This is to certify that the

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THE VARIATION IN HYDRAULIC CONDUCTIVITY
OF HETEROGENEOUS DRIFT DEPOSITS

presented by

CHERYL A. KEHRES

has been accepted towards fulfillment
of the requirements for

M.Sc. degree in Geology

Grahame J. Larson
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Dr. Grahame J. Larson

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THE VARIATION IN HYDRAULIC CONDUCTIVITY OF HETEROGENEOUS DRIFT DEPOSITS

by

Cheryl A. Kehres

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Submitted to
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ABSTRACT

THE VARIATION IN HYDRAULIC CONDUCTIVITY OF HETEROGENEOUS DRIFT DEPOSITS

By

Cheryl A. Kehres

Aquifer test analysis and laboratory permeability studies are the most common methods which have been used to determine the hydraulic conductivities of a leaky artesian system in a glaciated area. These techniques, however, can not adequately determine the variability in hydraulic conductivity of drift deposits that is expected over a broad regional area. In this study a finite-element model is applied to such an area in an attempt to estimate this anticipated range in hydraulic conductivity.

The area chosen for this investigation lies in south-central Michigan and encompasses 16 townships. It is underlain by Pleistocene drift that rests directly on the major bedrock aquifer for the region. A data base of approximately 2000 well logs was used to define drift and aquifer lithology, and areas of probable high recharge. The hydraulic conductivity values of drift determined from this research are $1.8*10^{-8}$ ft/sec ($5.5*10^{-7}$ cm/sec) for till deposits and $1.8*10^{-7}$ ft/sec ($5.5*10^{-6}$ cm/sec) for sand and gravel deposits. It can be concluded that application of a finite-element model can assess the variability in hydraulic conductivity of drift deposits over a regional area and should provide a more accurate description of the hydrogeology of regions characterized by such deposits.

To Matt

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INTRODUCTION

Often in glaciated areas the hydrologic regime is that of a leaky artesian system with drift acting as a semi-pervious layer. This condition has prompted several investigations in recent years that have focused primarily on the hydraulic properties of drift. They have included laboratory permeability studies (Desaulniers, et al. 1981; Norris, 1962), aquifer testing (Walton, 1962), and digital modeling (Grisak and Cherry, 1975). Collectively, these studies have shown that drift can have a range in hydraulic conductivity on the order of 10^{-13} to 10^{-7} ft/sec (10^{-11} to 10^{-5} cm/sec).

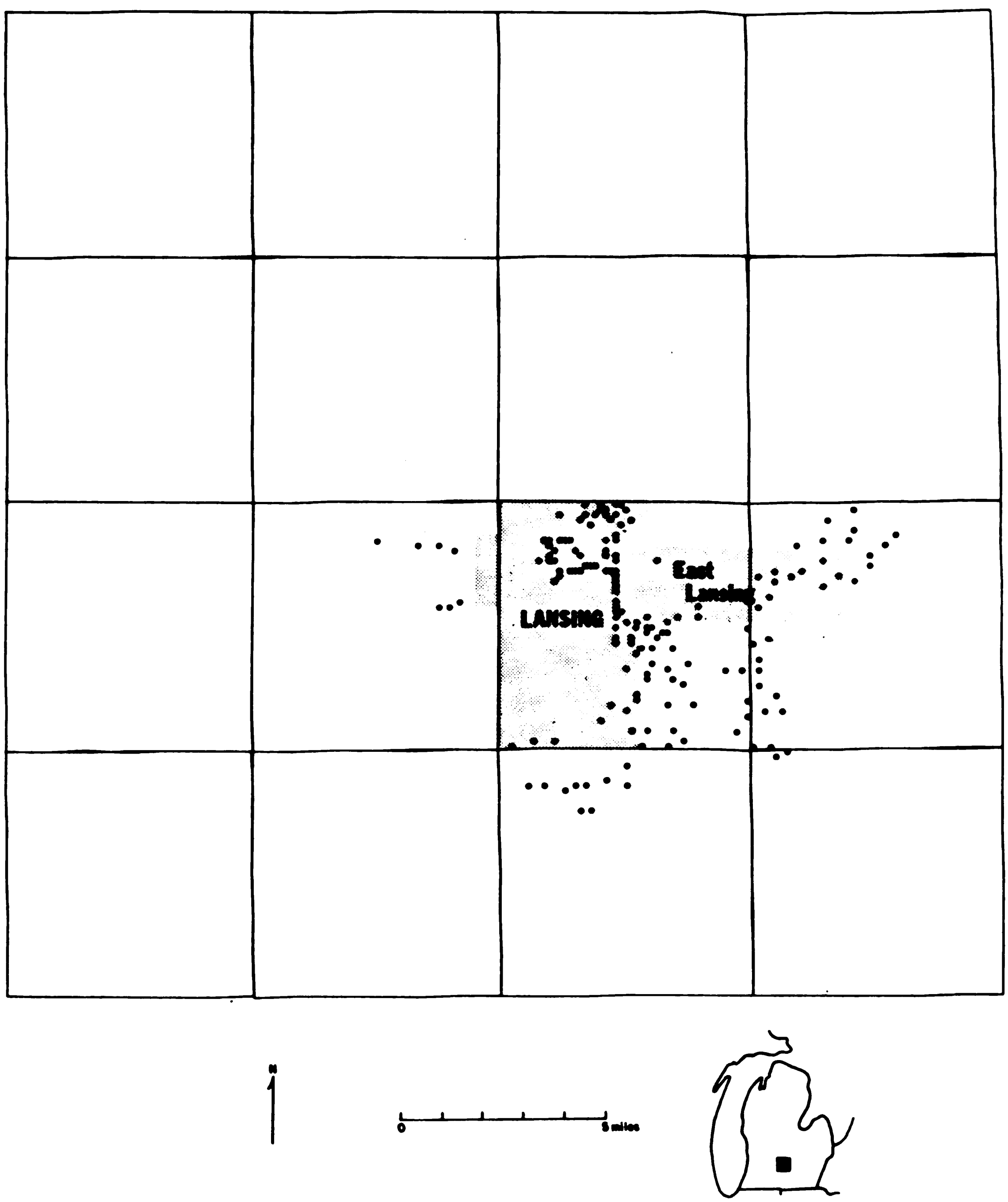
The above investigations have been mainly site specific rather than regional, and have generally treated the drift as a homogeneous unit. However, in a broad region characterized by heterogeneous drift deposits a range in hydraulic conductivity values as opposed to a single value can be expected. Therefore, in this investigation an analysis utilizing a finite-element model is applied to a broad region characterized by varied drift deposits in an attempt to estimate this anticipated range in hydraulic conductivity.

STUDY AREA

The area chosen for this investigation lies in south-central Michigan (Figure 1) and encompasses 16 townships that make up the Lansing - East Lansing metropolitan region. It is underlain by Pleistocene drift that varies from 50 to 150 feet (15 to 46 m) in thickness (Stuart, 1945; Vanlier, et al. 1973). This drift rests directly on the Saginaw Formation which is the major bedrock aquifer for the region. The Saginaw Formation is confined underneath by the Bayport Limestone. The entire area depends almost exclusively upon groundwater for its water supply (39.6 mgd) and contains approximately 1800 private wells and 167 municipal and industrial wells.

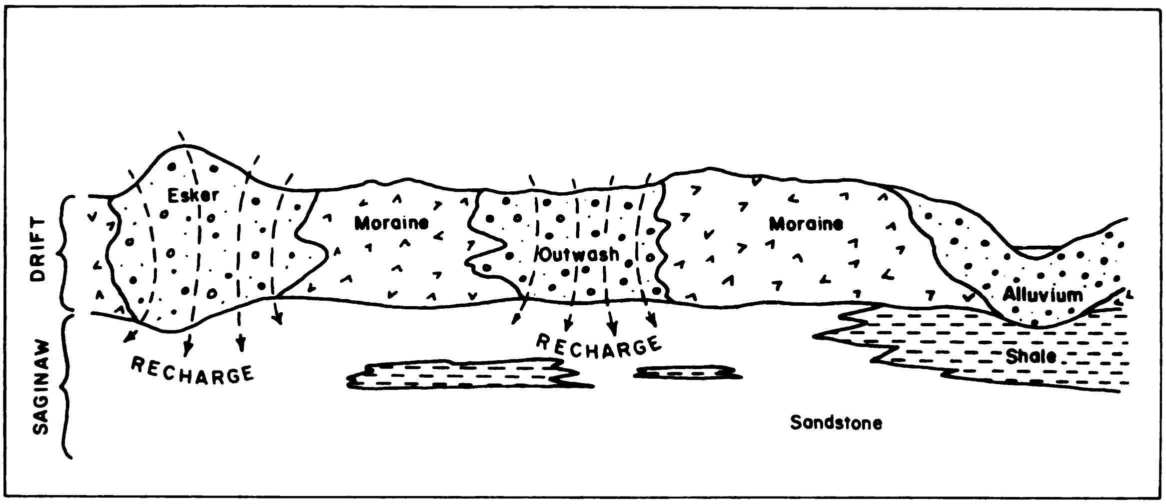
The Saginaw Formation is composed chiefly of interbedded sandstone and shale (Kelly, 1936; Vanlier, et al. 1973). It dips slightly towards the northeast and ranges in thickness from approximately 350 feet (107 m) in the southern part of the study area to 400 feet (122 m) in the northern part. The transmissibility of the aquifer has been determined from previous aquifer studies (Stuart, 1945; Firouzian, 1963) and ranges between $6.2*10^{-3}$ ft^2/sec (5.76 cm^2/sec) and 0.12 ft^2/sec (111.5 cm^2/sec). Assuming an average aquifer thickness of 375 ft (114 m) these values result in a range of hydraulic conductivity from $1.2*10^{-5}$ ft/sec ($3.6*10^{-4}$ cm/sec) to $3.3*10^{-4}$ ft/sec ($1.0*10^{-2}$ cm/sec).

Figure 1. Study Area. Darkened circles indicate municipal wells.


LANSING
East
Lansing
N
0
5 miles

The drift in the region consists mostly of clay till. However, in some areas there are localized deposits of sand and gravel associated with eskers and rivers. It has been proposed that recharge through the drift to the underlying aquifer occurs mainly through the permeable materials associated with the esker and river deposits; whereas, less recharge occurs through the till or where shales are in direct contact with the drift (Stuart, 1945; Vanlier, et al. 1973; Long, et al. 1981; Monaghan and Ritter, 1982), (Figure 2). It is this geologic setting which creates a leaky artesian groundwater system in the study area. A value of $1.8*10^{-7}$ ft/sec ($5.5*10^{-6}$ cm/sec) has been suggested for the hydraulic conductivity of the sands and gravel (Lovato and Larson, 1979). However, conductivity values for the till have not been determined.

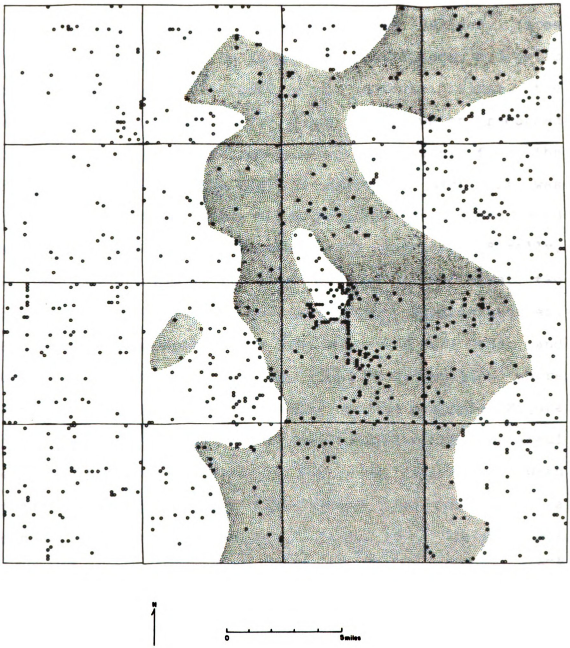
Figure 2. Schematic of Drift Overlying the Saginaw Formation.


DRIFT
SAGINAW
Esker
Moraine
Outwash
Moraine
Alluvium
Shale
RECHARGE
RECHARGE
Sandstone

HYDRAULIC CONDITIONS

A bedrock lithology map was prepared from a computerized data base of 893 private and municipal wells in the study area. To determine the lateral and vertical change in lithology of the aquifer, the Saginaw Formation was divided into three major lithologic units: sandstone, shale, and sandstone and shale (i.e. sandy shale, shaley sandstone, and thin beds of alternating shale and sandstone). If a well log recorded greater than 33% sandstone, the bedrock in the vicinity of the well was defined as sandstone. Similarily, if the well log recorded greater than 33% shale or greater than 33% shale and sandstone, the bedrock in the vicinity of the well was defined as shale or shale and sandstone, respectively. This averaging technique was applied at depths of 10 feet, 100 feet, 150 feet, and greater than 300 feet into the aquifer. It was found that the aquifer lithology was fairly constant with depth and consisted of a higher percentage of sandstone in the center of the study area than to the east or west (Figure 3). In conjunction with a review of results of numerous pump tests which have been performed in the study area (Keck Consulting; Stuart, 1945; East Lansing - Meridian Water and Sewer Authority), defining the bedrock lithology enabled assignment of hydraulic conductivity values to the aquifer. As a result, the center of study area was initially assigned a

Figure 3. Bedrock Lithology Map. Shaded area represents mostly sandstone; unshaded area represents mostly shale. Darkened circles indicate municipal wells; open circles indicate private wells.

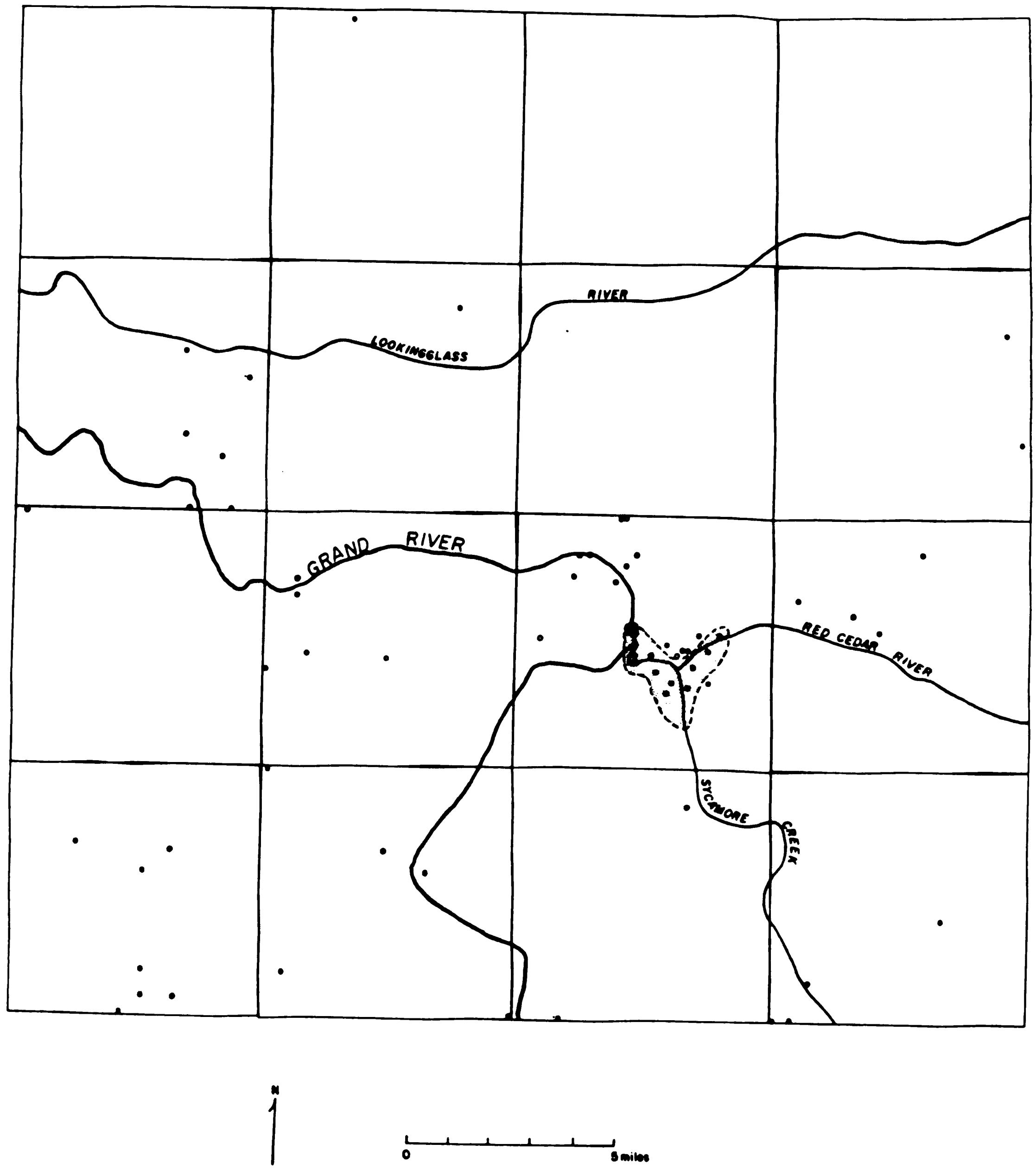

N
0
5miles

conductivity value of $7.9*10^{-5}$ ft/sec ($2.4*10^{-3}$ cm/sec), whereas, the area consisting of a higher percent of shale was assigned a conductivity value of $2.3*10^{-5}$ ft/sec ($7.0*10^{-4}$ cm/sec).

Once the aquifer conductivity was defined, three criteria were applied to define areas of direct hydraulic connection through the drift to the bedrock. First, the well file was searched for those wells which recorded continuous units of permeable sand and gravel from the ground surface to the bedrock aquifer. Next, it was determined if those wells which recorded continuous sand and gravel were in direct contact with sandstone. Finally, it was determined if the areas defined by the first two conditions were near any rivers or other recharge sources. From this assessment, the area where the Red Cedar and Grand Rivers converge was identified as a location where substantial recharge to the aquifer seemed probable (Figure 4). Also identified were a few deposits of smaller areal extent that were in direct contact with sandstone. With these areas of suspected high recharge differentiated, a conductivity value of $3.3*10^{-9}$ ft/sec (10^{-7} cm/sec) was assigned to the till; a value of $3.3*10^{-8}$ ft/sec (10^{-6} cm/sec) was assigned to the permeable sands and gravel of the suspected high recharge areas.

In conjunction with the hydraulic values of the drift and bedrock aquifer, pumping data were assembled for the period 1945-79. Because of the configuration of the

Figure 4. Areas of Direct Hydraulic Connection through Drift to Bedrock. Circles represent wells that recorded continuous sand and gravel to bedrock. Shaded area represents identified high recharge area.



