

PATHFINDER

 A Cogema Resources Company

April 3, 2000

Mr. Thomas H. Essig
Chief, Uranium Recovery and
Low-Level Waste Branch
Division of Waste Management
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, MD 20850

Re: Docket No. 40-6622
License No. SUA-442

Dear Mr. Essig:

Enclosed please find five copies of an application for ground water Alternate Concentration Limits (ACLs) for the Shirley Basin mill and tailings site. Pathfinder requests that the NRC amend the above referenced license to incorporate the proposed ACLs.

Pathfinder has been endeavoring for over fifteen years to accomplish a ground water restoration at the site with overall favorable results. Of the thirteen constituents assigned ground water protection standards in the license, only two continue to exceed the site standard limits: uranium and thorium-230. While both of these parameters have been dramatically reduced in the ground water over the years, they remain at levels which have become very difficult to further reduce. Additionally, it is noteworthy that over the period of record these two constituents have routinely exceeded the site standards in the designated site background well. This would suggest that the site standards for uranium and thorium-230 originally were set unrealistically low.

We have concluded that we have essentially reached the point of ALARA relative to ground water restoration at the Shirley Basin site, prompting this application for ACLs. The enclosed application discusses the attainment of ALARA, presents sound technical justification for the proposed ACLs, and ably demonstrates the minimal public health risk associated with the proposed ACLs.

We would like to encourage the NRC to accomplish a timely review of this application. The modeling completed as part of the application indicates that there is no significant additional public health advantage or environmental improvement to be gained from continued operation of the corrective action plan (CAP) beyond early to mid 2001. Pathfinder would like to terminate the CAP at that point, subject to ACL approval. Upon termination of the CAP, a significant source of



Letter to T. Essig, USNRC, re. ACL Application, PMC-Shirley Basin, April 3, 2000, page 2.

additional pumped water that must be managed as part of the tailings system water balance will be eliminated. This in turn will reduce the area on the tailings dedicated to solution storage and evaporation, and ultimately, will accelerate the completion of site reclamation and final closure. Also of importance to Pathfinder is the ongoing and substantial cost involved with operating the CAP. It is apparent that we are quickly approaching the point of minimal additional benefit for the funds being expended on the CAP.

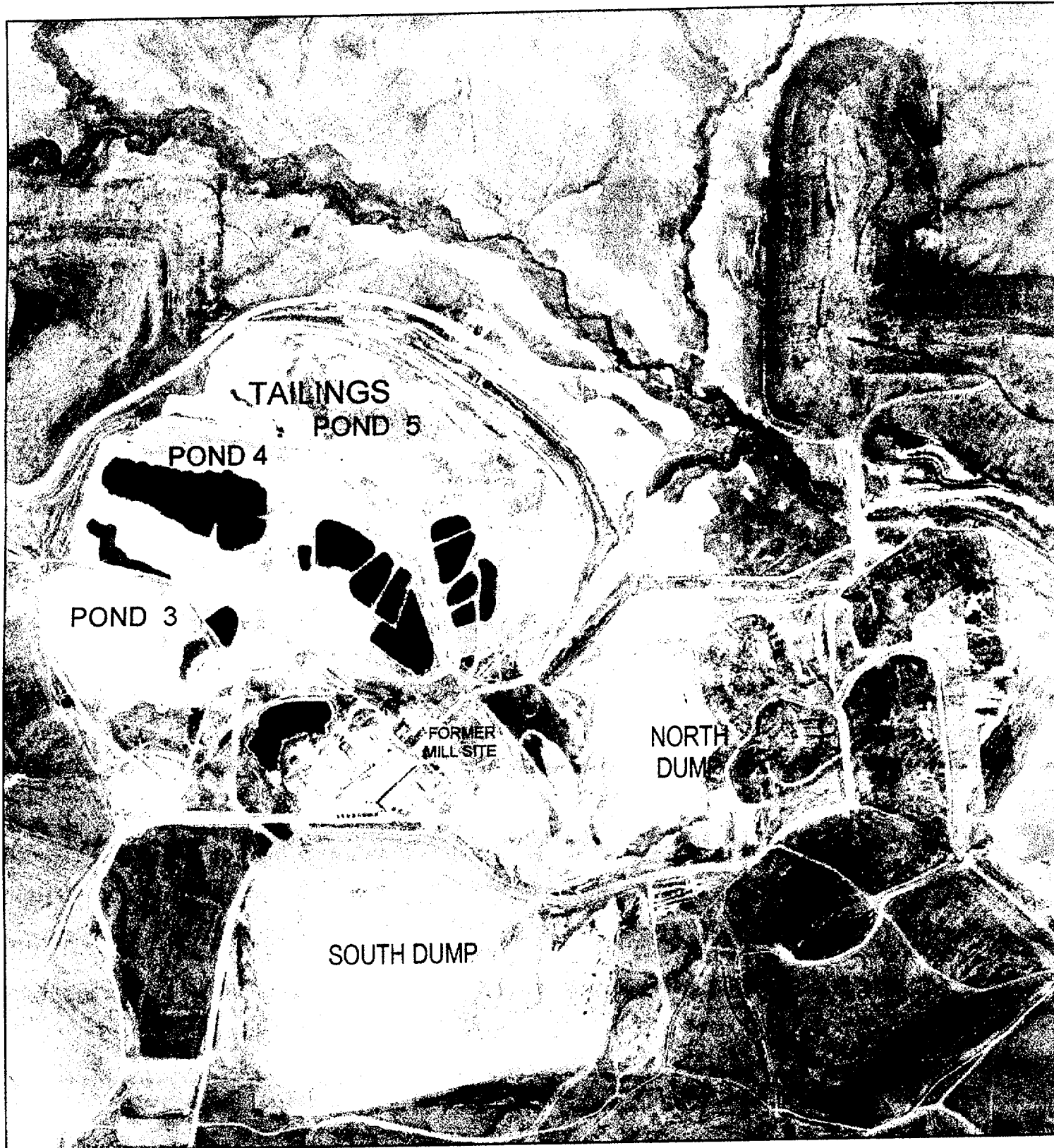
Once the NRC has completed an initial reading of the application we are willing to meet with your staff to discuss the application and provide any needed clarification or additional information that will expedite your staff's review. We look forward to hearing from you on this matter.

Sincerely,

T. W. Hardgrove
Manager, Environmental & Regulatory Services

Enclosure

cc: B. Spitzberg, USNRC Region IV
Gary Beach, Wyoming DEQ/WQD
D. L. Wichers
J. R. Blaise
Hydro-Engineering w/o encl.



**APPLICATION FOR
ALTERNATE CONCENTRATION LIMITS**

**PATHFINDER MINES CORPORATION
SHIRLEY BASIN MINE**

March 31, 2000

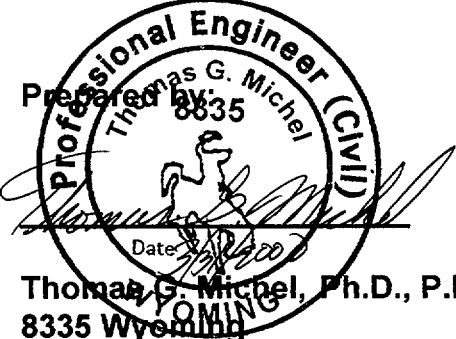
APPLICATION FOR:
ALTERNATE CONCENTRATION LIMITS
PATHFINDER MINES CORPORATION
SHIRLEY BASIN MINE

PREPARED FOR:
PATHFINDER MINES CORPORATION
SHIRLEY BASIN MINE

LICENSE NO. SUA-442

DOCKET NO. 40-6622

MARCH 2000



Professional Engineer (CIVIL)
Thomas G. Michel
8335
Date: 3/1/2000
Professional Engineer (CIVIL)
WYOMING

Thomas G. Michel, Ph.D., P.E.
8335 Wyoming
Hydro-Engineering

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PREFACE

This report presents a summary of the hydrologic conditions at the Shirley Basin Site in support of Alternate Concentration Limits (ACLs) for uranium and thorium-230. The 1999 Annual Report (Hydro-Engineering L.L.C., 2000) presents an updated analysis of the ground-water monitoring results. The 1999 Annual Report presents a tabulation of all Surficial Aquifer water-quality data in Appendix A. Ground-water conditions have also been defined in previous documents (see Hydro-Engineering, 1982, Robertson-Pincock, 1980). Monitoring results for this site have been presented in numerous documents and are listed in the Annual Reports (Hydro-Engineering, 1984-1996, and Hydro-Engineering L.L.C., 1997-1999). This report is written to summarize hydrologic conditions at the Shirley Basin Site, and these previous reports should be referred to for details.

Appendices A, B and C in this ACL report present details of the exposure assessment for this site. Section 2.3 of this report presents a summary of the results from these appendices. Appendices A, B and C and Section 2.3 were prepared by Kenneth R. Baker, Ph.D. of Environmental Restoration Group, Inc. Appendices D and E present the water-flow modeling and transport modeling, respectively. Appendix F presents summary water quality graphs and statistics. Page, figure, and table numbers are sequenced by the subsection number. Tables are located after their initial reference while all figures follow all text in their respective subsection.

EXECUTIVE SUMMARY

This document is an application for alternate concentration limits (ACLs) for Pathfinder Mines Corporation (PMC), Shirley Basin Site and follows the Nuclear Regulatory Commission (NRC) guidelines (NRC, 1996). The NRC has set the following site standards for the ground water at the site:

TABLE E-1. PMC SHIRLEY BASIN NRC SITE STANDARDS.

CONSTITUENTS	NRC
ARSENIC	0.05
BARIUM	1.0
BERYLLIUM	0.02
CADMIUM	0.01
CHROMIUM	0.05
GROSS ALPHA	15
LEAD	0.05
MOLYBDENUM	0.1
NICKEL	0.05
RADIUM-226 + RADIUM-228	5.0
SELENIUM	0.01
THORIUM-230	0.3
URANIUM	0.07

**NOTE: All concentrations are in mg/l except:
Radium-226 + Radium-228, Gross Alpha and Thorium-230 are in pCi/l.
Selenium site standard is replaced with EPA standard of 0.05 mg/l.**

The NRC site standards for uranium and thorium-230 will be exceeded at the two points of compliance (POC) after the completion of restoration efforts. The ground-water concentrations for arsenic, barium, beryllium, cadmium, chromium, lead, molybdenum, and nickel are presently low, and alternate concentration limits (ACL's) will not be required for these site standards. The site standard for selenium of 0.01 mg/l is lower than the current EPA drinking water standard of 0.05 mg/l, and the NRC site standard will be superseded by the drinking water standard. This document provides support for and proposes ACLs for uranium and thorium-230 at the POC's that will prevent the

exceedence of the concentrations stated in Table E-2 at the proposed point of exposure (POE). The following POE and POC concentrations are proposed:

TABLE E-2. PROPOSED CONCENTRATIONS.

CONSTITUENTS	POE Concentrations	Range of POC Concentrations
URANIUM	0.15	4.40 – 4.45
THORIUM-230	0.30	5.53 – 5.76

NOTE: Uranium concentration is in mg/l, Thorium-230 concentration is in pCi/l.

Based on historic data for well MC-14, background water-quality concentrations or activities at this site are above the site standards for uranium, thorium-230, gross alpha, and radium-226 + radium-228. However, the occurrences of elevated gross alpha, and radium-226 + radium-228 activities in MC-14 are infrequent and systematic in nature. As such, they are considered analytical or sampling errors that correspond with specific sampling cycles. South and west of the tailings impoundments, radium-226 + radium-228 activity is elevated and the selenium concentration exceeds the drinking water standard of 0.05 mg/l in a significant number of samples. The greater selenium concentration in this area occurs in some wells that are hydraulically isolated from tailings and is thought to be natural or the result of water table fluctuations that mobilize the constituents at the water table.

The recharge to the Surficial Aquifer is local, and there is not a contiguous regional Surficial aquifer system in the tailings area. The Surficial aquifer in the tailings area is bounded roughly on the northeast by Spring Creek and on the west by the Area 2 reclaimed mine pit. There is also a zero-saturation boundary southeast of the tailings where the Surficial sands are absent or are too shallow to be saturated. Northwest and

southwest of the tailings the piezometric surface is maintained by local recharge. Seepage from the tailings impoundments mixes with local recharge directly beneath the tailings.

Detailed hydrologic conditions have been defined for the quantity of water and drainage from the tailings area. A dewatering program has been designed to remove a substantial portion of the drainable water from the tailings. The long-term average drainage rate of the water that is not removed by dewatering has been estimated and presented in Section 2.1. The mixture of seepage from the tailings with the un-impacted Surficial ground water will require ACL's for this site.

Parameters developed from observed site ground-water conditions were used to predict the ion migration of the two constituents during post restoration conditions. These simulations, which represent as low as reasonably achievable (ALARA) conditions, were used to establish the ACL concentrations.

Exposure assessments were used to develop the proposed POE concentrations. This analysis shows that these concentrations are safe for down-gradient surface and ground-water users.

The corrective action program consists of aggressive dewatering of the tailings until mid 2001 in conjunction with continued operation of the Surficial aquifer collection and injection system until January 2001 or after. The analysis of the corrective action demonstrates that ALARA conditions can be met with this restoration program.

1.0 GENERAL INFORMATION

1.1 INTRODUCTION

This Alternate Concentration Limit (ACL) application is being submitted in accordance with 10 CFR, Part 40, Appendix A, Criterion 5B(6). Site-specific ACL's may be established by the United States Nuclear Regulatory Commission (NRC) if it can be shown that the constituents will not pose a substantial present or potential hazard to human health or the environment as long as the ACL's are not exceeded. It must also be demonstrated that the proposed ACL's are as low as reasonably achievable (ALARA). This application and the attachments provide sufficient evidence that these requirements have been met.

The groundwater restoration program at the Shirley Basin tailings facility has been operating since 1984, in compliance with a corrective action plan (CAP) approved by the NRC in 1989. The site is regulated by the NRC under radioactive materials license SUA-442.

A collection and injection system was designed to contain the seepage from the solid tailings storage area and restore the Surficial ground-water quality. The CAP consists of collecting contaminated water in the Surficial aquifer near the tailings impoundments and injecting non-contaminated fresh water into the aquifer down-gradient of this area to reverse the water flow toward the collection wells. A series of injection wells are also used to establish a hydraulic barrier in the Surficial aquifer along the east and northeast side of the No. 5 tailings impoundment. In addition, dewatering of the tailings impoundments is on-going. The contaminated water collected from the wells (collection water) has been evaporated or discharged to the Area 2/8 reclamation reservoir if it met specific water quality standards.

In 1989, the NRC established site standards for arsenic, barium, beryllium, cadmium, chromium, gross alpha, lead, molybdenum, radium-226 + radium-228, selenium, thorium-230, and uranium based on the average of a small number of samples taken from an up-gradient background well or based on EPA drinking water concentration

levels at the time. The operation of the CAP for over 16 years has resulted in the restoration of ground-water quality in the identified north and south plumes in the Mine Creek area. However, even after the tailings have been dewatered to the extent practicable, the concentrations of uranium, and thorium-230 at the point of compliance (POC) wells will not remain below the site standards. The background concentrations of uranium and thorium-230 at well MC-14 also routinely exceed the site standards. For thorium-230 and uranium, small quantities of seepage from the tailings are predicted to produce measurable elevations above background at the POC wells for a few decades. The seepage from the tailings after the planned dewatering until mid 2001 will be at a small rate that limits the concentrations at the POC wells, but also extends the duration of the elevated concentrations for a relatively long period of time. Continued restoration efforts beyond the planned dewatering until mid 2001 will be shown to be impractical. While ACLs will be required for these constituents, the calculations show that the concentrations at the point of exposure (POE) will be within acceptable limits.

1.2 FACILITY DESCRIPTION

PMC's Shirley Basin Mine site is located in southeast Wyoming as shown in Figure 1.2-1. The former uranium mill and mine site is located approximately 5 miles northeast of the former Shirley Basin town site. The town of Shirley Basin functioned primarily as a mining camp and has been entirely abandoned for more than 10 years. The nearest residence is a ranch location approximately three miles east of the tailings area.

The uranium mining in this area was in the Shirley Basin Mining district. PMC's mine site is just north of Petrotoxic's mine. Final reclamation is nearing completion for PMC's mine pits, which create two reclamation reservoirs.

1.2.1 URANIUM MILL FACILITIES

Uranium milling began at this site in 1971 and continued through 1992 when the last ore was processed. The mill has been decommissioned according to the decommissioning plan submitted to the NRC in June 1992. Figure 1.2-2 shows the former mill area. A total of 8,564,130 tons of ore were milled at the site. The mill utilized a conventional acid leaching process. The mill was demolished and placed in disposal trenches adjacent to the mill site and covered with uncontaminated soil.

The Tailings Reclamation Plan (TRP) specifies a cover system consisting of 2.5 feet of clay radon/infiltration barrier overlain by 0.5 feet of sandier material for the mill area. An erosion protection cover of topsoil or rock mulch and filter will overlay the barrier cover. Portions of the milling process equipment, including the dryer, were buried within the No. 4 Tailings Impoundment.

Figure 1.2-2 shows the location of the two solid tailings impoundments (the No. 4 and No. 5 Tailings impoundments) and the No. 3 Pond, which was used to contain tailings solution.

The No. 4 Tailings impoundment covers approximately 158 acres and appreciable (more than a few feet) depths of solid tailings were deposited over roughly 120 acres of

the pond. The No. 5 Tailings impoundment covers approximately 135 acres with tailings thicknesses of more than a few feet over approximately 110 acres. No solid tailings were deposited in Pond No. 3, which covers roughly 30 acres, but the area is used for disposal of ISL waste materials. There is interim cover over the No. 5 Tailings impoundment and over the exposed portions of the No. 4 impoundment. The maximum tailings thickness is approximately 63 feet in the No. 5 Tailings and the maximum thickness in the No. 4 Tailings is approaching 60 feet.

1.2.2 OFF-SITE POPULATIONS

There are currently no downstream or down-gradient residences within six miles of the tailings area. The nearest ranch residence is approximately three miles east of the tailings area and is located upgradient of the tailings in the flood plain of the Little Medicine Bow River. The confluence of Spring Creek, which bounds the Surficial Aquifer east of the tailings, and the Little Medicine Bow River is downstream of both the tailings area and the ranch site. This precludes any potential hydraulic communication in surface water or Surficial ground water between the tailings and the ranch home site.

1.2.3 GROUND-WATER RESTORATION FACILITIES

Pumping from five Surficial Aquifer collection wells installed downgradient (5A1, P3, P4, P6, and P7), began in November of 1984 (see Figure 1.2-3 for location of wells). Collection from well P4 ceased on November 28, 1984 because of very low yield. This left four collection wells operating to capture tailings seepage in the Surficial aquifer in the Mine Creek area. The initial monitoring program indicated that containment of seepage, or gradient reversal, was successful only in the permeable portions of the Surficial aquifer. It was determined that a water recharge system in conjunction with more pumping wells would be needed to insure continuous gradient reversal in the Mine Creek seepage areas of the Surficial aquifer. Consequently, a fresh water recharge system was constructed during the summer of 1986, and three more collection wells were added to the pumpback system.

Pumping from the three new wells, P1, P8A, and P9, began on October 6, 1986. Further monitoring, from late 1986 through August 7, 1987, indicated the need for two more pumping wells and better distribution of water in the North recharge line. Consequently, collection wells P10 and P11 and a permanent re-distribution water line from WW23 were added. Pumping of collection wells P1 and P7 was discontinued on August 9, 1990 because of low yields.

A series of injection, collection, and monitor wells were added to the ground-water restoration system in 1994. Twelve Surficial injection wells were installed on the interior of the northern edge of the No. 5 tailings dam (see Figure 1.2-3) with operation beginning on 5/2/94. The wells were placed 100 to 200 feet apart to produce a ground-water "ridge" as a barrier to seepage. The initial injection rate was approximately 25 gpm, but has declined to approximately 9 gpm with development of a ground-water mound. The source of the injection water is well WW20. With the exception of brief periods of down time for maintenance of individual wells, the system has operated continuously. Additional Surficial collection wells are distributed throughout the tailings area. Five additional Surficial monitoring wells were also installed on the northeast side of the No. 5 Tailings Dam to analyze the effectiveness of the injection/collection system.

In 1995, additional collection and injection wells were installed. Extraction from newly installed collection wells P12 through P21 began in 1996. The original common suction line pumping system was later converted to individual pumps. Extraction from the Surficial aquifer is supplemented with 16 collection wells within the tailings area. Injection wells TWI-12 through TWI-20 and TWI-22 extended the injection system along the No. 5 Dam to the south. Figure 1.2-3 presents the location of the injection and collection systems in the Surficial aquifer.

1.2.4 SURFACE WATER

Surface waters in the vicinity of the tailings include Mine Creek, the perennial streams Spring Creek and Fox Creek, the Area 3 and Area 2/8 reclamation reservoirs, and the Industrial Pond. The current continuous flow in Mine Creek results almost entirely from

fresh-water recharge. Fox Creek is tributary to Spring Creek on the east side of Spring Creek (see Figure 1.2-4 for location). The Surficial aquifer is intercepted and hydraulically bounded on the northeast side of the tailings by Spring Creek, and thus Fox Creek is hydraulically isolated from the tailings area. The Wyoming Department of Environmental Quality/Water Quality Division lists Spring Creek as a Class 2C surface water classification. A Class 2C water is subcategory of Class 2, Fisheries and Drinking water, which is known to support only non-game fish populations.

Both reclamation reservoirs penetrate the White River and Main Wind River aquifers, and the Area 2/8 reservoir also penetrates the Lower Wind River aquifer. The original mine pits removed the White River and Wind River aquifer materials. The reclamation of the mine pits has resulted in backfill of the pits to a point that is below the original White River aquifer. The slopes on the pit walls were graded to a 4H:1V or flatter. With this reclamation configuration, there is likely some convergent flow to the pit, but this is subject to the degree of hydraulic communication with the backfill.

The Industrial Pond is a constructed pond that provides water for construction uses and serves as a holding pond for the Area 2/8 discharge. The supply to the pond is a combination of runoff, discharge from the mine area supply well, WW20, and from the Surficial Aquifer discharge system. The water level in the pond is above the water level in the Surficial aquifer or the water level in the tailings. Thus, it is not vulnerable to contamination by seepage from the tailings. The final reclamation configuration will utilize the Industrial Pond as a surge pond for surface drainage with a partial breaching of the pond. Storage in the pond and the pond water level will be reduced dramatically, but the pond will still be hydraulically upgradient of the tailings and Surficial aquifer.

1.2.4.1 IMPACTS ON SURFACE WATER

Spring Creek serves as the receiver and hydraulic boundary for the Surficial aquifer on the east side of the tailings area. With the exception of Spring Creek and the remnant of Mine Creek, there are no measurable impacts on surface water. At the release point from the restricted area or the Point of Exposure (POE), Spring Creek has intercepted

the impacted Surficial ground water east of the tailings. Ground-water flow in this area is convergent to Spring Creek, which makes Spring Creek a gaining stream in this reach. As the boundary for the seepage impacted area of the Surficial aquifer, the ground-water impacts are consolidated to the POE on Spring Creek through discharge to the surface water. There is no measurable discharge of seepage-impacted ground water to other surface waters surrounding the tailings area.

1.2.4.2 SURFACE WATER FLOW

Base flows in Spring Creek and tributaries were measured in 1982 (Hydro-Engineering, 1982) and 1999. The measurements were taken in the fall when the flow is typically smallest. The identification of a base flow in Spring Creek is important because as the rate of surface flow decreases, the constituent concentrations in the composite of surface flow and ground-water discharge increase.

Two tributaries combine with Spring Creek in the reach adjacent to the tailings. Flow from Fox Creek, a perennial stream extending to the north and east from Spring Creek enters Spring Creek upstream of the confluence with Mine Creek. The flow in Fox Creek was measured and is typically 15% to 25% of the base flow in Spring Creek. Currently, the discharge from Mine Creek to Spring Creek is supported by the fresh-water recharge. The modeling predicts that the flow will decrease to approximately 1-2 gpm following cessation of recharge.

The 1982 flow measurements gave a flow rate of 237 gpm at a point on Spring Creek approximately 800 feet downstream of the confluence with Murdock Creek (see Figure 1.2-2). The base flow in Spring Creek just upstream of the confluence with Fox Creek was measured at 248 gpm and the flow in Fox Creek was measured at 57 gpm. Flow in Mine Creek was measured at 4.9 gpm and flow at a point just upstream of the haul road crossing of Spring Creek, (see Figure 1.2-2), was measured at 318 gpm. Downstream of the haul road crossing, Spring Creek enters a diversion around the reclaimed Area 3 mine pit. There is likely some surface-water/ground-water exchange in the diversion channel, but the configuration of the channel prevents accurate measurement. Based

on observation, there does not appear to be appreciable gain or loss within the diversion channel. The series of flow measurements indicates that there is approximately 24 gpm gain in Spring Creek through the measured reach when the Fox Creek flow is subtracted. The majority of this flow is believed to be ground-water discharge to Mine Creek and Spring Creek from the west side of Spring Creek. This is consistent with the modeling estimates of 20 gpm tailings area precipitation recharge, and 5 gpm of seepage from tailings.

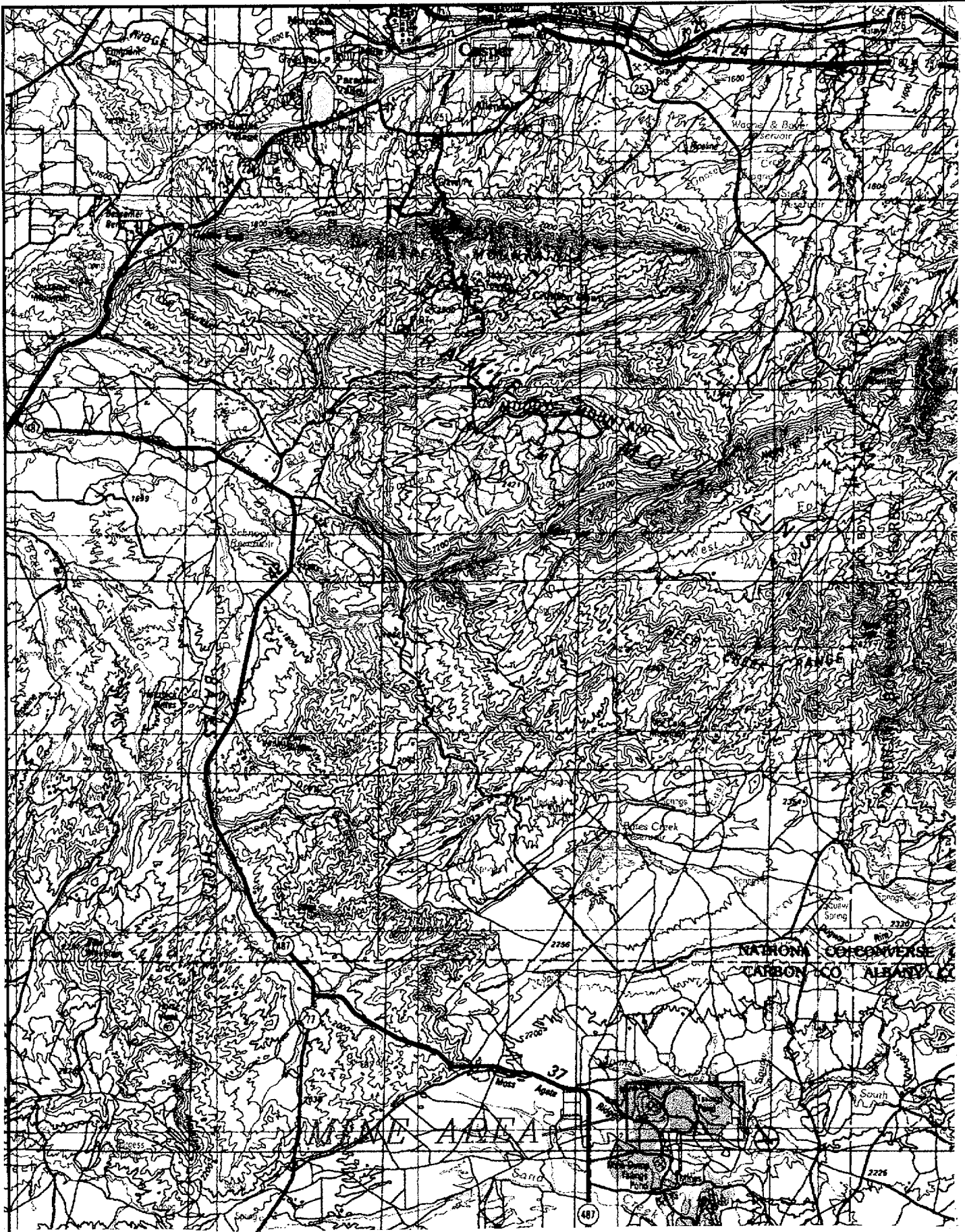
During the fall and early winter of 1999, additional flow measurements were taken along Spring Creek, Fox Creek and Mine Creek. Three 90-degree sharp-crested triangle weirs were installed along Spring Creek during 1999 and a 2-inch Parshall flume was installed on Fox Creek. The approximate locations of the flow measurements are shown in Figure 1.2-4. In addition, a 6-inch Parshall flume was used to measure flow in Spring Creek at the entrance of the culvert at the haul road crossing. A 3-inch Parshall flume was also used to measure flow rate in Mine Creek. A temporary 60-degree sharp-crested triangle weir plate was constructed to calibrate the three weirs. This weir plate was placed within the semi-permanent weirs along Spring Creek, and after stabilization, the flow measurements with and without the weir plate in place were compared to allow calibration of the semi-permanent weirs. Based on typical accuracies of open channel flow measurements under similar circumstances, a 3% resolution under steady flow would represent a fairly optimal installation. There is significant storage in the Spring Creek channel behind the weirs and natural obstructions, so the accuracy will deteriorate under non-steady flow conditions.

Four measurement cycles of Spring Creek flow were used to determine the ground-water discharge to the creek. The first two series of measurements were taken on 9/9/99 and 9/10/99 and yielded precisely the same results at each location where the measurements were taken on successive days, so these are lumped together as a single measurement cycle. Multiple measurements were taken on some days. The results are included in Table 1.2-1. The various measurement locations are listed starting on the upstream end. Weir #2 is located just downstream of the confluence

with Fox Creek, so the flow at Weir #2 represents the combination of Weir #1 flow, Fox Creek flow, and exchange with ground-water in the reach. Weir #3 is downstream of the confluence with Mine Creek, and thus represents the combination of Weir #2 flow, Mine Creek flow, and exchange with ground water in the reach. The 6-inch flume was temporarily installed at the entrance of the culvert for the haul road crossing and thus includes flow from Weir #3 and ground-water exchange in the reach downstream of Weir #3.

The sequence of measurements indicates the net flow gain between Weir #1 and Weir #3 for the first sampling cycle was 37.5 gpm when the Fox Creek flow is excluded. There was a measured net loss to ground water between Weir #1 and Weir #2 for this cycle, but this is thought to be an error resulting from the limits of flow measurement accuracy. The second sampling cycle of 10/6/99 showed a gain of 20.7 gpm between Weir #1 and Weir #2 when the Fox Creek flow is excluded. The gain between the Weir #2 and Weir #3 for this cycle was 46.9 gpm including a measured average of approximately 30 gpm flowing in Mine Creek. The last sampling cycle of 12/1/99 was intended primarily to determine ground-water discharge to the reach downstream of Weir #3. The comparison of the flow difference between Weir #3 and the 6-inch flume indicates that flow gain in the reach is between 9 gpm and 28 gpm. Unfortunately, there was snow on the ground at the time the measurements were taken, and by early afternoon the temperatures were high enough that there was some snowmelt. The first measurements were taken around noon when snowmelt was minimal. However, the flume installation was completed approximately an hour before the measurement was taken so the stabilization may not have been entirely complete. Shortly after the first measurement was taken, there was some evidence of snowmelt so the 28 gpm gain shown for the second measurement undoubtedly includes snowmelt runoff in the reach. Based on the range of measurements for this cycle, an estimated 10-12 gpm of ground water is discharging to Spring Creek in the reach between Weir #3 and the culvert. For the same cycle, the gain in flow between Weir #2 and Weir #3 was 41 gpm. Weir #1 was completely covered by a snowdrift during this cycle.

The smallest 1999 flow measurements for Spring Creek show nearly a 50% increase over the 1982 measurements. Based upon the Weir #1 and Fox Creek flows, all but the last measurement cycle appears to be representative of a late season base flow for a relatively wet recharge cycle. A comparison of the precipitation records for 1982 and 1998, the most recent available precipitation record, shows an increase from 10.13 inches to 14.71 inches of precipitation. It is likely that base flow is affected by the quantity and nature of precipitation for one or more years prior to the actual measurement. The 1982 measurements came at the end of a 3-year drought cycle, while precipitation in the two years prior to the 1999 measurements was above normal. For the purposes of transport modeling, the base flow in Spring Creek was assumed to be 290 gpm, or approximately the sum of the upstream base flow and the Fox Creek flow from 1982. The two flows were summed because Fox Creek contributes unimpacted flow upstream of the area of primary ground-water discharge to Spring Creek.

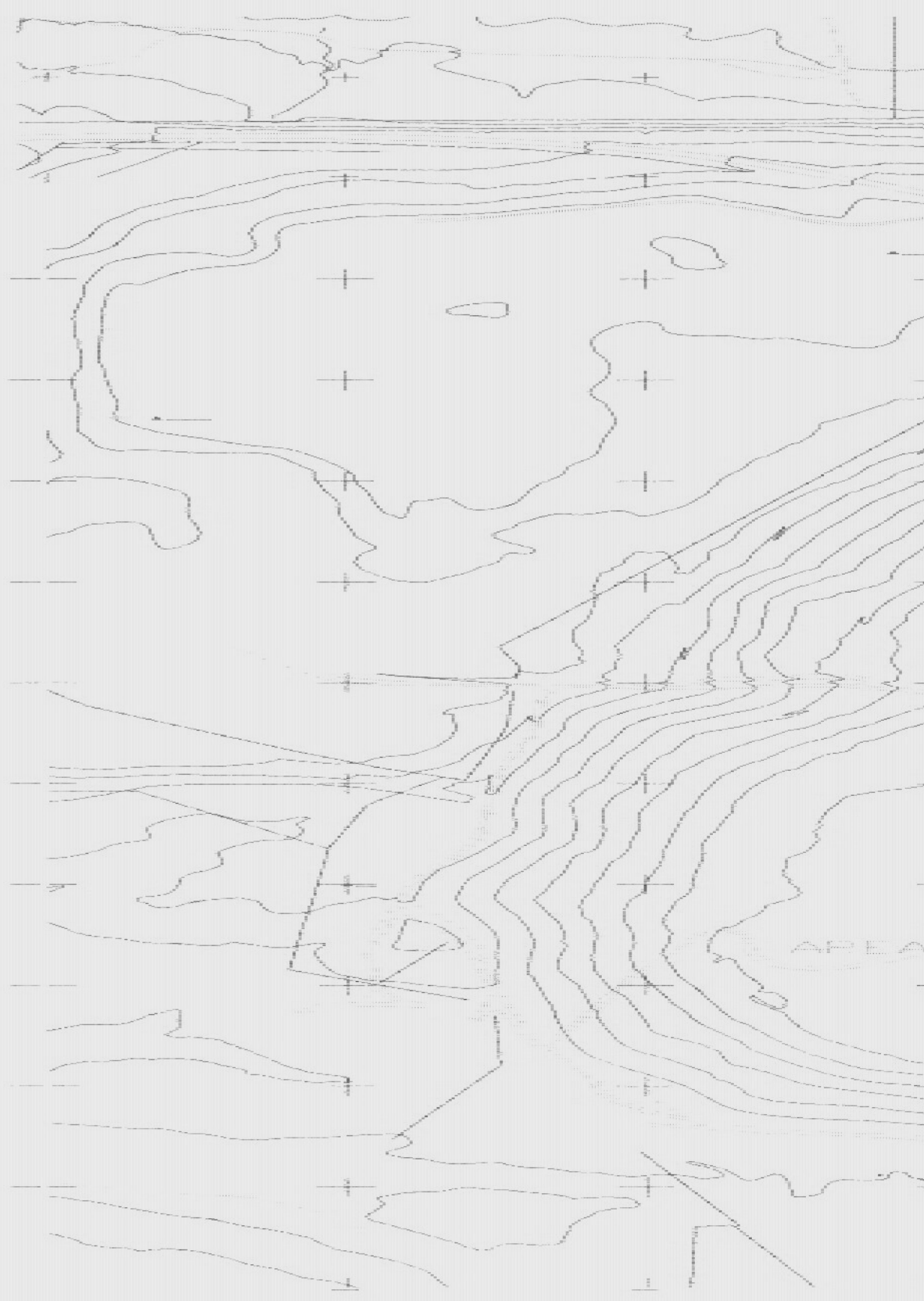


PATHFINDER
 PATHFINDER MINES CORPORATION
 SHIRLEY BASIN, WYOMING

FIGURE 1.2-1 LOCATION OF THE
 SHIRLEY BASIN MINE

DRAWN BY: TGM DATE: 1-2000





C-1



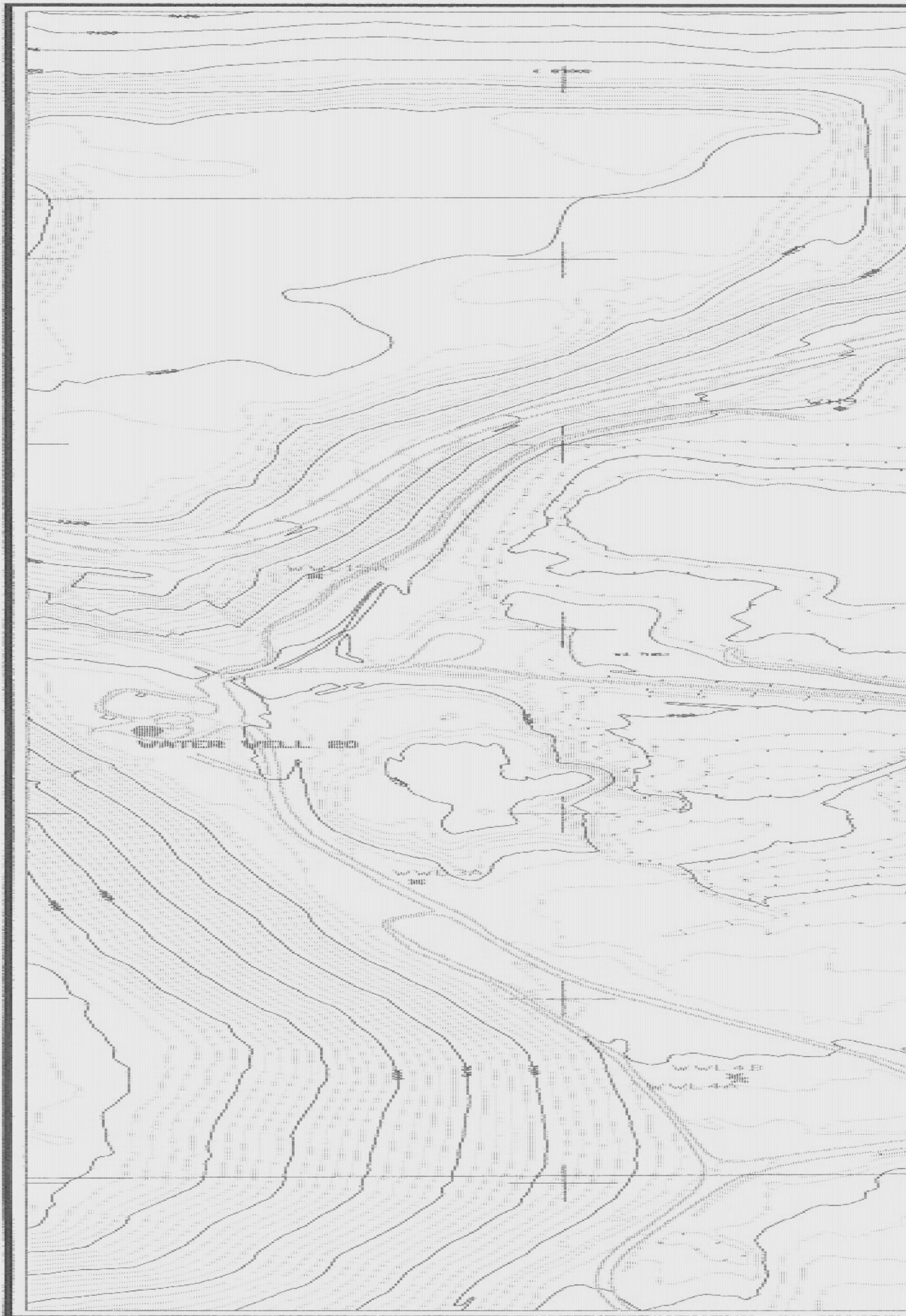
MINE CREEK

DRAINAGE

AREA 3 NORTH DUMP

MILL AREA AND

DUMP



C-3

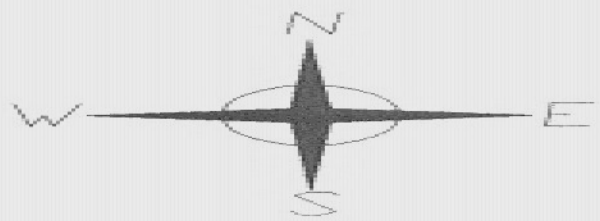


TABLE 1.2-1. SPRING CREEK FLOW SUMMARY FOR 1999

	Date	Time	Reading (feet)	Discharge (cfs)	Discharge (gpm)	Calibration Factor
Weir #1	9/9/99	16:55	0.64	0.781	350.44	0.957
	9/10/99	15:50	0.64	0.781	350.44	0.957
	10/6/99	7:46	0.638	0.775	347.71	0.957
Weir #2	9/9/99	16:49	0.675	0.929	417.07	0.997
	9/10/99	12:31	0.675	0.929	417.07	0.997
	10/6/99	8:13	0.69	0.982	440.63	0.997
	12/1/99	14:16	0.745	1.189	533.75	0.997
Weir #3	9/9/99	13:20	0.72	1.032	463.06	0.942
	10/6/99	10:00	0.735	1.086	487.55	0.942
	12/1/99	12:46	0.78	1.260	565.64	0.942
	12/1/99	14:35	0.785	1.281	574.75	0.942
6" Flume	12/1/99	12:46	0.74		574.5	
	12/1/99	14:38	0.763		603	
Fox Creek Flume	9/9/99	16:50	0.4		75.10	
	9/10/99	12:58	0.4		75.10	
	10/6/99	8:15	0.39		72.22	
	12/1/99	14:17	0.4		75.10	
Mine Creek Flume	10/6/99	10:40	0.175		31.36	
	10/6/99	13:50	0.173		30.81	

1.3 EXTENT OF GROUND WATER AND GROUND-WATER CONTAMINATION

This section describes the climatic conditions, ground-water systems, background water quality and current extent of ground-water contamination at PMC's Shirley Basin Mine site. The ground-water conditions and background water quality are presented because it is necessary to understand the ground-water systems and background concentrations before defining the degree and extent of contamination.

1.3.1 CLIMATIC CONDITIONS

The Shirley Basin site is at an elevation of 7100 feet above mean sea level (MSL). The climate is typical of high desert with average precipitation of 12 inches according to Martner (1986). A thirty-year record on site through 1998 gives an average of 11 inches/year. Annual lake evaporation is estimated by Martner (1986) at 47 inches. Precipitation is typically greatest in the months of May and June with high intensity thunderstorms a frequent occurrence. Figure 1.3-1 presents the total yearly precipitation for the Shirley Basin site from 1968 through 1998. Evaporation is typically greatest in the months of July and August.

1.3.2 GEOLOGIC AND HYDROLOGIC SETTING

The uranium-ore-bearing formation that has been mined in this area is the Wind River. There are two members of the Wind River formation in the mine area, and these members are designated the Lower and Main Wind River units. The Area 2/8 mine pit adjacent to the tailings area penetrated both units to mine ore sands in the Main and Lower Wind River units. In the tailings area, the Main Wind River exists throughout the area, while the Lower Wind River aquifer exists only in the western part of the No. 3 Pond. Overlying the Main Wind River aquifer is the White River Aquifer. This lower portion of sandstone is geologically a member of the Wind River formation, but is hydrologically distinct. The White River aquifer is present over the entire tailings area. Above the White River aquifer is a 10 to 60 feet thick siltstone and claystone that separates the White River aquifer from the Surficial aquifer. The Surficial aquifer consists of eroded and reworked White River material (see Figure 1.3-5).

1.3.3 SURFICIAL AQUIFER

Figure 1.3-2 shows the limits of the Surficial aquifer at the Shirley Basin site. The piezometric surface in the Surficial aquifer is supported by local recharge. In the tailings area, the Surficial aquifer discharges primarily to Spring Creek through more permeable materials in the vicinity of the Mine Creek channel. Spring Creek bounds the Surficial aquifer northeast and east of the tailings. West of the tailings, the Area 2 mine pit completely removed materials that could be hydraulically connected to the Surficial aquifer. Southeast of the tailings and Mine Creek area, the elevation of the Surficial sands rises above the piezometric surface resulting in a zero saturation boundary. The tailings dams were constructed across the Mine Creek channel, and the bulk of the seepage from tailings to the Surficial aquifer is likely occurring in close proximity to this channel. The original Mine Creek channel also terminated a few thousand feet northwest of the tailings ponds in an area now covered by an overburden pile.

1.3.3.1 SURFICIAL AQUIFER PROPERTIES

Data obtained from a large number of well logs has been used to define the base of the Surficial aquifer as shown in Figure 1.3-2. The combination of natural and artificial recharge maintains the piezometric surface. The difference between the water-level elevation and the base of the Surficial sands produces the saturated thickness of the Surficial aquifer. There is a relatively continuous clay at the surface in the tailings area that serves as a hydraulic barrier between the tailings and the Surficial aquifer. Directly beneath the tailings, the Surficial aquifer is largely confined. Outside of the immediate tailings area, the Surficial aquifer is typically unconfined.

The transmitting ability of an aquifer is defined by the transmissivity and the hydraulic conductivity (permeability). Transmissivity is the total transmitting ability of the aquifer, while permeability is the unit thickness transmitting ability of the aquifer. The specific yield is the primary storage property for the unconfined Surficial aquifer, while the storage coefficient is the important storage parameter for the confined underlying aquifers. Transmissivities for the Surficial aquifer near the Shirley Basin tailings aquifer

range from just a few gal/day/ft to 8000 gal/day/ft. The area of greatest transmissivity or hydraulic conductivity is near the Mine Creek channel.

Figure 1.3-3 presents the contours of hydraulic conductivity for the Surficial aquifer. These contours were developed using pumping test results from area wells, and from calibration of the modeling. As indicated above, the hydraulic conductivity is greatest near the original Mine Creek channel. Directly beneath Tailings Pond #5 and the east side of Tailings Pond #4, the pre-pumping piezometric surface was relatively flat, indicating the hydraulic conductivity in this area is relatively large. Between the crest and toe of the Pond #5 dam, there is a very steep gradient in the piezometric surface, indicating very small hydraulic conductivity. The small hydraulic conductivity in this area is attributed to chemical precipitation resulting from neutralization of the tailings seepage.

To the west and southwest of the tailings area, the gradient steepens substantially, indicating a decrease in hydraulic conductivity. Slug tests on the WWL series of wells by Water, Waste and Land (1983) also indicated small hydraulic conductivity in this area. A pumping test of well TW5S-1 also indicated a dramatic decrease in hydraulic conductivity while moving to the west. The reduced hydraulic conductivity in this area results in a situation where rates of movement for seepage plumes are very slow. The small quantities of seepage that have encroached in this area are essentially stagnant.

1.3.3.2 SURFICIAL AQUIFER GROUND-WATER FLOW

Water-level elevations define the gradient and direction of ground-water flow in the Surficial aquifer. Figure 1.3-4 presents the details of the water-level elevation of the Surficial aquifer in the tailings area. Because the majority of Surficial wells within the actual tailings area have been converted to injection or collection wells, the contours in the immediate vicinity of these wells represent expected water-level elevations outside of the immediate cone of depression or water level mound around each active well.

The general shape of the piezometric surface indicates the complexity of the containment and restoration systems, as well as past artificial and natural recharge. Collection and injection operations in the middle of the tailings area have created a depression in the potentiometric surface in the middle of the tailings, with a hydraulic ridge along the line of injection wells.

The ground-water velocity equation is presented on pages 70 and 71 of Freeze and Cherry (1979). Hydraulic gradient times the horizontal permeability divided by the effective porosity yields the groundwater velocity. The recharge lines are a constructed fresh-water injection system consisting of buried and gravel-packed perforated piping with a distributed supply system. Injection through the recharge lines creates ground-water mounds that have a significant impact of gradients and the direction of ground-water flow. The ground water east of the south Mine Creek recharge line is presently moving downgradient toward Spring Creek at a rate of 3.75 ft/day based on the present hydraulic gradient and aquifer properties. An average permeability of 25 ft/day, gradient of 0.015 ft/ft and effective porosity of 0.1 were used in this estimate. The gradient on the west side of the south recharge line ranges from approximately 0.003 to 0.007 ft/ft, giving an apparent seepage velocity ranging from 0.75 ft/day to 1.75 ft/day.

The gradient in the north Mine Creek recharge area between wells MC-7 and MC-8 (northeast of the north recharge line) is 0.0065 ft/ft. The piezometric surface between these two wells is very flat and appears to steepen near Spring Creek.

The quantity of water moving in the Surficial aquifer is governed by Darcy's Law, where the rate is equal to the product of the transmissivity, gradient and the width of the aquifer. With the complexity of the piezometric surface and ongoing discharge to Mine Creek and Spring Creek, numerical modeling was used to predict discharge of ground water to Spring Creek.

1.3.4 UNDERLYING AQUIFERS

In the immediate vicinity of the tailings, the White River aquifer, Main Wind River aquifer and the Lower Wind River aquifer all have sufficient permeability, thickness and saturation to function as major aquifer systems. The Upper Wind River sand is thinner and less continuous than the overlying and underlying sands and is typically not considered a major aquifer in the tailings area. The Area 2/8 Reservoir and associated reclaimed mine pit penetrate all three aquifers, and these aquifers are currently discharging to the reservoir. Figure 1.3-5 presents cross-sections for the Surficial and White River Aquifers in the tailings area.

1.3.4.1 WHITE RIVER AQUIFER

The White River aquifer is typically a 30-foot thick sandstone that is separated from the overlying Surficial aquifer by a 10 to 60-foot thick clay and siltstone. Fresh-water injection supply wells WW-22 and WW-23 are completed in the White River aquifer.

1.3.4.2 MAIN WIND RIVER AQUIFER

The Main Wind River aquifer is typically a 75-foot thick sandstone that is separated from the overlying White River aquifer by a 50-foot thick clay and siltstone and other thinner sandstone/claystone sequences.

1.3.4.3 LOWER WIND RIVER AQUIFER

The Lower Wind River aquifer is an 80-foot thick sandstone that is separated from the overlying Main Wind River aquifer by a 70-foot thick clay and siltstone. The Lower Wind River sands pinch in the No. 3 Pond area and does not exist east of the pinch out.

1.3.4.4 UNDERLYING AQUIFER PROPERTIES

Transmissivity of the White River aquifer varies from a few hundred to 2,500 gal/day/foot in the mine area. Transmissivity of the Main Wind River aquifer varies from 2,500 to 25,000 gal/day/foot in the mine area with the exception of small local areas with dramatically reduced permeability. Transmissivity of the Lower Wind River aquifer varies from 1,080 to 22,400 gal/day/foot in the tailings area.

1.3.4.5 UNDERLYING AQUIFER GROUND-WATER FLOW

The present ground-water flow in the White River aquifer beneath the tailings is to the east under a relatively mild gradient. This gradient is believed to be increased slightly by the pumping of wells WW-22 and WW-23 to supply the fresh-water recharge systems. The general direction of ground-water flow in the Main Wind River is radially inward to the two recovering reclamation reservoirs in Area 2/8 and Area 3. There are no Main Wind River monitoring wells in the immediate tailings area, so the direction of ground-water flow directly beneath the tailings area is unknown. The general direction of ground-water flow in the Lower Wind River Aquifer is to the Area 2/8 Reservoir and to the WW-20 mine area supply well. There are no indications of hydraulic communication between the Surficial aquifer and any of the underlying formations.

1.3.5 BACKGROUND WATER QUALITY

The background water-quality conditions at this site have been monitored since 1979 using well MC-14, which is located north of the tailings. Based on the piezometric surface, the general ground-water flow in the Surficial aquifer is currently radially outward to the east, north and west of the center of the tailings area. However, there is no indication of movement of ground water from the tailings area north to the vicinity of well MC-14. The water quality in well MC-14 has remained relatively unchanged over the period of record. Prior to mining activity, the ground-water flow in the Surficial aquifer probably paralleled the Mine Creek channel with a tapering of saturated thickness while moving upstream.

Table 1.3-1 presents the average background water quality for Surficial aquifer well MC-14 over the period of record. One outlier was removed for uranium and thorium-230 prior to calculating the statistics.

TABLE 1.3-1. PMC SHIRLEY BASIN SUMMARY OF BACKGROUND WATER-QUALITY CONCENTRATIONS.						
Constituents	No. of Samples	Concentrations in Well MC-14				Range of Typical Values
		Minimum	Maximum	Median	Mean	
Uranium	61	0.01	0.13	0.08	0.083	0.05 – 0.13
Thorium-230	49	<0.2	3	0.2	0.404	<0.2 – 1.2
Ra-226+228	24*	0.2	19.5	1.475	2.99	-----
Selenium	38*	<0.001	0.015	<0.001	0.0017	-----
Gross Alpha	24	<1.0	25.6	2.2	5.33	-----
Barium	25*	<0.02	0.5	<0.2	0.2	-----

Note: All concentrations are in mg/l, except:
 Ra-226+228, Gross Alpha and Thorium-230 which are in pCi/l
 * - More than 50% non-detects. Statistical analysis is compromised.

This table lists the minimum, maximum, mean and median for each of the hazardous constituents with less than 77% non-detects at this site. The remainder of the site standard constituents have 95% or more non-detects, which renders statistical analysis meaningless. For ACL constituents uranium and thorium-230, Table 1.3-1 also presents a range of typical values where 90% or more of the samples are within the range.

Background water quality as measured at well MC-14 has remained relatively consistent over the period of record. Hydro-Engineering L.L.C. (2000), presents the most recently tabulated water quality for the period of record.

