,J) = W(K,J)*F(II,J)/A(II)
      W(K,J) = W(K,J)*FACTOR(K)
    130 CONTINUE
      RETURN
    200 IF(.NOT.GRID) RETURN
      DO 230 K=1,NKK
        IF(ABS(FXFLOW(K,NGTYPE)).LT.1.E-10) GO TO 230
  C ZERO FORCED FLOW FRACTION DOES NOT BLOCK THE NATURAL DIVERSION CROSSFLOW.
      II = IK(K)
      JJ = JK(K)
      FDIV(K) = .TRUE.
      IF(NWRAP.LE.0) GO TO 1000
      DUMY = FLOAT(ITERAT)/FLOAT(NPAMP)
      IF(DUMY.GT.1.) DUMY = 1.
      DUMY = DUMY*FXFLOW(K,NGTYPE)/DX
      IF(DUMY.GT.0.) W(K,J) = DUMY*F(II,J)
      IF(DUMY.LT.0.) W(K,J) = DUMY*F(JJ,J)
      W(K,J) = W(K,J)*FACTOR(K)
    230 CONTINUE
      RETURN
    1000 ERROR = 6
      RETURN
      END

```

APPENDIX C

APPENDIX C

Tabulation of Reduced Experimental Data

TABULATION OF EXPERIMENTAL DATA.

AEC 7 ROD WIRE WRAP POSITION-30 WINDOW 4, DIST. 1.1

RUN NO	KEYNO LUS NO	X IN	Y IN	U FT/SEC	U/UB	UP FT/SEC	UP/U	V FT/SEC	V/U	CUTOFF KHZ
423	101811.	-1.612	-.537	17.40	.853	-	-	-3.51	-.20	-
424	101811.	-1.577	-.537	20.59	1.010	-	-	-3.15	-.15	-
425	101811.	-1.541	-.537	22.65	1.111	-	-	-2.92	-.13	-
426	101811.	-1.506	-.537	23.59	1.157	-	-	-2.74	-.12	-
427	101811.	-1.470	-.537	23.58	1.157	-	-	-2.51	-.11	-
428	101811.	-1.434	-.537	22.43	1.100	-	-	-2.10	-.09	-
429	101811.	-1.399	-.537	20.61	1.011	-	-	-2.26	-.11	-
AVERAGE TRANSVERSE VELOCITY =				-2.70	FT/SEC					
437	101811.	-1.613	.580	15.34	.752	-	-	-3.30	-.21	-
438	101811.	-1.576	.580	17.91	.878	-	-	-3.84	-.21	-
439	101811.	-1.542	.580	20.93	1.026	-	-	-2.48	-.12	-
440	101811.	-1.505	.580	21.46	1.053	-	-	-2.67	-.12	-
441	101811.	-1.470	.580	21.18	1.039	-	-	-2.49	-.12	-
442	101811.	-1.434	.580	18.21	.893	-	-	-4.03	-.22	-
443	101811.	-1.399	.580	16.15	.792	-	-	-3.96	-.25	-
AVERAGE TRANSVERSE VELOCITY =				-3.25	FT/SEC					
451	101811.	-1.628	.000	*	.921	*	.145	-	-	5.
452	101811.	-1.551	.000	23.56	1.155	1.50	.064	-	-	5.
453	101811.	-1.446	.000	25.16	1.234	1.09	.043	-	-	5.
454	101811.	-1.341	.000	25.06	1.229	1.15	.046	-	-	5.
455	101811.	-1.237	.000	25.21	1.236	1.08	.043	-	-	5.
456	101811.	-1.132	.000	24.76	1.214	1.03	.042	-	-	5.
457	101811.	-1.028	.000	24.73	1.213	1.10	.044	-	-	5.
458	101811.	-.923	.000	24.81	1.216	1.10	.044	-	-	5.
459	101811.	-.818	.000	24.25	1.189	1.36	.056	-	-	5.
460	101811.	-.714	.000	22.72	1.114	2.27	.100	-	-	5.
461	101811.	-.609	.000	23.79	1.167	1.23	.052	-	-	5.
462	101811.	-.504	.000	23.02	1.129	1.13	.049	-	-	5.
463	101811.	-.428	.000	19.71	.967	2.25	.114	-	-	5.
464	101811.	-1.609	-.537	*	.866	*	.174	-	-	5.
465	101811.	-1.576	-.537	20.71	1.016	2.45	.118	-	-	5.
466	101811.	-1.542	-.537	23.12	1.134	1.65	.071	-	-	5.
467	101811.	-1.509	-.537	24.30	1.192	1.23	.051	-	-	5.
468	101811.	-1.475	-.537	24.47	1.200	1.25	.051	-	-	5.
469	101811.	-1.442	-.537	23.79	1.167	1.49	.062	-	-	5.
470	101811.	-1.408	-.537	21.97	1.077	2.25	.102	-	-	5.
471	101811.	-.516	-.537	20.81	1.021	2.08	.100	-	-	5.
472	101811.	-.434	-.537	24.59	1.206	1.13	.046	-	-	5.
473	101811.	-.325	-.537	24.91	1.222	.97	.039	-	-	5.
474	101811.	-.217	-.537	24.49	1.201	1.05	.043	-	-	5.
475	101811.	-.108	-.537	24.88	1.220	1.07	.043	-	-	5.
476	101811.	.001	-.537	25.02	1.227	1.00	.040	-	-	5.
477	101811.	.109	-.537	24.81	1.216	1.06	.043	-	-	5.
478	101811.	.218	-.537	23.66	1.160	1.42	.060	-	-	5.
479	101811.	.327	-.537	22.32	1.094	1.15	.052	-	-	5.
480	101811.	.435	-.537	21.28	1.043	1.26	.059	-	-	5.
481	101811.	.516	-.537	17.76	.871	2.73	.154	-	-	5.
482	101811.	.538	.543	*	1.098	*	.150	-	-	5.
483	101811.	.453	.543	24.63	1.208	1.59	.065	-	-	5.
484	101811.	.340	.543	23.96	1.175	1.73	.072	-	-	5.
485	101811.	.227	.543	24.65	1.209	1.63	.066	-	-	5.
486	101811.	.115	.543	25.10	1.231	1.50	.060	-	-	5.
487	101811.	-.002	.543	23.86	1.170	1.59	.067	-	-	5.
488	101811.	.111	.543	22.44	1.100	1.49	.067	-	-	5.
490	101811.	.223	.543	21.49	1.054	1.42	.066	-	-	5.
491	101811.	.336	.543	22.37	1.097	1.24	.055	-	-	5.
492	101811.	.449	.543	22.40	1.099	1.31	.059	-	-	5.
493	101811.	.538	.543	18.90	.927	2.49	.132	-	-	5.
494	101811.	-1.609	.543	17.39	.853	2.71	.156	-	-	5.
495	101811.	-1.574	.543	19.42	.953	1.98	.102	-	-	5.
496	101811.	-1.540	.543	20.62	1.011	1.76	.085	-	-	5.
497	101811.	-1.505	.543	20.94	1.027	1.66	.079	-	-	5.
498	101811.	-1.470	.543	20.62	1.011	1.55	.075	-	-	5.
499	101811.	-1.435	.543	19.51	.957	1.77	.091	-	-	5.
500	101811.	-1.400	.543	18.04	.884	2.27	.126	-	-	5.

HYDRAULIC DIAMETER, D = .535 INCHES. AVERAGE VELOCITY, UB = 20.4 FT/SEC

* QUESTIONABLE DATA POINT. + TURBULENCE INTENSITY TOO HIGH TO MEASURE. - NO DATA POINT.

TABULATION OF EXPERIMENTAL DATA.

AEC 7 ROD WIRE WRAP POSITION 150 WINDOW 4, DIST. 1.1

RUN NO	REYNOLDS NO	X IN	Y IN	U FT/SEC	U/UB	UP FT/SEC	UP/U	V FT/SEC	V/U	CUTOFF KHZ
501	97766	-1.601	.000	19.34	.988	2.39	.124	-	-	5.
502	97766	-1.529	.000	22.15	1.131	1.40	.063	-	-	5.
503	97766	-1.428	.000	21.53	1.099	1.34	.062	-	-	5.
504	97766	-1.328	.000	21.10	1.077	1.26	.060	-	-	5.
505	97766	-1.229	.000	22.63	1.156	1.20	.053	-	-	5.
506	97766	-1.128	.000	23.38	1.194	1.18	.050	-	-	5.
507	97766	-1.029	.000	22.59	1.154	1.59	.070	-	-	5.
508	97766	-.928	.000	22.20	1.134	1.53	.069	-	-	5.
509	97766	-.828	.000	22.28	1.138	1.24	.055	-	-	5.
510	97766	-.728	.000	21.93	1.120	1.40	.064	-	-	5.
511	97766	-.628	.000	20.93	1.069	1.44	.069	-	-	5.
512	97766	-.529	.000	19.71	1.007	1.61	.082	-	-	5.
513	97766	-.455	.000	16.79	.858	2.54	.151	-	-	5.
514	97766	-1.597	-.550	*	.950	*	.156	-	-	5.
515	97766	-1.567	-.550	20.46	1.045	2.20	.107	-	-	5.
516	97766	-1.536	-.550	21.89	1.118	1.71	.078	-	-	5.
517	97766	-1.505	-.550	22.84	1.167	1.41	.062	-	-	5.
518	97766	-1.475	-.550	23.26	1.188	1.49	.064	-	-	5.
519	97766	-1.445	-.550	23.13	1.181	1.61	.070	-	-	5.
520	97766	-1.414	-.550	*	1.118	*	.113	-	-	5.
521	97766	-.508	-.550	*	.963	*	.137	-	-	5.
522	97766	-.428	-.550	21.61	1.104	1.42	.066	-	-	5.
523	97766	-.321	-.550	21.37	1.092	1.51	.071	-	-	5.
524	97766	-.215	-.550	21.15	1.080	2.36	.112	-	-	5.
525	97766	-.107	-.550	23.18	1.184	1.57	.068	-	-	5.
526	97766	.000	-.550	23.84	1.217	1.41	.059	-	-	5.
527	97766	.107	-.550	23.68	1.209	1.53	.065	-	-	5.
528	97766	.215	-.550	23.32	1.191	1.38	.059	-	-	5.
529	97766	.321	-.550	23.02	1.176	1.49	.065	-	-	5.
530	97766	.428	-.550	21.68	1.107	1.79	.083	-	-	5.
531	97766	.508	-.550	*	.919	*	.213	-	-	5.
532	97766	-1.598	.550	*	.938	*	.174	-	-	5.
533	97766	-1.567	.550	19.91	1.017	2.50	.126	-	-	5.
534	97766	-1.536	.550	21.13	1.079	2.22	.105	-	-	5.
535	97766	-1.505	.550	22.01	1.124	2.06	.094	-	-	5.
536	97766	-1.475	.550	22.19	1.133	2.01	.090	-	-	5.
537	97766	-1.444	.550	21.44	1.095	1.93	.090	-	-	5.
538	97766	-1.413	.550	*	.985	*	.153	-	-	5.
539	97766	-.491	.550	*	.946	*	.140	-	-	5.
540	97766	-.414	.550	20.77	1.061	1.61	.078	-	-	5.
541	97766	-.311	.550	21.50	1.098	1.61	.075	-	-	5.
542	97766	-.207	.550	23.44	1.197	1.70	.073	-	-	5.
543	97766	-.103	.550	23.14	1.182	1.76	.076	-	-	5.
544	97766	.000	.550	22.87	1.168	1.61	.071	-	-	5.
545	97766	.103	.550	22.23	1.135	1.73	.078	-	-	5.
546	97766	.207	.550	22.13	1.130	1.73	.078	-	-	5.
547	97766	.311	.550	23.21	1.186	1.63	.070	-	-	5.
548	97766	.414	.550	22.75	1.162	1.77	.078	-	-	5.
549	97766	.491	.550	*	.988	*	.139	-	-	5.
550	97766	-1.579	-.060	*	.901	+	+	-	-	5.
551	97766	-1.529	-.060	*	1.057	*	.144	-	-	5.
552	97766	-1.379	-.060	21.65	1.106	1.83	.084	-	-	5.
553	97766	-1.229	-.060	22.29	1.139	1.58	.071	-	-	5.
