A Research Report for Westinghouse Hanford Company

Summary of Water-Level Measurements Around the 1325-N Crib During the Fall of 1985 and the Winter of 1986-1987

E. J. Jensen

November 1987

Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830

Pacific Northwest Laboratory
Operated for the U.S. Department of Energy
by Battelle Memorial Institute

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor Battelle Memorial Institute, nor any of their employees, makes any warranty, expressed or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government of any agency thereof, or Battelle Memorial Institute. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof, or Battelle Memorial Institute.

PACIFIC NORTHWEST LABORATORY
operated by
BATTELLE MEMORIAL INSTITUTE
for the
UNITED STATES DEPARTMENT OF ENERGY
under Contract DE-AC06-76RLO 1830

Printed in the United States of America
Available from
National Technical Information Service
United States Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22161

NTIS Price Codes
Microfiche A01

Printed Copy

Pages	Price Codes
001-025	A02
026-050	A03
051-075	A04
076-100	A05
101-125	A06
126-150	A07
151-175	A08
176-200	A09
201-225	A010
226-250	A011
251-275	A012
276-300	A013

Research Report for Westinghouse Hanford Company

SUMMARY OF WATER-LEVEL
MEASUREMENTS AROUND THE 1325-N CRIB DURING
THE FALL OF 1985 AND THE WINTER OF 1986-1987

E. J. Jensen

November 1987

Prepared for
the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830

Pacific Northwest Laboratory
Richland, Washington 99352

Research Report for Washington National Forest

STUDY OF WATER LEVEL
MEASUREMENTS AND THE 1935-36 FLOOD
IN THE RIVER OF 1935-36

E. J. Jensen

November 1937

Presented to
the U.S. Department of Energy
under contract DE-AC05-68OR21400

Pacific Northwest Laboratory
Richland, Washington 99352

EXECUTIVE SUMMARY

This report provides a summary of the water-level data collected from the ground water under the Hanford Site and from the Columbia River during the fall of 1985 and the winter of 1986-1987 by the Pacific Northwest Laboratory for UNC Nuclear Industries, Inc., and more recently under the direction of Westinghouse Hanford Company. During this study, water levels were measured in 28 wells around the 1325-N crib and connecting trench to monitor the rise and fall of ground-water levels resulting from operation of this facility.

Analysis of the water-level data demonstrated that the water being added to the 1325-N crib has a direct effect on the ground-water movement at the 100-N Area. When the crib is in operation, a mound of water forms below the crib, and when the crib is shut down, the mound flattens out and dissipates outward in all directions.

EXPLANATION

This report gives a summary of the water-level data collected for the ground-water investigation in the San Joaquin River valley during the fall of 1955 and the summer of 1956. The data were collected by the U.S. Geological Survey, and are presented in the form of a series of maps and tables. The maps show the location of the wells and the general character of the ground-water conditions. The tables give the water-level data for each well. The data show that the water levels in the wells are generally higher than the water levels in the surface water of the San Joaquin River. This indicates that the ground water is being recharged by the surface water of the river. The data also show that the water levels in the wells are generally higher than the water levels in the surface water of the San Joaquin River during the summer months. This indicates that the ground water is being recharged by the surface water of the river during the summer months.

CONTENTS

EXECUTIVE SUMMARY	iii
INTRODUCTION	1
METHODS OF DATA COLLECTION	3
DATA INTERPRETATION	5
WATER LEVELS IN THE COLUMBIA RIVER	13
CONCLUSIONS	17
REFERENCES	19
APPENDIX A - WELL CONSTRUCTION DIAGRAMS	A.1
APPENDIX B - PROCEDURES FOR WATER-LEVEL MEASUREMENTS FOR THE 100-N AREA WATER-LEVEL NETWORK	B.1
APPENDIX C - STEEL-TAPE MEASUREMENTS AND CASING ELEVATIONS	C.1

FIGURES

1	Map of the Hanford Site Showing the 100-N Study Area	1
2	100-N Area Well Location Map	2
3	Hydrograph for Well 199-N27	6
4	Hydrograph for Well 199-N45	6
5	Hydrograph for Well 199-N31	7
6	Hydrograph for Well 199-N34	7
7	Hydrograph for Well 199-N4	8
8	Hydrograph for Well 199-N3	8
9	Hydrograph for Well 199-N43	9
10	Water-Table Map of 100-N Area on September 25, 1985	10
11	Water-Table Map of 100-N Area on July 21, 1987	11
12	Hydrograph for the Columbia River From September 1, 1985, to November 1, 1985	13
13	Hydrograph for the Columbia River From December 1, 1986, to June 1, 1987	14

INTRODUCTION

UNC Nuclear Industries, Inc. and its successor, Westinghouse Hanford Company, requested that the Pacific Northwest Laboratory (PNL) perform a study to determine what effects the operation of the 1325-N crib and trench has on the ground water beneath the 100-N Area. This was accomplished by collecting and analyzing water-level data from 28 wells located around the 1325-N and 1301-N cribs at the 100-N Area. The water levels in the Columbia River were being measured during the same period to determine what effects the fluctuating river levels had on the ground water.

The study took place on the Hanford Site, which is located in south-central Washington State (Figure 1). The study area was limited to the

FIGURE 1. Map of the Hanford Site Showing the 100-N Study Area

vicinity of the 1325-N and 1301-N cribs at the 100-N Area. Figure 2 illustrates the proximity of the 28 wells used to measure ground-water levels under the 1325-N and 1301-N cribs.

All of the wells used in this project are completed in the unconfined aquifer, which is the uppermost aquifer beneath the Hanford Site and the primary aquifer affected by site operations. The unconfined aquifer is contained in the glaciofluvial sediments informally called the Hanford formation and the semiconsolidated silts, sands, and gravels of the Ringold Formation. The bottom of the unconfined aquifer throughout the study area is the top of the Elephant Mountain Basalt (Myers/Price et al. 1979).