LOOKINGGLASS
RIVER
GRAND RIVER
RED CEDAR RIVER
SYCAMORE CREEK
N
0
5 miles

municipal well field, the wells were then clustered into pumping centers. With this information a finite element grid was designed.

FINITE-ELEMENT MODEL

The finite-element model (GEOFLOW) used in this study is a two dimensional computer program which utilizes the Galerkin-based finite-element method to transform the mathematical equations governing groundwater flow to a system of first-order partial differential equations as a means of evaluating the potentiometric surface over the study area (Haji Djafari, 1982). Features of the hydrodynamic model are:

1) Time-variable pumping rates can be modeled.
2) The system can be divided into regions, and each region can have different hydraulic conductivity parameters such as the transmissibility, recharge, and storage coefficients.
3) Initial hydraulic heads can be specified or can be computed by the program.
4) Along any designated element, a line source can be incorporated.
5) At any designated node, the value of the hydraulic head can be specified (Dirichlet boundary condition).
6) The thickness of aquifer can be updated if required.
7) Flow vectors are computed at the center of each element.

Finite-Element Grid

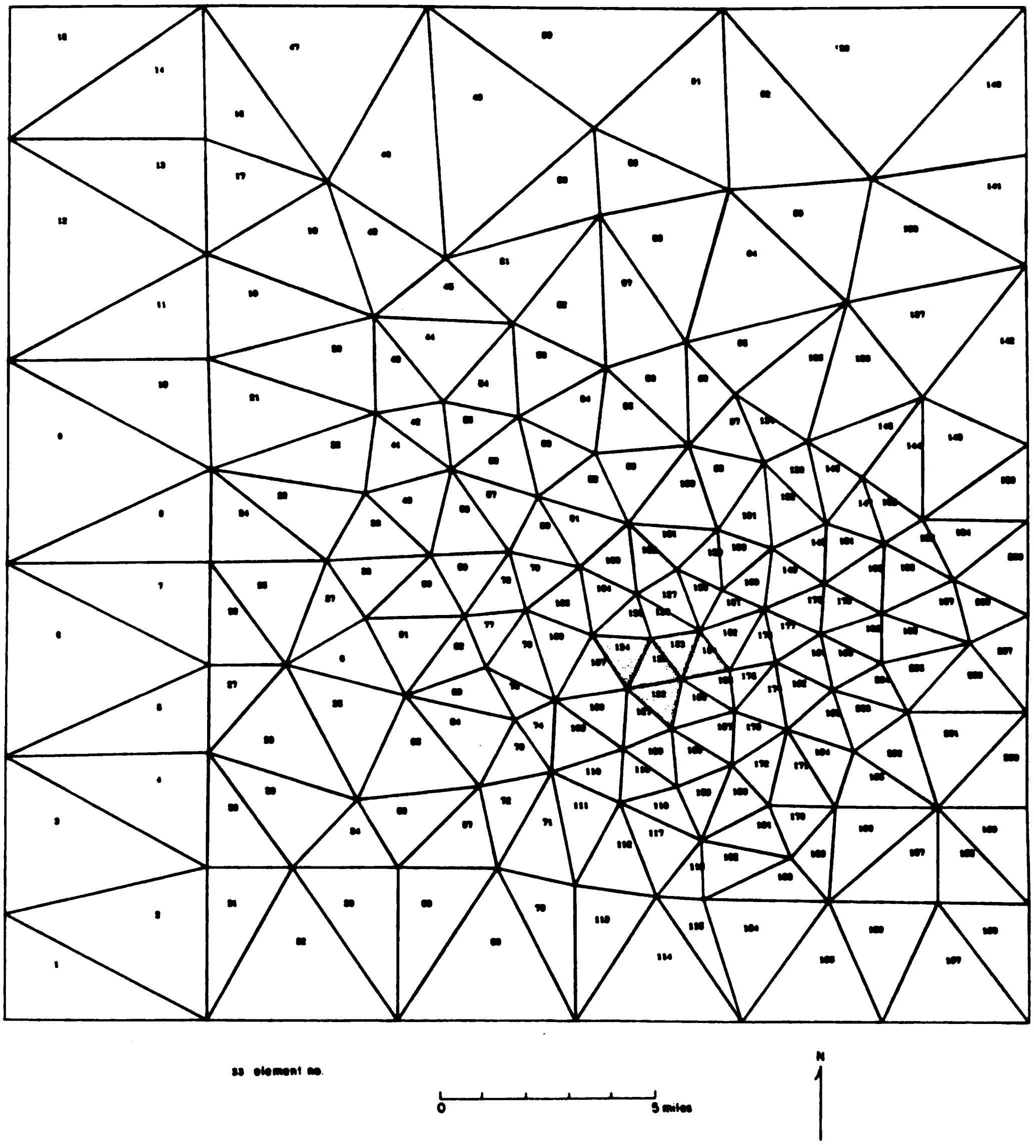
In the design of the finite-element grid (Figure 5) three major factors were considered. First was the aquifer hydraulic conductivity, second was the configuration of the municipal well field, and third was the hydrologic character of the drift. In regards to the aquifer hydraulic conductivity the elements of the grid were designed to conform to the facies relationship between the two conductivity zones as previously defined. To establish more detail near the municipal well field, the elements were also made smaller nearer the well field and generally larger farther away. The finite-element grid delineating pumping centers is included in the Appendix (Figure 6). The heterogeneous nature of the drift was also delineated by assigning a higher vertical conductivity value over the elements representing the suspected high recharge area (Figure 5). In total, the finite-element grid consisted of 209 elements and 118 nodes.

Assumptions

The main assumptions that were used to implement the program were as follows:

1) The aquifer was treated as being under semi-confined conditions. Although the drift is acting as the overlying confining bed, there is significant amount of leakage through the

Figure 5. Finite-Element Grid. Shaded area represents identified high recharge area.


33 element no.
0
5 miles
N

heterogeneous deposits characterizing the drift to the Saginaw aquifer.

2) Each node along the boundary of the study area was assumed to have a constant hydraulic head as prescribed by the Dirichlet condition (Prescribed Potential Boundary Condition) since historical data has shown that the potentiometric surface around the perimeter of the study area has not changed appreciably since 1900.

3) The thickness of the aquifer was assumed constant at 375 feet (114 m). An isopach map of the thickness of the Saginaw Formation was constructed from oil well logs in the area. The thickness was found to vary from 300 feet in the south to greater than 400 feet in the northeast. From the map it was determined that assuming a constant thickness of 375 feet for the Saginaw aquifer over the study area was reasonable.

4) Leakage from the rivers was only assumed to be important in those areas where the well logs recorded continuous units of sand and gravel to the bedrock.

5) Initial hydraulic heads were determined from historical data in 1900 because at that time there were no significant stresses imposed on

the groundwater system (Wheeler, 1967).

6) Resistivity values for drift were computed assuming an average thickness of 87.5 feet (27 m), where resistivity is defined as the thickness of a semi-confining layer divided by its' hydraulic conductivity. An isopach map of the thickness of the drift was computer generated. From this map an average drift thickness of 87.5 feet was chosen.

CALIBRATION

Calibration of the finite-element model was achieved with application of the indirect approach (Neuman, 1973) whereby input parameters are adjusted with repetitive application of the model until computed heads matched the observed field values (Freeze and Cherry, 1979). Over 60 simulation runs were made adjusting the resistivity of the drift, the hydraulic conductivity of the aquifer, the storage coefficient, and the boundary conditions to obtain a solution which best approximated the actual hydrologic conditions. Included in the Appendix are the various pumping schedules used in calibrating the finite element model (Table 1) and a sample computer run.

The model was initially calibrated to simulate 1945 steady-state conditions. Conductivity parameters were assigned uniform values so as not to force artificial complexities on the system. Therefore, the hydraulic conductivites of the drift and the aquifer were assigned the estimated values of $4.1*10^{-9}$ ft/sec ($1.25*10^{-7}$ cm/sec) and $9.8*10^{-6}$ ft/sec ($3.0*10^{-4}$ cm/sec), respectively. The pumpage in 1945 totaled 14 mgd over the study area.

Initial hydraulic heads were input as ϕ (head) zones based on data for the year 1900 when the aquifer was virtually undeveloped. The ϕ zones and hydraulic conductivity of the aquifer were then adjusted singularly keeping the hydraulic conductivity of the drift uniform until the simulated potentiometric surface (Figure 7) matched the historical potentiometric surface (Figure 8) fairly well. Five initial ϕ zones proved to be a good representation of initial conditions in 1900. In addition, differentiating the hydraulic conductivity of the aquifer into two zones ($7.9*10^{-5}$ ft/sec for the sandstone facies and $2.3*10^{-5}$ ft/sec for the shale facies) as originally anticipated, produced a good fit for the 1945 conditions.

After synthesis of the 1945 potentiometric surface a transient analysis was performed for the period 1945-64. In this analysis the initial ϕ zones were altered slightly in addition to checking the model sensitivity to various time steps. The values of drift conductivity and aquifer conductivity as determined from the 1945 calibration were used in this calibration. In addition, a storage coefficient of 10^{-4} was assigned to the bedrock aquifer. The model was not sensitive to the time step as values of 1, 2.5, and 5 years produced very little difference in the resulting hydraulic heads for 1964. Therefore, a 1 year time step was considered adequate. In 1964 27.5 mgd of water was withdrawn from the aquifer. The fit obtained from this calibration was reasonable considering that the drift heterogeneity had not yet been addressed. Figure 9 shows the 1964 simulated potentiometric surface and Figure 10 shows the actual 1964 potentiometric surface.

With the 1964 match completed, a transient analysis was performed for the period 1956-79. In this analysis the

Figure 7. Simulated 1945 Potentiometric Surface.

Figure 8. Actual 1945 Potentiometric Surface.

Figure 9. Simulated 1964 Potentiometric Surface.

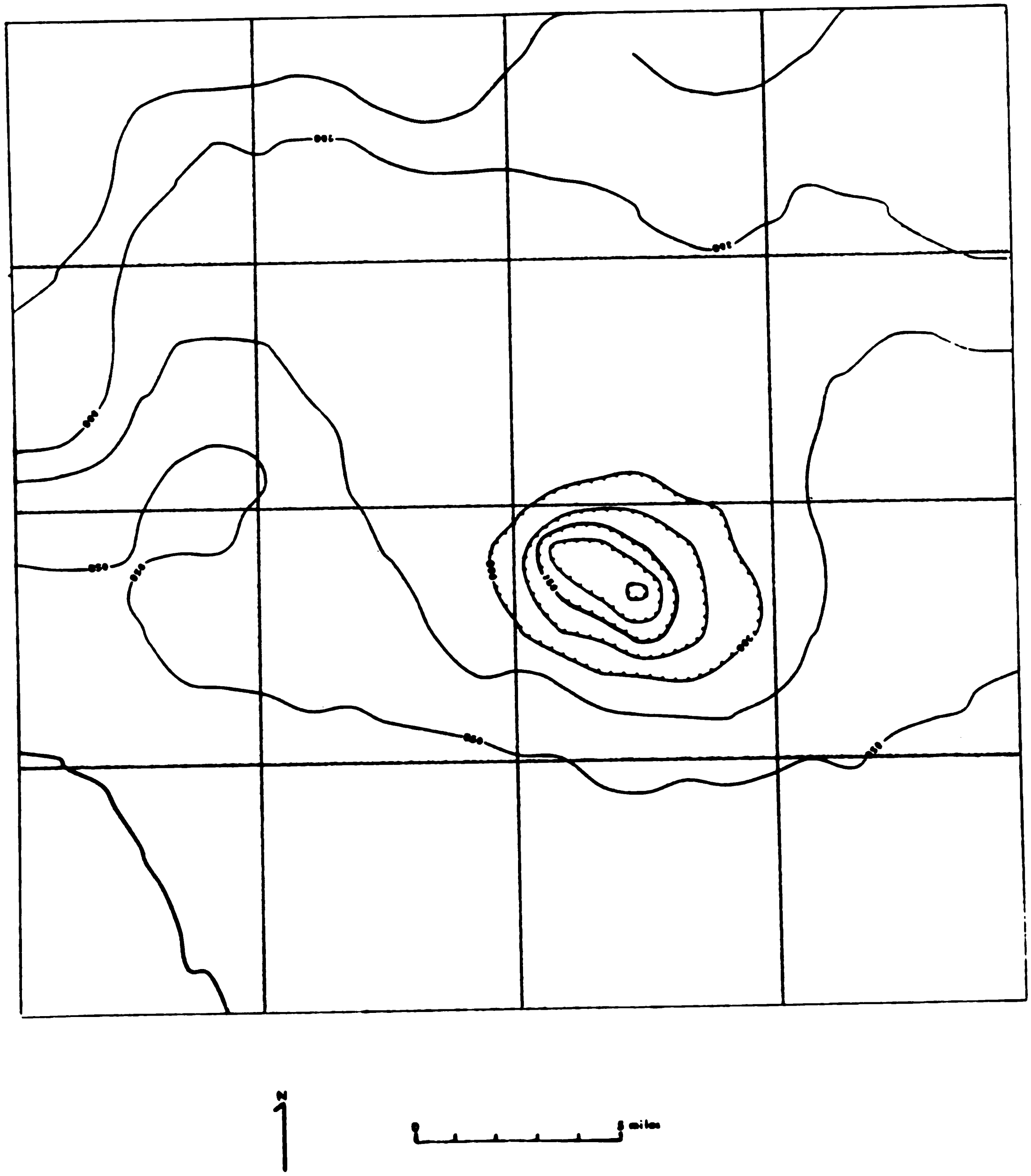
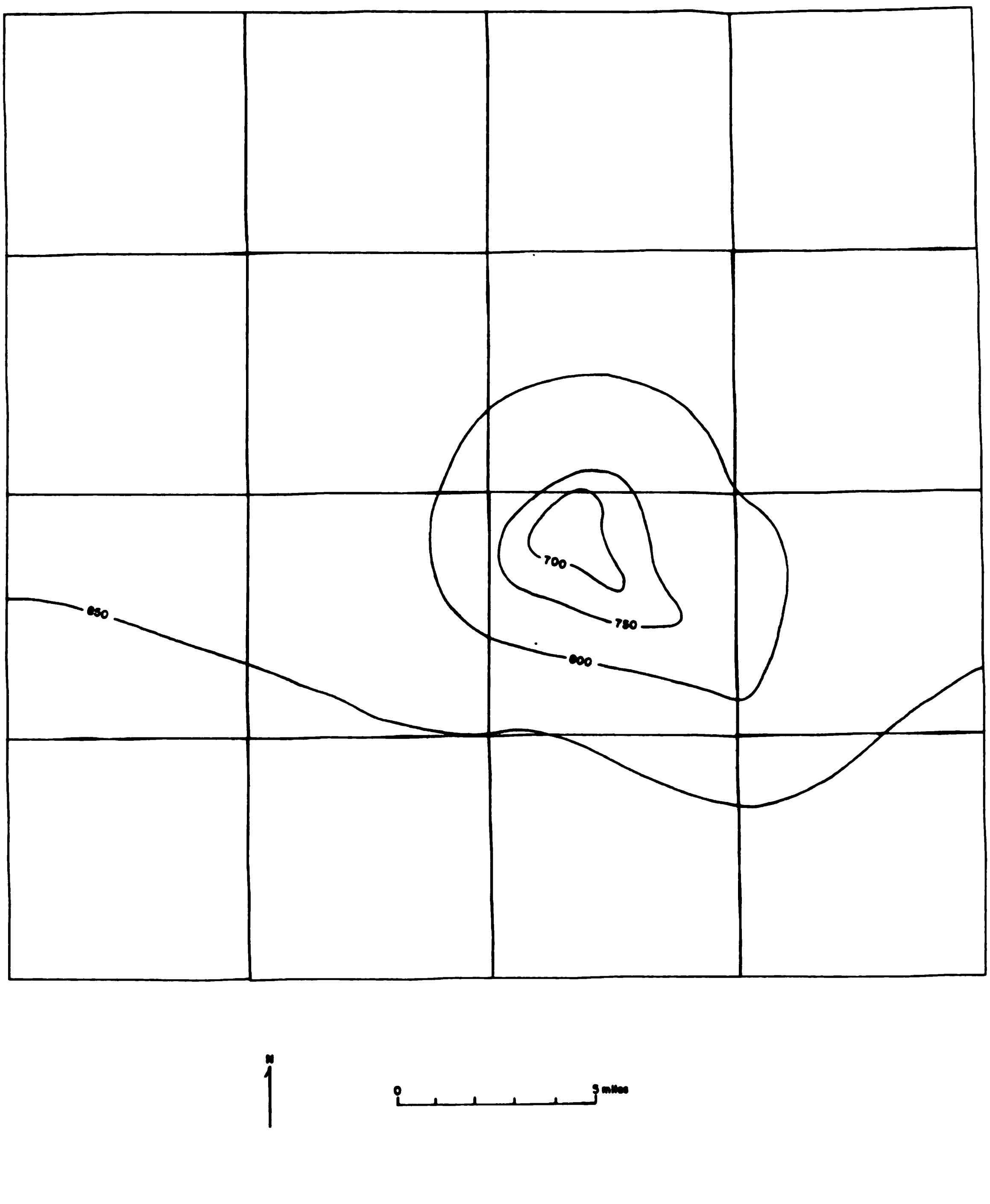


Figure 10. Actual 1964 Potentiometric Surface.



650
700
750
800
N
0
5 miles

drift hydraulic conductivity was addressed. Using the values of the aquifer conductivity, storage coefficient, time step, and ϕ zones as determined from the 1945 and 1964 calibrations, the drift hydraulic conductivity was adjusted until the simulated potentiometric surface matched the actual 1979 conditions. Values of $1.5*10^{-8}$ to $3.2*10^{-8}$ ft/sec ($4.6*10^{-7}$ to $9.8*10^{-7}$ cm/sec) were assigned to the conductivity of the till; whereas, values of $5.3*10^{-8}$ to $2.3*10^{-5}$ ft/sec ($1.6*10^{-6}$ to $7.0*10^{-4}$ cm/sec) were assigned to the conductivity of the suspected high recharge areas. From this analysis it was found that assigning a differential conductivity value to the permeable sand and gravel deposits of smaller areal extent produced a mounding effect. Therefore, these deposits may be important for recharge locally but on a regional level they were determined to be insignificant. The area where the Red Cedar and Grand Rivers converge, however, was determined to be an important avenue for recharge. Conductivity values of $1.8*10^{-7}$ ft/sec ($5.5*10^{-6}$ cm/sec) for the river deposit and $1.8*10^{-8}$ ft/sec ($5.5*10^{-7}$ cm/sec) for the till produced a good fit when compared with water well level data for 1979 from USGS observation wells (Huffman, 1980), Lansing Board of Water and Light municpal wells, and State of Michigan water well records. Figure 11 shows the 1979 simulated potentiometric surface and Figure 12 shows the 1979 actual potentiometric surface. The slight irregularity in the contours of the simulated

Figure 11. Simulated 1979 Potentiometric Surface.