554	97766	-1.078	-.060	22.42	1.145	1.70	.076	-	-	5.
555	97766	-.930	-.060	19.85	1.014	1.70	.086	-	-	5.
556	97766	-.779	-.060	21.07	1.076	1.32	.062	-	-	5.
557	97766	-.629	-.060	21.61	1.104	1.23	.057	-	-	5.
558	97766	-.479	-.060	21.13	1.079	1.27	.060	-	-	5.
559	97766	-1.579	.060	*	.985	*	.161	-	-	5.
560	97766	-1.529	.060	21.68	1.107	2.05	.095	-	-	5.
561	97766	-1.379	.060	20.93	1.069	1.59	.076	-	-	5.
562	97766	-1.229	.060	22.69	1.159	1.50	.066	-	-	5.
563	97766	-1.078	.060	23.92	1.222	1.46	.061	-	-	5.
564	97766	-.930	.060	23.26	1.188	2.21	.095	-	-	5.
565	97766	-.779	.060	22.96	1.173	2.06	.090	-	-	5.
566	97766	-.629	.060	*	1.077	*	.118	-	-	5.
567	97766	-.479	.060	*	.914	*	.230	-	-	5.
568	97766	-1.553	.109	*	.990	+	+	-	-	5.
569	97766	-1.478	.109	*	1.135	*	.099	-	-	5.
570	97766	-1.328	.109	20.45	1.044	1.34	.065	-	-	5.
571	97766	-1.178	.109	23.36	1.193	1.22	.052	-	-	5.
572	97766	-1.029	.109	21.49	1.098	1.52	.071	-	-	5.
573	97766	-.879	.109	19.29	.985	1.38	.071	-	-	5.
574	97766	-.728	.109	23.19	1.184	1.07	.046	-	-	5.
575	97766	-.578	.109	21.67	1.107	1.26	.058	-	-	5.
576	97766	-.503	.109	20.81	1.063	1.26	.060	-	-	5.

HYDRAULIC DIAMETER, D = .535 INCHES. AVERAGE VELOCITY, UB = 19.6 FT/SEC
 * QUESTIONABLE DATA POINT. + TURBULENCE INTENSITY TO HIGH TO MEASURE. - NO DATA POINT.

TABULATION OF EXPERIMENTAL DATA.

AEC 7 ROD WIRE WRAP POSITION 150, WINDOW 4, DIST. 1.1

RUN NO	REYNOLDS NO	X IN	Y IN	U FT/SEC	U/UB	UP FT/SEC	UP/U	V FT/SEC	V/U	CUTOFF KHZ
577	102148.	-1.553	-.108	22.11	1.081	1.47	.067	-	-	-
578	102148.	-1.478	-.108	23.44	1.146	1.03	.044	-	-	-
579	102148.	-1.328	-.108	23.06	1.127	.89	.038	-	-	-
580	102148.	-1.178	-.108	24.02	1.174	.98	.041	-	-	-
581	102148.	-1.029	-.108	16.78	.820	1.27	.076	-	-	-
582	102148.	-.879	-.108	16.94	.828	1.21	.072	-	-	-
583	102148.	-.728	-.108	20.61	1.007	1.41	.068	-	-	-
584	102148.	-.578	-.108	21.64	1.058	1.37	.063	-	-	-
585	102148.	-.503	-.108	19.97	.976	1.74	.087	-	-	-

HYDRAULIC DIAMETER, D = .535 INCHES. AVERAGE VELOCITY, UB = 20.5 FT/SEC
 * QUESTIONABLE DATA POINT. + TURBULENCE INTENSITY TOO HIGH TO MEASURE. - NO DATA POINT.

RUN NO	REYNOLDS NO	X IN	Y IN	U FT/SEC	U/UB	UP FT/SEC	UP/U	V FT/SEC	V/U	CUTOFF KHZ
586	75951.	-1.611	.000	*	.893	*	.193	-	-	5.
587	75951.	-1.538	.000	16.22	1.092	1.68	.104	-	-	5.
588	75951.	-1.434	.000	16.11	1.085	1.57	.097	-	-	5.
589	75951.	-1.334	.000	15.51	1.044	1.41	.091	-	-	5.
590	75951.	-1.232	.000	16.79	1.130	1.35	.081	-	-	5.
591	75951.	-1.130	.000	17.34	1.167	1.41	.082	-	-	5.
592	75951.	-1.028	.000	16.88	1.136	1.63	.097	-	-	5.
593	75951.	-.926	.000	16.55	1.114	1.67	.101	-	-	5.
594	75951.	-.826	.000	16.59	1.117	1.47	.088	-	-	5.
595	75951.	-.724	.000	16.24	1.093	1.54	.095	-	-	5.
596	75951.	-.622	.000	15.39	1.036	1.64	.107	-	-	5.
597	75951.	-.520	.000	14.27	.961	1.65	.116	-	-	5.
598	75951.	-.445	.000	*	.775	*	.236	-	-	5.
599	75951.	-1.601	-.542	*	.874	*	.224	-	-	5.
600	75951.	-1.569	-.542	14.89	1.002	1.95	.131	-	-	5.
601	75951.	-1.537	-.542	15.97	1.075	2.01	.126	-	-	5.
602	75951.	-1.506	-.542	16.71	1.125	1.86	.112	-	-	5.
603	75951.	-1.474	-.542	17.29	1.164	1.69	.098	-	-	5.
604	75951.	-1.443	-.542	17.25	1.161	1.69	.098	-	-	5.
605	75951.	-1.411	-.542	*	1.082	*	.155	-	-	5.
606	75951.	-.496	-.542	*	.839	+	+	-	-	5.
607	75951.	-.418	-.542	15.46	1.041	1.86	.121	-	-	5.
608	75951.	-.314	-.542	15.39	1.036	1.94	.126	-	-	5.
609	75951.	-.209	-.542	*	.960	*	.195	-	-	5.
610	75951.	-.105	-.542	*	1.047	*	.166	-	-	5.
611	75951.	.000	-.542	*	1.099	*	.155	-	-	5.
612	75951.	.105	-.542	*	1.129	*	.143	-	-	5.
613	75951.	.209	-.542	*	1.126	*	.162	-	-	5.
614	75951.	.314	-.542	*	1.119	*	.153	-	-	5.
615	75951.	.418	-.542	*	1.048	*	.194	-	-	5.
616	75951.	.496	-.542	*	.864	+	+	-	-	5.
617	75951.	-1.601	.542	*	.804	+	+	-	-	5.
618	75951.	-1.569	.542	*	.937	*	.219	-	-	5.
619	75951.	-1.537	.542	*	1.012	*	.199	-	-	5.
620	75951.	-1.506	.542	*	1.057	*	.179	-	-	5.
621	75951.	-1.474	.542	*	1.071	*	.190	-	-	5.
622	75951.	-1.443	.542	*	1.033	*	.207	-	-	5.
623	75951.	-1.411	.542	*	.898	+	+	-	-	5.
624	75951.	-.496	.542	*	.815	+	+	-	-	5.
625	75951.	-.418	.542	*	.998	*	.140	-	-	5.
626	75951.	-.314	.542	15.49	1.043	2.04	.132	-	-	5.
627	75951.	-.209	.542	17.10	1.151	1.81	.106	-	-	5.
628	75951.	-.105	.542	16.84	1.134	2.04	.121	-	-	5.
629	75951.	.000	.542	16.77	1.129	1.86	.111	-	-	5.
630	75951.	.105	.542	16.36	1.101	1.90	.116	-	-	5.
631	75951.	.209	.542	16.22	1.092	1.90	.117	-	-	5.
632	75951.	.314	.542	16.92	1.139	2.04	.121	-	-	5.
633	75951.	.418	.542	16.55	1.114	2.03	.123	-	-	5.
634	75951.	.496	.542	*	.919	*	.231	-	-	5.

HYDRAULIC DIAMETER, D = .535 INCHES. AVERAGE VELOCITY, UB = 14.9 FT/SEC
 * QUESTIONABLE DATA POINT. + TURBULENCE INTENSITY TOO HIGH TO MEASURE. - NO DATA POINT.

TABULATION OF EXPERIMENTAL DATA.

AEC 7 ROD WIRE WRAP POSITION 150 WINDOW 4 DIST. 1.1

RUN NO	REYNOLDS NO	X IN	Y IN	U FT/SEC	U/UB	UP FT/SEC	UP/U	V FT/SEC	V/U	CUTOFF KHZ
635	101474	-1.612	.000	16.74	.823	-	-	-3.19	-.19	-
636	101474	-1.536	.000	20.51	1.009	-	-	-3.68	-.18	-
637	101474	-1.435	.000	20.58	1.012	-	-	-3.07	-.15	-
638	101474	-1.334	.000	19.98	.983	-	-	-1.45	-.07	-
639	101474	-1.232	.000	21.56	1.061	-	-	-.04	-.00	-
640	101474	-1.130	.000	22.40	1.102	-	-	.55	.02	-
641	101474	-1.028	.000	21.77	1.071	-	-	.19	.01	-
642	101474	-.926	.000	21.28	1.047	-	-	-.03	-.00	-
643	101474	-.824	.000	21.14	1.040	-	-	.12	.01	-
644	101474	-.724	.000	21.11	1.039	-	-	.20	.01	-
645	101474	-.622	.000	20.17	.992	-	-	.47	.02	-
646	101474	-.520	.000	18.91	.930	-	-	.66	.03	-
647	101474	-.445	.000	15.74	.774	-	-	.43	.03	-
AVERAGE TRANSVERSE VELOCITY =				-.58 FT/SEC						
661	101474	-1.582	-.542	17.52	.862	-	-	-3.37	-.19	-
662	101474	-1.552	-.542	19.37	.953	-	-	-3.74	-.19	-
663	101474	-1.524	-.542	20.39	1.003	-	-	-3.88	-.19	-
664	101474	-1.496	-.542	21.10	1.038	-	-	-4.14	-.20	-
665	101474	-1.466	-.542	21.48	1.057	-	-	-4.35	-.20	-
666	101474	-1.438	-.542	20.99	1.033	-	-	-4.40	-.21	-
667	101474	-1.409	-.542	19.56	.962	-	-	-4.12	-.21	-
AVERAGE TRANSVERSE VELOCITY =				-4.06 FT/SEC						
675	101474	-1.590	.542	16.09	.836	-	-	-3.10	-.18	-
676	101474	-1.562	.542	18.46	.908	-	-	-3.66	-.20	-
677	101474	-1.534	.542	19.66	.968	-	-	-3.64	-.19	-
678	101474	-1.505	.542	20.53	1.010	-	-	-3.62	-.18	-
679	101474	-1.477	.542	20.65	1.016	-	-	-3.89	-.19	-
680	101474	-1.449	.542	20.01	.984	-	-	-3.77	-.19	-
681	101474	-1.421	.542	18.28	.900	-	-	-3.45	-.19	-
AVERAGE TRANSVERSE VELOCITY =				-3.66 FT/SEC						
HYDRAULIC DIAMETER, D = .535				INCHES. AVERAGE VELOCITY, UB = 20.3 FT/SEC						
* QUESTIONABLE DATA POINT.				+ TURBULENCE INTENSITY TOO HIGH TO MEASURE. - NO DATA POINT.						