FIGURE 2. 100-N Area Well Location Map

METHODS OF DATA COLLECTION

Construction diagrams of each well used for water-level measurements are contained in Appendix A. Some of the wells shown in Appendix A were not used for water-level measurements in this study, but are included here to provide reference material. All water-level measurements in these wells were taken with steel tape or continuous water-stage recorders (refer to Appendix B for procedures). The steel-tape measurements and casing elevations are contained in Appendix C. The charts from the continuous water-stage recorders are on file at PNL's Geosciences Department, Sigma V, Richland, Washington.

Water levels were measured during the fall of 1985 (September 11, 1985, to November 21, 1985) to monitor the first discharge of liquid wastes to the newly constructed trench. A base-line elevation for the water table below the 1325-N crib and trench was established by measurements taken one week before the first discharge to the crib. Continuous water-level recorders were installed on wells 199-N45 and 199-N43. Well 199-N45 is located within 30 feet of the first weir between the 1325-N crib and the trench. Well 199-N43 is the well farthest from the inlet end of the trench (Figure 2).

Continuous water-level measurements were started again during the winter of 1986-1987 (December 22, 1986, to February 25, 1987) in response to an extended outage of the N Reactor in early January 1987. This time, water-level measurements were collected to monitor the water-table surface during a reduction in discharge to the 1325-N crib and trench. During this measurement period, continuous water-level recorders were installed on five wells between the 1325-N crib and the river (Figure 2). These wells were chosen to track the migration of water between the crib and the river. The five wells in which continuous water-level recorders were used during this measurement period are listed in Table 1. Well 199-N45 (continuously measured in the fall of 1985) was located in a radiation zone after the activation of the 1325-N trench and was replaced by well 199-N27.

TABLE 1. Continuous Water Level Recorders Installed at 100-N Area

<u>Well Number</u>	<u>Recorder Serial No.</u>	<u>Type of Clock</u>	<u>Date Put Into Service</u>	<u>Date Taken Out of Service</u>
199-N3	68 99993-81	Electric	12-23-86	1-23-87
199-N4	68 99994-81	Wind-up	12-23-86	1-22-87
199-N27	12476-48	Wind-up	12-23-86	1-27-87
199-N31	68 92655-79	Wind-up	12-23-86	1-27-87
199-N34	68 99995-81	Electric	12-23-86	1-28-87
199-N43	68 99993-81	Electric	9-18-85	11-21-85
199-N45	68 99995-81	Electric	9-17-85	11-21-85

DATA INTERPRETATION

Hydrographs were drawn for each well that had a continuous water-level recorder (Figure 2 and Table 1). The data points for each hydrograph were taken from the charts on the continuous water-level recorders and from the individual steel-tape measurements (Appendix C). To facilitate comparison of water-level changes, the hydrographs for all wells were drawn at the same scale. The hydrographs in Figures 3 through 8 are shown in the order of the wells from the 1325-N crib to the river. Figure 9 is the hydrograph of well 199-N43, which is north of the other wells.

The first discharge of waste water to the 1325-N crib and trench began at 10:00 a.m. on September 19, 1985. Discharge to the crib ceased 3 days later. Water-level measurements continued to be taken during the shutdown. Discharges to the crib resumed at 10:00 a.m. on October 14, 1985, when the N Reactor went back into operation. Continuous water-level data were collected until November 21, 1985. Only once during this measurement period, and never during the winter of 1986-1987, was the volume of liquid wastes entering the 1325-N crib great enough to spill over the first weir into the first compartment of the 3000-foot trench. The water that entered the first compartment flowed a maximum of 50 feet before infiltrating into the ground.

The largest water-level fluctuations were in wells 199-N27, 199-N45, 199-N31, and 199-N34. Well 199-N45 showed a rise in water-level elevation within the 2 hours after water was added to the crib on September 19, 1985. Wells 199-N27 and 199-N31 showed a response within the first day, and the response at well 199-N34 had a 1-day lag time (Figures 3 through 6). The wells located closest to the 1325-N crib and trench had the shortest time interval between water being added to the trench and water rising in the well. The closer wells also showed the largest rise in water-level elevation, and the wells located farthest away had very slight, if any, fluctuation in water-level elevation caused by the water being added to the crib.

The hydrographs are constructed so that water-level data from the fall of 1985 can be compared with data from the winter of 1986-1987. The water levels in the wells with recorders were at least 1 foot lower in the winter of 1986-1987 than in the fall of 1985 (Figures 3 through 9). This 1-foot difference

FIGURE 3. Hydrograph for Well 199-N27

FIGURE 4. Hydrograph for Well 199-N45

FIGURE 5. Hydrograph for Well 199-N31

FIGURE 6. Hydrograph for Well 199-N34

FIGURE 7. Hydrograph for Well 199-N4

FIGURE 8. Hydrograph for Well 199-N3

FIGURE 9. Hydrograph for Well 199-N43

may be attributed to a reduction in the volume of water being discharged to the 1325-N crib during the period from November 25, 1985, to December 22, 1986, when no measurements were being taken. Well 199-N4 showed a 2.5-foot drop in water-level elevation between November 25, 1985, and December 22, 1986. This can be explained by its proximity to the 1301-N crib (Figures 2 and 7). The 1301-N crib began receiving a major portion of the liquid wastes from the N Reactor by the early summer of 1984 (Pratt 1984). This caused water levels around the 1301-N crib to rise from the summer of 1984 to the fall of 1985. On September 19, 1985, the liquid waste was diverted from the 1301-N crib to the 1325-N crib and trench, causing the water levels around the 1325-N crib to rise and the levels around the 1301-N crib to begin dropping.

The mound of water under the 1325-N crib is illustrated by the water-table maps in Figures 10 and 11. The map in Figure 10 was drawn at the maximum water-level height (September 25, 1985) and that in Figure 11 was drawn at the minimum water-level height (July 21, 1987). The mound of water under the

FIGURE 10. Water-Table Map of 100-N Area on September 25, 1985

1325-N crib was at a peak in September 1985. The sides of the mound were steep near the crib and tapered off to a gentle slope as the water moved away from the crib. By July 1987, the mound had spread out and flattened to a gentle slope under the entire study area.

FIGURE 11. Water-Table Map of 100-N Area on July 21 and 22, 1987

FIGURE 1. Water Table Map of 100-W Area on July 21 and 22, 1987.