1.3.5.1 INFLUENCE OF ORE-BEARING ZONES

The proximity of PMC's tailings and former mill area to the mining area raises the question of potential impacts of the presence of natural radionuclides in shallower aquifers. Unfortunately, the evidence for the presence of naturally occurring uranium and associated radionuclides is indirect. Soil sampling in conjunction with the windblown tailings cleanup has revealed that there are significant concentrations of radionuclides in Surficial sands adjacent to Spring Creek. These samples were taken from undisturbed areas at depths of more than five feet from the surface, which

precludes contamination by windblown tailings. The WWL series of wells south and west of the tailings have shown erratic results with elevated concentrations of uranium, radium-226 + radium-228, gross alpha, and selenium. However, there are some anomalies that indicate that the elevated concentrations may be natural or a combination of natural variation and some seepage impacts. These anomalies include elevated concentrations of selenium and radium-226 + radium-228, which is not typical of tailings seepage impacts on the Surficial aquifer. This is further supported by the absence of proportionate increases in chloride concentration (see Hydro-Engineering L.L.C., 2000), which is generally the first and most prominent indication of impacts by seepage from tailings.

1.3.6 EXTENT OF CONCENTRATIONS

The extent of elevated concentrations for uranium for 1999 is presented in the figures in this subsection. Concentration maps for uranium were also presented in the Annual reports for 1997 and 1998. Elevated concentrations of selenium are local phenomena and there are no distinct plumes or paths of migration. Elevated radium-226 + radium-228 activity is also a local phenomenon.

1.3.6.1 SURFICIAL AQUIFER

URANIUM

Uranium concentrations in excess of the site standard have been documented at this site since 1979. However, the extent and magnitude of elevated concentrations were not well understood until the mid 1980's, when additional wells were installed and uranium concentration was measured more routinely in existing wells. The largest measured uranium concentration in well RPI-20A was 3.5 mg/l in August of 1983. This well is located near the confluence of Mine Creek and Spring Creek and represents the "heart" of the historic Mine Creek area plume. The uranium concentration in this well began to gradually decrease after the 1983 sampling and was down to roughly one-half of the maximum value in late 1985. This decline occurred prior to the implementation of corrective action measures, which may indicate that there were some geochemical or neutralization processes which were gradually reducing the mobility of uranium.

Subsequent addition of recharge and collection systems has restored the water quality in this area to background conditions.

THORIUM-230

The occurrence of elevated thorium-230 activities is much more erratic than that of elevated uranium concentration. Like uranium, the first documented exceedances of the current site standard were in 1979, and ironically, the first measured thorium-230 activity in well MC-14 was twice the site standard of 0.3 pCi/l. Early samples for well RPI-20A rarely exceeded 0.3 pCi/l, while there was no question that the well was impacted by tailings seepage until the late 1980's, when the operation of recharge and collection systems began to have an effect. A typical scenario for elevated thorium-230 activity in a sampling record for an impacted well is 2 to 4 elevated analyses interspersed in 6 to 10 samples with activities below the detection level. For this reason, a thorium-230 activity contour map is not particularly useful. Sampling in 1999 yielded only two thorium-230 levels in excess of the proposed POE activity of 0.3 pCi/l and these were in at wells MC-14 and MC-6.

RADIUM-226 + RADIUM-228

Radium-226 + radium-228 has proven to be nearly immobile in the tailings area. A modest number of samples have shown activities in excess of the site standard of 5 pCi/l. However the distribution of elevated radium-226 + radium-228 activities in the known seepage area is characteristic of natural variation rather than a seepage front. Areas that are known to be profoundly affected by seepage from the tailings, (such as wells 5A-1 and P8A) have shown little or no elevated activity. On the other hand, areas where seepage impacts are milder or non-existent have shown occasional elevated activity.

SELENIUM

Selenium has proven to be relatively immobile in the tailings area. Concentrations in excess of the EPA drinking water standard of 0.05 mg/l, (which has been substituted for

the site standard), occur in only a fraction of a percent of samples for wells in the known seepage area.

1.3.6.2 WHITE RIVER AQUIFER

The White River aquifer is hydraulically separated from the Surficial aquifer by a thick clay and siltstone. There is no evidence that seepage from the tailings has impacted the water quality in the White River aquifer. Well WH-9 on the west side of the tailings has shown elevated TDS, chloride and uranium concentrations, but the well is located in close proximity to some historic underground mine workings and an early in-situ leaching test area. The gradient for the White River aquifer in this area is to the east to the pumping wells WW-22 and WW-23 and the first occurrence of noticeably elevated concentrations followed several years of pumping from the White River aquifer wells. This combination of sequence of contamination and the gradient to the east indicates that the elevated concentrations at well WH-9 likely result from some mine-related remnant contamination to the west of the well.

1.3.6.3 MAIN WIND RIVER AQUIFER

With the additional separation provided by a substantial aquitard between the Main Wind River aquifer and the overlying White River aquifer, there is virtually no potential for impacts by tailings seepage. Any local contamination of the Main Wind River aquifer is a result of mining penetration of the formation.

1.3.6.4 LOWER WIND RIVER AQUIFER

With additional separation by a massive clay and siltstone, there is no potential for tailings area seepage impacts on the Lower Wind River aquifer.

1.3-11

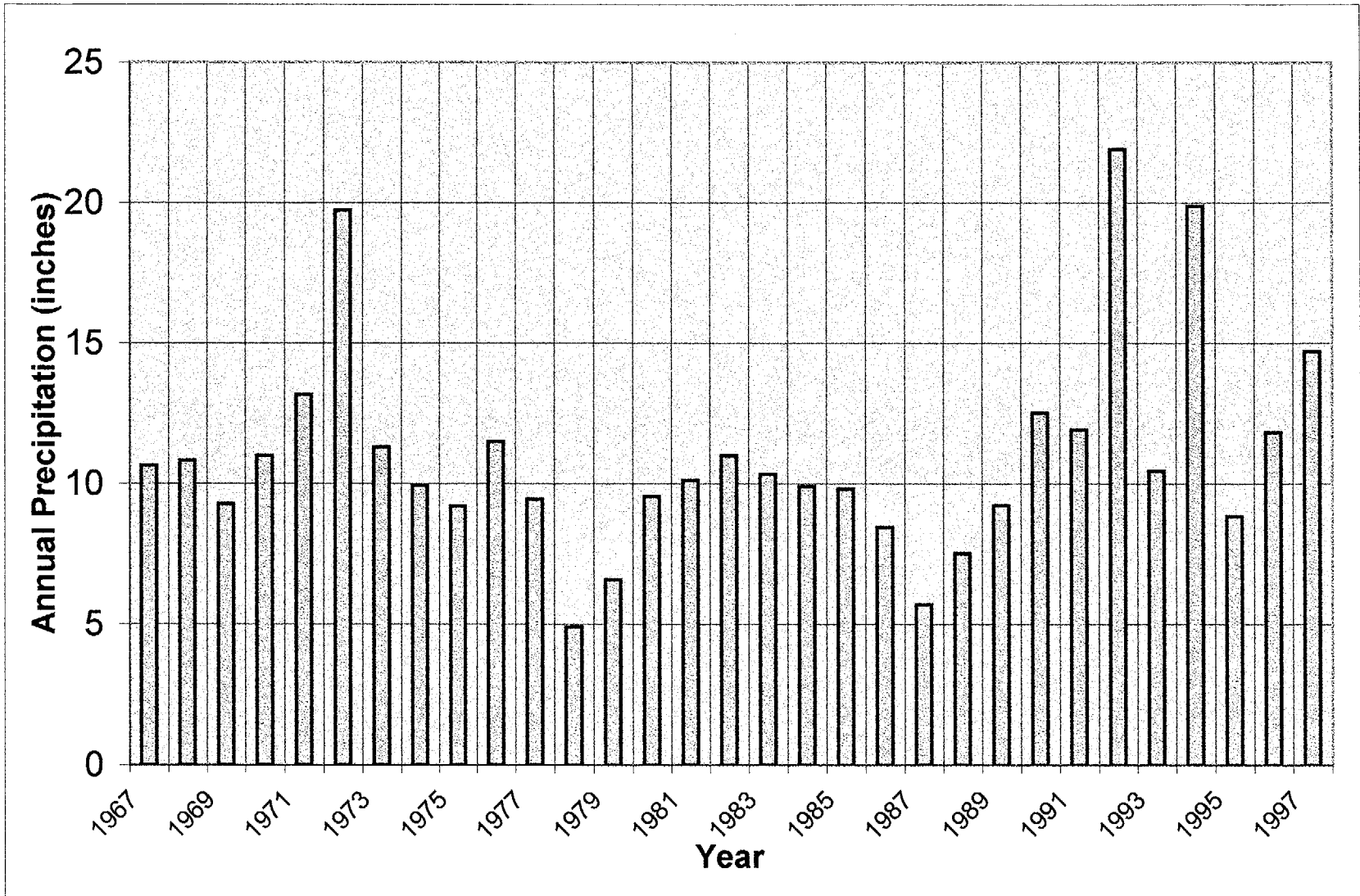
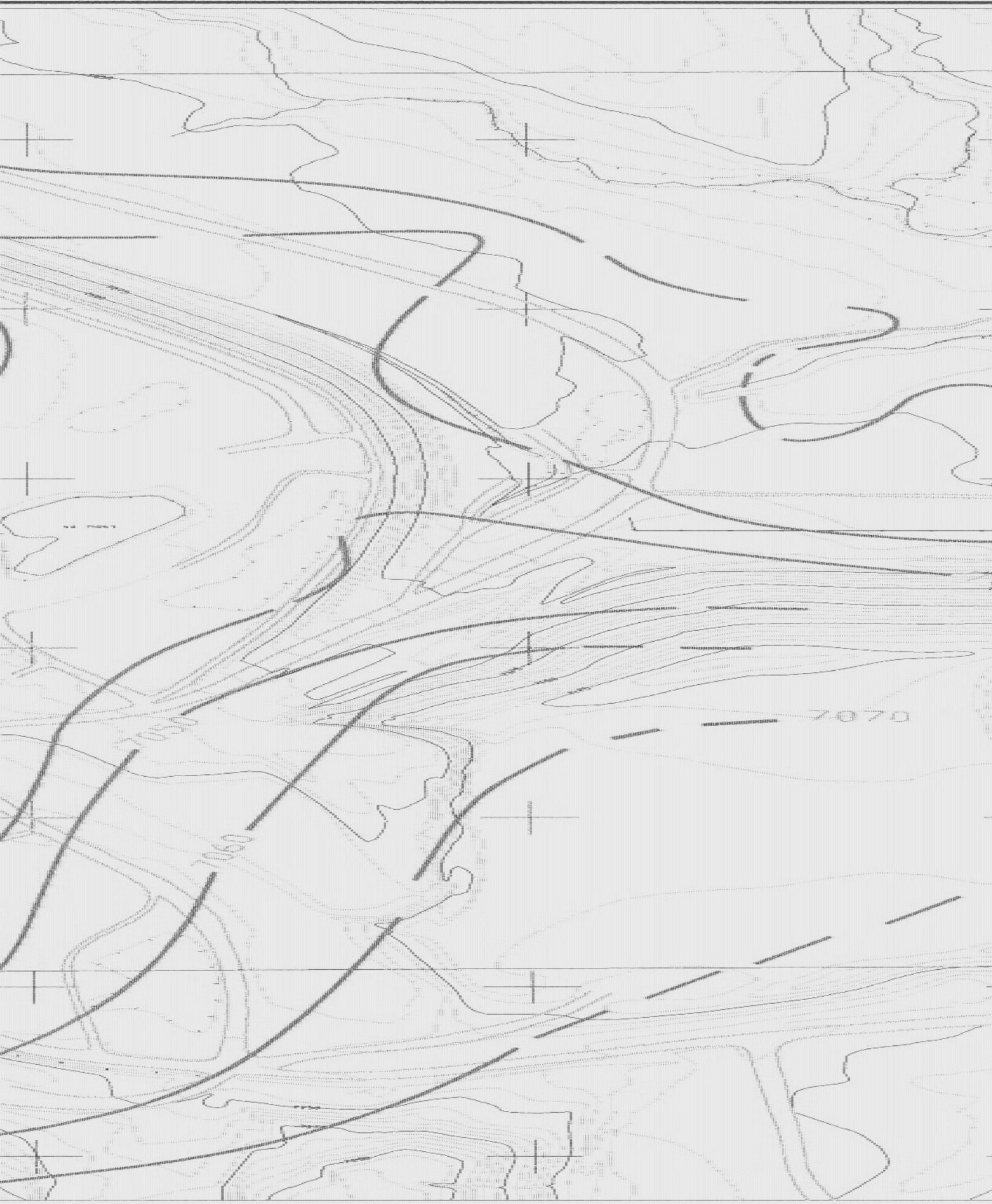


FIGURE 1.3-1 YEARLY TOTAL PRECIPITATION AT SHIRLEY BASIN SITE

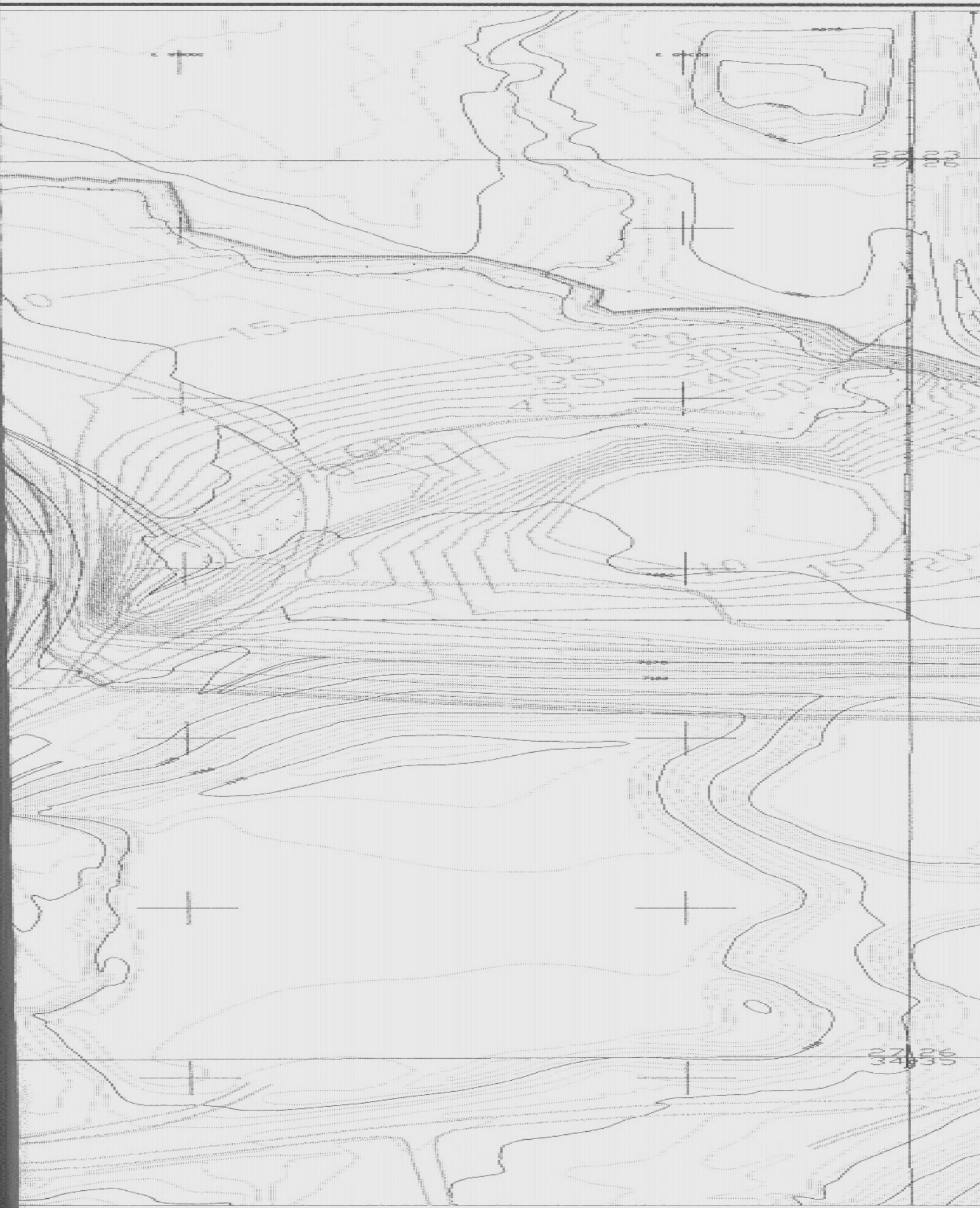


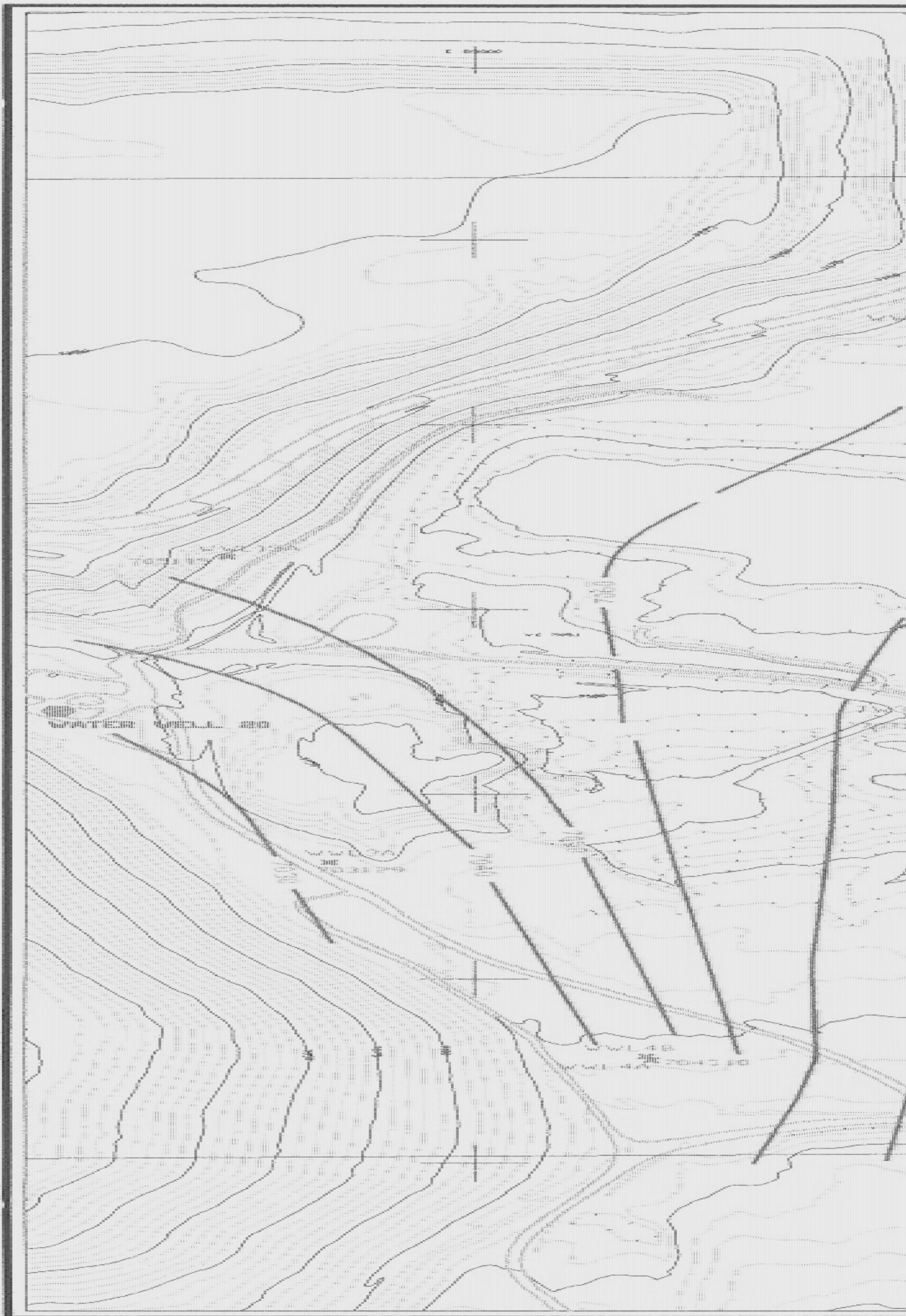
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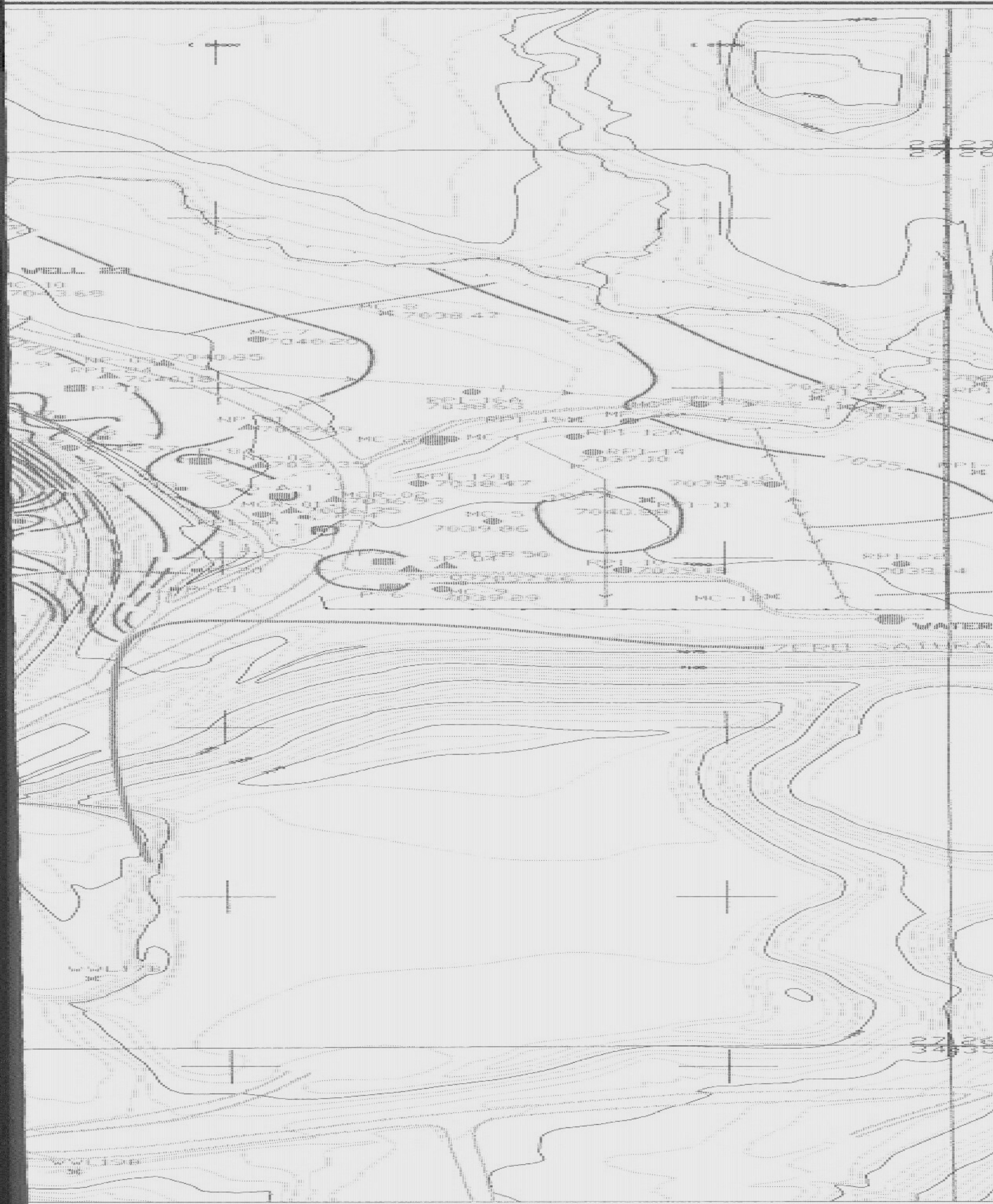


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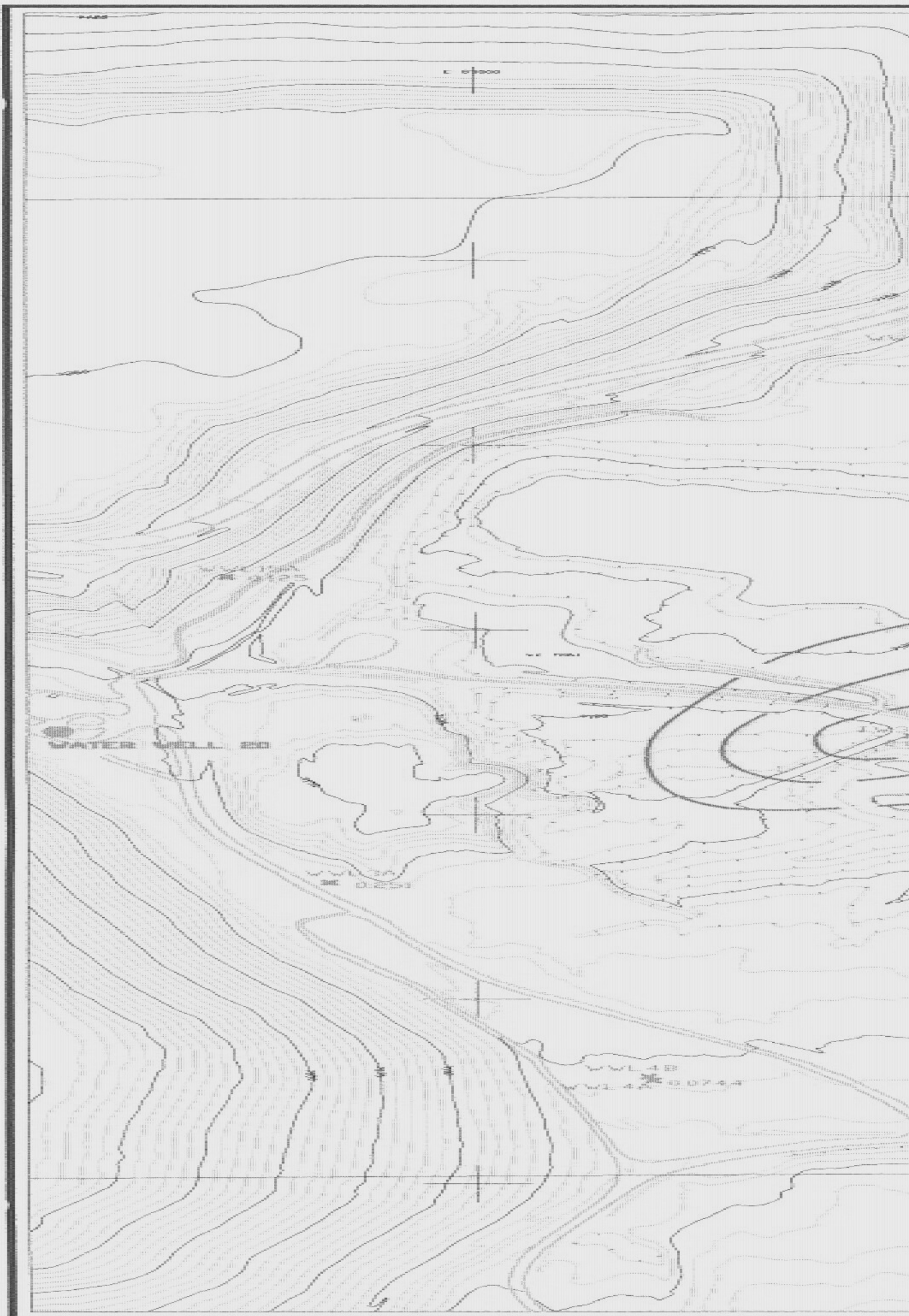


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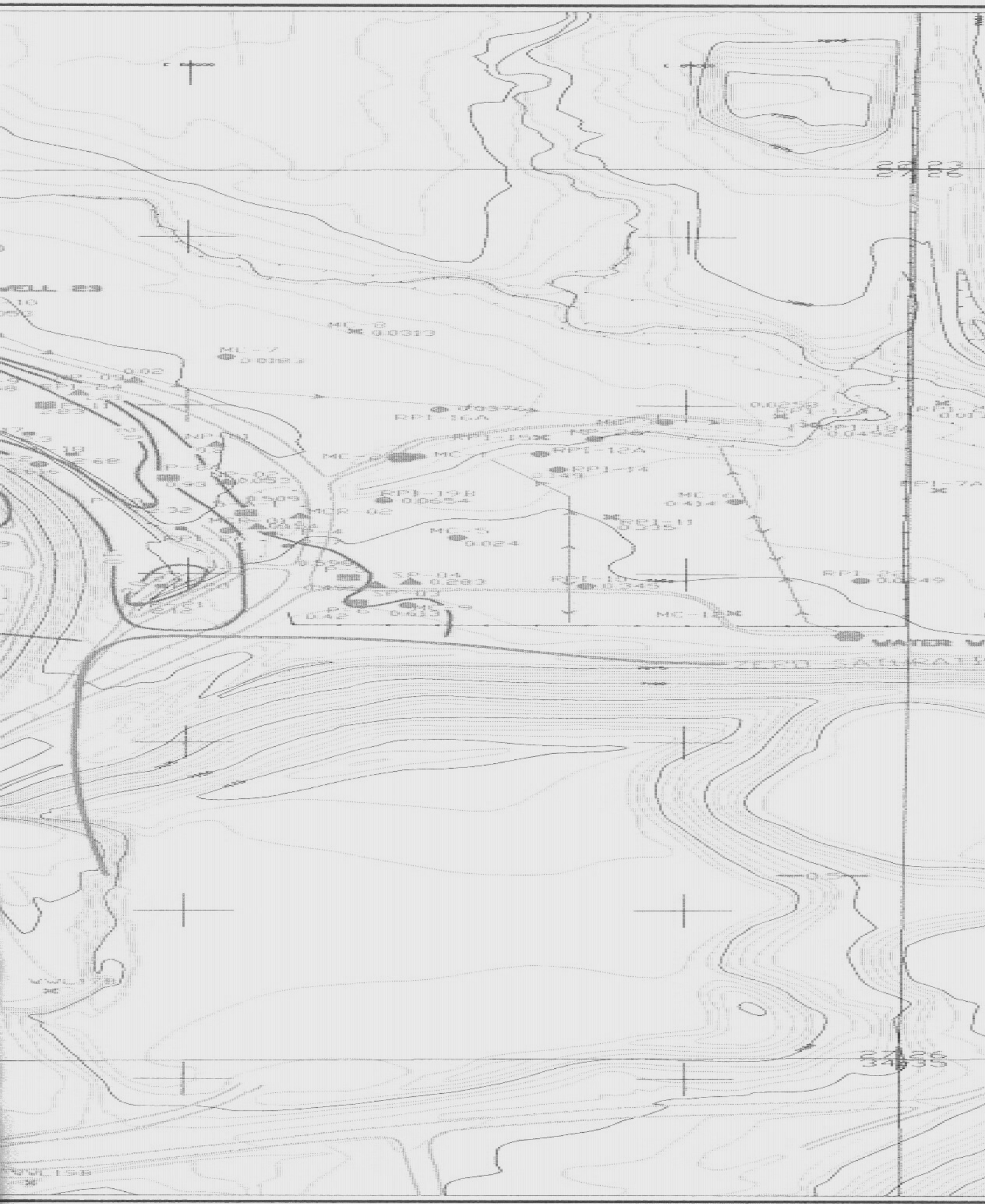


FACE
FACE





C-14



1.4 CURRENT GROUND-WATER PROTECTIONS STANDARDS

The PMC Shirley Basin site presently has ground-water protection standards established by the NRC to govern the points of compliance at this site. Section 1.5 presents the proposed alternate concentration limits. They are presented for comparison with the current standards. The following tabulation presents the thirteen site standards set by the NRC:

CONSTITUENTS	NRC STANDARD
ARSENIC	0.05
BARIUM	1.0
BERYLLIUM	0.02
CADMIUM	0.01
CHROMIUM	0.05
GROSS ALPHA	15
LEAD	0.05
MOLYBDENUM	0.1
NICKEL	0.05
RA-226 + RA-228	5.0
SELENIUM	0.01#
THORIUM-230	0.3
URANIUM	0.07

**NOTE: All concentrations are in mg/l except:
RA-226 + RA-228, Gross Alpha and Thorium-230 are in pCi/l
= Effective standard is the new EPA standard of 0.05 mg/l**

The EPA selenium drinking water standard is 0.05 mg/l, and this standard will supersede the current site standard.

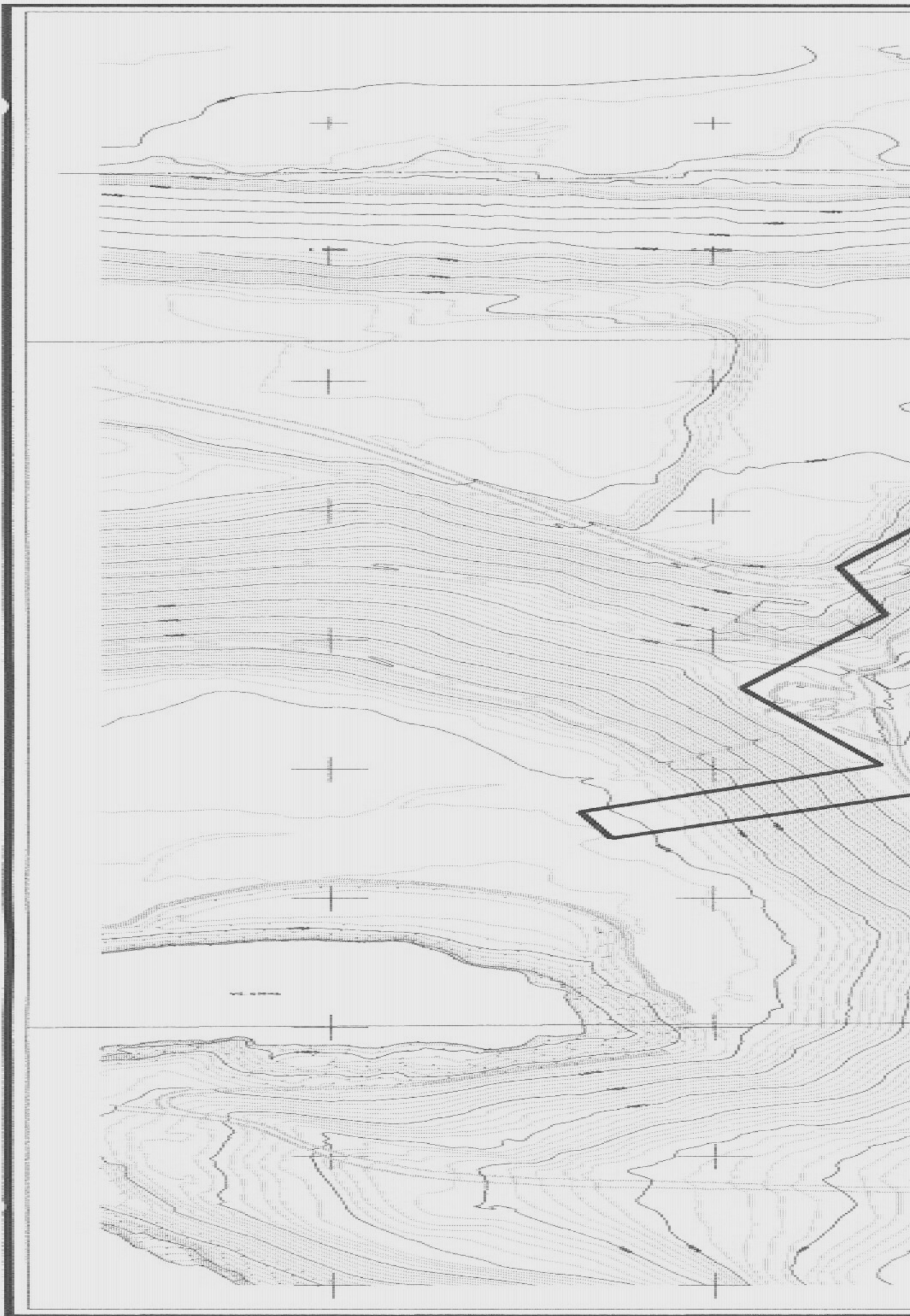
1.5 PROPOSED ALTERNATE CONCENTRATION LIMITS

Alternate concentration limits are needed for the Shirley Basin site because some background concentrations exceed the present site standards for uranium and thorium-230, and seepage from the tailings has resulted in elevated concentrations in the Surficial aquifer. The long-term drainage of water from the tailings after the planned dewatering effort will result in Surficial aquifer concentrations greater than the present site standards at the Points of Compliance. These concentrations will be As Low As Reasonably Achievable (ALARA). Therefore, ACL's are needed for uranium and thorium-230 at this site. Figure 1.5-1 presents the POC well locations, the proposed POE location, and the proposed DOE site boundary. No ground-water usage will be allowed within the eventual DOE site boundary.

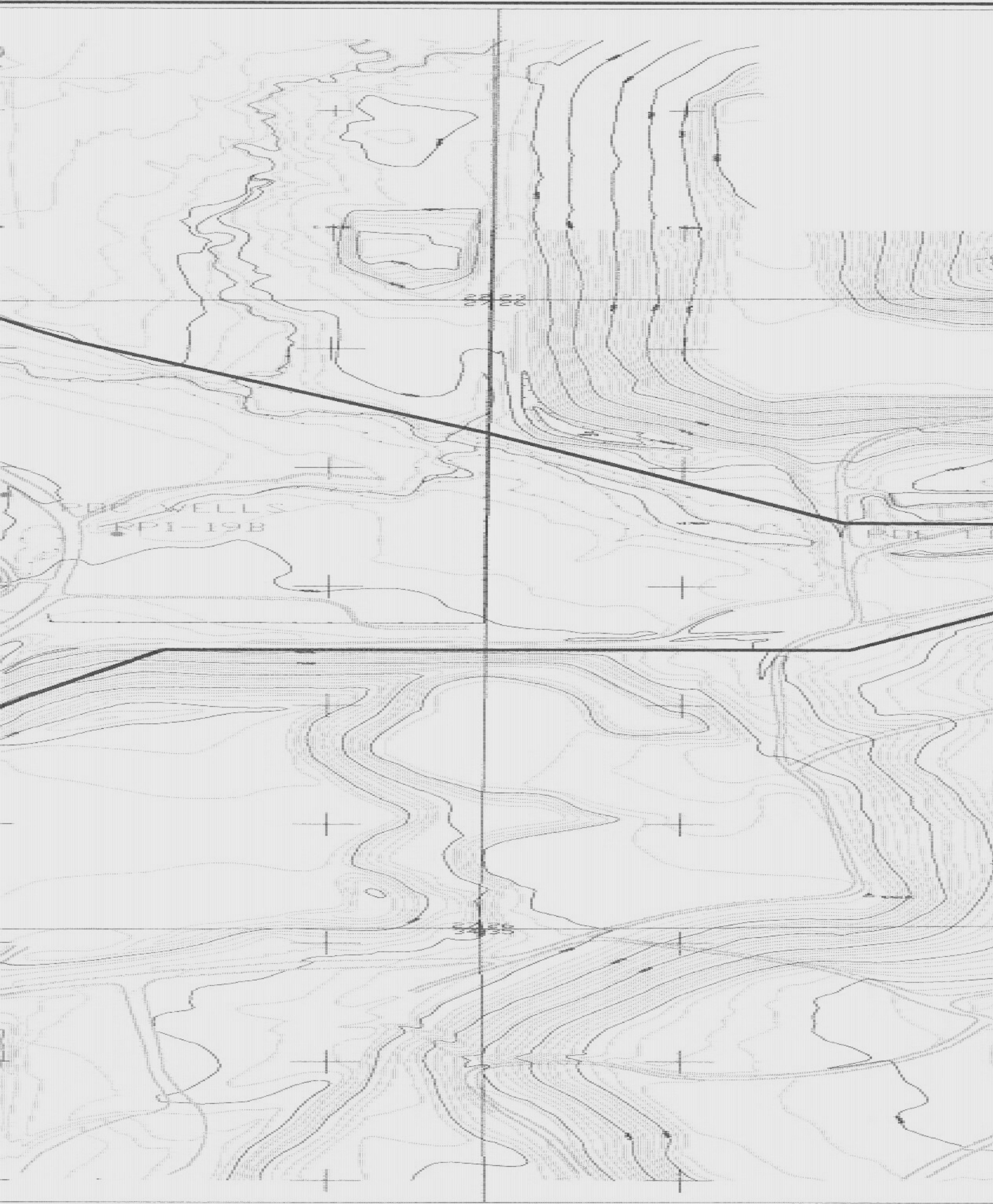
A three-dimensional ground-water flow model, MODFLOW, (McDonald and Harbaugh, 1988) was used to simulate ground water flow in the Surficial aquifer and seepage from the tailings. The model used a grid covering the entire tailings and extending beyond Spring Creek in order to incorporate virtually all of the area involved with the tailings area Surficial aquifer flow system. The flow modeling was used to simulate the rates of ground-water discharge to Spring Creek and the rates of recharge water movement and seepage from the tailings. Results from the flow modeling were then used to predict the maximum concentration of the ACL constituents at the discharge point in Spring Creek and to predict the maximum concentration at the POC wells RPI19B and NP01. A three-dimensional numerical solute transport model, MT3D, (S.S. Papadopoulos & Associates, 1992) was used to predict the concentrations with time at the POC wells, and an averaging technique was used to estimate the POE concentration at Spring Creek. This model uses the cell by cell flows produced by the MODFLOW model to predict the movement of the constituents from the tailings to the Surficial aquifer and eventually to the POC wells and beyond. The results from these simulations were used to determine the POC value for each of the POC wells for uranium and thorium-230. Table 1.5-1 presents ACL values for the POC wells.

TABLE 1.5-1. PROPOSED ALTERNATE CONCENTRATION LIMITS.		
CONSTITUENT	ALARA POC* WELLS	
	<u>RPI-19B</u>	<u>NP01</u>
Uranium	4.45	4.40
Thorium 230	5.76	5.53
NOTE: Uranium concentrations are in mg/ Thorium 230 activity is in pCi/l		

Pathfinder Mines Corporation has operated an extensive containment and restoration system for over 16 years that has been very successful in restoring water quality in the Mine Creek area. Restoration efforts beyond those currently in place are prohibitively expensive and result in incrementally smaller benefit. Discussions concerning ALARA values and the transport modeling are presented in Sections 3.5 and 2.2, respectively.



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THE WELLS
RPI-19B

5460

5455

2.0 HAZARD ASSESSMENT

The proposed Alternate Concentration Limits for uranium and thorium-230 are supported by the risk assessment described in this section. The source of the contamination is characterized and the transport of contaminants in ground water is described in the first two sub-sections. The potential pathways and rates of exposure are summarized in sub-section 2.3 and details are provided in Appendix A. The potential risk to human health is described in sub-section 2.3.2 and details are provided in Appendix B. The environmental risk is summarized in sub-section 2.3.3 and details are provided in Appendix C.

The source of ground-water contamination in PMC's Shirley Basin site is the tailings impoundments and the former mill site. The last mill tailings were hydraulically deposited in the tailings area in 1992. At the end of 1992, the tailings impoundments were essentially full of tailings solution. Since that time, enhanced evaporation and tailings dewatering have been used to reduce the quantity of tailings solution in ponds and stored within the saturated solid tailings. The tailings have been progressively covered and diversions have been constructed to reduce the runoff contribution.

2.1 SOURCE AND CONTAMINATION CHARACTERIZATION

The tailings impoundments have been the primary source of ground-water contamination at the Shirley Basin site. The hydraulic delivery of the tailings to the impoundments results in a segregation of material according to gradation at the point of discharge. Generally, the tailings were spigoted on the periphery of the impoundments resulting in a beach area made up of the coarser materials. The finer grained materials are typically carried to the pool area in the center of the ponds where they are deposited as slimes. The transition from coarse to fine grained materials is gradual and the process of advancing the spigot point radially inward resulted in stratification of the tailings by gradation. There are distinct sandy beach areas and slime pool areas, but much of the tailings area is made up of mixed gradation materials or layered sequences of sands and fine-grained materials.

The configuration of the tailings piles has some bearing on the concentrations reaching the Surficial aquifer. Sampling from tailings wells has indicated that there are measurable differences in the quality of tailings solution held in slime areas when compared to sandier beach areas. However, a more profound impact of the distinction between the slime areas and sandy areas is the dramatically different permeability between the two materials. The very low permeability slimes drain very slowly in both vertical and horizontal directions, and thus one of the more effective approaches to dewatering has been aggressive pumping of better yielding wells in more permeable areas to eventually draw the tailings solution from slime areas. Pumping of poor yielding wells in the slimes has been used to dewater the tailings, but based on relative pumping rates, lateral drainage to the cones of depression in sandier areas is the most effective dewatering mechanism.

The lateral redistribution of tailings solution has the effect of equilibrating water quality through the tailings. One of the more noticeable occurrences of this was the change in field water quality parameters for well TW5-3 over a four-year period. The first sample was taken shortly after the well was drilled, and the second sample was taken after roughly four years of aggressive dewatering. The field conductivity in this well nearly doubled over the period and is now similar to other tailings wells. Well TW5-4C exhibited similar behavior over a three-year period. It is plausible that early pumping from tailings wells yields a disproportionate fraction of solution that had been diluted by infiltrating precipitation, and this may explain the deterioration of tailings well water quality with time in some wells. However, regardless of the mechanism, the gradual equilibration of tailings water quality does lead to a "typical" tailings solution quality that can be used for uniform source term characterization. This uniform tailings solution quality uses slight weighting of the average to reduce the influence of wells or individual samples where the general water quality is appreciably better than typical tailings samples.

2.1.1 CONTAMINANT SOURCE TERM CHARACTERIZATION

Water-quality data for the tailings is tabulated in Table 2.1-1 where the major constituents are presented on the first page and the pH and minor constituents on the second page.

Uranium concentration for the tailings wells averaged 14.35 mg/l with the inclusion of all tailings well samples. When the three smallest uranium concentration values and the largest uranium concentration value are removed, the average becomes 14.57 mg/l. In this case, the largest uranium concentration was also removed to provide some balance in extreme value removal. The concentration of uranium in seepage from the tailings is dramatically reduced as evidenced by concentrations in Surficial aquifer wells within the tailings area that are typically less than one-half of the values that would occur with a simple dilution process. This reduction is attributed to adsorption or possibly a neutralization process that results in precipitation of uranium. The neutralization process was documented and described by Robertson-Pincock (1980) as a calcite dissolution – gypsum precipitation process, but the potential impacts on uranium mobility are not known. The estimated uranium concentration reaching the Surficial aquifer is 7 mg/l based on observed concentrations extending from the early 1980's through the present. Uranium concentrations in the more profoundly impacted wells in the Mine Creek area have approached roughly one-half of the 7 mg/l estimate.

The thorium-230 activity was not measured in the tailings well samples. However, the thorium-230 activity in many Surficial wells that have been affected by tailings seepage has been measured. Unfortunately, it appears from the tabulation of water quality in Hydro-Engineering L.L.C. (2000) that the sampling or analysis of thorium activity at these very low levels is considerably less reliable than uranium concentration analysis. There is strong evidence of systematic errors in the measurement of thorium-230 activity in the Surficial aquifer. The majority of samples for Mine Creek area Surficial aquifer wells have thorium-230 activities below detection, while most occurrences of elevated thorium-230 activities correspond with specific sampling cycles. As an example, the sampling cycle corresponding to the 3rd quarter of 1995 showed

dramatically elevated thorium-230 activities in wells ranging from MC-14 to RPI-20A, which is located at the confluence of Mine Creek. Wells north and south of Mine Creek exhibited this same behavior for areas where hydraulic communication of the seepage plumes is virtually impossible. This makes the thorium-230 activities in this particular sampling cycle highly suspect. There are other less prominent examples where the correlation between elevated thorium 230 activity and a particular sampling cycle calls the values into question.

In the absence of measured tailings thorium-230 activities in the tailings well samples, the characterization of the thorium activity for the tailings seepage source requires some interpretation of the maximum mobile thorium-230 activity. With the elimination of thorium-230 values from unreliable sampling cycles, a maximum thorium activity of 1 to 3 pCi/l has been observed in areas of the Surficial aquifer where seepage impacts have been evident. With a 3 to 5 fold dilution factor indicated by the conservative chloride transport, this indicates an upper bound of approximately 7 pCi/l as the mobile thorium-230 activity. It is likely that thorium activities are much greater in the tailings, but due to pH buffering, precipitation, and other attenuating processes between the tailings and the Surficial aquifer, the thorium-230 does not appear to enter the Surficial aquifer at activities greater than 7 pCi/l.

The average arsenic concentration for the tailings wells is 0.150 mg/l. The average chromium concentration in the tailings wells is 0.265 mg/l. The average selenium concentration for the tailings wells is 0.239 mg/l. Radium-228 activity was not measured in tailings wells, but radium-226 activity ranged from 198 pCi/l to 2,366 pCi/l. The radium-226 + radium-228 activity would necessarily be equal to or greater than the radium-226 activity. The average nickel concentration for tailings wells is 2.88 mg/l. Like arsenic, chromium, selenium and radium-226 + radium-228, the movement of nickel to the Surficial aquifer has been very limited in spite of significant concentrations in the tailings solution. The concentrations of beryllium and gross alpha were not measured in tailings well samples, but like the previously mentioned constituents, they have not proven to be mobile in the seepage from the tailings to the Surficial aquifer.

The remaining site standard constituents of barium, lead, and molybdenum are not present in the tailings wells in measurable concentrations.

2.1.2 HYDROLOGIC SOURCE TERM CHARACTERIZATION

Sixty-five tailings wells have been drilled and are in place on the tailings (see Figure 2.1-1). The majority of the tailings wells are located close to the centerline of the Mine Creek channel and a tributary to the south. Fifty-two of the tailings wells were constructed in a manner to allow extraction for dewatering and the majority of these wells are currently being used for dewatering. The remaining wells are constructed with two-inch diameter or smaller casing and serve as water level monitoring wells.

The siting of many wells along the centerline of the original Mine Creek channel was done to capitalize on the larger tailings depths in this area. Those wells closest to the edge of the pond or the dams are typically better yielding wells due to deposition of coarser materials near the tailings spigot points. With increasing distance from the dam or the edge of the ponds, the tailings consist of finer silts and clays (slimes), and the tailings become less permeable. Wells completed entirely in slime tailings have very poor yields. In order to dewater slime areas, a number of wells were completed on the periphery of the slime pool on Tailings Pond No. 5 to induce lateral drainage to more permeable tailings adjacent to the slime pool.

2.1.2.1 TAILINGS DRAINABLE VOLUME

The drainable portion of the water in the tailings is a function of the saturated thickness of the tailings and the specific yield of the tailings. The base of the tailings is shown in Figure 2.1-2 and water-elevation of the tailings in late 1999 is shown in Figure 2.1-3. Information from these figures is combined to produce the saturated thickness of tailings.

A series of multi-well pump tests were conducted shortly after the first series of tailings wells were drilled in 1993. However, with a relatively high water level at the time of the testing, the results were dominated by one of two effects. The first of these was either a

recharge boundary or no-flow boundary due to proximity to a dam or pond. The second effect was evidenced by dramatic increases in the slope of the drawdown response in areas where there was no evidence of potential boundaries. This effect was attributed to stratification in the tailings where recent advancement of the tailings discharge location had placed sandier tailings over less permeable tailings. Regardless of the cause, the result was an atypical drawdown response, which did not provide reliable measures of specific yield, and tailings specific yield was estimated based on experience with similar tailings materials.

The estimates of specific yield for the tailings range from 0.05 to 0.15. The larger specific yield is expected for sandier hydraulically emplaced tailings, while the smaller specific yield will reflect greater water retention in the finer slime materials. A typical specific yield of 0.12 was estimated for the modeling and for quantification of drainable water. The estimated drainable water in the tailings in late 1999 was 137 million gallons.

2.1.2.2 TAILINGS DEWATERING

Dewatering from tailings wells started in 1993 with pumping from well TW5-3. At that time, large volumes of ponded water in Pond #4 and #5 made an extensive pumping program futile. Pumping wells were progressively added in 1994 and 1995 with a total pumping rate of approximately 140 gpm in 1995. The maximum pumping rate of 250 gpm was reached for a short period in mid-1995. The current pumping rate from tailings wells is approximately 130 gpm, and with the exception of periods of interference by construction efforts and winter freeze up, has remained between 110 gpm and 140 gpm since 1995. The extraction rate has been maintained by addition of pumping wells and redevelopment of active wells. Vacuum enhancement of well yields was also used for a short period, but maintenance requirements were excessive for a relatively minor improvement in well yields.

There have been observed declines in tailings water levels with the dewatering program. With the reduction of quantities of water stored on the tailings surface and the placement of interim cover, the recharge to the tailings has been progressively reduced.

Infiltration into the tailings has slowed the dewatering process because it offsets much of the extraction by dewatering, and there have been periods where very little progress was made in lowering water levels in the tailings. Nearly all of the recently placed interim cover is a low permeability clay, but some of the earliest interim cover was coarser and more permeable. None of the interim cover has been placed as an engineered infiltration barrier, so there is potential for excessive infiltration over large portions of the interim cover area. Efforts are ongoing to capture and dispose of precipitation and runoff before it can infiltrate to the tailings. With the completion of the radon/infiltration barrier, the infiltration to the tailings will be reduced to a fraction of a gpm.

Tailings dewatering for the Shirley Basin site is a diminishing return process. As the saturated thickness of the tailings declines, the yield from individual wells naturally decreases. Unfortunately, this problem is also exacerbated by increased operation costs with declining yields. The equipment and energy costs for a 0.5 gpm well are virtually identical to those of a 3.0 gpm well and the lower yielding well will likely exhibit more precipitation problems and require more maintenance. Thus, the cost per unit volume of water extracted has been increasing since the start of the dewatering and will continue to increase at an accelerating rate. With the decreasing saturated thickness, the prospect for adding strong yielding wells also decreases. The presence of active dewatering systems on top of the tailings also interferes with other reclamation efforts. It is reasonable to assume that even preliminary grading for the final reclamation of the tailings will be delayed until the dewatering is terminated for that particular area.

2.1.2.3 TAILINGS SEEPAGE RATE

The active tailings dewatering program will extract tailings water to the point where further dewatering efforts add little or no benefit to the long-term water quality at the Spring Creek POE. It is not possible to completely evacuate water from the tails, so there will be a residual volume of tailings water that will discharge to the Surficial aquifer through gravity drainage. The rate of this drainage will gradually diminish over time as the water level in the tailings declines. The decline in head accounts for a portion of the

reduction in seepage rate, and the trough shaped base of the tailings in each pond results in a diminishing footprint of the saturated tailings with declining water level.

Lithologic and geophysical logs for Surficial aquifer wells in the tailings area indicate that there is some barrier to seepage from the tailings over nearly all of the tailings area. The nature and thickness of this barrier varies from a 15 foot thick claystone and siltstone to a few feet of a sandy clay material. Lithology from well TW5-3 and well TW4-21C indicates that there are at least two locations where this barrier is absent or compromised. Based on the available lithology, the barrier appears to be thickest and the least permeable in the northern portion of Pond #5. The barrier appears to be thinner and more permeable near the original Mine Creek channel in the tailings area, and this is supported by the concentration of seepage impacts in the Mine Creek area.