AEC 7 ROD WIRE WRAP POSITION 210 WINDOW 4 DIST. 1.1

RUN NO	REYNOLDS NO	X IN	Y IN	U FT/SEC	U/UB	UP FT/SEC	UP/U	V FT/SEC	V/U	CUTOFF KHZ
689	103497	-1.614	.000	16.48	.795	-	-	-2.80	-.17	-
690	103497	-1.538	.000	19.76	.953	-	-	-2.59	-.13	-
691	103497	-1.435	.000	22.25	1.073	-	-	-2.44	-.11	-
692	103497	-1.335	.000	22.34	1.078	-	-	-2.08	-.09	-
693	103497	-1.233	.000	21.78	1.051	-	-	-1.27	-.06	-
694	103497	-1.131	.000	21.88	1.056	-	-	-.59	-.03	-
695	103497	-1.029	.000	21.90	1.057	-	-	-.36	-.02	-
696	103497	-.927	.000	21.60	1.042	-	-	-.15	-.01	-
697	103497	-.825	.000	20.91	1.009	-	-	.25	.01	-
698	103497	-.724	.000	20.43	.986	-	-	.91	.04	-
699	103497	-.623	.000	19.71	.951	-	-	.71	.04	-
700	103497	-.521	.000	17.58	.848	-	-	-.39	-.02	-
701	103497	-.445	.000	15.43	.745	-	-	-1.95	-.13	-
AVERAGE TRANSVERSE VELOCITY =				-.80 FT/SEC						
715	103497	-1.618	-.543	18.51	.893	-	-	-2.61	-.14	-
716	103497	-1.580	-.543	20.23	.976	-	-	-2.52	-.12	-
717	103497	-1.543	-.543	21.40	1.033	-	-	-2.41	-.11	-
718	103497	-1.505	-.543	22.07	1.065	-	-	-2.52	-.11	-
719	103497	-1.468	-.543	22.00	1.061	-	-	-2.80	-.13	-
720	103497	-1.430	-.543	21.48	1.036	-	-	-3.10	-.14	-
721	103497	-1.389	-.543	19.92	.961	-	-	-3.57	-.18	-
AVERAGE TRANSVERSE VELOCITY =				-2.74 FT/SEC						
729	103497	-1.590	.542	18.33	.884	-	-	-4.46	-.24	-
730	103497	-1.562	.542	19.34	.933	-	-	-4.24	-.22	-
731	103497	-1.534	.542	20.14	.971	-	-	-4.20	-.21	-
732	103497	-1.505	.542	20.67	.997	-	-	-4.25	-.21	-
733	103497	-1.477	.542	20.86	1.007	-	-	-4.30	-.21	-
734	103497	-1.449	.542	20.46	.987	-	-	-4.54	-.22	-
735	103497	-1.421	.542	19.55	.943	-	-	-4.75	-.24	-
AVERAGE TRANSVERSE VELOCITY =				-4.35 FT/SEC						
HYDRAULIC DIAMETER, D = .535				INCHES. AVERAGE VELOCITY, UB = 20.7 FT/SEC						
* QUESTIONABLE DATA POINT.				+ TURBULENCE INTENSITY TOO HIGH TO MEASURE. - NO DATA POINT.						

TABULATION OF EXPERIMENTAL DATA.

AEC 7 ROD WIRE WRAP, POSITION 210, WINDOW 4, DIST. 1.1

RUN NO	REYNOLDS NO	X IN	Y IN	U FT/SEC	U/UB	UP FT/SEC	UP/U	V FT/SEC	V/U	CUTOFF KHZ
743	103497.	-1.619	.000	*	.853	*	.177	-	-	7.
744	103497.	-1.542	.000	21.97	1.060	1.91	.087	-	-	7.
745	103497.	-1.441	.000	23.92	1.154	1.32	.055	-	-	7.
746	103497.	-1.337	.000	23.39	1.129	1.38	.059	-	-	7.
747	103497.	-1.234	.000	22.77	1.099	1.37	.060	-	-	7.
748	103497.	-1.131	.000	23.27	1.123	1.40	.060	-	-	7.
749	103497.	-1.029	.000	23.56	1.137	1.47	.062	-	-	7.
750	103497.	-.926	.000	23.19	1.119	1.49	.064	-	-	7.
751	103497.	-.822	.000	22.15	1.069	1.62	.073	-	-	7.
752	103497.	-.720	.000	21.83	1.053	1.59	.073	-	-	7.
753	103497.	-.617	.000	20.81	1.004	1.49	.072	-	-	7.
754	103497.	-.514	.000	18.65	.900	1.37	.074	-	-	7.
755	103497.	-.437	.000	16.01	.773	2.28	.143	-	-	7.
756	103497.	-1.599	-.543	*	1.011	*	.148	-	-	7.
757	103497.	-1.569	-.543	22.65	1.093	2.39	.106	-	-	7.
758	103497.	-1.538	-.543	23.45	1.131	2.29	.097	-	-	7.
759	103497.	-1.509	-.543	23.92	1.154	2.06	.086	-	-	7.
760	103497.	-1.478	-.543	23.94	1.155	1.94	.081	-	-	7.
761	103497.	-1.447	-.543	*	1.121	*	.105	-	-	7.
762	103497.	-1.418	-.543	*	1.052	*	.131	-	-	7.
763	103497.	-.499	-.543	*	.799	*	.207	-	-	7.
764	103497.	-.421	-.543	21.15	1.020	2.03	.096	-	-	7.
765	103497.	-.315	-.543	23.81	1.149	1.61	.068	-	-	7.
766	103497.	-.211	-.543	24.28	1.171	1.78	.073	-	-	7.
767	103497.	-.105	-.543	23.98	1.157	1.74	.072	-	-	7.
768	103497.	-.000	-.543	23.39	1.129	1.71	.073	-	-	7.
769	103497.	.105	-.543	22.57	1.089	1.82	.081	-	-	7.
770	103497.	.211	-.543	21.31	1.028	1.86	.087	-	-	7.
771	103497.	.315	-.543	22.62	1.091	1.79	.079	-	-	7.
772	103497.	.421	-.543	20.36	.982	2.43	.119	-	-	7.
773	103497.	.499	-.543	*	.682	*	.238	-	-	7.
774	103497.	-1.590	.542	*	.909	*	.197	-	-	7.
775	103497.	-1.562	.542	*	.982	*	.145	-	-	7.
776	103497.	-1.534	.542	*	1.026	*	.136	-	-	7.
777	103497.	-1.505	.542	22.05	1.064	2.31	.105	-	-	7.
778	103497.	-1.477	.542	22.37	1.079	2.07	.092	-	-	7.
779	103497.	-1.449	.542	*	1.044	*	.105	-	-	7.
780	103497.	-1.421	.542	*	.947	*	.200	-	-	7.
781	103497.	-.506	.542	*	.850	*	.217	-	-	7.
782	103497.	-.426	.542	21.70	1.047	1.96	.090	-	-	7.
783	103497.	-.319	.542	22.31	1.076	2.01	.090	-	-	7.
784	103497.	-.213	.542	23.03	1.111	1.84	.080	-	-	7.
785	103497.	-.106	.542	23.56	1.137	1.86	.079	-	-	7.
786	103497.	-.000	.542	23.13	1.116	1.89	.082	-	-	7.
787	103497.	.106	.542	21.98	1.060	1.91	.087	-	-	7.
788	103497.	.213	.542	21.25	1.025	1.94	.091	-	-	7.
789	103497.	.319	.542	22.35	1.078	2.29	.102	-	-	7.
790	103497.	.426	.542	21.87	1.055	1.99	.091	-	-	7.
791	103497.	.506	.542	*	.934	*	.191	-	-	7.

HYDRAULIC DIAMETER, D = .535 INCHES. AVERAGE VELOCITY, UB = 20.7 FT/SEC.

* QUESTIONABLE DATA POINT. + TURBULENCE INTENSITY TOO HIGH TO MEASURE. - NO DATA POINT.

TABULATION OF EXPERIMENTAL DATA.

AEC 7 ROD WIRE WRAP POSITION 210 WINDOW 4 DIST. 1.1

RUN NO	REYNOLDS NO	X IN	Y IN	U FT/SEC	U/UB	UP FT/SEC	UP/U	V FT/SEC	V/U	CUTOFF KHZ
792	67947.	-1.630	.000	11.91	.844	1.59	.133	-	-	5.
793	67947.	-1.552	.000	15.00	1.063	1.01	.067	-	-	5.
794	67947.	-1.447	.000	16.89	1.197	.97	.057	-	-	5.
795	67947.	-1.343	.000	16.65	1.180	.77	.047	-	-	5.
796	67947.	-1.238	.000	16.12	1.142	.83	.052	-	-	5.
797	67947.	-1.133	.000	16.35	1.159	.85	.052	-	-	5.
798	67947.	-1.029	.000	16.53	1.171	.89	.054	-	-	5.
799	67947.	-.923	.000	16.29	1.154	1.00	.061	-	-	5.
800	67947.	-.818	.000	15.70	1.113	1.09	.069	-	-	5.
801	67947.	-.714	.000	15.19	1.076	1.02	.067	-	-	5.
802	67947.	-.609	.000	14.45	1.024	.94	.065	-	-	5.
803	67947.	-.504	.000	12.41	.880	1.12	.090	-	-	5.
804	67947.	-.427	.000	10.35	.733	2.05	.198	-	-	5.
805	67947.	-1.612	-.542	*	.943	*	.171	-	-	5.
806	67947.	-1.576	-.542	15.05	1.066	1.73	.115	-	-	5.
807	67947.	-1.541	-.542	16.15	1.144	1.49	.093	-	-	5.
808	67947.	-1.506	-.542	16.56	1.174	1.58	.096	-	-	5.
809	67947.	-1.470	-.542	16.66	1.181	1.51	.091	-	-	5.
810	67947.	-1.435	-.542	16.15	1.144	1.64	.102	-	-	5.
811	67947.	-1.400	-.542	*	1.033	*	.173	-	-	5.
812	67947.	-.503	-.542	*	.725	+	+	-	-	5.
813	67947.	-.424	-.542	13.90	.985	1.86	.134	-	-	5.
814	67947.	-.318	-.542	15.89	1.126	1.86	.117	-	-	5.
815	67947.	-.212	-.542	*	1.171	*	.125	-	-	5.
816	67947.	-.106	-.542	*	1.142	*	.154	-	-	5.
817	67947.	-.000	-.542	*	1.121	*	.131	-	-	5.
818	67947.	.106	-.542	*	1.083	*	.170	-	-	5.
819	67947.	.212	-.542	*	1.027	*	.161	-	-	5.
820	67947.	.318	-.542	*	1.028	*	.137	-	-	5.
821	67947.	.424	-.542	*	.862	+	+	-	-	5.
822	67947.	.503	-.542	*	.661	+	+	-	-	5.
823	67947.	-1.609	.543	*	.950	*	.191	-	-	5.
824	67947.	-1.575	.543	14.18	1.005	1.88	.133	-	-	5.
825	67947.	-1.540	.543	15.28	1.083	1.67	.110	-	-	5.
826	67947.	-1.505	.543	15.86	1.124	1.76	.111	-	-	5.
827	67947.	-1.470	.543	16.28	1.153	1.46	.090	-	-	5.
828	67947.	-1.437	.543	15.67	1.110	1.57	.100	-	-	5.
829	67947.	-1.402	.543	*	.982	*	.179	-	-	5.
830	67947.	-.516	.543	*	.751	+	+	-	-	5.
831	67947.	-.435	.543	14.52	1.029	1.46	.100	-	-	5.
832	67947.	-.326	.543	15.70	1.113	1.41	.090	-	-	5.
833	67947.	-.217	.543	16.39	1.161	1.44	.088	-	-	5.
834	67947.	-.109	.543	16.56	1.174	1.41	.085	-	-	5.
835	67947.	.000	.543	16.00	1.134	1.56	.097	-	-	5.
836	67947.	.109	.543	15.40	1.092	1.61	.105	-	-	5.
837	67947.	.217	.543	14.85	1.053	1.62	.109	-	-	5.
838	67947.	.326	.543	15.28	1.083	1.51	.099	-	-	5.
839	67947.	.435	.543	14.63	1.037	1.57	.107	-	-	5.

HYDRAULIC DIAMETER, D = .535 INCHES. AVERAGE VELOCITY, UB = 14.1 FT/SEC
 * QUESTIONABLE DATA POINT. + TURBULENCE INTENSITY TOO HIGH TO MEASURE. - NO DATA POINT.

TABULATION OF EXPERIMENTAL DATA.

AEC 7 ROD WIRE WRAP POSITION 210, WINDOW 4, DIST 1.1

RUN NO	KEYNOLDS NO	X IN	Y IN	U FT/SEC	U/UB	UP FT/SEC	UP/U	V FT/SEC	V/U	CUTOFF KHZ
840	102148.	-1.604	.056	20.08	.982	2.29	.114	-	-	5.
841	102148.	-1.552	.056	22.90	1.120	1.49	.065	-	-	5.
842	102148.	-1.395	.056	24.46	1.195	.97	.040	-	-	5.
843	102148.	-1.238	.056	22.47	1.096	1.08	.048	-	-	5.
844	102148.	-1.081	.056	22.99	1.124	1.39	.060	-	-	5.