WATER LEVELS IN THE COLUMBIA RIVER

Water levels in the Columbia River were measured with a transducer at the Hanford Generating Plant just upriver from the 100-N Area. These data were collected during the same measurement periods as the ground-water elevations for the wells around the 1325-N crib (September 19, 1985, to November 21, 1985, and December 22, 1986, to February 25, 1987). Hydrographs were drawn from these data and are illustrated in Figures 12 and 13. A comparison of the hydrographs of the river levels (Figures 12 and 13) to the hydrographs of the water table under the 1325-N crib (Figures 3 through 9) shows that the river level does not affect the ground-water levels as far inland as well 199-N3.

FIGURE 12. Hydrograph for the Columbia River from September 1, 1985, to November 1, 1985

FIGURE 13. Hydrograph for the Columbia River from December 1, 1986, to June 1, 1987

However, the river does affect the ground-water level in well 199-N51, which is closer to the river than well 199-N3. This is illustrated by comparing the water-level measurements in Appendix C with the hydrographs in Figures 12 and 13.

During periods when water is not being added to the 1301-N or 1325-N cribs, the mound of water under the cribs will subside. As the mound subsides, the effects on the ground-water levels caused by changes in the river level will be observed further inland.

However, the river does affect the groundwater level in well 15-12, which is closer to the river than well 15-13. The 15-12 is located in a valley with water-level measurements in November 1962 with the hydrograph in Figure 13.

During periods when water is not added to the 15-12 or 15-13, the amount of water added to the river is small. As the water level in the river rises, the groundwater level in well 15-12 will rise. The effect on the groundwater level in well 15-13 will be observed in the future.

CONCLUSIONS

This project showed a direct relationship between the liquid wastes being discharged to the 100-N Area cribs and the water-level elevations in the wells surrounding the cribs. It also shows that the water level of the river has little effect on the ground-water levels close to the 1325-N crib and trench. The mound of ground water beneath the 1325-N crib forms steep sides when the crib is in operation, and when the crib is shut down the mound dissipates outward in all directions.

REFERENCES

Myers, C. W./S. M. Price et al. 1979. Geologic Studies of the Columbia Plateau: A Status Report. RHO-BWI-ST-4, Rockwell Hanford Operations, Richland, Washington.

Pratt, D. R. 1984. Permeability of the Glaciofluvial Deposits at 100-N. UNI-2999 REVO, UNC Nuclear Industries, Richland, Washington.

APPENDIX A

WELL CONSTRUCTION DIAGRAMS

FIGURE A.1. Well No. 199-N2

FIGURE A.2. Well No. 199-N3

FIGURE A.3. Well No. 199-N4

FIGURE A.4. Well No. 199-N6

FIGURE A.5. Well No. 199-N7

FIGURE A.6. Well No. 199-N8P

FIGURE A.7. Well No. 199-N8Q

FIGURE A.8. Well No. 199-N8R

FIGURE A.9. Well No. 199-N8S

FIGURE A.10. Well No. 199-N8T

FIGURE A.11. Well No. 199-N14

FIGURE A.12. Well No. 199-N15

FIGURE A.13. Well No. 199-N27

FIGURE A.14. Well No. 199-N28

FIGURE A.15. Well No. 199-N29

FIGURE A.16. Well No. 199-N30

FIGURE A.17. Well No. 199-N31

FIGURE A.18. Well No. 199-N32

FIGURE A.19. Well No. 199-N33

FIGURE A.20. Well No. 199-N34

FIGURE A.21. Well No. 199-N35

FIGURE A.22. Well No. 199-N36

FIGURE A.23. Well No. 199-N37

FIGURE A.24. Well No. 199-N38

FIGURE A.25. Well No. 199-N39

FIGURE A.26. Well No. 199-N40

FIGURE A.27. Well No. 199-N41

FIGURE A.28. Well No. 199-N42

FIGURE A.29. Well No. 199-N43

FIGURE A.30. Well No. 199-N44

FIGURE A.31. Well No. 199-N45

FIGURE A.32. Well No. 199-N46

FIGURE A.33. Well No. 199-N49

FIGURE A.34. Well No. 199-N50

FIGURE A.35. Well No. 199-N51

FIGURE A.36. Well No. 199-N52

FIGURE A.37. Well No. 199-N53

FIGURE A.38. Well No. 699-86-60

FIGURE A.37. Well No. 800-82-30

FIGURE A.38. Well No. 800-82-30

APPENDIX B

PROCEDURE FOR WATER-LEVEL MEASUREMENTS FOR THE 100-N AREA
WATER-LEVEL NETWORK

APPENDIX B

PROCEDURE FOR WATER-LEVEL MEASUREMENTS FOR THE 100-N AREA WATER-LEVEL NETWORK

EQUIPMENT

The following equipment will be needed:

- graduated steel measuring tape with attached weight
- blue carpenter's chalk
- 100-N Area Water-Level Network field notebook

PROCEDURE

If the steel tape has a zero reading point, chalk the 1-foot section of tape below it. If the steel tape has no zero reading point and has divisions in hundredths of a foot all along it, then chalk several feet of the bottom portion of the tape.

Estimate the approximate depth to water by using the most recent of previous measurements.

Lower the steel tape into the well to the estimated water level. Read the value of the "hold point" from the tape while holding it even with the well's measuring point (marked with paint) on the top of the casing.

Remove the steel tape and check the wetted portion at the end of the tape.

NOTE: If the chalked portion is not wet, repeat the procedure using a greater hold point. If the chalked portion is completely wet, repeat the procedure using a lesser hold point.

If the tape has the 1-foot section of divisions, then add the unwetted length of the chalked portion of the tape to the hold point value to obtain the depth-to-water measurement. If the tape has divisions all along its length, then subtract the wetted length of the chalked portion of the tape from the hold point value to obtain the depth-to-water measurement.

Repeat the procedure until two steel-tape measurements are within ± 0.05 feet of each other.

Record the date, well number, depth-to-water measurements, time of measurements, steel-tape number, and the initials of the person taking the measurements in the 100-N Area Water-Level Network field notebook. If you must subtract the wetted length to obtain the depth-to-water measurement, then record the hold point and the length of the wet portion as well as the depth-to-water measurements.