The historic seepage rate from the tailings is estimated at 5 gpm. This estimate is based upon observed maximum concentrations of conservative constituents (chiefly chloride) in profoundly impacted Surficial wells. Wells that appeared to reach a steady-state chloride concentration with known seepage impacts approached an average concentration of 1,300 to 1,500 mg/l. Estimates of recharge to the Surficial aquifer that is passing beneath the tailings is 10 gpm. This gives a 2:1 dilution of local groundwater flow to tailings seepage. The average chloride concentration in tailings well samples is 3,318 mg/l, while the average with elimination of the seven lowest concentration samples is 4,318 mg/l. The lower concentration tailings samples were eliminated to reduce the effects of dilution of near surface water by precipitation or runoff. This combination of 5 gpm tailings seepage at a chloride concentration of more than 4,000 mg/l produces Surficial aquifer concentrations of 1,300 to 1,500 mg/l when combined with approximately 10 gpm of Surficial water with very little chloride.

With ongoing dewatering and the drainage of residual water in the tailings, the seepage rate is expected to gradually decline. With a distributed seepage footprint and dams that restrict lateral movement of tailings solution beyond the existing tailings boundaries, the water table in the tailings is expected to gradually flatten out following cessation of

pumping. There may be slight depressions in the piezometric surface in areas where the hydraulic contact between tailings and the Surficial aquifer is greater. However, the general footprint of the area covered by saturated tailings will shrink towards the original Mine Creek channel following the base of the tailings surface. The model prediction of the seepage from the tailings drops to approximately 1.8 gpm 20 years after the cessation of pumping and will eventually drop to 1 gpm 50 years after the cessation of pumping. This eventual long-term seepage rate is difficult to predict because the footprint of the saturated tailings is gradually changing, and the available lithology information indicates that the vertical communication between the tailings and the Surficial aquifer is very heterogeneous. It is plausible that the seepage rate could drop dramatically if the saturation over an area of large vertical communication is thin. A smaller long-term seepage rate would reduce the concentrations at the POE, but would extend the duration of the seepage input to Spring Creek. Fortunately, the seepage rate over the next decade is more critical to seepage impacts than longer term seepage rates, and the extrapolation of current seepage rates to shorter periods of time is more reliable.

The dewatering of tailings reduces the volume of water that will eventually seep to the Surficial aquifer and eventually discharge to Spring Creek. Because the seepage rate is proportional to the remaining tailings water volume, reduction of that volume reduces the eventual seepage rate. However, the seepage rate is expected to exhibit an exponential decay type of curve with a long-term pseudo steady-state seepage rate. Extension of the dewatering program brings the maximum seepage rate closer to the long-term seepage rate, but the benefit of each additional increment of dewatering gets smaller. As the predicted maximum seepage rate approaches this long-term seepage rate, the benefit of dewatering approaches zero, while the cost of dewatering increases dramatically.

2.1.2.4 POC ALARA CONCENTRATION

The active dewatering effort will be continued until mid 2001 which meets the ALARA conditions with respect to reducing seepage impacts on Spring Creek water quality. At

present, little or no tailings seepage is escaping the collection/recharge system. Seepage from the tailings is occurring, but the rate is likely reduced because excess fresh-water injection in the Surficial aquifer has reduced the gradient between the tailings and the Surficial aquifer. When collection and fresh-water injection ceases, the present ground-water mounds in the Mine Creek area and beneath the tailings area injection wells will decay to a nearly steady state condition. With this decay, the seepage rate from tailings is expected to increase slightly to reflect the increase in vertical gradient and then begin to slowly decline as the water level in the tailings drops and the more permeable contact area declines. The concentrations of constituents at the POC wells will be a result of the combination of the seepage from the tailings and the local ground water moving beneath the tailings.

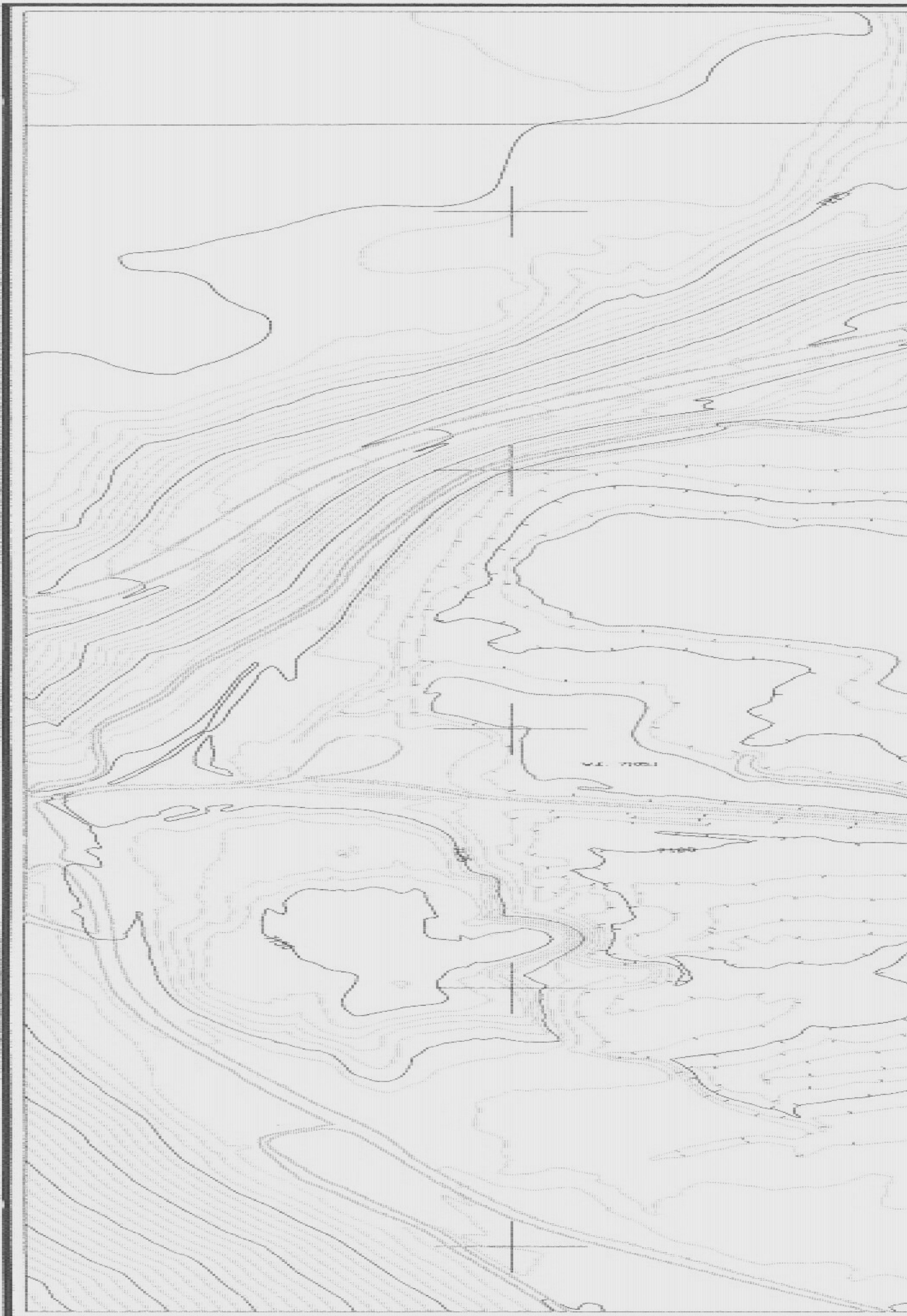
For the transport modeling, the up-gradient and peripheral ground water concentrations were assumed to be equal to the average background concentrations measured at well MC-14. Recharge by precipitation was assumed to be at the background concentrations. The background uranium concentration for ground water was 0.083 mg/l, and the background thorium-230 activity was 0.4 pCi/l. The average uranium concentration in the Spring Creek base flow was assumed to be 0.02 mg/l, and the average thorium-230 activity in Spring Creek was assumed to be 0.1 pCi/l, or one-half of the typical lower limit of detection level.

The uranium concentration in the tailings used in the transport modeling was 7.0 mg/l. This is roughly one-half of the average uranium concentration in water samples from tailings wells. The concentration was reduced because the observed concentrations are significantly lower than can be attributed to dilution and the adsorption and/or neutralization and precipitation process discussed earlier limits the uranium concentration reaching the Surficial aquifer. Once the uranium reaches the Surficial aquifer, the observed migration of the contaminant front indicates that the solubility of uranium doesn't change dramatically. When compared with the movement of conservative ions, there does appear to be some retardation by adsorption/desorption processes. However the reaction rates of chemical processes that result in permanent

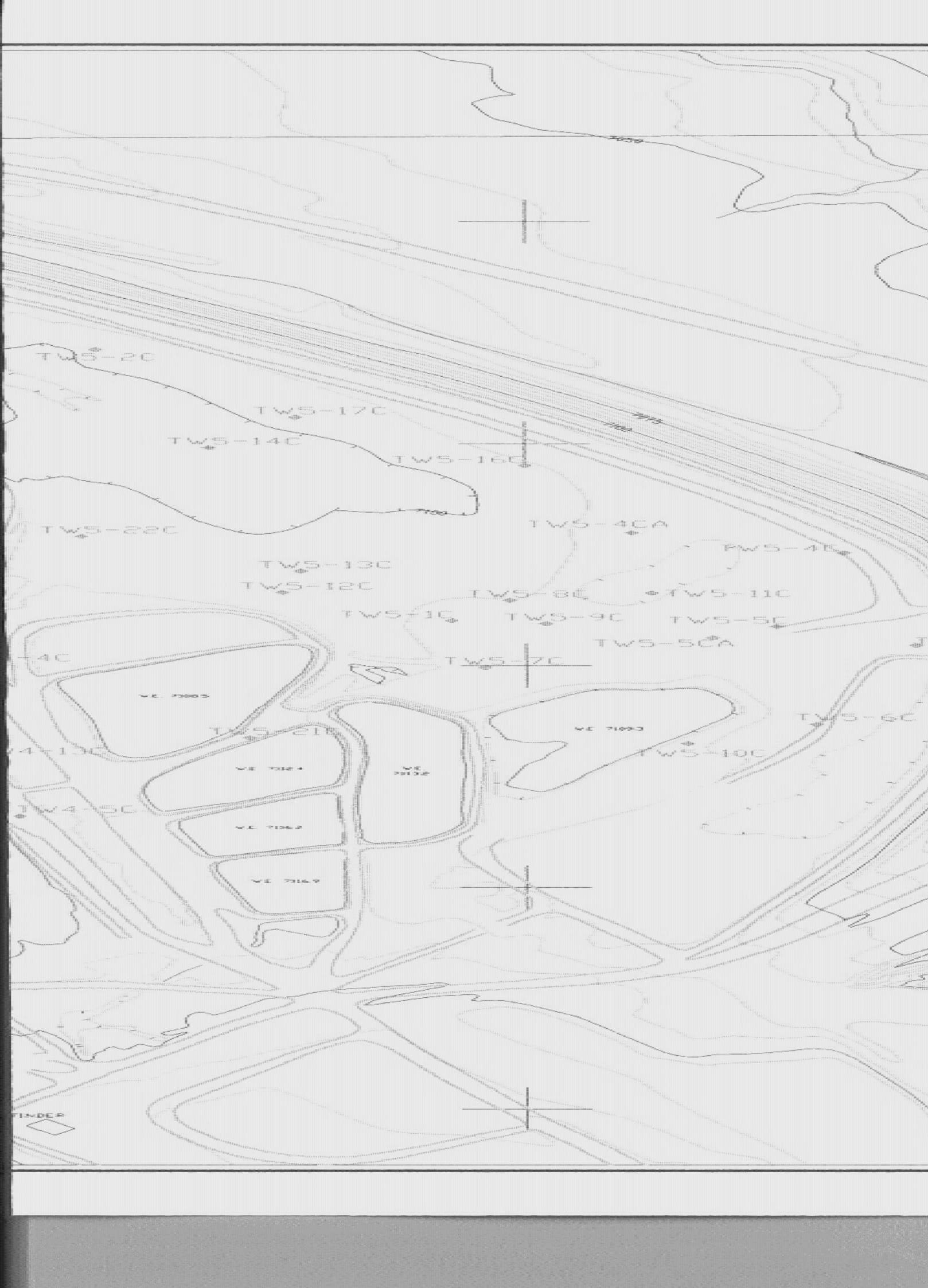
or semi-permanent removal of the uranium appear to be dramatically reduced. The modeled concentration of 7.0 mg/l produces peak concentrations in wells along the Mine Creek channel that closely match historic values. Preliminary modeling with the approximate average tailings uranium concentration of 15 mg/l produced concentrations in key wells that were dramatically larger than any measured concentrations. This includes Surficial wells within the tailings area where there is no potential for restoration by the injection/collection systems.

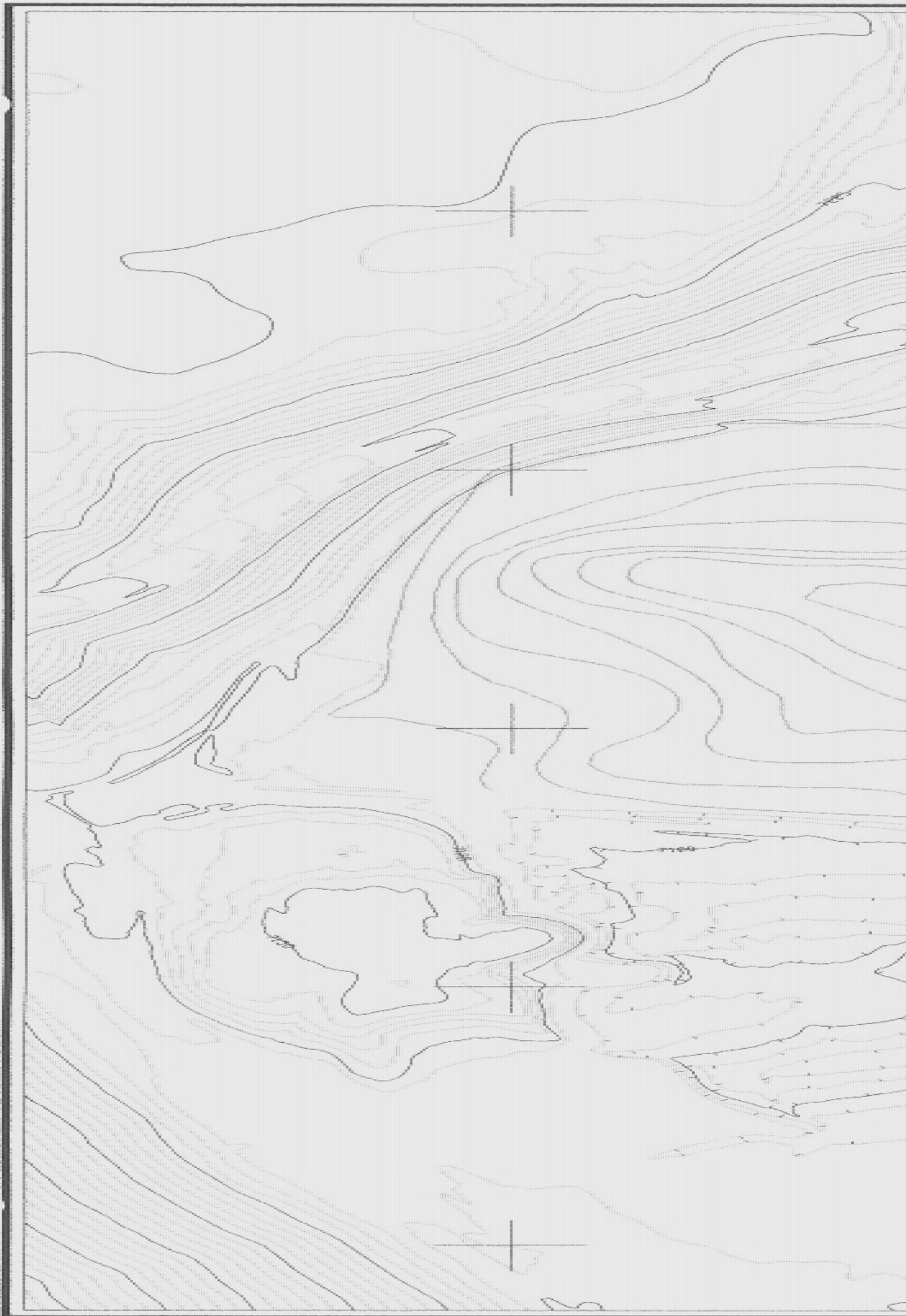
The thorium-230 activity in the tailings used in the transport modeling was 7.0 pCi/l. As mentioned earlier, the measured thorium-230 activity in Surficial wells has been erratic, and the reliability of the analysis must be considered for the occasions where the site standard is exceeded. Although true mobility for thorium-230 appears to be much less than uranium, use of a value of 7.0 pCi/l for the tailings source produces model predictions of maximum thorium-230 activity in the Mine Creek area plume that are consistent with maximum measured values.

The concentrations calculated above represent the projected mobile constituent concentrations for the tailings at present. The modeled scenario includes 1 ½ years of continued dewatering and collection/injection system operation with a modeled start time of January 2000. At the end of this period, the tailings dewatering and collection/injection are discontinued. This operational sequence and the constituent concentrations were used to determine the ALARA POC and projected POE concentrations. An alternate simulation with discontinuation of the Surficial aquifer injection and discontinuation of collection in the Mine Creek area at the end of year 2000 gave virtually no change in the POE concentrations from the original simulation which continued all system operations through mid-2001. Therefore, this alternate scenario with one year of continued injection/recharge system operation and one year of Surficial aquifer collection is considered equivalent to the original simulation with respect to POE concentrations.

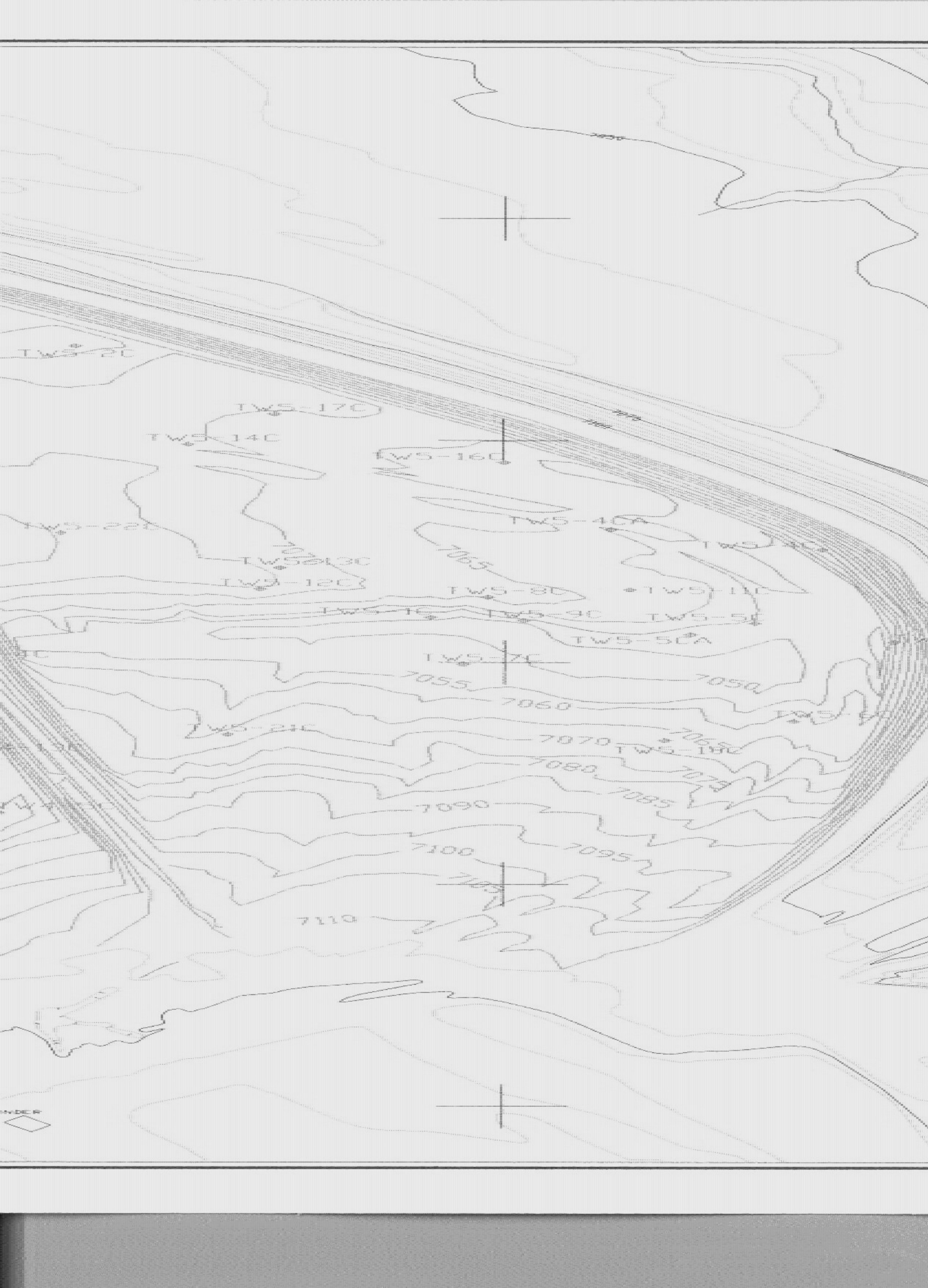


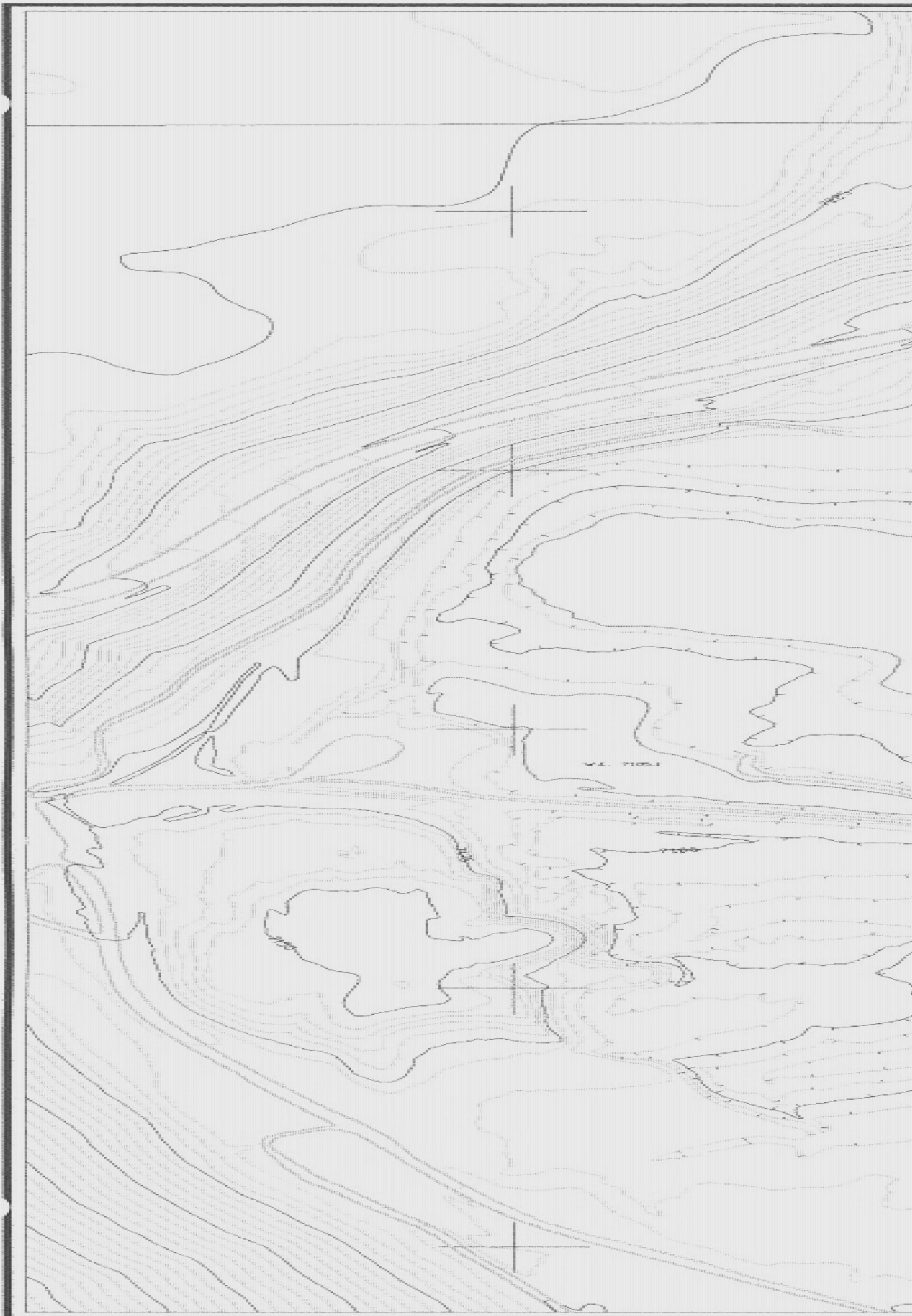
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TABLE 2.1-1. WATER-QUALITY ANALYSES FOR THE TAILINGS.

Well Name	Date	Cl (mg/l)	SO4 (mg/l)	pH (units)	TDS (mg/l)	Cond(f) (umhos/c)	As (mg/l)	Se (mg/l)	Unat (mg/l)	Ra226 (pCi/l)
TW4-1C	4/29/1993	3008	10819	2.61	20835	16720	0.105	0.416	28.7	1173
	7/27/1995	---	---	---	---	20940	---	---	---	---
TW4-2C	7/27/1993	3921	11654	3.01	21776	15300	0.0580	0.395	6.71	320
TW4-3C	8/2/1993	5402	12000	2.75	25986	21070	0.892	0.399	29.6	530
TW4-4C	6/18/1993	2127	7696	3.04	1435	10750	0.0160	< 0.0010	4.09	447
TW4-4CA	8/1/1995	---	---	---	---	17410	---	---	---	---
TW4-5C	4/1/1993	4067	11106	2.89	22972	19370	0.0940	0.536	21.2	1249
TW4-6C	7/14/1995	5932	13574	2.53	27775	26310	0.255	< 0.0010	34.2	2366
	7/26/1995	---	---	---	---	22530	---	---	---	---
	7/26/1995	---	---	---	---	21490	---	---	---	---
TW4-6CA	7/12/1995	---	---	---	---	30310	---	---	---	---
TW4-6CB	7/14/1995	---	---	---	---	15880	---	---	---	---
TW4-7C	8/3/1995	5992	16030	2.85	31270	24960	0.336	0.582	52.4	1379
TW4-8C	7/7/1995	2539	8912	2.96	16455	14570	0.215	0.731	18.2	714
	7/14/1995	---	---	---	---	20210	---	---	---	---
TW4-8CA	7/27/1995	---	---	---	---	16140	---	---	---	---
TW4-8CB	7/27/1995	---	---	---	---	24180	---	---	---	---
TW4-8CC	3/22/1999	2000	15200	2.84	24900	20461	0.294	0.833	48.0	1470
TW4-9C	6/30/1995	339	3687	2.98	5338	5320	0.154	0.0750	2.02	235
	12/17/1997	---	---	---	---	5346	---	---	---	---
TW4-9CA	6/30/1995	167	3915	3.15	5703	5850	0.272	0.0290	0.593	377
TW4-10C	8/1/1995	5457	14461	3.26	27280	21920	0.0540	0.538	23.1	811
TW4-10CA	8/1/1995	---	---	---	---	21850	---	---	---	---
TW4-11C	7/10/1995	5200	13900	3.39	26324	22990	0.110	0.262	6.55	1062
TW4-11CA	8/1/1995	---	---	---	---	19730	---	---	---	---
TW4-11CB	7/25/1995	---	---	---	---	14040	---	---	---	---
TW4-11CC	7/12/1995	---	---	---	---	12330	---	---	---	---
TW5-1C	3/31/1993	1732	9342	4.50	16518	14780	0.0240	0.0050	1.27	212
TW5-2C	4/1/1993	4745	17822	3.68	35049	22480	0.0050	0.330	30.0	1578
	1/9/1998	2360	14100	---	28500	25036	---	---	8.28	---
TW5-3	3/24/1993	2542	3901	5.31	9439	10770	0.0360	0.0060	0.521	263
	12/17/1997	---	---	---	---	20461	---	---	---	---
TW5-4C	1/24/1994	1578	2943	5.94	7264	7490	0.0960	0.0020	1.07	198
	12/17/1997	---	---	---	---	20673	---	---	---	---
TW5-4CA	7/26/1995	---	---	---	---	20930	---	---	---	---
TW5-5C	3/2/1994	2097	5151	4.14	11584	8910	0.0400	0.0160	0.492	447
TW5-6C	3/2/1994	2194	7992	3.11	15152	9250	0.107	0.0490	4.38	532
TW5-7C	7/26/1995	4111	7372	2.99	18035	16000	0.101	0.286	9.62	306
TW5-8C	7/26/1995	3215	9840	9.74	18284	15300	0.0310	0.126	12.4	172
	7/26/1995	---	---	3.74	---	---	---	---	---	---
TW5-9C	7/26/1995	---	---	---	---	24950	---	---	---	---

TABLE 2.1-1. WATER-QUALITY ANALYSES FOR THE TAILINGS (cont'd).

Well Name	Date	Ba (mg/l)	Cd (mg/l)	Cr (mg/l)	NO3 (mg/l)	Fe (mg/l)	Pb (mg/l)	Mo (mg/l)	Ni (mg/l)
TW4-1C	4/29/1993	< 0.100	< 0.0100	< 0.0500	0.300	1770	< 0.0500	< 0.100	3.21
TW4-2C	7/27/1993	< 0.100	< 0.0100	< 0.0500	< 0.100	1740	< 0.0500	0.100	4.74
TW4-3C	8/2/1993	< 0.100	< 0.0100	< 0.0500	0.410	1635	< 0.0500	< 0.100	3.99
TW4-4C	6/18/1993	< 0.100	< 0.0100	< 0.0500	0.130	943	< 0.0500	< 0.100	2.14
TW4-5C	4/1/1993	< 0.100	< 0.0100	0.570	< 0.100	1338	< 0.0500	< 0.100	4.23
TW4-6C	7/14/1995	< 0.100	< 0.0100	0.970	0.360	1711	< 0.0500	< 0.100	0.490
TW4-7C	8/3/1995	< 0.100	0.140	1.35	< 0.100	2093	< 0.0500	< 0.100	5.00
TW4-8C	7/7/1995	< 0.100	< 0.0100	0.270	0.180	1177	< 0.0500	< 0.100	1.90
TW4-8CC	3/22/1999	0.100	0.0580	0.450	---	2500	0.350	0.100	3.60
TW4-9C	6/30/1995	< 0.100	< 0.0100	0.120	< 0.100	532	< 0.0500	< 0.100	0.500
TW4-9CA	6/30/1995	< 0.100	< 0.0100	0.0600	< 0.100	559	< 0.0500	< 0.100	0.640
TW4-10C	8/1/1995	< 0.100	< 0.0100	0.0800	< 0.100	1342	< 0.0500	< 0.100	4.70
TW4-11C	7/10/1995	< 0.100	< 0.0100	< 0.0500	< 0.100	1520	< 0.0500	< 0.100	4.00
TW5-1C	3/31/1993	< 0.100	< 0.0100	< 0.0500	< 0.100	1942	< 0.0500	< 0.100	4.17
TW5-2C	4/1/1993	0.510	< 0.0100	1.17	< 0.100	2136	< 0.0500	< 0.100	6.12
TW5-3	3/24/1993	< 0.100	< 0.0100	< 0.0500	< 0.100	705	< 0.0500	< 0.100	< 0.0500
TW5-4C	1/24/1994	< 0.100	< 0.0100	< 0.0500	< 0.100	178	< 0.0500	< 0.100	< 0.0500
TW5-5C	3/2/1994	< 0.100	< 0.0100	< 0.0500	0.400	800	< 0.0500	---	2.40
TW5-6C	3/2/1994	< 0.100	< 0.0100	< 0.0500	0.380	1403	< 0.0500	< 0.100	3.87
TW5-7C	7/26/1995	< 0.100	0.0900	0.0600	0.630	567	< 0.0500	< 0.100	2.01
TW5-8C	7/26/1995	< 0.100	< 0.0100	0.160	0.260	1226	< 0.0500	< 0.100	3.34

2.2 TRANSPORT ASSESSMENT

The quantity of water moving in the Surficial aquifer in the tailings area is the sum of recharge from precipitation, seepage from tailings, and excess artificial recharge. When the collection/injection system operation is terminated, the ground-water mound that has developed will decay and the long-term ground-water flow will result almost exclusively from recharge and a small quantity of tailings seepage. In the area of concern, this water is moving to Spring Creek and is combining with the surface flow in the perennial stream. The transport of constituents from the tailings is primarily in the Mine Creek area where the transmissivity of the Surficial aquifer is greater. The movement rates of the constituents are governed by the seepage velocity and retarding processes such as adsorption/desorption. The seepage velocity is a function of hydraulic conductivity, ground-water gradient, and specific yield (effective porosity) of the aquifer.

The modeling of ground-water flow was done with MODFLOW (McDonald and Harbaugh, 1988), a three-dimensional finite-difference model. A two-layer model was used with the upper layer consisting of the tailings, and the Surficial aquifer represented by the lower layer. The details of the flow model construction are presented in Appendix D. The tailings aquifer was modeled as a bounded aquifer with the only means of discharge/recharge through exchange with the Surficial aquifer or through extraction by wells. The Surficial aquifer was modeled as a confined/unconfined aquifer with potential discharge/recharge by drains, river cells, wells, precipitation recharge, or movement beyond the boundaries of the model. Spring Creek was modeled as a river, and the remaining section of Mine Creek was modeled as a series of drain cells. This allowed separation of the ground-water discharge to Mine Creek from the discharge to Spring Creek in the tabulation of water balance provided by the model. Flow measurements have shown Spring Creek is a gaining stream in the reach adjacent to the tailings, and the modeling supported this. However, the ground-water discharge to Spring Creek will decline once the excess fresh-water injection ceases. The precipitation recharge over the area south of the tailings and between the tailings and Spring Creek was estimated as 0.96 inch/year.

The change in remaining volume of water in the tailings was calculated by summing the volume in each tailings cell at the end of each stress period. Stress periods were set to correspond with planned changes in system operation and to provide coverage of the entire model period. Up to 14 stress periods were used to provide up to 50 years of simulation. The changes in remaining volume for the tailings were used to calculate the rate of seepage from the tailings for each stress period. The model results also provided rates of ground-water discharge to the drain cells (Mine Creek) and to the river cells (Spring Creek). These rates then allowed a proportional comparison of various dewatering and collection/injection system scenarios. With a ratio of seepage rate from the tailings to total ground-water discharge to Spring Creek, the potential benefits of changing or extending remediation system operation could be evaluated. The alternate approaches are presented in Sections 3.2.1 and 3.2.2.

Current versions of the MODFLOW model can create a file of cell by cell flow terms for use by a transport model. The MT3D model (S.S. Papadopoulos & Associates, 1992), can use the flow terms from the MODFLOW model in simulation of reactive solute transport, and was used to model the transport of uranium and thorium-230 for the tailings area. The version of MT3D used in this modeling has been updated from an explicit finite difference solution to an implicit solution.

2.2.1 CONSTITUENT TRANSPORT

The transport of uranium and thorium-230 in the Surficial aquifer is radially outward from the tailings area. With the exception of the Mine Creek area, the rate of transport is extremely slow due to much smaller hydraulic conductivities outside of this area. The transport modeling included exchange of the uranium and thorium-230 between the tailings and the Surficial aquifer and eventual transport according to the ground-water velocities. A matrix of existing concentrations was established for the Surficial aquifer. This included a background concentration of 0.083 mg/l for uranium and a background thorium-230 activity of 0.4 pCi/l for all areas outside of the tailings. Directly beneath the tailings, the range of estimated uranium concentrations was 0.083 mg/l to 0.83 mg/l. The larger concentrations were placed close to the original Mine Creek channel with a

gradient to the general background concentration of 0.083 mg/l with increasing distance from the channel. The same approach was used for a thorium-230 with a range of 0.4 pCi/l to 4.0 pCi/l. The concentration in the tailings was assumed to be constant. All fresh-water injection was assumed to be at background concentrations.

2.2.1.1 DISPERSION

The dispersivity of the formation is unknown. Fortunately, the larger hydraulic conductivity in the Mine Creek area and the use of drains to simulate the Mine Creek surface flow makes the transport an advection dominated process with slight convergence toward the drains. This dramatically reduces the effects of dispersion and makes the modeling insensitive to dispersivity. The dispersivities used in the model were 10 feet for both layers, with a ratio of 0.2 for transverse/longitudinal dispersivity and a ratio of 0.2 for vertical/horizontal dispersivity. Diffusion was not used in the model.

2.2.1.2 RETARDATION

The retardation factor used in the model was one, giving no simulated retardation. Based on comparisons between observed chloride movement rates and uranium movement rates, it is apparent that there is some retardation of uranium transport. However, the retardation does appear to be inversely proportional to permeability of the aquifer with the least retardation in the immediate Mine Creek area. This is consistent with the expectation that a larger fraction of silts and clays in the aquifer would offer more adsorptive surface and reduce the permeability at the same time. The net effect of retardation in a situation where the source is slow leakage from a relatively large source volume, is a slowing of the movement rate and a modest reduction in peak concentrations at a given observation point. Hence, the use of no retardation in the modeling adds a measure of conservatism in the transport approach.

2.2.1.3 URANIUM

The predicted peak uranium concentration at POC wells RPI-19B and NP01 was 4.45 mg/l and 4.40 mg/l, respectively (see Figure 2.2-1). The modeling assumed no

retardation and the two POC wells are located relatively close to the toe of the No. 5 Tailings dam, so retardation would not appreciably change the peak concentrations. The POE concentration at Spring Creek is discussed in Section 2.2.2.3.

2.2.1.4 THORIUM-230

The predicted peak thorium-230 activity at POC wells RPI-19B and NP01 was 5.76 pCi/l and 5.53 pCi/l, respectively. The modeling assumed no retardation and the two POC wells are located relatively close to the toe of the No. 5 Tailings dam, so retardation would not appreciably change the peak activity. The POE activity at Spring Creek is discussed in Section 2.2.2.3.

2.2.2 TRANSPORT TO SURFACE WATER

The seepage impacted ground-water discharges to Spring Creek. A large portion of the total ground-water discharge to Spring Creek occurs in the vicinity of Mine Creek because that precipitation recharge south of the tailings area is discharging through this area. Precipitation recharge to the area between Spring Creek and the tailings also discharges eventually to Spring Creek and is largely unaffected by tailings seepage. Discharge from the drain cells used in modeling the discharge to Mine Creek was assumed to be instantaneously combined with ground-water discharge to the river cells for Spring creek. The concentrations or activities in the ground-water discharge to surface water vary dramatically, so a proportional combination is required to determine the composite concentrations in the discharge.

2.2.2.1 FLOW RATES IN SPRING CREEK

Flow rates in Spring Creek and tributaries were measured in 1982 (Hydro-Engineering, 1982) and 1999. The measurements were taken in the fall when the flow is typically smallest. Section 1.2.4.2 describes the measurement of the flow rates. The resulting estimate of typical late season base flow is 290 gpm. The identification of a base flow in Spring Creek is important because as the rate of surface flow decreases, the concentration of the composite of surface flow and ground-water discharge increases. The use of this base flow represents a conservative approach because 290 gpm

represents the smallest expected flow rate during the year for a year in the midst of a moderate drought cycle. The through flow in Spring Creek was not included in the flow model because it added complexity to the compositing of water and would not allow segregation of the Mine Creek discharge with drain cells.

2.2.2.2 GROUND-WATER DISCHARGE TO SPRING CREEK

Based on the measurements in the previous section, the current ground-water discharge to Spring Creek ranges from 47.5 gpm to approximately 80 gpm. Prior to the installation of the collection/recharge system, the ground-water discharge was approximately 24 gpm. There is undoubtedly some seasonal cycling of this discharge. The total predicted ground-water discharge to Spring Creek is tabulated by the MODFLOW model. The predicted rate of groundwater discharge during operation of the collection/injection system is 91 to 93 gpm. Following cessation of injection, the model predicts that the discharge rate will drop to 23 to 24 gpm after roughly 20 years. The predictions correspond reasonably well with measured values.

2.2.2.3 PROJECTED POE CONCENTRATIONS IN SPRING CREEK

A significant portion of the ground water entering Spring Creek has been impacted by seepage from the tailings. This water combines with the base flow in Spring Creek to produce composite surface water concentrations that are much lower than the typical ground-water concentrations. The MODFLOW model predictions of ground-water discharge to the river and drains cells representing Spring Creek and Mine Creek were extracted for each of 14 stress periods over a 50-year simulation period. The average concentrations for a series of drain and river cells was then multiplied by the discharge to each type of cell to give a constituent "load" to Spring Creek. The composite concentration of the ground-water discharge and the 290 gpm base flow in Spring Creek was then the POE concentration.

Mine Creek was represented by 20 drain cells, and the concentration of every other drain cell was averaged at regular intervals through the simulation period to represent the Mine Creek discharge. This quantity was then multiplied by the total drain discharge

rate for each stress period. Since the drain cells are located roughly in a line perpendicular to the gradient from the tailings, the contaminant front reaches the cells sequentially. The maximum concentration in the Mine Creek discharge represented by the drain cells occurs long after the fresh-water mound from injection has decayed, and the contaminant has reached the last drain cell at the confluence of Mine Creek and Spring Creek.

A similar approach was used in determining the average concentration of ground water entering the river cells in Spring Creek over time. There were 143 river cells used for Spring Creek and the ground-water discharge to a cell was not uniform. For this reason, 12 indicator river cells along Spring Creek were used in this averaging. The indicator cells were selected to provide a distribution that would reflect the varying rates of discharge due to the larger conductivity near the Mine Creek confluence. Four cells were distributed upstream from the Fox Creek confluence. Seven cells were placed in the reach between the Fox Creek confluence and the haul road crossing. The remaining cell was placed just downstream of the haul road crossing. Over the simulation period, the concentrations in all but one cell did show an increase over background, although the magnitude of change was small for far upstream cells. Like the drain cells, the concentration across the 12 indicator cells was averaged at regular intervals and then multiplied by the rate of ground-water discharge for each stress period.

When the base flow in Spring Creek and the ground-water discharge to river cells and drain cells is combined at the end and middle of each stress period, a concentration curve for the POE is developed. This curve is somewhat bell shaped in nature and the maximum concentration represents the proposed ACL POE concentration. The predicted POE concentration for uranium is 0.15 mg/l and the predicted thorium-230 activity is 0.3 pCi/l.

2.3 EXPOSURE ASSESSMENT

Exposure assessments (and risk characterization) for uranium and thorium-230, demonstrate that impacts on human health and the environment are acceptable at the projected POE concentrations in ground water and surface water. These conclusions are based on the results of a detailed exposure pathway analysis; exposure estimations; toxicity evaluations; and projections of the risk of adverse impacts on human health and the environment. The details of the assessments are presented in Appendices A, B, and C.

2.3.1 EXPOSURE PATHWAYS

Ingestion is the only route of entry to the body where exposures to uranium and thorium-230 could be sufficient to impact human health or the environment at this site. Potential users will be precluded from extracting ground water within the area where the elevated concentrations are presented. The closest possible POE is Spring Creek. Exposure estimates were made for each pathway as determined in Appendix A.

2.3.1.1 GROUND-WATER USES

With the discharge of impacted ground water to Spring Creek within the restricted area, the usage of ground water from impacted areas is not allowed.

2.3.1.2 SURFACE-WATER USES

Spring Creek discharges to Little Medicine Bow River and eventually to the North Platte drainage. At present, there is no usage of the surface water upstream of the confluence with Little Medicine Bow River other than consumption by livestock and wildlife. The confluence with Little Medicine Bow River is less than two miles downstream of the proposed POE location. At this point, the flow in the system increases several fold.

2.3.2 HUMAN HEALTH RISKS

The potential for anything other than occasional human consumption of the surface water in Spring Creek is highly unlikely. The risk of bacterial contamination in surface

water is simply too great to utilize the water without treatment. The potential for construction of a surface water treatment facility drawing from the reach of Spring Creek between the mine and the confluence with Little Medicine Bow River is so remote that it can be disregarded. Hence, the potential means of human exposure are indirect or are limited to very infrequent direct consumption of the water. The most direct of the plausible exposure pathways is extraction from a Surficial well directly adjacent to the Spring Creek channel. However, such a well that was close enough to draw surface water from Spring Creek would be subject to the same treatment concerns as water drawn directly from the Creek. The well would also be extremely vulnerable to flooding. However, because ingestion accounts for the largest contribution to the potential for an adverse health effect, it will be assumed that there is a hypothetical group of residents who consume the POE water.

Ingestion accounts for the largest contribution to the potential for an adverse health effect. The potential risks from exposure, both directly and indirectly, to uranium, and thorium-230 at the projected POE values have been characterized by a toxicity evaluation and an analysis of the most recent scientific data. Estimates of human exposure are described in detail in Appendix A, while the analysis of human health hazards based on the proposed POE concentrations are described in Appendix B.

The traditional approach of the EPA derives acceptable drinking water limits by very conservative methods and the use of reference oral doses (RfD_o) that can be applied anywhere in the United States. RfD_o 's are a function of uncertainty factors and toxicity values for which no toxic effects have been observed (NOAEL), or the lowest dose at which toxic effects have been observed (LOAEL) in humans or laboratory animals. The EPA's objective is to develop drinking water quality criteria that will protect the entire U.S. population. Therefore, it must be more protective and conservative than the objective of an Alternate Concentration Limit. One significant difference between the two approaches is the weight of consideration given by the Nuclear Regulatory Commission to the probability, in this case, that the ground water will ever be used as a potable water source in the future. Currently, the ground water at the boundary of the

site (simulated POE locations) is not being used for drinking water, and it is unlikely that it will ever be. Consequently, the criteria for predicting the risk of toxic effects occurring at the proposed POE values are not the same. Concentrations of the constituents may be higher than those listed by the EPA, or other agencies, as long as the risks of adverse impacts on human health and the environment are shown to be acceptable.

2.3.2.1 URANIUM

Excessive exposure to uranium was linked to two possible end-points: chronic kidney disease due to chemical toxicity and cancer due to radioactivity. This risk assessment addressed the toxicology and the probable risks of adverse health effects for both end-points assuming the use of water containing the maximum projected POE uranium concentration of 0.15 mg/l. An estimated daily intake value was developed from a uranium concentration of 0.15 mg/l in the uranium exposure assessment in Table A.4-7 in Appendix A.

The biokinetic model for estimating the kidney burden of uranium was validated by comparing the reported values, from studies of residents in New York City and Japan, with the predicted model value (Fisenne and Welford, 1987; Igarishi, 1985). The reported and predicted values compared favorably, thus validating the model.

The uranium burden in the kidneys was estimated for residents at this site who would use water with a uranium concentration of 0.15 mg/l. Kidney concentration values were calculated to be 0.04 mg U/g kidney. In this assessment, a threshold value for preventing the occurrence of irreparable kidney damage was assumed to be 1 mg U/g kidney, based on available data. The assessment concludes that the use of well water containing 0.15 mg U/l by the residents at this site is not expected to result in uranium burdens in the kidney that are associated with kidney damage.

The potential risk of cancer from ingestion of uranium while living at the site for 30 years was estimated using the exposure pathways described in Section 2.3.1 and risk factors from the EPA. Details are provided in Appendix B. The conservative calculation

resulted in a lifetime risk of $4.8E-5$. This value is below the cancer risk criteria of the NRC of $1.0E-04$ (NRC, 1996) and the EPA at $3.0E-04$ (FR(57), 1992).

The potential annual radiation dose from ingestion of uranium in ground water was estimated using the exposure pathways described in Section 2.3.1 and the dose factors from the NRC. Details are provided in Appendix B. The calculations show that the total effective dose equivalent is 10 mrem/y. This is less than the NRC dose criterion of 100 mrem/y to members of the public from licensed nuclear facilities (FR(56) p.2335, 1991).

In conclusion, the chemical- and radio-toxicity to residents using water at the maximum projected POE uranium concentration should not result in unacceptable adverse effects.

2.3.2.2 THORIUM-230

The health risk associated with exposure to thorium-230 is considered to arise from its radiological properties rather than its chemical properties. This conclusion was reached from studies primarily related to human studies where thorium had been injected into patients for medical diagnostic purposes. While no drinking water standards are known to exist for thorium-230, dose and risk factors have been published by the EPA and other standards setting organizations.

In the exposure assessment presented in Appendix A, it was shown that thorium has a very low bioavailability to man. The transfer coefficients from soil to plant to man are low compared to most other radionuclides. However, once in the blood or lung, thorium is considered to be more hazardous than most radionuclides.

The incremental thorium-230 concentration at the POE location has been projected to be 0.2 pCi/l, or twice the natural background level in Spring Creek. When this water is used for irrigation over a period of 30 years, the incremental increase in thorium-230 concentration in the soil was calculated to be only 0.007 pCi/g (see Appendix A, Section A.4.4.1). This is a small increase above the natural background concentration of 1.6 pCi/g.

The human health assessment in Appendix B showed that these small incremental thorium-230 concentrations in the groundwater, soil, and food resulted in an insignificant radiation dose to the potential occupants near the site. The calculated incremental dose to occupants is only 2 mrem/y. The potential lifetime risk from 30 years of exposure was calculated to be $9E-8$, which is insignificant compared to the NRC guideline of $1E-4$.

2.3.2.3 UNCERTAINTY

The numerous sources of uncertainty in this risk assessment have been discussed in each section of the analysis. In most cases, conservative assumptions have been made to increase the exposure estimate. The most conservative assumption is that a hypothetical resident(s) would consume water within the reach between the POE location and the confluence with Little Medicine Bow River, where the concentrations would be substantially reduced from dilution. Beside the fact that the location is very undesirable for a residence, the risk from natural bacterial contamination of the surface waters may be far greater than the radiotoxicity effects from uranium and thorium-230 at the maximum projected POE concentrations. Table 2.3-1 lists some of the sources of uncertainty and associated consequences in predicting risk estimates for this human health assessment.

TABLE 2.3-1. UNCERTAINTIES IN HAZARDS ANALYSES.

PROBABLE DIRECTION OF ERROR	SOURCE OF UNCERTAINTY
Underestimation of risk	Lack of measured concentration data for chemicals in environmental media
Overestimation of risk	<p>POE concentrations are the maximum value that should occur at any of the POE locations. Average 30 year concentrations at all POE locations will be significantly less than the POE concentrations.</p> <p>Use of conservative parameters in the ion migration simulations</p> <p>Assume limited constituent losses in soil over time due to weathering or biodegradation</p> <p>Conservative assumptions for human and exposure animal parameter values</p> <p>Lack of adequate toxicity data relevant to exposure to these chemicals by ingesting drinking water</p> <p>Application of conservative uncertainty factors that may not represent the current knowledge base</p>
Unknown direction	<p>Variations in analytical measurements</p> <p>Uncertainties in hydrological modeling</p> <p>Toxicological interactions between chemical constituents or between the constituents and other biochemicals in the body</p> <p>Use of site reference doses RfD_o for uranium, selenium and molybdenum</p> <p>Use of generic agricultural biotransfer factors</p>

2.3.3 ENVIRONMENTAL HAZARDS

It was shown in Appendix C that uranium and thorium-230 in ground water at the POE concentrations are expected to produce no irreversible environmental impacts. The use of ground water for irrigation at this site results in two potential sources for contact with

these constituents: standing surface water from irrigation operations for short periods of time, and accumulation in plants and lower food chain organisms, both aquatic and terrestrial. Spring Creek will experience the same radionuclide concentrations as the POE. However, since the exposure assessments have shown that a minimal impact exists to man from using the water for drinking water and eating locally produced meat and produce, no significant impacts to fish or other aquatic species are expected.

The critical end-point of environmental toxicity being considered at this site is mainly the potential for adverse effects on livestock being watered with surface water and grazed on irrigated forage. An analysis of the impacts on beef and dairy cattle in Appendix C showed that uranium toxicity in cattle was very unlikely. Similarly, uranium intakes that had produced transient declines in milk production in dairy cattle were approximately 50 times higher than the potential intakes at this site. Therefore it was concluded that environmental uranium toxicity effects are improbable.

The exposure assessment showed that the transport of thorium-230 to soils and forage resulted in near background concentrations and that the dose to humans was extremely small. This was due to the small incremental thorium-230 concentration in the groundwater at the POE as well as the fact that the bio-availability of thorium is low compared to most elements. Therefore, it can easily be concluded that the environmental toxicity of thorium-230 in groundwater at these very low levels is insignificant. The numerous sources of uncertainty in this risk assessment have been discussed in each section of the analysis. In most cases, conservative assumptions have been made to increase the exposure estimate. The most dramatic assumption is that a hypothetical resident(s) would consume water within the reach between the POE location and the confluence with Little Medicine Bow River, where the concentrations would be substantially reduced. Besides the fact the location is grossly undesirable for a residence, the risk from natural bacterial contamination of the surface waters is far greater than chronic toxicity effects of uranium or Th230 at the maximum projected POE concentrations. Table 2.3-1 lists some of the sources that may influence the risk estimates for exposure to uranium and Th230 at the POE values.

3.0 CORRECTIVE ACTION ASSESSMENT

This section presents the results of the Corrective Action Program (CAP). Major topics to this subsection are the corrective actions relative to the tailings and the Surficial aquifer. The planned future corrective actions conclude the discussions in this subsection.

The feasibility of alternative corrective actions is presented as a second subsection. The final three subsections are the corrective action cost, corrective action benefits and ALARA conditions.

3.1 RESULTS OF CORRECTIVE ACTION PROGRAM

The corrective action program (CAP) for PMC's Shirley Basin site has included three basic components to restore ground-water quality. The first component was a series of Surficial aquifer collection wells that were pumped beginning in 1984. Additional wells were installed in 1986, and the second component of the CAP, a fresh-water recharge system was installed in 1986. Subsequent additions to the CAP have included additional recharge lines, improved fresh-water distribution systems and a series of fresh-water injection wells to construct a hydraulic barrier. The third component of the CAP has been the tailings dewatering program, which was begun in 1993 and has been expanded.

The purpose of the combination of Surficial collection and fresh-water injection/recharge is to create a hydraulic depression surrounded by a hydraulic ridge to effect a "sweeping" of the area between collection and recharge. The combination of both techniques allows the establishment of gradient reversal, which both contains seepage plumes and allows restoration of areas upgradient and downgradient of the hydraulic ridge or mound.