845	102148.	-.924	.056	22.25	1.087	1.53	.069	-	-	5.
846	102148.	-.766	.056	22.57	1.103	1.33	.059	-	-	5.
847	102148.	-.609	.056	21.22	1.037	1.43	.067	-	-	5.
848	102148.	-.452	.056	16.34	.799	1.59	.097	-	-	5.
849	102148.	-1.604	-.056	*	.848	*	.227	-	-	5.
850	102148.	-1.552	-.056	*	1.020	*	.121	-	-	5.
851	102148.	-1.395	-.056	24.45	1.195	1.55	.063	-	-	5.
852	102148.	-1.238	-.056	24.43	1.194	1.58	.065	-	-	5.
853	102148.	-1.081	-.056	24.94	1.219	1.52	.061	-	-	5.
854	102148.	-.924	-.056	23.18	1.133	1.88	.081	-	-	5.
855	102148.	-.766	-.056	21.53	1.052	1.88	.087	-	-	5.
856	102148.	-.609	-.056	22.35	1.093	1.81	.081	-	-	5.
857	102148.	-.452	-.056	*	.875	*	.143	-	-	5.
858	102148.	-1.577	-.102	*	.804	+	+	-	-	5.
859	102148.	-1.500	-.102	*	1.066	*	.118	-	-	5.
860	102148.	-1.343	-.102	24.73	1.209	1.52	.062	-	-	5.
861	102148.	-1.186	-.102	25.09	1.226	1.41	.056	-	-	5.
862	102148.	-1.029	-.102	22.76	1.112	1.97	.087	-	-	5.
863	102148.	-.871	-.102	18.83	.920	1.52	.081	-	-	5.
864	102148.	-.714	-.102	22.46	1.098	2.07	.092	-	-	5.
865	102148.	-.557	-.102	23.85	1.166	1.51	.064	-	-	5.
866	102148.	-.478	-.102	22.41	1.096	1.69	.076	-	-	5.
867	102148.	-1.577	.089	20.07	.981	2.26	.113	-	-	5.
868	102148.	-1.500	.089	23.80	1.163	1.48	.062	-	-	5.
869	102148.	-1.343	.089	24.12	1.179	.97	.040	-	-	5.
870	102148.	-1.186	.089	21.47	1.049	1.06	.049	-	-	5.
871	102148.	-1.029	.089	20.52	1.003	1.48	.072	-	-	5.
872	102148.	-.871	.089	19.73	.965	1.67	.085	-	-	5.
873	102148.	-.714	.089	22.42	1.096	1.11	.049	-	-	5.
874	102148.	-.557	.089	18.53	.906	1.77	.096	-	-	5.
875	102148.	-.478	.089	16.16	.790	1.49	.093	-	-	5.

AEC 7 ROD WIRE WRAP POSITION 210, WINDOW 4, DIST. 1.1

RUN NO	KEYNOLDS NO	X IN	Y IN	U FT/SEC	U/UB	UP FT/SEC	UP/U	V FT/SEC	V/U	CUTOFF KHZ
876	102148.	-1.630	.000	*	.851	*	.172	-	-	5.
877	102148.	-1.553	.000	22.62	1.105	1.38	.061	-	-	5.
878	102148.	-1.448	.000	25.01	1.222	.93	.037	-	-	5.
879	102148.	-1.343	.000	24.45	1.195	1.45	.059	-	-	5.
880	102148.	-1.237	.000	22.93	1.121	1.51	.066	-	-	5.
881	102148.	-1.133	.000	22.05	1.078	1.22	.055	-	-	5.
882	102148.	-1.028	.000	22.82	1.115	1.42	.062	-	-	5.
883	102148.	-.924	.000	24.12	1.179	1.28	.053	-	-	5.
884	102148.	-.819	.000	24.75	1.210	1.14	.046	-	-	5.
885	102148.	-.714	.000	24.88	1.216	.98	.040	-	-	5.
886	102148.	-.610	.000	24.49	1.197	1.03	.042	-	-	5.
887	102148.	-.504	.000	22.37	1.093	1.57	.070	-	-	5.
888	102148.	-.426	.000	*	.866	*	.174	-	-	5.
889	102148.	-1.611	-.552	20.30	.992	2.09	.103	-	-	5.
890	102148.	-1.576	-.552	23.00	1.124	1.86	.081	-	-	5.
891	102148.	-1.541	-.552	24.70	1.207	1.39	.056	-	-	5.
892	102148.	-1.506	-.552	25.08	1.226	1.30	.042	-	-	5.
893	102148.	-1.470	-.552	24.67	1.206	1.30	.053	-	-	5.
894	102148.	-1.435	-.552	24.00	1.173	1.40	.058	-	-	5.
895	102148.	-1.400	-.552	22.28	1.089	2.08	.093	-	-	5.
896	102148.	-.522	-.552	*	.899	*	.132	-	-	5.
897	102148.	-.439	-.552	22.08	1.079	1.33	.060	-	-	5.
898	102148.	-.329	-.552	22.31	1.090	1.38	.062	-	-	5.
899	102148.	-.220	-.552	23.07	1.128	1.60	.069	-	-	5.
900	102148.	-.110	-.552	24.28	1.187	1.49	.061	-	-	5.
901	102148.	.000	-.552	24.54	1.200	1.51	.061	-	-	5.
902	102148.	.110	-.552	24.09	1.177	1.85	.077	-	-	5.
903	102148.	.220	-.552	23.32	1.140	1.76	.075	-	-	5.
904	102148.	.329	-.552	*	1.085	*	.095	-	-	5.
905	102148.	.439	-.552	*	1.017	*	.115	-	-	5.
906	102148.	.522	-.552	*	.815	+	+	-	-	5.
907	102148.	-1.619	.552	*	.827	*	.182	-	-	5.
908	102148.	-1.582	.552	19.76	.966	2.23	.113	-	-	5.
909	102148.	-1.543	.552	21.87	1.069	1.43	.065	-	-	5.
910	102148.	-1.505	.552	22.35	1.093	1.26	.056	-	-	5.
911	102148.	-1.468	.552	21.26	1.039	1.57	.074	-	-	5.
912	102148.	-1.430	.552	18.71	.914	2.36	.126	-	-	5.
913	102148.	-1.391	.552	*	.753	*	.191	-	-	5.
914	102148.	-.524	.552	*	.816	*	.204	-	-	5.
915	102148.	-.441	.552	19.35	.946	1.73	.080	-	-	5.

HYDRAULIC DIAMETER, D = .535 INCHES. AVERAGE VELOCITY, UB = 20.5 FT/SEC
 * QUESTIONABLE DATA POINT. + TURBULNCE INTENSITY TOO HIGH TO MEASURE. - NO DATA POINT.

TABULATION OF EXPERIMENTAL DATA.

AEC 7 ROW WIRE WRAP POSITION+30 WINDOW 4 DIST. 1.1

RUN NO	KEYNO LUS NO	X IN	Y IN	U FT/SEC	U/UB	UP FT/SEC	UP/U	V FT/SEC	V/U	CUTOFF KHZ
916	102148.	-.331	.552	21.82	1.066	1.60	.074	-	-	5.
917	102148.	-.221	.552	21.73	1.062	1.74	.080	-	-	5.
918	102148.	-.111	.552	23.38	1.143	1.76	.075	-	-	5.
919	102148.	-.001	.552	24.27	1.186	1.83	.075	-	-	5.
920	102148.	.111	.552	24.78	1.211	1.64	.066	-	-	5.
921	102148.	.221	.552	24.55	1.200	1.68	.068	-	-	5.
922	102148.	.331	.552	23.47	1.147	1.93	.082	-	-	5.
923	102148.	.441	.552	21.16	1.034	2.10	.089	-	-	5.
924	102148.	.524	.552	*	.870	*	.174	-	-	5.
925	102148.	-1.605	-.061	*	.866	*	.169	-	-	5.
926	102148.	-1.553	-.061	21.41	1.046	2.10	.088	-	-	5.
927	102148.	-1.396	-.061	24.65	1.205	1.64	.066	-	-	5.
928	102148.	-1.239	-.061	22.40	1.095	1.74	.078	-	-	5.
929	102148.	-1.080	-.061	22.71	1.110	1.67	.073	-	-	5.
930	102148.	-.924	-.061	24.30	1.188	1.25	.052	-	-	5.
931	102148.	-.767	-.061	25.10	1.227	1.12	.045	-	-	5.
932	102148.	-.610	-.061	24.47	1.196	1.21	.050	-	-	5.
933	102148.	-.452	-.061	19.53	.955	2.18	.112	-	-	5.
934	102148.	-1.605	.061	*	.810	*	.260	-	-	-
935	102148.	-1.553	.061	20.81	1.017	1.94	.083	-	-	-
936	102148.	-1.396	.061	25.38	1.241	.87	.074	-	-	-
937	102148.	-1.239	.061	24.71	1.208	1.82	.083	-	-	-
938	102148.	-1.080	.061	20.79	1.016	1.87	.071	-	-	-
939	102148.	-.924	.061	19.38	.947	1.57	.081	-	-	-
940	102148.	-.767	.061	21.70	1.060	1.88	.087	-	-	-
941	102148.	-.610	.061	23.87	1.167	1.61	.068	-	-	-
942	102148.	-.452	.061	*	1.060	*	.187	-	-	-

HYDRAULIC DIAMETER, D = .535 INCHES. AVERAGE VELOCITY, UR = 20.5 FT/SEC
 * QUESTIONABLE DATA POINT. + TURBULENCE INTENSITY TO HIGH TO MEASURE. - NO DATA POINT.

AEC 7 ROW WIRE WRAP POSITION+30 WINDOW 4 DIST. 1.1

RUN NO	KEYNO LUS NO	X IN	Y IN	U FT/SEC	U/UB	UP FT/SEC	UP/U	V FT/SEC	V/U	CUTOFF KHZ
943	67619.	-1.632	.000	*	.845	*	+	-	-	5.
944	67619.	-1.554	.000	15.02	1.096	1.21	.081	-	-	5.
945	67619.	-1.448	.000	16.83	1.228	.95	.056	-	-	5.
946	67619.	-1.343	.000	16.46	1.201	1.18	.072	-	-	5.
947	67619.	-1.239	.000	15.31	1.117	1.21	.079	-	-	5.
948	67619.	-1.133	.000	14.53	1.060	1.11	.076	-	-	5.
950	67619.	-1.028	.000	15.18	1.107	1.13	.074	-	-	5.
951	67619.	-.924	.000	16.12	1.176	1.01	.063	-	-	5.
952	67619.	-.818	.000	16.53	1.206	.98	.059	-	-	5.
953	67619.	-.713	.000	16.65	1.215	.88	.053	-	-	5.
954	67619.	-.608	.000	16.11	1.175	1.04	.064	-	-	5.
955	67619.	-.502	.000	14.44	1.053	1.85	.083	-	-	5.
956	67619.	-.425	.000	*	.807	*	.243	-	-	5.
957	67619.	-1.607	-.552	*	.886	*	+	-	-	5.
958	67619.	-1.573	-.552	15.17	1.106	1.69	.111	-	-	5.
959	67619.	-1.540	-.552	16.47	1.202	1.40	.085	-	-	5.
960	67619.	-1.506	-.552	17.19	1.254	1.32	.077	-	-	5.
961	67619.	-1.471	-.552	17.26	1.259	1.32	.077	-	-	5.
962	67619.	-1.438	-.552	16.53	1.206	1.56	.084	-	-	5.
963	67619.	-1.404	-.552	*	1.085	*	.164	-	-	5.
964	67619.	-.530	-.552	*	.800	*	.249	-	-	5.
965	67619.	-.445	-.552	14.29	1.043	1.22	.085	-	-	5.
966	67619.	-.334	-.552	14.77	1.078	1.26	.086	-	-	5.
967	67619.	-.223	-.552	15.45	1.127	1.33	.086	-	-	5.
968	67619.	-.111	-.552	16.19	1.181	1.20	.074	-	-	5.
969	67619.	.000	-.552	16.47	1.202	1.20	.073	-	-	5.
970	67619.	.111	-.552	16.39	1.195	1.22	.074	-	-	5.
971	67619.	.223	-.552	15.75	1.149	1.29	.082	-	-	5.
972	67619.	.334	-.552	14.84	1.090	1.27	.085	-	-	5.