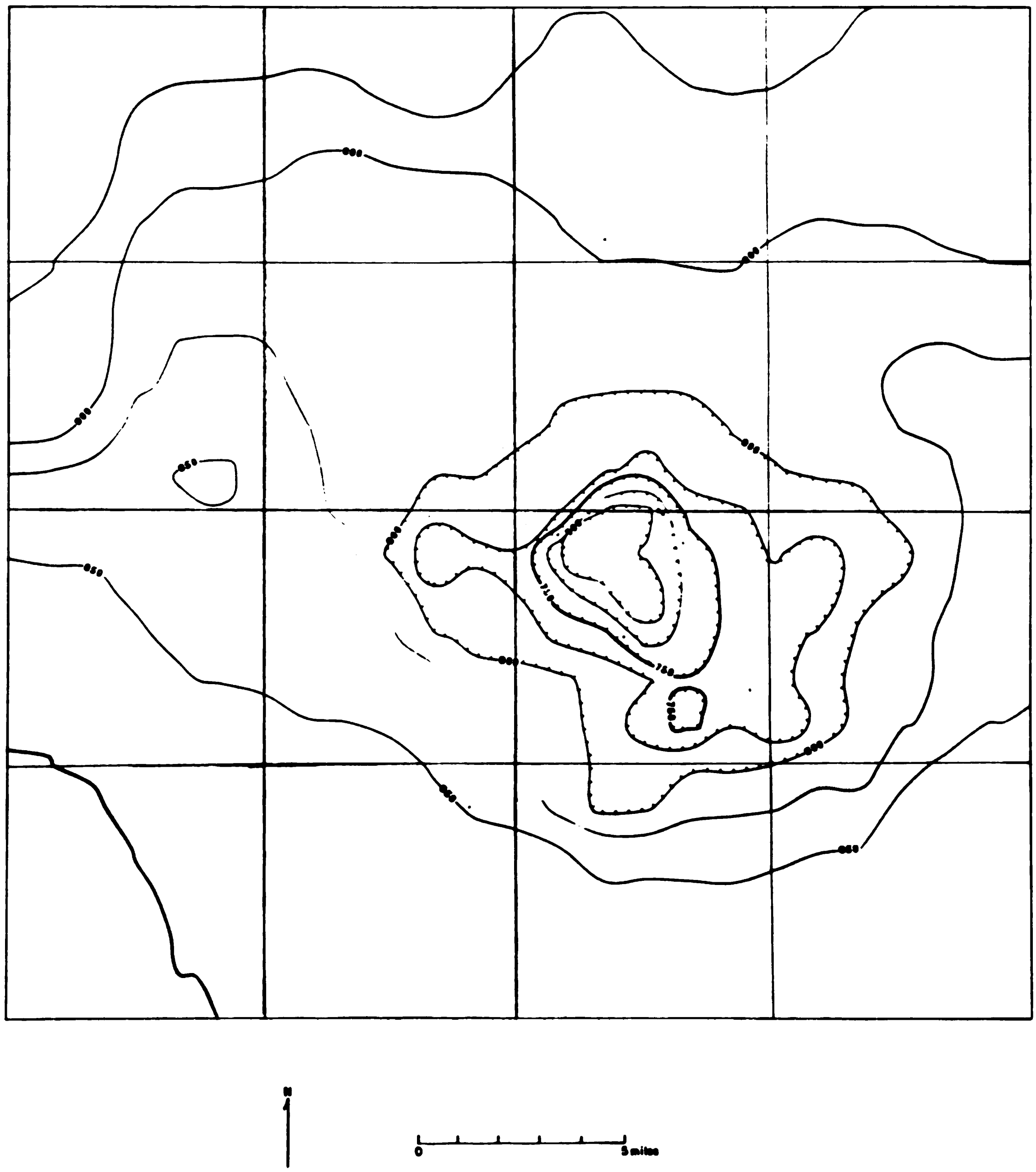

N
0
5 miles

Figure 12. Actual 1979 Potentiometric Surface.

potentiometric surface near the center of the cone of depression can be attributed to artificial influence caused by clustering pumping wells into a limited number of pumping nodes. Pumpage for 1979 totaled 39.6 mgd in the Lansing area.

With an acceptable match obtained, sensitivity analyses were performed by varying the aquifer conductivity and storage coefficient. Values ranging from $6.2*10^{-5}$ to $9.3*10^{-5}$ ft/sec ($1.9*10^{-3}$ to $2.8*10^{-3}$ cm/sec) and $1.5*10^{-5}$ to $3.1*10^{-5}$ ft/sec ($4.6*10^{-4}$ to $9.4*10^{-4}$ cm/sec) were assigned to the sandstone facies and shale facies respectively, to determine the best estimate of the aquifer conductivity. The model was only slightly sensitive to these changes and produced the best fit using conductivity values of $7.9*10^{-5}$ ft/sec ($2.4*10^{-3}$ cm/sec) for the sandstone and $2.3*10^{-5}$ ft/sec ($7.1*10^{-4}$ cm/sec) for the shale. The model was run with storage coefficients ranging from 10^{-2} to 10^{-6}, however, the simulations showed no sensitivity to the storage coefficient. Therefore, a storage coefficient of 10^{-4} was assumed adequate for calibration. With the model calibrated to the 1979 data the 1945-64 transient analysis and the 1945 steady state analysis was again performed to check the calibration. Figure 13 shows the final simulated 1945 potentiometric surface and Figure 14 shows the final simulated 1964 potentiometric surface. In both cases the computed

Figure 13. Final Simulated 1945 Potentiometric Surface.

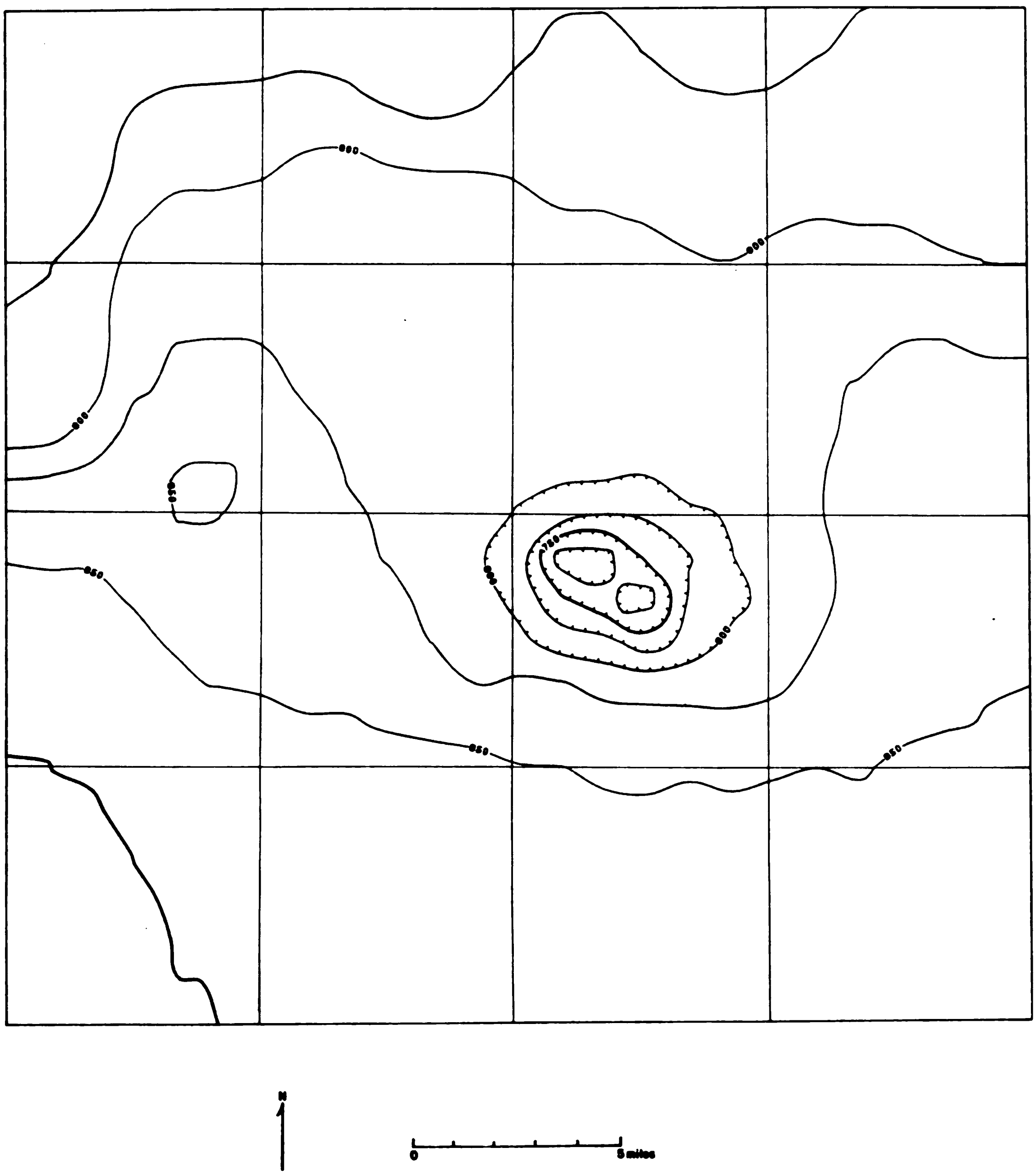

750
N
0
5 miles

Figure 14. Final Simulated 1964 Potentiometric Surface.

potentiometric surface matched well with the actual measured surface.

DISCUSSION

Electric-Analog Model

Approximately 15 years ago, an electric-analog model (Wheeler, 1967; Vanlier and Wheeler, 1968) was utilized in the Lansing area to predict the change in the potentiometric surface with time due to increased pumpage. In the application of the analog model leakage was contributed along the total length of the rivers. However, even though the amount of pumpage input to the analog model in 1975 (43 mgd) virtually matched that actually pumped in 1979 (39.5 mgd), drawdown in the downtown Lansing area in 1975 was overpredicted by 50 feet when compared to actual 1979 conditions (Huffman, 1980; Lansing Board of Water and Light municipal well data). Furthermore, the drawdown in the East Lansing area predicted by the 1975 analog simulation was 83 feet greater than the actual 1976 conditions (Van Til, 1977).

To assess the hydraulic character of the drift, leakage values were used in the analog analysis, whereas, in the finite-element analysis hydraulic conductivity values were used. However, the recharge values input to the analog model appear to have been underestimated since all other parameters used in the analog model are fairly close to those used in the finite-element model.

<u>Dewatering</u>

In 1979 the potentiometric surface in the northern Lansing area was reported to be 75 feet (23 m) below the surface of the Saginaw aquifer, while in the southern Lansing area, near the identified high recharge area, it was reported to be as much as 25 feet (8 m) below the surface of the aquifer (Keck Consulting; Huffman, 1980). These data which were collected from wells that penetrate at least 155 feet (47 m) into the aquifer would suggest that the Saginaw aquifer is locally being dewatered.

In order to evaluate the significance of dewatering in the Lansing area, a dewatering option (DEWA) was applied to the finite element model. The potentiometric heads calculated when using this option were found to be nearly identical (± 5 ft) to those simulated when no dewatering option was applied. This lack of significant head difference would suggest that perhaps the finite element grid is not refined enough in the vicinity exhibiting dewatered conditions to adequately simulate such conditions. An alternative explanation is that the observation well data may reflect mainly vertical pressure differences due to shale lenses occuring within the aquifer, rather than actual dewatering conditions.

To determine which of the two explanations is correct, shallow observation wells would have to be drilled to test if dewatering is occuring. In addition, a more refined

grid could be applied to the area exhibiting dewatered conditions.

If dewatering is occuring in the Lansing area, water may be drawn into the Saginaw aquifer from the underlying Bayport Limestone. This could result in contamination of the Saginaw aquifer since the Bayport Limestone produces saline water in areas where it is overlain by the Saginaw Formation (Vanlier, et al., 1973).

CONCLUSIONS

The methods which have been most commonly used to determine the hydraulic conductivities of a leaky aretesian system in a glaciated area are aquifer test analyses and laboratory permeability studies. These techniques, though, can not adequately determine the variabilty in hydraulic conductivity of drift deposits that is expected over a broad regional area. Application of a finite-element model, however, can assess this variability and should provide a more accurate description of the hydrologic regime of a region characterized by heterogeneous deposits.

The hydraulic conductivity values for drift obtained in this investigation can be compared to values obtained by other researchers in the United States and Canada (Table 2). The conductivity values of drift as determined from previous investigations range from $3.3*10^{-13}$ to $3.3*10^{-7}$ ft/sec (10^{-11} to 10^{-5} cm/sec). The final values determined from this research are $1.8*10^{-8}$ ft/sec ($5.5*10^{-7}$ cm/sec) for till deposits and $1.8*10^{-7}$ ft/sec ($5.5*10^{-6}$ cm/sec) for sand and gravel deposits. These hydraulic conductivity values are clearly within the range defined by others.

TABLE 2

HYDRAULIC CONDUCTIVITY OF DRIFT (cm/sec)

SOUTHEASTERN MANITOBA (Grisak and Cherry, 1975)	SOUTHWESTERN ONTARIO (Desaulniers, et al., 1981)	ILLINOIS, OHIO AND SOUTH DAKOTA (Norris, 1962)	SOUTHEASTERN ILLINOIS (Walton, 1960)	SOUTHCENTRAL MICHIGAN (Kehres, et al., 1983)
Lab $9.0x10^{-11}$-$2.0x10^{-10}$	Lab $9.3x10^{-8}$-$8.3x10^{-7}$	Field and Lab	Field	FEM
FEM $1.8x10^{-7}$	Field $7.9x10^{-8}$-$2.4x10^{-7}$	$9.5x10^{-9}$-$4.3x10^{-5}$	$3.8x10^{-6}$-$7.6x10^{-5}$	$6.0x10^{-7}$-$6.0x10^{-6}$

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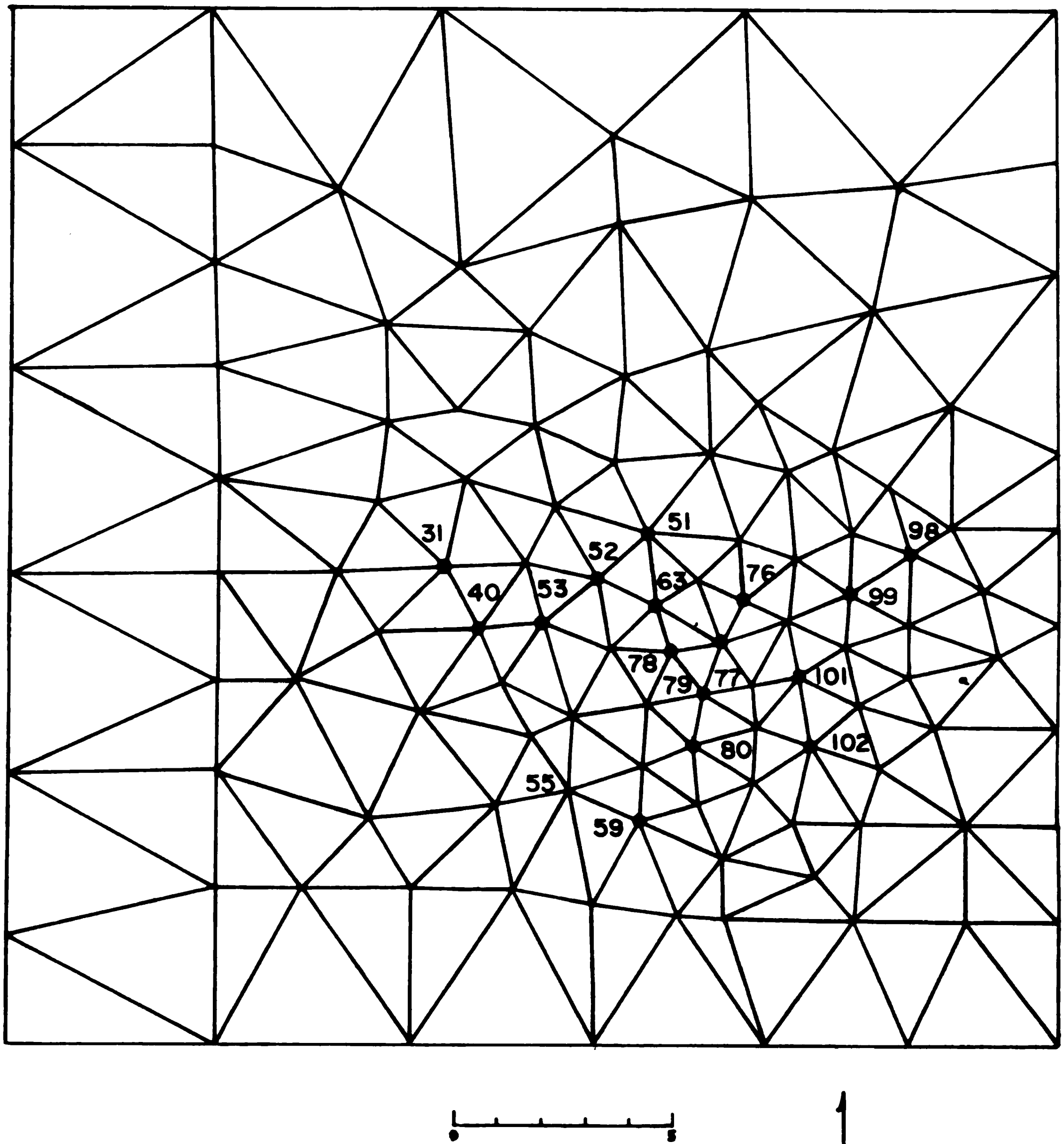
APPENDIX

Figure 6. Finite Element Grid with Pumping Centers.
Darkened circles represent pumping nodes.