Originally, the collection water from the Surficial aquifer was recycled through the milling process. When milling ended in 1992, the collection water was returned to tailings for evaporation. In 1997, PMC began discharge of a portion of the Surficial collection water

to the Area 2/8 pit after treatment. All remaining collection water is evaporated in the tailings area through a series of shallow ponds and spray enhanced evaporation systems. The results of the corrective action program are discussed below.

3.1.1 TAILINGS

Collection rates from the tailings wells currently average approximately 130 gpm. The gradual reduction in surface water volume in the tailings ponds has allowed progressive coverage of Tailings Pond #5 and the majority of Tailings Pond #4 with interim cover. Unfortunately, the Shirley Basin has experienced a relatively wet precipitation cycle since 1992, which has hampered efforts to dispose of water through evaporation.

A total of 65 tailings wells are in place on the tailings, with 52 of the wells constructed as potential pumping or extraction wells. The first tailings well was drilled and began pumping in 1993. Additional tailings wells have been added in more than four drilling programs. The operation of the tailings wells has been difficult with severe precipitation and corrosion problems. The high TDS and low pH of the tailings water makes constant maintenance of the dewatering system necessary. Frequent well development and rehabilitation is necessary to maintain well yields. Unfortunately, lower yielding wells in less permeable tailings require similar or greater maintenance efforts and expense when compared to better yielding wells. This leads to constantly escalating cost per unit volume of water extracted.

The remaining volume of water contained within the tailings is estimated at 137 Mgal at the end of 1999. This does not include tailings solution stored in No. 4 pond or a series of shallow evaporation ponds. The surface tailings water is being disposed of with evaporation systems, and construction of a clay-lined pond is planned to contain the remaining water. Also under consideration is a reverse osmosis (R.O.) system to create a good quality water stream that can be discharged to the mine. Infiltration of precipitation or runoff and leakage from evaporation ponds on the tailings surface has resulted in a large rate of recharge to the tailings in the past. This has effectively offset a substantial portion of the tailings dewatering extraction volume. However,

replacement of leaky evaporation ponds with clay-lined ponds, and diversion or capture of runoff from surrounding areas has reduced the recharge to the tailings.

3.1.2 SURFICIAL AQUIFER

Fresh water injection has been used at this site to build a hydraulic mound to reverse the gradient back to collection wells to remove the contaminated water. Collection started in 1984 and has continued to the present with staged addition of collection wells. A total of 22 fresh-water injection wells were added on the crest of the No. 5 dam to create a hydraulic barrier to seepage in the Surficial aquifer. An additional recharge line was added in 1995.

3.1.2.1 COLLECTION AND INJECTION

Figure 1.2-3 presents the location of the injection and collection systems. Improvement in water quality resulting from operation of these systems is presented in the following sections. Pumping from five collection wells (5A1, P3, P4, P6, and P7), began in November of 1984 (see Figure 1.2-3 for location of wells). The initial monitoring program indicated that containment of seepage, or gradient reversal, was successful only in the permeable portions of the Surficial aquifer. It was determined that a water recharge system in conjunction with more pumping wells would be needed to insure continuous gradient reversal in the Mine Creek seepage areas of the Surficial aquifer. Consequently, a fresh water recharge system was constructed during the summer of 1986, and three more collection wells were added to the pumpback system.

Pumping from the three new wells, P1, P8A, and P9, began on October 6, 1986. Further monitoring, during late 1986 through August 7, 1987, indicated the need for two more pumping wells and better distribution of water in the North recharge line. Consequently, collection wells P10 and P11 and a permanent re-distribution water line from WW23 were added. Pumping of collection wells P1 and P7 was discontinued on August 9, 1990 because of low yields.

A series of injection, collection, and monitor wells were added to the ground-water restoration system in 1994. Twelve Surficial injection wells were installed on the interior of the northern edge of the No. 5 tailings dam (see Figure 1.2-3) with operation beginning on 5/2/94. The wells were placed 100 to 200 feet apart to produce a ground-water "ridge" as a barrier to seepage. The initial injection rate was approximately 25 gpm, but has declined to approximately 9 gpm with development of a ground-water mound. The source of the injection water is well WW20. With the exception of brief periods of down time for maintenance of individual wells, the system has operated continuously. Additional Surficial collection wells are distributed throughout the tailings area. Five additional Surficial monitoring wells were also installed on the northeast side of the No. 5 Tailings Dam to analyze the effectiveness of the injection/collection system. In 1995, additional collection and injection wells were installed. Collection wells P12 through P21 were installed and pumping with a common suction line began in 1996. The pumping system was later converted to individual pumps. Injection wells TWI-12 through TWI-20 and TWI-22 extended the injection system along the No. 5 Dam to the south.

3.1.2.2 SURFICIAL WATER-QUALITY RESTORATION

With respect to the ACL constituents, uranium and thorium-230, the water-quality restoration in the seepage plume area has been very successful. In areas where data for uranium and thorium-230 are sparse or less frequent, chloride concentration has been used as an indicator of the success of restoration programs. Figure 1.3-6 presents measured uranium concentrations in the Surficial aquifer. The uranium concentration contours clearly indicate that the area of significantly elevated concentrations has been drawn to the immediate vicinity of the collection wells. In contrast, uranium concentrations for well RPI-20A at the confluence of Mine Creek and Spring Creek were as high as 3.5 mg/l in the mid 1980's but now are at 0.1 mg/l or less. In the south plume area, the uranium concentration in well RPI-21B has declined from a high of 3.14 mg/l to less than 0.2 mg/l. In the north plume area, the chloride concentration in well MC-8 has declined from a high of 750 mg/l to less than 50 mg/l in recent years. There is no uranium concentration data available for this well prior to

1989, so the nature of the restoration with respect to uranium can only be inferred from restoration of other constituent concentrations. The restoration of uranium concentration does lag restoration of chloride concentration due to retarding processes, and this is evident from slightly elevated uranium concentrations at many wells distributed throughout the Mine Creek area. However, for all practical purposes, the ground-water quality in the seepage plume area has been restored back to the immediate vicinity of the collection system.

As mentioned earlier, thorium-230 activities in the seepage plume area are more erratic than uranium concentrations, and this makes evaluation of the success of restoration efforts far less certain. Using well RPI-20A as the primary indicator well, there were six occurrences of thorium-230 activity in excess of the site standard of 0.3 pCi/l prior to 1990. Since 1990, there has been only one detection of thorium-230 in samples from this well, and that particular detection was highly questionable. This indicates that restoration with respect to thorium-230 activity has been successful.

Directly beneath the tailings and in close proximity to the collection system, the ongoing seepage from tailings is maintaining uranium and thorium-230 levels. There has been an improvement trend over the last 3 to 4 years in collection wells P-3, P-6, P-8A and 5A-1, and this is attributed to retrieval of the seepage front east of these wells. However, unless the tailings are completely dewatered and seepage ceases, restoration of the Surficial aquifer water beneath the tailings and in the capture area (near the collection wells), will never be complete. Since it is impossible to completely dewater the tailings, the restoration of the Surficial aquifer water quality beneath the tailings is not feasible.

3.1.3 PLANNED CORRECTIVE ACTION

The planned corrective action has been broken into subsections of collection and injection, and tailings dewatering.

3.1.3.1 COLLECTION AND INJECTION

The existing collection and injection system will continue operation until mid 2001. This includes Surficial collection wells throughout the tailings and Mine Creek areas, recharge lines in the Mine Creek area, and the fresh-water injection wells on crest of the No. 5 dam. The only potential change in the current system is the conversion of selected wells near the toe of the No. 5 dam from collection wells to injection wells. This change is under consideration because water quality in these wells is improving, and the conversion could produce additional restoration benefits in the immediate collection area.

3.1.3.2 TAILINGS DEWATERING

The present tailings dewatering program will be continued until mid 2001. There is an expected decline in well yields, and projections of extraction rates were adjusted accordingly. The well yields were also adjusted to reflect a net extraction rate rather than the actual projected well yield. This adjusts for ongoing infiltration that will continue until the infiltration barrier is place. Once the infiltration barrier is in place, the infiltration rates will be dramatically reduced. The continuation of the dewatering is projected to extract approximately 39 Mgal of water from the tailings, leaving an estimated 98 Mgal in the tailings.

3.1.3.3 INFILTRATION BARRIER

The schedule for the construction of the radon/infiltration barrier is dependent on several factors, and is not yet finalized. Extension of the interim cover as the surface water is eliminated will reduce infiltration, but the final clay cover with grading to eliminate ponding will reduce infiltration to a fraction of current rates.

3.2 FEASIBILITY OF ALTERNATE CORRECTIVE ACTIONS

The three alternative corrective action programs presented herein (Sections 3.2.1, 3.2.2 and 3.2.3) were developed to allow comparison of the planned corrective action plan with a variety of alternatives for purposes of demonstrating that the planned action meets ALARA conditions. The alternatives that utilize a time frame for corrective action are assumed to start in January of 2000. The planned corrective action includes continued operation of both the dewatering and collection/injection systems for 18 months. The first two alternatives are changes in the duration of continued operation of the current corrective action program. The third alternative is a barrier to serve as a seepage containment system. A variation of the planned corrective action truncated the injection system operation and a portion of the Surficial collection system at 12 months as a test of sensitivity to the injection system operation.

3.2.1 CESSATION OF COLLECTION/INJECTION AND DEWATERING

The first alternative correction program consists of cessation of collection/injection system and dewatering efforts immediately. This is potentially the least costly option because operational and maintenance costs are eliminated, and there are no direct capital costs except common decommissioning costs.

3.2.2 EXTENDED COLLECTION/INJECTION AND DEWATERING

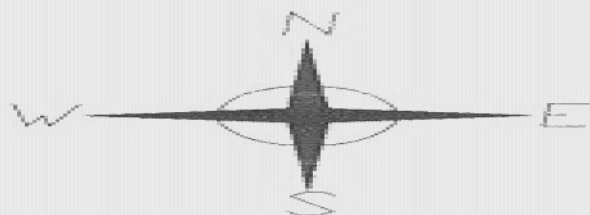
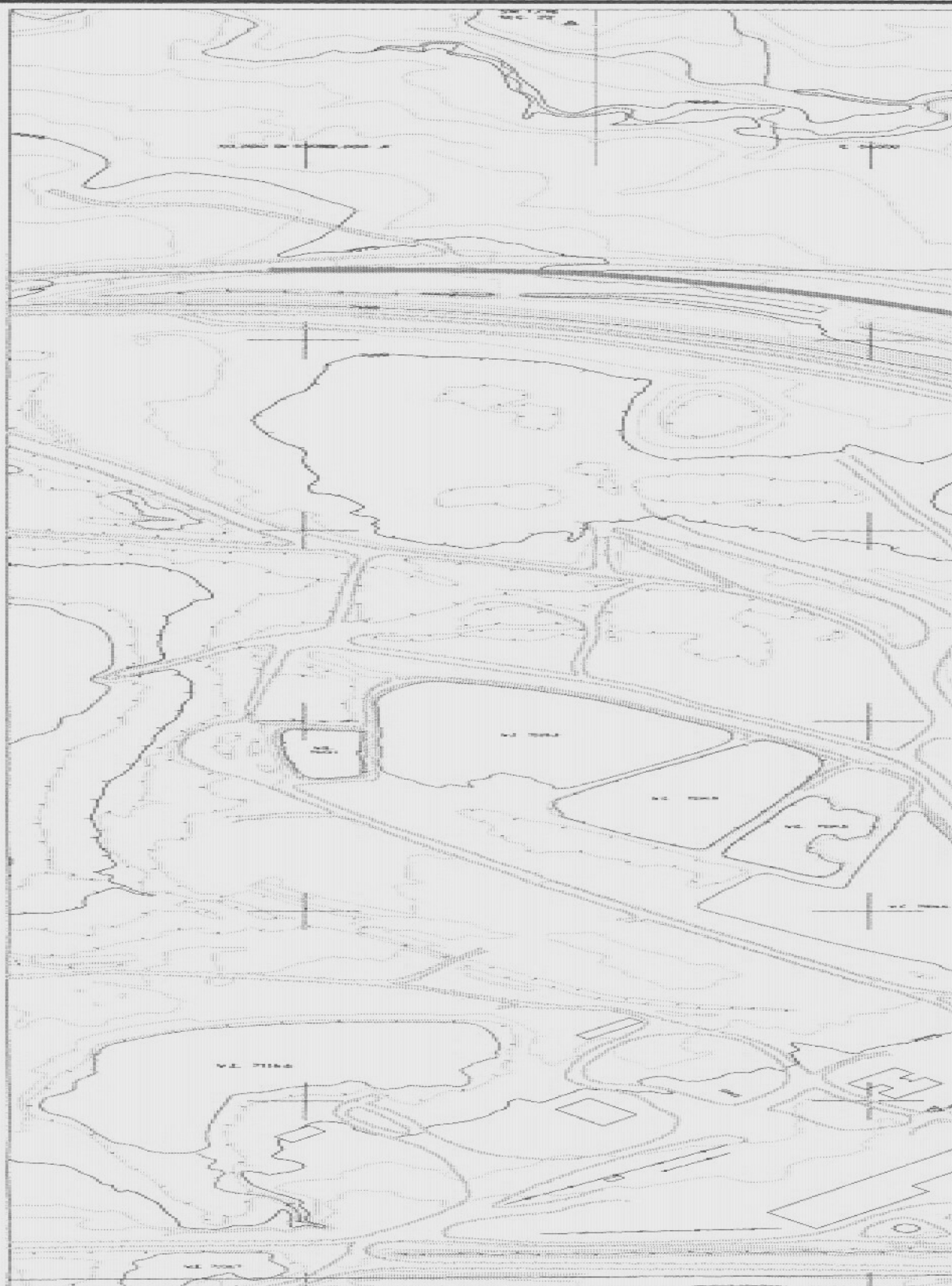
This alternative is based on an extended dewatering program with additional operational time for the collection/injection system. The tailings dewatering would be extended for 3½ years to a total of 5 years (dewatering until late 2004), giving a total of 75 Mgal removed from the tailings. The net annual extraction rate is decreased with subsequent years to reflect the anticipated decline in well yields. Operation of the injection wells is discontinued after 18 months (mid 2001), and operation of the Surficial collection wells and recharge lines is discontinued after 3½ years (mid 2003). The primary effect of the extended operation is the reduction of the seepage rate and the reduction in the duration of the measurable seepage impacts at the POE.

3.2.3 SLURRY TRENCH

A slurry trench in the more permeable area of the Surficial aquifer could potentially reduce the seepage impacts. The installation of a slurry trench to a depth ranging from 35 feet to approximately 70 feet along the toe of the No. 5 dam would reduce the seepage to the Mine Creek area (see Figure 3.2-1). Unfortunately, the use of this type of ground-water flow barrier will eventually divert the flow over or around the barrier or require perpetual collection efforts. There will be ongoing recharge to the Surficial aquifer upgradient of the barrier, and eventually the ground-water will discharge through an alternate pathway. Because of the large elevation difference between the recharge areas and the land surface in the Mine Creek area, it is plausible that the ground water will discharge to the surface just upgradient of the barrier. It is also plausible that the ground water will be diverted to the north or south of the barrier as the head in the Surficial aquifer increases.

The installation of a slurry trench across the more permeable portion of the Surficial aquifer would require a barrier length of approximately 2000 feet, but this wall would be circumvented relatively rapidly. In order to extend the duration of containment by the wall, a wall length of nearly one mile would be required with additional fill to bring the surface elevation in the Mine Creek area up to approximately 7060 feet above MSL. A typical depth in this area would be 45 feet, and a typical trench width would be 3-4 feet. The incremental benefit of extending the trench length is small. The estimated cost of the slurry trench installation is \$4,400,000 with the cost of a berm to raise the land surface in the Mine Creek area estimated at \$300,000. The slurry trench cost was developed using scaling from a similar but larger proposed slurry wall containment system at another site.

The installation of a physical barrier to seepage is considered an undesirable approach to mitigation of seepage effects because the cost is very large, and eventually the seepage problem will reoccur. The nature and location of the eventual seepage is difficult to predict, and this uncertainty makes this option very undesirable.



3.3 CORRECTIVE ACTION COSTS

This section summarizes the capital and yearly operational and maintenance (O & M) costs of both the planned corrective action plan (Section 3.1), as well as the alternative corrective action plans discussed above. Capital and yearly O & M costs are presented in 1999 dollars. Because the maintenance requirements for the tailings dewatering system are substantially greater than those for the Surficial injection/collection system, the projected O & M costs are extended for the duration of the dewatering effort. There will be some reduction in component O & M costs as the injection, recharge and Surficial aquifer collection systems are shut off, but these are some of the least demanding components of the overall corrective action systems, and the reduction is likely to be offset by increasing O & M costs of the tailings dewatering system. These costs are presented in Table 3.3-1. Costs common to all alternatives are not included in the table. Common costs include decommissioning of the dewatering, injection, collection and recharge systems; construction of the infiltration/radon barrier; and disposal of the existing surface water. There are also some intangible costs associated with some options that are difficult to quantify. The most prominent of these is delays in completion of the reclamation due to continued operation of dewatering systems or the lagging of consolidation with less aggressive tailings dewatering.

The exclusion of common costs provides a fairer comparison of the merits of various options, but also gives a distorted picture of the effort expended in restoration of the Surficial aquifer. This is particularly true in the case where restoration systems and dewatering systems are in place and the large capital expenditures have already been made. The cost of the decommissioning of these systems will only be a small fraction of the original installation cost, and there is virtually no salvage value in system components. The cost of disposal of the surface water is not included in the comparison because the planned clay-lined pond will be required to dispose of existing surface water in a timely manner. However, these disposal systems do provide substantial benefit to the corrective action program and the cost of these systems is assignable to demonstration of ALARA conditions.

The cost of continued operation of the dewatering system and the collection/injection system is estimated at \$400,000 per year. This includes labor, equipment replacement, and energy costs.

TABLE 3.3-1. CORRECTIVE ACTION COST SUMMARY.

<u>PROGRAM</u>	<u>TOTAL OPERATIONAL AND MAINTENANCE COST (Thousands)</u>	<u>CAPITAL COST (Thousands)</u>
<u>PLANNED CORRECTIVE ACTION</u>		
Tailings Dewatering & Surficial Restoration for 18 months	600	---
<u>ALTERNATIVE CORRECTIVE ACTIONS</u>		
Cessation of Dewatering And Surficial Restoration	---	---
Extended Dewatering And Surficial Restoration	2000	300*
Slurry Trench	---	4700

* Estimated cost of well replacement or rehabilitation.

3.4 CORRECTIVE ACTION BENEFITS

The primary benefit of the proposed corrective action plan is to remove a substantial part of the remaining water in the tailings in a time frame that will not appreciably delay reclamation of the tailings. A secondary benefit of the proposed corrective action plan is the continued containment of the seepage while the seepage rate from the tailings is declining with the ongoing dewatering. When the operation of the dewatering and collection/injection system is discontinued after 18 months (mid 2001), the seepage rate from the tailings will have declined significantly due to reduced head and a shrinking footprint of the saturated tailings. The removal of 39 Mgal of the remaining tailings water over 18 months takes advantage of the period when the extraction is most efficient. The decommissioning of the dewatering and collection/injection systems after 18 months allows reclamation construction to proceed. The cessation of dewatering discharge to the clay-lined pond will allow final disposal of the remaining surface water. A variation of the proposed corrective action plan terminates injection well operation, recharge line operation, and collection at the toe of the No. 5 dam at the end of year 2000. With this variation, predicted maximum uranium concentration at the POE is 0.153 mg/l, representing an insignificant increase of 0.003 mg/l over the proposed CAP. This is well within the expected modeling resolution and is not considered a measurable change in the simulation results. The change in POE thorium-230 activity with this variation is within rounding error. Hence, cessation of the operation of these portions of the system at the end of year 2000 is functionally equivalent to continuation through mid-2001.

The proposed corrective action plan reduces the maximum concentrations of uranium and thorium-230 to the proposed POE values in Spring Creek. Based on the modeling projections, the maximum concentrations will occur at the POE approximately 9 years after the cessation of dewatering. The delay is due to the fact that the Surficial water quality in the Mine Creek area has been restored, and the seepage front will have to reach Spring Creek. There is a strong likelihood that the peak concentration will be delayed and slightly reduced due to retarding processes in the Surficial aquifer. The peak concentrations may also be reduced due to increased base flow in Spring Creek.

There is a distinct advantage to placing the radon barrier as soon as practicable as the construction of the radon/infiltration barrier will dramatically reduce the rate of infiltration into the tailings. The rate of infiltration will likely be reduced to a fraction of a gpm with the installation of the clay cap. The surface drainage system is designed to eliminate permanent ponding over the tailings.

The proposed corrective action is not the least cost option available, but does provide some benefit over the least cost option of cessation of collection/injection and dewatering. The benefit is some reduction in the predicted maximum POE concentrations.

3.4.1 COMPARISON WITH ALTERNATE CORRECTIVE ACTIONS

The least cost option of immediate cessation of collection/injection and dewatering programs has the significant benefit of eliminating discharge of the tailings water to the evaporation/disposal system. There are potential savings in the size of the planned clay-lined evaporation pond with this option. A second benefit of this option is that it provides immediate access for preliminary reclamation construction. However, the disadvantage of this option is that the predicted maximum concentrations at the POE will increase by a measurable amount (increase of 0.07 mg/l). The health and safety implications of this minor increase are trivial.

A water-flow modeling scenario was developed for the option where dewatering and collection/injection programs are terminated immediately. This leaves approximately 137 Mgal of water in the tailings and the initial predicted seepage rate is much higher than the proposed corrective action plan with 18 months of dewatering. The larger seepage rate combines with un-impacted ground-water seepage and base flow in Spring Creek to yield a composite water quality. Therefore, a simplistic approach comparing the critical fractions of the total flow represented by seepage from tailings and resident ground water should provide an approximate ratio of the POE concentrations for this option compared to the proposed corrective action plan.

Recharge to the Surficial aquifer by precipitation was assumed to be at background concentration and uranium concentration was used as the indicator parameter for comparison. Because this approach does not consider initial concentrations and transport processes, it is functional only for a rough comparison between various dewatering scenarios. This ratio of percentage seepage and percentage ground-water recharge for this option versus the proposed corrective action option is 1.50. This gives roughly a 50% increase in predicted concentration at the POE. The incremental benefit of 18 months of continued remediation system operation is a measurable reduction in POC concentrations, and ultimately, a measurable reduction in POE concentrations of up to 50%. The variation of the planned corrective action with cessation of all recharge/injection system operations and Surficial collection in the Mine Creek area at the end of year 2000 is functionally equivalent to the planned corrective action which extends the operation of these systems to mid 2001. Hence, this ratio is applicable to both the planned corrective action and the variation of the planned corrective action.

The second alternate corrective action plan extends the operation of the dewatering program to 5 years and also extends the operation of the collection/injection systems. The primary benefit of this option is the further reduction of the remaining volume of water in the tailings, and consequently, the maximum seepage rate from tailings. The primary disadvantage to this alternative is the cost of operating the system. A significant, but difficult to quantify disadvantage of this option is the interference with reclamation construction by the tailings dewatering program. It may be possible to work around an active dewatering system, but both the construction activities and dewatering efforts will be compromised. The continued discharge from the dewatering system will also extend the operation of the clay-lined evaporation pond, further delaying complete site closure.

Using the same composite ratio method described above with the extended operation plan versus the proposed corrective action plan gives a ratio of 0.54. This will provide a measurable decrease in uranium concentration at the POE. An additional model run extending the dewatering to 12 years gave a ratio of 0.46. The diminishing incremental

benefit with additional dewatering reflects the anticipated declining efficiency of dewatering in successive years.

The previously mentioned ratios are referenced to the uranium concentration for the proposed corrective action plan and provide a means of making a rough cost/benefit comparison between the three modeled scenarios. Using the cost estimates in Table 3.3-1, the improvement from a ratio of 1.5 to 1.0 between scenario #1 and scenario #2 is \$600,000. The additional cost of improving the ratio from 1.0 to 0.54 between scenario #2 and scenario #3 is estimated at \$1,700,000 (\$2,300,000 - \$600,000). This indicates the cost per increment of benefit roughly triples when the operation of dewatering and Surficial recharge/collection systems is extended beyond the planned 18 month period. In addition to the cost of continued system operation, extension beyond this period will interfere with reclamation construction.

The third alternate corrective action plan proposes use of a slurry wall to cut off seepage in the Mine Creek area. The viability of this option is questionable because it would divert ground-water flow around or over the barrier, or require pumping for decades. The assumption in analyzing this option was that no maintenance or pumping would be required after installation. The benefit of this option is that it would delay and spread the seepage impacts over a much longer time period. In the absence of a pumping and disposal system, the spreading of the seepage impacts over a longer time period will reduce peak concentrations. The seepage impacts will eventually reach Spring Creek, but the transport time would likely be increased by a factor of two or more. This could conceivably reduce the maximum POE concentrations by 30% to 50%. However, the uncertainties associated with this option make it undesirable, particularly in consideration of the significant costs associated with slurry wall construction.

3.5 AS LOW AS REASONABLY ACHIEVABLE DEMONSTRATION

Pathfinder Mines Corporation has operated a corrective action program over the last 16 years that has resulted in successful restoration of the Surficial aquifer water quality in the seepage plume area near Mine Creek. The corrective action plan has undergone substantial modification to enhance performance and has been expanded to include hydraulic barriers to seepage and collection directly beneath the tailings. Tailings dewatering was initiated at the earliest possible opportunity and has been progressively expanded to remain aggressive in the extraction effort. An enhanced evaporation system consisting of spray systems and shallow evaporation ponds has been operated for more than nine years to dispose of tailings solution. Coverage of accessible areas of exposed tailings has reduced the recharge to the tailings in spite of a period of above average precipitation.

The present corrective action program consists of containment measures and extraction and disposal of the seepage source. The containment measures are represented by the Surficial collection/injection systems. The water quality in the historic seepage plumes in the Mine Creek area has been almost completely restored back to the collection wells near the toe of the No. 5 dam. There is modest progress in restoration of the area between the recharge lines and the collection wells, but the remaining "band" of seepage-impacted area east of the collection wells has become very narrow. Because of the radial inflow pattern to collection wells, there is a practical limit to how closely a downgradient seepage front can be "drawn" back to the well. The existing collection system at the toe of the No. 5 dam has nearly reached this limit along most of the system. As such, the present Mine Creek area collection/injection system is functioning primarily as a seepage containment system. The small area immediately around the collection wells is the only remaining portion of the seepage plume area where appreciable water quality restoration can occur. However, unless the entire seepage source could be eliminated, complete restoration of the immediate collection area is not possible without a radical change in the system configuration. Thus, there is very little additional benefit in restoration to be gained by continuing the

collection/injection system operation beyond the cessation of tailings dewatering. This meets the ALARA condition for aquifer restoration.

Surficial collection wells operating within the tailings area are intercepting a portion of the seepage-impacted water moving in the Surficial aquifer. In combination with the fresh-water injection wells on the crest of the No. 5 dam, there is a functional system that is providing some restorative effect in the Surficial aquifer beneath the tailings. However, the distributed nature of the ongoing seepage prevents a complete restoration of the Surficial aquifer water quality as occurred in the Mine Creek area. As the tailings dewatering progresses and the head in the tailings declines, the excess fresh-water injection could eventually result in a local reversal of flow from the Surficial aquifer to the tailings. This is undesirable because it adds water to the tailings and slows dewatering progress. Preliminary MODFLOW model runs indicate that this reversal of the seepage direction may occur when operation of the injection wells is continued beyond two years. The use of the hydraulic barrier to contain seepage has been effective and there is some additional benefit that will occur with continued operation over the next 18 months. However, the ALARA condition with respect to Surficial aquifer restoration beneath the tailings is achieved when the fresh-water injection is continued in conjunction with tailings dewatering for a one to two year period. Continuation of the fresh-water injection beyond this period will maintain the hydraulic barrier, but will likely be detrimental to the dewatering progress.

The Surficial collection within the tailings area has served to intercept seepage impacted water before it migrates outside of the tailings area. It is supplemental to the tailings dewatering effort and will be discontinued after 18 months when the dewatering program ends. This is an ALARA condition because Surficial collection rates from the wells are modest at best, and once the dewatering program ends, collection from seepage impacted Surficial wells essentially becomes a very inefficient dewatering program.

The tailings dewatering effort has been ongoing since 1993, with several drilling programs to expand the dewatering system. As the water level in the tailings drops, well yields decline and precipitation problems and maintenance costs increase. The water levels in more permeable areas of the tailings have dropped and well yields from the strongest wells have declined dramatically. An aggressive well development and maintenance program has been successful in maintaining total dewatering yield. However, as more permeable portions of the tailings are dewatered, the practical dewatering rate is expected to decline to approach a long-term drainage rate from the low permeability slimes. The yield from slime wells is very poor (typically a fraction of a gpm), and the practice of inducing drainage from slimes by pumping on the periphery of slime areas has been an effective dewatering technique.

The modeling of extended dewatering included an aggressive (and possibly optimistic), estimate of dewatering rates over a 5 year period. The projected net tailings dewatering rate at the end of the 5 year period was 13 gpm. It is difficult to predict what the dewatering rate will be several years in the future, but there is little question that the practicably achievable rate will decrease. With the drawdown in more permeable tailings, the prospect for well replacement to bolster yield also diminishes dramatically. At an assumed yield of 0.3 gpm per slime well, it would take 43 slime wells to replace the projected yield of 13 gpm.

In addition to the probable limits on dewatering rates, the cost per unit volume of water extracted increases dramatically with time. For the projected extraction of 39 Mgal over 18 months at a cost of \$600,000, the cost per 1000 gallons extracted is \$15.38. With an extension of the dewatering to 5 years, an estimated additional 36 Mgal will be removed at an additional cost of \$1,400,000. This gives a cost of \$47.22 per 1000 gallons extracted with an assumed cost of \$300,000 for pumping well replacement and well rehabilitation. These costs represent only projected extraction costs and do not include disposal costs for the water or the less tangible but highly significant costs of construction delays with the extension of tailings dewatering.

The ultimate potential benefit of extending the dewatering and collection/injection system operation is a projected reduction in the maximum POE uranium concentration from 0.15 mg/l to 0.086 mg/l. Both values exceed the current site standard of 0.07 mg/l and are based on the simple ratio approach described previously. Because of the comparatively higher background values with respect to the seepage activities for thorium-230, the improvement in POE activity for thorium-230 with extended dewatering is smaller. In fact, the potential improvement in thorium-230 activity at the POE with additional remedial activity likely falls within analytic resolution. Therefore, the comparison for ALARA conditions will be based on uranium concentrations.

The implication to human health and safety of the reduction in uranium concentration with extension of the dewatering program is minimal. The maximum POE concentrations are based on the assumption of usage of water during late season base flow during a relatively dry weather cycle above the confluence of Spring Creek with Little Medicine Bow River. Even with a very conservative analysis of the human or animal exposure to the increased uranium concentration, the analyses presented in Appendices A, B, and C indicate that there will be no measurable effects on public health or safety under the alternative. Thus, the proposed corrective action plan with respect to tailings dewatering meets ALARA conditions.

4.0 PROPOSED ALTERNATE CONCENTRATION LIMITS

4.1 PROPOSED ALTERNATE CONCENTRATION LIMITS

The following alternate concentration limits are proposed for the point of compliance wells.

TABLE 4.1-1. PROPOSED ALTERNATE CONCENTRATION LIMITS.

CONSTITUENT	ALARA POC* WELLS	
	<u>RPI-19B</u>	<u>NP01</u>
Uranium	4.45	4.40
Thorium 230	5.76	5.53

NOTE: Uranium concentrations are in mg/l
Thorium-230 activity is in pCi/l

These alternate concentration limits have been developed by simulating the migration of these constituents from tailings to the Surficial aquifer and then to Spring Creek. The Spring Creek POE concentrations are developed by combining the ground-water discharge to Spring Creek with the base flow in the creek. The resulting POE concentrations have been shown to provide adequate health protection for the public.

4.2 PROPOSED IMPLEMENTATION MEASURES

The alternate concentrations will be met by completing the corrective action plan for the ground-water systems at the Shirley Basin site, which includes the continuation of Surficial collection/injection system operation and aggressive tailings dewatering until mid 2001. Surficial collection/injection programs will continue to contain seepage and will restore water quality in the immediate area of the Mine Creek collection wells. The Surficial collection/injection within the tailings area will provide some additional restoration of water quality in this area. The tailings dewatering will reduce the quantity of water remaining in the tailings, and consequently, the long-term seepage rate to the Surficial aquifer. The construction of the radon/infiltration barrier and surface drainage system following the termination of dewatering efforts will reduce recharge to the tailings.

4.2.1 COMPLIANCE MONITORING

A semi-annual monitoring program through 2005 for the two POC wells is proposed to define compliance after restoration. The samples will be analyzed for TDS, chloride concentration, uranium concentration, and thorium-230.

The final step in the implementation of the ACL process will be turning over the site to the DOE. A three-sample average will be used to evaluate the concentration/activity of the ACL constituents. This average for the monitoring data will be analyzed to show that the alternate concentration at each well has not been exceeded at the points of compliance. This analysis will be submitted prior to the transfer of the property to the DOE.

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APPENDIX A
EXPOSURE ASSESSMENT

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APPENDIX A**

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A.1 INTRODUCTION

Risk assessments of environmental toxins are conducted for making health-based risk decisions. A risk assessment of potentially hazardous constituents in the environment is a process that integrates the results of four investigations to determine the probability, or the risk, of adverse effects on human health and the environment. These investigations include selection of the hazardous constituents, analysis of environmental pathways and exposure estimations, toxicity evaluations, and characterizations of current and future risks. This appendix describes the environmental exposure pathway and the exposure assessment. The health risk assessment is discussed in Appendix B and the potential environmental impacts are presented in Appendix C.

The methods for conducting an exposure assessment vary according to the degree of confidence that is required to support risk management decisions. The Environmental Protection Agency (EPA) drinking water quality standards, or Maximum Concentration Limits (MCLs), are based on exposure assessments that build-in large margins of safety to ensure protection of the U.S. population with a high degree of confidence. The MCL is the maximum permissible level of a contaminant in water that is delivered to any user of a public water system. The EPA accomplishes this by using the most conservative or protective assumptions, methods, and toxicity values for evaluating contaminants in drinking water.

The Nuclear Regulatory Commission (NRC) makes risk decisions about the appropriateness of Alternate Concentration Limit values (ACLs) for site-related hazardous constituents in ground water based on the results of an exposure assessment. The concept of an Alternate Concentration Limit is different than that of a Maximum Concentration Limit. An ACL value may be site-specific and higher than the MCL, or other applicable environmental standards, if the local conditions and the habits of nearby residents warrant this type of risk assessment consideration. NRC approval requires an exposure assessment to demonstrate two things: 1) that the proposed ACL values pose no substantial present or future hazard to human health and the environment, and 2) that the ACL values are as low as reasonably achievable (ALARA)

after considering practical corrective actions. The proposed ACL values are justified for use as site-specific and health-based groundwater criteria.

The method used to calculate the constituent doses to be received by hypothetical groundwater and surface water users are consistent with recommendations in NUREG/CR-5512 (NRC, 1992). Where appropriate, generic parameter values provided in this document or other government guidance has been used in the calculations. These default values are suitable for screening purposes and are "intended to produce generic dose estimates that are unlikely to be exceeded at real sites" (p.1.2 NRC, 1992).

Where data are available, site-specific parameter values have been used to calculate the doses to livestock and humans. As discussed in the body of the report, natural uranium and Th-230 in groundwater are the site constituents under consideration for proposed ACL values.

Throughout this appendix, dose is used as a measure of intake of a chemical constituent (e.g. mg per kg-day by ingestion or inhalation). The conventional use of dose with respect to radiation exposures refers to absorbed energy from radiation per unit mass of absorbing medium, e.g. 100 ergs/gram (rad) of tissue. In order to convert a dose to risk, the total effective dose equivalent (TEDE) will be calculated rather than the radiological dose.

A.2 PATHWAY ANALYSIS AND EXPOSURE ESTIMATIONS

A.2.1 EXPOSURE PATHWAYS

An analysis of the environmental pathways that provide opportunities for human exposure to the site constituents includes: 1) an assessment of existing and potential water uses, 2) an identification of exposure pathways and estimates of exposure for the primary pathways, and 3) an evaluation of the likelihood that people will be exposed to the hazardous constituents.

People generally have potential contact with environmental contaminants by a variety of exposure pathways. The potential environmental pathways at this site for human exposure include:

- ◆ Ingestion of drinking water from surface water
- ◆ Ingestion of locally-raised food products (meat, milk, poultry, eggs, vegetables) that may have been impacted by constituents in the water or soil
- ◆ External radiation from uranium and Th-230 in soil
- ◆ Ingestion of constituents in soil or dust
- ◆ Inhalation of airborne constituents in dust

While these pathways exist, it is very unlikely that the surface water will be used for drinking purposes in the vicinity of the site. The Surficial aquifer out to Spring Creek is included in the long-term restricted area and, therefore, is not a potential ground-water source. No wells currently exist and residential development in the area is very unlikely. Also, no active irrigation water rights exist along Spring Creek. However, in this analysis, it is assumed that a ranch house is located across Spring Creek from the site, that the drinking water quality is that of Spring Creek down-gradient of the site, and the source of drinking water is also used for growing a portion of the vegetables, for livestock watering, and for irrigating hay and pasture fields. This adds considerable conservatism to the analysis.

A.2.2 QUANTIFYING EXPOSURES TO RESIDENTS

The basic methods for quantifying human exposures to a chemical are different for non-radioactive and radioactive constituents (EPA, 1989) and (NRC, 1992). Exposure estimates for uranium are assessed as both a toxic chemical and a radioactive material. Th-230 is assessed only for its radiological properties since chemical toxicity has not been demonstrated but is considered to be insignificant when compared to its radiological properties.

A.2.2.1 INTAKE RATES

Intake rates are an expression of the quantity, or dose, of the constituents that enters the human body per unit time. For chemical toxins, that time period is one day, given a rate unit of daily intake (DI). For radionuclides, the intake is described as the total quantity that enters the body over the period of exposure (TI). For assessing the chemical toxicity, the total intake at the POE, including that from natural background concentrations, is used. For carcinogens, it is customary to assess the incremental cancer risk above natural background. Since radionuclides are considered carcinogens, the intake rates for cancer risk assessments were calculated excluding the contribution from naturally occurring radionuclide concentrations in the soil and groundwater. Since the water in Spring Creek is considered to be the source of water at the POE, the naturally occurring background concentrations in the creek above the site will be used in the calculations.

The average daily intake (DI) of uranium describes the magnitude of human exposure from contact with environmental media. This is the average amount of each constituent that enters the body each day by any exposure pathway per unit body weight. The equation for calculating the daily intake of a constituent in tap water and food (EPA, 1989) is as follows:

$$DI = \{(C_w * IR + I_f)(EF * ED)\} / (BW * AT) \quad (A-1)$$

where:

- DI = average daily intake of constituent per unit body weight (mg/kg-day)
- C_w = concentration of constituent in tap water (mg/l)
- IR = intake rate (l/day)
- I_f = constituent ingestion rate from food (mg/day)
- EF = exposure frequency (day/year)
- ED = exposure duration (years)
- BW = body weight (kg)
- AT = averaging time (days)

The potential for toxic effects from uranium in hypothetical individuals living near the site is evaluated by estimating the average daily intake of uranium and the retention in the kidney over a period of several years, and by comparing the concentration of retained uranium to a reference safe level.

The potential annual radiation dose to individuals living near the site in the future is evaluated by calculating the annual total effective dose equivalent (TEDE) from ingested and inhaled uranium and Th-230. The potential lifetime cancer risk from intake of radionuclides is estimated by multiplying the estimated lifetime intake of the radionuclides by appropriate risk factors. The equation to calculate the daily ingestion rate for the internal radiation dose equivalent and lifetime risk calculation for a radionuclide is as follows:

$$IRG = (C_w \cdot IR) + I_f \quad (A-2)$$

where:

$$IRG = \text{daily ingestion rate (mg/d)}$$

The other parameters are the same as those defined in the previous equation.

Exposure to direct radiation from these constituents in the environment (build-up on irrigated lands) is an additional source of radiation dose. For external exposure to uranium and Th-230 in soil, the exposure estimate for each radionuclide is the product of the concentration in soil (pCi/g) multiplied by a unit dose equivalent conversion factor and the fraction of the years exposed:

$$Ext Rad = C * (EF/365) * D_f \quad (A-3)$$

where:

- C = radionuclide concentration in soil, pCi/g
- ExtRad = external gamma radiation, dose equivalent, mrem/y
- D_f = external gamma radiation dose conversion factor, mrem/y/pCi/g for continuous exposure (365 d/y)
- EF = Fraction of year (days)

A.2.2.2 VARIABILITY AMONG INDIVIDUALS

Within a single group of people (population), there is a wide variation in intake rates and, consequently, in the doses received by different people. However this individual variability within a single population is considered in developing the TEDE and chemical intake dose limits. It is, therefore, more important to determine the average exposure rates for the population.

The hypothetical individual or family living near this site would be expected to be similar to the average population as far as socio-economics and other factors for which conservative default values for modeling parameters have been developed. The one difference that is assumed is that the family would be reliant on the land for all of their food and water, with the exception of garden vegetables, for 350 days of the year.

For this risk assessment the most critical parameter is tap water consumption. A lifetime average consumption rate of 1.11 liter/day is recommended by the EPA (EPA, 1999), which includes water in cooking and for beverages prepared using tap water. This was based on a survey for the Department of Agriculture (Ershow and Cantor, 1989).

A.2.2.3 EXPOSURE CONCENTRATION TERMS

The exposure concentration term is the concentration in the environmental pathway that is available for human intake. The exposure estimate for residents is the product of this concentration term for each environmental pathway and the human exposure parameter values. The ACL values at the POE are used for calculating intakes to humans and animals and for projecting the deposition of constituents in soil from land irrigation.

A.2.2.4 ENVIRONMENTAL BACKGROUND EXPOSURES

Determining the ingestion exposures to uranium and Th-230 due to groundwater concentrations at POE values requires information about the background environmental exposures to these constituents. Part of the total daily intake (DI) for the hypothetical residents is attributable to background exposures. An estimate of the average background intake value from exposure to uranium in the environment from drinking water and food is 0.001 mg/day with a range of 6.0E-04 to 3.0E-03 mg/day (EPA, 1991b). For Th-230, not enough data exist to accurately determine an average background exposure (EPA, 1999). Cothorn, 1987 estimated that the U. S. population intake of Th-230 from drinking water was <0.06 pCi/day and considered the intake from food as insignificant. Fisenne, 1987 estimated that the residents of New York City had an intake of 0.17 pCi/day from the inhalation and ingestion pathways.

The average local background soil concentrations were determined from samples taken annually at the four environmental background stations around the mill site during the period 1988-1992. The mean and standard deviation for the measured concentrations are 2.0 ± 1.3 pCi/g for Th-230 and 1.7 ± 1.0 pCi/g for uranium.

Food and drinking water generally are the most significant pathways for human exposure to groundwater constituents. Exposure assessments for Maximum Concentration Limits (MCLs), and other similar guidelines for drinking water, also include the contribution of the average background daily intakes when developing concentration limits. Quantifying background environmental exposures is another source of uncertainty in total daily intakes (DI) estimates. Soil and water concentrations of these

chemicals and individual dietary consumption patterns are the primary sources of variation in the background daily intake estimates. Concentrations of the constituents in different kinds of food is not as important as the mix of food sources, or the fraction of foods that are consumed from one source such as locally-raised food products. The paucity of data describing these variations is a source of uncertainty in the estimates of background daily intakes.

A.3 QUANTIFYING HUMAN EXPOSURES FROM DRINKING WATER

A.3.1 EXPOSURE PARAMETER VALUES

Generic exposure parameters are used to calculate the ingestion of uranium and Th-230 from tap water by hypothetical residents near this site (NRC, 1992; EPA 1991a, 1991b, 1999). These parameter values are listed below in Table A.3-1.

Parameter	Average
Drinking water intake rate for all ages	1.11 l/day
Body Weight as an Adult	70 kg
Exposure Frequency	350 days/yr
Exposure Duration	30 years
Averaging Time	30 years x 365days

Averaging time is a term that is used to differentiate the mechanism of a toxic effect, for example, between short-term and chronic exposures to toxic chemicals (EPA, 1989). For carcinogens, the potential effect is considered to be proportional to the total intake throughout the lifetime of the exposed individual. It is reasonable to assume that the average time for someone living at this remote site is 30 years.

A.3.2 POE CONCENTRATION VALUES

The concentration values for exposures to uranium and Th-230 from ingestion of drinking water are 0.15 mg/l for uranium and 0.3 pCi/l for Th-230. The POE values for uranium and Th-230 include background concentration values of 0.02 mg/l and 0.1 pCi/l, respectively. These background values are the estimated concentrations in Spring Creek based on measured concentrations in samples taken up-gradient of the site.

A.3.3 ESTIMATES OF INTAKES FROM DRINKING WATER

The daily intakes of constituents from drinking water are calculated using Equations A-1 or A-2 with the exposure parameter values in Section A.3.1, and the concentration values in Section A.3.2. The results are presented in the intake summary table, Table A.4-7.

A.4 EXPOSURES FROM AGRICULTURAL USES OF GROUND WATER

Exposure pathways considered for the hypothetical resident include crop irrigation and livestock watering that may impact locally raised food products. Contamination of locally-raised food products occurs when livestock are exposed both directly by ingestion of constituents in drinking water and indirectly through grazing or eating hay produced by land irrigation. Locally raised fruits and vegetables can incorporate constituents from irrigation, both indirectly through soil or directly from plant surfaces.

When water is used for livestock watering and irrigation, the transfer of ACL constituents through the food chain depends on five parameters. These include the constituent soil concentrations in the root zone of irrigated fields, the agricultural biotransfer coefficients, livestock and human exposure factors such as the drinking water and food consumption rates, and the fraction of consumption that is locally raised.

Locally raised food products are evaluated in two groups according to the expected contribution to ingestion: meat and meat products including beef, chicken, milk and eggs; and vegetables and fruits.

A.4.1 QUANTIFYING ACL CONCENTRATIONS IN FOOD PRODUCTS

The calculation of the intake of ACL constituents in locally raised foods includes locally grown vegetables, beef, dairy, and poultry products. Sources such as fruit, sheep and fish are not included in the exposure estimates since they would not be expected to significantly contribute to the dose. The transfer of ACL constituents from the POE to food products requires an estimate of the concentrations in soil from land irrigation using water at the POE concentrations. These calculations are done in the following sections.

A.4.1.1 ESTIMATING SOIL CONCENTRATION VALUES

Concentrations of the ACL constituents in the soil of irrigated fields are required to estimate the quantity of each constituent transferred from soil to vegetation, and then from vegetation to food products for human consumption. Soil concentrations are defined as the quantity of each constituent per acre.

Factors required for estimating the accumulation of the ACL constituents in irrigated fields include the ground-water application rate, the constituent concentrations, and the site soil density. The ACL constituents are assumed to be fixed within the uppermost foot of soil. This is a conservative assumption since a significant fraction of the constituents will be transported naturally from the upper foot of soil to underlying soils.

Constituent concentration in one acre

$$C_{ac} = C_w * A * V * T \quad (A-4)$$

where:

- C_{ac} = Constituent concentration applied per year on one acre (g/ac or pCi/ac)
- C_w = Concentration of constituent in ground water (mg/l or pCi/l)
- A = Application rate is 1.67^a ft of water to site per year (ft/yr)
- V = Conversion - 28.3 l/ft³
- T = Conversion - 43,560 ft²/ac

^a - based on local USDA consumptive use data

Mass of soil per acre to a depth of 12 inches (1 foot)

$$\begin{aligned} \text{kg / ac} &= (1.0 \text{ ft})(90\# / \text{ft}^3) * (454 \text{ g / \#}) * (43,560 \text{ ft}^2 / \text{ac}) / 1000 \text{ g / kg} \\ &= 1.78\text{E}06 \text{ kg / ac} \end{aligned} \quad (A-5)$$

where soil density is 90# / ft³

Annual (C_y) accumulation of constituent concentrations in soil

$$C_y = \text{mg (chemical)/ac} / (\text{kg (soil)/ac}) \quad (A-6)$$

For uranium:

$$\begin{aligned} &= (0.15 \text{ mg/l} * 28.3 \text{ l/ft}^3 * 1.67 \text{ ft} * 43560 \text{ ft}^2/\text{ac}) / 1.78\text{E}06 \text{ kg/ac} \\ &= 0.17 \text{ mg/kg-y} \end{aligned}$$

Lifetime (C_L) accumulation of constituent concentrations-30 years

For uranium:

$$\begin{aligned} C_L &= C_Y * 30 \text{ yrs} && \text{(A-7)} \\ &= 0.116 \text{ mg/kg-y} * 30 \text{ y} \\ &= 5.2 \text{ mg/kg} \end{aligned}$$

If one neglects the contribution from the natural background levels in Spring Creek, the build up of uranium would be 4.5 mg/kg, or 3100 pCi/kg.

Similar calculations predict increases in the Th-230 concentrations in soil from 30 years of irrigation of only 10 pCi/kg. Neglecting the build up arising from the natural background concentrations in Spring Creek, the 30-year build up of Th-230 would be only 6.9 pCi/kg. The soil concentration predictions for thirty years of irrigation are summarized in Table A.4-1. The reported build up when the units are in terms of radioactivity (pCi/g) neglects the contribution of the natural background radioactivity in Spring Creek and the local soil. The background data were obtained from soil samples taken near the site, as discussed in Section A.2.2.4. These conservative predictions result in additional concentrations of roughly the background concentration for uranium and an insignificant increase above natural background for Th-230.

CONSTITUENT	UNITS	SOIL CONCENTRATION DUE TO IRRIGATION	BACKGROUND
Uranium			
Non-radioactive	mg/kg	5.2	2.5
Radioactive	U-nat pCi/g	3.1	1.7
Th-230	pCi/g	0.007	2.0

A.4.1.2 ESTIMATING VEGETATION CONCENTRATION VALUES

The agricultural biotransfer coefficients, in Tables A.4-2 and A.4-3 below, are generic values describing the transfer of the ACL constituents from soil to pasture grass and garden produce for livestock and human consumption (NRC 1992). These coefficients reflect differences in the environmental fate and transport of the constituents from soil to vegetation and they represent steady-state concentrations in vegetation under conditions of ongoing irrigation. The biotransfer coefficient (days/kg) for transfer from soil to vegetation is defined as follows:

$$\frac{\text{mg (constituent) / kg (dry grass)}}{\text{mg/day (intake)}} \quad (\text{A-8})$$

or

$$\frac{\text{pCi (constituent) / kg (dry grass)}}{\text{pCi/day (intake)}}$$

TABLE A.4-2. SOIL TO VEGETATION TRANSFER FACTORS (B _v).		
Constituent	Alfalfa and Leafy Vegetables	Root Vegetables
Uranium	1.7E-02	1.4E-02
Th-230	6.6E-03	1.2E-04

The concentrations of ACL constituents in forage are calculated as the product of the concentration of each constituent in soil and a soil to forage (NRC, 1992) transfer coefficient. Vegetation concentrations are calculated as shown below:

$$C_f = C_L * B_v * f_{dw} \quad (\text{A-9})$$

where:

- C_f = Constituent concentration in vegetation, mg/kg fresh weight
- C_L = Constituent concentration in soil, mg/kg dry
- B_v = Transfer factor from soil to vegetation,
mg/kg dry vegetable x 1/(mg/kg soil - dry)
- f_{dw} = dry/wet fraction of vegetation, kg dry veg/kg wet veg

Table A.4-5 shows the results of the calculations for ACL constituents in locally grown garden products.

A.4.1.3 ESTIMATING CONSTITUENT CONCENTRATIONS IN LIVESTOCK

The concentrations of ACL constituents in food products from livestock ingestion of water and irrigated pasture grass are quantified using the following equations.

Livestock Water to Animal Products:

$$C_f = C_w * Q * F_p * B \quad (A-10)$$

Livestock Feed to Animal Products:

$$C_f = C_w * Q * F_p * B \quad (A-11)$$

where:

- C_f = Concentration of constituents in food products (mg/kg or pCi/kg)
- C_w = Concentration in livestock water and feed (mg/l, mg/kg or pCi/kg)
- Q = Livestock water and feed ingestion rate (l/day for water, kg (dry) /day for feed)
- F_p = Fraction of the total annual a) livestock water from well is 1.0 (100%) and b) grass and hay grown by irrigation is 0.5 (50%)
- B = Biotransfer coefficient from livestock water and feed to food product concentration (days/kg)

Agricultural biotransfer factors are generic values describing the transfer of ACL constituents from feed to livestock product. These coefficients reflect differences in the bioavailability of the constituents in livestock. The transfer factors for animal feed to animal product are given in Table A.4-3.

Food Product	Uranium (day/kg wet wt.)	Th-230 (day/kg wet wt.)
Beef Cattle	2.0E-04	6.0E-06
Dairy Cows	6.0E-04	5.0E-06
Poultry	1.2E+00	4.E-03
Eggs	9.9E-01	2.E-03

NRC, 1992

For the livestock intake to food product pathway the biotransfer coefficient (days/kg) is defined as:

$$\frac{\text{mg (constituent) / kg (fresh animal product)}}{\text{mg / day (intake)}} \quad (A-12)$$

or

$$\frac{\text{pCi (constituent) / kg (fresh animal product)}}{\text{pCi / day (intake)}}$$

The concentrations of ACL constituents in food products are a function of the concentrations in livestock watering and pasture grass, livestock watering and feed intake rates, and biotransfer factors. Table A.4-4 below lists GENERIC feed and water intake rates. While it is unlikely that 100 percent of the forage that livestock eats grows on irrigated fields, this value has been assumed for conservatism.

Livestock	Livestock Water Intake Rate (l/day)		Feed Intake Rate (kg/day -wet wt.)		Fraction of Feed Hay/Grass
	Typical	Range ^b	Typical	Range ^b	
Beef Cattle	50 ^a	20 – 60	27 ^a	15 – 30	1
Dairy Cows	60 ^a	50 – 100	36 ^a	26 – 64	1
Chicken	0.3 ^a	0.1 – 0.3	0.13 ^a	0.07 – 0.20	1

^a – from NRC, 1992
^b – IAEA, 1994

Table A.4-5 provides the results of the ACL constituents transferred through the environment by ground water to meat and meat products, and from ground water through irrigated soil and pasture grass or hay to meat and meat products. The total constituent concentration in these food products is the sum of these intakes.