PROCEDURE FOR CONTINUOUS WATER-LEVEL MONITORING USING STEVENS RECORDERS

1. Set up the water-stage recorder as shown in Figure B.1.
2. Make a depth-to-water measurement by the graduated steel-tape method as described above.
3. Mark on the graph paper the well number, time increment, depth increment, date, time, measurement device, initials of person taking the measurement, and depth-to-water measurement.
4. Set the pen on the graph paper so that the pen is at the current depth-to-water measurement and time increment.
5. Start the clock.
6. Repeat this procedure each time a piece of graph paper is removed.
7. Note unusual occurrences (e.g., clock stopped) in the field log book.
8. Record in the field log book the well number, date and time of measurement, depth-to-water measurement, time and date of measurement, measuring device, and person taking the measurement.

FIGURE B.1. Schematic Drawing of Water-Stage Recorder

Water - also Recorder

Well Casing

Well Bottom

Water Level

Water Level

Groundwater

Flow

FIGURE 3.1. Schematic drawing of water-level recorder.

APPENDIX C

STEEL-TAPE MEASUREMENTS AND CASING ELEVATIONS

APPENDIX C

STEEL-TAPE MEASUREMENTS AND CASING ELEVATIONS

The tables in this appendix show the actual data on which this report is based. Table C.1 lists the casing elevations for wells in the 100-N Area. Table C.2 cross-references the wells and the dates they were sampled, making it easier to find measurements from a particular well in Tables C.3 and C.4 (1985 and 1986-1987 measurements, respectively).

TABLE C.1. Casing Elevations of Wells at 100-N Area

<u>Well Number</u>	<u>Casing Elevation (ft)</u>	<u>Date Surveyed</u>
199-N2	459.83	01/01/67
199-N3	459.45	01/01/67
199-N4	458.73	05/22/84
199-N6	460.97	01/01/67
199-N7	460.73	01/01/67
199-N8P	405.12	08/28/87
199-N8Q	404.62	08/28/87
199-N8R	404.09	08/28/87
199-N8S	404.57	08/28/87
199-N8T	not surveyed	
199-N14	453.15	09/19/85
199-N15	456.38	no record
199-N17	461.20	3/81
199-N18	458.20	3/81
199-N19	453.90	3/81
199-N20	455.90	3/81
199-N27	449.09	09/19/85
199-N28	464.24	10/27/83
199-N29	465.25	10/27/83
199-N30	459.90	10/27/83
199-N31	462.63	10/27/83
199-N32	462.08	10/27/83
199-N33	459.87	09/19/85
199-N34	459.63	10/27/83
199-N35	449.38	05/22/84
199-N36	458.97	09/19/85
199-N37	456.12	09/19/85
199-N38	456.40	05/22/84
199-N39	454.31	09/19/85
199-N40	456.35	09/19/85
199-N41	457.59	09/19/85
199-N42	455.14	09/19/85
199-N43	449.01	09/19/85
199-N44	460.76	09/19/85
199-N45	452.31	09/19/85
199-N46	404.70	08/28/87
199-N49	450.72	09/19/85
199-N50	463.36	09/19/85
199-N51	462.18	09/19/85
199-N52	463.70	09/19/85
199-N53	461.76	09/19/85
699-86-60	453.07	no record

TABLE C.2. Dates When Measurements Were Taken at Each Well

	9/11/ 85	9/12/ 85	9/13/ 85	9/17/ 85	9/18/ 85	9/20/ 85	9/21/ 85	9/25/ 85	9/27/ 85	9/30/ 85	10/2/ 85	10/4/ 85	10/11/ 85	10/16/ 85	10/23/ 85
199-N2															
199-N3															
199-N4		1	1	1		1									
199-N6		1	1	1		1									
199-N7		1	1	1		1	1 1	1	1	1	1				
199-N8P															
199-N8Q															
199-N8R															
199-N8S															
199-N14	1	1	1	1	1	1	1 1	1	1	1	1				
199-N15		1	1	1		1									
199-N17															
199-N18															
199-N19															
199-N20															
199-N27	1	1	1	1		1	1 1	1	1	1	1				
199-N28	1	1	1	1		1	1 1	1	1	1	1				
199-N29	1	1	1	1		1	1 1	1	1	1	1				
199-N30	1	1	1	1		1	1 1	1	1	1	1				
199-N31	1	1	1	1		1	1 1	1	1	1	1				
199-N32	1	1	1	1		1	1 1	1	1	1	1				
199-N33	1	1	1	1		1	1 1	1	1	1	1				
199-N34	1	1	1	1		1	1 1	1	1	1	1				
199-N35															
199-N36	1	1	1	1		1	1 1	1	1	1	1				
199-N37	1	1	1	1		1	1 1	1	1	1	1				
199-N38															
199-N39			1	1		1	1 1	1	1	1	1				
199-N40	1	1	1	1		1	1 1	1	1	1	1				
199-N41	1	1	1	1		1	1 1	1	1	1	1				
199-N42	1	1	1	1		1	1 1	1	1	1	1				
199-N43				1	1	1		1				1	1	1	
199-N44	1	1	1	1		1	1 1	1	1	1	1				
199-N45	1	1	1	1	1	1	1	1		1	1	1	1	1	
199-N46															
199-N49	1	1	1	1		1	1 1	1	1	1	1				
199-N50	1	1	1	1		1	1 1	1	1	1	1				
199-N51	1	1	1	1		1	1 1	1	1	1	1				
199-N52	1	1	1	1		1	1 1	1	1	1	1				
199-N53	1	1	1	1	1	1	1 1	1	1	1	1				
899-86-80		1	1	1		1									

TABLE C.2. (contd)