1

TABLE 1
PUMPING SCHEDULES

1945 STEADY STATE PUMPING SCHEDULE*

NODE	AMOUNT PUMPED
52	$6.55*10^5$
63	$5.48*10^5$
77	$1.87*10^5$
78	$2.94*10^5$
76	$2.67*10^4$
99	$6.68*10^4$
101	$9.36*10^4$

1945 - 1964 TRANSIENT ANALYSIS PUMPING SCHEDULE*

NODE	1945-1949	1950-1954	1955-1959	1960-1964
52	$6.95*10^5$	$6.82*10^5$	$6.15*10^5$	$6.15*10^5$
63	$6.95*10^5$	$6.28*10^5$	$4.52*10^5$	$4.41*10^5$
78	$2.27*10^5$	$2.91*10^5$	$3.88*10^5$	$4.81*10^5$
77	$2.27*10^5$	$2.27*10^5$	$2.94*10^5$	$2.94*10^5$
51	0	$2.46*10^5$	$4.01*10^5$	$6.42*10^5$
76	$2.67*10^4$	$5.35*10^4$	$6.68*10^4$	$5.35*10^4$
99	$6.68*10^4$	$9.36*10^4$	$1.60*10^5$	$2.14*10^5$
101	$1.47*10^5$	$2.54*10^5$	$6.68*10^4$	$6.68*10^4$
102	0	0	$2.41*10^5$	$3.21*10^5$
53	$4.01*10^4$	$1.20*10^5$	$1.47*10^5$	$1.74*10^5$

TABLE 1 (Continued)

1964 - 1979 TRANSIENT ANALYSIS
PUMPING SCHEDULE*

NODE	1956-1963	1964-1971	1972-1979
52	$5.82*10^5$	$6.02*10^5$	$5.07*10^5$
63	$4.74*10^5$	$5.40*10^5$	$5.32*10^5$
78	$4.57*10^5$	$5.75*10^5$	$5.52*10^5$
77	$3.18*10^5$	$2.81*10^5$	$3.26*10^5$
51	$4.99*10^5$	$6.68*10^5$	$5.59*10^5$
76	$5.35*10^4$	$6.68*10^4$	0
99	$1.86*10^5$	$2.54*10^5$	$3.68*10^5$
101	$6.68*10^4$	$8.02*10^4$	$1.66*10^5$
102	$2.86*10^5$	$4.01*10^5$	$4.49*10^5$
53	$1.75*10^5$	$2.00*10^5$	0
98	0	0	$2.19*10^5$
79	0	0	$3.44*10^5$
80	0	0	$5.37*10^5$
55	0	0	$1.02*10^5$
59	0	0	$3.22*10^5$
31	0	0	$2.46*10^5$
40	0	0	$6.42*10^4$

* Values in ft^3/day

SAMPLE COMPUTER RUN

FINITE ELEMENT MODEL - LANSING, MI
UNITS FT,DAYS

***** VERTICAL RECHARGE DATA *****

ZONE	GRLC	SIGMAI	PHIU	QR	CTHICK
1	0.	.1830E-04	850.00	0.	375.000
2	0.	.1830E-04	850.00	0.	375.000
3	0.	.1830E-04	875.00	0.	375.000
4	0.	.1830E-04	800.00	0.	375.000
5	0.	.1830E-04	825.00	0.	375.000
6	0.	.1830E-03	825.00	0.	375.000

***** ELEMENT DATA *****

ELEMENT NO.	NODE 1	NODE 2	NODE 3	NODE 4	PROPERTY ZONE	RECHARGE ZONE	THICKNESS	DATUM
1	1	17	2	2	2	3	375.00	0.00
2	2	17	16	16	2	3	375.00	0.00
3	2	16	3	3	2	3	375.00	0.00
4	3	16	15	15	2	3	375.00	0.00
5	3	15	14	14	2	1	375.00	0.00
6	3	14	4	4	2	1	375.00	0.00
7	4	14	13	13	2	1	375.00	0.00
8	4	13	12	12	2	1	375.00	0.00
9	4	12	5	5	2	1	375.00	0.00
10	5	12	11	11	2	4	375.00	0.00
11	5	11	10	10	2	4	375.00	0.00
12	5	10	6	6	2	4	375.00	0.00
13	6	10	9	9	2	4	375.00	0.00
14	6	9	8	[illegible]	2	4	375.00	0.00
15	6	8	7	7	2	4	375.00	0.00
16	25	8	9	9	2	4	375.00	0.00
17	10	25	9	9	2	4	375.00	0.00
18	10	24	25	25	2	4	375.00	0.00
19	11	24	10	10	2	4	375.00	0.00
20	11	23	24	24	2	5	375.00	0.00
21	12	23	11	11	2	1	375.00	0.00
22	12	22	23	23	2	5	375.00	0.00
23	21	22	12	12	2	5	375.00	0.00
24	13	21	12	12	2	1	375.00	0.00
25	20	21	13	13	2	1	375.00	0.00
26	14	20	13	13	2	1	375.00	0.00
27	15	20	14	14	2	1	375.00	0.00
28	19	20	15	15	2	1	375.00	0.00
29	16	19	15	15	2	3	375.00	0.00
30	16	18	15	15	2	3	375.00	0.00
31	17	18	16	16	2	3	375.00	0.00
32	17	35	15	16	2	3	375.00	0.00
33	35	34	16	18	2	3	375.00	0.00
34	16	34	19	19	2	3	375.00	0.00
35	19	33	20	20	2	1	375.00	0.00
36	33	32	20	20	2	1	375.00	0.00
37	20	32	21	21	2	5	375.00	0.00
38	32	31	21	21	2	5	375.00	0.00
39	21	31	22	22	2	5	375.00	0.00
40	31	30	22	22	2	5	375.00	0.00
41	22	30	23	23	2	5	375.00	0.00
42	30	29	23	23	1	5	375.00	0.00
43	23	29	24	24	1	5	375.00	0.00
44	29	26	24	24	1	5	375.00	0.00
45	24	28	27	27	1	4	375.00	0.00
46	29	27	25	25	1	4	375.00	0.00
47	25	26	[illegible]	8	1	4	375.00	0.00
48	27	26	25	25	1	4	375.00	0.00
49	27	46	26	26	1	4	375.00	0.00
50	27	45	46	46	1	4	375.00	0.00
51	28	45	27	27	1	4	375.00	0.00
52	44	45	28	28	1	4	375.00	0.00
53	43	44	28	24	1	5	375.00	0.00
54	43	28	29	29	1	5	375.00	0.00
55	3[illegible]	43	29	29	1	5	375.00	0.00

[illegible]

137	7[illegible]	7[illegible]	67	67	[illegible]	5	375.00	0.00
138	67	7[illegible]	66	68	2	4	375.00	0.00
139	58	[illegible]	47	47	1	4	375.00	0.00
140	52	70	69	69	1	4	375.00	0.00
141	68	71	70	70	2	4	375.00	0.00
142	72	96	71	71	2	5	375.00	0.00
143	97	96	72	72	2	1	375.00	0.00
144	95	97	72	72	2	1	375.00	0.00
145	73	95	72	72	2	5	375.00	0.00
146	94	95	73	73	1	5	375.00	0.00
147	94	98	95	95	1	1	375.00	0.00
148	93	99	94	94	1	5	375.00	0.00
149	92	99	93	93	1	5	375.00	0.00
150	92	93	76	76	1	5	375.00	0.00
151	77	92	76	76	1	5	375.00	0.00
152	91	92	77	77	1	5	375.00	0.00
153	79	77	78	78	1	6	375.00	0.00
154	79	91	77	77	1	6	375.00	0.00
155	79	90	91	91	1	5	375.00	0.00
156	80	90	79	79	1	5	375.00	0.00
157	80	89	90	90	1	1	375.00	0.00
158	81	89	80	80	1	1	375.00	0.00
159	82	89	81	81	1	1	375.00	0.00
160	82	88	89	89	1	1	375.00	0.00
161	82	87	88	88	1	3	375.00	0.00
162	83	87	82	82	1	3	375.00	0.00
163	83	86	87	87	1	3	375.00	0.00
164	84	86	83	83	1	3	375.00	0.00
165	84	85	86	86	1	3	375.00	0.00
166	85	104	86	86	2	3	375.00	0.00
167	86	104	107	107	2	3	375.00	0.00
168	86	107	103	103	2	3	375.00	0.00
169	86	103	87	87	1	3	375.00	0.00
170	87	103	88	88	1	3	375.00	0.00
171	88	103	102	102	1	1	375.00	0.00
172	88	102	89	89	1	1	375.00	0.00
173	89	102	90	90	1	1	375.00	0.00
174	90	102	101	101	1	5	375.00	0.00
175	96	101	91	91	1	5	375.00	0.00
176	91	101	92	92	1	5	375.00	0.00
177	101	100	92	92	1	5	375.00	0.00
178	92	100	99	99	1	5	375.00	0.00
179	100	111	99	99	1	1	375.00	0.00
180	99	111	98	98	1	1	375.00	0.00
181	99	98	94	94	1	1	375.00	0.00
182	98	97	95	95	1	1	375.00	0.00
183	97	113	96	96	2	1	375.00	0.00
184	112	113	97	97	2	1	375.00	0.00
185	98	112	97	97	1	1	375.00	0.00
186	111	112	98	96	1	1	375.00	0.00
187	111	115	112	112	1	1	375.00	0.00
188	110	115	111	111	1	1	375.00	0.00
189	106	113	111	111	1	1	375.00	0.00
190	109	110	110	100	1	1	375.00	0.00
191	101	109	100	100	1	1	375.00	0.00
192	102	109	101	101	1	1	375.00	0.00
193	102	106	109	109	1	1	375.00	0.00
194	103	108	102	102	1	1	375.00	0.00
195	103	107	108	108	2	1	375.00	0.00
196	104	106	107	107	2	3	375.00	0.00
197	63	105	104	104	2	3	375.00	0.00
198	105	106	104	104	2	3	375.00	0.00
199	106	117	107	107	2	3	375.00	0.00
200	107	117	118	118	2	1	375.00	0.00
201	107	118	116	116	2	1	375.00	0.00
202	107	116	108	108	2	1	375.00	0.00
203	108	116	109	109	1	1	375.00	0.00
204	109	116	110	110	1	1	375.00	0.00
205	116	115	110	110	1	1	375.00	0.00
206	116	118	115	115	2	1	375.00	0.00
207	118	114	115	115	2	1	375.00	0.00
208	115	114	112	112	2	1	375.00	0.00
209	112	114	113	113	2	1	375.00	0.00

***** NODAL DATA *****

NODAL COORDINATE DATA WILL BE MULTIPLIED BY XFACT = 4961.00 AND YFACT = 49[illegible]1.00

NODE	TYPE	X	Y	HEAD	POTENTIAL
1	2	.00	.87	[illegible]75.00	

2	2	.00	3.52	900.00	POTENTIAL
3	2	.00	7.90	875.00	POTENTIAL
4	2	.02	12.34	85[illegible].00	POTENTIAL
5	2	.03	17.96	775.00	POTENTIAL
6	2	.04	23.[illegible]6	75[illegible].00	POTENTIAL
7	2	.04	26.41	750.00	POTENTIAL
8	2	5.73	26.40	750.00	POTENTIAL
9	0	5.79	23.09	0.00	
10	0	5.84	20.13	0.00	
11	1	5.88	17.49	0.00	SOURCE
12	1	5.56	14.71	0.00	SOURCE
13	0	5.94	12.37	0.00	
14	0	5.92	9.78	0.00	
15	0	5.91	7.58	0.00	
16	0	5.89	4.70	0.00	
17	2	5.90	.86	875.00	POTENTIAL
18	0	6.03	4.70	0.00	
19	0	5.65	6.40	0.00	
20	0	7.65	9.75	0.00	
21	0	8.66	12.91	0.00	
22	0	9.82	14.11	0.00	
23	0	10.08	16.12	0.00	
24	0	10.03	18.56	0.00	
25	0	[illegible]	21.96	0.00	
26	2	11.36	26.40	750.00	POTENTIAL
27	0	11.83	20.02	0.00	
28	0	13.52	18.39	0.00	
29	0	11.78	16.41	0.00	
30	0	11.96	14.70	0.00	
31	1	11.47	12.55	0.00	SOURCE
32	0	9.84	10.96	0.00	
33	0	10.65	9.46	0.00	
34	0	10.67	4.70	0.00	
35	2	10.67	.67	875.00	POTENTIAL
36	0	13.15	4.68	0.00	
37	0	14.71	6.74	0.00	
38	0	13.59	8.42	0.00	
39	0	12.86	9.73	0.00	
40	1	12.32	11.02	0.00	SOURCE
41	0	[illegible]	12.63	0.00	
42	0	14.15	14.02	0.00	
43	0	13.66	16.03	0.00	
44	0	15.65	17.26	0.00	
45	0	15.69	21.11	0.00	
46	0	15.54	23.32	0.00	
47	2	18.76	26.34	760.00	POTENTIAL
48	0	18.92	21.75	0.00	
49	0	17.65	17.91	0.00	
50	0	15.58	15.11	0.00	
51	1	16.41	13.35	0.00	SOURCE
52	1	15.28	12.25	0.00	SOURCE
53	1	13.85	11.17	0.00	SOURCE
54	0	14.59	8.89	0.00	
55	1	14.50	7.09	0.00	SOURCE
56	0	15.08	4.25	0.00	
57	2	15.11	.86	875.00	POTENTIAL
58	0	17.12	3.97	0.00	
59	1	16.20	6.32	0.00	SOURCE
60	0	16.28	7.67	0.00	
61	0	[illegible]	9.18	0.00	
62	0	15.50	10.53	0.00	
63	1	16.62	11.57	0.00	SOURCE
64	1	17.[illegible]3	12.19	0.00	SOURCE
65	0	17.[illegible]2	15.31	0.00	
66	0	19.[illegible]8	16.6[illegible]	0.00	
67	0	21.08	18.9[illegible]	0.00	
68	0	22.[illegible]0	22.04	0.00	
69	2	26.[illegible]5	26.37	775.00	POTENTIAL
70	2	26.[illegible]9	22.63	785.00	POTENTIAL
71	2	26.[illegible]8	19.85	800.00	POTENTIAL
72	0	23.78	16.5[illegible]	0.00	
73	0	[illegible]	15.41	0.00	
74	0	[illegible]	14.[illegible]	0.00	
75	0	16.[illegible]4	13.1[illegible]	0.00	
76	1	16.75	11.67	0.00	SOURCE
77	1	[illegible]	10.65	0.00	SOURCE
78	1	16.[illegible]8	10.45	0.00	SOURCE
79	1	17.76	9.4[illegible]	0.00	SOURCE
80	1	17.[illegible]	[illegible].17	0.00	SOURCE
81	0	17.[illegible]5	[illegible].72	0.00	
82	0	16.[illegible]4	5.36	0.00	

63	[illegible]	[illegible]	3.9[illegible]	[illegible]	
64	[illegible]	[illegible]	.83	875.[illegible]	POTENTIAL
65	[illegible]	[illegible].77	.32	875.00	POTENTIAL
66	[illegible]	[illegible]1.43	3.44	0.00	
67	[illegible]	[illegible].49	4.94	0.00	
88	[illegible]	19.[illegible]	6.26	0.00	
89	[illegible]	19.[illegible]	7.27	0.00	
90	[illegible]	19.[illegible]	8.6[illegible]	0.00	
91	0	[illegible]	9.65	0.00	
92	[illegible]	19.61	11.20	0.00	
93	[illegible]	[illegible]	12.72	0.00	
94	[illegible]	[illegible]1.36	13.35	0.00	
95	[illegible]	[illegible].27	14.50	0.00	
96	[illegible]	[illegible]	15.33	850.00	POTENTIAL
97	0	23.76	13.45	0.00	
98	1	22.82	12.85	0.00	SOURCE
99	1	21.3[illegible]	11.64	0.00	SOURCE
100	0	21.22	10.37	0.00	
101	1	[illegible]	9.36	0.00	SOURCE
102	1	[illegible]	8.16	0.00	SOURCE
103	0	[illegible]1.89	6.22	0.00	
104	0	24.16	3.81	0.00	
105	2	[illegible].45	.81	875.00	POTENTIAL
106	2	26.45	3.78	875.00	POTENTIAL
107	0	24.16	6.2[illegible]	0.00	
108	0	22.[illegible]5	7.52	0.00	
109	0	21.52	9.16	0.00	
110	0	[illegible].75	9.43	0.00	
111	1	22.75	11.09	0.00	SOURCE
112	0	24.56	11.93	0.00	
113	2	26.42	13.41	850.00	POTENTIAL
114	2	26.43	11.[illegible]4	85[illegible].00	POTENTIAL
115	0	24.97	10.34	0.00	
116	0	23.40	8.60	0.00	
117	2	26.40	6.20	875.00	POTENTIAL
118	2	26.40	8.60	850.00	POTENTIAL

***** MEDIA PROPERTY DATA *****

ZONE	XPERM	YPERM	ALPHA	STORAGE COEFF.
1	.67E+01	.67E+01	0.	.1000E-03
2	.20E+01	.20E+01	0.	.1000E-03

***** TIME VARIABLE PUMPING RATES *****

NO. OF TIME INCREMENTS PER PUMPING CHANGE (NSTEP) = 6
NO. OF RATES IN PUMPING SCHEDULE (NRATE) = 3

NODE	SCHEDULE		
52	-.58[illegible]+06	-.6[illegible]2E+06	-.5[illegible]7E+06
63	-.474[illegible]+06	-.540E+06	-.532[illegible]+06
77	-.[illegible]+06	-.261E+06	-.326[illegible]+06
78	-.457[illegible]+06	-.575E+06	-.55[illegible]+06
51	-.499[illegible]+06	-.668E+06	-.559E+06
76	-.535[illegible]+05	-.66[illegible]E+05	0.
99	-.166[illegible]+06	-.254E+06	-.[illegible]66[illegible]+06
101	-.[illegible]+05	-.[illegible]+05	-.166[illegible]+06
102	-.[illegible]+06	-.[illegible]+06	-.449E+06
53	-.175[illegible]+06	-.200[illegible]+06	0.
31	0.	0.	-.246E+06
40	0.	0.	-.64[illegible]E+05
55	0.	0.	-.1[illegible]2E+06
59	0.	0.	-.322E+06
64	0.	0.	0.
79	0.	0.	-.[illegible]4E+06
80	0.	0.	-.537[illegible]+06
98	0.	0.	-.219E+06
11	0.	0.	0.
12	0.	0.	0.
111	0.	0.	0.