973	67619.	.445	-.552	13.49	.984	1.49	.111	-	-	5.
974	68436.	.530	-.552	*	.750	*	+	-	-	5.
975	68436.	-1.601	.552	*	.844	*	+	-	-	5.
976	68436.	-1.570	.552	13.36	.975	1.89	.142	-	-	5.
977	68436.	-1.538	.552	14.42	1.052	1.66	.115	-	-	5.
978	68436.	-1.505	.552	14.75	1.076	1.55	.105	-	-	5.
979	68436.	-1.473	.552	14.34	1.046	1.61	.113	-	-	5.
980	68436.	-1.442	.552	13.13	.958	1.95	.148	-	-	5.
981	68436.	-1.410	.552	*	.833	*	.209	-	-	5.
982	68436.	-.530	.552	*	.829	*	.247	-	-	5.
983	68436.	-.445	.552	13.11	.956	1.72	.131	-	-	5.
984	68436.	-.334	.552	14.73	1.075	1.61	.102	-	-	5.
985	68436.	-.223	.552	14.72	1.074	1.60	.109	-	-	5.
986	68436.	-.111	.552	16.04	1.170	1.48	.092	-	-	5.
987	68436.	.000	.552	16.52	1.205	1.42	.086	-	-	5.
988	68436.	.111	.552	16.66	1.215	1.39	.083	-	-	5.
989	68436.	.223	.552	16.33	1.191	1.44	.088	-	-	5.
990	68436.	.334	.552	15.39	1.123	1.40	.081	-	-	5.
991	68436.	.445	.552	13.60	.992	1.69	.124	-	-	5.
992	68436.	.530	.552	*	.801	*	.238	-	-	5.

HYDRAULIC DIAMETER, D = .535 INCHES. AVERAGE VELOCITY, UR = 13.7 FT/SEC
 * QUESTIONABLE DATA POINT. + TURBULENCE INTENSITY TO HIGH TO MEASURE. - NO DATA POINT.

TABULATION OF EXPERIMENTAL DATA.

AEC 7 ROD WIRE WRAP POSITION+30 WINDOW 4 DIST. 1.1

RUN NO	KEYNO	DS	X IN	Y IN	U FT/SEC	U/UB	UP FT/SEC	UP/U	V FT/SEC	V/U	CUTOFF KHZ
993	102823		-1.571	-.112	20.85	1.012	1.52	.073	-	-	5.
994	102823		-1.493	-.112	24.14	1.172	1.07	.044	-	-	5.
995	102823		-1.337	-.112	21.96	1.066	1.61	.073	-	-	5.
996	102823		-1.183	-.112	22.04	1.070	1.10	.050	-	-	5.
997	102823		-1.029	-.112	20.63	1.002	1.35	.065	-	-	5.
998	102823		-.873	-.112	20.48	.994	2.09	.102	-	-	5.
999	102823		-.719	-.112	24.12	1.171	1.15	.048	-	-	5.
1000	102823		-.563	-.112	24.04	1.167	1.15	.048	-	-	5.
1001	102823		-.487	-.112	21.89	1.063	1.49	.068	-	-	5.
1002	102823		-1.571	.061	23.39	1.136	1.49	.064	-	-	5.
1003	102823		-1.493	.061	24.52	1.191	1.08	.044	-	-	5.
1004	102823		-1.337	.061	24.70	1.199	1.18	.048	-	-	5.
1005	102823		-1.183	.061	22.45	1.090	1.57	.070	-	-	5.
1006	102823		-1.029	.061	19.28	.936	1.44	.075	-	-	5.
1007	102823		-.873	.061	20.89	1.015	1.46	.070	-	-	5.
1008	102823		-.719	.061	23.49	1.141	1.27	.054	-	-	5.
1009	102823		-.563	.061	24.11	1.171	1.11	.046	-	-	5.
1010	102823		-.487	.061	22.01	1.069	1.43	.065	-	-	5.
1011	102823		-1.644	.000	16.59	.806	-	-	-1.94	-.12	-
1012	102823		-1.563	.000	21.30	1.034	-	-	-3.13	-.15	-
1013	102823		-1.456	.000	23.01	1.161	-	-	-2.98	-.12	-
1014	102823		-1.349	.000	23.67	1.149	-	-	-2.23	-.09	-
1015	102823		-1.243	.000	22.27	1.081	-	-	-1.92	-.09	-
1016	102823		-1.135	.000	21.36	1.037	-	-	-1.90	-.09	-
1017	102823		-1.028	.000	22.16	1.076	-	-	-1.69	-.08	-
1018	102823		-.921	.000	23.46	1.139	-	-	-1.77	-.08	-
1019	102823		-.815	.000	24.03	1.167	-	-	-1.88	-.08	-
1020	102823		-.708	.000	24.15	1.173	-	-	-2.16	-.09	-
1021	102823		-.600	.000	23.50	1.141	-	-	-2.33	-.10	-
1022	102823		-.493	.000	21.04	1.022	-	-	-2.55	-.12	-
1023	102823		-.413	.000	16.24	.788	-	-	-1.93	-.12	-
AVERAGE TRANSVERSE VELOCITY =					-2.22	FT/SEC					
1037	102823		-1.622	-.552	18.55	.901	-	-	-3.54	-.19	-
1038	102823		-1.583	-.552	21.49	1.043	-	-	-4.36	-.20	-
1039	102823		-1.544	-.552	23.59	1.145	-	-	-4.73	-.20	-
1040	102823		-1.505	-.552	24.61	1.195	-	-	-4.85	-.20	-
1041	102823		-1.466	-.552	24.52	1.191	-	-	-4.49	-.18	-
1042	102823		-1.428	-.552	23.57	1.145	-	-	-4.06	-.17	-
1043	102823		-1.389	-.552	21.47	1.042	-	-	-3.34	-.16	-
AVERAGE TRANSVERSE VELOCITY =					-4.35	FT/SEC					
1051	102823		-1.618	.552	16.71	.811	-	-	-2.55	-.15	-
1052	102823		-1.580	.552	19.05	.925	-	-	-2.93	-.15	-
1053	102823		-1.543	.552	20.76	1.008	-	-	-3.21	-.15	-
1054	102823		-1.505	.552	21.29	1.034	-	-	-2.99	-.14	-
1055	102823		-1.468	.552	20.52	.996	-	-	-2.60	-.13	-
1056	102823		-1.430	.552	18.49	.898	-	-	-2.13	-.12	-
1057	102823		-1.393	.552	15.87	.770	-	-	-1.91	-.12	-
AVERAGE TRANSVERSE VELOCITY =					-2.69	FT/SEC					

HYDRAULIC DIAMETER: D = .535 INCHES. AVERAGE VELOCITY: UB = 20.6 FT/SEC
 * QUESTIONABLE DATA POINT. + TURBULENCE INTENSITY TO HIGH TO MEASURE. - NO DATA POINT.

TABULATION OF EXPERIMENTAL DATA.

AEC 7 ROD WIRE WRAP POSITION+30 WINDOW 4 DIST. 1.1

RUN NO	REYNOLDS NO	X IN	Y IN	U FT/SEC	U/UB	UP FT/SEC	UP/U	V FT/SEC	V/U	CUTOFF KHZ
1065	76763	-1.629	.000	12.56	.827	-	-	-1.68	-.13	-
1066	76763	-1.558	.000	15.63	1.029	-	-	-2.62	-.17	-
1067	76763	-1.451	.000	17.92	1.180	-	-	-2.41	-.13	-
1068	76763	-1.346	.000	17.78	1.170	-	-	-1.78	-.10	-
1069	76763	-1.240	.000	16.76	1.103	-	-	-1.48	-.09	-
1070	76763	-1.134	.000	15.90	1.047	-	-	-1.45	-.09	-
1071	76763	-1.028	.000	16.30	1.073	-	-	-1.44	-.09	-
1072	76763	-.922	.000	17.39	1.145	-	-	-1.39	-.08	-
1073	76763	-.816	.000	17.90	1.178	-	-	-1.44	-.08	-
1074	76763	-.712	.000	18.08	1.190	-	-	-1.54	-.09	-
1075	76763	-.606	.000	17.59	1.158	-	-	-1.66	-.09	-
1076	76763	-.500	.000	16.02	1.055	-	-	-1.67	-.10	-
1077	76763	-.429	.000	13.41	.883	-	-	-1.10	-.08	-
AVERAGE TRANSVERSE VELOCITY =				-1.70	FT/SEC					
1091	76763	-1.617	-.552	14.32	.942	-	-	-2.89	-.20	-
1092	76763	-1.580	-.552	16.45	1.083	-	-	-3.24	-.20	-
1093	76763	-1.542	-.552	17.90	1.178	-	-	-3.41	-.19	-
1094	76763	-1.505	-.552	18.49	1.217	-	-	-3.44	-.19	-
1095	76763	-1.467	-.552	18.40	1.211	-	-	-3.43	-.19	-
1096	76763	-1.430	-.552	17.38	1.144	-	-	-3.26	-.19	-
1097	76763	-1.392	-.552	15.19	1.000	-	-	-3.13	-.21	-
AVERAGE TRANSVERSE VELOCITY =				-3.31	FT/SEC					
1105	76763	-1.617	.552	12.44	.819	-	-	-1.94	-.16	-
1106	76763	-1.579	.552	14.18	.934	-	-	-2.34	-.17	-
1107	76763	-1.543	.552	15.57	1.025	-	-	-2.44	-.16	-
1108	76763	-1.505	.552	15.98	1.052	-	-	-2.40	-.15	-
1109	76763	-1.469	.552	15.43	1.015	-	-	-2.16	-.14	-
1110	76763	-1.432	.552	13.84	.911	-	-	-1.93	-.14	-
1111	76763	-1.395	.552	12.93	.851	-	-	-.69	-.05	-
AVERAGE TRANSVERSE VELOCITY =				-2.14	FT/SEC					
HYDRAULIC DIAMETER, D = .535 INCHES. AVERAGE VELOCITY, UB = 15.2 FT/SEC										

AEC 7 ROD WIRE WRAP POSITION+30 WINDOW 4 DIST. 1.1

RUN NO	REYNOLDS NO	X IN	Y IN	U FT/SEC	U/UB	UP FT/SEC	UP/U	V FT/SEC	V/U	CUTOFF KHZ
1119	143632	-1.645	.000	21.95	.772	-	-	-1.90	-.09	-
1120	143632	-1.565	.000	28.28	.995	-	-	-3.43	-.12	-
1121	143632	-1.457	.000	32.89	1.157	-	-	-3.63	-.11	-
1122	143632	-1.350	.000	34.08	1.199	-	-	-3.47	-.10	-
1123	143632	-1.243	.000	32.72	1.151	-	-	-3.24	-.10	-
1124	143632	-1.135	.000	30.86	1.086	-	-	-2.78	-.09	-
1125	143632	-1.028	.000	30.83	1.084	-	-	-2.41	-.08	-
1126	143632	-.921	.000	32.30	1.136	-	-	-2.36	-.07	-
1127	143632	-.814	.000	32.73	1.151	-	-	-2.66	-.08	-
1128	143632	-.706	.000	32.96	1.159	-	-	-3.10	-.09	-
1129	143632	-.599	.000	32.47	1.142	-	-	-3.49	-.11	-
1130	143632	-.492	.000	29.33	1.032	-	-	-3.20	-.11	-
1131	143632	-.411	.000	23.54	.828	-	-	-2.81	-.12	-
AVERAGE TRANSVERSE VELOCITY =				-3.04	FT/SEC					
1145	143632	-1.633	-.552	26.27	.924	-	-	-3.14	-.12	-
1146	143632	-1.591	-.552	30.69	1.080	-	-	-5.03	-.16	-
1147	143632	-1.548	-.552	33.91	1.193	-	-	-5.95	-.18	-
1148	143632	-1.506	-.552	35.31	1.242	-	-	-6.23	-.18	-
1149	143632	-1.463	-.552	34.86	1.226	-	-	-5.89	-.17	-
1150	143632	-1.420	-.552	32.83	1.155	-	-	-5.19	-.16	-
1151	143632	-1.377	-.552	29.18	1.027	-	-	-4.28	-.15	-
AVERAGE TRANSVERSE VELOCITY =				-5.38	FT/SEC					
1159	143632	-1.639	.552	22.60	.795	-	-	-1.42	-.06	-
1160	143632	-1.595	.552	26.99	.950	-	-	-2.94	-.11	-
1161	143632	-1.550	.552	29.79	1.048	-	-	-3.64	-.12	-
1162	143632	-1.505	.552	30.26	1.064	-	-	-3.59	-.12	-
1163	143632	-1.461	.552	28.22	.993	-	-	-2.70	-.10	-
1164	143632	-1.417	.552	24.18	.851	-	-	-1.65	-.07	-
1165	143632	-1.371	.552	19.78	.696	-	-	-1.78	-.09	-
AVERAGE TRANSVERSE VELOCITY =				-2.69	FT/SEC					
HYDRAULIC DIAMETER, D = .535 INCHES. AVERAGE VELOCITY, UB = 28.4 FT/SEC										
* QUESTIONABLE DATA POINT. + TURBULENCE INTENSITY TOO HIGH TO MEASURE. - NO DATA POINT.										