TABLE A.4-5 EXPOSURE PATHWAY ESTIMATES FROM LIVESTOCK WATERING AND FORAGE

	units	Uranium* mg/l	Uranium pCi/l	Th-230 pCi/l	Th-230* pCi/l
C_W = concentration in ground water		0.15	88	0.2	0.3
		POINT OF EXPOSURE CONCENTRATION		pCi/l	pCi/l
SOIL AND FORAGE CONCENTRATIONS					
Constituent applied per year on 1 acre	units	mg/ac-y	pCi/ac-y	pCi/ac-y	pCi/ac-y
$C_{ac} = C_W * A * V * T$ (mg/ac-yr)		3.09E+05	1.81E+08	4.12E+05	6.18E+05
A = application rate	1.67 (ft/yr)				
V = conversion	28.3 (l/ft ³)				
T = conversion	43560 (ft ² /ac)				
Weight of soil per acre = Depth*D*W*T/1000 (kg/ac)		1.78E+06			
Depth	1 (ft)				
W = conversion	454 (g/lb)				
D = soil density	90 (lb/ft ³)				
Concentration in soil	units	mg/kg	pCi/kg	pCi/kg	pCi/kg
Avg. Background		3.30E+00	0.00E+00	0.00E+00	1.60E+03
$C_Y = [(mg_{chemical} \text{ or } pCi_{i})/ac-y]/(kg_{soil}/ac)$		1.73E-01	1.02E+02	2.31E-01	3.47E-01
$C_L = C_Y * 30 \text{ Years} + \text{Avg. Background}$		8.50E+00	3.05E+03	6.94E+00	1.61E+03
Concentration in Forage(wet wt.)	units	mg/kg	pCi/kg	pCi/kg	pCi/kg
$C_W = C_L * B_V * f_{DW}$ (mg/kg) (wet)		2.89E-02	1.04E+01	9.16E-03	2.13E+00
B_V = biotransfer coefficient, soil:forage (dry)		1.70E-02	1.70E-02	6.60E-03	6.60E-03
f_{DW} = dry to wet fraction of vegetation	0.2				
EXPOSURE ESTIMATES FOR PATHWAY FROM LIVESTOCK FEED AND WATERING TO FOOD					
Livestock Watering - Beef - Meat	Units	mg/kg	pCi/kg	pCi/kg	pCi/kg
C_F = concentration in meat = $C_W * Q * F_P * B$ (mg/kg)		1.50E-03	8.80E-01	6.00E-05	9.00E-05
C_W = concentration in ground water (mg/l)		1.50E-01	8.80E+01	2.00E-01	3.00E-01
Q = water intake rate (l/day)	50				
F_P = fraction of water from well	1				
B = biotransfer coefficient intake to meat (day/kg)		2.00E-04	2.00E-04	6.00E-06	6.00E-06
Irrigation - Forage - Beef - Meat	units	mg/kg	pCi/kg	pCi/kg	pCi/kg
C_F = concentration in meat = $C_W * Q * F_P * B$ (mg/kg)		1.56E-04	5.61E-02	1.48E-06	3.44E-04
C_W = concentration in forage (mg/kg) (wet)		2.89E-02	1.04E+01	9.16E-03	2.13E+00
Q = food intake rate (kg/day) (wet)	27				
F_P = fraction of feed from irrigated pasture	1				
B = biotransfer coefficient forage to meat (day/kg)		2.00E-04	2.00E-04	6.00E-06	6.00E-06
Livestock Watering - Poultry - Meat	units	mg/kg	pCi/kg	pCi/kg	pCi/kg
C_F = concentration in meat = $C_W * Q * F_P * B$ (mg/kg)		5.40E-02	3.17E+01	2.40E-04	3.60E-04
C_W = concentration in ground water (mg/l)		1.50E-01	8.80E+01	2.00E-01	3.00E-01
Q = water intake rate (l/day)	0.3				
F_P = fraction of water from well	1				
B = biotransfer coefficient intake to meat (day/kg)		1.20E+00	1.20E+00	4.00E-03	4.00E-03

TABLE A.4-5 EXPOSURE PATHWAY ESTIMATES FROM LIVESTOCK WATERING AND FORAGE (cont.)

Irrigation - Forage - Poultry - Meat	units	mg/kg	pCi/kg	pCi/kg	pCi/kg
C_F = concentration in meat = $C_W * Q * F_P * B$ (mg/kg)		4.51E-03	1.62E+00	4.76E-06	1.11E-03
C_W = concentration in forage (mg/kg) (wet)		2.89E-02	1.04E+01	9.16E-03	2.13E+00
Q = food intake rate (kg/day) (wet)	0.13				
F_P = fraction of feed from irrigated pasture	1				
B = biotransfer coefficient forage to meat (day/kg)		1.20E+00	1.20E+00	4.00E-03	4.00E-03
Livestock Watering - Poultry - Eggs	units	mg/kg	pCi/kg	pCi/kg	pCi/kg
C_F = concentration in eggst = $C_W * Q * F_P * B$ (mg/kg)		4.46E-02	2.61E+01	1.20E-04	1.80E-04
C_W = concentration in ground water (mg/l)		1.50E-01	8.80E+01	2.00E-01	3.00E-01
Q = water intake rate (l/day)	0.3				
F_P = fraction of water from well	1				
B = biotransfer coefficient intake to meat (day/kg)		9.90E-01	9.90E-01	2.00E-03	2.00E-03
Irrigation - Forage - Poultry - Eggs	units	mg/kg	pCi/kg	pCi/kg	pCi/kg
C_F = concentration in eggs = $C_W * Q * F_P * B$ (mg/kg)		3.72E-03	1.34E+00	2.38E-06	5.53E-04
C_W = concentration in forage (mg/kg) (wet)		2.89E-02	1.04E+01	9.16E-03	2.13E+00
Q = food intake rate (kg/day) (wet)	0.13				
F_P = fraction of feed from irrigated pasture	1				
B = biotransfer coefficient forage to meat (day/kg)		9.90E-01	9.90E-01	2.00E-03	2.00E-03
Livestock Watering - Cow - Milk	units	mg/kg	pCi/kg	pCi/kg	pCi/kg
C_F = concentration in milk = $C_W * Q * F_P * B$ (mg/kg)		5.40E-03	3.17E+00	6.00E-05	9.00E-05
C_W = concentration in ground water (mg/l)		1.50E-01	8.80E+01	2.00E-01	3.00E-01
Q = water intake rate (l/day)	60				
F_P = fraction of water from well	1				
B = biotransfer coefficient intake to meat (day/kg)		6.00E-04	6.00E-04	5.00E-06	5.00E-06
Irrigation - Forage - Cow - Milk	units	mg/kg	pCi/kg	pCi/kg	pCi/kg
C_F = concentration in milk = $C_W * Q * F_P * B$ (mg/kg)		6.25E-04	2.24E-01	1.65E-06	3.83E-04
C_W = concentration in forage (mg/kg) (wet)		2.89E-02	1.04E+01	9.16E-03	2.13E+00
Q = food intake rate (kg/day) (wet)	36				
F_P = fraction of feed from irrigated pasture	1				
B = biotransfer coefficient forage to meat (day/kg)		6.00E-04	6.00E-04	5.00E-06	5.00E-06
Soil - Leafy Garden Produce	units	mg/kg	pCi/kg	pCi/kg	pCi/kg
C_F = concentration in leafy vegetables = $C_L * B_V * f_{DW}$ (mg/kg)		2.89E-02	1.04E+01	9.16E-03	2.13E+00
C_L = concentration in soil (mg/kg) (wet)		8.50E+00	3.05E+03	6.94E+00	1.61E+03
B_V = biotransfer coefficient, soil:forage (dry)		1.70E-02	1.70E-02	6.60E-03	6.60E-03
f_{DW} = dry to wet fraction of vegetation	0.2				
Soil - Root Garden Produce	units	mg/kg	pCi/kg	pCi/kg	pCi/kg
C_F = concentration in root vegetables = $C_L * B_V * f_{DW}$ (mg/kg) (wet)		2.98E-02	1.07E+01	2.08E-04	4.83E-02
C_L = concentration in soil (mg/kg) (wet)		8.50E+00	3.05E+03	6.94E+00	1.61E+03
B_V = biotransfer coefficient, soil:forage (dry)		1.40E-02	1.40E-02	1.20E-04	1.20E-04
f_{DW} = dry to wet fraction of vegetation	0.25				

* Calculations made using concentrations that include natural background water and soil concentrations.

A.4.2 HUMAN EXPOSURE ESTIMATES FOR INGESTION OF LOCALLY-RAISED FOOD PRODUCTS

The ingestion of uranium and Th-230 from locally raised food products is determined by using the equation to estimate exposure in Section A.2.2, Quantifying Exposures to Residents. The total food intake rates for the hypothetical individuals living near the Shirley Basin site were selected from sources recommended by the EPA as given in Table A.4-6.

FOOD PRODUCT	TOTAL ADULT INGESTION RATE^a (per day)	ADULT INGESTION RATE (local foods) (per day)
Beef	0.0929 kg	0.0929 kg
Poultry	0.0289 kg	0.0289 kg
Milk	0.243 l	0.243 l
Eggs	0.0291 kg	0.0291 kg
Leafy Vegetables	0.045 kg	0.011 kg
Root Vegetables	0.15 kg	0.038 kg

^a = EPA, 1984; EPA, 1999

There is no standard guidance on the fraction of food ingested that is locally raised, so a value of 100% was assumed for beef. This value is considered high based on today's lifestyles but is possible considering the remoteness of the site. The fraction of locally-raised leafy and root vegetables was taken at the default value are 25% (NRC, 1992). It is assumed that the resident eats all locally grown poultry, milk, or eggs. The exposure frequency is 350 days per year to adjust for the data being in terms of yearly intake rates (EPA, 1989). Average total daily food product ingestion rates, as well as fractional rates, are presented in Table A.4-6.

Table A.4-7 presents the total dose calculations for the ingestion of uranium and Th-230 in tap water and food. The basic formulae used and the input parameters are also given in the table. For uranium, the total chemical dose in mg/day-kg is calculated using parameters that include the effect of natural background concentrations in Spring Creek water (same as that at the POE) and the local soils. This is done to assess the

chemical toxic effect of uranium. For the radiogenic effects of uranium and Th-230, the intake is calculated assuming the background is zero. This results in the incremental dose above that which the hypothetical individual would have received if the Shirley Basin Mill and Mine had never operated. As can be seen from the table, the contribution to the total dose from food products is approximately five percent for uranium and less than 0.1 percent for Th-230, indicating that the use of drinking water is the only significant pathway to the hypothetical individual.

The assumptions in the dose calculations are considered conservative for several reasons. Grain to feed dairy cows and chickens is not normally grown locally due to the short growing season and other climatic conditions. Therefore, dairy cows and chickens are uncommon in this area. In addition, it would be difficult to produce a significant fraction of the family produce for the same reasons. The growing of hay for beef production is more common. However, the hay production would likely occur in fields located a mile or more down gradient of the POE wells where the constituents in the water have been diluted compared to the values used in the calculations of this appendix. A rancher and family may, however, eat more beef than the average U.S. citizen, which may compensate for the overestimation of the uptake of the ACL constituents in the hay or pasture. In addition, a residence time of 30 years was used which is believed to be conservative due to the remoteness of the site.

Table A.4-7 Dose Calculation for Ingestion of Constituents in Drinking Water and Food

Dose from Drinking Water (DI)
 $DI = Cw \cdot (IR \cdot EF \cdot ED / BW \cdot AT)$ mg/day-kg or pCi/day-kg
 Cw = Concentration in drinking water (mg/l or pCi/l)
 IR = intake rate (l/day) = 1.11
 BW = body weight (kg) = 70
 EF = exposure frequency (day/yr) = 350
 ED = exposure duration (yr) = 30
 AT = averaging time (days) = $30 \cdot 365 = 10950$

Dose from Food (DI)
 $DI = Cw \cdot (IR \cdot EF \cdot ED / BW \cdot AT)$ mg/day-kg or pCi/day-kg
 Cw = Concentration in food (mg/kg or pCi/kg)
 (livestock watering + irrigation)
 IR = Ingestion rate (kg/day)
 BW = body weight (kg) = 70
 EF = exposure frequency (day/yr) = 350
 ED = exposure duration (yr) = 30
 AT = averaging time (days) = $10950 (30 \cdot 365)$

Beef

Watering (mg/kg or pCi/kg)
 Forage (mg/kg or pCi/kg)
 Total Exposure (mg/kg or pCi/kg)
 Ingestion rate (kg/day) = 0.0929
Total dose from meat (mg/day-kg or pCi/day-kg)

Chicken

Watering (mg/kg or pCi/kg)
 Forage (mg/kg or pCi/kg)
 Total Exposure (mg/kg or pCi/kg)
 Ingestion rate (kg/day) = 0.0289
Total dose from chicken (mg/day-kg or pCi/day-kg)

Milk

Watering (mg/kg or pCi/kg)
 Forage (mg/kg or pCi/kg)
 Total Exposure (mg/kg or pCi/kg)
 Ingestion rate (kg/day) = 0.243
Total dose from milk (mg/day-kg or pCi/day-kg)

Eggs

Watering (mg/kg or pCi/kg)
 Forage (mg/kg or pCi/kg)
 Total Exposure (mg/kg or pCi/kg)
 Ingestion rate (kg/day) = 0.0291
Total dose from eggs (mg/day-kg or pCi/day-kg)

Dose to Humans from Drinking Water		
Element	Radioactive Elements*	
mg/day-kg	pCi/day-kg	
Uranium	Uranium	Th-230
2.28E-03	1.34E+00	3.04E-03
0.15	88	0.2

Elements	Radioactive Elements*	
mg/day-kg	pCi/day-kg	
Uranium	Uranium	Th-230

Watering (mg/kg or pCi/kg)	1.50E-03	8.80E-01	6.00E-05
Forage (mg/kg or pCi/kg)	1.56E-04	5.61E-02	1.48E-06
Total Exposure (mg/kg or pCi/kg)	1.66E-03	9.36E-01	6.15E-05

Total dose from meat (mg/day-kg or pCi/day-kg)	2.11E-06	1.19E-03	7.82E-08
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Watering (mg/kg or pCi/kg)	5.40E-02	3.17E+01	2.40E-04
Forage (mg/kg or pCi/kg)	4.51E-03	1.62E+00	4.76E-06
Total Exposure (mg/kg or pCi/kg)	5.85E-02	3.33E+01	2.45E-04

Total dose from chicken (mg/day-kg or pCi/day-kg)	2.32E-05	1.32E-02	9.69E-08
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Watering (mg/kg or pCi/kg)	5.40E-03	3.17E+00	6.00E-05
Forage (mg/kg or pCi/kg)	6.26E-04	2.24E-01	1.65E-06
Total Exposure (mg/kg or pCi/kg)	6.03E-03	3.39E+00	6.17E-05

Total dose from milk (mg/day-kg or pCi/day-kg)	2.01E-05	1.13E-02	2.05E-07
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Watering (mg/kg or pCi/kg)	4.46E-02	2.61E+01	1.20E-04
Forage (mg/kg or pCi/kg)	3.72E-03	1.34E+00	2.38E-06
Total Exposure (mg/kg or pCi/kg)	4.83E-02	2.74E+01	1.22E-04

Total dose from eggs (mg/day-kg or pCi/day-kg)	1.93E-05	1.09E-02	4.88E-08
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Table A.4-7 Dose Calculation for Ingestion of Constituents in Drinking Water and Food (cont.)

		Elements		Radioactive Elements*	
		mg/day-kg		pCi/day-kg	
		Uranium	Uranium	Th-230	
Vegetables					
Leafy (mg/kg or pCi/kg)		2.89E-02	1.04E+01	9.16E-03	
Root (mg/kg or pCi/kg)		2.98E-02	1.07E+01	2.08E-04	
Total (mg/kg or pCi/kg)		5.87E-02	2.11E+01	9.37E-03	
Ingestion rate (kg/day)	(leafy) 0.011				
Ingestion rate (kg/day)	(root) 0.038				
Total dose from vegetables (mg/day-kg or pCi/day-kg)		1.99E-05	7.14E-03	1.49E-06	
TOTAL DOSE FROM FOOD	mg/day-kg	8.45E-05			
	pCi/day-kg		4.38E-02	1.92E-06	
TOTAL DOSE	mg/day-kg	2.37E-03			
	pCi/day-kg		1.38E+00	3.04E-03	

*Calculations made using above-background water and soil concentrations.

A.5 EXPOSURES FROM INCIDENTAL CONTACT WITH SOIL AND DUST

Residents may be exposed to uranium and Th-230 by ingesting small amounts of dust during hand to mouth contact, by inhalation, or by proximity to surface soils emitting very low doses of gamma radiation from uranium. The source of the contamination in the dust for this hypothetical exposure situation is from the direct application of water by irrigation. Exposure to ACL constituents by inhalation of contaminated dust is another potential pathway. Inhalation exposure is expected to be very small due to the low concentrations in the irrigated soils and to the dilution effect of air releases, which further reduce the contribution of the already minor inhalation pathway.

The soil ingestion rate is used with the other generic exposure parameter values for the average resident (EPA, 1989) as presented in Table A.5-1.

PARAMETER	EXPOSURE VALUE
Soil Ingestion Rate for Adults	50 mg/day
Inhalation Rate for Adults	28.8 m ³ /day
Exposure Frequency	350 days
Exposure Duration as an Adult	30 years

The concentration terms for calculating doses expected from ingestion of contaminated dust are the predicted levels of uranium and Th-230 in fields that have been irrigated with water at the POE values for 30 years as listed in Table A.4-1. Daily intake estimates from the incidental ingestion of uranium and thorium in surface dusts are shown in Table A.5-2. These exposure values are calculated by multiplying the 30-year build-up concentration (from Table A.4-1) in dust by the exposure parameter values presented in Table A.5-1.

TABLE A.5-2. INGESTION OF INCIDENTAL DUST.	
CONSTITUENT	INTAKE
Uranium	1.7E-04 mg/day
Th-230	3.3E-04 pCi/day

These intake rates are less than one percent of the corresponding intake rates from drinking water (see Table A.4-7), and thus have not been included in the risk assessment.

A.6 REFERENCES

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APPENDIX B
HUMAN HEALTH HAZARDS

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B.1 INTRODUCTION

The objective of the toxicity assessment is to evaluate the potential adverse health effects from chronic or lifetime exposures to the ACL constituents at the projected POE concentrations. This toxicity assessment presents an overview of the current toxicity knowledge on the health effects associated with the expected exposures.

The route of exposure can include ingestion, inhalation, and/or dermal absorption. As demonstrated by the exposure estimates in Appendix A, the most significant pathway for human exposure to ground water is the ingestion of drinking water. Dermal exposure is not significant for the ACL constituents because they are not easily transported across the skin barrier. Inhalation, also, is an insignificant exposure pathway at this site, as discussed in Appendix A. Thus, information that is relevant to the ingestion of these constituents (oral exposure) is the focus of this toxicity evaluation.

B.2 CHRONIC HEALTH EFFECTS

The duration of exposure is an important factor in understanding the potential for adverse chronic health effects. The exposure analysis discussed in Appendix A conservatively assumes thirty years of exposure to natural uranium and Th-230. This toxicity assessment considers the chemical toxicity and the cancer effects of these constituents separately, since the potential risk of the different toxicity end-points is determined differently.

The potential uranium toxicity is evaluated by comparing the estimated total uranium concentration in kidneys to a reference level at which no toxic effects are expected. While some data exist to estimate toxic effects, the EPA has not published a reference oral dose (RFD_o) for chronic oral exposure to uranium (EPA, 2000). An assessment of this exposure has been presented in this report. The cancer incidence is evaluated by multiplying the estimated lifetime incremental intake of uranium by the appropriate risk factors, using guidance in Federal Guidance Report No. 13 (EPA, 1999).

Th-230 is a naturally occurring radionuclide in the U-238 decay series. The exposure to Th-230 is normally associated with exposure to uranium ore or mill tailings and thus health effects studies from exposure to pure Th-230 are not available. Instead, the available studies from exposure to the Th-232 decay series are used. A review (ATSDR, 1990) of the available information on the toxicity of thorium revealed that very little data exist associated with the inhalation, ingestion, or dermal exposure in humans or animals. Studies of thorium workers showed increases of lung, pancreatic, and hematopoietic cancers. However, the effect could not be attributable solely to thorium since the workers were also exposed to uranium dust and other sources of radioactivity. Studies on rats could not produce many of the effects observed in humans, supporting the conclusion that the effects may be attributable to exposures to other radionuclides and toxic chemicals.

There are many studies, however, on the health effects of injecting Thorotrast intravenously to patients as a radiologic contrast medium. Thorotrast is a colloidal

thorium dioxide consisting of 25 percent Th-232 dioxide stabilized with dextran. It was used between the years 1928 to 1955 but its use was discontinued once potential health effects were recognized. Cirrhosis of the liver, liver tumors, bone cancer, and blood disorders were the most common effects of intravenously injected Thorotrast. A long latency period existed before many of the effects were evident. The studies suggest that these observed effects could be attributed to the radiation emitted from thorium rather than thorium being a carcinogen. Studies designed to assess the chemical toxicity showed that effects did not occur for many years, with latency periods similar to that from radiation exposure. These and other studies support the conclusion that the observed effects arise from the radiological properties rather than the chemical properties. Inhalation-based pharmacokinetic data indicate that the lymph nodes, lungs, and bone may be the target organs of thorium toxicity. Oral pharmacokinetic data indicate that bone may be the target organ following ingestion of thorium. A detailed compilation of the information available in 1990 is presented in ATSDR, 1990 and the references cited therein.

For ingestion of thorium, the transfer through the gastrointestinal tract is very low and believed to be on the order of 0.02 percent for adults and 0.05 percent for infants (EPA, 1999). In addition, the transport of thorium from soil to plant to man is very low. It is estimated that 70 percent of the thorium that gets into the blood will be deposited on bone surfaces, 4 percent will go to the liver, 16 percent will be deposited in soft tissues, and 10 percent will be excreted (EPA, 1999 and references cited therein). This deposited material will have the potential to produce cancers.

The EPA does not at this time consider thorium a chemical toxin or carcinogen but has very recently evaluated the risk from its radiological properties (EPA, 1999). Cancer risk factors have been developed for inhalation of radionuclides in air, for ingestion of radionuclides in ground water, and external exposure to radiation from radionuclides in air, on the ground surface, and radionuclides in soil. These factors will be used to estimate the cancer risk by multiplying the incremental intake by the risk factors.

B.3 HUMAN HEALTH RISK ASSESSMENT FOR INGESTION OF URANIUM

B.3.1 BACKGROUND

In the soluble hexavalent form, natural uranium is reported to be ubiquitous in many ground-water sources (Hess, et.al., 1985). Natural background groundwater concentrations of uranium in Spring Creek up-gradient of the site has been estimated to be 0.02 mg/l, based on NPDES sampling efforts.

Uranium intake by the public is primarily from drinking water and food sources. The mean dietary intake of uranium, as estimated by the EPA for the United States, is 0.001 mg/day (EPA, 1991b). In regions of high natural uranium the intake may be as high as 0.007 mg/day (Singh, 1990).

The health risk associated with natural uranium is a function of the total mass of uranium ingested for chemotoxicity, or of the pCi of radioactivity ingested for the radiogenic risk. Natural uranium is a mixture of three isotopes, where U-238 accounts for the predominant majority of the mass (>99%) and, hence, for the chemical toxicity. On the other hand, all three isotopes contribute to the radioactivity of natural uranium. U-238 and U-234 each comprise 48.9 % of the total activity and U-235 comprises the remaining 2.2% (ATSDR, 1990; NRC, 1992).

The concentrations used in this analysis correspond to the maximum projected concentrations at the POE locations. For chemical toxicity assessments, the total hazardous constituent concentration has been used, including background levels. For calculating carcinogenic effects, the incremental effects are calculated by modeling the intakes using the concentrations above natural background levels.

B.3.1.1 NON-CANCER EFFECTS

Chemotoxicity in the kidney is recognized as the limiting adverse health effect from the ingestion of soluble uranium. In the bloodstream, uranium forms low-molecular weight bicarbonate complexes. About 60% of the uranium in this form in the bloodstream is eliminated with the urine. In acidic urine, the remaining 40% dissociates from the

bicarbonate complex as soluble uranium oxide ions (UO_2^{2+}), which is a more bioavailable form of uranium. The uranium oxide ions bind to tissue protein in the kidney tubules where it accumulates.

Uranium targets the kidney tubule cells by initially interfering with their normal filtration function to preferentially extract water-soluble wastes from the bloodstream. Essential biochemicals such as glucose, proteins, amino acids and water are not reabsorbed as required for good health. As the dose of uranium increases, damage occurs to the structure of the cells in the tubular lining, possibly by disabling the sodium transport mechanism, which then changes the permeability of the cell membrane. Calcium, for example, is transported to the kidney tubules where it can accumulate to toxic levels. This depletes the body of the calcium necessary for the production of cellular energy in the mitochondria, eventually leading to cell death.

At the critical dose in the kidney, it begins to shed dead cells as uranium accumulates in the interstitial tissue in the tubules. The kidney, however, has a large reserve functional capacity so the loss of these cells has not been observed to impact kidney function.

Reversible weight loss and biochemical changes in urine composition can develop at moderate uranium exposure levels, with no apparent permanent renal damage. A biomarker for early change in kidney function is an increased level of proteins in the urine, or proteinuria. These abnormalities return to normal levels after the uranium exposure ceases and the kidney cells have time to regenerate. Abnormalities on the cell surface remain, but the significance of this, and other similar biochemical or tissue changes that do not reflect measurable kidney damage, are not known.

Human data on the toxicity of soluble uranium as a chronic exposure come mainly from occupational health reports. In the workplace, soluble uranium usually is inhaled as a vapor that is complexed with a halogen (e.g. fluoride), which is also toxic (EPA, 1991, Leggett, 1989). In the occupational environment, the route of exposure, the concentration, the duration of exposure and usually the chemical form are not the same

as the exposure parameters to hypothetical residents near this site. These differences are important considerations in evaluating the toxicity of much lower concentrations of uranium ingested by residents through drinking water.

In one of the only reported cases of residents ingesting soluble uranium in drinking water (at concentrations 10 to 35 times the Canadian Drinking Water Standard of 0.10 mg/l, no significant toxic effects were observed in the kidney when compared to non-exposed residents (Moss, et. al., 1983). While there was no evidence of renal damage, the researchers did note an increase in b₂ micro globulin levels (b₂-m) in the urine with increasing exposure to uranium in drinking water. When the uranium exposure stopped, the b₂-m value decreased, thus supporting earlier observations of temporary, but not permanent, changes in the kidney. The researchers concluded, however, that the increase in b₂-m may be a sub-critical toxic effect related to low level, chronic exposures to uranium in drinking water (Moss et al., 1983). In this report, the focus is on the irreversible, permanent adverse effects of uranium on the kidney, since the relevance of b₂-m as a biomarker in kidney toxicity is currently unknown.

Uranium toxicity is characterized by a critical threshold concentration in the kidney, which is expressed as micrograms of uranium per gram kidney ($\mu\text{g U/g}$). Threshold values for uranium in the kidney have been reported from observations in both humans and in laboratory animals. Data for humans are shown in Table B.3-1. In Table B.3-1, LOAEL is the "lowest observed adverse effect level" and NOAEL is the "no observed adverse effect level."

Threshold Value (ug/g)	NOAEL or LOAEL*	Measurement Technique	Type of Exposure	Subject (number)	Comment	Safety Factor to Apply	Reference
0.3	NOAEL	alpha spec.	low level occup. (chronic)	Humans (7)	Autopsies		Russell, et.al., (1996)
2.6	NOAEL	not given	acute	Humans (3)	Urinary output and ICRP calculation	10	Zhao and Zhao (1990)
2 to 6	LOAEL	not given	acute	Humans	Based on body burden calculation humans		Bernard (1958)

At present, a threshold value of 1 µg U/g kidney is considered adequate to prevent irreversible kidney damage, based on current uranium toxicity knowledge. This threshold value, however, has not been "observed" in humans, but rather is an extrapolation from human and animal data combined with professional judgment (Wrenn, 1985).

From Table B.3-1 it can be seen that there are three studies involving human subjects (Russel, et. al., 1996; Zhao and Zhao, 1990; Bernard, 1958). In the two most recent studies, the kidney threshold differs by an order of magnitude (0.3 mg U/g kidney vs. 2.6 mg U/g kidney). This may represent variability in human populations, which can account for a safety factor of 10.

B.3.1.2 CANCER EFFECTS

Uranium is assumed to be a human carcinogen due to the alpha emissions from the radioactive isotopes, primarily U-238 and U-234 which together account for 97.8% of uranium's radioactivity. An extremely low level of gamma radiation is also emitted from uranium. The potential adverse health effects resulting from exposure to uranium's radioactivity have been assessed by the International Commission on Radiological Protection (ICRP), the National Council on Radiological Protection and Measurements (NCRP), and others. Generally, the most current generic dose and risk factors recommended by the NRC have been used in this report (NRC, 1992; EPA, 1999).

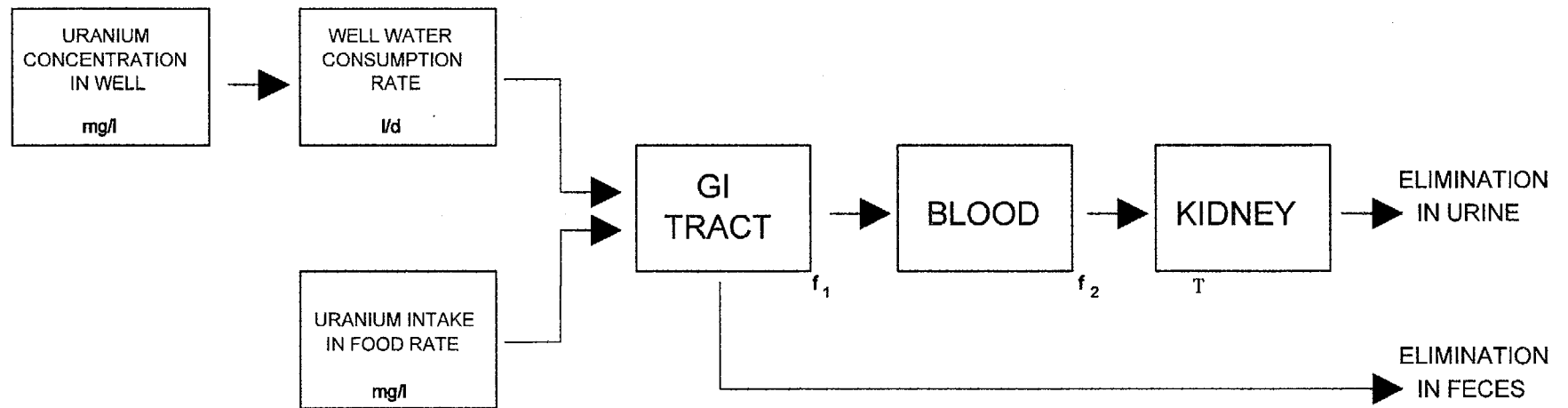
B.3.2 BIODYNAMICS OF URANIUM ABSORPTION AND RETENTION IN THE KIDNEY

An important step in assessing the risk of ingesting uranium in food and water at this site is estimating the resulting kidney burden of uranium. This is done using a biokinetic model or a mathematical description of the absorption, distribution, storage and elimination of uranium in the body. With this biokinetic model, a prediction can be made of the mass of uranium in the kidney resulting from the anticipated ingestion of 0.17 mg/d (see Table A.4-7 in Appendix A) while at this site. A simple schematic for a two-compartment kidney model of the biokinetics of uranium in uptake and retention in the human kidney is shown in Figure B.3-1.

B.3.2.1 TWO-COMPARTMENT KIDNEY BIODYNAMIC MODEL

The ICRP two-compartment model of uranium toxicity (ICRP, 1995) in the kidney from oral ingestion was used to predict the uranium in the kidney following chronic uranium ingestion. This model allows for the distribution of the two forms of uranium in the blood, and consists of a kidney with two compartments, as well as several other compartments for uranium distribution, storage and elimination including the skeleton, liver, red blood cells (macrophages) and other soft tissues.

B.3-6



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R13\DOS\9906\ACL\BIOMODEL

FIGURE B.3-1. SCHEMATIC FOR TWO COMPARTMENT BIOKINETIC MODEL OF URANIUM UPTAKE AND RETENTION IN KIDNEYS

Between one and two percent of ingested uranium is absorbed rapidly from the GI tract to the blood stream, where a small fraction (0.7 %) then binds with proteins in the red blood cells. Over 40 % of plasma uranium is deposited either in the skeleton (10.5 %) and soft tissues (35 %). According to the ICRP, about 8.4 % of plasma uranium reaches the kidney (ICRP, 1995). From Figure B.3-1, the mathematical representation for the kidney burden of uranium at steady state can be derived as follows:

$$Q_p = \frac{IR f_1}{\lambda_p (1 - f_{ps} - f_{pr} - f_{pl} - f_{pt} - f_{pk1})}$$

where:

- Q_p = uranium burden in the plasma, μg ;
- IR = dietary consumption rate, mg U/d ;
- f_1 = fractional transfer of uranium from GI tract to blood, unitless;
- f_{ps} = fractional transfer of uranium from plasma to skeleton, unitless;
- f_{pr} = fractional transfer of uranium from plasma to red blood cells, unitless;
- f_{pl} = fractional transfer of uranium from plasma to liver, unitless;
- f_{pt} = fractional transfer of uranium from plasma to soft tissue, unitless;
- f_{pk1} = fractional transfer of uranium from plasma to kidney compartment 1, unitless;
- λ_p = biological retention constant in the plasma, d^{-1} .

The burden in kidney compartment 1 is:

$$Q_{k1} = \lambda_p Q_p \frac{f_{pk1}}{\lambda_{k1}}$$

where:

- Q_{k1} = uranium burden in kidney compartment 1, mg ;
- λ_{k1} = biological retention constant of uranium in kidney compartment 1, d^{-1} .

Similarly, for compartment 2 in the kidney, the burden is:

$$Q_{k2} = \lambda_p Q_p \frac{f_{pk2}}{\lambda_{k2}}$$

where:

- Q_{k2} = uranium burden in kidney compartment 2, μg ;
- λ_{k2} = biological retention constant of uranium in kidney compartment 2, d^{-1} ;
- f_{pk2} = fractional transfer of uranium from plasma to kidney compartment 2, unitless.

The total burden to the kidney is then the sum of the two compartments as follows:

$$Q_{k1} + Q_{k2} = \frac{IR f_1}{(1 - f_{ps} - f_{pr} - f_{pl} - f_{pt} - f_{pk1})} \left[\frac{f_{pk1}}{\lambda_{k1}} + \frac{f_{pk2}}{\lambda_{k2}} \right]$$

B.3.2.1.1 PARAMETER VALUES

The parameter input values for the two-compartment kidney model include the daily intake of uranium estimated for residents at this site, and the ICRP recommendations are listed below (ICRP, 1995).

The daily uranium intake rate is estimated in the pathway analysis in Table A.4-7 to be 0.16 mg/d for tap water ingestion, and 0.01 mg/d from food intake, for a total of 0.17 mg/d.

IR	=	0.17 mg/day	f_{pk1}	=	0.00035
f_1	=	0.02	f_{pk2}	=	0.084
f_{ps}	=	0.105	λ_p	=	35/d
f_{pr}	=	0.007	λ_{k1}	=	$\ln(2)/5$ yrs
f_{pl}	=	0.0105	λ_{k2}	=	$\ln(2)/7$ days
f_{pt}	=	0.347			where $\ln(2) = 0.693\dots$

B.3.2.1.2 BIOKINETIC MODEL VALIDATION

The biokinetic model was tested by comparing a prediction of the uranium burden in the kidney based on the model to actual values of the uranium burden in the kidneys of

residents in New York City and Japan (Fisenne and Welford, 1986; Igarishi, et. al., 1985). A dietary intake of 1.2 $\mu\text{g U/day}$, the average value for residents of New York City (Fisenne, et. al., 1987), was assumed. The biokinetic model predicted a total mass of 0.08 $\mu\text{g U}$, which corresponds to a concentration of 0.26 $\mu\text{g U/kg kidney}$. The model prediction is in good agreement with the lower range of the uranium concentrations in the kidneys of New York residents, which ranged from 0.26 to 0.89 $\mu\text{g U/kg}$ (Fisenne and Welford, 1986), and with those values reported in a Japanese study that ranged from 0.12 to 0.80 $\mu\text{g U/kg kidney}$ (Igarashi, et.al, 1985). Therefore, this model seems well suited for predicting the kidney burden of uranium resulting from chronic ingestion in food and water.

B.3.2.1.3 PREDICTION OF URANIUM BURDEN IN THE KIDNEY

Given a daily uranium intake of 0.17 mg/day at this site, the calculated concentration of uranium in the kidney is 0.04 $\mu\text{g U/g}$. This is only four percent of the 1.0 $\mu\text{g U/g}$ value that has been assumed to protect the kidney from the toxic effects of uranium. Since the exposure assessment was conservative, it is highly unlikely that anyone could exceed the toxicity limit for uranium.

B.3.3 CANCER EFFECTS: SLOPE FACTORS AND RISK

The estimate of cancer risk from exposure to natural uranium in the environment resulting directly or indirectly from ground water at the proposed POE value is based on knowledge about the carcinogenicity of radiation on humans, and the calculated cancer potency of the radioactivity in natural uranium. The EPA and other agencies classify chemicals into six categories according to the weight of evidence of human carcinogenicity, which ranges from known human carcinogens (Category A) to those that are unequivocally non-carcinogenic, Category E. As for all radionuclides, uranium is classified by the EPA as a Category A carcinogen (EPA, 1991).

For carcinogens, the risk assessment model assumes that the number of cancers increases linearly with any dose greater than "zero exposure", thus eliminating the use of a threshold concentration. Therefore, the expected carcinogenic action of a substance

for chronic, low exposure conditions is a linear extrapolation of the dose factors developed from human data and adjusted for dose rate effects. The slope of this linear extrapolation is the Slope Factor (SF), which describes the rate of tumors observed per unit intake of a chemical. The slope factor is the primary criterion in the U.S. for evaluating radiological carcinogenicity.

The uncertainty in using slope factors lies in the possibility that the dose-response curve may not be linear especially at these low exposure levels, or that tumor induction by some radionuclides may not occur within the lifetime of the laboratory animal or human. For radionuclides, the cancer slope factors are often based on human data that is considered to contain less uncertainty about the rate of tumor induction at low doses than animal data. Consequently, the slope factors derived by the EPA are usually best estimate values that are closer to the actual value of the slope factor than the most conservative, upper bound estimate at the 95th percentile (EPA, 1995).

The cancer risk is the probability that an exposed individual will develop cancer because of that exposure. The cancer risk is the product of the intake of uranium from all sources (with the exception of natural background), and the slope factors, or

$$CANCER\ RISK = TI * SF$$

where:

TI = Total intake of radionuclide (pCi)

SF = Slope factor (risk per pCi)

Cancer risks greater than 1 in 10,000 (1E-04) above natural background levels are considered by the NRC to require intervention or remedial action. Cancer risks close to 1E-04 may be acceptable values when the site-specific conditions are considered in the risk assessment.

B.3.4 QUANTIFYING RADIATION DOSES FROM INTERNAL AND EXTERNAL RADIATION FROM INCIDENTAL EXPOSURE TO URANIUM IN SOIL AND DUST

B.3.4.1 EXPOSURE PARAMETERS

The generic exposure parameters for calculating both the internal and external radiation dose from uranium in the soil and dust are the same as those used to estimate the ingestion of incidental soil and dust as shown in Section A.5.

B.3.4.2 CONCENTRATION VALUES

The same soil concentration values for estimating the intake of uranium by incidental ingestion are used to estimate doses from both ingestion and inhalation of contaminated dust and from external gamma radiation emitted from surface soils. In all cases, the incremental risk is calculated by subtracting the background concentration.

B.3.4.3 RADIATION DOSE ESTIMATE FOR URANIUM IN INGESTED DUST

The internal radiation dose from the incidental ingestion of uranium can be estimated by using the following screening calculation. Assuming that the average annual ingestion of dust by an adult is 18.25 g at a rate of 50 mg/d and the incremental soil concentration of uranium is 3.1 pCi/g (Table A.4-5, Appendix A), then the radiation dose equivalent is

$$\begin{aligned} 18.25 \text{ g} * 3.1 \text{ pCi U/g} * 2.7\text{E-4mrem/pCi U} \\ = 0.02 \text{ mrem/y} \end{aligned}$$

Ingestion dose factors were taken from EPA, 1988: 7.66E-08 Sv/Bq U234, 7.19E-08 Sv/Bq U235, and 6.88E-08 Sv/Bq U238. The dose equivalent factor per pCi of natural uranium inhaled is calculated to be:

$$\begin{aligned} (7.66 + 7.19 * 0.045 + 6.88) * 1.0\text{E-08} * 1.0\text{E05} * 0.018 \\ = 2.7\text{E-4 mrem/pCi U} \end{aligned}$$

where:

0.045 = Bq U235 per Bq U238

1.0E05 = conversion factor, mrem/Sv

0.018 = conversion factor, Bq U-238/pCi U

This dose is insignificant compared to the other pathways and will not be considered further.

B.3.4.4 RADIATION DOSE ESTIMATE FOR INTERNAL RADIATION FROM URANIUM IN INHALED DUST

The internal radiation dose from inhaling uranium-contaminated dust can be estimated using the following calculation and assumptions. It will be assumed that the average respirable particulate concentration (PM_{10}) is the same as in Grants, NM, a similarly arid area, where the New Mexico Air Quality Bureau (N.M. Air Quality Bureau, 1996) reported an average concentration of 0.025 mg/m^3 . Respirable particles are those that are small enough in diameter (less than 10 microns) to be inhaled into the respiratory tract. If the dust consists of soil containing an incremental uranium concentration of 3.1 pCi/g above background levels and the breathing rate is $10,512 \text{ m}^3/\text{y}$, the excess annual total dose equivalent is calculated to be:

$$\begin{aligned} 0.025 \text{ mg/m}^3 * 10,512 \text{ m}^3/\text{y} * 1 \text{ g/1,000 mg} * 3.1 \text{ pCi U/g} * 0.12 \text{ mrem/pCi U} \\ = 0.1 \text{ mrem/y} \end{aligned}$$

Inhalation dose factors were taken from EPA, 1988: $3.58\text{E-}05 \text{ Sv/Bq U234}$, $3.32\text{E-}05 \text{ Sv/Bq U235}$, and $3.2\text{E-}05 \text{ Sv/Bq U238}$. The dose equivalent factor per mg of natural uranium inhaled is calculated to be:

$$\begin{aligned} (3.58 + 3.32 * 0.045 + 3.2) * 1.0\text{E-}05 * 1.0\text{E}05 * 0.018 \\ = 0.12 \text{ mrem/pCi U} \end{aligned}$$

where:

- 0.045 = Bq U235 per Bq U238
- 1.0E05 = conversion factor, mrem/Sv
- 0.018 = conversion factor, Bq U-238/pCi U
- 12.3 = conversion factor, Bq U238/mg U

This dose equivalent is insignificant compared to the other pathways and will not be considered further.

B.3.4.5 RISK ESTIMATE FOR EXTERNAL RADIATION FROM URANIUM IN SOIL

The external radiation dose equivalent is calculated as the product of the soil concentration of uranium (pCi/g) in irrigated fields, by the human exposure parameter values given in Table A.4-5. The cancer risk from external radiation deposited on the ground during irrigation was estimated using a simple screening model. The potential lifetime risk of fatal cancer from lifetime exposure to uranium from this site was calculated as follows:

$$3.1 \text{ pCi U/g} * 3.9 \text{ E-08 risk/y/pCi/g} * 30 \text{ y} = 3.6 \text{ E-06}$$

Where 3.9E-08 = lifetime risk from one year of exposure to natural uranium in soil at 1 pCi/g. (EPA, 1995). Calculations using risk factors in EPA, 1999 showed a risk approximately 2 times as large but the result is still insignificant. Therefore this exposure pathway will not be considered further.

B.3.5 LIFETIME CANCER RISK ESTIMATE FROM INGESTION OF URANIUM AT THE MAXIMUM POE LEVEL

The distribution of potential annual radiation dose and cancer risk from a lifetime of ingesting uranium at the POE value to those people living near the site throughout the coming decades is estimated using a site-specific exposure scenario. For this assessment, it was assumed that residents take their tap water from a local well and that the concentration of uranium in the ground water is at the concentration of uranium

at the Point of Exposure (POE) less the average measured natural background levels (0.02 mg/l) at the site. Other assumptions included tap water being used to irrigate a garden and ground water being used to irrigate fields that provide forage for beef and dairy cattle and chickens. The estimated ingestion rate of uranium (excluding that arising from background levels of uranium in the water) in food pathways was developed in Appendix A (Table A.4-7), which is used in the calculations below. The ingestion dose factor for ingestion of uranium is 2.7E-04 mrem/pCi U as developed in Section B.3.4.3. The potential annual total effective dose equivalent from ingestion of uranium can be calculated as follows:

$$TEDE = IR * EF * D_f$$

$$= 10 \text{ mrem/yr}$$

where:

TEDE = total effective dose equivalent per year from internal radiation

IR = daily ingestion rate, mg/d = 1.38 pCi/d-kg * 70 kg = 97 pCi/d

EF = frequency of exposure, d/y = 365 d

D_f = natural uranium dose conversion factor, mrem/pCi

The potential risk from lifetime exposure attributable to ingestion of uranium can be calculated using the formula:

$$Risk = IR * EF * ED * R_f$$

where:

Risk = probability of death from cancer arising from radiation from site

ED = duration of exposure = 30 y

R_f = risk factor, risk/pCi U

The risk factors are taken from EPA,1995: 4.44E-11 risk/pCi U-234, 4.52E-11 risk/pCi U-235, and 4.27E-11 risk/pCi U-238. The natural uranium risk factor is calculated as follows:

$$(4.44 + 4.52*0.045 + 4.27) * E-11 * 0.49$$

$$= 4.4 \text{ E-11 risk/pCi U}$$

where :

0.49 is the percentage of U-238 in 1 pCi/g of natural uranium

0.045 is the ratio of U-235 activity to U-238 activity

As indicated above, the total uranium uptake by the hypothetical occupant of the site is 97 pCi/day or 1.1E6 pCi in 30 years. Multiplying the total intake over 30 years by the risk factor above indicates a total risk from uranium intake of 4.8 E-5. This value is approximately 50 percent of the NRC criterion of 1.0E-04 (NRC, 1996).

B.4 HUMAN HEALTH RISK ASSESSMENT FOR EXPOSURE TO TH-230

The health risk associated with exposure to thorium is considered to arise from its radiological properties rather than its chemical properties as discussed in Section B.2. While no drinking water standards exist for Th-230, dose and risk factors exist and are recommended for use by the EPA and other organizations. These risk factors for inhalation and oral intake are significantly higher than for most radionuclides. However, because of the low concentrations of Th-230 in the groundwater at the POE location and the low bioavailability, the intake and risk associated with these concentrations are very small.

The projected ACL concentration of Th-230, as presented in the main text of this report, is 0.3 pCi/l. Of that concentration, 0.1 pCi/l is attributable to natural background. The exposure assessment for Th-230 (presented in Table A.4-7 of Appendix A) showed that the daily incremental intake of Th-230 for a hypothetical individual living near the site is 3.04×10^{-3} pCi/kg-day. Multiplying by the mass of the standard man, 70 kg, the oral intake from food and water is only 0.21 pCi/day. After 30 years of land irrigation using water at the projected POE concentration, the incremental buildup of Th-230 in soil was calculated to be only 0.007 pCi/g. This small buildup, along with the low biotransfer coefficients from forage to food products made the food pathway exposure very small. Calculations of the dose and risk associated with these small exposures follows.

B.4.1 LIFETIME CANCER RISK ESTIMATE FROM INGESTION OF TH-230 AT THE MAXIMUM POE LEVEL

The potential annual radiation dose and cancer risk from ingesting Th-230 to hypothetical people living near the site is estimated using the same method and scenario as that used for assessing the uranium risk. For this assessment, it was assumed that residents take their tap water from a local well and that the concentration of uranium in the ground water is at the concentration at the Point of Exposure (POE). Other assumptions include tap water being used to irrigate a garden and ground water being used to irrigate fields that provide forage and drinking water for beef, dairy cattle, and chickens. The estimated ingestion rate of Th-230 (excluding that arising from

background levels of uranium in the water) in food pathways was developed in Table A.4-7 in Appendix A. These values are used in the calculations below.

The ingestion dose conversion factor for Th-230 is 1.48E-07 Sv/Bq, or 5.5E-04 mrem/pCi. The potential annual total effective dose equivalent from ingestion is calculated as follows:

$$\begin{aligned} TEDE &= IR * EF * D_f \\ &= 2 \text{ mrem/yr} \end{aligned}$$

where:

TEDE = total effective dose equivalent per year from internal radiation

IR = daily ingestion rate, 0.21 pCi/d

EF = frequency of exposure, d/y = 365 d

D_f = dose conversion factor, mrem/pCi

The potential risk from lifetime exposure attributable to ingestion of Th-230 is calculated using the formula:

$$Risk = IR * EF * ED * R_f$$

where:

Risk = probability of death from cancer arising from radiation from site

ED = duration of exposure = 30 y

R_f = risk factor, risk/pCi U

EPA, 1995 presents the ingestion risk factor for Th-230 as 3.75E-11 risk/pCi. With the daily intake of 0.21 pCi/d and an exposure time of 30 years, the cancer risk is calculated to be 9E-08. This is insignificant compared to the NRC criterion of a maximum risk of 1E-04.

B.4.2 Health Risk from Other Exposure Pathways for Th-230

Other pathways that might be considered for Th-230 include inhalation, ingestion of dust, and direct radiation exposure. All of these pathways use the buildup of ACL

constituents in soil after 30 years of land irrigation using water at the projected POE concentrations. The assessment of buildup of Th-230 in soil is shown in Table A.4-5 of Appendix A. The incremental buildup of Th-230 arising from 30 years of land irrigation is only 0.007 pCi/g, which is very small compared to the natural background levels in soil of 1.6 pCi/g. Therefore all exposures from these pathways will be negligible compared to the oral intake pathway presented in the previous section.

B.5 UNCERTAINTY IN HAZARD ANALYSES

The numerous sources of uncertainty in this risk assessment have been discussed throughout the text. In summary, the following table lists some of the sources of uncertainty that influence the risk estimates for exposure to uranium and Th-230 at the POE values.

TABLE 5-1. UNCERTAINTIES IN HAZARDS ANALYSES.	
Probable Direction of Error	Source of Uncertainty
Underestimation of Risk	Lack of measured concentration data for chemicals in environmental media
Overestimation of Risk	<p>POE concentrations are the maximum value that should occur at the POE location. Average 30 year concentrations may be significantly less than the POE concentration</p> <p>Use of conservative parameters in the ion migration simulations</p> <p>Assume no constituent losses in soil over time due to weathering or biodegradation</p> <p>Conservative assumptions for human and animal exposure parameter values</p>
Unknown direction	<p>Variations in analytical measurements</p> <p>Uncertainties in hydrological modeling</p> <p>Toxicological interactions between chemical constituents or between the constituents and other biochemicals in the body</p> <p>Lack of adequate toxicity data relevant to exposure to these chemicals by ingesting drinking water</p> <p>Use of generic agricultural biotransfer factors</p>

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APPENDIX C
ENVIRONMENTAL HAZARDS

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C.1 INTRODUCTION

Uranium and Th-230 in ground water at the POE concentrations are expected to have no irreversible impacts on environmental health, either by directly affecting wildlife, livestock, and other ecosystem organisms, or through bioaccumulation and food web interactions. The use of ground water for irrigation at this site results in two potential sources for contact with these constituents: standing surface water from irrigation operations for short periods of time, and accumulation in plants and lower food chain organisms, both aquatic and terrestrial. Spring Creek will experience the same radionuclide concentrations as the POE. However, since the exposure assessments have shown that a minimal impact exists to man from using the water for drinking water, no significant impacts to fish or other aquatic species are expected. The critical end-point of environmental toxicity being considered at this site is mainly the potential for adverse effects on livestock being watered with ground water and grazed on irrigated forage.

C.2 URANIUM

From the exposure pathway analysis, it was calculated that irrigation for 30 years using water containing 0.13 mg U/l results in an increase in soil concentration of 5.2 mg U/kg dry weight to a total of 8.5 mg U/kg, including background. The corresponding concentration of U in forage consumed by beef cattle is calculated to be 0.029 mg/kg wet weight. The predicted intake of uranium on a daily basis from forage and cattle watering is 0.8 mg/d and 6.5 mg/d, respectively. These values show that the greatest impact of uranium on cattle is from livestock watering.

Linsalata, et.al. (1989) estimated daily intakes of uranium in feed and water by beef cattle at 6.4 to 7.7 mg/d (mainly from mineral supplements) and measured corresponding uranium concentrations in their kidneys in the range of 1.55×10^{-3} to 7.37×10^{-3} $\mu\text{g U/g kidney}$. Using these factors, ingestion of 7.3 mg U/d by livestock near the site would result in maximum uranium concentration in the kidney of 0.008 $\mu\text{g U/g kidney}$. These concentrations are a factor of more than 100 times lower than the toxicity criteria for human kidneys (1 $\mu\text{g U/g}$). Therefore, these levels should be far below the toxic limit for cattle.

An earlier study on dairy cows (Garner, 1963) showed that deterioration in general health and a decrease in milk production were associated with a daily intake of 400 mg U. However, these effects were transient and only lasted two weeks with general health and milk production returning to normal even though the animals were still exposed to this concentration. The daily intake for cattle from this site is about 50 times lower than the intake for transient effects reported by Garner. On this basis, therefore, cattle should not be impacted.

Fish and other aquatic life may be slightly impacted by incorporating radionuclides into their body from the slightly elevated uranium in the stretch of Spring Creek between the site and Little Medicine Bow River. The maximum uranium concentration in Spring Creek will be equal to the POE concentration of 0.15 mg/l, including background. This level is approximately 30 percent of the NRC effluent limit (10 CFR Part 20, Appendix B, Table 2) for operating facilities. This low concentration should not have a significant impact.

C.3 TH-230

The exposure assessment showed that the transport of Th-230 to soils and forage resulted in near background concentrations and that the dose to humans was extremely small. This was due to the small incremental Th-230 concentration in the groundwater at the POE as well as the fact that the bio-availability of thorium is low compared to most elements. Therefore, it can easily be concluded that the environmental toxicity of Th-230 in groundwater at these very low levels is insignificant.

C.4 REFERENCES

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APPENDIX D

MODFLOW GROUND-WATER FLOW MODELING

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D.1 INTRODUCTION

The MODFLOW model (McDonald and Harbaugh, 1988) was used to model ground-water flow in the Surficial aquifer at the Shirley Basin site. The MODFLOW model is a multi-layer finite difference model that allows pseudo-three-dimensional flow modeling with distributed properties. The model has routines to allow incorporation of rivers, wells, drains, recharge, constant head boundaries, and constant flux boundaries. The model allows variable cell size so the grid can be refined to give greater resolution in critical areas. However, cells must be rectangular and consequently, the grid is rectangular. Aquifer thickness and hydraulic properties can be assigned for each individual cell and each layer in a multi-layer model.