***** TIME *****
TIME STEP FOR FLOW (DT) =******* (FACTORED FOR DISPERSION)
MAXIMUM TIME FOR FLOW (TMAX) =********

***** FLOW *****

KOUNT (PIEZOMETRIC HEAD OUTPUT MULTIPLE)........= 4

KFLOW (VECTOR OUTPUT MULTIPLE)....................= 24
KAPPF (TYPE OF TIME APPROXIMATION FOR FLOW)......= 3

***** CALCOMP PLOT OUTPUT CONTROL VARIABLES *****

PIEZOMETRIC HEAD, KPHI.................. 24
NODAL VELOCITY, KVNOD................... 9999
VELOCITY AT ELEMENT CENTERS, KVCEN...... 9999
SATURATED THICKNESS, KTHK............... 9999
CONTAMINANT CONCENTRATION, KCON......... 9999
****

P E R F O R M   COMMAND HAS BEEN REACHED AND MINIMUM DATA CHECK BEGUN
DEFAULT INPUT DATA, IF ANY, FOLLOWS AND LISTING OF
COUNTERS (PLUS ERROR MESSAGES, IF ANY)

NTYPE = 4 , LINEAR QUADRILATERAL ELEMENT

NO. OF ELEMENTS (NELS) ....= 209
NO. OF NODES (NNODS) ....= 118
NO. OF POROUS MEDIA AND/OR DISPERSION ZONES (NZNS) .....= 2
NO. OF WELLS (NWELS) ....= 21
NO. OF RATES IN PUMPING SCHEDULE (NRATE) ....= 3
NO. OF TIME INCREMENTS PER PUMPING CHANGE (NSTEP) ......= 5
NO. OF ELEMENT SIDES OF KNOWN FLOW BOUNDARIES (NOBND) .= 0
NO. OF VERTICAL RECHARGE ZONES (NREC) ....= 6

***** FLOW SOLUTION AND AQUIFER TYPE *****

TRANSIENT FLOW, INITIAL VALUES OF PHI TO BE COMPUTED

CONFINED AQUIFER (TRANSMISSIVITY ALWAYS TIME INVARIENT)

************ END OF INPUT DATA ****************

NODAL COORDINATES AFTER MULTIPLICATION BY XFACT AND YFACT

NODE	X	Y	NODE	X	Y
1	3984.80	4333.47	2	3984.80	17533.12
3	3984.60	37257.80	4	4084.42	61465.54
5	4134.23	86968.26	6	4164.04	114061.66
7	4184.04	131548.21	8	28541.13	131498.40
9	26839.99	11476[illegible].24	10	29[illegible]9.04	1[illegible]0267.53
11	29286.26	87117.69	12	29086.76	73270.51
13	29587.19	61619.97	14	29487.52	46714.18
15	29437.71	37755.98	16	29338.09	23410.70
17	29387.90	4383.28	18	39997.43	23410.70
19	40066.65	31878.40	20	39161.85	46763.99
21	44131.66	61814.21	22	48913.42	73261.91
23	50208.48	80293.72	24	49959.43	92447.36
25	44131.66	109382.76	26	56564.16	131498.40
27	56925.23	99719.62	28	67343.12	91600.59
29	55676.18	81738.21	30	59672.36	73222.70
31	57132.07	62511.55	32	49713.64	54591.76
33	54743.85	44926.62	34	53147.27	23410.70
35	53147.27	4333.47	36	65500.15	23311.06
37	63308.51	33571.94	38	67691.79	41940.02
39	64055.66	48465.13	40	61365.92	54890.62
41	66944.64	62510.03	42	71481.15	69033.62
43	67940.46	79645.43	44	73948.85	85972.06
45	76151.89	105148.91	46	77430.74	116156.92
47	93443.56	131199.54	48	54241.52	1[illegible]336.75
49	86911.85	89209.71	50	77663.95	75252.91
51	6[illegible]73[illegible].21	66456.35	52	75711.26	6[illegible]17.25
53	66900.85	55637.77	54	72672.79	44[illegible].59
55	72224.50	35315.29	56	75113.46	2[illegible]169.25
57	75262.91	4283.66	58	85274.72	19774.57
59	[illegible].20	31479.92	60	[illegible].65	[illegible]
61	[illegible].70	45725.38	62	77205.50	52949.93
63	[illegible].22	57630.17	64	[illegible]	[illegible].37
65	[illegible].52	76259.11	66	[illegible]	[illegible]
67	[illegible].28	[illegible]	68	112[illegible].35	1[illegible]761.24
69	[illegible].35	131348.97	70	[illegible].55	[illegible]
71	[illegible].76	[illegible]	72	112446.[illegible]	[illegible].12
73	[illegible].40	76757.21	74	[illegible]	74117.24
75	[illegible].84	65649.[illegible]	76	[illegible].75	[illegible].27
77	[illegible].20	[illegible].65	78	[illegible]	[illegible].45
79	[illegible].56	[illegible]	80	[illegible]	[illegible].77

81	[illegible]	3347[illegible]	[illegible]	[illegible]3.44	[illegible]7.7[illegible]
83	91102.49	19425.[illegible]	[illegible]	[illegible]934.[illegible]	4134.23
85	113[illegible]17.77	[illegible]	[illegible]	1[illegible]6742.[illegible]	[illegible]127.24
87	[illegible]	[illegible]	[illegible]	[illegible]9273.33	[illegible]
89	94[illegible]39.00	36211.[illegible]7	[illegible]	94937.36	[illegible]936.22
91	[illegible]40.14	49[illegible]66.65	[illegible]	92673.51	55[illegible]67.2[illegible]
93	99[illegible]20.00	63356.32	[illegible]	1[illegible]6394.16	[illegible]492.35
95	11[illegible]26.67	72[illegible]29.5[illegible]	[illegible]	131592.62	7[illegible]358.73
97	116[illegible]96.16	66994.4[illegible]	[illegible]	113066.42	6[illegible]95
99	1[illegible]0145.11	55975.04	100	105696.52	[illegible]64[illegible].17
101	10[illegible]6[illegible].29	49112.66	1[illegible]2	1[illegible]15[illegible]2.76	4[illegible]644.96
103	107539.75	309[illegible]1.[illegible]2	1[illegible]4	1[illegible]0341.96	[illegible]977.61
105	131747.45	4[illegible]34.61	1[illegible]6	131747.45	1[illegible]2[illegible].19
107	120340.96	39882.2[illegible]	1[illegible]8	1[illegible]9[illegible]31.65	[illegible]79[illegible].22
109	107191.12	45625.96	110	1133[illegible]7.75	4[illegible]963.23
111	113317.75	55239.29	112	1[illegible]2333.36	[illegible]423.33
113	131598.02	65795.21	114	131647.63	5495[illegible].24
115	124375.57	51[illegible]3.54	116	116555.41	42[illegible]36.60
117	131496.40	30862.20	118	131498.4[illegible]	42836.60

MAXIMUM BAND WIDTH IS 28 AT ELEMENT 114

DIMENSION USED BY COMMON BLOCK TO EXECUTE THIS PROGRAM IS 39663

STEADY-STATE SOLUTION

THE VALUES OF PIEZOMETRIC HEADS AT TIME T= 0.000

1	.875E+03	2	.900E+03	3	.675E+03	4	.850E+03	5	.775E+03	6	.75[illegible]E+03	7	.750E+03	8	.760E+03
9	.797E+03	10	.809E+03	11	.828E+03	12	.[illegible]51E+03	13	.649E+03	14	.649E+03	15	.[illegible]61E+03	16	.[illegible]72E+03
17	.875E+03	18	.873E+03	19	.663E+03	20	.[illegible]46E+03	21	.834E+03	22	.824E+03	23	.[illegible]21E+03	24	.[illegible]11E+03
25	.8[illegible]E+03	26	.750E+03	27	.806E+03	28	.[illegible]8E+03	29	.815E+03	30	.8[illegible]E+03	31	.807E+03	32	.[illegible]35E+03
33	.845E+03	34	.869E+03	35	.875E+03	36	.[illegible]68E+03	37	.857E+03	38	.832E+03	39	.812E+03	40	.[illegible]E+03
41	.782E+03	42	.793E+03	43	.610E+03	44	.[illegible]05E+03	45	.[illegible]00E+03	46	.79[illegible]E+03	47	.76[illegible]E+03	48	.795E+03
49	.806E+03	50	.79[illegible]E+03	51	.70[illegible]E+03	52	.[illegible]2E+03	53	.764E+03	54	.821E+03	55	.[illegible]E+03	56	.[illegible]67E+03
57	.875E+03	58	.866E+03	59	.851E+03	60	.[illegible]36E+03	61	.[illegible]13E+03	62	.77[illegible]E+03	63	.[illegible]91E+03	64	.740E+03
65	.797E+03	66	.80[illegible]E+03	67	.[illegible]13E+03	68	.797E+03	69	.775E+03	70	.78[illegible]E+03	71	.[illegible]0E+03	72	.[illegible]32E+03
73	.815E+03	74	.807E+03	75	.779E+03	76	.[illegible]6E+03	77	.753E+03	78	.73[illegible]E+03	79	.[illegible]7E+03	80	.[illegible]25E+03
81	.842E+03	82	.655E+03	83	.666E+03	84	.[illegible]75E+03	85	.875E+03	86	.86[illegible]E+03	87	.[illegible]59E+03	88	.[illegible]43E+03
89	.83[illegible]E+03	90	.811E+03	91	.796E+03	92	.7[illegible]E+03	93	.75[illegible]E+03	94	.[illegible]12[illegible]E+03	95	.[illegible]23E+03	96	.[illegible]E+03
97	.83[illegible]E+03	98	.827E+03	99	.793E+03	100	.[illegible]9E+03	101	.798E+03	102	.79[illegible]E+03	103	.[illegible]47E+03	104	.[illegible]73E+03
105	.875E+03	106	.875E+03	107	.862E+03	108	.[illegible]29E+03	109	.[illegible]5E+03	110	.62[illegible]E+03	111	.326E+03	112	.[illegible]3E+03
113	.850E+03	114	.850E+03	115	.841E+03	116	.[illegible]36E+03	117	.875E+03	118	.85[illegible]E+03				

DISCHARGE VECTORS PRINTED AT TIME = 0.00

DISCHARGE VECTORS ARE CALCULATED AT THE CENTER OF ELEMENT
THETA IS THE ANGLE THAT TOTAL VELOCITY MAKES WITH POSITIVE X-COORDINATE

ELEMENT NO.	QX	QY	Q-TOTAL	THETA	X-COORD	Y-COORD
1	.279E-02	-.142E+01	.142E+01	-69.[illegible]9	16335.56	10945.75
2	.602E+00	.125E+00	.611E+00	8.71	23012.22	[illegible]7164.45
3	.610E+00	.951E+00	.[illegible]13E+01	57.32	10323.12	2[illegible]64.9[illegible]
4	.404E+00	.574E+00	.702E+00	54.[illegible]5	23[illegible]49.5[illegible]	34[illegible]45.[illegible]9
5	.339E+00	.814E+00	.907E+00	63.[illegible]	23[illegible]99.39	43[illegible]1[illegible].56
6	.416E+00	.773E+00	.679E+00	61.[illegible]1	1[illegible]41[illegible].29	52225.79
7	.186E-01	-.224E-01	.291E-01	-50.36	23186.56	56352.42
8	.192E-01	-.135E+00	.136E+00	-81.87	23261.27	[illegible]74[illegible]5.3[illegible]
9	-.106E+01	.221E+01	.245E+01	115.66	1050[illegible].51	77[illegible]6[illegible].14
10	-.159E+01	.123E+01	.201E+01	142.34	23[illegible]99.39	[illegible]361[illegible].54
11	-.159E+01	.103E+01	.169E+01	[illegible]46.92	[illegible]29[illegible].15	[illegible]6[illegible]5.25
12	-.140E+01	.675E+00	.155E+01	154.[illegible]9	10397.84	1[illegible]423[illegible].[illegible]
13	-.142E+01	.63[illegible]E+00	.155E+01	155.99	22738.27	111[illegible]63.47
14	-.141E+01	.207E+01	.251E+01	124.33	22526.57	123[illegible]55.23
15	-.[illegible]27[illegible]-1[illegible]	.455E-12	.5[illegible]E-12	[illegible]	1[illegible]273.31	127364.17
16	.46[illegible]E+00	.210E+01	.216E+01	77.4[illegible]	3[illegible]5[illegible]6.19	[illegible]27[illegible]4
17	-.412E-01	.656E+00	.657E+00	93.59	32725.17	[illegible]9793.69
18	.106E+00	.41[illegible]E+00	.424E+0[illegible]	7[illegible]	41627.5[illegible]	[illegible]207.1[illegible]
19	.353E+00	.106E+01	.112E+01	71.6[illegible]	34356.45	[illegible]5025.03
20	.457E+0[illegible]	.659E+0[illegible]	.[illegible]2E+0[illegible]	55.[illegible]4	44[illegible]53.[illegible]	[illegible]2[illegible]76.5[illegible]
21	.663E+00	.129E+01	.145E+01	62.[illegible]	34617.45	[illegible]1949.9[illegible]
22	.109E+01	.445E-01	.109E+01	2.3[illegible]	44754.29	76[illegible]54.97
23	.112E+01	.264E+00	.115E+01	13.[illegible]2	[illegible]4.65	[illegible]96[illegible].25
24	.[illegible]02E+0[illegible]	-.141E+0[illegible]	.[illegible]14E+0[illegible]	-[illegible]	[illegible]3273.[illegible]	[illegible]7452.55
25	.794E+00	.417E+0[illegible]	.894E+0[illegible]	27.[illegible]	3[illegible]61.7[illegible]	[illegible]452.[illegible]

81	[illegible]	3347[illegible]	[illegible]	[illegible].44	[illegible]7.7[illegible]
83	91132.[illegible]	19425.[illegible]	[illegible]	[illegible]34.[illegible]	4134.23
85	11[illegible]17.77	[illegible]	[illegible]	1[illegible]6792.[illegible]	[illegible]127.[illegible]
87	[illegible]	[illegible]	[illegible]	[illegible]73.[illegible]	[illegible]
89	[illegible]	36211. 7	[illegible]	94937.86	[illegible]36.22
91	[illegible].14	[illegible]	[illegible]	[illegible]73.51	[illegible]
93	[illegible]	63356.32	[illegible]	[illegible]	[illegible]
95	11[illegible]26.67	72[illegible]	[illegible]	[illegible]	[illegible]
97	116[illegible].16	66994.[illegible]	[illegible]	113066.[illegible]	[illegible]
99	[illegible]	[illegible]75.04	100	105696.[illegible]	[illegible]
101	[illegible].29	49212.66	102	[illegible]	[illegible]
103	107[illegible].75	[illegible]	104	[illegible]	[illegible]977.61
105	131747.45	[illegible]	106	131747.45	[illegible].19
107	120340.96	39882.[illegible]	108	[illegible]	[illegible]
109	107[illegible]	45625.96	110	1133[illegible]7.75	[illegible].23
111	113317.75	55239.29	112	[illegible]	[illegible].33
113	131598.02	65795.21	114	131647.63	5499[illegible].24
115	12[illegible]375.[illegible]7	51[illegible]3.54	116	116555.4[illegible]	[illegible]
117	131496.40	30862.20	118	131498.4[illegible]	42836.60

MAXIMUM BAND WIDTH IS 28 AT ELEMENT 114

DIMENSION USED BY COMMON BLOCK TO EXECUTE THIS PROGRAM IS 39663

STEADY-STATE SOLUTION

THE VALUES OF PIEZOMETRIC HEADS AT TIME T= 0.000

1	.875E+03	2	.900E+03	3	.675E+03	4	.850E+03	5	.775E+03	6	.75[illegible]E+03	7	.750E+03	8	.750E+03
9	.797E+03	10	.809E+03	11	.828E+03	12	[illegible]E+03	13	.649E+03	14	.849E+03	15	.861E+03	16	.872E+03
17	.875E+03	18	.873E+03	19	.663E+03	20	.546E+03	21	.834E+03	22	.824E+03	23	[illegible]E+03	24	[illegible]E+03
25	[illegible]E+03	26	.750E+03	27	.806E+03	28	[illegible]E+03	29	.815E+03	30	[illegible]E+03	31	.867E+03	32	[illegible]E+03
33	.845E+03	34	.869E+03	35	.675E+03	36	[illegible]E+03	37	.857E+03	38	[illegible]E+03	39	[illegible]E+03	40	[illegible]E+03
41	.782E+03	42	.793E+03	43	.610E+03	44	[illegible]E+03	45	[illegible]E+03	46	.79[illegible]E+03	47	.76[illegible]E+03	48	.795E+03
49	.806E+03	50	.79[illegible]E+03	51	.700E+03	52	[illegible]E+03	53	.764E+03	54	[illegible]E+03	55	[illegible]E+03	56	[illegible]E+03
57	.875E+03	58	.866E+03	59	.851E+03	60	[illegible]E+03	61	[illegible]E+03	62	.77[illegible]E+03	63	.691E+03	64	.740E+03
65	.797E+03	66	.80[illegible]E+03	67	.813E+03	68	.797E+03	69	.775E+03	70	.78[illegible]E+03	71	[illegible]E+03	72	[illegible]E+03
73	.815E+03	74	.807E+03	75	.779E+03	76	[illegible]E+03	77	.753E+03	78	.73[illegible]E+03	79	[illegible]E+03	80	[illegible]E+03
81	.842E+03	82	.655E+03	83	.666E+03	84	[illegible]E+03	85	.875E+03	86	[illegible]E+03	87	[illegible]E+03	88	[illegible]E+03
89	.83[illegible]E+03	90	.811E+03	91	.796E+03	92	[illegible]E+03	93	.75[illegible]E+03	94	[illegible]E+03	95	[illegible]E+03	96	[illegible]E+03
97	.83[illegible]E+03	98	.827E+03	99	.793E+03	100	[illegible]E+03	101	.798E+03	102	.79[illegible]E+03	103	[illegible]E+03	104	.873E+03
105	.875E+03	106	.875E+03	107	.862E+03	108	[illegible]E+03	109	[illegible]E+03	110	[illegible]E+03	111	[illegible]E+03	112	[illegible]E+03
113	.850E+03	114	.850E+03	115	.841E+03	116	[illegible]E+03	117	.875E+03	118	[illegible]E+03				

DISCHARGE VECTORS PRINTED AT TIME = 0.00

DISCHARGE VECTORS ARE CALCULATED AT THE CENTER OF ELEMENT
THETA IS THE ANGLE THAT TOTAL VELOCITY MAKES WITH POSITIVE X-COORDINATE