	10/30/ 85	11/8/ 85	11/14/ 85	11/21/ 85	12/22/ 86	12/23/ 86	1/5/ 87	1/6/ 87	1/13/ 87	1/15/ 87	1/19/ 87	2/25/ 87	7/21/ 87	7/22/ 87
199-N2					1			1		1				
199-N3					1	1	1			1		1		
199-N4					1	1	1			1		1		
199-N6					1			1		1			1	
199-N7					1			1			1			
199-N8P													1	
199-N8Q													1	
199-N8R													1	
199-N8S													1	
199-N14					1			1	1		1		1	
199-N15					1			1						
199-N17														1
199-N18														1
199-N19														1
199-N20														1
199-N27					1	1	1		1		1	1	1	
199-N28					1			1	1		1		1	
199-N29					1			1	1		1		1	
199-N30					1			1	1		1		1	
199-N31					1	1		1	1	1	1	1	1	
199-N32					1			1	1		1		1	
199-N33					1			1			1		1	
199-N34					1	1	1		1		1	1	1	
199-N35														
199-N36					1			1	1		1		1	
199-N37					1			1	1		1			
199-N38														
199-N39					1			1	1		1		1	
199-N40					1			1	1		1		1	
199-N41					1			1	1		1		1	
199-N42					1			1	1		1		1	
199-N43	1	1	1	1										
199-N44					1			1	1		1		1	
199-N45	1	1	1	1										
199-N46														
199-N49					1			1	1		1		1	
199-N50									1		1		1	
199-N51					1			1	1		1		1	
199-N52					1			1	1		1		1	
199-N53					1			1	1				1	
699-86-60					1			1		1				

TABLE C.3. 100-N Water-Level Measurements Taken From
September 11, 1985, to November 21, 1985

<u>Well Number</u>	<u>Depth to Water (ft)</u>	<u>Elev. of Water Table (ft)</u>	<u>Time</u>
--------------------	--------------------------------	--------------------------------------	-------------

** WATER-LEVEL MEASUREMENTS TAKEN ON 09/11/85

199-N14	56.91	396.24	1323
199-N27	50.38	398.71	1428
199-N28	65.51	398.73	1420
199-N29	65.94	399.31	1115
199-N30	59.88	400.02	1119
199-N31	61.98	400.65	1135
199-N32	62.15	399.93	1142
199-N33	58.02	401.85	1129
199-N34	59.02	400.61	1125
199-N36	59.38	399.59	1150
199-N37	56.12	400.00	1225
199-N40	59.27	397.08	1238
199-N41	65.42	392.17	1247
199-N42	63.08	392.06	1439
199-N44	64.20	396.56	1435
199-N45	53.18	399.13	1459
199-N49	53.67	397.05	1311
199-N50	77.95	385.41	1345
199-N51	79.30	382.88	1335
199-N52	66.00	397.70	1445
199-N53	60.17	401.59	1316

** WATER-LEVEL MEASUREMENTS TAKEN ON 09/12/85

199-N4	58.59	400.14	1031
199-N6	59.62	401.35	1036
199-N7	60.34	400.39	0851
199-N14	57.06	396.09	0953
199-N15	57.14	399.24	1026
199-N27	50.38	398.71	0811
199-N28	65.49	398.75	0806
199-N29	65.88	399.37	0801
199-N30	59.84	400.06	0854
199-N31	62.01	400.62	0914
199-N32	62.18	399.90	0907
199-N33	58.10	401.77	0903
199-N34	59.04	400.59	0859
199-N36	59.42	399.55	0920
199-N37	56.21	399.91	0924
199-N40	59.29	397.06	0929
199-N41	65.41	392.18	0933

TABLE C.3. (contd)

<u>Well Number</u>	<u>Depth to Water (ft)</u>	<u>Elev. of Water Table (ft)</u>	<u>Time</u>
199-N42	63.09	392.05	0821
199-N44	64.19	396.57	0819
199-N45	53.18	399.13	0841
199-N49	53.72	397.00	0959
199-N50	77.96	385.40	0943
199-N51	78.29	383.89	0948
199-N52	66.78	396.92	0829
199-N53	60.02	401.74	1003
699-86-60	53.22	399.85	1039

** WATER-LEVEL MEASUREMENTS TAKEN ON 09/13/85

199-N4	58.82	399.91	1422
199-N6	59.75	401.22	1426
199-N7	60.38	400.35	1305
199-N14	57.30	395.85	1359
199-N15	57.21	399.17	1419
199-N27	50.41	398.68	1223
199-N28	65.47	398.77	1148
199-N29	65.93	399.32	1143
199-N30	59.88	400.02	1306
199-N31	62.11	400.52	1316
199-N32	62.27	399.81	1319
199-N33	58.27	401.60	1312
199-N34	59.13	400.50	1309
199-N36	59.52	399.45	1322
199-N37	56.35	399.77	1324
199-N39	55.36	398.95	1335
199-N40	59.35	397.00	1341
199-N41	65.40	392.19	1345
199-N42	63.03	392.11	1247
199-N44	64.18	396.58	1228
199-N45	53.23	399.08	1152
199-N49	53.86	396.86	1403
199-N50	77.95	385.41	1350
199-N51	78.23	383.95	1355
199-N52	66.74	396.96	1258
199-N53	60.23	401.53	1406
699-86-60	53.27	399.80	1430

TABLE C.3. (contd)

<u>Well Number</u>	<u>Depth to Water (ft)</u>	<u>Elev. of Water Table (ft)</u>	<u>Time</u>
--------------------	--------------------------------	--------------------------------------	-------------

** WATER LEVEL MEASUREMENTS TAKEN ON 09/17/85

199-N4	59.19	399.54	1218
199-N6	60.11	400.86	1221
199-N7	60.59	400.14	1022
199-N14	58.29	394.86	1120
199-N15	57.50	398.88	1214
199-N27	50.56	398.53	0956
199-N28	65.49	398.75	0950
199-N29	66.03	399.22	0946
199-N30	60.10	399.80	1025
199-N31	62.45	400.18	1036
199-N32	62.59	399.49	1040
199-N33	58.84	401.03	1032
199-N34	59.44	400.19	1028
199-N36	59.84	399.13	1043
199-N37	56.83	399.29	1047
199-N39	55.76	398.55	1051
199-N40	59.67	396.68	1055
199-N41	65.48	392.11	1102
199-N42	63.00	392.14	1004
199-N43	62.62	386.39	0932
199-N44	64.25	396.51	1000
199-N45	53.38	398.93	0805
199-N49	54.33	396.39	1127
199-N50	77.99	385.37	1108
199-N51	78.21	383.97	1114
199-N52	66.96	396.74	1015
199-N53	61.47	400.29	1130
699-86-60	53.55	399.52	1226