TABULATION OF EXPERIMENTAL DATA.

AEC 7 ROD WIRE WRAP POSITION 150°, WINDOW 4, DST. 1.1

RUN NO	KEYHOLDS NO	X IN	Y IN	U FT/SEC	U/UB	UP FT/SEC	UP/U	V FT/SEC	V/U	CUTOFF KHZ
1227	73387	-1.601	-.030	15.22	1.011	-	-	-1.25	-.12	-
1228	73387	-1.591	-.030	15.77	1.113	-	-	-3.35	-.20	-
1229	73387	-1.437	-.030	16.95	1.126	-	-	-3.43	-.20	-
1230	73387	-1.335	-.030	16.14	1.072	-	-	-2.21	-.14	-
1231	73387	-1.233	-.030	16.42	1.117	-	-	-1.18	-.07	-
1232	73387	-1.130	-.030	17.50	1.162	-	-	-.97	-.06	-
1233	73387	-1.028	-.030	16.16	1.073	-	-	-.69	-.06	-
1234	73387	-.926	-.030	15.28	1.015	-	-	-1.04	-.07	-
1235	73387	-.823	-.030	15.09	1.002	-	-	-.59	-.04	-
1236	73387	-.721	-.030	15.47	1.054	-	-	-.63	-.04	-
1237	73387	-.619	-.030	15.72	1.044	-	-	-.70	-.04	-
1238	73387	-.516	-.030	14.49	.962	-	-	-1.04	-.07	-
1239	73387	-.455	-.030	12.33	.819	-	-	-1.24	-.10	-
AVERAGE TRANSVERSE VELOCITY = -1.46 FT/SEC										
1253	73387	-1.609	-.531	13.07	.866	-	-	-3.71	-.28	-
1254	73387	-1.574	-.531	14.88	.989	-	-	-4.09	-.27	-
1255	73387	-1.540	-.531	16.36	1.067	-	-	-4.20	-.26	-
1256	73387	-1.505	-.531	17.01	1.130	-	-	-4.61	-.27	-
1257	73387	-1.472	-.531	17.34	1.151	-	-	-4.82	-.28	-
1258	73387	-1.437	-.531	16.80	1.115	-	-	-5.01	-.30	-
1259	73387	-1.403	-.531	16.25	1.079	-	-	-3.94	-.24	-
AVERAGE TRANSVERSE VELOCITY = -4.45 FT/SEC										
1267	73387	-1.612	.531	13.63	.905	-	-	-3.26	-.24	-
1268	73387	-1.577	.531	14.96	.994	-	-	-3.70	-.25	-
1269	73387	-1.541	.531	16.06	1.067	-	-	-3.86	-.24	-
1270	73387	-1.506	.531	16.59	1.102	-	-	-4.05	-.24	-
1271	73387	-1.471	.531	16.61	1.103	-	-	-4.24	-.26	-
1272	73387	-1.436	.531	15.46	1.027	-	-	-4.16	-.27	-
1273	73387	-1.400	.531	15.44	.959	-	-	-2.54	-.18	-
AVERAGE TRANSVERSE VELOCITY = -3.86 FT/SEC										
HYDRAULIC DIAMETER, D = .535 INCHES. AVERAGE VELOCITY, UP = 15.1 FT/SEC										

AEC 7 ROD WIRE WRAP POSITION 150°, WINDOW 4, DST. 1.1

RUN NO	KEYHOLDS NO	X IN	Y IN	U FT/SEC	U/UB	UP FT/SEC	UP/U	V FT/SEC	V/U	CUTOFF KHZ
1173	102485	-1.622	.000	17.48	.852	-	-	-4.47	-.26	-
1174	102485	-1.546	.000	21.76	1.060	-	-	-5.25	-.24	-
1175	102485	-1.443	.000	22.39	1.091	-	-	-4.64	-.21	-
1176	102485	-1.339	.000	20.96	1.021	-	-	-2.94	-.14	-
1177	102485	-1.235	.000	22.24	1.084	-	-	-1.64	-.07	-
1178	102485	-1.091	.000	23.43	1.142	-	-	-1.16	-.05	-
1179	102485	-1.026	.000	23.08	1.124	-	-	-1.11	-.05	-
1180	102485	-.925	.000	22.07	1.075	-	-	-1.23	-.06	-
1181	102485	-.822	.000	21.50	1.047	-	-	-1.03	-.05	-
1182	102485	-.718	.000	21.69	1.066	-	-	-.98	-.04	-
1183	102485	-.614	.000	21.43	1.044	-	-	-.68	-.03	-
1184	102485	-.511	.000	20.20	.984	-	-	-1.17	-.06	-
1185	102485	-.434	.000	19.34	.796	-	-	-.68	-.04	-
AVERAGE TRANSVERSE VELOCITY = -2.02 FT/SEC										
1199	102485	-1.611	-.533	17.91	.873	-	-	-4.72	-.26	-
1200	102485	-1.576	-.533	20.02	.975	-	-	-5.33	-.27	-
1201	102485	-1.540	-.533	21.73	1.059	-	-	-5.75	-.26	-
1202	102485	-1.505	-.533	22.85	1.113	-	-	-6.06	-.27	-
1203	102485	-1.470	-.533	23.52	1.146	-	-	-6.36	-.27	-
1204	102485	-1.435	-.533	23.14	1.127	-	-	-6.29	-.27	-
1205	102485	-1.399	-.533	21.46	1.046	-	-	-5.86	-.27	-
AVERAGE TRANSVERSE VELOCITY = -5.87 FT/SEC										
1213	102485	-1.605	.533	18.39	.896	-	-	-4.60	-.25	-
1214	102485	-1.572	.533	20.20	.984	-	-	-4.97	-.25	-
1215	102485	-1.538	.533	21.55	1.050	-	-	-5.26	-.24	-
1216	102485	-1.506	.533	22.22	1.083	-	-	-5.40	-.24	-
1217	102485	-1.473	.533	22.50	1.096	-	-	-5.47	-.24	-
1218	102485	-1.439	.533	21.47	1.046	-	-	-5.29	-.25	-
1219	102485	-1.405	.533	19.02	.927	-	-	-4.51	-.24	-
AVERAGE TRANSVERSE VELOCITY = -5.18 FT/SEC										
HYDRAULIC DIAMETER, D = .535 INCHES. AVERAGE VELOCITY, UP = 20.5 FT/SEC										

AEC 7 ROD WIRE WRAP POSITION 150°, WINDOW 4, DST. 1.1

RUN NO	KEYHOLDS NO	X IN	Y IN	U FT/SEC	U/UB	UP FT/SEC	UP/U	V FT/SEC	V/U	CUTOFF KHZ
1281	143291	-1.613	.000	26.23	.925	-	-	-6.23	-.24	-
1282	143291	-1.554	.000	30.07	1.060	-	-	-6.09	-.23	-
1283	143291	-1.448	.000	31.24	1.102	-	-	-5.78	-.19	-
1284	143291	-1.343	.000	29.69	1.047	-	-	-3.97	-.13	-
1285	143291	-1.239	.000	31.38	1.106	-	-	-2.55	-.08	-
1286	143291	-1.133	.000	33.33	1.175	-	-	-1.67	-.05	-
1287	143291	-1.028	.000	34.03	1.200	-	-	-1.52	-.04	-
1288	143291	-.924	.000	32.92	1.161	-	-	-1.68	-.05	-
1289	143291	-.818	.000	31.95	1.127	-	-	-1.47	-.05	-
1290	143291	-.713	.000	32.64	1.151	-	-	-1.62	-.05	-
1291	143291	-.608	.000	31.83	1.122	-	-	-1.25	-.04	-
1292	143291	-.503	.000	26.58	1.008	-	-	-1.05	-.04	-
1293	143291	-.444	.000	24.81	.975	-	-	-.46	-.02	-
AVERAGE TRANSVERSE VELOCITY = -2.69 FT/SEC										
1307	143291	-1.618	-.535	23.62	.833	-	-	-4.88	-.21	-
1308	143291	-1.580	-.535	27.00	.952	-	-	-6.23	-.23	-
1309	143291	-1.543	-.535	26.85	1.042	-	-	-7.06	-.24	-
1310	143291	-1.505	-.535	31.61	1.111	-	-	-7.46	-.24	-
1311	143291	-1.468	-.535	32.64	1.151	-	-	-7.70	-.24	-
1312	143291	-1.430	-.535	32.45	1.144	-	-	-7.42	-.23	-
1313	143291	-1.393	-.535	30.40	1.072	-	-	-6.36	-.21	-
AVERAGE TRANSVERSE VELOCITY = -6.96 FT/SEC										
1321	143291	-1.613	.535	26.71	.871	-	-	-5.60	-.23	-
1322	143291	-1.578	.535	27.20	.959	-	-	-6.53	-.24	-
1323	143291	-1.542	.535	29.29	1.033	-	-	-7.08	-.24	-
1324	143291	-1.505	.535	30.75	1.084	-	-	-7.44	-.24	-
1325	143291	-1.469	.535	31.10	1.097	-	-	-7.46	-.24	-
1326	143291	-1.434	.535	29.78	1.050	-	-	-6.74	-.23	-
1327	143291	-1.398	.535	26.58	.937	-	-	-5.32	-.20	-
AVERAGE TRANSVERSE VELOCITY = -6.43 FT/SEC										
HYDRAULIC DIAMETER, D = .535 INCHES. AVERAGE VELOCITY, UP = 26.4 FT/SEC										
* QUESTIONABLE DATA POINT. * TURBULENCE INTENSITY TOO HIGH TO MEASURE. - NO DATA POINT.										

TABLE 1.1. SUMMARY OF EXPERIMENTAL DATA.