ELEMENT NO.	QX	QY	Q-TOTAL	THETA	X-COORD	Y-COORD
1	.279E-02	-.142E+01	.142E+01	-69.[illegible]9	16335.58	10945.75
2	.602E+00	.123E+00	.611E+00	8.71	23012.22	[illegible]
3	.610E+00	.951E+00	.113E+01	57.32	10323.12	[illegible]
4	.404E+00	.574E+00	.702E+00	54.[illegible]5	23[illegible]49.5[illegible]	[illegible]
5	.339E+00	.814E+00	.907E+00	63.[illegible]	23[illegible]9.39	43[illegible]
6	.418E+00	.773E+00	.679E+00	61.[illegible]	1[illegible]41[illegible].29	52[illegible].79
7	.186E-01	-.224E-01	.291E-01	-50.36	23186.56	56352.42
8	.192E-01	-.135E+00	.136E+00	-81.87	23261.[illegible]7	[illegible]
9	-.106E+01	.221E+01	.245E+01	115.66	105[illegible].91	[illegible]
10	-.159E+01	.123E+01	.201E+01	142.34	23[illegible]99.39	[illegible]
11	-.159E+01	.103E+01	.189E+01	146.92	[illegible].15	[illegible]
12	-.140E+01	.675E+00	.155E+01	154.[illegible]	10397.84	[illegible]
13	-.142E+01	.63[illegible]E+00	.155E+01	155.99	22738.27	111[illegible].47
14	-.141E+01	.207E+01	.251E+01	124.33	22526.57	123[illegible].23
15	-.227E-12	.455E-12	.508E-12	[illegible]	1[illegible]273.31	127[illegible].17
16	.469E+00	.210E+01	.216E+01	77.4[illegible]	32500.19	[illegible]
17	-.412E-01	.656E+00	.657E+00	93.59	32725.17	[illegible]
18	.108E+00	.410E+00	.424E+00	7[illegible]	41627.9[illegible]	[illegible]
19	.353E+00	.106E+01	.112E+01	71.63	34356.45	[illegible]
20	.457E+00	.659E+00	[illegible]	55.[illegible]	[illegible]	[illegible]
21	.663E+00	.129E+01	.145E+01	62.[illegible]	34617.9[illegible]	[illegible]
22	.109E+01	.445E-01	.109E+01	2.3[illegible]	44754.2[illegible]	76[illegible]4.97
23	.112E+01	.264E+00	.115E+01	13.[illegible]	[illegible]	[illegible]
24	[illegible]	-.141E+[illegible]	[illegible]	[illegible]	[illegible]	[illegible]7452.55
25	.794E+00	.41[illegible]E+[illegible]	.894E+[illegible]	27.[illegible]	[illegible]	[illegible]

26	[illegible]	-.239E-01	[illegible]	[illegible]	51940.64	[illegible]
27	[illegible]	[illegible]	[illegible]	75.[illegible]	[illegible]	45967.[illegible]
28	.170E+00	.144E+00	[illegible]	76.[illegible]	56510.73	57036.55
29	.138E+00	.744E+00	.757E+00	[illegible]	[illegible]	[illegible]
30	-.189E-01	.577E+00	.564E+00	[illegible]	[illegible]	[illegible]
31	-.189E-01	.121E+00	[illegible]	126.4[illegible]	[illegible]	15653.[illegible]
32	.149E-03	.705E-01	[illegible]	[illegible]	40632.51	[illegible]
33	.137E+00	.234E+00	.333E+02	44.[illegible]	46572.33	[illegible]
34	.237E+00	.651E+00	[illegible]	69.[illegible]	[illegible]	27644.55
35	.308E+00	.916E+00	.566E+00	71.42	[illegible]	43563.75
36	.315E+00	.942E+00	.453E+00	71.[illegible]	45314.[illegible]	49262.[illegible]
37	.578E+00	.494E+00	.765E+00	[illegible]	44094.3[illegible]	[illegible]
38	.146E+01	.105E+01	.133E+01	36.72	45662.11	[illegible]
39	.152E+01	.357E-01	[illegible]	[illegible]	45772.64	[illegible]
40	.682E+00	-.529E+00	.112E+01	-26.[illegible]	[illegible]	[illegible]
41	.165E+00	-.602E-01	[illegible]	[illegible]	[illegible]	[illegible]
42	.189E+01	-.650E+00	.207E+01	-24.21	54691.3[illegible]	[illegible]
43	.137E+01	[illegible]	.254E+01	[illegible]	[illegible]	[illegible]
44	.445E+00	.144E+01	.151E+01	72.0[illegible]	[illegible]	[illegible]
45	.422E+00	.960E+00	.107E+01	[illegible]	[illegible]	[illegible]
46	.489E-01	.369E+00	.342E+00	[illegible]	45267.[illegible]	[illegible]
47	0.	.177E+01	.177E+01	[illegible]	[illegible]	125969.49
48	.233E+01	.961E+01	.517E+01	[illegible]	[illegible]	112495.85
49	-.244E+01	.426E+01	[illegible]	119.75	62374.57	119716.34
50	.602E+00	.848E+00	[illegible]	54.[illegible]	72971.[illegible]	[illegible]
51	.532E+00	.109E+01	.122E+01	64.[illegible]	65636.[illegible]	[illegible]
52	.551E+00	.761E+00	.122E+01	3[illegible].63	72946.75	[illegible]
53	.782E+00	.912E+00	[illegible]	27.79	70410.[illegible]	[illegible]
54	.157E+01	.459E+00	.163E+01	16.33	63183.[illegible]	[illegible]
55	.129E+01	-.920E+00	.156E+01	-35.56	[illegible]	[illegible]
56	.323E+01	-.338E+01	.460E+01	[illegible]	64465.5[illegible]	[illegible]
57	.263E+01	-.541E+01	[illegible]	-64.31	64192.64	65755.26
58	.603E+01	-.256E+01	.711E+01	-21.11	[illegible]	67565.75
59	.646E+01	.175E+01	[illegible]	15.[illegible]	60643.[illegible]	[illegible]
60	.199E+01	.554E+00	[illegible]	15.56	56161.74	[illegible]
61	.196E+01	.160E+01	.256E+01	42.[illegible]	[illegible]	[illegible]
62	.174E+01	.196E+01	[illegible]	42.41	66267.[illegible]	50753.75
63	.137E+01	.299E+01	.325E+01	65.36	[illegible]	[illegible]
64	.109E+01	.171E+01	.203E+01	57.45	59772.[illegible]	41342.30
65	.187E+00	.973E+00	.991E+00	75.[illegible]	54865.72	[illegible]
66	.749E+00	.215E+01	.227E+01	75.75	53147.27	[illegible]
67	.326E+00	.257E+01	.259E+01	62.76	61316.11	[illegible]
68	.312E+00	.762E+00	.542E+00	[illegible]	56235.49	[illegible]
69	.221E-02	[illegible]	.933E+00	59.87	[illegible]	[illegible]
70	.420E+00	.122E+01	.127E+01	[illegible]	72344.27	[illegible]
71	.952E+00	.259E+01	.371E+01	75.13	71265.6[illegible]	[illegible]
72	.204E+01	.255E+01	.362E+01	54.[illegible]	[illegible]	31442.56
73	.131E+01	.694E+01	.706E+01	79.29	67729.15	[illegible]
74	.201E+01	.741E+01	.766E+01	79.0[illegible]	[illegible]	[illegible]
75	.158E+01	.832E+01	.847E+01	79.27	[illegible]	[illegible]
76	.431E+01	.139E+02	.146E+02	72.[illegible]	68675.54	[illegible]
77	.115E+02	.495E+01	.146E+02	37.76	[illegible]	[illegible]
78	.127E+02	-.256E+01	.129E+02	-11.50	66063.51	[illegible]
79	.289E+02	.157E+01	.289E+02	3.9[illegible]	[illegible]	[illegible]
80	.248E+02	-.168E+02	[illegible]	-34.[illegible]	70904.54	[illegible]
81	.415E+01	-.657E+01	.811E+01	[illegible]	74662.53	66755.21
82	.456E+01	-.551E+01	.717E+01	[illegible]	76856.63	[illegible]
83	.112E+01	-.975E+00	.149E+01	-41.01	71041.51	76196.65
84	.333E+01	-.412E+01	[illegible]	-51.[illegible]	75385.54	[illegible]
85	-.122E+01	-.355E+01	.375E+01	[illegible]	[illegible]	[illegible]
86	.367E+00	-.186E+01	.190E+01	-76.67	84617.02	64353.24
87	-.467E+00	.771E+00	.642E+00	123.06	[illegible]	[illegible]
88	.136E+00	.396E+00	.418E+00	71.06	84963.79	101561.07
89	.548E+00	.694E+00	[illegible]	57.[illegible]	51601.47	[illegible]
90	-.187E+00	.201E+01	.202E+01	95.31	71004.16	127568.32
91	.196E+01	.394E+01	.441E+01	63.25	49633.1[illegible]	121723.15
92	-.575E+00	.315E+01	.369E+01	96.49	[illegible]	[illegible]
93	-.145E+00	.815E+00	[illegible]	[illegible]	1[illegible]2384.46	[illegible]
94	[illegible]	.546E+00	.678E+00	[illegible]	96594.[illegible]	[illegible]
95	-.262E+00	-.131E-01	.263E+00	-177.25	[illegible]	[illegible]
96	-.291E+01	[illegible]	[illegible]	-146.[illegible]	90529.60	[illegible]
97	[illegible]	-.269E+01	.362E+01	[illegible]	94465.57	[illegible]
98	[illegible]	-.552E+01	[illegible]	[illegible]	92497.17	[illegible]
99	[illegible]	-.253E+02	.253E+02	[illegible]	[illegible]	[illegible]
100	-.187E+02	[illegible]	.219E+02	-150.76	[illegible]	71165.[illegible]
101	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
102	[illegible]	-.502E+01	.219E+02	[illegible]	[illegible]	[illegible]
103	[illegible]	-.314E+01	[illegible]	[illegible]	76986.[illegible]	[illegible]
104	[illegible]	.276E+02	[illegible]	[illegible]	[illegible]	[illegible]
105	.557E+01	.274E+02	[illegible]	72.[illegible]	72722.6[illegible]	[illegible]
106	[illegible]	.136E+02	[illegible]	75.[illegible]	71963.[illegible]	[illegible]

107	-.367E+00	.156E+02	.156E+02	91.4[illegible]	77168.14	45726.53
108	.93[illegible]E+00	.745E+01	.751E+01	[illegible]	77006.20	45123.[illegible]
109	.944E+00	.747E+01	.753E+01	82.79	74665.19	40520.44
110	.16[illegible]E+0[illegible]	.547E+01	.570E+01	73.73	76557.97	35[illegible]7[illegible].69
111	.722E+00	.354E+01	.361E+01	78.47	75663.67	30819.94
112	.616E+00	.360E+01	.365E+01	80.28	80443.15	25975.92
113	.238E+00	.120E+01	.123E+01	76.64	77691.15	16559.15
114	.994E-02	.136E+01	.136E+01	89.59	55430.60	11991.76
115	.433E+00	.166E+01	.172E+01	75.42	49395.5[illegible]	15777.32
116	.552E+00	.362E+01	.366E+01	81.36	69521.02	23199.01
117	.589E+00	.359E+01	.353E+01	80.67	64376.19	27353.65
118	.141E+01	.530E+01	.556E+01	75.27	65013.22	3[illegible]7.49
119	.139E+01	.548E+01	.565E+01	75.92	62672.15	35340.20
120	.155E+01	.571E+01	.592E+01	74.83	64290.97	37643.91
121	.834E+00	.746E+01	.750E+01	83.62	62859.94	42557.55
122	.895E+00	.752E+01	.758E+01	83.22	64701.91	44706.74
123	-.350E+01	.328E+02	.330E+02	96.09	64801.53	49107.35
124	.130E+02	.247E+02	.262E+02	61.16	80144.29	51659.22
125	.136E+02	.239E+02	.275E+02	60.45	81637.83	54990.45
126	-.104E+02	.162E+02	.193E+02	122.69	85200.01	55769.86
127	-.221E+02	-.375E+01	.224E+02	-170.35	86009.42	57256.69
128	-.116E+02	.104E+00	.116E+02	179.49	89919.59	56153.19
129	-.142E+02	-.543E+01	.152E+02	-159.09	91725.11	62536.46
130	-.760E+01	-.496E+01	.924E+01	-147.54	94670.36	63196.49
131	-.725E+01	-.335E+01	.799E+01	-155.21	95983.67	67193.69
132	-.465E+01	-.311E+01	.559E+01	-146.22	100615.49	69522.31
133	-.291E+01	-.134E+01	.320E+01	-155.32	101936.17	72672.03
134	-.282E+01	-.153E+01	.321E+01	-151.48	99200.42	75[illegible].92
135	-.424E+00	.183E+00	.462E+00	156.72	104277.24	66900.71
136	-.999E+00	.343E+00	.106E+01	161.05	110129.91	66661.09
137	.186E+00	.120E+01	.130E+01	81.74	116953.28	92410.[illegible]
138	.301E+00	.727E+00	.756E+00	67.51	116132.02	103166.96
139	-.101E+01	.347E+01	.362E+01	106.16	1[illegible]755[illegible].24	125062.32
140	.137E+01	.136E+01	.193E+01	44.80	126504.95	121295.80
141	.349E+00	.811E+00	.883E+00	66.75	126592.12	1[illegible]523.54
142	-.302E+01	.166E+01	.165E+01	160.35	128210.94	95197.64
143	-.483E+00	.151E+00	.995E+00	171.25	121735.64	76951.36
144	-.109E+01	.151E+00	.110E+01	172.11	116567.65	75947.80
145	-.858E+00	-.234E-01	.858E+00	-178.44	112981.53	78384.49
146	-.384E+01	-.155E+01	.414E+01	-158.[illegible]	1[illegible]6361.71	73758.82
147	-.519E+01	-.481E+00	.521E+01	-174.70	110478.58	66737.[illegible]
148	-.317E+01	-.629E+01	.705E+01	-116.75	104638.36	63631.52
149	-.167E+00	-.162E+01	.163E+01	-95.28	1[illegible]1014.68	69369.72
150	-.116E+02	-.384E+00	.116E+02	-178.[illegible]	96270.28	58650.52
151	-.115E+02	.109E-01	.115E+02	179.95	94026.83	56272.85
152	-.153E+02	.113E+02	.190E+02	143.66	93580.54	52467.29
153	-.121E+02	.263E+02	.290E+02	114.83	87067.86	51017.89
154	-.538E+00	.222E+02	.222E+02	91.39	91027.79	50275.79
155	.255E+01	.637E+01	.686E+01	68.23	93[illegible].18	46497.64
156	.299E+01	.709E+01	.769E+01	67.10	89757.62	44363.26
157	.296E+01	.718E+01	.777E+01	67.62	92920.56	40694.77
158	.210E+01	.576E+01	.613E+01	69.94	89197.26	37760.43
159	.213E+01	.570E+01	.609E+01	69.53	90280.63	32498.57
160	.215E+00	.647E+01	.647E+01	88.19	94850.69	32660.65
161	.364E+00	.618E+01	.619E+01	86.63	97851.75	26441.51
162	-.149E+00	.355E+01	.363E+01	92.39	93705.06	24406.90
163	-.259E+00	.364E+01	.365E+01	93.67	100466.77	21941.31
164	-.305E+00	.143E+01	.146E+01	102.05	96220.47	15526.27
165	.344E-02	.121E+01	.121E+01	89.84	105709.27	11615.18
166	-.273E+00	.240E+00	.364E+00	138.71	111511.0[illegible]	15329.03
167	-.269E+00	.661E+00	.713E+00	112.11	116941.43	24567.26
168	-.867E+00	.135E+01	.161E+01	122.65	119541.64	27993.22
169	.264E+00	.431E+01	.431E+01	86.23	104576.15	24630.29
170	-.115E+01	.555E+01	.567E+01	101.73	102023.33	29467.52
171	-.972E+00	.131E+02	.131E+02	94.25	102459.17	35663.20
172	.568E+01	.115E+02	.128E+02	63.72	97515.53	36[illegible]62.44
173	.863E+01	.693E+01	.111E+02	38.75	96506.66	41662.32
174	.627E+01	.172E+00	.627E+01	1.57	99146.81	45451.63
175	-.735E+00	.599E+01	.604E+01	96.99	95921.61	47[illegible]45.55
176	-.143E+00	.275E+01	.275E+01	92.97	97930.91	52166.43
177	-.594E+01	.154E+01	.614E+01	165.50	100778.08	53334.06
178	-.372E+01	.651E+01	.750E+01	119.75	109165.16	56596.01
179	-.792E+01	.601E+01	.104E+02	134.31	107626.[illegible]	56459.64
180	-.114E+02	.175E+00	.114E+02	179.12	111690.95	60156.51
181	-.713E+01	-.616E+01	.942E+01	-139.17	108149.96	63993.40
182	-.498E+01	-.112E+0[illegible]	.948E+01	-178.43	[illegible]13492.[illegible]	66602.33
183	-.476E+00	.455E-12	.476E+00	180.00	126310.56	71626.78
184	-.677E+00	-.104E+00	.685E+00	-173.27	122706.94	65[illegible].[illegible]
185	-.369E+01	-.734E+00	.376E+01	-168.74	118224.[illegible]	59754.52
186	-.337E+01	-.143E+00	.338E+01	-177.57	115745.[illegible]	60653.54
187	-.347E+01	.577E-01	.347E+01	179.05	120590.[illegible]	56397.37

188	-.30[illegible]E+01	.130E+01	.331E+01	156.9[illegible]	.1608[illegible]	5[illegible]73[illegible].34
189	-.604E+01	.130E+01	[illegible]	1[illegible]7.66	11141[illegible]	[illegible]
190	-.50[illegible]E+01	.1[illegible]E+01	.[illegible]4E+01	160.09	137975.63	[illegible]
191	-.6[illegible]	.[illegible]95E+01	[illegible]	[illegible]2.57	1[illegible]466[illegible]	5[illegible].24
192	-.82[illegible]E+01	-.23[illegible]E+01	.[illegible]E+01	-164.41	1[illegible]221[illegible]	461[illegible]
193	-.108E+02	.[illegible]E+[illegible]	.[illegible]E+02	179.06	1[illegible]6431.[illegible]	42463.[illegible]
194	-.763E+01	.693E+01	.117E+02	[illegible]	1[illegible]5[illegible]	37[illegible].74
195	-.660E+00	.221E+01	.237E+01	111.31	111[illegible].71	[illegible]443.62
196	-.139E+0[illegible]	.661E+0[illegible]	.67[illegible]E+0[illegible]	1[illegible]1.[illegible]	125192.[illegible]	[illegible].55
197	.307E-03	.113E+00	.113E+00	69.84	12146[illegible]	11[illegible]1[illegible].56
198	-.147E+0[illegible]	-.227E-12	.147E+0[illegible]	-1[illegible]	125644.[illegible]	[illegible]
199	-.256E+00	-.177E-01	.[illegible]E+00	-17[illegible]	1[illegible]9[illegible]1.[illegible]4	[illegible]
200	-.856E+00	.157E+01	.179E+01	118.62	128[illegible]9.[illegible]4	36[illegible]59.[illegible]
201	-.694E+00	.142E+01	.158E+01	116.[illegible]9	[illegible]21237.[illegible]4	[illegible]
202	-.156E+01	.114E+01	.195E+01	144.27	114139.62	37407.31
203	-.421E+01	.2[illegible]E+01	.4[illegible]E+01	151.11	110152.17	43[illegible].94
204	-.47[illegible]E+01	.402E+00	.474E+01	175.15	112595.51	46[illegible]7.[illegible]
205	-.305E+01	.131E+01	.332E+01	156.7[illegible]	116891.62	4[illegible]66.[illegible]5
206	-.694E+00	.195E+00	.721E+00	[illegible]64.29	124201.[illegible]	4717.[illegible]7
207	-.[illegible]16E+00	.113E-01	.[illegible]E+00	179.39	[illegible]27974.34	[illegible].46
208	-.933E+00	.443E-01	.934E+00	177.2[illegible]	125172.53	[illegible]6335.11
209	-.956E+00	-.404E-02	.956E+00	-179.76	129294.31	62001.00

THE COEFFICIENTS FOR FLOW SOLUTION ARE AS FOLLOWS:

A11= .667E+00   A12= .[illegible]E+01   A13= 0.
A21= .333E+00   A22= -.100E+01   A23= .110E+01
A31= 0.   A32= 0.   A33= 0.