** WATER-LEVEL MEASUREMENTS TAKEN ON 09/18/85

199-N14	58.42	394.73	1132
199-N43	62.62	386.39	1100
199-N45	53.45	398.86	1222
199-N53	61.53	400.23	1137

** WATER-LEVEL MEASUREMENTS TAKEN ON 09/20/85

199-N4	59.44	399.29	1237
199-N6	60.01	400.96	1241
199-N7	60.62	400.11	1049

TABLE C.3. (contd)

<u>Well Number</u>	<u>Depth to Water (ft)</u>	<u>Elev. of Water Table (ft)</u>	<u>Time</u>
199-N14	58.82	394.33	1215
199-N15.	57.68	398.70	1234
199-N27	50.05	399.04	1040
199-N28	65.20	399.04	0938
199-N29	65.19	400.06	0927
199-N30	59.72	400.18	1108
199-N31	62.02	400.61	1116
199-N32	61.81	400.27	1122
199-N33	58.90	400.97	1112
199-N34	59.56	400.07	1104
199-N36	59.57	399.40	1129
199-N37	56.86	399.26	1148
199-N39	55.96	398.35	1152
199-N40	59.83	396.52	1158
199-N41	65.58	392.01	1201
199-N42	63.04	392.10	1048
199-N43	62.64	386.37	1021
199-N44	64.30	396.46	1045
199-N45	50.62	401.69	0950
199-N49	54.71	396.01	1219
199-N50	78.05	385.31	1205
199-N51	78.36	383.82	1210
199-N52	66.69	397.01	1053
199-N53	61.95	399.81	1223
699-86-60	53.69	399.38	1244

** WATER-LEVEL MEASUREMENTS TAKEN ON 09/21/85

199-N7	60.32	400.41	1605
199-N14	59.15	394.00	1755
199-N27	49.17	399.92	1455
199-N28	64.43	399.81	1443
199-N29	63.91	401.34	1550
199-N30	58.86	401.04	1555
199-N31	61.06	401.57	1623
199-N32	60.54	401.54	1635
199-N33	58.56	401.31	1619
199-N34	58.52	401.11	1610
199-N36	58.91	400.06	1640
199-N37	56.56	399.56	1647

TABLE C.3. (contd)

<u>Well Number</u>	<u>Depth to Water (ft)</u>	<u>Elev. of Water Table (ft)</u>	<u>Time</u>
199-N39	55.80	398.51	1658
199-N40	59.74	396.61	1705
199-N41	65.62	391.97	1711
199-N42	63.04	392.10	1526
199-N44	64.15	396.61	1506
199-N49	54.84	395.88	1720
199-N50	78.06	385.30	1734
199-N51	78.35	383.83	1747
199-N52	66.60	397.10	1538
199-N53	62.50	399.26	1759

** WATER-LEVEL MEASUREMENTS TAKEN ON 09/25/85

199-N7	59.68	401.05	1122
199-N14	60.38	392.77	1207
199-N27	47.89	401.20	1041
199-N28	63.01	401.23	1048
199-N29	62.52	402.73	1044
199-N30	57.61	402.29	1125
199-N31	59.79	402.84	1132
199-N32	59.41	402.67	1138
199-N33	58.04	401.83	1132
199-N34	57.50	402.13	1128
199-N36	57.90	401.07	1141
199-N37	56.03	400.09	1144
199-N39	55.44	398.87	1147
199-N40	59.41	396.94	1151
199-N41	65.49	392.10	1155
199-N42	62.96	392.18	1029
199-N44	63.54	397.22	1024
199-N45	47.28	405.03	1004
199-N49	55.27	395.45	1210
199-N50	77.88	385.48	1159
199-N51	77.89	384.29	1203
199-N52	66.01	397.69	1034
199-N53	63.36	398.40	1214

** WATER-LEVEL MEASUREMENTS TAKEN ON 09/27/85

199-N7	59.81	400.92	0809
199-N14	60.81	392.34	0852
199-N27	48.40	400.69	0749
199-N28	63.20	401.04	0711

TABLE C.3. (contd)

<u>Well Number</u>	<u>Depth to Water (ft)</u>	<u>Elev. of Water Table (ft)</u>	<u>Time</u>
199-N29	63.18	402.07	0707
199-N30	58.15	401.75	0812
199-N31	60.53	402.10	0821
199-N32	60.23	401.85	0825
199-N33	58.47	401.40	0819
199-N34	58.01	401.62	0814
199-N36	58.35	400.62	0827
199-N37	56.29	399.83	0830
199-N39	55.54	398.77	0833
199-N40	59.40	396.95	0836
199-N41	65.44	392.15	0839
199-N42	62.81	392.33	0756
199-N43	62.48	386.53	0736
199-N44	63.77	396.99	0753
199-N45	49.24	403.07	0723
199-N49	55.45	395.27	0855
199-N50	77.74	385.62	0843
199-N51	77.76	384.42	0847
199-N52	65.74	397.96	0803
199-N53	63.68	398.08	0858

** WATER-LEVEL MEASUREMENTS TAKEN ON 09/30/85

199-N7	60.05	400.68	0949
199-N14	61.54	391.61	1117
199-N27	48.59	400.50	0903
199-N28	63.24	401.00	0854
199-N29	63.25	402.00	0847
199-N30	58.48	401.42	0955
199-N31	60.98	401.65	1011
199-N32	60.60	401.48	1018
199-N33	59.01	400.86	1005
199-N34	59.18	400.45	1000
199-N36	58.72	400.25	1025
199-N37	56.68	399.44	1031
199-N39	55.86	398.45	1042
199-N40	59.61	396.74	1047
199-N41	65.40	392.19	1051
199-N42	62.72	392.42	0922
199-N44	63.42	397.34	0915
199-N49	55.79	394.93	1123
199-N50	77.83	385.53	1104
199-N51	77.86	384.32	1112
199-N52	65.59	398.11	0940
199-N53	64.28	397.48	1129

TABLE C.3. (contd)