The model used for simulation of ground-water flow in the Surficial aquifer was a two layer model. The tailings overlie the native surface and are bounded by constructed tailings dams. The water levels in the tailings are such that lateral flow through the dams is minimal. Thus, the only modeled means of discharge was vertically downward to the Surficial aquifer. All simulations were transient simulations where piezometric surfaces and flux rates could change with time. A calibration procedure using current operational characteristics to model long-term stability of the piezometric surfaces was employed.

The unit of time used in the modeling was days, and the unit of length was feet. Units of hydraulic conductivity and recharge were ft/day. The unit of flow for wells was ft³/day and the unit of conductance for river cells and drain cells was ft²/day. The unit of vertical conductance is day⁻¹.

D.2 FLOW MODEL

The model area within the grid is shown in Figure D.2-1. The grid was 77 rows by 117 columns in size with the smallest cell being 50 feet by 50 feet. The finest grid was placed over the area between Spring Creek and the tailings area. Beyond this fine grid, the cell size was gradually expanded to a maximum cell size of 500 feet by 500 feet. Figure D.3-1 shows an expanded area in the vicinity of Spring Creek and Mine Creek, along with the river and drain cells used in the simulation. Table D.2-1 presents the row and column dimensions for the grid.

D.2.1 AQUIFER PROPERTIES AND CHARACTERISTICS

The aquifer properties and characteristics for the tailings and Surficial aquifers are input to the MODFLOW model in a series of arrays. For convenience, all aquifer characteristic values that included the elevation were reduced by 7000 feet. This reduced the number of required digits in the arrays without compromising results. The tailings aquifer is a bounded aquifer located above the Surficial aquifer, and does not exist beyond the tailings dams or tailings boundaries. The Surficial aquifer was assumed to exist over the entire area for modeling purposes, but was rendered inactive in some areas with no saturation or by setting the hydraulic conductivity to zero.

D.2.1.1 TAILINGS AQUIFER

The tailings aquifer was modeled as a completely bounded unconfined aquifer. The active cell matrix for the tailings aquifer is presented in Table D.2-2. In this table, a value of 1 indicates a cell where flow is allowed. A value of 0 indicates a no-flow cell where no exchange occurs. The hydraulic conductivity array for the tailings is presented in Table D.2-3. The values of hydraulic conductivity were varied from 0.024 ft/day for slimes to 18 ft/day for sandy beach areas in the tailings. Hydraulic conductivity isopleths were drawn for the tailings area, and then intermediate values were interpolated.

The specific yield of the tailings aquifer was set at a uniform value of 0.12. The base of the tailings was developed using pre-tailings topographical information with the constructed tailings dams in place. Table D.2-4 presents the array for base of tailings.

Outside of the tailings area, the cells are inactive and the base of tailings was set at the present land surface. Table D.2-5 presents the array of initial water-level elevation in the tailings. This surface was developed with from late 1999 tailings monitor well data.

D.2.1.2 SURFICIAL AQUIFER

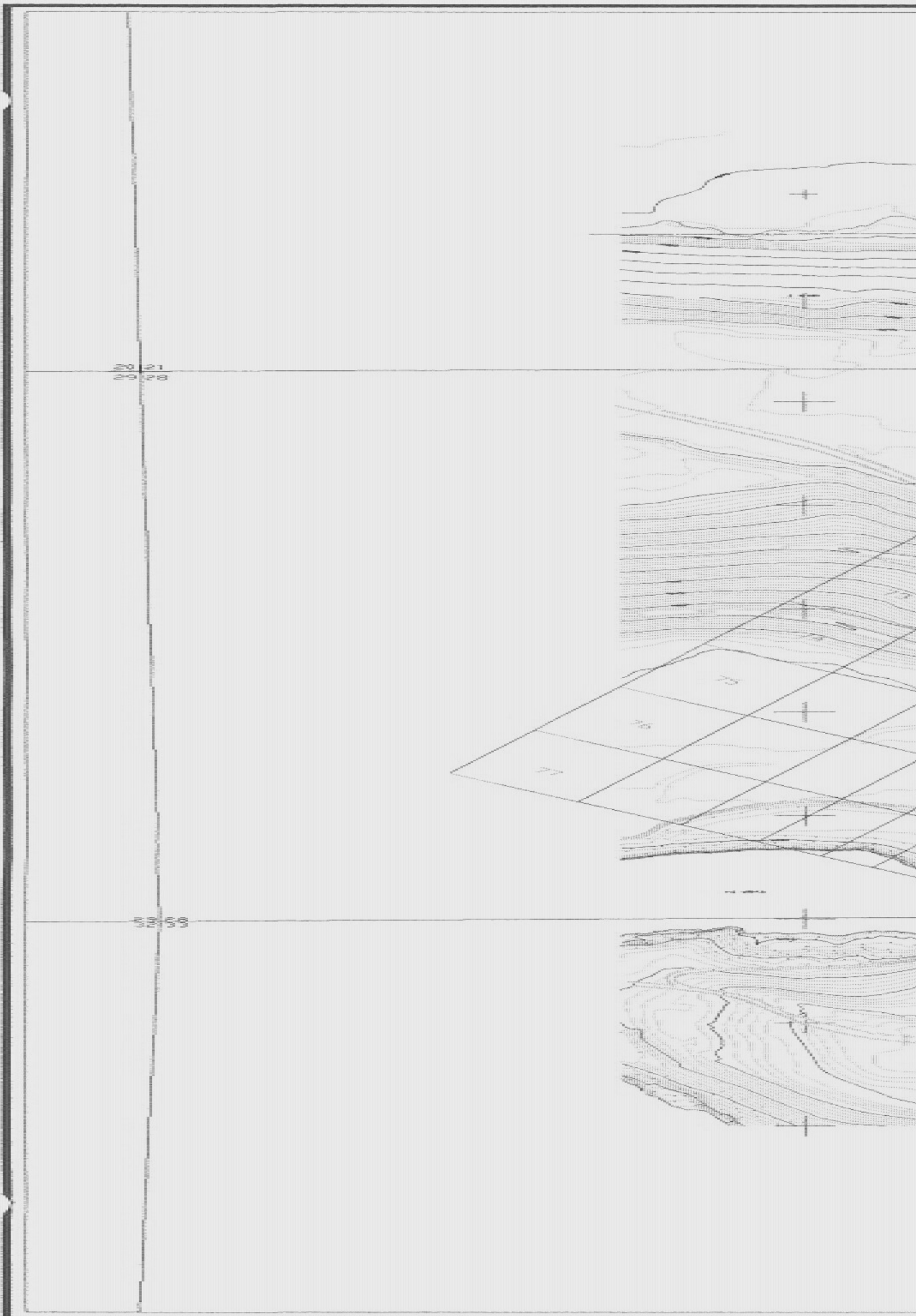
The Surficial aquifer in the tailings area consists primarily of connected sands that are highly correlated with natural surface drainage features. The more transmissive areas are associated with the original Mine Creek channel. The present piezometric surface has developed as a result of natural and artificial recharge and ongoing collection efforts. The more transmissive areas are proximate to the original Mine Creek area. Table D.2-6 presents the hydraulic conductivity array used in the modeling. Measured transmissivities from well testing were used to determine hydraulic conductivity at key points in the modeled area, and then the existing gradients in the water surface were used to infer the hydraulic conductivity in areas where no other information was available. The remaining cell values were interpolated. The Surficial aquifer was modeled as a confined/unconfined aquifer with a uniform storage coefficient of 0.0001 and a specific yield of 0.10. The storage characteristics are important to highly transient periods in the modeling when the piezometric surfaces are changing.

The base of the Surficial aquifer was developed from lithologic and geophysical logs from boreholes in the area. Table D.2-7 presents the array for the bottom of the Surficial aquifer. Because the aquifer is typically confined beneath the tailings, the top of the aquifer is a necessary input to the model. Table D.2-8 presents the array for the top of the Surficial aquifer. Table D.2-9 presents the array for the initial water-level elevation in the Surficial Aquifer at the start of modeling. This surface was developed from a combination of late 1999 monitoring well data and the calibration/stabilization process for the modeling.

D.2.1.3 VERTICAL COMMUNICATION

The tailings are bounded by the tailings dams and the only means of measurable exchange of stored tailings water is through vertical leakage to the Surficial aquifer or

through artificial collection or injection. There is the potential for recharge to the top of the tailings from precipitation or ponding, but this was offset in the modeling by use of a net tailings dewatering rate rather than a gross dewatering rate. The extension of low-permeability interim cover and the eventual construction of the infiltration barrier will nearly eliminate infiltration into the tailings. The water levels in the tailings are too low for appreciable horizontal drainage through the dams or losses through evaporation. The array presenting the vertical conductance between tailings and the Surficial aquifer is presented in Table D.2-10. The vertical conductance was estimated to be greater near the original Mine Creek channel and to be smaller in the northern portion of Pond #5 where borehole lithology has indicated the presence of a thick clay layer.



C-2Ce

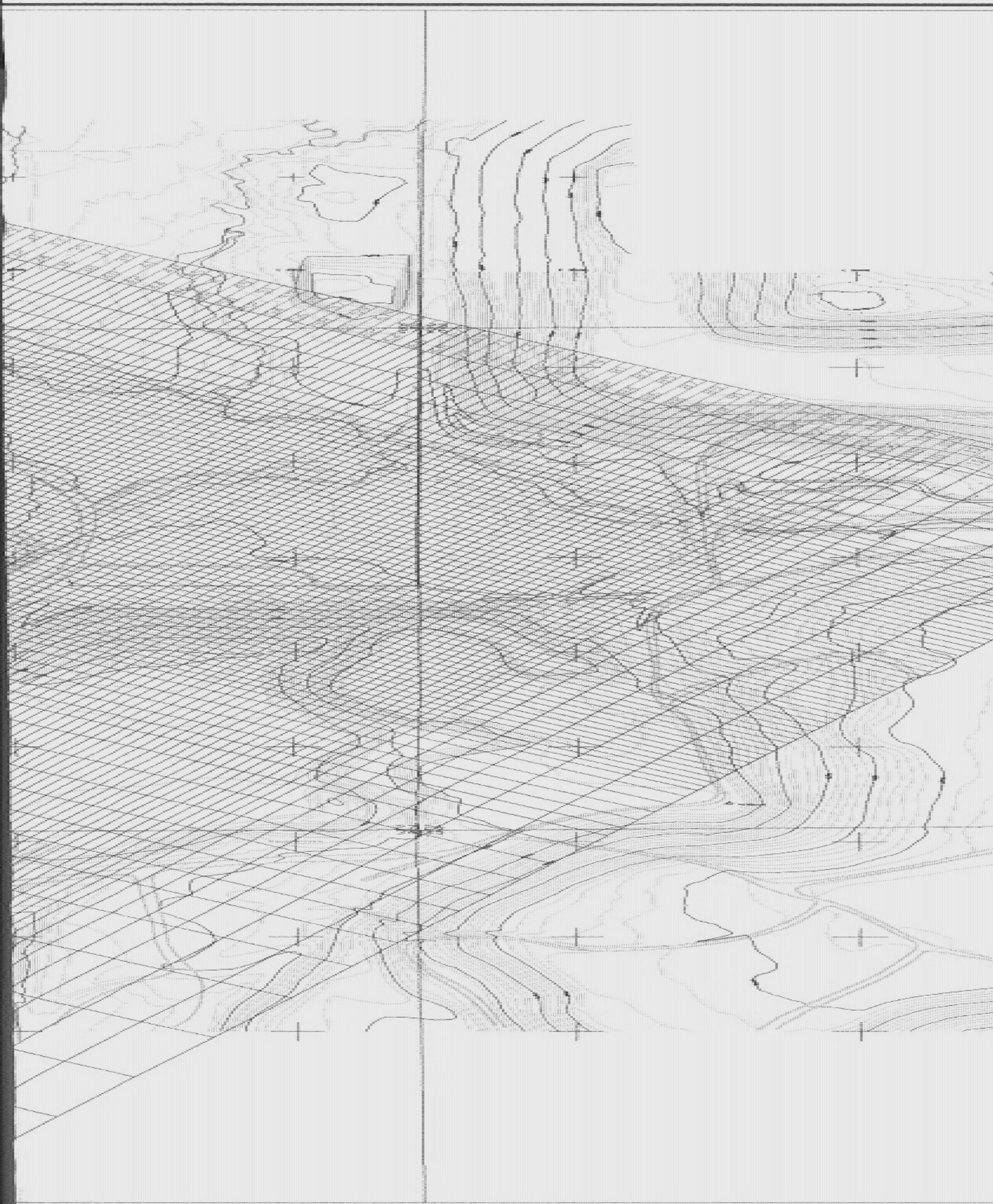


TABLE D.2-1. MODEL GRID COLUMN AND ROW DIMENSIONS.

<u>Column Number</u>	<u>Dimension Across Columns (feet)</u>	<u>Column Number</u>	<u>Dimension Across Columns (feet)</u>	<u>Row Number</u>	<u>Dimension Across Rows (feet)</u>	<u>Row Number</u>	<u>Dimension Across Rows (feet)</u>
1	500	60	50	1	300	59	100
2	400	61	50	2	250	60	100
3	300	62	50	3	200	61	100
4	250	63	50	4	150	62	100
5	200	64	50	5	100	63	100
6	200	65	50	6	75	64	150
7	150	66	50	7	50	65	200
8	150	67	50	8	50	66	200
9	150	68	50	9	50	67	200
10	100	69	50	10	50	68	200
11	100	70	50	11	50	69	200
12	100	71	50	12	50	70	200
13	100	72	50	13	50	71	300
14	100	73	50	14	50	72	400
15	100	74	50	15	50	73	500
16	100	75	50	16	50	74	500
17	100	76	50	17	50	75	500
18	100	77	50	18	50	76	500
19	100	78	50	19	50	77	500
20	100	79	50	20	50		
21	100	80	50	21	50		
22	75	81	50	22	50		
23	75	82	50	23	50		
24	75	83	50	24	50		
25	75	84	50	25	50		
26	75	85	50	26	50		
27	75	86	50	27	50		
28	50	87	50	28	50		
29	50	88	50	29	50		
30	50	89	50	30	50		
31	50	90	50	31	50		
32	50	91	50	32	50		
33	50	92	50	33	50		
34	50	93	50	34	50		
35	50	94	50	35	50		
36	50	95	50	36	50		
37	50	96	50	37	50		
38	50	97	50	38	50		
39	50	98	50	39	50		
40	50	99	50	40	50		
41	50	100	50	41	50		
42	50	101	50	42	50		
43	50	102	50	43	50		
44	50	103	50	44	50		
45	50	104	50	45	50		
46	50	105	50	46	50		
47	50	106	50	47	50		
48	50	107	50	48	50		
49	50	108	50	49	50		
50	50	109	50	50	50		
51	50	110	50	51	50		
52	50	111	75	52	50		
53	50	112	100	53	50		
54	50	113	125	54	50		
55	50	114	150	55	50		
56	50	115	200	56	50		
57	50	116	250	57	50		
58	50	117	300	58	75		
59	50						

TABLE D.2-2. ACTIVE CELLS IN THE TAILINGS AQUIFER.

Row	Column																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
38	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
39	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
40	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1
41	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1
42	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1
43	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1
44	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1
45	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
46	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
47	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
48	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
49	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
50	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
51	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
52	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
53	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
54	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
55	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
56	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
57	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
58	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
59	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1
60	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1
61	0	0	0	0	0	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1
62	0	0	0	0	0	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1
63	0	0	0	0	0	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1
64	0	0	0	0	0	1	1	1	1	0	0	0	0	0	1	1	1	1	1	1
65	0	0	0	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1
66	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
67	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
68	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE D.2-3. HYDRAULIC CONDUCTIVITY OF THE TAILINGS (FEET/DAY).

Row	Column																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
9	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
11	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
12	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
13	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
14	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
15	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
16	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
17	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
19	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
23	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
24	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
25	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
26	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
28	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
29	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
30	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
31	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
32	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
33	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
34	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
35	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4.290	6.371	7.930
36	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	6.763	12.636	16.859	18.000	18.000	
37	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.120	0.254	16.342	16.374	16.379	16.414	16.511	9.51	
38	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.043	0.262	0.425	0.535	11.660	11.387	10.804	10.058	9.51		
39	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.210	0.449	0.619	0.737	0.821	6.978	6.384	5.299	3.889	2.543		
40	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.276	0.666	0.866	0.984	1.064	1.108	2.296	1.458	1.123	1.034	0.966	
41	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.191	0.728	1.110	1.139	1.084	1.031	1.006	0.974	0.916	0.823	0.739	0.678	
42	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.583	1.183	1.033	0.892	0.816	0.743	0.719	0.885	0.617	0.523	0.442	0.386		
43	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.217	0.983	1.022	0.829	0.655	0.551	0.464	0.431	0.396	0.317	0.223	0.143	0.101	
44	0.000	0.000	0.000	0.000	0.000	0.000	0.630	1.124	0.840	0.634	0.433	0.288	0.187	0.143	0.108	0.024	0.024	0.024	0.024	0.024	
45	0.000	0.000	0.000	0.000	0.000	0.000	0.215	1.021	0.980	0.659	0.443	0.227	0.025	0.024	0.024	0.024	0.024	0.024	0.024	0.024	
46	0.000	0.000	0.000	0.000	0.000	0.000	0.582	1.134	0.858	0.554	0.256	0.034	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	
47	0.000	0.000	0.000	0.000	0.000	0.036	0.937	1.032	0.727	0.470	0.138	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	
48	0.000	0.000	0.000	0.000	0.000	0.214	1.200	0.972	0.626	0.367	0.092	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	
49	0.000	0.000	0.000	0.000	0.000	0.304	1.200	0.913	0.568	0.280	0.054	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	
50	0.000	0.000	0.000	0.000	0.000	0.378	1.199	0.853	0.518	0.268	0.079	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	
51	0.000	0.000	0.000	0.000	0.000	0.439	1.157	0.836	0.538	0.302	0.122	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.067	0.146	
52	0.000	0.000	0.000	0.000	0.000	0.497	1.154	0.848	0.565	0.335	0.163	0.024	0.024	0.024	0.024	0.024	0.043	0.188	0.299	0.388	
53	0.000	0.000	0.000	0.000	0.000	0.542	1.156	0.860	0.586	0.367	0.204	0.096	0.024	0.024	0.024	0.048	0.244	0.408	0.528	0.628	
54	0.000	0.000	0.000	0.000	0.000	0.545	1.156	0.874	0.606	0.422	0.294	0.212	0.109	0.061	0.114	0.254	0.445	0.618	0.757	0.866	
55	0.000	0.000	0.000	0.000	0.000	0.546	1.157	0.881	0.672	0.511	0.383	0.330	0.257	0.257	0.329	0.462	0.652	0.827	0.976	1.103	
56	0.000	0.000	0.000	0.000	0.000	0.665	1.157	0.954	0.761	0.600	0.472	0.455	0.403	0.450	0.545	0.674	0.859	1.031	1.194	1.055	
57	0.000	0.000	0.000	0.000	0.000	0.859	1.200	1.043	0.851	0.690	0.562	0.581	0.562	0.636	0.745	0.					

TABLE D.2-3. HYDRAULIC CONDUCTIVITY OF THE TAILINGS (FEET/DAY) (continued).

Row	Column																			
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
14	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
16	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
19	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
26	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
28	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
29	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
30	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
31	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
32	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
33	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
34	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
35	9.434	9.961	9.200	8.202	7.199	6.190	5.174	4.255	3.392	2.531	1.668	0.806	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
36	18.000	18.000	18.000	18.000	18.000	18.000	17.597	16.524	15.661	14.800	13.937	13.075	12.214	11.351	10.615	9.866	9.096	7.914	6.329	4.478
37	16.464	16.417	16.373	16.331	16.416	17.009	17.614	18.000	18.000	18.000	18.000	18.000	18.000	18.000	18.000	18.000	18.000	18.000	18.000	18.000
38	9.758	9.948	10.098	10.240	10.472	10.990	11.466	11.862	12.205	12.558	12.923	13.297	13.684	14.308	14.881	15.661	16.426	17.137	17.819	18.000
39	3.077	3.497	3.841	4.168	4.518	4.952	5.290	5.585	5.838	6.091	6.349	6.616	7.033	7.964	8.818	9.758	10.632	11.468	12.269	13.025
40	0.980	0.997	1.014	1.027	1.042	1.057	1.068	1.079	1.087	1.097	1.106	1.121	1.156	1.662	2.782	3.835	4.852	5.828	6.757	7.620
41	0.676	0.683	0.691	0.691	0.686	0.682	0.678	0.680	0.682	0.682	0.684	0.713	0.768	0.841	0.913	0.986	1.066	1.141	1.273	2.231
42	0.370	0.368	0.370	0.358	0.335	0.311	0.290	0.283	0.278	0.269	0.262	0.316	0.380	0.454	0.526	0.598	0.713	0.816	0.900	0.964
43	0.065	0.054	0.046	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024
44	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024
45	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024
46	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024
47	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024
48	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024
49	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024
50	0.024	0.048	0.077	0.104	0.131	0.155	0.166	0.107	0.059	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.028
51	0.233	0.313	0.334	0.352	0.370	0.366	0.398	0.341	0.293	0.212	0.119	0.028	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.061
52	0.485	0.576	0.590	0.600	0.608	0.617	0.624	0.575	0.529	0.433	0.335	0.242	0.122	0.024	0.024	0.024	0.024	0.024	0.024	0.080
53	0.734	0.839	0.850	0.850	0.850	0.851	0.851	0.809	0.751	0.650	0.548	0.445	0.301	0.124	0.024	0.024	0.024	0.024	0.024	0.080
54	0.985	1.097	1.109	1.099	1.091	1.084	1.076	1.052	0.968	0.860	0.760	0.629	0.470	0.298	0.176	0.125	0.221	2.263	2.830	2.245
55	1.171	1.083	1.205	1.295	1.288	1.284	1.273	1.247	1.181	1.073	0.961	0.816	0.650	0.487	0.402	0.331	1.996	4.628	5.296	4.711
56	0.941	0.906	1.062	1.452	1.448	1.451	1.435	1.397	1.328	1.255	1.162	1.003	0.841	0.704	0.605	0.522	3.772	6.994	7.762	7.177
57	0.728	0.720	0.919	1.610	1.607	1.618	1.588	1.537	1.472	1.394	1.300	1.195	1.036	0.904	0.792	1.885	5.548			

TABLE D.2-4. BASE OF TAILINGS (FEET ABOVE MSL MINUS 7000).

Row	Column																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	73.58	72.25	70.92	69.60	68.73	67.52	66.56	65.38	63.45	61.0P
2	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	74.96	71.93	69.58	67.24	64.90	62.68	61.35	60.24	59.21	58.24	57.19	55.1
3	75.00	75.00	75.00	71.71	73.20	75.00	75.00	72.62	68.78	65.97	63.94	62.25	60.56	58.87	57.17	54.79	53.07	52.29	51.24	50.1
4	75.00	75.00	75.00	69.24	68.00	71.95	72.03	68.42	64.36	61.15	58.81	56.79	55.10	53.40	51.71	50.02	50.00	50.00	50.00	48.11
5	75.00	75.00	75.00	67.47	64.29	67.82	67.62	65.45	61.45	58.10	55.43	53.09	51.19	50.00	50.00	50.00	50.00	50.00	49.98	42.98
6	75.00	75.00	75.00	66.24	61.69	64.90	64.48	62.96	59.37	56.03	53.35	50.67	50.00	50.00	50.00	50.00	50.00	47.00	43.06	41.04
7	75.00	75.00	75.00	65.35	59.83	62.71	62.23	60.71	57.89	54.55	51.87	50.00	50.00	50.00	50.00	48.85	47.61	43.31	41.33	43.34
8	75.00	75.00	74.78	64.65	58.35	60.96	60.43	58.91	56.70	53.36	50.88	50.00	50.00	50.00	50.00	48.73	44.75	40.74	44.04	45.42
9	75.00	75.00	74.07	63.94	56.86	59.26	58.63	57.11	55.33	52.18	50.00	50.00	50.00	50.00	48.57	44.80	42.27	43.56	46.75	47.70
10	75.00	75.00	73.37	63.24	55.84	57.56	56.83	55.31	53.79	50.99	50.00	50.00	50.00	50.00	47.88	43.32	41.88	48.83	50.00	50.00
11	75.00	75.00	72.66	62.53	54.93	55.86	55.03	53.51	51.99	50.00	50.00	50.00	50.00	50.00	49.90	46.62	48.46	50.56	51.01	50.55
12	75.00	75.00	71.95	61.82	54.01	54.15	53.24	51.71	50.19	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.73	51.60	52.08	51.62
13	75.00	75.00	71.25	61.12	53.09	52.45	51.44	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.14	50.80	51.80	52.65	53.15	52.69
14	75.00	75.00	70.54	60.41	52.17	50.75	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.58	51.30	51.99	52.83	53.69	54.22	53.76
15	75.00	75.00	69.84	59.70	51.41	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.90	51.84	52.44	53.19	53.87	54.71	55.29	54.83
16	75.00	75.00	69.13	59.00	50.71	50.00	50.00	50.00	50.00	50.00	50.00	51.22	52.16	53.10	53.75	54.38	55.04	55.89	56.33	55.90
17	75.00	75.00	68.42	58.29	50.99	50.00	50.00	50.00	50.00	50.67	51.23	52.48	53.42	54.36	54.98	55.57	56.31	56.65	57.38	56.97
18	75.00	75.00	67.72	57.58	52.78	50.74	50.00	50.00	51.07	52.48	52.84	53.78	54.68	55.62	56.25	56.77	57.40	57.75	58.42	58.05
19	75.00	75.00	67.01	56.88	54.46	52.75	50.37	50.41	52.87	54.29	54.40	54.92	55.94	56.88	57.53	57.96	58.60	58.97	59.47	59.12
20	75.00	75.00	66.30	57.04	56.17	54.77	52.39	52.24	54.68	56.10	55.96	56.09	57.20	58.14	58.81	59.16	59.81	60.15	60.51	60.19
21	75.00	75.00	65.60	58.03	57.92	56.79	54.40	54.08	56.49	57.90	57.52	57.60	58.51	59.40	60.09	60.32	61.01	61.19	61.55	61.26
22	75.00	75.00	64.89	59.74	59.66	58.80	56.42	55.91	58.15	59.71	59.22	59.24	59.87	60.66	61.41	61.71	62.20	62.53	62.56	62.33
23	75.00	75.00	64.18	61.46	61.41	60.82	58.43	57.76	59.82	61.52	60.94	61.13	61.02	61.92	62.73	63.09	63.40	63.89	63.66	63.40
24	75.00	75.00	64.29	63.18	63.16	62.84	60.62	59.99	61.70	63.33	62.71	62.87	62.42	63.23	64.05	64.36	64.59	65.17	64.88	64.47
25	75.00	75.00	65.29	64.90	64.90	64.86	62.87	62.22	63.64	65.13	64.51	64.43	63.98	64.64	65.37	65.84	65.78	66.37	66.09	65.53
26	75.00	74.96	66.83	66.61	66.65	66.87	65.11	64.45	65.57	66.94	66.31	66.02	65.58	65.95	66.64	66.92	66.98	67.98	67.53	66.56
27	75.00	74.25	68.54	68.33	68.39	68.89	67.34	66.89	67.40	68.75	68.11	67.81	67.25	67.34	67.95	68.68	68.51	67.88	66.88	66.54
28	75.00	73.55	70.26	70.05	70.14	70.91	69.56	68.92	69.24	70.56	69.91	69.41	68.96	68.99	69.77	70.68	67.13	66.78	66.14	65.06
29	75.00	73.23	71.98	71.87	71.89	72.87	71.77	71.15	71.08	72.36	71.71	71.13	70.99	71.25	71.87	72.72	68.35	65.67	65.39	65.38
30	75.00	74.67	73.69	73.79	73.63	74.57	74.00	73.39	73.07	74.17	73.51	73.64	72.59	73.39	73.85	74.79	70.00	70.00	70.00	69.95
31	75.00	63.89	75.00	75.06	75.00	77.08	76.50	74.81	75.00	76.10	75.40	75.00	74.10	75.00	74.57	71.52	67.07	65.00	65.00	66.09
32	75.00	95.54	75.00	75.88	75.00	79.99	79.33	71.66	76.52	78.36	75.28	75.00	75.00	72.25	72.57	74.89	72.67	69.30	72.05	73.40
33	78.13	105.93	75.00	76.49	75.00	82.86	81.91	71.98	78.00	80.00	75.87	74.48	72.28	75.88	78.22	79.69	78.31	82.28	86.80	89.81
34	86.32	116.02	75.72	77.09	75.00	84.70	80.30	75.00	82.24	80.50	75.51	73.42	76.89	78.75	83.45	89.05	97.23	105.27	108.86	110.00
35	93.92	126.20	79.98	80.14	78.64	85.83	84.29	75.00	83.36	80.72	75.15	77.20	82.46	88.85	99.22	108.95	110.00	110.00	104.93	100.88
36	100.38	138.77	84.24	83.20	80.82	86.25	85.38	80.91	82.10	77.88	77.24	86.07	95.97	107.91	110.00	99.16	87.26	79.80	76.68	75.00
37	109.03	148.11	88.49	86.25	83.16	87.34	86.74	85.55	79.93	77.57	89.53	101.10	110.00	100.42	82.54	75.00	75.00	75.00	75.00	73.71
38	118.17	159.03	92.75	88.37	85.53	88.57	88.03	85.25	79.58	91.42	102.31	109.55	89.17	79.71	77.10	75.00	75.00	75.00	75.76	73.4
39	128.13	168.29	96.28	89.76	87.87	89.76	89.56	82.07	86.32	104.65	110.00	82.11	79.70	79.05	76.01	75.00	75.00	75.74	76.66	73.13
40	137.68	176.81	99.23	91.23	90.21	91.98	91.53	78.61	100.27	109.75	81.46	80.00	79.51	78.36	76.06	75.79	75.99	77.17	76.50	72.74
41	147.97	184.96	104.96	93.57	92.54	94.63	88.56	88.97	109.50	85.00	81.22	80.00	79.31	78.06	77.07	77.42	77.92	78.78	76.16	72.51
42	160.52	193.86	111.47	95.91	94.88	96.89	84.24	101.48	89.23	85.00	82.17	80.73	79.19	78.22	78.48	78.82	78.94	78.91	75.40	72.16
43	173.94	202.15	117.78	98.24	97.22	99.68	87.87	108.37	85.00	85.00	83.26	81.39	79.46	79.12	79.51	80.35	81.63	78.28	75.00	71.93
44	187.31	208.33	123.82	99.51	99.55	101.52	100.03	90.00	85.00	85.00	84.41	83.06	80.00	79.95	81.94	83.33	81.64	78.76	74.88	71.36
45	200.21	214.42	132.83	97.51	98.39	101.26	107.88	90.00	86.35	86.12	86.76	86.74	83.00	83.67	85.00	84.63	81.35	79.25	75.00	70.63
46	208.44	219.79	142.79	96.46	96.64	100.00	90.00	87.70	87.75	88.93	90.00	85.49	85.71	85.00	85.00	82.88	80.00	75.00	74.98	
47	216.00	226.21	152.38	98.33	97.80	106.86	90.00	89.28	89.38	90.23	90.01	87.99	87.27	85.32	85.01	84.69	81.76	80.00	75.91	
48	223.56	234.51	161.23	100.00	99.12	97.43	90.28	90.38	90.68	90.78	90.61	90.15	88.84	87.41	86.53	84.58	80.89	74.95	74.48	
49	232.49	240.18	168.58	100.00	103.10	93.22	91.35	91.69	91.90	91.75	91.49	91.20	90.64	90.00	88.28	85.27	83.34	80.78	74.95	74.76
50	241.76	238.03	175.90	108.76	109.67	93.07	92.40	92.93	93.07	92.74	92.25	91.33	90.12	89.51	88.93	86.84	86.00	85.27	78.61	76.91
51	250.00	235.27	184.37	115.12	112.92	93.15	93.34	94.13	94.24	93.15	92.32	91.21	91.14	90.28	89.28	88.51	87.79	86.82	85.70	83.20
52	250.00	237.04	192.28	121.23	117.79	93.20	94.28	97.46	95.21	93.47	92.46	92.23	92.00	90.98	89.83	89.19	88.77	88.03	87.24	86.59
53	250.00	239.52	199.17	129.27	120.64	93.34	95.43	100.18	96.47	93.82	92.72	93.64	92.82	91.65	90.57	89.91	89.75	89.18	88.70	89.30
54	250.00	240.68	204.71	139.30	122.35	93.62	98.18	100.52	97.02	93.98	94.68	94.88	93.53	92.20	91.39	90.86	90.68	90.31	90.07	90.77
55	250.00	241.97	207.77	149.66	125.00	93.90	100.28	100.63	96.98	94.55	95.67	95.38	94.00	92.81	92.26	91.90	91.78	91.39	91.50	92.42
56	250.00	242.09	213.32	159.84	125.61	94.24	100.52	100.26	96.50	95.89	96.51	95.43	94.61	93.43	93.13	92.95	92.88	92.53	92.95	94.07
57	250.00	242.06	218.21	168.39	129.32	94.66	100.55	99.35	96.46	96.78	97.52	95.08	95.00	94.17	94					

TABLE D.2-4. BASE OF TAILINGS (FEET ABOVE MSL MINUS 7000) (continued).

Row	Column																			
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	60.06	59.02	58.12	57.23	56.34	55.44	54.55	53.81	53.21	52.62	52.02	51.43	50.83	50.24	50.00	50.00	50.00	50.00	50.00	50.00
2	54.45	53.41	52.51	51.62	50.73	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
3	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
4	47.53	50.00	50.00	50.00	50.00	49.92	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
5	40.06	42.18	41.54	42.28	42.70	43.34	41.87	41.18	42.37	44.23	47.17	49.14	50.00	49.99	49.69	49.44	49.68	50.00	50.00	50.00
6	40.56	39.57	39.40	38.16	37.88	37.44	36.98	36.42	35.91	38.34	40.66	43.26	43.98	45.37	45.16	44.28	44.28	44.05	44.59	44.70
7	43.23	42.69	42.13	40.19	39.92	39.09	39.30	38.40	37.68	36.48	36.97	39.60	41.36	42.08	41.89	41.51	40.40	39.68	39.37	38.14
8	45.37	45.20	44.31	42.38	41.88	40.78	41.28	40.38	39.66	38.11	36.19	36.95	39.00	39.47	39.27	39.08	37.45	36.59	35.49	34.71
9	47.55	47.72	45.99	44.46	43.67	42.51	43.22	42.36	41.64	39.73	38.12	35.97	36.65	36.85	36.65	36.46	35.56	35.41	35.46	34.94
10	49.94	50.00	47.90	46.42	45.40	44.25	44.74	44.33	43.30	41.80	40.01	38.46	36.73	35.37	35.31	35.19	36.12	38.57	37.90	37.34
11	50.00	50.00	49.80	48.29	47.14	45.98	46.41	46.31	44.93	44.04	42.82	41.68	39.13	37.81	37.64	39.19	39.28	41.20	40.33	39.77
12	50.60	50.00	50.00	50.00	48.87	47.72	48.12	48.29	47.41	46.43	45.87	44.62	42.77	41.61	41.62	43.19	42.45	43.68	42.77	42.20
13	51.67	50.79	50.03	50.00	50.00	49.45	49.83	50.00	50.00	49.81	49.38	47.82	46.57	45.35	43.60	47.36	45.86	46.15	45.20	44.64
14	52.75	51.86	51.06	50.17	50.09	50.27	50.10	50.00	50.00	50.00	50.00	50.00	47.28	45.05	46.59	50.00	49.93	48.63	47.64	46.81
15	53.82	52.93	52.06	51.18	51.02	51.09	50.84	50.32	50.05	50.00	50.00	50.00	47.72	48.43	50.00	50.00	50.00	50.00	49.94	48.39
16	54.89	54.00	53.06	52.19	51.95	51.90	51.59	51.07	50.65	50.23	50.09	50.02	49.08	50.00	50.00	50.00	50.00	50.00	50.00	49.67
17	55.96	55.03	54.07	53.19	52.89	52.72	52.33	51.81	51.40	50.98	50.56	50.19	50.21	50.08	50.02	50.00	50.00	50.00	50.00	50.00
18	57.03	55.28	55.08	54.19	53.82	53.54	53.08	52.56	52.14	51.72	51.31	50.89	50.59	50.43	50.28	50.12	50.06	50.00	50.00	50.00
19	58.10	56.51	56.08	55.19	54.75	54.35	53.83	53.30	52.89	52.47	52.05	51.53	51.62	51.32	51.17	51.01	50.86	50.70	50.47	50.00
20	59.17	57.74	57.08	56.20	55.68	55.17	54.61	54.05	53.63	53.22	52.78	52.38	52.59	52.21	52.05	51.90	51.75	51.59	51.00	50.50
21	60.23	58.97	58.08	57.20	56.62	55.98	55.40	54.80	54.38	53.96	53.29	53.39	53.57	53.12	52.94	52.79	52.64	52.29	51.88	51.26
22	60.37	60.07	59.08	58.20	57.55	56.87	56.19	55.54	55.12	54.48	54.02	54.40	54.54	54.19	53.83	53.68	53.52	53.04	52.62	52.35
23	60.56	61.07	60.07	59.21	58.48	57.80	56.98	56.29	55.73	55.05	55.03	55.37	55.51	55.27	54.72	54.57	54.21	53.90	53.49	53.46
24	61.80	62.07	61.07	60.21	59.42	58.72	57.77	56.99	56.18	55.70	56.04	56.35	56.49	56.34	55.67	55.40	55.08	54.74	54.60	54.57
25	62.94	63.03	62.03	61.13	60.51	60.01	59.21	58.15	57.37	57.17	57.56	57.58	57.49	57.33	56.65	56.17	55.88	55.66	55.67	55.67
26	63.01	62.94	63.11	61.30	61.12	61.05	60.79	60.27	59.90	59.82	59.81	59.36	58.70	57.94	57.15	56.59	56.08	55.70	55.53	55.48
27	63.59	63.54	63.71	61.42	60.73	60.70	60.52	60.19	59.95	59.88	59.73	59.56	58.99	58.36	57.86	57.36	56.94	56.14	55.33	55.29
28	64.16	64.14	64.31	62.00	60.33	60.36	60.29	60.11	59.97	59.94	59.85	59.77	59.45	58.81	58.56	58.14	57.82	56.80	55.59	55.12
29	64.72	64.75	64.88	63.32	60.00	60.00	60.06	60.03	60.00	60.00	59.99	59.98	59.88	59.49	59.27	58.98	58.68	57.47	56.39	55.00
30	70.00	67.87	63.35	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00
31	67.60	66.75	65.06	63.04	62.40	62.21	63.27	64.01	60.21	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	58.72	55.71
32	74.00	72.56	69.98	68.75	66.47	65.34	65.00	68.28	65.70	64.87	64.94	63.93	63.09	62.70	62.79	61.49	60.40	57.68	56.20	55.65
33	91.21	90.69	88.99	86.94	85.82	85.18	84.43	83.10	81.70	80.69	79.70	78.56	77.19	75.70	74.34	72.58	70.78	67.96	66.20	64.37
34	110.00	110.00	110.00	110.00	110.00	108.32	106.07	104.09	103.48	102.33	101.13	100.26	99.09	98.24	96.98	95.06	92.79	90.28	86.97	83.43
35	99.01	98.06	97.23	99.28	101.75	104.19	107.34	109.94	110.00	110.00	110.00	110.00	110.00	110.00	110.00	110.00	110.00	109.62	107.97	105.84
36	74.41	71.92	72.61	73.18	73.62	74.62	77.47	79.59	81.23	82.96	84.93	87.13	89.66	92.11	94.45	96.54	98.96	102.00	105.30	108.26
37	70.00	68.65	67.42	65.00	65.00	66.59	70.13	70.11	70.10	70.00	70.00	70.00	70.00	70.00	70.00	69.74	68.78	68.22	67.80	64.96
38	69.32	67.51	65.81	65.00	65.00	67.17	70.62	70.80	70.33	70.00	70.00	70.00	70.00	70.00	69.74	68.78	68.22	67.80	64.96	64.43
39	68.78	66.44	65.00	65.00	65.17	67.77	70.88	70.89	70.50	70.10	70.00	70.00	69.93	69.53	68.60	67.31	66.54	65.54	63.86	62.48
40	68.68	65.67	65.00	65.00	66.60	68.49	70.89	71.12	70.66	70.27	70.00	69.53	69.01	68.25	66.13	64.93	63.52	62.80	62.31	63.56
41	68.45	65.32	65.00	67.01	68.98	69.76	71.40	71.84	71.07	70.49	69.89	69.05	68.13	67.35	66.75	65.88	64.96	64.61	63.91	63.56
42	68.54	65.28	65.82	69.15	70.66	70.75	71.84	72.18	71.52	70.85	70.13	69.57	69.17	68.75	68.27	67.73	65.63	65.00	65.00	64.83
43	69.19	66.27	67.07	70.38	71.82	71.69	72.56	72.75	72.04	71.33	70.68	70.00	70.00	69.79	69.55	69.17	68.84	68.21	67.60	67.60
44	70.00	67.84	68.70	71.49	72.91	72.82	73.40	73.24	72.51	71.91	71.58	70.90	70.97	70.79	70.37	69.74	69.92	66.61	66.38	66.19
45	70.00	69.40	70.00	72.63	74.24	73.97	73.17	73.79	71.90	71.32	70.72	70.61	70.86	70.22	70.00	69.15	68.97	68.65	67.94	67.17
46	77.55	76.25	75.38	75.00	73.27	72.33	71.54	74.12	74.80	75.00	75.00	74.73	72.83	71.60	70.38	69.79	68.94	68.03	67.15	66.29
47	74.79	74.17	73.38	72.74	72.57	72.73	72.96	74.54	75.00	75.00	75.00	73.79	72.54	71.28	69.99	69.53	68.69	68.05	67.30	67.30
48	73.99	73.75	73.54	73.36	73.24	73.39	74.08	75.04	75.42	75.29	75.17	75.04	74.23	73.21	72.04	70.87	70.28	69.83	68.91	68.39
49	74.58	74.34	74.13	73.98	73.88	74.00	74.83	76.02	76.62	76.56	76.43	76.09	75.38	74.19	73.13	72.62	71.77	70.08	69.98	69.47
50	76.01	74.93	74.71	74.61	74.52	74.62	75.28	77.06	77.64	77.83	77.70	77.16	76.51	75.39	74.86	74.34	73.10	71.56	71.16	70.74
51	79.67	77.63	75.62	75.20	75.79	76.24	77.21	77.82	78.75	79.10	78.79	78.44	77.64	76.72	76.13	75.68	74.84	74.23	74.10	73.46
52	85.36	80.78	78.76	78.44	78.90	78.99	79.16	79.35	79.97	80.29	80.00	79.82	78.93	77.96	77.37	76.88	76.01	75.98	75.79	75.19
53	87.31	86.41	85.68	85.08	85.13	85.01	83.68	82.35	82.44	82.21	81.54	80.76	79.99	79.21	78.60	77.71	76.78	75.89	75.39	75.01
54	89.24	88.59	88.25	87.64	87.46	87.07	86.56	85.79	84.88	84.04	83.06	82.02	80.54	79.47	77.24	75.97	75.39	74.45	72.06	70.01
55	91.16	90.95	90.88	90.29	89.78	89.13	88.74	87.91	87.08	85.07	84.49	82.35	80.12	78.24	76.12	73.88	72.08	70.42	67.65	64.78
56	93.31	93.36	93.75	94.08	94.62	94.59	94.14	90.24	89.48	85.09	85.00	82.79	78.73	76.57	74.26	71.37	69.12	67.32	64.80	57.91
57	100.21	107.48	110.82	113.00	113.00	113.00	113.00	111.48	101.75	89.43	83.41	79.48	77.48	74.76	71.19	67.90	65.98	64.34	61.44	

TABLE D.2-4. BASE OF TAILINGS (FEET ABOVE MSL MINUS 7000) (continued).

Row	Column																			
	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
1	50.00	50.00	50.00	50.00	50.00	48.34	46.11	50.00	53.37	56.55	59.72	63.12	66.08	68.90	70.97	72.92	73.73	75.00	75.00	75.00
2	50.00	50.00	50.00	50.00	50.00	50.00	50.00	49.46	46.56	43.17	40.20	47.40	47.85	50.19	50.64	51.09	51.54	52.23	53.70	54.2
3	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	46.67	43.59	41.49	39.40	37.28	36.24	38.99	43.21
4	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	48.96	46.81	44.51	42.13	39.69	37.42	35.14
5	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	47.84	45.01	41.64	38.27	35.00	
6	43.82	44.56	45.97	47.74	48.44	48.55	48.55	49.15	50.00	50.00	50.00	50.00	50.00	50.00	49.29	44.73	40.17	35.44	31.30	
7	36.05	37.84	41.63	43.46	44.08	44.96	45.04	45.57	46.84	47.13	47.13	47.96	48.40	47.13	47.19	42.96	39.25	38.92	34.04	30.92
8	34.88	34.34	37.78	40.15	41.12	42.08	42.22	42.71	43.61	43.88	43.48	44.08	43.13	40.52	37.00	31.59	28.98	28.82	32.28	29.88
9	34.61	33.50	34.49	38.83	38.16	39.21	39.41	39.93	40.38	40.63	39.91	39.98	38.48	35.47	31.64	31.12	32.15	31.70	30.93	30.94
10	36.77	36.21	35.56	33.42	35.20	36.36	36.60	37.05	37.15	37.15	38.33	35.46	34.30	31.81	31.38	34.63	35.00	35.00	35.10	34.84
11	39.21	38.65	37.43	36.18	35.00	33.02	33.88	32.49	33.36	34.24	33.80	32.93	32.73	35.23	35.76	36.07	36.17	36.27	36.29	36.03
12	41.64	40.56	39.30	38.07	37.02	35.98	35.30	35.18	33.65	32.23	32.06	35.10	35.85	36.61	37.13	37.33	37.43	37.53	37.36	37.10
13	43.68	42.42	41.13	40.09	38.66	37.14	36.89	36.73	35.17	34.88	36.11	36.58	37.26	37.98	38.50	38.60	38.70	38.69	38.43	38.02
14	45.41	44.20	42.84	41.31	39.77	38.60	38.48	38.14	36.52	37.25	37.60	38.07	38.66	39.35	39.77	39.87	39.97	39.76	39.42	38.91
15	47.02	45.49	43.96	42.42	40.89	40.19	40.03	39.56	37.87	38.84	39.08	39.55	40.06	40.72	41.03	41.13	41.09	40.82	40.31	39.80
16	48.14	46.60	45.07	43.54	42.16	41.77	41.44	40.97	39.22	40.38	40.57	41.04	41.46	42.09	42.30	42.40	42.18	41.71	41.20	40.69
17	49.25	47.72	46.18	44.65	43.52	43.33	42.86	42.39	40.59	41.92	42.14	42.53	42.87	43.46	43.56	43.49	43.11	42.60	42.09	41.58
18	50.00	48.82	47.30	45.81	45.07	44.74	44.27	43.80	42.35	43.46	43.71	44.01	44.27	44.73	44.83	44.51	44.00	43.49	42.98	42.49
19	50.00	49.94	48.41	47.18	46.63	46.16	45.69	45.21	44.35	45.00	45.25	45.50	45.67	45.99	45.90	45.40	44.89	44.38	43.87	43.45
20	50.07	50.01	49.52	48.54	48.04	47.57	47.10	46.63	46.41	46.55	46.78	46.98	47.05	47.23	48.80	48.29	45.78	45.27	44.77	44.40
21	51.19	51.04	50.60	49.93	49.46	48.99	48.51	48.04	47.92	48.09	48.32	48.47	48.42	48.20	47.69	47.18	46.67	46.17	45.66	45.35
22	52.30	52.07	51.57	50.96	50.06	50.00	49.93	49.46	49.47	49.63	49.85	50.00	49.60	49.09	48.58	48.07	47.57	47.06	46.55	46.30
23	53.41	53.10	52.55	52.02	51.19	50.78	50.69	50.53	50.51	50.56	50.38	50.29	50.06	49.98	49.47	48.97	48.48	47.95	47.44	47.24
24	54.52	54.14	53.66	53.08	52.52	52.25	52.01	51.33	51.38	51.40	50.81	50.69	50.32	50.00	50.00	49.86	49.35	48.84	48.37	48.17
25	55.58	55.17	54.77	54.33	53.97	53.74	53.39	52.15	52.28	52.26	51.43	51.04	50.79	50.31	50.00	50.00	50.00	49.73	49.32	49.09
26	55.82	55.27	54.94	54.57	54.03	53.50	52.90	52.34	52.28	52.16	51.71	51.77	51.68	51.90	51.83	51.58	50.92	50.64	50.30	50.00
27	55.44	55.13	54.91	54.80	54.18	53.57	52.91	52.67	52.49	52.17	52.44	52.73	52.88	52.45	52.15	51.98	51.71	51.67	50.89	50.09
28	55.26	55.06	54.87	54.62	54.38	53.83	53.31	53.07	52.98	53.34	53.71	53.69	53.60	53.47	53.06	52.43	52.08	51.71	51.34	51.06
29	55.08	55.02	54.93	54.66	54.57	54.09	53.75	53.67	53.64	53.78	54.14	54.67	54.70	54.88	54.87	54.57	54.07	52.30	51.01	51.70
30	55.00	55.00	54.99	54.86	54.77	54.34	54.20	54.16	54.22	54.53	54.91	55.00	55.00	55.00	55.00	55.00	55.00	55.00	53.64	50.49
31	55.00	55.00	55.00	55.00	54.96	54.74	54.65	54.66	54.80	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	54.36	50.96
32	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	53.43
33	60.85	59.04	58.13	57.51	58.78	55.00	55.00	50.00	50.00	51.17	52.82	55.00	55.00	55.00	55.00	55.00	55.00	55.00	54.77	52.93
34	79.64	75.95	73.47	70.78	65.88	62.34	59.85	57.48	53.98	52.24	50.77	48.51	45.00	51.41	55.00	55.00	55.00	55.00	54.23	52.39
35	102.25	98.33	94.39	90.54	86.47	82.02	77.75	73.31	69.10	65.79	59.77	54.69	52.93	50.74	46.36	49.24	55.00	55.00	53.86	52.89
36	110.00	110.00	110.00	110.00	106.75	102.55	97.39	92.85	88.35	83.14	77.66	72.61	65.45	57.50	53.59	50.94	45.00	50.75	55.00	54.28
37	84.06	88.09	93.01	99.14	105.29	110.00	110.00	110.00	110.00	108.66	99.08	92.91	85.79	76.19	66.79	56.25	52.63	47.75	45.00	55.00
38	63.76	63.66	67.49	73.92	78.50	82.96	88.30	94.80	103.10	110.00	110.00	110.00	106.45	94.48	83.95	72.41	61.05	54.38	51.58	45.00
39	60.39	60.00	60.00	60.04	60.12	60.00	63.45	69.48	75.50	81.09	88.61	99.78	110.00	110.00	105.42	91.40	78.15	65.74	55.85	52.75
40	61.91	61.53	61.59	61.56	61.29	60.87	60.00	59.34	59.33	57.55	64.52	71.83	84.52	97.57	110.00	110.00	96.82	81.48	67.78	57.05
41	63.55	63.30	63.49	63.26	62.71	60.44	60.00	59.31	57.57	55.92	55.00	55.00	65.39	75.05	91.32	109.70	110.00	101.00	84.41	69.04
42	64.95	65.66	65.15	65.00	63.78	61.92	61.32	60.44	59.95	55.83	55.00	55.00	55.00	55.13	70.25	86.10	108.57	110.00	102.12	84.95
43	64.76	64.09	62.63	62.79	62.56	61.21	60.21	57.89	55.53	57.00	57.53	55.89	55.00	55.00	55.00	64.87	82.62	104.58	110.00	101.22
44	66.06	66.17	66.03	65.33	64.35	63.03	61.75	60.40	58.80	56.61	55.54	55.00	55.66	55.00	54.82	54.69	59.25	78.87	100.09	110.00
45	65.86	65.00	64.69	63.73	62.57	61.67	61.24	60.32	60.11	59.73	60.00	58.15	55.00	54.54	53.84	53.93	53.89	56.89	76.71	102.67
46	65.44	64.74	64.23	63.78	63.27	62.80	62.60	61.81	61.77	61.01	60.61	60.17	57.52	54.93	52.83	51.89	50.60	50.04	59.87	83.07
47	66.58	65.71	64.96	64.70	64.36	63.93	63.85	63.49	63.37	62.25	61.51	60.61	58.68	56.09	53.09	50.91	50.29	50.00	50.00	67.82
48	67.72	66.86	66.25	65.84	65.48	65.08	65.00	65.07	64.74	63.48	61.79	60.50	57.08	54.43	52.45	50.02	50.00	50.93	54.75	54.91
49	68.86	68.13	67.63	67.09	66.74	66.43	66.18	65.68	63.97	62.17	60.67	59.17	54.90	53.15	51.34	50.00	50.00	51.72	55.00	54.08
50	70.11	69.50	69.01	68.31	68.01	65.26	64.21	62.77	60.65	59.89	57.51	55.43	53.42	51.99	50.60	50.00	50.00	50.00	54.01	55.25
51	72.30	71.16	69.88	67.10	63.89	61.14	56.36	54.52	50.87	52.93	53.32	52.07	50.74	50.00	50.00	50.00	50.00	50.00	52.02	56.23
52	73.15	70.08	67.40	63.30	57.13	53.57	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	52.84	55.00
53	71.37	66.98	62.95	56.48	51.88	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	51.29	52.89	52.65	54.44	59.29
54	66.82	62.85	57.66	51.37	50.00	50.00	50.59	50.93	50.76	50.54	50.00	50.00	50.00	50.95	51.95	53.27	55.94	56.56	55.45	60.00
55	62.01	57.05	51.82	50.00	50.00	50.90	51.73	52.19	51.95	52.06	51.69	52.06	51.98	52.84	53.88	56.01	60.23	59.87	58.82	61.43
56	56.12	50.34	50.00	50.00	50.64	52.06	52.83	53.44	53.29	53.48	53.71	54.84	54.87	55.15	58.41	61.47	62.69	62.53	61.81	62.66
57	51.99	50.00	50.88	51.96	52.63	53.17	54.06	54.66	54.71	54.90	55.73	58.35	58.72	60.85	62.38	64.15	65.54	65.39	64.84	64.39

TABLE D.2-4. BASE OF TAILINGS (FEET ABOVE MSL MINUS 7000) (continued).