THE VALUES OF PIEZOMETRIC HEADS AT TIME T= 1460.000

1	.875E+03	2	.900E+03	3	.875E+03	4	.850E+03	5	.775E+03	6	.750E+03	7	.750E+03	8	.750E+03
9	.797E+03	10	.80[illegible]E+03	11	.828E+03	12	.[illegible]51E+03	13	.849E+03	14	.849E+03	15	.861E+03	16	.872E+03
17	.875E+03	18	.873E+03	19	.863E+03	20	.846E+03	21	.834E+03	22	.823E+03	23	.821E+03	24	.81[illegible]E+03
25	.802E+03	26	.750E+03	27	.806E+03	28	.8[illegible]8E+03	29	.815E+03	30	.811E+03	31	.807E+03	32	.835E+03
33	.845E+03	34	.869E+03	35	.875E+03	36	.867E+03	37	.857E+03	38	.832E+03	39	.812E+03	40	.[illegible]2E+03
41	.782E+03	42	.793E+03	43	.810E+03	44	.[illegible]5E+03	45	.800E+03	46	.796E+03	47	.786E+03	48	.795E+03
49	.806E+03	50	.789E+03	51	.700E+03	52	.6[illegible]2E+03	53	.764E+03	54	.821E+03	55	.848E+03	56	.867E+03
57	.875E+03	58	.866E+03	59	.851E+03	60	.836E+03	61	.813E+03	62	.771E+03	63	.691E+03	64	.740E+03
65	.796E+03	66	.808E+03	67	.813E+03	68	.7[illegible]7E+03	69	.775E+03	70	.7[illegible]E+03	71	.[illegible]E+03	72	.831E+03
73	.815E+03	74	.807E+03	75	.779E+03	76	.766E+03	77	.753E+03	78	.734E+03	79	.[illegible]7E+03	80	.826E+03
81	.842E+03	82	.855E+03	83	.865E+03	84	.875E+03	85	.675E+03	86	.86[illegible]E+03	87	.659E+03	88	.843E+03
89	.830E+03	90	.811E+03	91	.796E+03	92	.7[illegible]E+03	93	.795E+03	94	.612E+03	95	.622E+03	96	.[illegible]E+03
97	.834E+03	98	.827E+03	99	.793E+03	100	.80[illegible]E+03	101	.797E+03	102	.794E+03	103	.847E+03	104	.873E+03
105	.875E+03	106	.875E+03	107	.862E+03	108	.829E+03	109	.815E+03	110	.829E+03	111	.826E+03	112	.835E+03
113	.850E+03	114	.850E+03	115	.641E+03	116	.836E+03	117	.875E+03	118	.850E+03				

THE VALUES OF PIEZOMETRIC HEADS AT TIME T= 2920.000

1	.875E+03	2	.900E+03	3	.875E+03	4	.850E+03	5	.775E+03	6	.750E+03	7	.750E+03	8	.750E+03
9	.797E+03	10	.809E+03	11	.826E+03	12	.851E+03	13	.849E+03	14	.849E+03	15	.861E+03	16	.872E+03
17	.875E+03	18	.873E+03	19	.863E+03	20	.846E+03	21	.834E+03	22	.823E+03	23	.821E+03	24	.81[illegible]E+03
25	.802E+03	26	.750E+03	27	.806E+03	28	.8[illegible]6E+03	29	.815E+03	30	.811E+03	31	.807E+03	32	.835E+03
33	.845E+03	34	.869E+03	35	.875E+03	36	.867E+03	37	.857E+03	38	.832E+03	39	.812E+03	40	.[illegible]2E+03
41	.782E+03	42	.793E+03	43	.810E+03	44	.805E+03	45	.800E+03	46	.796E+03	47	.786E+03	48	.795E+03
49	.806E+03	50	.789E+03	51	.700E+03	52	.6[illegible]2E+03	53	.764E+03	54	.821E+03	55	.848E+03	56	.867E+03
57	.875E+03	58	.866E+03	59	.851E+03	60	.836E+03	61	.813E+03	62	.771E+03	63	.691E+03	64	.740E+03
65	.796E+03	66	.806E+03	67	.813E+03	68	.797E+03	69	.775E+03	70	.7[illegible]E+03	71	.[illegible]E+03	72	.831E+03
73	.815E+03	74	.807E+03	75	.779E+03	76	.766E+03	77	.753E+03	78	.734E+03	79	.[illegible]7E+03	80	.825E+03
81	.842E+03	82	.855E+03	83	.865E+03	84	.875E+03	85	.675E+03	86	.86[illegible]E+03	87	.659E+03	88	.843E+03
89	.830E+03	90	.811E+03	91	.796E+03	92	.79[illegible]E+03	93	.795E+03	94	.612E+03	95	.622E+03	96	.8[illegible]E+03
97	.834E+03	98	.826E+03	99	.793E+03	100	.808E+03	101	.797E+03	102	.794E+03	103	.847E+03	104	.873E+03
105	.875E+03	106	.875E+03	107	.862E+03	108	.829E+03	109	.815E+03	110	.829E+03	111	.826E+03	112	.835E+03
113	.850E+03	114	.850E+03	115	.841E+03	116	.836E+03	117	.875E+03	118	.85[illegible]E+03				

THE VALUES OF PIEZOMETRIC HEADS AT TIME T= 43[illegible].000

1	.875E+03	2	.900E+03	3	.875E+03	4	.850E+03	5	.775E+03	6	.75[illegible]E+03	7	.750E+03	8	.750E+03
9	.797E+03	10	.809E+03	11	.826E+03	12	.[illegible]1E+03	13	.845E+03	14	.849E+03	15	.861E+03	16	.872E+03
17	.875E+03	18	.873E+03	19	.863E+03	20	.846E+03	21	.833E+03	22	.823E+03	23	.[illegible]21E+03	24	.81[illegible]E+03
25	.802E+03	26	.750E+03	27	.[illegible]6E+03	28	.[illegible]7[illegible]E+03	29	.814E+03	30	.81[illegible]E+03	31	.805E+03	32	.834E+03
33	.84[illegible]E+03	34	.869E+03	35	.875E+03	36	.857E+03	37	.856E+03	38	.829E+03	39	.809E+03	40	.775E+03
41	.777E+03	42	.739E+03	43	.[illegible]8E+03	44	.[illegible]3E+03	45	.795E+03	46	.796E+03	47	.76[illegible]E+03	48	.79[illegible]E+03
49	.804E+03	50	.78[illegible]E+03	51	.67[illegible]E+03	52	.[illegible]E+03	53	.7[illegible]5E+03	54	.[illegible]E+03	55	.846E+03	56	.[illegible]E+03
57	.875E+03	58	.866E+03	59	.[illegible]45E+03	60	.[illegible]4E+03	61	.[illegible]E+03	62	.763E+03	63	.671E+03	64	.7[illegible]3E+03
65	.791E+03	66	.[illegible]5E+03	67	.[illegible]3E+03	68	.7[illegible]7E+03	69	.775E+03	70	.7[illegible]5E+03	71	.[illegible]E+03	72	.[illegible]1E+03
73	.812E+03	74	.8[illegible]E+03	75	.77[illegible]E+03	76	.757E+03	77	.749E+03	78	.7[illegible]E+03	79	.[illegible]E+03	80	.[illegible]3E+03
81	.840E+03	82	.85[illegible]E+03	83	.865E+03	84	.75[illegible]E+03	85	.[illegible]E+03	86	.867E+03	87	.657E+03	88	.[illegible]E+03
89	.825E+03	90	.8[illegible]E+03	91	.79[illegible]E+03	92	.7[illegible]E+03	93	.7[illegible]E+03	94	[illegible]	95	.[illegible]4E+03	96	.[illegible]E+03
97	.832E+03	98	.8[illegible]E+03	99	.7[illegible]E+03	100	.[illegible]E+03	101	.7[illegible]E+03	102	.777E+03	103	.[illegible]43E+03	104	.[illegible]72E+03
105	.875E+03	106	.875E+03	107	.861E+03	108	.[illegible]3E+03	109	.8[illegible]E+03	110	.824E+03	111	.[illegible]2[illegible]E+03	112	.8[illegible]E+03

113	[illegible]	114	.850E+03	115	.639E+03	116	[illegible]	117	.875E+03	118	.850E+03

THE VALUES OF PIEZOMETRIC HEADS AT TIME T= 584[illegible].000

1	.875E+03	2	.900E+03	3	.675E+03	4	.850E+03	5	.775E+03	6	.750E+03	7	.750E+03	8	.750E+03
9	.797E+03	10	.829E+03	11	.828E+03	12	[illegible]	13	.649E+03	14	.649E+03	15	.861E+03	16	.872E+03
17	.675E+03	18	.573E+03	19	.863E+03	20	.846E+03	21	.613E+03	22	.623E+03	23	.821E+03	24	[illegible]
25	[illegible]	26	.750E+03	27	.606E+03	28	[illegible]	29	[illegible]	30	.611E+03	31	.805E+03	32	[illegible]
33	.844E+03	34	.869E+03	35	.675E+03	36	.867E+03	37	.655E+03	38	.629E+03	39	[illegible]	40	.759E+03
41	.776E+03	42	.789E+03	43	.608E+03	44	[illegible]	45	[illegible]	46	.796E+03	47	.76[illegible]E+03	48	.755E+03
49	[illegible]	50	[illegible]	51	.669E+03	52	[illegible]	53	.755E+03	54	.815E+03	55	.846E+03	56	.665E+03
57	.875E+03	58	.866E+03	59	.649E+03	60	[illegible]	61	.816E+03	62	.762E+03	63	.67[illegible]E+03	64	.724E+03
65	.790E+03	66	.855E+03	67	.613E+03	68	.757E+03	69	.775E+03	70	.765E+03	71	[illegible]	72	.651E+03
73	.812E+03	74	.803E+03	75	.769E+03	76	.756E+03	77	.745E+03	78	.717E+03	79	.663E+03	80	[illegible]
81	.840E+03	82	.653E+03	83	.665E+03	84	.875E+03	85	.575E+03	86	.867E+03	87	.856E+03	88	.658E+03
89	.824E+03	90	[illegible]	91	.792E+03	92	.762E+03	93	[illegible]	94	[illegible]	95	.814E+03	96	[illegible]
97	.832E+03	98	.822E+03	99	.779E+03	100	.800E+03	101	.755E+03	102	.776E+03	103	.843E+03	104	.872E+03
105	.875E+03	106	.875E+03	107	.661E+03	108	.822E+03	109	[illegible]	110	.624E+03	111	.820E+03	112	.835E+03
113	.850E+03	114	.850E+03	115	.639E+03	116	.832E+03	117	.875E+03	118	.850E+03				

THE VALUES OF PIEZOMETRIC HEADS AT TIME T= 73[illegible].000

1	.875E+03	2	.900E+03	3	.675E+03	4	.850E+03	5	.775E+03	6	.750E+03	7	.750E+03	8	.750E+03
9	.797E+03	10	.809E+03	11	.626E+03	12	[illegible]	13	.649E+03	14	.649E+03	15	.861E+03	16	.872E+03
17	.675E+03	18	.873E+03	19	.861E+03	20	.846E+03	21	.632E+03	22	.819E+03	23	[illegible]	24	[illegible]
25	.882E+03	26	.750E+03	27	.606E+03	28	.867E+03	29	.613E+03	30	.804E+03	31	.762E+03	32	.835E+03
33	.843E+03	34	.865E+03	35	.875E+03	36	.866E+03	37	.645E+03	38	.617E+03	39	[illegible]	40	[illegible]
41	.774E+03	42	.782E+03	43	.607E+03	44	.663E+03	45	.799E+03	46	.796E+03	47	.760E+03	48	.795E+03
49	.834E+03	50	.785E+03	51	.686E+03	52	.855E+03	53	.774E+03	54	[illegible]	55	[illegible]	56	.854E+03
57	.875E+03	58	.855E+03	59	.794E+03	60	.793E+03	61	.793E+03	62	.764E+03	63	.674E+03	64	.727E+03
65	.791E+03	66	.804E+03	67	.613E+03	68	.757E+03	69	.775E+03	70	[illegible]	71	[illegible]	72	.650E+03
73	.606E+03	74	.799E+03	75	.768E+03	76	.755E+03	77	.755E+03	78	.712E+03	79	.754E+03	80	.743E+03
81	[illegible]	82	.834E+03	83	.655E+03	84	.875E+03	85	.675E+03	86	.863E+03	87	.846E+03	88	.822E+03
89	.797E+03	90	.772E+03	91	.766E+03	92	.766E+03	93	.775E+03	94	[illegible]	95	.805E+03	96	.650E+03
97	.811E+03	98	.785E+03	99	.752E+03	100	.781E+03	101	.761E+03	102	.753E+03	103	.834E+03	104	.872E+03
105	.675E+03	106	.875E+03	107	.660E+03	108	[illegible]	109	.793E+03	110	[illegible]	111	[illegible]	112	.823E+03
113	.850E+03	114	.850E+03	115	.832E+03	116	.824E+03	117	.875E+03	118	.850E+03				

THE VALUES OF PIEZOMETRIC HEADS AT TIME T= 876[illegible].000

1	.875E+03	2	.900E+03	3	.675E+03	4	.850E+03	5	.775E+03	6	.750E+03	7	.750E+03	8	.750E+03
9	.797E+03	10	.809E+03	11	.828E+03	12	.811E+03	13	.649E+03	14	.649E+03	15	.861E+03	16	.872E+03
17	.875E+03	18	.672E+03	19	.861E+03	20	.846E+03	21	.832E+03	22	.619E+03	23	.829E+03	24	[illegible]
25	.832E+03	26	.750E+03	27	.806E+03	28	.867E+03	29	.613E+03	30	.804E+03	31	.766E+03	32	.830E+03
33	.843E+03	34	.865E+03	35	.875E+03	36	.865E+03	37	.645E+03	38	.617E+03	39	.806E+03	40	.754E+03
41	.774E+03	42	.789E+03	43	.607E+03	44	[illegible]	45	.795E+03	46	.796E+03	47	.760E+03	48	.795E+03
49	.804E+03	50	.785E+03	51	.686E+03	52	.666E+03	53	.775E+03	54	.805E+03	55	.814E+03	56	.853E+03
57	.875E+03	58	.854E+03	59	.790E+03	60	.791E+03	61	.792E+03	62	.764E+03	63	.674E+03	64	.727E+03
65	.791E+03	66	.804E+03	67	.613E+03	68	.757E+03	69	.775E+03	70	.765E+03	71	.600E+03	72	.650E+03
73	.606E+03	74	.799E+03	75	.768E+03	76	.755E+03	77	.735E+03	78	.712E+03	79	.752E+03	80	.758E+03
81	.796E+03	82	.833E+03	83	.655E+03	84	.675E+03	85	.675E+03	86	.862E+03	87	.840E+03	88	.822E+03
89	.795E+03	90	[illegible]	91	.766E+03	92	[illegible]	93	.775E+03	94	.789E+03	95	[illegible]	96	.855E+03
97	.810E+03	98	.783E+03	99	.750E+03	100	.780E+03	101	.750E+03	102	.751E+03	103	.833E+03	104	.872E+03
105	.875E+03	106	.875E+03	107	.660E+03	108	[illegible]	109	.793E+03	110	.811E+03	111	[illegible]	112	.822E+03
113	.850E+03	114	.850E+03	115	.832E+03	116	.823E+03	117	.875E+03	118	.850E+03				

DISCHARGE VECTORS PRINTED AT TIME = 8760.00

DISCHARGE VECTORS ARE CALCULATED AT THE CENTER OF ELEMENT
THETA IS THE ANGLE THAT TOTAL VELOCITY MAKES WITH POSITIVE X-COORDINATE

ELEMENT NO.	UX	UY	Q-TOTAL	THETA	X-COORD	Y-COORD
1	.796E-02	-.142E+01	.142E+01	-89.69	10335.56	10945.75
2	.809E+00	.137E+00	.821E+00	9.63	23012.22	[illegible]7159.45
3	.621E+00	.951E+00	.114E+01	56.86	10323.12	[illegible]
4	.411E+00	.566E+00	.701E+00	54.06	[illegible]	[illegible]45.14
5	.406E+00	.822E+00	.917E+00	63.70	23099.35	43110.56
6	.429E+00	.773E+00	.884E+00	[illegible]	[illegible]	[illegible]2225.79
7	.287E-01	-.241E-01	.374E-01	[illegible]	23186.56	[illegible]5352.42
8	.294E-01	-.144E+00	.147E+00	[illegible]	23261.27	67405.38
9	-.106E+01	.222E+01	[illegible]	115.[illegible]	[illegible]	[illegible]
10	-.158E+01	.122E+01	[illegible]	142.[illegible]	[illegible]	[illegible]
11	-.156E+01	.104E+01	[illegible]	146.72	[illegible]	[illegible]3655.25
12	-.139E+01	.675E+00	[illegible]	154.[illegible]	10397.[illegible]	[illegible]
13	[illegible]	[illegible]	.155E+01	155.[illegible]	22738.27	[illegible]
14	[illegible]	[illegible]	[illegible]	124.33	22526.57	[illegible]3155.23
15	[illegible]	.114E+01	[illegible]	[illegible]	[illegible]	[illegible]7364.17
16	[illegible]	[illegible]	[illegible]	77.[illegible]	[illegible]	[illegible]
17	-.372E-01	.655E+00	[illegible]	93.[illegible]	32725.17	[illegible]9793.[illegible]