<u>Well Number</u>	<u>Depth to Water (ft)</u>	<u>Elev. of Water Table (ft)</u>	<u>Time</u>
--------------------	--------------------------------	--------------------------------------	-------------

** WATER-LEVEL MEASUREMENTS TAKEN ON 10/02/85

199-N7	60.25	400.48	0910
199-N14	61.70	391.45	1021
199-N27	48.78	400.31	0844
199-N28	63.39	400.85	0838
199-N29	63.51	401.74	0833
199-N30	58.77	401.13	0914
199-N31	61.32	401.31	0932
199-N32	60.91	401.17	0937
199-N33	59.34	400.53	0928
199-N34	59.23	400.40	0921
199-N36	58.97	400.00	0941
199-N37	56.93	399.19	0945
199-N39	56.07	398.24	0950
199-N40	59.74	396.61	0954
199-N41	65.41	392.18	0959
199-N42	62.66	392.48	0856
199-N44	63.45	397.31	0851
199-N49	55.98	394.74	1026
199-N50	77.55	385.81	1008
199-N51	77.50	384.68	1016
199-N52	65.53	398.17	0904
199-N53	64.59	397.17	1031

** WATER-LEVEL MEASUREMENTS TAKEN ON 10/04/85

199-N7	60.38	400.35	1056
199-N14	62.03	391.12	1203
199-N27	48.80	400.29	1029
199-N28	63.40	400.84	1021
199-N29	63.51	401.74	1017
199-N30	58.86	401.04	1100
199-N31	61.43	401.20	1116
199-N32	60.97	401.11	1122
199-N33	59.56	400.31	1110
199-N34	59.04	400.59	1105
199-N36	59.07	399.90	1125
199-N37	57.10	399.02	1129
199-N39	56.25	398.06	1133
199-N40	59.96	396.39	1137
199-N41	65.41	392.18	1142
199-N42	62.67	392.47	1042
199-N43	62.33	386.68	1251
199-N44	63.54	397.22	1037

TABLE C.3. (contd)

<u>Well Number</u>	<u>Depth to Water (ft)</u>	<u>Elev. of Water Table (ft)</u>	<u>Time</u>
199-N45	49.41	402.90	1237
199-N49	56.20	394.52	1207
199-N50	77.64	385.72	1153
199-N51	77.44	384.74	1158
199-N52	65.50	398.20	1049
199-N53	64.87	396.89	1212

** WATER-LEVEL MEASUREMENTS TAKEN ON 10/11/85

199-N43	62.20	386.81	1518
199-N45	50.14	402.17	1452

** WATER-LEVEL MEASUREMENTS TAKEN ON 10/16/85

199-N43	62.34	386.67	0821
199-N45	51.35	400.96	0808

** WATER-LEVEL MEASUREMENTS TAKEN ON 10/23/85

199-N43	62.43	386.58	0927
199-N45	47.23	405.08	0907

** WATER-LEVEL MEASUREMENTS TAKEN ON 10/30/85

199-N43	62.35	386.66	1030
199-N45	49.25	403.06	1030

** WATER-LEVEL MEASUREMENTS TAKEN ON 11/08/85

199-N43	62.17	386.84	1335
199-N45	48.38	403.93	1320

** WATER-LEVEL MEASUREMENTS TAKEN ON 11/14/85

199-N43	61.98	387.03	1325
199-N45	49.73	402.58	1310

** WATER-LEVEL MEASUREMENTS TAKEN ON 11/21/85

199-N43	61.81	387.20	1450
199-N45	50.65	401.66	1441

TABLE C.4. 100-N Water-Level Measurements Taken From
December 22, 1986, to July 22, 1987

<u>Well Number</u>	<u>Depth to Water (ft)</u>	<u>Elev. of Water Table (ft)</u>	<u>Time</u>
--------------------	--------------------------------	--------------------------------------	-------------

** WATER-LEVEL MEASUREMENTS TAKEN ON 12/22/86

199-N2	67.50	392.33	1157
199-N3	67.83	391.62	1205
199-N4	62.06	396.67	1124
199-N6	62.91	398.06	1134
199-N7	61.81	398.92	1252
199-N14	64.38	388.77	1439
199-N15	59.59	396.79	1057
199-N27	49.38	399.71	1457
199-N28	61.49	402.75	1452
199-N29	65.18	400.07	1449
199-N30	60.77	399.13	1256
199-N31	63.63	399.00	1326
199-N32	62.91	399.17	1346
199-N33	61.89	397.98	1315
199-N34	60.91	398.72	1302
199-N36	60.57	398.40	1354
199-N37	58.76	397.36	1357
199-N39	57.88	396.43	1412
199-N40	61.12	395.23	1401
199-N41	65.74	391.85	1403
199-N42	62.49	392.65	1521
199-N44	64.08	396.68	1516
199-N49	57.92	392.80	1416
199-N51	77.69	384.49	1434
199-N52	65.41	398.29	1527
199-N53	66.87	394.89	1445
699-86-60	55.43	397.64	1139

** WATER-LEVEL MEASUREMENTS TAKEN ON 12/23/86

199-N3	67.81	391.64	1124
199-N4	62.06	396.67	1142
199-N27	48.81	400.28	1302
199-N31	63.61	399.02	1235
199-N34	60.88	398.75	0930

TABLE C.4. (contd)

<u>Well Number</u>	<u>Depth to Water (ft)</u>	<u>Elev. of Water Table (ft)</u>	<u>Time</u>
--------------------	--------------------------------	--------------------------------------	-------------

** WATER-LEVEL MEASUREMENTS TAKEN ON 01/05/87

199-N3	67.81	391.64	0932
199-N4	61.88	396.85	0954
199-N27	50.09	399.00	1037
199-N34	60.59	399.04	1013

** WATER-LEVEL MEASUREMENTS TAKEN ON 01/06/87

199-N2	67.45	392.38	0812
199-N6	61.79	399.18	0821
199-N7	61.59	399.14	0837
199-N14	64.43	388.72	1003
199-N15	59.46	396.92	0755
199-N28	62.70	401.54	1021
199-N29	64.91	400.34	1017
199-N30	60.53	399.37	0840
199-N31	63.65	398.98	0851
199-N32	63.00	399.08	0911
199-N33	61.68	398.19	0909
199-N36	60.78	398.19	0915
199-N37	58.84	397.28	0918
199-N39	57.88	396.43	0927
199-N40	61.18	395.17	0930
199-N41	65.84	391.75	0932
199-N42	62.61	392.53	1033
199-N44	64.15	396.61	1030
199-N49	58.00	392.72	1010
199-N51	77.20	384.98	0949
199-N52	65.42	398.28	1042
199-N53	56.84	404.92	1013
699-86-60	55.25	397.82	0826