AEC 7 ROD WIRE WRAP POSITION-30, WINDOW 4-DIST 1.1

RUN NO	REYNOLDS NO	X IN	Y IN	U FT/SEC	U/UB FT/SEC	UP FT/SEC	UP/H	V FT/SEC	V/U	CUTOFF KHZ
1335	103715	-1.644	.000	17.70	.843	-	-	-1.07	-.06	-
1336	103715	-1.575	.000	21.07	1.027	-	-	-2.20	-.10	-
1337	103715	-1.465	.000	24.76	1.187	-	-	-2.06	-.08	-
1338	103715	-1.357	.000	21.05	1.220	-	-	-1.62	-.06	-
1339	103715	-1.247	.000	20.45	1.240	-	-	-1.17	-.05	-
1340	103715	-1.138	.000	20.95	1.215	-	-	-1.07	-.04	-
1341	103715	-1.028	.000	23.00	1.164	-	-	-1.05	-.04	-
1342	103715	-.920	.000	23.72	1.156	-	-	-.66	-.04	-
1343	103715	-.810	.000	24.45	1.191	-	-	-.90	-.04	-
1344	103715	-.701	.000	24.02	1.170	-	-	-1.12	-.05	-
1345	103715	-.591	.000	22.72	1.107	-	-	-2.38	-.10	-
1346	103715	-.482	.000	20.64	1.006	-	-	-2.60	-.13	-
1347	103715	-.413	.000	17.24	.840	-	-	-1.47	-.09	-
AVERAGE TRANSVERSE VELOCITY = -1.65 FT/SEC										
1361	103715	-1.641	-.539	11.28	.793	-	-	-.63	-.06	-
1362	103715	-1.596	-.539	14.25	.938	-	-	-2.18	-.11	-
1363	103715	-1.550	-.539	21.76	1.060	-	-	-3.05	-.14	-
1364	103715	-1.506	-.539	21.08	1.124	-	-	-3.34	-.14	-
1365	103715	-1.460	-.539	22.82	1.112	-	-	-3.09	-.14	-
1366	103715	-1.415	-.539	21.03	1.024	-	-	-2.14	-.10	-
1367	103715	-1.369	-.539	11.20	.887	-	-	-1.11	-.06	-
AVERAGE TRANSVERSE VELOCITY = -2.50 FT/SEC										
1375	103715	-1.636	.539	10.14	.731	-	-	-1.07	-.07	-
1376	103715	-1.592	.539	17.70	.862	-	-	-2.27	-.13	-
1377	103715	-1.549	.539	14.29	.940	-	-	-2.62	-.15	-
1378	103715	-1.506	.539	18.42	.966	-	-	-2.64	-.14	-
1379	103715	-1.462	.539	17.37	.944	-	-	-2.27	-.12	-
1380	103715	-1.419	.539	17.22	.868	-	-	-1.60	-.08	-
1381	103715	-1.375	.539	15.55	.758	-	-	-.28	-.02	-
AVERAGE TRANSVERSE VELOCITY = -2.11 FT/SEC										
HYDRAULIC DIAMETER: D = .535 INCHES. AVERAGE VELOCITY: UP = 20.5 FT/SEC										

AEC 7 ROD WIRE WRAP POSITION-30, WINDOW 4-DIST 1.1

RUN NO	REYNOLDS NO	X IN	Y IN	U FT/SEC	U/UB FT/SEC	UP FT/SEC	UP/H	V FT/SEC	V/U	CUTOFF KHZ
1384	80175	-1.589	.000	14.84	.935	-	-	-2.14	-.14	-
1390	80175	-1.548	.000	16.70	1.053	-	-	-2.07	-.12	-
1391	80175	-1.445	.000	16.78	1.184	-	-	-1.62	-.09	-
1392	80175	-1.341	.000	16.23	1.212	-	-	-1.37	-.07	-
1393	80175	-1.236	.000	16.15	1.207	-	-	-1.06	-.06	-
1394	80175	-1.133	.000	18.48	1.165	-	-	-1.02	-.06	-
1395	80175	-1.028	.000	17.86	1.126	-	-	-1.01	-.06	-
1396	80175	-.924	.000	18.23	1.149	-	-	-.95	-.05	-
1397	80175	-.820	.000	18.15	1.144	-	-	-.61	-.03	-
1398	80175	-.716	.000	17.18	1.083	-	-	-.27	-.05	-
1399	80175	-.611	.000	17.17	1.082	-	-	-2.04	-.12	-
1400	80175	-.508	.000	18.96	1.006	-	-	-2.54	-.16	-
1401	80175	-.468	.000	14.50	.914	-	-	-2.17	-.15	-
AVERAGE TRANSVERSE VELOCITY = -1.36 FT/SEC										
1415	80175	-1.613	-.541	15.20	.832	-	-	-1.58	-.12	-
1416	80175	-1.576	-.541	15.37	.968	-	-	-1.84	-.12	-
1417	80175	-1.542	-.541	16.96	1.069	-	-	-2.26	-.13	-
1418	80175	-1.505	-.541	17.57	1.108	-	-	-2.35	-.13	-
1419	80175	-1.470	-.541	17.35	1.083	-	-	-2.26	-.13	-
1420	80175	-1.434	-.541	16.11	.915	-	-	-1.97	-.12	-
1421	80175	-1.399	-.541	15.12	.953	-	-	-.75	-.05	-
AVERAGE TRANSVERSE VELOCITY = -2.01 FT/SEC										
1429	80175	-1.602	.541	11.92	.751	-	-	-1.63	-.14	-
1430	80175	-1.570	.541	13.83	.871	-	-	-1.78	-.13	-
1431	80175	-1.538	.541	14.51	.915	-	-	-2.03	-.14	-
1432	80175	-1.505	.541	14.78	.932	-	-	-2.00	-.14	-
1433	80175	-1.473	.541	14.37	.906	-	-	-1.60	-.13	-
1434	80175	-1.441	.541	13.51	.851	-	-	-1.72	-.13	-
1435	80175	-1.409	.541	12.03	.815	-	-	-.74	-.06	-
AVERAGE TRANSVERSE VELOCITY = -1.79 FT/SEC										
HYDRAULIC DIAMETER: D = .535 INCHES. AVERAGE VELOCITY: UP = 15.9 FT/SEC										

AEC 7 ROD WIRE WRAP POSITION-30, WINDOW 4-DIST 1.1

RUN NO	REYNOLDS NO	X IN	Y IN	U FT/SEC	U/UB FT/SEC	UP FT/SEC	UP/H	V FT/SEC	V/U	CUTOFF KHZ
1443	144655	-1.632	.000	24.92	.870	-	-	-2.60	-.10	-
1444	144655	-1.554	.000	31.94	1.116	-	-	-2.75	-.09	-
1445	144655	-1.448	.000	35.39	1.236	-	-	-2.40	-.07	-
1446	144655	-1.343	.000	36.32	1.269	-	-	-1.85	-.05	-
1447	144655	-1.239	.000	36.41	1.272	-	-	-1.41	-.04	-
1448	144655	-1.133	.000	35.77	1.250	-	-	-1.27	-.04	-
1449	144655	-1.028	.000	35.67	1.248	-	-	-1.22	-.03	-
1450	144655	-.924	.000	35.48	1.239	-	-	-1.31	-.04	-
1451	144655	-.818	.000	34.57	1.207	-	-	-1.14	-.03	-
1452	144655	-.713	.000	34.57	1.122	-	-	-1.26	-.04	-
1453	144655	-.608	.000	32.12	1.122	-	-	-2.60	-.09	-
1454	144655	-.503	.000	29.63	1.035	-	-	-4.10	-.14	-
1455	144655	-.425	.000	23.00	.835	-	-	-3.20	-.16	-
AVERAGE TRANSVERSE VELOCITY = -2.02 FT/SEC										
1469	144655	-1.622	-.539	21.00	.765	-	-	-.38	-.02	-
1470	144655	-1.583	-.539	27.00	.943	-	-	-2.70	-.10	-
1471	144655	-1.544	-.539	30.83	1.077	-	-	-3.66	-.13	-
1472	144655	-1.505	-.539	32.33	1.129	-	-	-4.02	-.12	-
1473	144655	-1.466	-.539	32.13	1.122	-	-	-3.96	-.12	-
1474	144655	-1.428	-.539	30.06	1.050	-	-	-3.26	-.11	-
1475	144655	-1.389	-.539	26.34	.920	-	-	-2.21	-.08	-
AVERAGE TRANSVERSE VELOCITY = -3.22 FT/SEC										
1483	144655	-1.626	.539	20.12	.703	-	-	-1.36	-.07	-
1484	144655	-1.586	.539	24.21	.846	-	-	-2.70	-.11	-
1485	144655	-1.546	.539	27.64	.965	-	-	-3.42	-.12	-
1486	144655	-1.505	.539	27.09	1.016	-	-	-3.52	-.12	-
1487	144655	-1.465	.539	26.57	.998	-	-	-3.11	-.11	-
1488	144655	-1.425	.539	26.73	.934	-	-	-2.27	-.09	-
1489	144655	-1.385	.539	23.87	.834	-	-	-1.13	-.05	-
AVERAGE TRANSVERSE VELOCITY = -2.75 FT/SEC										
HYDRAULIC DIAMETER: D = .535 INCHES. AVERAGE VELOCITY: UP = 28.6 FT/SEC										

* QUESTIONABLE DATA POINT. * TURBULENCE INTENSITY TOO HIGH TO MEASURE. - NO DATA POINT.

TABLE 1.0. OF EXPERIMENTAL DATA.

SECTION NO. 1. POSITION 430 N. 1000 W. 015. 1.1

REL. NO.	KEY-NO.	X	Y	U	UR	UR/	V	V/U	CUTOFF
NO.	NO.	IN	IN	FT/SEC	FT/SEC	FT/SEC	FT/SEC		KHZ
01	107263	-1.630	.048	21.49	.463	1.87	.107	-	u.
02	107263	-1.564	.048	21.18	1.046	1.12	.043	-	u.
03	107263	-1.497	.048	22.75	1.123	.83	.076	-	u.
04	107263	-1.432	.048	22.47	1.104	1.12	.040	-	u.
05	107263	-1.365	.048	21.09	1.086	1.04	.047	-	u.
06	107263	-1.299	.048	21.49	1.060	1.00	.046	-	u.
07	107263	-1.232	.048	21.31	1.054	.97	.046	-	u.
08	107263	-1.166	.048	20.07	1.035	1.04	.040	-	u.
09	107263	-1.101	.048	20.45	1.014	1.24	.040	-	u.
10	107263	-1.034	.048	21.75	1.124	1.28	.041	-	u.
11	107263	-.968	.048	21.00	1.081	1.29	.049	-	u.
12	107263	-.901	.048	20.04	1.034	1.12	.044	-	u.
13	107263	-.835	.048	20.45	1.207	.93	.038	-	u.
14	107263	-.769	.048	25.12	1.240	.85	.044	-	u.
15	107263	-.702	.048	24.40	1.244	.92	.036	-	u.
16	107263	-.637	.048	24.42	1.210	1.23	.040	-	u.
17	107263	-.570	.048	22.56	1.134	1.41	.041	-	u.
18	107263	-.504	.048	21.75	1.024	1.61	.078	-	u.
19	107263	-.437	.048	17.29	.854	2.02	.117	-	u.
20	107263	-.425	.048	14.47	.813	2.03	.123	-	u.
21	107263	-1.630	.108	14.20	.499	1.79	.049	-	u.
22	107263	-1.564	.108	21.82	1.077	.98	.045	-	u.
23	107263	-1.497	.108	22.41	1.100	.80	.046	-	u.
24	107263	-1.432	.108	22.28	1.100	.97	.044	-	u.
25	107263	-1.365	.108	21.84	1.078	1.01	.046	-	u.
26	107263	-1.299	.108	21.25	1.044	1.07	.040	-	u.
27	107263	-1.232	.108	21.24	.994	1.14	.046	-	u.
28	107263	-1.166	.108	16.26	.951	1.28	.046	-	u.
29	107263	-1.101	.108	14.40	.903	1.20	.045	-	u.
30	107263	-1.034	.108	17.65	.871	1.20	.048	-	u.
31	107263	-.968	.108	14.04	.935	1.25	.071	-	u.
32	107263	-.901	.108	20.45	1.214	1.19	.048	-	u.
33	107263	-.835	.108	21.05	1.083	1.29	.049	-	u.
34	107263	-.769	.108	23.20	1.145	1.20	.042	-	u.
35	107263	-.702	.108	21.12	1.191	1.12	.047	-	u.
36	107263	-.637	.108	23.00	1.180	1.20	.040	-	u.
37	107263	-.570	.108	22.42	1.114	1.39	.042	-	u.
38	107263	-.504	.108	20.18	.966	2.44	.126	-	u.
39	107263	-.437	.108	16.43	.779	2.13	.141	-	u.
40	107263	-.425	.108	"	.779	"	.149	-	u.
41	107263	-1.630	-.012	"	.769	"	.236	-	u.
42	107263	-1.564	-.012	21.15	1.044	1.07	.041	-	u.
43	107263	-1.497	-.012	22.60	1.116	.87	.038	-	u.
44	107263	-1.432	-.012	22.45	1.100	1.08	.048	-	u.
45	107263	-1.365	-.012	21.82	1.077	1.20	.075	-	u.
46	107263	-1.299	-.012	21.12	1.043	1.27	.040	-	u.
47	107263	-1.232	-.012	21.45	1.054	1.45	.073	-	u.
48	107263	-1.166	-.012	21.44	1.043	1.28	.044	-	u.
49	107263	-1.101	-.012	21.82	1.077	1.17	.043	-	u.
50	107263	-1.034	-.012	22.42	1.107	1.17	.041	-	u.
51	107263	-.968	-.012	22.43	1.157	1.08	.046	-	u.
52	107263	-.901	-.012	24.18	1.193	1.13	.047	-	u.