18	.123E+00	.391E+00	.410E+00	72.5[illegible]	41327.45	[illegible]
19	.376E+00	.107E+01	.113E+01	7[illegible].59	34356.45	55025.23
20	.497E+00	.599E+00	.776E+00	[illegible]	44053.9[illegible]	[illegible]76.53
21	.723E+00	.129E+01	.148E+01	[illegible].76	34617.95	61949.96
22	.122E+01	-.174E+00	.124E+01	-[illegible].11	44754.29	75034.97
23	.131E+01	.387E+00	.137E+01	16.44	38104.65	69059.29
24	.884E+00	-.152E+00	.897E+00	-9.73	33273.0[illegible]	67492.55
25	.876E+00	.450E+00	.985E+00	27.16	35601.7[illegible]	56452.24
26	.234E+00	-.257E-01	.235E+00	-6.27	31940.06	55177.23
27	.224E+00	.823E+00	.854E+00	74.43	31874.4[illegible]	45967.[illegible]
28	.224E+00	.823E+00	.854E+00	74.43	36510.73	39036.59
29	.215E+00	.777E+00	.806E+00	74.54	36734.65	3270[illegible].27
30	-.641E-01	.571E+00	.575E+00	96.49	32052.74	[illegible]
31	-.649E-01	.135E+00	.150E+00	115.66	32015.35	15653.35
32	.207E-03	.987E-01	.987E-01	89.88	40632.51	13884.54
33	.411E+00	.362E+00	.561E+00	42.69	46572.35	18641.39
34	.41[illegible]E+00	.590E+00	.719E+00	55.14	47319.5[illegible]	27644.55
35	.361E+00	.853E+00	.963E+00	67.99	45070.65	43563.75
36	.454E+00	.125E+01	.133E+01	70.11	45314.65	49262.39
37	.942E+00	.424E+00	.103E+01	24.22	44094.3[illegible]	56746.34
38	.404E+01	.252E+01	.476E+01	31.93	45602.11	60182.93
39	.424E+01	-.127E+01	.442E+01	-16.63	49772.64	66622.4[illegible]
40	.204E+01	-.359E+01	.413E+01	-60.36	53657.82	59074.82
41	.111E+01	-.159E+00	.112E+01	-8.19	5225[illegible].69	76022.51
42	.242E+01	-.224E+01	.329E+01	-42.64	54691.35	76880.59
43	.169E+01	.200E+01	.262E+01	49.79	5220[illegible]	86731.66
44	.480E+00	.101E+01	.112E+01	64.66	56464.54	89556.36
45	.471E+00	.836E+00	.960E+00	60.56	58782.25	55671.60
46	.478E-01	.365E+00	.368E+00	82.54	49287.65	1[illegible]2733.13
47	-.341E-12	.176E+01	.176E+01	0.00	39449.52	125909.49
48	.235E+01	.457E+01	.514E+01	62.81	50943.18	112495.65
49	-.244E+01	.422E+01	.487E+01	12[illegible]	62374.57	115716.34
50	.594E+00	.811E+00	.100E+01	53.79	72971.65	1[illegible]9295.59
51	.560E+00	.928E+00	.108E+01	58.88	65836.37	99047.19
52	.101E+01	.566E+00	.116E+01	29.13	72946.75	93580.54
53	.772E+00	.639E-01	.774E+00	4.74	78416.89	87254.67
54	.151E+01	.108E+00	.152E+01	4.0[illegible]	63183.99	63735.61
55	.100E+01	-.241E+01	.261E+01	-67.34	61266.3[illegible]	79135.64
56	.231E+01	-.405E+01	.467E+01	-60.33	64466.59	74[illegible]30.11
57	.167E+01	-.629E+01	.651E+01	-74.64	64192.64	65796.26
58	-.330E+01	-.959E+01	.101E+02	-1[illegible].97	60955.37	67965.75
59	-.393E+01	.595E+01	.713E+01	123.45	60643.64	60735.94
60	.267E+01	.392E+01	.474E+01	55.72	56162.76	56626.37
61	.271E+01	.243E+01	.364E+01	41.89	53356.96	52250.69
62	.168E+01	.318E+01	.360E+01	62.24	60207.84	50793.75
63	.196E+01	.238E+01	.3[illegible]E+01	5[illegible].56	59956.79	45[illegible]65.6[illegible]
64	.179E+01	.160E+01	.240E+01	41.62	59772.0[illegible]	41342.30
65	.720E+00	.729E+00	.102E+01	45.35	54865.7[illegible]	38626.90
66	.239E+01	.258E+01	.352E+01	47.21	53147.27	3[illegible]34.76
67	.121E+01	.375E+01	.395E+01	72.08	61316.11	26466.42
68	.119E+01	.126E+01	.175E+01	46.68	56235.49	[illegible]6646.49
69	.462E-02	.205E+01	.205E+01	89.87	64652.6[illegible]	13509.62
70	.237E+01	.326E+01	.403E+01	54.01	70344.17	18[illegible].77
71	.333E+01	.757E+01	.827E+01	66.26	71265.65	28777.73
72	.767E+01	.513E+01	.923E+01	33.78	66085.4[illegible]	31442.56
73	.782E+01	.438E+01	.896E+01	29.22	67729.15	38151.62
74	.458E+01	.215E+01	.506E+01	25.21	7[illegible]	40809.11
75	.282E+01	.589E+01	.653E+01	64.35	67118.9[illegible]	45767.69
76	.306E+01	.602E+01	[illegible]	64.29	66675.54	51905.44
77	.215E+01	.919E+01	.944E+01	76.81	63943.59	53471.04
78	.294E+01	.117E+01	.316E+01	21.65	66060.5[illegible]	59[illegible]07.11
79	.209E+02	.790E+01	.22[illegible]E+02	16.36	69646.[illegible]	6[illegible]615.77
80	.217E+02	-.163E+02	.271E+02	-36.95	7[illegible]	[illegible]
81	.511E+01	-.570E+01	.766E+01	-48.10	74692.93	66795.21
82	.530E+01	-.689E+01	.7[illegible]E+01	-5[illegible].61	76856.[illegible]3	71713.35
83	.119E+01	-.169E+01	.1[illegible]E+01	-42.53	71041.51	76190.65
84	.346E+01	-.472E+01	.58[illegible]E+01	-53.77	75805.54	[illegible]1762.12
85	-.100E+01	-.416E+01	.42[illegible]E+01	-1[illegible]	81119.[illegible]	[illegible].54
86	.553E+00	-.251E+01	.257E+01	-77.56	[illegible]4017.[illegible]2	[illegible]4353.24
87	-.426E+00	.5[illegible]6E+00	.661E+00	1[illegible]	[illegible]	[illegible]6369.9[illegible]
88	.137E+00	.330E+00	.356E+00	67.42	64863.74	1[illegible]196.[illegible]7
89	.318E+00	[illegible]5E+00	.957E+00	57.[illegible]	[illegible].47	11[illegible]449.[illegible]
90	-.187E+00	.200E+01	.20[illegible]E+01	95.36	71004.1[illegible]	12795[illegible].[illegible]2
91	.196E+01	[illegible]11E+01	[illegible]	63.35	[illegible]9633.[illegible]1	[illegible]21723.19
92	-.574E+00	.383E+01	.3[illegible]7E+01	98.53	983[illegible]	[illegible]129.27
93	-.145E+00	[illegible]17E+00	[illegible]	1[illegible]	1[illegible]2384.45	1[illegible]5173.62
94	-.453E+00	.495E+00	.671E+00	132.4[illegible]	98594.[illegible]4	[illegible].93
95	-.264E+00	-.256E+00	.369E+00	-135.75	9546[illegible]	[illegible]636.14
96	-.[illegible]73E+01	-.2[illegible]E+01	.377E+01	-13[illegible]6	[illegible]652[illegible]	[illegible]474[illegible].7[illegible]
97	-.26[illegible]E+01	-.271E+01	.376E+01	-1[illegible].[illegible]1	944[illegible]7	75[illegible]36.4
98	-.35[illegible]E+01	-.663E+01	.750E+01	-1[illegible]7.[illegible]3	42457.17	73[illegible]71.27

99	.101E+01	-.277E+02	.277E+02	-47.52	[illegible]	7332.32
100	-.194E+02	-.120E+02	.228E+02	-146.25	84275.77	71166.94
101	-.161E+02	-.167E+01	.167E+02	-174.08	86734.[illegible]	64649.17
102	-.226E+02	-.114E+01	.234E+02	-165.13	83510.[illegible]	62635.32
103	.57?E+01	-.317E+01	.4?0E+01	-50.33	73986.[illegible]	61549.26
104	.164E+02	.250E+02	.305E+02	57.56	77653.[illegible]	56022.65
105	.131E+02	.252E+02	.284E+02	62.57	72722.[illegible]	56165.65
106	.67?E+01	.697E+01	.112E+02	52.5[illegible]	71963.[illegible]	52[illegible].69
107	.209E+01	.116E+02	.118E+02	80.[illegible]	77168.14	46726.63
108	.401E+01	-.598E+00	.406E+01	-6.43	77006.26	43123.41
109	.595E+01	.219E+01	.630E+01	19.33	74665.19	40520.44
110	.661E+01	-.573E+00	.664E+01	-4.[illegible]	76557.57	35[illegible]75.69
111	.112E+02	.916E+01	.145E+02	39.26	75063.07	35027.94
112	.171E+01	.143E+02	.144E+02	83.19	65443.15	25975.92
113	.188E+00	.324E+01	.325E+01	86.6[illegible]	77691.15	16555.18
114	.242E+01	.335E+01	.335E+01	89.59	85436.62	11991.76
115	-.891E-01	.327E+01	.327E+01	91.56	89396.5[illegible]	[illegible]5777.32
116	.154E+00	.742E+01	.742E+01	88.77	89521.62	23199.[illegible]
117	-.516E+01	.116E+02	.127E+02	113.52	84376.14	27563.[illegible]
118	-.569E+01	.105E+02	.119E+02	118.45	75013.22	32207.49
119	-.275E+01	-.614E-02	.275E+01	-179.87	82672.15	35340.20
120	.128E+02	.221E+02	.255E+02	59.51	84297.47	37647.91
121	.226E+02	-.163E+01	.227E+02	-4.12	82856.44	42557.55
122	.162E+02	-.892E+01	.185E+02	-28.[illegible]	84701.96	44765.74
123	.100E+02	.266E+02	.286E+02	69.52	84501.53	49117.39
124	.189E+02	.226E+02	.295E+02	50.09	80144.2[illegible]	5[illegible]669.22
125	.189E+02	.230E+02	.298E+02	50.57	81037.[illegible]	5494[illegible].43
126	-.117E+02	.132E+02	.176E+02	131.6[illegible]	85207.[illegible]	55[illegible]9.66
127	-.227E+02	-.561E+01	.235E+02	-165.7[illegible]	85909.42	57256.00
128	-.137E+02	-.243E+01	.139E+02	-169.90	89919.50	58153.16
129	-.15[illegible]E+02	-.595E+01	.160E+02	-160.[illegible]	91725.11	62536.46
130	-.500E+01	-.476E+01	.690E+01	-136.46	94676.36	63[illegible].44
131	-.524E+01	-.544E+01	.755E+01	-133.89	95963.[illegible]	67[illegible].59
132	-.174E+01	-.512E+01	.541E+01	-108.76	100615.44	69522.31
133	-.118E+01	-.455E+01	.471E+01	-104.56	101936.17	72672.03
134	-.216E+01	-.253E+01	.333E+01	-130.52	98200.42	79061.92
135	-.296E+00	-.220E+00	.368E+00	-143.37	104277.24	[illegible].71
136	-.126E+01	.500E-01	.126E+01	177.73	110129.91	86661.09
137	.196E+00	.120E+01	.122E+01	80.75	115953.85	52413.00
138	.294E+00	.729E+00	.786E+00	68.03	116132.02	103166.96
139	-.101E+01	.345E+01	.359E+01	106.29	117552.[illegible]	125862.32
140	.134E+01	.136E+01	.191E+01	45.36	126504.95	121295.80
141	.340E+00	.811E+00	.880E+00	67.23	126592.12	1[illegible]6523.54
142	-.390E+00	.166E+01	.171E+01	103.22	128210.94	[illegible]9257.69
143	-.159E+01	-.596E+00	.168E+01	-147.51	121735.64	76561.36
144	-.120E+01	-.996E+00	.156E+01	-140.21	116567.65	75947.6[illegible]
145	-.722E+00	-.135E+01	.153E+01	-118.12	112981.55	78356.49
146	-.266E+01	-.418E+01	.556E+01	-115.56	116361.71	73[illegible]
147	-.271E+00	-.677E+01	.678E+01	-92.30	110976.5[illegible]	65757.80
148	.686E+01	-.129E+02	.130E+02	-61.79	104636.36	63531.52
149	.773E+01	-.420E+01	.877E+01	-28.65	101614.6[illegible]	60309.72
150	-.701E+01	-.237E+01	.740E+01	-161.36	96270.[illegible]	58653.52
151	-.832E+01	-.531E+01	.987E+01	-147.43	94228.63	56272.65
152	-.124E+02	.650E+01	.140E+02	152.25	93580.54	52467.29
153	-.113E+02	.107E+02	.155E+02	136.61	87367.86	51[illegible]7.59
154	-.821E+01	.957E+01	.126E+02	130.64	91027.75	50270.74
155	-.659E+01	.118E+01	.668E+01	169.85	93[illegible].10	46497.64
156	-.950E+01	-.357E+01	.101E+02	-159.42	89757.63	44356.56
157	-.133E+02	.978E+01	.165E+02	143.77	92920.56	40694.77
158	-.702E+01	.203E+02	.215E+02	109.07	89197.26	37765.43
159	-.349E+01	.115E+02	.120E+02	106.85	90280.63	32400.37
160	-.239E+01	.111E+02	.113E+02	102.19	94851.63	32001.65
161	-.146E+01	.927E+01	.939E+01	98.94	97651.75	26441.51
162	-.184E+01	.735E+01	.757E+01	104.04	93705.06	24496.90
163	-.109E+01	.578E+01	.588E+01	100.69	100466.77	21541.31
164	-.114E+01	.294E+01	.315E+01	111.28	96220.47	15525.27
165	.601E-02	.211E+01	.211E+01	89.84	105709.27	11616.16
166	-.520E+00	.400E+00	.656E+00	142.43	111811.[illegible]	[illegible]53[illegible].03
167	-.516E+00	.737E+00	.900E+00	125.01	116941.43	24557.26
168	-.155E+01	.193E+01	.248E+01	128.73	110547.04	27993.22
169	-.661E+00	.615E+01	.618E+01	96.13	109576.10	29633.29
170	-.336E+01	.248E+01	.412E+01	111.56	102023.33	25947.52
171	-.309E+01	.153E+02	.196E+02	[illegible]	102455.17	35063.2[illegible]
172	.961E+01	.175E+02	.151E+02	75.24	97515.53	35062.44
173	.103E+02	.673E+01	.135E+02	4[illegible].34	96506.[illegible]	41662.3[illegible]
174	.679E+01	-.22[illegible]E+01	.691E+01	-19.[illegible]	39146.[illegible]	45451.63
175	.155E+01	.274E+01	.315E+01	61.[illegible]	55921.61	47[illegible]96.5[illegible]
176	.738E+01	-.533E+01	.911E+01	-34.[illegible]	47979.[illegible]	[illegible]
177	-.631E+01	-.430E+01	.766E+01	-145.7[illegible]	100775.[illegible]	53334.36
178	-.902E+00	.117E+02	.117E+02	95.07	104165.10	56159.61
179	-.115E+02	.126E+02	.171E+02	132.[illegible]	107026.[illegible]	66457.64

180	-.14[illegible]E+02	.6[illegible]E+01	.161E+02	157.[illegible]	111692.93	[illegible]55.51
181	[illegible]E+01	-.1[illegible]E+02	.130E+02	-1[illegible]	1[illegible]8149.46	[illegible]3993.40
182	-.[illegible]4E+01	-.543E+01	.125E+02	-131.[illegible]	11349[illegible]	[illegible]152.33
183	-.23[illegible]E+01	.455E-02	.230E+01	1[illegible]	128310.56	71626.7[illegible]
184	-.23[illegible]E+01	.644E-01	.23[illegible]E+01	177.[illegible]	122706.54	65[illegible]1.66
185	-.127E+02	-.229E+01	.129E+02	-164.75	118224.64	[illegible]254.52
186	-.691E+01	.5[illegible]E+01	.102E+02	145.59	115745.59	6[illegible].5[illegible]
187	-.631E+01	.126E+01	.694E+01	165.[illegible]	1225[illegible]	[illegible]6397.37
188	-.595E+01	.345E+01	.656E+01	146.[illegible]5	1160[illegible].21	52730.34
189	-.637E+01	.345E+01	.9[illegible]5E+01	157.[illegible]	11191[illegible].52	53[illegible]22.75
190	-.676E+01	.264E+01	.[illegible]15E+01	163.23	107575.63	49571.[illegible]
191	-.1[illegible]E+0[illegible]	.[illegible]E+01	.1[illegible]7E+02	167.74	1[illegible]4663.26	[illegible]5.24
192	-.13[illegible]E+02	-.482E+01	.140E+02	-160.94	10221[illegible].12	46[illegible]24.[illegible]
193	-.177E+02	-.505E+00	.177E+02	-178.37	1[illegible]543[illegible].52	42463.03
194	-.134E+02	.129E+02	.186E+02	136.[illegible]4	1[illegible]5059.1[illegible]	37556.74
195	-.154E+01	.306E+01	.342E+01	116.74	111625.71	34443.62
196	-.197E+00	.737E+00	.763E+00	1[illegible]4.97	123192.53	24892.55
197	.430E-03	.156E+00	.156E+00	89.84	121461.69	11516.56
198	-.[illegible]7E+00	0.	.207E+00	1[illegible]	126044.21	[illegible]5264.5[illegible]
199	-.[illegible]9[illegible]E+00	-.266E-01	.998E+00	-[illegible]78.[illegible]2	125981.94	27060.7[illegible]
200	-.95[illegible]E+00	.157E+01	.186E+01	122.46	128705.04	36657.40
201	-.135E+01	.169E+01	.232E+01	125.41	121237.54	33645.[illegible]
202	-.259E+01	.150E+01	.299E+01	149.67	114139.62	37407.31
203	-.725E+01	.31[illegible]E+01	.769E+01	156.[illegible]4	110[illegible]92.17	43[illegible]10.94
204	-.787E+01	.101E+01	.794E+01	172.67	112595.51	40597.26
205	-.533E+01	.236E+01	.583E+01	156.[illegible]	116691.62	45066.65
206	-.135E+01	.461E+00	.143E+01	160.33	124201.24	4717[illegible].[illegible]7
207	-.19[illegible]E+01	.274E-01	.190E+01	179.30	127974.34	5[illegible]208.49
208	-.206E+01	-.342E+00	.209E+01	170.57	125172.53	56335.11
209	-.222E+01	-.936E-02	.222E+01	-179.76	129294.31	62[illegible]1.0[illegible]

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