** WATER-LEVEL MEASUREMENTS TAKEN ON 01/13/87

199-N14	73.97	379.18	1104
199-N27	50.50	398.59	1240
199-N28	64.63	399.61	1200
199-N29	65.35	399.90	1151
199-N30	60.86	399.04	0844
199-N31	63.88	398.75	0945
199-N32	63.49	398.59	1007
199-N34	60.91	398.72	0900
199-N36	61.10	397.87	1009
199-N37	59.05	397.07	1015

TABLE C.4. (contd)

<u>Well Number</u>	<u>Depth to Water (ft)</u>	<u>Elev. of Water Table (ft)</u>	<u>Time</u>
199-N39	57.95	396.36	1142
199-N40	61.18	395.17	1024
199-N41	65.66	391.93	1030
199-N42	62.48	392.66	1226
199-N44	64.26	396.50	1221
199-N49	57.89	392.83	1113
199-N50	76.57	386.79	1041
199-N51	76.38	385.80	1046
199-N52	65.54	398.16	1211
199-N53	66.98	394.78	1129

** WATER-LEVEL MEASUREMENTS TAKEN ON 01/15/87

199-N2	67.17	392.66	0910
199-N3	67.22	392.23	0859
199-N4	61.97	396.76	0845
199-N6	62.18	398.79	0918
199-N31	64.18	398.45	0951
699-86-60	55.42	397.65	0923

** WATER-LEVEL MEASUREMENTS TAKEN ON 01/19/87

199-N7	62.16	398.57	0914
199-N14	63.26	389.89	1057
199-N27	51.10	397.99	1120
199-N28	65.22	399.02	1113
199-N29	66.14	399.11	1109
199-N30	61.47	398.43	0918
199-N31	64.58	398.05	0951
199-N32	64.15	397.93	1011
199-N33	62.38	397.49	1004
199-N34	61.50	398.13	0932
199-N36	61.65	397.32	1015
199-N37	59.53	396.59	1019
199-N39	58.27	396.04	1023
199-N40	61.39	394.96	1026
199-N41	65.62	391.97	1030
199-N42	62.47	392.67	1132
199-N44	64.54	396.22	1128
199-N49	57.85	392.87	1101
199-N50	76.30	387.06	1041
199-N51	75.84	386.34	1046
199-N52	65.80	397.90	1138

TABLE C.4. (contd)

<u>Well Number</u>	<u>Depth to Water (ft)</u>	<u>Elev. of Water Table (ft)</u>	<u>Time</u>
--------------------	--------------------------------	--------------------------------------	-------------

** WATER-LEVEL MEASUREMENTS TAKEN ON 02/25/87

199-N3	68.23	391.22	0914
199-N4	62.99	395.74	0854
199-N27	51.69	397.40	1026
199-N31	65.41	397.22	0945
199-N34	62.37	397.26	0800

** WATER-LEVEL MEASUREMENTS TAKEN ON 07/21/87

199-N6	64.86	396.11	1258
199-N8P	16.13	388.99	1353
199-N8Q	19.53	385.09	1343
199-N8R	19.08	385.01	1340
199-N8S	19.40	385.17	1349
199-N14	67.05	386.10	1320
199-N27	53.42	395.67	0937
199-N28	67.53	396.71	0900
199-N29	68.78	396.47	1154
199-N30	63.87	396.03	1206
199-N31	67.11	395.52	1146
199-N32	66.43	395.65	1135
199-N33	64.76	395.11	1305
199-N34	63.96	395.67	1250
199-N36	63.97	395.00	1049
199-N39	59.40	394.91	1045
199-N40	63.58	392.77	1027
199-N41	66.85	390.74	1019
199-N42	64.26	390.88	0958
199-N44	66.59	394.17	0951
199-N49	59.80	390.92	1420
199-N50	77.89	385.47	1415
199-N51	79.82	382.36	1406
199-N52	67.89	395.81	0925
199-N53	68.74	393.02	1312

** WATER-LEVEL MEASUREMENTS TAKEN ON 07/22/87

199-N17	70.96	390.24	0845
199-N18	69.96	388.24	0829
199-N19	65.72	388.18	0838
199-N20	66.26	389.64	0852

DISTRIBUTION

<u>No. of Copies</u>		<u>No. of Copies</u>
<u>OFFSITE</u>		C. S. Cline
2	<u>DOE Technical Information Center</u>	D. W. Dragnich
		S. Dudziak
		C. E. Elderkin
		M. D. Freshley
		M. J. Graham
		L. K. Grove
		J. M. Hales
		M. S. Hanson
		P. C. Hays
15	<u>Westinghouse Hanford Company</u>	D. J. Holford
	D. F. Brendel	E. A. Jacobson
	L. P. Diediker	E. J. Jensen (10)
	J. J. Dorian	C. T. Kincaid
	K. A. Gano	G. V. Last
	E. M. Greager	T. L. Liikala
	I. D. Jacques	V. L. McGhan
	W. J. Klover	P. J. Mitchell
	A. C. McKarns	R. W. Nelson
	E. V. Padgett	D. R. Newcomer
	C. J. Perkins	J. R. Raymond
	K. M. Probasco	J. T. Rieger
	V. R. Richards	R. Schalla
	D. J. Rokkan	R. L. Skaggs
	D. J. Watson	R. M. Smith
	D. A. Wiggins	J. A. Stottlemire
45	<u>Pacific Northwest Laboratory</u>	R. E. Wildung
	M. J. Amios	Publishing Coordination (2)
	M. A. Chamness	Technical Report Files (5)

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100