Row	Column																			
	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
1	74.84	74.62	74.40	74.18	73.95	73.73	73.51	73.29	74.34	87.27	101.96	112.78	123.78	133.79	143.57	153.52	163.02	173.23	175.00	175.00
2	54.24	54.20	54.17	54.13	54.09	54.06	53.99	53.77	54.07	54.45	61.13	67.59	74.22	86.14	98.62	107.54	114.50	121.35	129.43	141.31
3	48.32	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	49.43	45.87	45.82	50.00	55.54	65.21	74.79	84.92	92.01	94.66
4	37.34	42.58	47.05	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	46.47	43.49	40.52	47.21	50.00	44.00	42.53	46.03	47.91
5	33.77	36.22	39.51	42.63	43.21	43.36	44.36	45.17	44.96	43.68	43.71	42.06	40.41	38.78	38.26	43.80	47.69	50.00	50.00	50.00
6	31.96	35.00	34.89	36.91	36.06	35.74	36.05	35.99	34.96	35.12	36.55	35.64	34.98	34.27	33.62	36.92	40.11	40.67	42.55	44.06
7	29.83	32.95	32.79	33.72	33.31	31.77	32.16	30.00	28.62	27.85	27.85	26.97	33.00	34.81	33.27	31.70	32.73	32.33	31.31	33.41
8	28.55	29.71	31.36	32.22	31.61	29.45	28.14	28.29	29.26	31.11	30.37	29.31	27.28	31.03	27.89	26.96	27.37	27.19	27.46	26.94
9	30.49	29.07	29.69	30.72	30.07	27.73	30.06	31.95	32.84	33.45	33.05	31.95	30.63	28.86	27.82	28.18	26.88	27.76	29.66	29.88
10	33.89	31.78	28.49	28.87	28.13	29.69	33.35	34.89	35.27	35.28	35.22	34.40	33.45	33.81	32.98	30.01	27.56	29.99	29.89	30.07
11	35.73	35.46	35.26	35.22	35.28	35.36	35.46	35.67	35.96	36.11	36.09	35.69	35.26	35.00	35.00	34.49	27.76	29.43	29.77	31.81
12	36.62	36.41	36.19	36.04	36.10	36.05	36.24	36.35	36.65	36.95	36.92	36.59	36.50	35.76	35.00	35.00	31.06	30.11	29.70	30.60
13	37.57	37.36	37.11	36.83	36.92	36.97	36.96	37.13	37.32	37.64	37.75	37.50	37.56	37.03	36.26	35.50	33.25	29.91	29.77	34.55
14	38.51	38.30	38.04	37.73	37.75	37.79	37.56	37.86	38.02	38.34	38.59	38.41	38.58	38.31	37.54	36.72	35.04	29.70	34.03	35.00
15	39.46	39.25	38.96	38.65	38.57	38.62	38.52	38.46	38.77	38.92	39.32	39.32	39.53	39.44	38.81	37.82	36.10	32.66	35.00	35.00
16	40.41	40.18	39.88	39.57	39.29	39.47	39.49	39.09	39.37	39.68	39.93	40.23	40.50	40.50	39.94	38.26	36.80	34.25	35.00	33.41
17	41.35	41.11	40.80	40.49	40.18	40.31	40.31	39.97	39.97	40.28	40.58	40.97	40.84	39.15	37.69	36.71	35.19	33.69	33.03	35.00
18	42.30	42.03	41.72	41.41	41.10	41.03	41.18	41.15	40.62	40.88	41.19	40.51	36.95	36.19	35.06	32.89	33.41	34.57	35.24	35.62
19	43.25	42.95	42.64	42.33	42.02	41.75	42.05	42.01	41.46	41.47	41.83	38.49	34.17	34.37	35.25	35.44	35.70	36.24	36.31	36.55
20	44.18	43.87	43.56	43.25	42.94	42.63	42.77	42.90	42.61	42.15	39.87	34.88	34.94	35.70	36.80	36.99	37.14	37.69	37.58	37.50
21	45.10	44.79	44.48	44.17	43.86	43.56	43.50	43.79	43.36	40.35	37.26	34.87	35.93	37.20	38.35	38.55	38.58	39.13	38.85	38.74
22	46.02	45.71	45.40	45.09	44.78	44.48	44.22	44.45	41.39	37.70	35.84	36.16	37.43	38.69	39.90	40.10	40.03	40.58	40.12	40.01
23	46.94	46.63	46.32	46.01	45.70	45.40	45.09	41.69	37.67	35.59	36.11	37.62	38.92	40.19	41.45	41.65	41.47	41.88	41.39	41.28
24	47.86	47.55	47.24	46.93	46.60	46.18	45.36	41.48	36.45	35.86	37.45	39.05	40.42	41.68	42.95	43.18	42.92	43.17	42.66	42.55
25	48.78	48.47	48.09	47.65	47.18	46.56	43.29	39.48	36.32	37.19	38.79	40.39	41.90	43.18	44.44	44.66	44.36	44.47	43.93	43.82
26	49.60	49.19	48.49	47.81	45.81	46.01	43.07	39.33	36.94	38.53	40.13	41.73	43.33	44.67	45.94	46.13	45.81	45.76	45.20	45.09
27	50.03	49.47	48.13	46.92	45.23	45.70	43.38	39.60	38.97	39.20	41.43	43.07	44.67	46.27	47.43	47.81	47.28	47.05	46.47	46.38
28	50.07	50.01	49.12	47.41	46.56	45.62	42.40	38.38	38.06	40.05	41.74	43.73	45.74	47.61	48.92	49.09	48.74	48.35	47.74	47.63
29	50.01	49.90	50.09	48.50	46.87	45.66	41.75	37.69	39.34	41.37	43.26	44.95	46.64	48.47	50.00	50.00	50.00	49.64	49.01	48.90
30	49.98	49.27	49.62	49.19	47.45	45.42	41.22	38.96	40.87	42.81	44.67	46.47	48.16	49.85	50.00	50.00	50.00	50.00	50.00	50.00
31	49.83	49.52	49.13	48.61	48.21	46.11	40.80	40.87	42.65	44.36	46.28	47.98	49.68	50.00	50.00	50.00	50.00	50.00	50.00	50.00
32	50.00	49.80	49.44	48.77	48.17	47.62	44.20	43.21	44.20	45.96	47.86	49.76	50.15	50.45	50.44	50.22	50.00	50.00	50.00	50.00
33	51.27	50.00	49.16	48.30	45.77	48.01	47.35	46.49	47.48	48.48	49.47	50.17	50.53	50.88	51.12	50.90	50.68	50.46	50.24	50.02
34	50.75	50.00	48.32	45.00	45.00	45.00	47.57	46.88	47.56	48.48	49.64	50.44	50.90	51.25	51.52	51.59	51.37	51.15	50.93	50.89
35	51.91	50.76	48.95	45.85	45.00	45.00	45.12	47.25	47.42	48.62	49.97	50.58	51.18	51.63	51.98	52.18	52.05	51.83	51.61	51.12
36	53.27	52.01	50.10	47.18	45.00	45.00	45.00	48.35	48.47	49.12	50.13	50.72	51.32	51.92	52.35	52.63	52.73	52.51	52.29	51.62
37	54.80	52.60	50.00	48.24	46.15	45.00	45.00	47.44	49.18	50.02	50.85	51.54	51.47	52.06	52.66	53.08	53.27	53.20	52.58	52.33
38	45.35	53.54	50.00	48.45	46.61	45.00	45.00	47.78	50.27	50.97	52.07	52.72	53.13	53.15	52.93	53.40	53.73	53.88	53.52	54.31
39	50.00	45.00	48.34	47.39	45.46	45.00	45.00	46.34	50.70	52.71	53.25	54.00	54.59	54.85	54.89	54.77	54.92	55.74	56.43	56.67
40	50.00	50.00	45.00	45.00	45.00	45.00	45.89	45.48	50.98	54.57	54.73	55.28	55.93	56.46	56.72	56.89	57.15	57.98	58.87	59.11
41	56.04	50.52	47.59	45.83	43.12	41.09	45.31	50.13	53.06	55.51	56.25	56.71	56.86	57.92	58.49	59.25	59.50	59.98	61.04	62.01
42	68.59	55.09	50.69	48.18	46.96	45.00	40.03	46.95	53.33	54.47	55.48	57.85	56.96	58.71	60.58	61.01	62.01	62.19	63.06	64.10
43	83.69	66.82	54.39	50.32	48.76	46.31	44.92	50.26	51.92	52.96	55.05	59.04	58.12	59.95	62.15	62.83	63.80	64.70	64.97	66.15
44	98.33	79.66	63.67	53.07	50.00	50.00	46.52	53.35	50.60	51.87	54.94	58.27	58.99	61.19	63.39	64.80	65.45	66.58	67.31	68.05
45	110.00	93.42	74.68	58.92	50.00	50.00	50.00	54.19	52.44	52.43	55.38	57.84	60.24	62.44	64.64	66.84	67.26	68.23	69.36	70.00
46	110.00	106.96	87.41	68.25	53.50	50.00	50.00	55.00	55.00	54.86	56.44	58.27	60.78	63.68	65.88	68.08	69.19	69.89	71.01	72.14
47	90.23	110.00	99.86	78.89	60.99	53.80	51.33	55.00	55.21	56.45	57.40	58.98	61.81	64.38	67.01	69.33	71.13	71.69	72.67	73.80
48	75.52	99.75	109.34	89.18	70.49	55.84	54.52	55.36	57.03	58.28	59.04	59.92	61.94	64.98	68.02	70.33	72.77	73.63	74.32	75.83
49	65.16	86.28	110.00	99.79	79.25	61.20	55.89	56.01	58.15	60.04	60.68	61.35	66.46	69.55	71.20	72.86	74.51	75.00	80.13	90.57
50	56.39	74.12	101.35	110.00	88.91	69.58	59.17	60.00	60.00	60.00	60.00	60.41	63.12	64.02	71.45	75.00	75.00	75.00	80.84	92.30
51	60.00	64.51	89.54	110.00	98.65	76.83	61.59	60.00	60.00	60.41	63.12	64.02	71.45	75.00	75.00	75.00	75.00	80.84	92.30	102.99
52	59.54	60.00	77.68	106.89	107.31	85.34	67.55	62.24	60.40	61.40	65.11	65.29	73.91	75.00	75.00	75.00	75.00	87.04	99.03	108.28
53	60.00	60.00	67.13	95.39	110.00	93.16	72.52	65.00	64.11	64.44	67.78	67.41	75.00	75.00	75.00	75.00	79.73	92.30	104.16	114.78
54	60.46	62.40	64.85	84.94	110.00	102.10	79.05	67.07	68.87	68.62	71.01	69.48	74.19	75.00	75.00	75.00	83.71	97.73	109.13	120.12
55	64.25	64.24	65.00	75.23	106.21	108.94	87.04	70.64	70.00	71.53	72.94	71.36	75.00	75.00	75.00	75.00	86.97	101.35	113.60	125.20
56	65.00	65.53	66.86	67.99	94.83	110.00	94.38	74.40	70.93	73.84	75.02	74.90	75.20	75.34	76.86	81.82	90.97	104.73	117.42	129.35
57	66.61	69.93	70.00	70.00	84.49	110.00	101.23	79.74	75.00	75.37	75.67	75.98	76.13	79.49	83.18	86.87	96.47	107.95		

TABLE D.2-4. BASE OF TAILINGS (FEET ABOVE MSL MINUS 7000) (continued).

Row	Column																				
	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	
1	175.00	175.00	175.00	175.00	175.00	175.00	175.00	175.00	175.00	175.00	175.00	175.00	169.82	162.37	154.15	145.17	136.00	127.12	122.67	121.92	
2	147.96	151.24	153.06	155.98	159.28	161.72	161.17	156.88	150.85	143.27	135.48	126.88	117.06	106.42	98.04	92.15	84.66	77.18	72.65	68.7	
3	95.67	96.36	97.87	96.31	96.43	95.46	96.23	96.54	93.85	90.31	88.02	87.51	86.25	81.92	79.70	76.95	74.28	68.86	63.44	58.16	
4	47.96	47.96	47.07	48.98	50.00	50.50	50.00	51.97	55.23	58.49	56.37	53.16	50.00	52.65	56.49	59.05	63.05	63.03	59.20	55.67	
5	50.00	50.00	50.00	49.32	49.93	50.00	50.00	50.00	50.00	50.00	49.74	49.08	48.43	47.77	47.12	47.80	50.72	53.96	53.93	55.72	
6	43.68	42.69	41.67	42.12	42.03	42.95	44.64	45.76	46.71	45.49	44.77	43.50	42.86	42.20	41.55	42.23	44.16	45.74	50.37	52.00	
7	34.54	33.74	34.45	35.23	35.84	36.42	37.58	38.96	39.84	40.03	40.33	39.50	38.66	38.22	37.57	38.15	37.75	39.52	42.78	48.31	
8	27.17	28.16	29.29	28.63	29.82	30.56	31.76	33.05	33.68	34.94	35.73	36.38	35.66	35.02	35.00	34.42	34.26	33.86	34.50	39.19	
9	29.84	29.64	29.28	28.66	28.19	28.09	28.09	28.09	28.09	28.09	28.09	28.09	31.05	33.27	34.37	33.73	32.82	32.65	31.64	31.77	33.95
10	31.83	31.77	31.46	30.80	30.35	30.27	29.10	28.58	28.33	28.09	28.09	28.09	29.64	31.24	31.44	31.38	30.40	29.54	29.52	30.36	
11	33.79	33.97	33.65	32.40	31.83	31.77	31.27	30.52	29.51	28.81	28.09	28.09	28.09	28.09	28.09	28.09	28.09	28.09	28.09	28.09	28.09
12	35.00	35.00	35.00	33.99	33.31	33.27	32.85	32.20	30.93	29.82	29.27	28.09	28.09	28.09	28.09	28.09	28.09	28.09	28.09	28.09	28.09
13	35.00	35.00	34.97	35.00	34.81	34.78	34.49	33.88	32.77	32.53	31.30	29.97	28.67	28.09	28.09	28.09	28.09	28.09	28.09	28.09	28.09
14	35.00	34.45	34.50	35.00	35.00	35.00	35.00	35.00	35.00	35.00	34.12	32.72	31.45	31.07	30.97	30.94	31.52	31.98	32.30	33.27	
15	33.93	34.34	35.00	35.00	35.00	35.13	35.52	35.90	35.73	35.14	35.00	35.00	34.63	34.31	35.00	35.00	35.20	35.65	35.75	35.68	
16	35.00	35.00	35.00	35.30	35.68	36.06	36.45	36.83	36.62	36.03	35.44	35.00	35.00	35.00	35.34	35.89	36.45	37.01	37.42	37.51	
17	35.07	35.46	35.84	36.23	36.61	37.00	37.38	37.76	37.51	36.92	36.33	35.75	35.36	36.03	36.59	37.15	37.70	38.26	38.82	39.19	
18	36.01	36.39	36.77	37.16	37.54	37.93	38.31	38.70	38.40	37.81	37.22	36.64	36.30	36.90	37.82	38.40	38.95	39.51	40.07	40.63	
19	36.94	37.32	37.71	38.09	38.47	38.86	39.24	39.63	39.29	38.70	38.11	37.55	37.30	37.59	38.44	39.30	40.20	40.76	41.32	41.88	
20	37.87	38.25	38.64	39.02	39.41	39.79	40.17	40.56	40.18	39.59	39.00	38.61	38.30	38.37	39.13	39.99	40.84	41.75	42.57	43.13	
21	38.80	39.18	39.57	39.95	40.34	40.72	41.10	41.49	41.07	40.48	39.89	39.61	39.31	39.36	39.82	40.68	41.53	42.38	43.23	44.29	
22	39.90	40.11	40.50	40.88	41.27	41.65	42.04	42.42	41.96	41.37	40.87	40.63	40.32	40.36	40.53	41.37	42.22	43.07	43.92	44.77	
23	41.17	41.09	41.43	41.81	42.20	42.58	42.97	43.35	42.85	42.26	41.95	41.64	41.33	41.36	41.42	42.06	42.91	43.76	44.61	45.46	
24	42.44	42.33	42.38	42.75	43.13	43.51	43.90	44.28	43.74	43.15	42.98	42.65	42.34	42.35	42.41	42.75	43.60	44.45	45.30	46.15	
25	43.71	43.60	43.49	43.68	44.06	44.45	44.83	45.21	44.63	44.20	43.98	43.67	43.36	43.35	43.41	43.57	44.29	45.14	45.98	46.84	
26	44.98	44.87	44.76	44.69	44.99	45.38	45.76	46.11	45.52	45.28	44.99	44.68	44.37	44.35	44.41	44.47	44.98	45.83	46.68	47.53	
27	46.25	46.14	46.03	45.92	45.99	46.31	46.69	47.00	46.42	46.33	46.01	45.70	45.38	45.35	45.41	45.47	45.72	46.52	47.37	48.22	
28	47.52	47.41	47.30	47.19	47.07	47.26	47.62	47.89	47.53	47.36	47.02	46.71	46.40	46.35	46.41	46.47	46.81	47.21	48.06	48.91	
29	48.79	48.68	48.57	48.46	48.34	48.28	48.56	48.78	48.61	48.37	48.04	47.72	47.41	47.35	47.41	47.47	47.53	47.90	48.75	49.61	
30	50.00	49.95	49.84	49.73	49.61	49.50	49.59	49.75	49.67	49.36	49.05	48.74	48.43	48.34	48.40	48.46	48.53	48.77	49.44	50.00	
31	50.00	50.00	50.00	50.00	50.00	50.00	50.31	50.37	50.34	50.13	50.00	49.75	49.44	49.34	49.40	49.46	49.52	49.66	50.00	50.00	
32	50.00	50.00	50.00	50.00	50.11	50.54	50.83	50.97	50.83	50.53	50.44	50.10	49.98	49.99	50.00	50.00	50.71	50.00	50.00	50.00	
33	50.00	50.00	50.00	50.08	50.77	51.14	51.35	51.48	51.23	51.21	51.16	50.81	50.07	49.93	50.60	53.26	56.31	58.38	56.83	56.95	
34	50.25	50.02	50.14	50.86	51.44	51.73	51.93	51.94	51.93	51.96	51.90	51.11	50.57	51.67	54.98	58.30	61.32	64.21	65.78	66.16	
35	51.08	50.83	50.44	50.68	52.00	52.95	52.62	52.65	52.67	52.70	52.39	51.62	53.63	56.73	60.02	63.33	66.34	69.22	72.11	75.58	
36	51.95	50.62	51.76	52.19	52.51	52.82	53.89	53.53	53.51	53.15	52.64	55.59	58.69	61.78	65.01	68.37	71.36	74.24	81.29	90.42	
37	52.71	53.05	54.21	54.93	55.24	55.55	55.87	56.37	55.21	56.16	57.68	60.41	63.66	66.84	69.97	73.40	79.07	87.61	96.15	100.0	
38	55.38	55.86	56.66	57.67	57.98	58.29	58.60	59.54	59.40	61.32	62.46	65.39	68.40	71.63	74.93	83.39	91.38	99.35	100.00	100.0	
39	57.70	58.80	59.09	60.25	60.72	61.03	61.34	62.70	63.58	65.39	68.02	70.08	73.17	78.37	86.29	95.28	100.00	100.00	100.00	100.00	
40	59.92	61.05	62.11	62.70	63.45	63.77	64.08	65.87	67.93	69.45	72.08	74.67	82.17	89.93	97.79	106.13	105.37	100.00	100.00	100.00	
41	62.19	63.33	64.45	65.26	66.19	66.50	67.14	69.04	71.59	73.51	78.24	85.89	93.81	101.58	109.33	116.52	112.34	102.49	100.00	100.00	
42	64.70	65.52	66.72	67.91	68.74	69.24	70.30	72.20	74.74	82.24	89.73	97.21	105.13	113.19	120.97	125.00	115.68	101.31	100.00	100.00	
43	67.17	67.72	68.93	70.11	71.36	71.98	73.47	76.41	84.43	92.88	100.82	108.26	116.19	124.26	127.67	125.00	115.79	100.00	100.00	100.00	
44	69.24	70.28	71.12	72.34	73.56	74.74	81.25	88.37	95.15	103.15	111.32	119.29	126.84	133.49	136.71	128.49	117.92	102.91	100.00	100.00	
45	71.14	72.33	73.31	74.53	79.16	86.27	93.32	100.26	106.69	114.05	122.15	129.54	135.83	142.59	145.76	136.48	121.93	107.08	100.00	100.00	
46	73.03	74.23	77.74	84.25	90.84	98.01	104.76	111.38	117.99	125.15	132.16	138.85	144.81	150.00	150.00	140.97	128.13	112.66	100.69	100.00	
47	74.92	82.29	90.06	96.55	102.47	108.88	115.46	122.08	128.39	134.79	141.79	148.15	152.74	152.47	150.00	144.94	130.51	117.83	105.85	100.00	
48	87.36	95.61	102.50	108.32	113.93	119.44	125.97	132.06	138.11	144.46	150.93	154.96	158.93	157.41	152.97	148.29	133.67	120.44	105.84	100.00	
49	100.28	107.60	114.01	119.84	125.32	129.85	135.67	141.76	147.82	152.67	157.18	161.16	165.13	162.35	156.47	145.66	134.58	123.23	108.15	100.00	
50	108.21	116.84	124.65	130.23	134.75	139.30	145.38	150.99	155.08	159.06	163.28	167.89	171.20	165.97	155.52	145.17	134.64	123.59	109.41	100.00	
51	114.34	124.10	132.31	138.18	143.77	149.01	154.03	158.35	161.62	165.62	169.30	173.89	174.96	165.49	155.29	144.93	134.65	124.38	110.57	100.00	
52	118.31	129.68	138.77	146.08	151.65	157.16	161.70	165.82	168.54	172.18	175.00	175.00	170.29	162.94	154.97	146.09	135.67	125.30	112.69	100.00	
53	123.79	134.91	146.06	153.74	159.50	165.05	169.54	173.28	175.00	175.00	174.59	169.84	165.01	160.19	155.37	150.55	140.30	129.45	118.09	104.14	
54	131.37	142.16	152.35	160.74	167.27	172.87	175.00	175.00	175.00	172.19	168.18	164.17	160.17	156.16	152.16	145.71	135.61	125.27	112.15		
55	137.27	149.33	157.97	168.39	174.74	175.00	175.00	175.00	175.00	174.11	170.10	166.35	163.25	160.15	157.07	154.02	150.97	143.20	133.05	122.99	
56	140.67	151.56	160.83	170.18	175.00	175.00	175.00	175.00	175.00	172.38	169.35	166.									

TABLE D.2-5. INITIAL WATER-LEVEL ELEVATION IN THE TAILINGS (FEET ABOVE MSL MINUS 7000).

Row	Column																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	73.58	72.25	70.92	69.60	68.73	67.52	66.56	65.38	63.45	61.0F
2	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	74.96	71.93	69.58	67.24	64.90	62.68	61.35	60.24	59.21	58.24	57.19	55.1
3	75.00	75.00	75.00	71.71	73.20	75.00	75.00	72.62	68.78	65.97	63.94	62.25	60.56	58.87	57.17	54.79	53.07	52.29	51.24	50.1
4	75.00	75.00	75.00	69.24	68.00	71.95	72.03	68.42	64.36	61.15	58.81	56.79	55.10	53.40	51.71	50.02	50.00	50.00	50.00	48.11
5	75.00	75.00	75.00	67.47	64.29	67.82	67.62	65.45	61.45	58.10	55.43	53.09	51.19	50.00	50.00	50.00	50.00	50.00	49.98	42.98
6	75.00	75.00	75.00	66.24	61.69	64.90	64.48	62.96	59.37	56.03	53.35	50.67	50.00	50.00	50.00	50.00	50.00	47.00	43.06	41.04
7	75.00	75.00	75.00	65.35	59.83	62.71	62.23	60.71	57.89	54.55	51.87	50.00	50.00	50.00	50.00	48.65	47.61	43.31	41.33	43.34
8	75.00	75.00	74.78	64.65	58.35	60.96	60.43	58.91	56.70	53.36	50.68	50.00	50.00	50.00	50.00	48.73	44.75	40.74	44.04	45.42
9	75.00	75.00	74.07	63.94	56.86	59.26	58.63	57.11	55.33	52.18	50.00	50.00	50.00	50.00	48.57	44.80	42.27	43.56	46.75	47.70
10	75.00	75.00	73.37	63.24	55.84	57.56	56.83	55.31	53.79	50.99	50.00	50.00	50.00	50.00	47.88	43.32	41.88	48.83	50.00	50.00
11	75.00	75.00	72.66	62.53	54.93	55.86	55.03	53.51	51.99	50.00	50.00	50.00	50.00	50.00	49.90	46.62	48.46	50.56	51.01	50.55
12	75.00	75.00	71.95	61.82	54.01	54.15	53.24	51.71	50.19	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.73	51.60	52.08	51.62
13	75.00	75.00	71.25	61.12	53.09	52.45	51.44	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.14	50.80	51.80	52.65	53.15	52.69
14	75.00	75.00	70.54	60.41	52.17	50.75	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.58	51.30	51.99	52.83	53.69	54.22	53.76
15	75.00	75.00	69.84	59.70	51.41	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.90	51.84	52.44	53.19	53.87	54.71	55.29	54.83
16	75.00	75.00	69.13	59.00	50.71	50.00	50.00	50.00	50.00	50.00	50.00	51.22	52.16	53.10	53.75	54.38	55.04	55.89	56.33	55.90
17	75.00	75.00	68.42	58.29	50.99	50.00	50.00	50.00	50.00	50.67	51.23	52.48	53.42	54.36	54.98	55.57	56.31	56.65	57.38	56.97
18	75.00	75.00	67.72	57.58	50.28	50.74	50.00	50.00	51.07	52.48	52.84	53.78	54.68	55.62	56.25	56.77	57.40	57.75	58.42	58.05
19	75.00	75.00	67.01	56.88	54.46	52.75	50.37	50.41	52.87	54.29	54.40	54.92	55.94	56.88	57.53	57.96	58.60	58.97	59.47	59.12
20	75.00	75.00	66.30	57.04	56.17	54.77	52.39	52.24	54.68	56.10	55.96	56.09	57.20	58.14	58.81	59.16	59.81	60.15	60.51	60.19
21	75.00	75.00	65.60	58.03	57.92	56.79	54.40	54.08	56.49	57.90	57.52	57.60	58.51	59.40	60.09	60.32	61.01	61.19	61.55	61.23
22	75.00	75.00	64.89	59.74	59.68	58.80	56.42	55.91	58.15	59.71	59.22	59.24	59.87	60.68	61.41	61.71	62.20	62.63	62.66	62.36
23	75.00	75.00	64.18	61.46	61.41	60.82	58.43	57.76	59.82	61.52	60.94	61.13	61.02	61.92	62.73	63.09	63.40	63.89	63.66	63.40
24	75.00	75.00	64.29	63.18	63.16	62.84	60.62	59.99	61.70	63.33	62.71	62.87	62.42	63.23	64.05	64.36	64.59	65.17	64.88	64.47
25	75.00	75.00	65.29	64.90	64.90	64.86	62.87	62.22	63.64	65.13	64.51	64.43	63.98	64.64	65.37	65.64	65.78	66.37	66.09	65.53
26	75.00	74.96	66.83	66.61	66.65	66.87	65.11	64.45	65.57	66.94	66.31	66.02	65.58	65.95	66.64	66.92	66.98	67.98	67.53	66.56
27	75.00	74.25	68.54	68.33	68.39	68.89	67.34	66.69	67.40	68.75	68.11	67.81	67.25	67.34	67.95	68.68	68.51	67.86	66.88	66.54
28	75.00	73.55	70.26	70.05	70.14	70.91	69.56	68.92	69.24	70.56	69.91	69.41	68.96	68.99	69.77	70.68	67.13	66.78	66.14	66.06
29	75.00	73.23	71.98	71.87	71.89	72.87	71.77	71.15	71.08	72.36	71.71	71.13	70.99	71.25	71.87	72.72	68.35	65.67	65.39	65.35
30	75.00	74.67	73.69	73.79	73.63	74.57	74.00	73.39	73.07	74.17	73.51	73.64	72.59	73.39	73.85	74.79	70.00	70.00	70.00	69.80
31	75.00	83.89	75.00	75.06	75.00	77.08	76.50	74.81	75.00	76.10	75.40	75.00	74.10	75.00	74.57	71.52	67.24	65.00	65.00	66.05
32	75.00	95.54	75.00	75.88	75.00	79.99	79.33	71.66	76.52	78.36	75.26	75.00	75.00	72.25	72.57	74.89	72.67	69.30	72.05	73.40
33	78.13	105.93	75.00	76.49	75.00	82.86	81.91	71.98	78.00	80.00	75.87	74.48	72.26	75.88	78.22	79.69	78.31	82.23	86.80	89.81
34	86.32	116.02	75.72	77.09	75.00	84.70	80.30	75.00	82.24	80.50	75.51	73.42	76.92	78.80	83.45	89.32	97.31	104.42	108.83	110.00
35	93.92	126.20	79.98	80.14	78.64	85.83	84.29	75.00	83.36	80.72	75.15	77.33	82.90	89.12	99.13	108.91	110.00	110.00	105.02	100.60
36	100.38	136.77	84.24	83.20	80.82	86.25	85.38	80.91	82.10	77.86	77.24	86.06	95.97	107.81	110.00	99.40	95.00	95.00	95.00	95.00
37	109.03	148.11	88.49	86.25	83.16	87.34	86.74	85.55	79.93	77.56	89.22	98.89	110.00	100.02	95.00	95.00	95.00	95.00	95.00	95.00
38	118.17	159.03	92.75	88.37	85.53	88.57	88.03	85.25	79.58	91.51	102.29	110.00	95.00	95.00	95.00	95.00	95.00	95.00	95.00	95.00
39	128.13	168.29	96.28	89.76	87.87	89.76	89.56	82.07	86.32	104.65	110.00	95.00	95.00	95.00	95.00	95.00	95.00	95.00	95.00	95.00
40	137.68	176.61	99.23	91.23	90.21	91.98	91.53	78.81	100.27	109.75	95.02	95.19	95.05	95.00	95.00	95.00	95.00	95.00	95.00	95.00
41	147.97	184.96	104.96	93.57	92.54	94.63	88.56	88.97	109.82	95.27	95.57	95.72	95.60	95.40	95.06	95.00	95.00	95.00	95.00	95.00
42	160.52	193.86	111.47	95.91	94.88	96.89	84.24	101.46	95.10	95.76	96.11	96.26	96.15	95.96	95.60	95.06	95.00	95.00	95.00	95.00
43	173.94	202.15	117.78	98.24	97.22	99.68	87.87	108.37	95.63	96.26	96.65	96.80	96.71	96.53	96.12	95.54	95.00	95.00	95.00	95.00
44	187.31	208.33	123.82	99.51	99.55	101.52	99.92	95.17	96.16	96.77	97.19	97.34	97.28	97.08	96.62	96.00	95.43	95.00	95.00	95.00
45	200.21	214.42	132.83	97.51	98.39	101.26	107.54	95.71	96.68	97.29	97.73	97.87	97.84	97.63	97.09	96.44	95.85	95.00	95.00	95.00
46	208.44	219.79	142.79	96.46	96.64	100.00	95.17	96.27	97.23	97.82	98.24	98.41	98.40	98.17	97.53	96.87	96.10	95.18	95.00	95.00
47	216.00	226.21	152.38	98.33	97.80	106.43	95.77	96.84	97.78	98.35	98.74	98.95	98.96	98.68	97.93	97.28	96.36	95.43	95.00	95.00
48	223.56	234.51	161.23	100.00	99.12	97.43	96.39	97.42	98.34	98.90	99.27	99.48	99.52	99.08	98.34	97.54	96.61	95.68	95.00	95.00
49	232.49	240.18	168.58	100.00	102.76	93.25	96.67	98.02	98.91	99.47	99.82	100.00	100.00	99.46	98.72	97.79	96.83	95.65	95.00	95.00
50	241.76	238.03	175.90	108.76	109.10	93.10	96.32	98.64	99.49	100.00	100.00	100.00	100.00	99.83	98.97	97.80	96.62	95.44	95.00	95.00
51	250.00	235.27	184.37	115.12	112.91	93.08	95.96	99.28	100.00	100.00	100.00	100.00	100.00	99.95	98.77	97.59	96.41	95.23	95.00	95.00
52	250.00	237.04	192.28	121.23	115.68	93.15	96.80	99.93	100.00	100.00	100.00	100.00	100.00	99.69	98.21	97.20	96.20	95.02	95.00	95.00
53	250.00	239.52	199.17	129.27	120.66	93.39	97.61	100.18	100.00	100.00	100.00	100.00	100.00	99.37	97.80	96.59	95.62	95.00	95.00	95.00
54	250.00	240.68	204.71	139.30	122.73	93.62	98.87	100.50	100.00	100.00	100.00	100.00	100.00	98.87	97.34	96.07	95.01	95.00	95.00	95.00
55	250.00	241.97	207.77	149.66	125.24	93.82	100.28	100.54	100.00	100.00	100.00	100.00	99.43	98.11	96.78	95.43	95.00	95.00	95.00	95.00
56	250.00	242.09	213.32	159.84	125.61	94.24	100.51	100.31	100.00	100.00	100.00	99.89	98.46	97.27	95.98	95.00	95.00	95.00	95.00	95.00
57	250.00	242.06	218.21	168.39	129.20	94.63	100.55	100.00	100.											

TABLE D.2-5. INITIAL WATER-LEVEL ELEVATION IN THE TAILINGS (FEET ABOVE MSL MINUS 7000) (continued).

Row\	Column																			
	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
1	50.00	50.00	50.00	50.00	50.00	48.34	46.11	50.00	53.37	56.55	59.72	63.12	66.08	68.90	70.97	72.92	73.73	75.00	75.00	75.00
2	50.00	50.00	50.00	50.00	50.00	50.00	50.00	49.46	46.56	43.17	40.20	47.40	47.85	50.19	50.64	51.09	51.54	52.23	53.70	54.21
3	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	46.67	43.59	41.49	39.40	37.28	36.24	38.99	43.27
4	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	48.96	46.81	44.51	42.13	39.69	37.42	35.14
5	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	47.84	45.01	41.64	38.27	35.00
6	43.82	44.56	45.97	47.74	48.44	48.55	48.55	49.15	50.00	50.00	50.00	50.00	50.00	50.00	50.00	49.29	44.73	40.17	35.44	31.30
7	36.05	37.84	41.63	43.46	44.08	44.96	45.04	45.57	46.84	47.13	47.13	47.96	48.40	47.13	47.19	42.96	39.25	38.92	34.04	30.92
8	34.88	34.34	37.78	40.15	41.12	42.08	42.22	42.71	43.61	43.88	43.48	44.08	43.13	40.52	37.00	31.59	28.98	28.82	32.28	29.88
9	34.61	33.50	34.49	36.83	38.16	39.21	39.41	39.93	40.38	40.63	39.91	39.98	38.48	35.47	31.64	31.12	32.15	31.70	30.93	30.94
10	36.77	36.21	35.56	33.42	35.20	36.36	36.60	37.05	37.15	37.15	36.33	35.46	34.30	31.81	31.38	34.63	35.00	35.00	35.10	34.84
11	39.21	38.65	37.43	36.18	35.00	33.02	33.88	32.49	33.36	34.24	33.80	32.93	32.73	35.23	35.76	36.07	36.17	36.27	36.29	36.03
12	41.84	40.56	39.30	38.07	37.02	35.98	35.30	35.18	33.65	32.23	32.06	35.10	35.85	36.61	37.13	37.33	37.43	37.53	37.36	37.10
13	43.68	42.42	41.13	40.09	38.66	37.14	36.89	36.73	35.17	34.88	36.11	36.58	37.26	37.98	38.50	38.60	38.70	38.69	38.43	38.02
14	45.41	44.20	42.84	41.31	39.77	38.60	38.48	38.14	36.52	37.25	37.60	38.07	38.66	39.35	39.77	39.87	39.97	39.76	39.42	38.91
15	47.02	45.49	43.96	42.42	40.89	40.19	40.03	39.56	37.87	38.84	39.08	39.55	40.06	40.72	41.03	41.13	41.09	40.82	40.31	39.80
16	48.14	46.60	45.07	43.54	42.16	41.77	41.44	40.97	39.22	40.38	40.57	41.04	41.46	42.09	42.30	42.40	42.16	41.71	41.20	40.69
17	49.25	47.72	46.18	44.65	43.52	43.33	42.86	42.39	40.59	41.92	42.14	42.53	42.87	43.46	43.56	43.49	43.11	42.60	42.09	41.58
18	50.00	48.83	47.30	45.81	45.07	44.74	44.27	43.80	42.35	43.46	43.71	44.01	44.27	44.73	44.83	44.51	44.00	43.49	42.98	42.49
19	50.00	49.94	48.41	47.18	46.63	46.16	45.69	45.21	44.35	45.00	45.25	45.50	45.67	45.99	45.90	45.40	44.89	44.38	43.87	43.45
20	50.07	50.01	49.52	48.54	48.04	47.57	47.10	46.63	46.41	46.55	46.78	46.98	47.05	47.23	46.80	46.29	45.78	45.27	44.77	44.40
21	51.19	51.04	50.60	49.93	49.46	48.99	48.51	48.04	47.92	48.09	48.32	48.47	48.42	48.20	47.69	47.18	46.67	46.17	45.66	45.35
22	52.30	52.07	51.57	50.96	50.06	50.00	49.93	49.46	49.47	49.63	49.85	50.00	49.60	49.09	48.58	48.07	47.57	47.06	46.55	46.30
23	53.41	53.10	52.55	52.02	51.19	50.78	50.69	50.53	50.51	50.56	50.38	50.29	50.06	49.98	49.47	48.97	48.46	47.95	47.44	47.24
24	54.52	54.14	53.66	53.08	52.52	52.25	52.01	51.33	51.38	51.40	50.61	50.69	50.32	50.00	50.00	49.86	49.35	48.84	48.37	48.17
25	55.58	55.17	54.77	54.33	53.97	53.74	53.39	52.15	52.28	52.26	51.43	51.04	50.79	50.31	50.00	50.00	49.73	49.32	48.99	48.09
26	55.82	55.27	54.94	54.57	54.03	53.50	52.90	52.34	52.28	52.16	51.71	51.77	51.88	51.90	51.83	51.58	50.92	50.64	50.30	50.00
27	55.44	55.13	54.91	54.60	54.18	53.57	52.91	52.67	52.49	52.17	52.44	52.73	52.68	52.45	52.15	51.98	51.71	51.67	50.89	50.09
28	55.26	55.06	54.87	54.62	54.37	53.83	53.31	53.17	53.07	52.98	53.34	53.71	53.69	53.60	53.47	53.06	52.43	52.08	50.05	50.06
29	55.08	55.02	54.93	54.66	54.56	54.09	53.75	53.67	53.64	53.78	54.14	54.67	54.70	54.88	54.87	54.57	54.07	52.30	50.79	51.08
30	55.00	55.00	54.99	54.86	54.76	54.34	54.20	54.16	54.22	54.53	54.91	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	50.28
31	55.00	55.00	55.00	55.00	54.95	54.74	54.65	54.66	54.80	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	54.36	50.96
32	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	53.51
33	60.65	59.04	58.13	57.51	56.78	55.00	55.00	50.00	50.00	51.17	52.75	55.00	55.00	55.00	55.00	55.00	55.00	55.00	54.95	53.00
34	79.64	75.95	73.47	71.12	65.88	62.85	59.85	57.62	53.99	52.24	50.77	48.29	45.00	51.40	55.00	55.00	55.00	55.00	54.54	52.59
35	102.22	98.33	94.39	90.54	86.47	82.02	77.76	73.31	69.14	65.76	59.79	54.69	52.93	50.75	46.36	49.24	55.00	55.00	54.14	52.89
36	110.00	110.00	110.00	110.00	106.89	102.25	97.40	92.85	88.35	83.14	77.62	72.61	65.35	57.50	53.52	50.94	45.00	50.75	55.00	54.28
37	84.59	88.59	93.06	99.10	105.33	110.00	110.00	110.00	110.00	108.71	99.26	92.92	85.79	76.41	66.72	56.28	52.63	47.75	45.00	55.00
38	83.61	82.54	81.30	80.21	79.60	83.07	88.32	94.91	102.83	110.00	110.00	105.64	94.48	83.95	72.40	61.08	54.37	51.47	45.00	55.00
39	84.81	83.68	82.36	81.05	79.88	79.27	78.66	78.39	79.29	81.09	88.63	99.97	110.00	105.39	91.40	78.24	65.74	55.85	52.67	55.00
40	85.99	84.74	83.42	82.09	80.50	79.57	78.96	78.37	77.79	77.20	77.27	78.74	84.09	97.57	110.00	110.00	96.86	81.48	67.78	57.05
41	87.12	85.80	84.44	82.92	81.26	79.85	79.25	78.65	78.07	77.48	76.91	76.30	75.71	77.43	91.00	109.69	110.00	100.98	84.41	69.11
42	88.21	86.86	85.32	83.73	82.08	80.36	79.52	78.93	78.34	77.76	77.15	76.45	75.74	75.21	75.00	86.12	108.57	110.00	102.36	84.95
43	89.39	87.87	86.30	84.66	82.96	81.20	79.79	79.20	78.61	78.01	77.30	76.59	75.88	75.21	75.00	75.00	82.66	105.03	110.00	101.17
44	90.21	88.94	87.34	85.67	83.92	82.10	80.20	79.47	78.87	78.16	77.45	76.74	76.03	75.32	75.00	75.00	75.00	78.23	100.09	110.00
45	90.71	90.03	88.43	86.72	84.93	83.08	81.12	79.72	79.01	78.34	77.61	76.90	76.23	75.52	75.00	75.00	75.00	75.00	75.00	102.67
46	91.21	90.52	89.63	87.91	86.09	84.07	82.06	80.00	79.33	78.65	77.99	77.30	76.63	75.89	75.11	75.00	75.00	75.00	75.00	83.12
47	91.67	90.99	90.33	89.09	87.15	85.23	83.19	81.23	79.75	79.09	78.44	77.76	77.07	76.30	75.49	75.00	75.00	75.00	75.00	75.00
48	92.15	91.44	90.78	90.12	88.40	86.44	84.49	82.57	80.58	79.58	78.93	78.25	77.53	76.71	75.87	75.13	75.00	75.00	75.00	75.00
49	92.63	91.84	91.14	90.50	89.71	87.80	85.88	83.90	82.11	80.38	79.49	78.79	77.99	77.22	76.53	75.82	75.04	75.00	75.00	75.00
50	92.82	92.13	91.46	90.84	90.31	89.19	87.25	85.38	83.57	81.87	80.16	79.30	78.60	77.94	77.27	76.53	75.76	75.03	75.00	75.00
51	92.96	92.36	91.75	91.18	90.64	90.13	88.58	86.76	85.00	83.22	81.46	79.99	79.35	78.71	78.01	77.30	76.53	76.06	75.82	75.58
52	93.01	92.52	91.98	91.44	90.93	90.44	89.86	88.03	86.27	84.50	82.97	81.53	80.28	79.50	78.82	78.09	77.55	77.09	76.90	76.74
53	93.02	92.53	92.16	91.72	91.22	90.74	90.29	89.31	87.54	85.91	84.39	83.10	81.86	80.63	79.66	79.07	78.57	78.12	78.02	77.92
54	93.03	92.65	92.35	91.99	91.54	91.09	90.63	90.16	88.87	87.33	85.92	84.68	83.48	82.06	80.37	80.00	79.60	79.15	79.12	79.10
55	93.14	92.89	92.55	92.25	91.90	91.46	90.99	90.54	90.09	88.79	87.47	86.32	85.03	83.34	82.16	81.47	80.91	80.45	80.44	80.45
56	93.41	93.11	92.84	92.54	92.21	91.84	91.41	90.97	90.51	90.07	89.11	87.97	86.47	85.29	84.21	83.54	82.99	82.51	82.36	82.32
57	93.67	93.43	93.14	92.84	92.53	92.22	91.85	91.41	90.96	90.58	90.23	89.62	88.43	87.34	86.26	85.62	84.88	84.48	84.27</	

TABLE D.2-5. INITIAL WATER-LEVEL ELEVATION IN THE TAILINGS (FEET ABOVE MSL MINUS 7000) (continued).

Row	Column																			
	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
1	74.84	74.62	74.40	74.18	73.95	73.73	73.51	73.29	74.34	87.27	101.96	112.78	123.78	133.79	143.57	153.52	163.02	173.23	175.00	175.00
2	54.24	54.20	54.17	54.13	54.09	54.06	53.99	53.77	54.07	54.45	61.13	67.59	74.22	86.14	98.62	107.54	114.50	121.35	129.43	141.31
3	48.32	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	46.47	43.49	40.52	47.21	50.00	44.00	42.53	46.03	47.91
4	37.34	42.58	47.05	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	46.47	43.49	40.52	47.21	50.00	44.00	42.53	46.03	47.91
5	33.77	36.22	39.51	42.63	43.21	43.36	44.36	45.17	44.96	43.68	43.71	42.06	40.41	38.76	38.26	43.80	47.69	50.00	50.00	50.00
6	31.96	35.00	34.89	36.91	36.06	35.74	36.05	35.99	34.96	35.12	36.55	35.64	34.98	34.27	33.62	36.92	40.11	40.67	42.55	44.06
7	29.83	32.95	32.79	33.72	33.31	31.77	32.16	30.00	28.62	27.85	27.85	26.97	33.00	34.81	33.27	31.70	32.73	32.33	31.31	33.41
8	28.55	29.71	31.36	32.22	31.61	29.45	28.14	28.29	29.28	31.11	30.37	29.31	27.28	31.03	27.69	28.96	27.37	27.19	27.46	28.94
9	30.49	29.07	29.69	30.72	30.07	27.73	30.06	31.95	32.84	33.45	33.05	31.95	30.63	28.86	27.82	28.18	26.88	27.78	29.86	29.88
10	33.89	31.76	28.49	28.87	28.13	29.69	33.35	34.89	36.27	35.28	35.22	34.40	33.45	33.81	32.98	30.01	27.56	29.99	29.89	30.07
11	35.73	35.46	35.26	35.22	35.28	35.36	35.46	35.67	35.96	36.11	36.09	35.69	35.26	35.00	35.00	34.49	27.76	29.43	29.77	31.81
12	36.62	36.41	36.19	36.04	36.10	36.05	36.24	36.35	36.65	36.95	36.92	36.59	36.50	35.76	35.00	35.00	31.06	30.11	29.70	30.60
13	37.57	37.36	37.11	36.83	36.92	36.97	36.96	37.13	37.32	37.64	37.75	37.50	37.56	37.03	36.26	35.50	33.25	29.91	29.77	34.55
14	38.51	38.30	38.04	37.73	37.75	37.79	37.56	37.86	38.02	38.34	38.59	38.41	38.56	38.31	37.54	36.72	35.04	29.70	34.03	35.00
15	39.46	39.25	38.96	38.65	38.57	38.62	38.52	38.46	38.77	38.92	39.32	39.32	39.53	39.44	38.81	37.82	36.10	32.66	35.00	35.00
16	40.41	40.18	39.88	39.57	39.29	39.47	39.49	39.09	39.37	39.68	39.93	40.23	40.50	40.50	39.94	38.26	36.80	34.25	35.00	33.41
17	41.35	41.11	40.80	40.49	40.18	40.31	39.97	39.97	39.97	40.28	40.58	40.97	40.84	39.15	37.69	36.71	35.19	33.69	33.03	35.00
18	42.30	42.03	41.72	41.41	41.10	41.03	41.18	41.15	40.62	40.88	41.19	40.51	36.95	36.19	35.06	32.89	33.41	34.57	35.24	35.62
19	43.25	42.95	42.64	42.33	42.02	41.75	42.05	42.01	41.46	41.47	41.83	38.49	34.17	34.37	35.25	35.44	35.70	36.24	36.31	36.55
20	44.18	43.87	43.56	43.25	42.94	42.63	42.77	42.90	42.61	42.15	39.87	34.88	34.94	35.70	38.80	36.99	37.14	37.69	37.58	37.50
21	45.10	44.79	44.48	44.17	43.86	43.56	43.50	43.79	43.36	40.35	37.26	34.87	35.93	37.20	38.35	38.55	38.58	39.13	38.85	38.74
22	46.02	45.71	45.40	45.09	44.78	44.48	44.22	44.45	41.39	37.70	35.84	36.16	37.43	38.69	39.90	40.10	40.03	40.58	40.12	40.01
23	46.94	46.63	46.32	46.01	45.70	45.40	45.09	41.69	37.67	35.59	36.11	37.62	38.92	40.19	41.45	41.65	41.47	41.88	41.39	41.28
24	47.86	47.55	47.24	46.93	46.60	46.18	45.36	41.48	36.45	35.86	37.45	39.05	40.42	41.68	42.95	43.18	42.92	43.17	42.66	42.55
25	48.78	48.47	48.09	47.65	47.18	46.58	43.29	39.48	36.32	37.19	38.79	40.39	41.90	43.18	44.44	44.66	44.36	44.47	43.93	43.82
26	49.60	49.19	48.49	47.81	45.81	46.01	43.07	39.33	36.94	38.53	40.13	41.73	43.33	44.67	45.94	46.13	45.81	45.78	45.20	45.09
27	50.03	49.47	48.13	46.92	45.23	45.70	43.38	39.60	38.97	39.20	41.43	43.07	44.67	46.27	47.43	47.61	47.26	47.05	46.47	46.36
28	50.07	50.01	49.12	47.41	46.56	45.62	42.40	38.38	38.06	40.05	41.74	43.73	45.74	47.61	48.92	49.09	48.74	48.35	47.74	47.83
29	50.01	49.90	50.09	48.50	46.87	45.66	41.75	37.69	39.34	41.37	43.26	44.95	46.64	48.47	50.00	50.00	50.00	49.64	49.01	48.90
30	49.86	49.25	49.62	49.19	47.45	45.42	41.22	38.96	40.87	42.81	44.67	46.47	48.16	49.85	50.00	50.00	50.00	50.00	50.00	50.00
31	49.82	49.54	49.14	48.61	48.21	48.11	40.80	40.87	42.65	44.36	46.28	47.98	49.68	50.00	50.00	50.00	50.00	50.00	50.00	50.00
32	50.08	49.82	49.39	48.75	48.17	47.82	44.20	43.21	44.20	45.96	47.86	49.76	50.15	50.45	50.44	50.22	50.00	50.00	50.00	50.00
33	51.27	50.00	48.96	46.28	45.77	48.01	47.35	46.49	47.48	48.48	49.47	50.17	50.53	50.88	51.12	50.90	50.68	50.46	50.24	50.02
34	50.78	50.00	48.78	45.00	45.00	45.00	47.57	46.88	47.56	48.48	49.64	50.44	50.90	51.25	51.52	51.59	51.37	51.15	50.93	50.89
35	51.91	50.76	49.78	46.34	45.00	45.00	45.12	47.25	47.42	48.62	49.97	50.58	51.18	51.63	51.98	52.18	52.05	51.83	51.61	51.12
36	53.27	52.10	50.10	47.18	45.00	45.00	45.00	48.35	48.47	49.12	50.13	50.72	51.32	51.92	52.35	52.63	52.73	52.51	52.29	51.62
37	54.80	52.60	50.00	48.24	46.05	45.00	45.00	47.44	49.18	50.02	50.85	51.54	51.47	52.06	52.66	53.08	53.27	53.20	52.58	52.33
38	45.35	53.54	50.00	47.92	45.33	45.00	45.00	47.78	50.27	50.97	52.07	52.72	53.13	53.15	52.93	53.40	53.73	53.88	53.52	54.31
39	50.00	45.00	48.34	47.19	45.00	45.00	45.00	46.34	50.70	52.71	53.25	54.00	54.59	54.85	54.99	54.77	54.92	55.74	56.43	56.67
40	50.00	50.00	45.00	45.00	45.00	45.00	45.00	45.26	50.98	54.57	54.73	55.28	55.93	56.46	56.72	56.89	57.15	57.98	58.67	59.11
41	56.04	50.52	47.58	45.83	43.12	41.09	45.55	50.13	53.06	55.51	56.25	56.71	56.86	57.92	58.49	59.25	59.50	59.98	61.04	62.01
42	68.59	55.08	50.64	48.18	46.96	45.00	40.03	47.93	52.39	53.78	55.48	57.85	56.96	58.71	60.58	61.01	62.01	62.19	63.06	64.10
43	83.89	66.82	54.39	50.32	48.76	46.31	44.92	50.00	50.34	52.42	55.05	59.04	58.12	59.95	62.15	62.83	63.80	64.70	64.97	66.15
44	98.33	79.66	63.67	53.07	50.00	50.00	46.52	53.30	50.60	51.81	54.97	58.27	58.99	61.19	63.39	64.80	65.45	66.58	67.31	68.05
45	110.00	93.26	74.65	58.92	50.00	50.00	50.00	55.00	52.44	52.56	55.38	57.84	60.24	62.44	64.64	66.84	67.26	68.23	69.36	70.00
46	110.00	106.95	87.41	68.21	53.50	50.00	50.00	55.00	55.00	55.45	58.52	58.27	60.78	63.68	65.88	68.08	69.19	69.89	71.01	72.14
47	90.26	110.00	98.89	78.89	60.98	53.80	51.33	55.00	55.00	55.23	57.06	58.98	61.81	64.38	67.01	69.33	71.13	71.69	72.67	73.80
48	75.70	99.49	109.11	89.18	70.49	55.84	54.52	55.00	56.09	57.53	58.99	59.92	61.94	64.98	68.02	70.33	72.77	73.63	74.32	78.53
49	75.00	86.39	110.00	99.46	79.25	61.20	56.07	55.99	57.91	60.22	60.72	61.35	66.46	69.55	71.20	72.86	74.51	75.00	80.13	90.57
50	75.00	75.00	101.26	110.00	88.91	69.55	60.00	60.00	60.00	60.51	62.28	62.97	68.41	75.00	75.00	75.00	75.00	76.43	87.74	98.73
51	75.60	75.66	88.81	110.00	98.63	76.86	61.59	60.00	60.00	60.41	63.12	64.02	71.45	75.00	75.00	75.00	75.00	80.84	92.30	102.99
52	76.78	78.86	78.70	106.80	106.88	85.34	67.53	62.33	60.40	61.40	65.11	65.29	73.91	75.00	75.00	75.00	75.00	87.04	99.03	108.26
53	77.96	78.05	78.19	95.50	110.00	93.18	72.52	65.00	64.11	64.44	67.78	67.41	75.00	75.00	75.00	75.00	79.73	92.30	104.16	114.78
54	79.14	79.21	79.39	84.47	110.00	101.97	79.05	67.07	66.87	68.26	71.01	69.48	74.19	75.00	75.00	75.00	83.71	97.73	109.13	120.12
55	80.47	80.58	80.91	81.96	106.21	108.94	87.08	70.64	70.00	71.53	72.94	71.36	75.00	75.00	75.00	75.00	86.97	101.35	113.60	125.20
56	82.34	82.46	82.77	83.08	95.22	110.00	94.35	74.40	70.93	73.72	75.02	74.90	75.20	75.34	78.86	81.82	90.97	104.73	117.42	129.35
57	84.22	84.35	84.66	84.96	88.11	110.00	101.26	79.74	75.00	74.99	75.67	75.98	76.13	79.49	83.18	86.87	95.47	107.		