53	107263	-.835	-.012	24.72	1.220	1.07	.043	-	u.
54	107263	-.769	-.012	21.25	1.240	.96	.048	-	u.
55	107263	-.702	-.012	21.18	1.243	1.07	.040	-	u.
56	107263	-.637	-.012	24.43	1.211	1.17	.046	-	u.
57	107263	-.570	-.012	22.56	1.134	1.28	.040	-	u.
58	107263	-.504	-.012	21.70	1.024	1.44	.071	-	u.
59	107263	-.437	-.012	17.13	.840	2.27	.113	-	u.
60	107263	-.425	-.012	14.45	.807	2.42	.110	-	u.
61	107621	-1.617	.598	15.03	.784	2.47	.111	-	u.
62	107621	-1.568	.598	17.04	.883	1.06	.109	-	u.
63	107621	-1.534	.598	20.83	1.025	1.06	.041	-	u.
64	107621	-1.479	.598	21.00	1.033	1.00	.048	-	u.
65	107621	-1.424	.598	18.31	.801	1.67	.041	-	u.
66	107621	-1.395	.598	16.45	.814	1.83	.111	-	u.
67	107621	-1.618	-.502	14.18	.894	1.03	.170	-	u.
68	107621	-1.568	-.502	20.41	.909	1.44	.071	-	u.
69	107621	-1.534	-.502	21.07	1.135	.97	.042	-	u.
70	107621	-1.477	-.502	23.29	1.140	.89	.048	-	u.
71	107621	-1.412	-.502	20.40	1.004	1.44	.040	-	u.
72	107621	-1.343	-.502	19.18	.844	1.08	.112	-	u.
73	107621	-1.630	-.052	"	.837	"	"	-	u.
74	107621	-1.564	-.052	21.40	1.053	1.71	.040	-	u.
75	107621	-1.497	-.052	21.70	1.068	1.79	.043	-	u.
76	107621	-1.432	-.052	20.42	1.005	1.83	.040	-	u.
77	107621	-1.365	-.052	20.40	1.004	1.42	.044	-	u.
78	107621	-1.299	-.052	21.49	1.037	1.25	.049	-	u.
79	107621	-1.232	-.052	21.18	1.054	1.26	.049	-	u.
80	107621	-1.166	-.052	21.42	1.054	1.23	.047	-	u.
81	107621	-1.101	-.052	21.24	1.045	1.14	.044	-	u.
82	107621	-1.034	-.052	20.76	1.024	1.20	.048	-	u.
83	107621	-.968	-.052	21.00	1.033	1.17	.046	-	u.
84	107621	-.901	-.052	22.42	1.106	1.04	.048	-	u.
85	107621	-.835	-.052	24.44	1.196	.93	.038	-	u.
86	107621	-.769	-.052	21.43	1.240	.89	.027	-	u.
87	107621	-.702	-.052	24.26	1.243	.80	.042	-	u.
88	107621	-.637	-.052	24.45	1.204	.94	.048	-	u.
89	107621	-.570	-.052	23.06	1.135	1.20	.042	-	u.
90	107621	-.504	-.052	20.44	1.018	1.40	.047	-	u.
91	107621	-.437	-.052	17.14	.843	1.70	.040	-	u.
92	107621	-.425	-.052	16.43	.809	1.87	.114	-	u.
93	107621	-1.630	.118	"	.840	"	.223	-	u.
94	107621	-1.564	.118	21.43	1.054	1.66	.077	-	u.
95	107621	-1.497	.118	24.35	1.100	1.81	.072	-	u.
96	107621	-1.432	.118	22.03	1.044	1.72	.078	-	u.
97	107621	-1.365	.118	21.62	1.064	1.49	.078	-	u.
98	107621	-1.299	.118	20.41	1.024	1.45	.048	-	u.
99	107621	-1.232	.118	16.45	.877	1.74	.048	-	u.
100	107621	-1.166	.118	14.74	.922	1.87	.100	-	u.
101	107621	-1.101	.118	17.38	.855	1.79	.115	-	u.
102	107621	-1.034	.118	16.48	.816	1.79	.108	-	u.
103	107621	-.968	.118	17.71	.872	1.82	.103	-	u.
104	107621	-.901	.118	14.43	.850	1.89	.103	-	u.
105	107621	-.835	.118	21.15	1.044	2.09	.049	-	u.
106	107621	-.769	.118	21.62	1.113	1.79	.079	-	u.
107	107621	-.706	.118	23.82	1.174	1.66	.070	-	u.
108	107621	-.637	.118	21.47	1.160	1.88	.040	-	u.
109	107621	-.570	.118	22.25	1.095	2.09	.044	-	u.
110	107621	-.504	.118	"	.974	"	.141	-	u.
111	107621	-.437	.118	"	.703	"	"	-	u.
M 02	107621	-1.630	-.052	"	.637	"	"	-	u.
M 03	107621	-1.630	-.032	14.49	.910	2.54	.137	-	u.
M 04	107621	-1.630	-.012	"	.797	"	.236	-	u.

HYDRAULIC DIAMETER: D = .535 INCHES. AVERAGE VELOCITY: UR = 20.3 FT/SEC.
 * QUESTIONABLE DATA POINT. * TURBULENCE INTENSITY TOO HIGH TO MEASURE. - NO DATA POINT.

TABULATION OF EXPERIMENTAL DATA.

AEC7 ROD WIREWRAP POSITION +30 WINDOW 4 D15. 1.1

RUN NO	REYNOLDS NO	X IN	Y IN	U FT/SEC	U/UB	UP FT/SEC	UP/U	V FT/SEC	V/U	CUTOFF KHZ
H 05	107621.	-1.630	.008	16.41	.807	2.09	.128	-	-	4.
H 06	107621.	-1.630	.028	16.90	.832	2.28	.135	-	-	4.
H 07	107621.	-1.630	.048	17.49	.860	1.87	.107	-	-	4.
H 08	107621.	-1.630	.068	17.20	.846	2.09	.122	-	-	4.
H 09	107621.	-1.630	.088	17.26	.849	2.45	.142	-	-	4.
H 10	107621.	-1.630	.108	18.20	.896	1.95	.107	-	-	4.
F 02	107621.	-1.365	-.052	20.50	1.009	1.32	.064	-	-	4.
F 03	107621.	-1.365	-.032	21.17	1.042	1.04	.049	-	-	4.
F 04	107621.	-1.365	-.012	20.92	1.029	1.44	.069	-	-	4.
F 05	107621.	-1.365	.008	21.26	1.046	1.32	.062	-	-	4.
F 06	107621.	-1.365	.028	21.47	1.056	1.22	.057	-	-	4.
F 07	107621.	-1.365	.056	21.82	1.073	1.20	.055	-	-	4.
F 08	107621.	-1.365	.068	21.97	1.081	1.04	.047	-	-	4.
F 09	107621.	-1.365	.088	21.87	1.076	1.13	.052	-	-	4.
F 10	107621.	-1.365	.108	21.85	1.075	1.06	.048	-	-	4.
F 11	107621.	-1.365	.128	21.56	1.061	.99	.046	-	-	4.
G 02	107621.	-1.497	-.052	21.70	1.068	1.79	.083	-	-	4.
G 03	107621.	-1.497	-.032	22.25	1.095	1.48	.066	-	-	4.
G 04	107621.	-1.497	-.012	23.11	1.137	.98	.043	-	-	4.
G 05	107621.	-1.497	.008	23.15	1.139	.91	.039	-	-	4.
G 06	107621.	-1.497	.028	23.11	1.137	.90	.039	-	-	4.
G 07	107621.	-1.497	.048	23.11	1.137	.89	.038	-	-	4.
G 08	107621.	-1.497	.068	23.02	1.133	.92	.040	-	-	4.
G 09	107621.	-1.497	.088	22.98	1.130	.88	.038	-	-	4.
G 10	107621.	-1.497	.108	22.89	1.126	.92	.040	-	-	4.
E 02	107621.	-1.232	.948	21.09	1.037	1.25	.059	-	-	4.
E 03	107621.	-1.232	-.032	21.83	1.074	1.10	.050	-	-	4.
E 04	107621.	-1.232	.038	21.99	1.082	1.10	.050	-	-	4.
E 05	107621.	-1.232	.008	21.97	1.081	1.05	.048	-	-	4.
E 06	107621.	-1.232	.028	21.84	1.075	1.07	.049	-	-	4.
E 07	107621.	-1.232	.018	21.67	1.066	1.10	.051	-	-	4.
E 08	107621.	-1.232	.068	21.53	1.059	1.07	.050	-	-	4.
E 09	107621.	-1.232	.088	21.32	1.049	1.10	.051	-	-	4.
E 10	107621.	-1.232	.108	21.05	1.036	1.17	.056	-	-	4.
C 02	107621.	-.835	-.052	24.34	1.198	.93	.038	-	-	4.
C 03	107621.	-.835	-.032	25.06	1.233	.79	.032	-	-	4.
C 04	107621.	-.835	-.012	25.14	1.237	.84	.033	-	-	4.
C 05	107621.	-.835	.008	24.96	1.228	.94	.038	-	-	4.
C 06	107621.	-.835	.028	24.83	1.222	.96	.039	-	-	4.
C 07	107621.	-.835	.048	24.54	1.208	1.06	.043	-	-	4.
C 08	107621.	-.835	.068	24.16	1.189	1.12	.046	-	-	4.
C 09	107621.	-.835	.088	23.36	1.149	1.22	.052	-	-	4.
C 10	107621.	-.835	.108	22.17	1.091	1.29	.058	-	-	4.
D 02	107263.	-1.034	-.052	20.76	1.025	1.20	.058	-	-	4.
D 03	107263.	-1.034	-.032	*	1.037	*	.140	-	-	4.
D 04	107263.	-1.034	-.212	22.42	1.107	1.37	.061	-	-	4.
D 05	107263.	-1.034	.008	21.92	1.082	1.38	.063	-	-	4.
D 06	107263.	-1.034	.028	21.38	1.056	1.38	.064	-	-	4.
D 07	107263.	-1.034	.048	20.75	1.024	1.28	.061	-	-	4.
D 08	107263.	-1.034	.068	19.85	.980	1.35	.068	-	-	4.
D 09	107263.	-1.034	.088	18.96	.936	1.27	.067	-	-	4.
D 10	107263.	-1.034	.108	17.65	.871	1.20	.068	-	-	4.
D 11	107263.	-1.034	.128	14.65	.723	2.13	.145	-	-	4.
B 02	107263.	-.702	-.052	25.26	1.247	.80	.032	-	-	4.
B 03	107263.	-.702	-.032	24.21	1.195	2.04	.084	-	-	4.
B 04	107263.	-.702	-.012	25.18	1.243	1.02	.040	-	-	4.
B 05	107263.	-.702	.008	25.26	1.247	1.01	.040	-	-	4.
B 06	107263.	-.702	.028	25.31	1.249	.93	.037	-	-	4.
B 07	107263.	-.702	.048	25.30	1.249	.92	.036	-	-	4.
B 08	107263.	-.702	.068	24.94	1.231	1.00	.040	-	-	4.
B 09	107263.	-.702	.088	24.57	1.213	1.08	.044	-	-	4.
B 10	107263.	-.702	.108	24.11	1.190	1.10	.046	-	-	4.
A 02	107263.	-.425	-.052	16.43	.811	1.87	.114	-	-	4.
A 03	107263.	-.425	-.032	16.19	.799	2.13	.132	-	-	4.
A 04	107263.	-.425	-.012	16.35	.807	2.62	.160	-	-	4.
A 05	107263.	-.425	.008	16.42	.811	1.92	.117	-	-	4.
A 06	107263.	-.425	.028	16.56	.818	2.39	.144	-	-	4.
A 07	107263.	-.425	.048	16.71	.825	2.03	.122	-	-	4.
A 08	107263.	-.425	.068	16.04	.792	2.39	.149	-	-	4.
A 09	107263.	-.425	.088	15.91	.785	2.34	.147	-	-	4.
A 10	107263.	-.425	.108	*	.779	*	.189	-	-	4.

HYDRAULIC DIAMETER, D = .535 INCHES. AVERAGE VELOCITY, UB = 20.3 FT/SEC
 * QUESTIONABLE DATA POINT. + TURBULENCE INTENSITY TOO HIGH TO MEASURE. - NO DATA POINT.

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