TABLE D.2-5. INITIAL WATER-LEVEL ELEVATION IN THE TAILINGS (FEET ABOVE MSL MINUS 7000) (continued).

Row	Column																			
	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	175.00	175.00	175.00	175.00	175.00	175.00	175.00	175.00	175.00	175.00	175.00	175.00	169.82	162.37	154.15	145.17	136.00	127.12	122.67	121.97
2	147.96	151.24	153.06	155.98	159.28	161.72	161.17	156.88	150.85	143.27	135.48	126.88	117.06	106.42	98.04	92.15	84.66	77.18	72.65	68.7
3	95.67	96.36	97.87	96.31	96.43	95.46	96.23	96.54	93.85	90.31	88.02	87.51	86.25	81.92	79.70	76.95	74.28	68.86	63.44	58.10
4	47.96	47.96	47.07	48.98	50.00	50.50	50.00	51.97	55.23	58.49	56.37	53.16	50.00	52.65	56.49	59.05	63.05	63.03	59.20	55.67
5	50.00	50.00	50.00	49.32	49.93	50.00	50.00	50.00	50.00	50.00	49.74	49.08	48.43	47.77	47.12	47.80	50.72	53.96	53.93	55.72
6	43.68	42.69	41.67	42.12	42.03	42.95	44.64	45.76	46.71	45.49	44.77	43.50	42.86	42.20	41.55	42.23	44.16	45.74	50.37	52.00
7	34.54	33.74	34.45	35.23	35.84	36.42	37.58	38.96	39.84	40.03	40.33	39.50	38.86	38.22	37.57	38.15	37.75	39.52	42.78	48.31
8	27.17	28.16	29.29	28.63	29.82	30.56	31.76	33.05	33.68	34.94	35.73	36.38	35.68	35.02	35.00	34.42	34.26	33.86	34.50	39.19
9	29.84	29.64	29.28	28.66	28.19	28.09	28.09	28.09	28.09	28.09	28.09	28.09	31.05	33.27	34.37	33.73	32.82	32.65	31.64	31.77
10	31.83	31.77	31.46	30.80	30.35	30.27	29.10	28.58	28.33	28.09	28.09	28.09	29.64	31.24	31.44	31.38	30.40	29.54	29.52	30.36
11	33.79	33.97	33.65	32.40	31.83	31.77	31.27	30.52	29.51	28.81	28.09	28.09	28.09	28.09	28.09	28.09	28.09	28.09	28.09	28.09
12	35.00	35.00	35.00	33.99	33.31	33.27	32.85	32.20	30.93	29.82	29.27	28.09	28.09	28.09	28.09	28.09	28.09	28.09	28.09	28.09
13	35.00	35.00	34.97	35.00	34.81	34.78	34.49	33.88	32.77	32.53	31.30	29.97	28.67	28.09	28.09	28.09	28.09	28.09	28.09	28.09
14	35.00	34.45	34.50	35.00	35.00	35.00	35.00	35.00	35.00	35.00	34.12	32.72	31.45	31.07	30.97	30.94	31.52	31.98	32.30	33.27
15	33.93	34.34	35.00	35.00	35.00	35.13	35.52	35.90	35.73	35.14	35.00	34.63	34.31	34.31	35.00	35.00	35.00	35.65	35.75	35.68
16	35.00	35.00	35.00	35.30	35.68	36.06	36.45	36.83	36.82	36.03	35.44	35.00	35.00	35.00	35.34	35.89	36.45	37.01	37.42	37.51
17	35.07	35.46	35.84	36.23	36.61	37.00	37.38	37.76	37.51	36.92	36.33	35.75	35.36	38.03	36.59	37.15	37.70	38.26	38.82	39.19
18	36.01	36.39	36.77	37.16	37.54	37.93	38.31	38.70	38.40	37.81	37.22	36.64	36.30	36.90	37.82	38.40	38.95	39.51	40.07	40.63
19	36.94	37.32	37.71	38.09	38.47	38.86	39.24	39.63	39.29	38.70	38.11	37.55	37.30	37.59	38.44	39.30	40.20	40.76	41.32	41.88
20	37.87	38.25	38.64	39.02	39.41	39.79	40.17	40.56	40.18	39.59	39.00	38.61	38.30	38.37	39.13	39.99	40.84	41.75	42.57	43.13
21	38.80	39.18	39.57	39.95	40.34	40.72	41.10	41.49	41.07	40.48	39.89	39.61	39.31	39.36	39.82	40.68	41.53	42.38	43.23	44.29
22	39.90	40.11	40.50	40.88	41.27	41.65	42.04	42.42	41.96	41.37	40.87	40.63	40.32	40.36	40.53	41.37	42.22	43.07	43.92	44.77
23	41.17	41.09	41.43	41.81	42.20	42.58	42.97	43.35	42.85	42.26	41.95	41.64	41.33	41.36	41.42	42.06	42.91	43.76	44.61	45.46
24	42.44	42.33	42.38	42.75	43.13	43.51	43.90	44.28	43.74	43.15	42.98	42.65	42.34	42.35	42.41	42.75	43.60	44.45	45.30	46.15
25	43.71	43.60	43.49	43.68	44.06	44.45	44.83	45.21	44.63	44.20	43.98	43.67	43.36	43.35	43.41	43.57	44.29	45.14	45.99	46.84
26	44.98	44.87	44.76	44.69	44.99	45.38	45.76	46.11	45.52	45.28	44.99	44.68	44.37	44.35	44.41	44.47	44.98	45.83	46.68	47.53
27	46.25	46.14	46.03	45.92	45.99	46.31	46.69	47.00	46.42	46.33	46.01	45.70	45.38	45.35	45.41	45.47	45.72	46.52	47.37	48.22
28	47.52	47.41	47.30	47.19	47.07	47.28	47.62	47.89	47.53	47.36	47.02	46.71	46.40	46.35	46.41	46.47	46.81	47.21	48.06	48.91
29	48.79	48.68	48.57	48.46	48.34	48.28	48.56	48.78	48.61	48.37	48.04	47.72	47.41	47.35	47.41	47.47	47.53	47.90	48.75	49.61
30	50.00	49.95	49.84	49.73	49.61	49.50	49.59	49.75	49.67	49.36	49.05	48.74	48.43	48.34	48.40	48.46	48.53	48.77	49.44	50.00
31	50.00	50.00	50.00	50.00	50.00	50.00	50.31	50.37	50.34	50.13	50.00	49.75	49.44	49.34	49.40	49.46	49.52	49.66	50.00	50.00
32	50.00	50.00	50.00	50.00	50.11	50.54	50.83	50.97	50.83	50.53	50.44	50.10	49.98	49.99	50.00	50.00	50.71	50.00	50.00	50.00
33	50.00	50.00	50.00	50.08	50.77	51.14	51.35	51.48	51.23	51.21	51.16	50.61	50.07	49.93	50.60	53.26	56.31	58.38	56.83	56.95
34	50.25	50.02	50.14	50.86	51.44	51.73	51.93	51.94	51.93	51.96	51.90	51.11	50.57	51.67	54.98	58.30	61.32	64.21	65.78	66.16
35	51.08	50.83	50.44	50.68	52.00	52.95	52.62	52.67	52.70	52.39	51.62	53.63	56.73	60.02	63.33	66.34	69.22	72.11	75.58	
36	51.95	50.62	51.76	52.19	52.51	52.82	53.89	53.53	53.51	53.15	52.64	55.59	58.69	61.78	65.01	68.37	71.36	74.24	81.29	90.42
37	52.71	53.05	54.21	54.93	55.24	55.55	55.87	56.37	55.21	56.16	57.68	60.41	63.66	66.84	69.97	73.40	79.07	87.61	96.15	100.0
38	55.38	55.86	56.68	57.67	57.98	58.29	58.60	59.54	59.40	61.32	62.46	65.39	68.40	71.83	74.93	83.39	91.38	99.35	100.00	100.0
39	57.70	58.80	59.09	60.25	60.72	61.03	61.34	62.70	63.58	65.39	68.02	70.08	73.17	78.37	84.93	95.28	100.00	100.00	100.00	100.00
40	59.92	61.05	62.11	62.70	63.45	63.77	64.08	65.87	67.93	69.45	72.08	74.67	82.17	89.93	97.79	106.13	105.37	100.00	100.00	100.00
41	62.19	63.33	64.45	65.26	66.19	66.50	67.14	69.04	71.59	73.51	78.24	85.69	93.81	101.58	109.33	116.52	112.34	102.49	100.00	100.00
42	64.70	65.52	66.72	67.91	68.74	69.24	70.30	72.20	74.74	82.24	89.73	97.21	105.13	113.19	120.97	125.00	115.68	101.31	100.00	100.00
43	67.17	67.72	68.93	70.11	71.36	71.98	73.47	76.41	84.43	92.88	100.82	108.26	116.19	124.26	127.67	125.00	115.79	100.27	100.00	100.00
44	69.24	70.28	71.12	72.34	73.56	74.74	81.25	88.37	95.15	103.15	111.32	119.29	128.84	133.49	136.71	128.49	117.92	102.91	100.00	100.00
45	71.14	72.33	73.31	74.53	79.16	86.27	93.32	100.26	106.69	114.05	122.15	129.54	135.83	142.59	145.76	136.48	121.99	107.08	100.00	100.00
46	73.03	74.23	77.74	84.25	90.84	98.01	104.78	111.38	117.99	125.15	132.16	138.85	144.81	150.00	150.00	140.97	126.13	112.66	100.69	100.00
47	74.92	82.29	90.06	96.55	102.47	108.88	115.46	122.08	128.39	134.79	141.79	148.15	152.74	152.47	150.00	144.94	130.51	117.83	105.85	100.00
48	87.36	95.61	102.50	108.32	113.93	119.44	125.97	132.06	138.11	144.46	150.93	154.96	158.93	157.41	152.97	146.29	133.67	120.44	105.84	100.00
49	100.28	107.60	114.01	119.84	125.32	129.85	135.67	141.76	147.82	152.67	157.18	165.13	162.35	156.47	145.66	134.58	123.23	108.15	100.00	
50	108.21	116.84	124.65	130.23	134.75	139.30	145.38	150.99	155.08	159.06	163.28	167.89	171.20	165.97	155.52	145.17	134.64	123.59	109.41	100.00
51	114.34	124.10	132.31	138.18	143.77	149.01	154.03	158.35	161.62	165.62	169.30	173.89	174.96	165.49	155.29	144.93	134.65	124.38	110.57	100.00
52	118.31	129.66	138.77	146.08	151.65	157.16	161.70	165.82	168.54	172.18	175.00	175.00	170.29	162.94	154.97	146.09	135.67	125.30	112.69	100.00
53	123.79	134.91	146.06	153.74	159.50	165.05	169.54	173.28	175.00	175.00	174.59	169.84	165.01	160.19	155.37	150.55	140.30	129.45	118.09	104.14
54	131.37	142.16	152.35	160.74	167.27	172.87	175.00	175.00	175.00	175.00	172.19	168.18	164.17	160.17	156.16	152.16	145.71	135.81	125.27	112.15
55	137.27	149.33	157.97	168.39	174.74	175.00	175.00	175.00	175.00	174.11	170.10	166.35	163.25	160.15	157.07	154.02	150.97	143.20	133.05	122.99
56	140.87	151.58	160.83	170.18	175.00	175.00	175.00	175.00	175.00	175.00	172.74	168.33	165.49	163.81	161.14					

TABLE D.2-5. INITIAL WATER-LEVEL ELEVATION IN THE TAILINGS (FEET ABOVE MSL MINUS 7000) (continued).

Row	Column																	
	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	
1	118.03	112.84	107.88	101.33	94.55	88.35	82.92	79.68	77.35	75.74	74.27	75.00	76.75	78.40	80.84	81.85	80.85	
2	63.56	58.79	50.40	48.82	47.53	45.93	43.89	40.91	40.00	40.00	40.00	40.00	40.00	45.55	50.00	51.16	51.09	
3	52.77	50.00	48.90	47.51	48.50	50.00	50.00	50.00	50.68	50.00	50.00	49.36	46.09	39.80	19.64	25.68	31.45	
4	51.52	49.16	50.00	50.00	55.05	56.75	55.36	52.48	48.50	45.62	44.85	43.53	33.26	22.87	30.81	35.84	13.13	
5	50.36	50.00	50.00	47.69	49.91	49.43	46.36	42.63	39.90	38.46	35.19	31.00	20.92	29.39	37.72	24.84	-4.79	
6	52.27	50.44	44.46	37.34	37.13	37.44	37.13	36.82	33.08	29.68	25.88	24.01	25.00	31.50	34.72	15.38	-11.89	
7	51.04	50.00	44.42	39.43	35.00	35.83	36.03	33.61	30.21	26.65	23.30	26.83	28.92	34.13	29.42	8.62	-16.49	
8	48.13	50.19	48.20	42.71	37.37	37.00	34.59	28.90	26.98	23.18	26.09	28.48	31.52	36.06	25.38	5.76	-19.44	
9	38.62	44.64	50.00	46.97	42.14	39.31	31.29	22.24	23.42	26.03	27.76	29.84	32.72	36.77	22.37	2.91	-22.32	
10	31.33	34.47	45.12	51.11	44.84	41.27	26.62	27.13	27.80	28.00	29.50	31.74	34.26	35.29	19.36	0.10	-25.00	
11	28.09	28.09	34.63	44.70	46.04	41.90	32.72	31.55	30.14	30.70	31.51	33.69	36.23	33.17	17.22	-1.93	-25.00	
12	28.33	30.76	33.80	40.75	45.95	45.19	38.12	34.38	32.84	33.39	34.08	35.66	38.30	32.18	16.23	-3.71	-25.00	
13	29.93	32.75	35.00	36.04	41.00	44.57	41.68	37.80	35.53	36.08	36.77	37.80	40.39	30.91	15.27	-6.51	-25.00	
14	32.74	34.98	35.00	35.00	36.38	40.41	43.06	39.71	38.22	38.78	39.47	40.44	42.03	29.69	13.52	-8.88	-25.00	
15	35.23	35.00	35.00	35.00	35.00	36.39	40.65	41.63	40.92	41.47	42.16	43.13	42.10	28.41	11.53	-11.18	-25.00	
16	37.22	38.83	36.30	35.28	35.00	35.00	39.46	42.96	42.08	42.38	42.89	44.21	41.96	26.25	9.52	-12.74	-25.00	
17	39.22	38.77	38.40	37.52	35.98	35.00	37.73	41.36	43.27	42.81	43.70	45.11	39.96	25.00	7.40	-12.90	-25.00	
18	40.95	40.76	40.50	39.78	38.18	35.12	37.25	39.60	41.94	43.24	44.29	45.85	37.42	23.99	4.51	-14.73	-25.00	
19	42.54	42.72	42.48	42.04	40.37	38.41	39.70	40.99	42.28	43.57	44.06	45.79	35.40	22.81	1.77	-14.84	-25.00	
20	43.69	44.39	44.30	44.17	42.57	41.72	43.01	44.30	45.59	45.73	46.17	45.23	35.62	22.52	2.72	-14.52	-25.00	
21	44.94	45.49	46.16	46.27	44.76	45.03	46.32	47.25	46.95	46.66	46.48	43.81	34.80	22.65	5.00	-13.48	-25.00	
22	45.68	46.75	47.30	47.83	47.24	48.35	48.47	48.17	47.88	47.48	46.65	42.90	34.80	24.23	6.16	-11.87	-25.00	
23	46.32	47.17	48.22	49.11	49.99	49.69	49.40	49.10	48.80	48.27	46.98	42.62	35.05	25.81	7.79	-9.80	-25.00	
24	47.01	47.86	48.71	49.60	50.00	50.00	50.00	50.00	49.72	48.50	47.19	42.45	35.36	26.70	10.33	-7.76	-23.29	
25	47.70	48.55	49.40	50.00	50.00	50.00	50.00	50.00	50.00	48.73	48.10	42.51	35.23	26.72	11.31	-5.08	-19.68	
26	48.39	49.24	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.03	48.96	43.34	36.20	26.82	11.99	-1.69	-16.72	
27	49.08	49.93	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	49.44	44.89	38.80	26.19	12.55	3.18	-14.96	
28	49.77	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	49.97	45.43	36.32	25.56	16.20	8.21	-15.28	
29	50.00	50.00	50.00	50.00	50.00	50.03	50.00	50.00	50.00	50.00	50.00	47.46	38.58	25.00	19.84	13.20	-12.73	
30	50.00	50.00	50.00	53.11	54.58	54.18	53.96	53.75	53.53	53.32	50.39	50.14	40.30	26.21	23.49	16.95	-10.05	
31	50.00	51.17	56.35	60.56	59.35	58.32	58.11	57.89	57.68	56.43	53.48	51.14	45.00	31.06	25.00	21.64	-6.74	
32	53.04	59.13	64.00	66.18	64.14	62.46	62.25	62.04	61.63	58.58	58.11	51.90	51.02	36.80	25.00	25.28	-2.70	
33	62.62	68.00	72.23	71.28	68.93	66.94	66.39	66.18	63.82	63.35	62.14	59.23	55.57	43.18	25.93	26.21	1.14	
34	72.14	78.62	82.12	77.73	73.79	71.61	70.54	69.08	67.95	68.84	66.78	64.10	58.36	48.15	33.34	26.23	3.68	
35	84.66	90.32	92.00	87.80	83.20	77.96	74.30	72.79	73.44	74.33	72.96	68.24	62.15	52.76	40.84	27.88	5.32	
36	98.98	100.00	100.00	98.67	93.97	88.81	84.00	80.18	79.22	79.46	77.31	72.71	66.51	57.51	48.39	29.83	7.47	
37	100.00	100.00	100.00	100.00	100.00	99.89	95.19	91.50	89.95	87.54	85.13	79.44	70.54	63.26	53.43	32.76	11.44	
38	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	98.87	95.63	92.68	90.03	74.57	67.82	58.82	36.56	13.74
39	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	83.91	71.08	63.28	41.80	15.79
40	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	92.81	74.41	67.12	49.71	20.57
41	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	96.19	79.20	71.02	57.72	28.93
42	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	92.98	80.80	74.69	65.68	34.77
43	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	98.61	91.09	81.88	77.90	74.90	41.58
44	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.84	92.30	83.08	81.78	84.44	52.66
45	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.84	92.30	83.08	81.78	84.44	52.66
46	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.84	92.30	83.08	81.78	84.44	52.66
47	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	93.51	84.46	85.33	86.74	85.92	65.92
48	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	94.11	86.71	87.08	88.44	87.23	72.30
49	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	94.72	88.96	88.89	89.97	76.94	61.67
50	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	95.32	90.98	90.71	91.29	81.67	66.25
51	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	95.92	92.62	92.57	92.61	86.25	71.63
52	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	96.53	94.25	94.38	93.67	91.63	81.11
53	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	97.13	95.89	96.05	94.73	93.11	81.11
54	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	98.30	97.52	97.37	95.79	93.89	81.11
55	112.34	104.88	101.33	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.98	99.15	98.18	96.54	94.66	81.11
56	126.49	119.01	114.74	109.83	105.01	101.90	100.96	100.00	100.00	100.00	102.50	104.19	100.00	100.00	98.85	97.31	95.43	81.11
57	138.38	131.89	127.18	122.56	118.75	115.14	113.21	111.06	109.85	108.31	107.90	109.59	100.00	100.00	99.61	98.08	96.19	81.11
58	150.43	148.84	141.04	136.13	132.83	130.12	127.61	125.72	122.74	117.10	114.65	111.40	101.32	100.00	99.87	99.03	97.15	81.11
59	150.00	150.00	150.00	150.00	149.58	145.63	143.55	140.95	135.46	127.83	121.13	113.29	103.22	100.00	99.95	100.05	98.50	81.11
60	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	148.46	138.78	128.91	119.74	104.69	100.00	99.96	99.84	100.03	81.11
61	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	145.83	137.76	126.33	102.48	100.00	99.97	99.89	99.53	81.11
62	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	145.07	138.33	129.24	112.51	100.00	99.99	99.90	97.94	81.11
63	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	147.39	141.51	134.62	127.17	107.98	100.00	100.44	91.66	81.11
64	150.00	150.00	150.00	150.00														

TABLE D.2-6. HYDRAULIC CONDUCTIVITY OF THE SURFICIAL AQUIFER (FEET/DAY) (continued).

Row	Column																				
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	
1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
5	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
6	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	
7	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	1.327	0.000	0.000	0.000	0.000	0.000	0.061	2.000	
8	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	0.000	0.000	0.000	0.069	2.000	2.000	2.000	
9	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	1.654	0.000	0.000	2.000	2.000	2.000	2.000	2.000	
10	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	
11	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	
12	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	
13	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	
14	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	
15	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	
16	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	
17	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	
18	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.709	
19	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.711	3.683	
20	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.732	3.606	4.528
21	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.770	3.580	4.389	5.304	6.065
22	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.018	2.828	3.637	4.446	5.256	6.065	6.932
23	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	1.986	2.775	3.484	4.338	5.141	6.122	6.932	7.785	8.632
24	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	1.987	1.830	1.640	1.786	2.851	3.917	4.982	6.047	7.112
25	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	1.987	1.830	1.640	1.786	2.851	3.917	4.982	6.047	7.112
26	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	1.895	1.735	1.663	1.473	1.368	2.302	3.367	4.433	5.498	6.563
27	2.000	2.000	2.000	2.000	2.000	2.000	2.000	1.961	1.905	1.864	1.827	1.482	1.398	1.306	1.193	1.753	2.818	3.883	4.949	6.014	7.079
28	2.000	2.000	1.975	1.863	1.760	1.665	1.594	1.537	1.501	1.471	1.385	1.230	1.124	1.140	0.971	1.204	2.269	3.334	4.399	5.465	6.530
29	1.649	1.532	1.438	1.341	1.257	1.182	1.149	1.114	1.097	1.079	1.065	0.978	0.850	0.881	0.783	0.750	1.720	2.785	3.850	4.916	5.981
30	1.042	0.968	0.895	0.819	0.749	0.700	0.703	0.690	0.693	0.687	0.729	0.654	0.576	0.606	0.616	0.549	1.171	2.236	3.301	4.366	5.431
31	0.427	0.397	0.351	0.296	0.240	0.218	0.249	0.267	0.283	0.295	0.336	0.349	0.314	0.332	0.363	0.327	0.622	1.687	2.752	3.817	4.882
32	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.040	0.040	0.040	0.040	0.040
33	0.789	1.191	1.141	0.648	0.158	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.040	0.040	0.040	0.040	0.040
34	9.031	9.042	9.034	9.024	9.013	9.002	8.519	8.021	7.309	6.192	5.080	4.030	3.068	2.140	1.251	0.317	0.040	0.040	0.040	0.040	0.040
35	9.220	9.236	9.232	9.228	9.224	9.212	9.212	9.206	9.190	9.176	9.150	9.124	9.097	9.067	9.034	8.485	6.735	5.423	4.292	3.592	2.947
36	9.410	9.430	9.430	9.432	9.429	9.432	9.434	9.433	9.419	9.414	9.399	9.383	9.365	9.340	9.319	9.273	9.203	9.124	8.988	8.549	7.904
37	9.599	9.625	9.628	9.629	9.638	9.646	9.649	9.653	9.648	9.655	9.648	9.632	9.622	9.613	9.604	9.569	9.510	9.441	9.370	8.548	7.903
38	9.777	9.812	9.818	9.831	9.846	9.852	9.868	9.878	9.877	9.895	9.882	9.884	9.885	9.887	9.872	9.865	9.797	9.753	9.705	8.548	7.903
39	9.964	10.003	10.014	10.033	10.043	10.065	10.085	10.102	10.106	10.108	10.127	10.137	10.141	10.139	10.151	10.161	10.096	10.070	10.040	8.549	7.904
40	10.151	10.194	10.210	10.223	10.249	10.277	10.294	10.315	10.334	10.322	10.372	10.372	10.386	10.407	10.430	10.438	10.396	10.366	10.364	8.549	7.904
41	10.328	10.374	10.405	10.423	10.455	10.475	10.511	10.534	10.561	10.546	10.589	10.616	10.645	10.670	10.680	10.710	10.695	10.674	10.661	10.270	9.409
42	10.514	10.564	10.599	10.623	10.647	10.685	10.724	10.757	10.778	10.775	10.829	10.865	10.886	10.908	10.950	10.995	10.991	10.984	10.966	10.701	9.410
43	10.693	10.753	10.793	10.811	10.849	10.894	10.925	10.964	10.993	11.004	11.064	11.086	11.122	11.171	11.219	11.251	11.287	11.272	11.311	11.132	9.411
44	10.872	10.943	10.988	11.002	11.053	11.087	11.140	11.177	11.217	11.233	11.277	11.322	11.376	11.418	11.457	11.514	11.583	11.572	11.605	11.582	9.412
45	11.056	11.119	11.167	11.200	11.242	11.292	11.349	11.396	11.429	11.462	11.490	11.563	11.603	11.648	11.718	11.789	11.845	11.843	11.891	11.957	9.413
46	11.229	11.293	11.354	11.389	11.436	11.499	11.546	11.600	11.637	11.689	11.703	11.776	11.832	11.906	11.971	12.031	12.101	12.114	12.196	12.292	9.414
47	11.408	11.475	11.540	11.571	11.638	11.690	11.755	11.805	11.859	11.903	11.918	12.004	12.079	12.139	12.204	12.286	12.382	12.411	12.503	12.589	9.415
48	11.588	11.659	11.716	11.767	11.826	11.887	11.961	12.022	12.066	12.111	12.134	12.234	12.296	12.364	12.457	12.545	12.630	12.708	12.781	12.882	9.416
49	11.759	11.832	11.905	11.962	12.012	12.092	12.156	12.222	12.269	12.333	12.380	12.446	12.517	12.614	12.695	12.782	12.877	13.000	13.059	13.176	9.417
50	11.938	12.015	12.094	12.156	12.211	12.281	12.357	12.421	12.487	12.542	12.589	12.659	12.751	12.834	12.924	13.028	13.141	13.252	13.341	13.484	9.418
51	12.111	12.192	12.271	12.344	12.399	12.471	12.561	12.634	12.690	12.748	12.817	12.872	12.964	13.055	13.168	13.272	13.383	13.504	13.625	13.769	9.419
52	12.281	12.364	12.445	12.521	12.583	12.673	12.754	12.832	12.891	12.962	13.029	13.085	13.179	13.288	13.393	13.505	13.626	13.761	13.895	14.000	9.420
53	12.460	12.547	12.620	12.706	12.773	12.861	12.948	13.029	13.101	13.168	13.237	13.299	13.403	13.505	13.617	13.742	13.870	14.000	14.000	14.000	9.421
54	12.628	12.718	12.797	12.885	12.961	13.049	13.149	13.234	13.301	13.371	13.448	13.514	13.616	13.722	13.845	13.972	14.000	14.000	14.000	14.000	9.4

TABLE D.2-8. HYDRAULIC CONDUCTIVITY OF THE SURFICIAL AQUIFER (FEET/DAY) (continued).

Row	Column																				
	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	
1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
7	2.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.000	10.000	10.264	10.117	10.000	
8	2.000	2.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.634	10.266	10.591	10.889	11.188	11.407	10.951
9	2.000	2.000	2.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	7.839	10.428	10.964	11.458	11.813	12.111	12.409	12.539	
10	2.000	2.000	2.000	2.000	1.945	0.398	0.143	0.000	0.000	0.000	1.920	10.036	10.533	11.061	11.599	12.154	12.660	13.034	13.333	13.590	
11	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	5.761	7.724	10.183	10.653	11.139	11.651	12.204	12.771	13.344	13.869	14.256	14.554	
12	2.000	2.000	2.000	2.000	2.000	2.149	3.432	5.649	9.077	10.000	10.620	11.250	11.739	12.242	12.770	13.333	13.944	14.534	15.077	15.478	
13	2.000	2.000	2.000	2.000	2.526	4.006	5.477	7.341	10.000	10.409	11.039	11.670	12.300	12.825	13.346	13.889	14.462	15.075	15.707	16.286	
14	2.000	2.000	2.000	2.555	3.836	5.239	6.794	8.772	10.198	10.828	11.459	12.089	12.719	13.350	13.901	14.449	15.008	15.592	16.222	16.872	
15	2.000	2.000	2.598	3.792	5.071	6.445	7.938	9.602	10.504	11.233	11.878	12.509	13.139	13.769	14.400	14.965	15.560	16.127	16.725	17.369	
16	2.000	2.656	3.753	4.909	6.191	7.563	9.034	10.242	10.885	11.533	12.197	12.893	13.558	14.189	14.819	15.449	16.028	16.629	17.246	17.861	
17	2.661	3.657	4.880	6.025	7.170	8.528	9.981	10.627	11.268	11.909	12.556	13.214	13.888	14.554	15.238	15.869	16.499	17.092	17.708	18.342	
18	3.720	4.708	5.785	7.008	8.231	9.431	10.374	11.002	11.639	12.282	12.931	13.582	14.233	14.894	15.578	16.241	16.919	17.549	18.156	18.788	
19	4.693	5.767	6.755	7.912	9.135	10.000	10.638	11.329	12.013	12.646	13.286	13.937	14.594	15.255	15.915	16.581	17.289	17.939	18.599	19.220	
20	5.553	6.613	7.743	8.817	10.000	10.206	10.896	11.587	12.277	12.968	13.652	14.294	14.938	15.592	16.258	16.928	17.597	18.272	18.960	19.638	
21	6.293	7.343	8.463	9.651	10.000	10.079	10.991	11.857	12.535	13.226	13.916	14.607	15.291	15.941	16.594	17.254	17.921	18.601	19.278	19.963	
22	7.004	8.028	9.132	10.000	10.000	10.000	10.761	11.673	12.585	13.497	14.193	14.868	15.555	16.246	16.929	17.588	18.250	18.918	19.594	21.873	
23	7.741	8.712	9.764	10.000	10.000	10.000	10.531	11.443	12.355	13.267	14.179	15.091	15.853	16.528	17.204	17.885	18.588	19.236	19.906	24.032	
24	8.203	9.324	10.000	10.000	10.000	10.000	10.302	11.214	12.125	13.037	13.949	14.861	15.773	16.685	17.512	18.188	18.863	19.539	21.501	26.230	
25	8.174	9.149	10.000	10.000	10.000	10.000	10.072	10.984	11.896	12.807	13.719	14.631	15.543	16.455	17.367	18.279	19.172	19.848	23.696	28.467	
26	7.628	8.694	9.801	10.000	10.000	10.000	10.000	10.754	11.666	12.578	13.490	14.401	15.313	16.225	17.137	18.049	19.072	20.937	25.470	30.631	
27	7.079	8.036	9.375	10.000	10.000	10.000	10.000	10.524	11.436	12.348	13.260	14.172	15.084	15.995	17.206	18.450	19.694	22.792	27.325	31.858	
28	6.530	7.449	8.597	9.136	9.905	10.000	10.000	10.294	11.206	12.118	13.030	14.096	15.340	16.583	17.827	19.071	20.115	24.648	29.180	33.713	
29	5.572	6.714	6.887	7.488	8.137	8.889	9.778	10.064	10.986	12.230	13.269	14.185	15.101	16.017	17.062	18.782	21.556	25.785	30.014	34.243	
30	4.654	5.007	5.225	5.705	6.318	6.983	7.794	8.774	9.958	10.885	11.801	12.717	13.659	15.026	16.709	18.833	22.341	26.652	30.962	35.273	
31	3.123	3.300	3.576	3.988	4.399	4.897	5.747	6.772	7.918	9.139	10.333	11.375	12.655	14.261	16.338	19.083	22.916	27.155	31.426	35.724	
32	1.416	1.586	1.804	2.111	2.465	2.892	3.782	4.669	5.765	6.860	8.185	9.622	11.104	12.995	15.756	18.784	22.813	27.240	31.668	36.095	
33	0.040	0.040	0.040	0.217	0.415	0.837	1.622	2.493	3.448	4.478	5.703	7.101	8.767	11.208	14.179	17.588	21.808	26.316	30.823	35.330	
34	0.040	0.040	0.040	0.040	0.040	0.040	0.177	1.018	1.985	3.006	4.594	6.641	8.932	11.855	15.792	20.781	25.245	29.685	34.126		
35	3.368	3.067	2.373	1.712	1.081	0.211	0.040	0.040	0.040	0.501	2.232	4.307	6.427	9.030	13.355	18.575	23.081	27.571	31.961		
36	8.715	8.778	7.989	7.214	6.484	5.552	4.284	2.710	0.463	0.040	0.040	0.040	1.425	3.681	8.110	9.284	14.296	20.241	24.833	29.948	
37	8.407	8.752	9.098	9.287	9.242	9.190	9.125	9.008	8.817	4.096	1.148	0.040	0.040	0.435	2.763	5.887	9.591	15.680	21.866	27.434	
38	8.756	9.101	9.446	9.713	9.696	9.675	9.630	9.521	9.336	9.117	7.681	4.622	1.365	0.040	0.040	1.233	5.643	10.847	17.712	24.34	
39	9.152	9.449	9.794	10.128	10.112	10.122	10.134	10.034	9.849	9.631	9.413	9.325	8.649	3.342	0.040	0.040	1.105	6.374	12.780	19.870	
40	9.549	9.797	10.142	10.488	10.551	10.592	10.639	10.547	10.363	10.145	9.926	10.185	9.852	9.242	4.580	0.040	0.040	1.058	7.648	14.845	
41	9.945	10.174	10.491	10.836	10.990	11.030	11.075	11.060	10.877	10.658	10.622	10.978	10.803	10.307	9.738	5.941	0.040	0.040	2.147	9.627	
42	10.341	10.571	10.839	11.184	11.371	11.446	11.553	11.573	11.391	11.172	11.340	11.677	11.751	11.371	11.243	10.815	6.466	0.040	0.040	3.766	
43	10.738	10.967	11.197	11.532	11.778	11.900	12.010	12.081	11.904	11.720	12.057	12.395	12.682	12.472	12.746	13.308	10.993	6.507	0.040	8.009	
44	11.134	11.364	11.593	11.880	12.187	12.300	12.428	12.586	12.418	12.437	12.775	13.112	13.481	13.589	14.248	15.000	14.319	11.622	6.818	1.000	
45	11.531	11.760	11.990	12.229	12.556	12.692	12.873	13.058	12.932	13.155	13.492	13.830	14.230	14.705	15.000	15.000	15.000	14.917	10.911	3.908	
46	11.927	12.157	12.386	12.616	12.922	13.112	13.289	13.491	13.534	13.872	14.210	14.547	14.979	15.000	15.000	15.000	15.000	15.000	13.406	9.172	
47	12.323	12.553	12.783	13.012	13.271	13.493	13.694	13.924	14.191	14.488	14.784	15.000	15.000	15.000	15.000	15.000	15.000	15.000	14.840	10.926	
48	12.720	12.950	13.179	13.409	13.638	13.873	14.081	14.291	14.532	14.869	15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000	14.318	11.880	
49	13.116	13.346	13.575	13.805	14.019	14.169	14.371	14.602	14.852	15.000	15.000	15.000	15.000	15.000	15.000	15.000	14.584	13.878	12.915	12.153	
50	13.513	13.742	13.972	14.104	14.223	14.342	14.538	14.767	15.000	15.000	15.000	15.000	15.000	15.000	14.763	14.307	13.750	13.070	12.342	11.616	
51	13.909	14.000	14.000	14.000	14.188	14.429	14.666	14.795	15.000	15.000	15.000	15.000	14.905	14.606	14.187	13.769	13.351	12.797	12.145	11.443	
52	14.000	14.000	14.000	14.000	14.015	14.256	14.497	14.738	14.892	14.963	14.930	14.694	14.424	14.006	13.587	13.169	12.751	12.333	11.915	11.497	
53	14.000	14.000	14.000	14.000	14.000	14.003	14.324	14.565	14.589	14.571	14.482	14.242	13.824	13.406	12.988	12.569	12.151	11.733	11.315	10.887	
54	14.000	14.000	14.000	14.000	14.000	14.000	14.151	14.392	14.291	14.191	14.031	13.680	13.305	12.931	12.557	12.182	11.808	11.434	11.059	10.685	
55	14.000	1																			

TABLE D.2-6. HYDRAULIC CONDUCTIVITY OF THE SURFICIAL AQUIFER (FEET/DAY) (continued).

Row	Column																				
	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	
1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	5.674	6.879	8.200	9.839	5.871	0.000	0.000	0.482	0.000	0.000	0.000	
7	10.000	9.302	0.000	0.000	0.000	0.000	10.062	11.814	13.405	15.054	17.788	20.000	20.000	15.042	11.569	16.742	21.426	20.954	19.012	17.455	
8	10.198	10.000	9.210	0.000	0.000	10.588	12.607	14.559	16.580	18.866	20.000	21.160	22.355	23.550	20.331	30.437	42.962	47.359	45.996	35.242	
9	11.786	11.033	10.279	7.967	10.249	12.655	14.929	17.014	19.141	22.298	25.896	29.292	30.487	31.682	34.882	45.718	50.000	50.000	50.000	40.327	
10	13.373	12.620	11.867	12.081	12.367	14.753	17.063	19.261	22.359	25.958	29.556	33.154	36.752	39.813	41.008	50.000	50.000	50.000	50.000	43.137	
11	14.952	14.208	13.455	14.290	15.143	16.889	19.227	21.679	24.170	28.049	31.928	35.807	39.687	43.566	47.445	50.000	50.000	50.000	50.000	47.373	
12	15.774	15.796	15.042	15.900	17.273	19.079	21.619	24.295	26.568	29.414	33.293	37.173	41.052	44.931	48.810	50.000	50.000	50.000	50.000	50.000	
13	16.699	17.115	16.630	17.509	19.146	21.452	24.135	26.811	29.250	31.493	34.658	38.538	42.417	46.296	50.000	50.000	50.000	50.000	50.000	50.000	
14	17.494	17.921	18.218	19.056	21.375	23.936	26.618	29.327	32.003	34.284	36.104	39.903	43.782	47.661	50.000	50.000	50.000	50.000	50.000	49.970	
15	18.038	18.703	19.279	20.810	23.950	26.773	29.079	31.785	34.518	37.195	38.987	41.268	45.147	49.026	50.000	50.000	50.000	50.000	50.000	49.854	
16	18.516	19.204	19.912	23.103	26.402	29.537	32.000	34.221	36.952	39.710	42.006	43.778	46.512	50.000	50.000	50.000	50.000	50.000	50.000	50.000	
17	18.995	19.663	21.950	25.525	28.882	31.993	35.035	37.227	39.399	42.119	44.902	46.838	48.322	50.000	50.000	50.000	50.000	50.000	50.000	50.000	
18	19.438	20.659	24.545	28.106	31.487	34.662	37.585	40.283	42.454	44.626	47.268	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	44.194	
19	19.867	23.444	27.481	31.114	34.317	37.449	40.401	43.177	45.510	47.682	49.853	50.000	50.000	50.000	50.000	50.000	49.023	43.104	37.121	29.431	
20	21.870	26.204	30.521	34.304	37.683	40.650	43.411	46.117	48.566	50.000	50.000	50.000	50.000	50.000	43.422	34.609	27.787	19.705	13.582	10.858	7.903
21	24.357	28.886	33.281	37.599	41.126	44.282	46.983	49.524	50.000	50.000	50.000	50.000	50.000	50.000	43.422	34.609	27.787	19.705	13.582	10.858	7.903
22	26.519	31.117	35.686	40.181	44.676	48.057	50.000	50.000	50.000	50.000	50.000	50.000	50.000	49.281	36.787	27.978	19.511	12.318	7.251	7.000	7.000
23	28.688	33.344	37.936	42.496	47.048	50.442	53.239	50.875	50.000	50.000	50.000	50.000	46.584	32.747	21.288	13.213	7.821	7.000	7.000	7.000	7.000
24	30.910	35.599	40.205	44.808	49.367	52.936	55.733	54.332	51.956	50.000	50.000	50.000	43.800	28.804	14.717	9.302	7.000	7.000	7.000	7.000	7.000
25	33.172	37.849	42.494	47.129	51.812	55.859	58.227	57.788	55.412	53.037	50.661	50.000	40.558	24.638	13.279	8.183	7.000	7.000	7.000	7.000	7.000
26	35.419	40.191	44.849	49.492	54.293	59.066	60.721	61.244	58.869	56.493	54.118	51.425	37.306	22.507	12.327	7.148	7.000	7.000	7.000	7.000	7.000
27	36.390	41.467	46.711	51.464	56.773	61.593	63.965	64.701	62.325	59.949	56.539	50.371	37.373	24.448	13.603	7.013	7.000	7.000	7.000	7.000	7.000
28	38.245	42.778	47.311	52.720	58.564	63.852	67.994	68.157	66.000	63.925	56.482	48.542	37.403	26.263	15.316	7.000	7.000	7.000	7.000	7.000	7.000
29	38.657	43.203	47.750	53.706	60.111	66.288	70.000	70.000	70.000	63.328	55.360	46.840	37.162	27.484	17.806	8.811	7.000	7.000	7.000	7.000	7.000
30	39.584	43.883	48.181	54.741	62.700	69.366	70.000	70.000	70.000	65.475	55.245	45.400	36.508	28.008	19.508	11.289	7.000	7.000	7.000	7.000	7.000
31	40.022	44.320	48.618	56.700	66.244	70.000	70.000	70.000	70.000	67.993	54.518	44.367	36.355	28.406	20.824	13.352	7.000	7.000	7.000	7.000	7.000
32	40.485	44.758	49.056	57.705	64.725	70.000	70.000	70.000	70.000	66.981	51.629	43.535	36.302	29.069	21.885	15.042	9.001	7.519	7.000	7.000	7.000
33	39.912	44.534	49.156	50.400	63.073	70.000	70.000	70.000	70.000	64.250	49.418	42.520	35.821	28.724	23.222	18.170	14.060	12.009	11.812	11.546	11.546
34	38.410	43.532	48.891	56.188	64.739	70.000	70.000	70.000	70.000	61.459	48.102	41.843	35.697	30.468	26.076	21.202	17.257	15.717	15.802	15.908	15.908
35	37.182	42.501	48.198	55.853	63.992	70.000	70.000	70.000	70.000	58.578	47.222	41.855	36.472	31.763	27.177	22.979	20.001	17.895	18.057	18.426	18.426
36	35.593	41.216	47.577	55.187	63.190	70.000	70.000	70.000	70.000	55.594	46.828	41.957	37.098	32.238	28.713	25.735	22.757	19.779	20.343	20.706	20.706
37	33.319	39.571	46.994	55.368	63.995	70.000	70.000	70.000	70.000	55.808	47.018	42.159	37.424	34.446	31.489	28.491	25.513	22.535	22.267	23.067	23.067
38	31.568	38.899	47.556	57.081	66.792	70.000	70.000	70.000	70.000	69.116	55.839	47.220	43.158	40.180	37.202	34.224	31.247	28.269	25.291	23.968	24.956
39	28.687	37.535	48.101	59.443	70.000	70.000	70.000	70.000	68.175	55.861	48.798	45.914	42.936	39.958	36.980	34.003	31.025	28.047	25.339	26.911	26.911
40	23.550	35.864	49.058	60.180	70.000	70.000	70.000	70.000	67.275	55.794	48.831	48.441	44.260	42.097	39.736	36.758	33.781	30.803	27.825	28.684	28.684
41	17.001	32.040	50.500	60.604	70.000	70.000	70.000	70.000	67.874	56.360	48.284	45.108	43.447	41.696	39.371	37.490	35.395	33.559	30.581	30.000	30.000
42	12.043	19.292	40.300	57.740	70.000	70.000	70.000	70.000	69.656	57.428	48.257	44.609	41.684	39.606	37.855	36.104	34.353	32.404	30.523	30.000	30.000
43	6.245	14.388	25.181	51.345	64.749	70.000	70.000	70.000	70.000	58.649	48.223	43.925	39.851	37.418	35.590	34.014	32.263	30.512	30.000	29.471	29.471
44	1.000	9.526	17.081	38.045	58.131	70.000	70.000	70.000	70.000	59.541	48.418	43.551	38.678	35.738	33.164	31.558	30.173	29.339	27.236	25.547	25.547
45	1.000	2.941	12.390	23.044	51.057	68.072	70.000	70.000	70.000	59.749	47.825	43.153	38.480	33.807	29.653	28.444	27.048	25.538	23.741	21.788	21.788
46	1.000	1.000	6.402	16.120	37.105	61.405	70.000	70.000	70.000	59.020	47.231	41.781	36.283	30.785	26.601	25.131	23.655	21.962	20.124	17.771	17.771
47	5.444	1.000	1.000	11.011	21.496	51.940	70.000	70.000	70.000	56.208	44.159	38.209	32.711	27.213	23.622	21.997	20.396	18.008	15.605	13.277	13.277
48	9.442	1.098	0.025	4.263	15.311	36.669	63.740	70.000	67.604	52.421	40.653	33.830	28.619	23.640	20.642	18.314	15.866	13.168	10.851	9.460	9.460
49	10.606	6.683	0.025	0.025	9.812	19.368	52.262	64.106	62.328	50.388	36.890	28.209	22.286	18.664	15.729	13.053	10.508	9.321	8.455	7.583	7.583
50	10.686	9.479	3.219	0.025	2.820	12.148	28.063	46.877	46.898	35.768	26.275	19.076	15.857	12.901	10.118	9.185	8.325	7.462	6.588	5.715	5.715
51	10.749	9.895	8.292	0.025	5.001	13.933	23.740	24.241	18.477	15.730	12.659	9.898	9.050	8.199	7.341	6.477	5.608	4.731	3.851	3.851	3.851
52	10.910	10.151	9.416	4.653	0.025	0.246	6.683	12.521	14.470	11.821	9.767	8.942	8.104	7.221	6.369</						

TABLE D.2-6. HYDRAULIC CONDUCTIVITY OF THE SURFICIAL AQUIFER (FEET/DAY) (continued).

Row	Column																				
	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	
1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
7	16.014	14.698	13.423	12.226	8.575	4.517	4.163	4.002	3.611	2.944	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
8	28.219	24.207	23.604	21.533	20.000	17.332	17.557	17.769	17.968	18.173	10.268	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
9	33.250	30.501	28.853	26.781	23.938	19.652	19.646	19.688	19.851	20.000	20.000	11.761	1.668	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
10	37.748	36.173	33.248	29.000	22.668	19.225	19.219	19.315	19.477	19.639	19.801	19.964	13.285	3.319	1.438	1.751	2.060	2.415	2.832	10.005	
11	43.494	38.976	34.062	27.730	21.398	18.797	18.792	18.941	19.103	19.265	19.428	19.599	19.876	16.600	17.331	18.149	18.996	19.905	20.267	21.243	
12	44.704	39.123	32.792	26.460	20.128	18.370	18.405	18.567	18.730	18.892	19.054	19.224	19.599	20.876	22.952	24.026	24.307	24.713	25.140	25.669	
13	44.185	37.854	31.522	25.190	18.858	17.942	18.032	18.194	18.356	18.518	18.773	19.046	19.725	21.415	23.106	25.889	28.923	29.403	30.000	30.000	
14	42.915	36.584	30.252	23.920	17.588	17.515	17.658	17.820	17.982	18.222	18.493	18.750	20.264	21.955	23.645	25.335	28.255	30.000	30.000	30.000	
15	41.737	35.313	28.982	22.650	17.093	17.122	17.284	17.447	17.610	17.939	18.197	18.493	20.803	22.494	24.184	25.874	27.565	30.000	30.000	30.000	
16	41.621	34.044	27.712	21.380	16.666	16.748	16.911	17.119	17.386	17.644	17.962	19.653	21.343	23.033	24.723	26.414	28.104	29.794	30.000	30.000	
17	41.894	33.388	26.442	20.110	16.239	16.375	16.567	16.833	17.090	17.348	18.501	20.192	21.882	23.572	25.263	26.953	28.358	29.563	30.000	30.000	
18	41.047	33.745	25.172	18.840	15.839	16.016	16.279	16.537	16.795	17.350	19.041	20.731	22.421	24.111	25.642	26.786	27.977	29.204	30.000	30.000	
19	27.509	27.442	25.350	17.570	15.465	15.726	15.984	16.242	16.500	17.890	19.580	21.270	22.961	24.652	25.141	26.290	27.574	28.857	30.000	30.000	
20	14.470	14.488	14.503	14.515	15.173	15.431	15.689	15.946	16.739	18.429	20.119	21.297	22.319	23.400	24.680	25.943	27.227	28.510	29.793	30.000	
21	7.611	8.171	8.708	9.172	12.994	15.135	15.393	15.651	17.278	18.715	19.663	20.667	21.746	23.029	24.313	25.596	26.879	28.163	29.660	30.000	
22	7.000	7.000	7.000	7.000	8.252	12.450	15.097	16.127	16.983	17.882	18.832	20.115	21.399	22.682	24.113	25.616	27.119	28.622	30.000	30.000	
23	7.000	7.000	7.000	7.000	7.000	7.900	12.438	15.196	16.070	17.201	18.566	20.069	21.572	23.075	24.578	26.082	27.585	29.088	30.000	30.000	
24	7.000	7.000	7.000	7.000	7.000	7.000	9.619	13.231	15.837	17.538	19.032	20.535	22.038	23.541	25.044	26.547	28.051	29.554	30.000	30.000	
25	7.000	7.000	7.000	7.000	7.000	7.000	8.094	11.880	15.445	17.372	19.329	20.899	22.702	24.007	25.510	27.013	28.516	30.000	30.000	30.000	
26	7.000	7.000	7.000	7.000	7.000	7.000	7.000	10.675	14.872	17.183	19.434	21.217	23.163	24.723	26.353	27.798	29.162	30.000	30.000	30.000	
27	7.000	7.000	7.000	7.000	7.000	7.000	7.724	10.809	14.136	16.928	19.543	21.639	23.770	25.642	27.380	29.029	30.000	30.000	30.000	30.000	
28	7.000	7.000	7.000	7.000	7.000	7.000	9.569	12.192	14.814	17.365	19.592	22.226	24.602	26.887	28.757	30.000	30.000	30.000	30.000	30.000	
29	7.000	7.000	7.000	7.000	7.000	8.835	11.417	14.040	16.767	19.386	21.791	24.018	26.246	28.473	30.000	30.000	30.000	30.000	30.000	30.000	
30	7.000	7.000	7.000	7.000	8.387	10.801	13.298	16.051	18.882	21.520	23.962	26.217	28.444	30.000	30.000	30.000	30.000	30.000	30.000	30.000	
31	7.000	7.000	7.000	7.953	10.237	12.629	15.151	18.441	21.440	24.032	26.419	28.624	30.000	30.000	30.000	30.000	30.000	30.000	30.000	29.874	
32	7.236	7.917	8.543	9.994	12.047	14.399	17.716	21.040	24.061	26.818	29.200	30.000	30.000	30.000	30.000	30.000	30.000	30.000	28.797	24.993	
33	11.893	12.092	12.431	12.438	14.088	16.938	20.861	24.221	27.186	29.872	30.000	30.000	30.000	30.000	30.000	30.000	30.000	27.698	23.860	20.061	
34	15.975	16.134	16.351	16.497	17.833	20.847	24.218	27.735	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	26.553	22.675	19.367	17.315
35	18.895	19.217	19.899	20.908	22.101	25.313	28.548	30.000	30.000	30.000	30.000	30.000	30.000	30.000	29.372	25.392	21.481	18.654	16.538	14.516	
36	21.383	22.314	23.246	24.472	26.501	29.588	30.000	30.000	30.000	30.000	30.000	30.000	30.000	28.221	24.213	20.254	17.818	15.662	13.606	11.617	
37	23.801	24.750	26.288	28.029	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	27.048	22.990	19.343	16.917	14.604	12.502	10.537	9.277	
38	26.118	27.317	28.896	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	25.747	21.743	18.426	15.796	13.454	11.214	9.611	8.664	7.691	
39	28.062	29.558	30.000	30.000	30.000	30.000	30.000	30.000	30.000	28.421	23.438	19.763	17.350	14.620	12.062	9.900	8.962	8.018	7.064	6.108	
40	30.000	30.000	30.000	30.000	30.000	30.000	30.000	27.380	24.393	20.295	17.847	15.474	13.043	10.505	9.256	8.323	7.378	6.433	5.472	4.515	
41	30.000	30.000	30.000	30.000	29.186	26.763	23.922	20.768	18.294	16.002	13.672	11.243	9.540	8.621	7.687	6.753	5.803	4.855	3.890	2.928	
42	30.000	30.000	28.375	26.195	23.857	21.155	18.707	16.507	14.252	11.931	9.817	8.875	7.949	7.064	6.127	5.187	4.235	3.281	2.315	1.345	
43	27.767	25.817	23.763	21.405	19.090	16.978	14.790	12.571	10.267	9.132	8.169	7.249	6.336	5.467	4.574	3.629	2.676	1.716	0.749	0.009	
44	23.860	21.631	19.427	17.362	15.304	13.160	10.943	9.409	8.407	7.446	6.509	5.593	4.715	3.839	3.017	2.079	1.123	0.159	0.008	0.006	
45	19.763	17.569	15.450	13.480	11.582	9.709	8.675	7.659	6.695	5.728	4.828	3.915	3.064	2.208	1.394	0.537	0.009	0.007	0.005	0.003	
46	15.509	13.408	11.367	9.746	8.859	7.890	6.883	5.879	4.936	3.999	3.101	2.225	1.369	0.549	0.009	0.008	0.006	0.004	0.002	0.000	
47	11.130	9.602	8.722	7.837	6.946	6.051	5.053	4.090	3.142	2.244	1.355	0.503	0.009	0.008	0.006	0.004	0.002	0.001	0.000	0.000	
48	8.588	7.706	6.823	5.930	5.040	4.136	3.195	2.264	1.339	0.454	0.009	0.008	0.007	0.005	0.003	0.001	0.000	0.000	0.000	0.000	
49	6.706	5.819	4.931	4.033	3.136	2.230	1.321	0.398	0.009	0.008	0.007	0.006	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	
50	4.828	3.942	3.043	2.144	1.239	0.331	0.009	0.008	0.007	0.006	0.005	0.003	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
51	2.959	2.068	1.166	0.259	0.009	0.008	0.007	0.006	0.005	0.004	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
52	1.102	0.201	0.009	0.009	0.008	0.007	0.006	0.004	0.003	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
53	0.009	0.009	0.008	0.007	0.006	0.005	0.004	0.003	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
54	0.008	0.007	0.006	0.005	0.004	0.003	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
55	0.006	0.005	0.005																		

TABLE D.2-7. BASE OF THE SURFICIAL AQUIFER (FEET ABOVE MSL MINUS 7000).

Row	Column																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	20.00	18.32	16.33	14.78	13.38	12.06	10.80	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
2	20.80	19.34	17.07	15.17	13.61	12.04	10.62	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
3	22.27	20.31	17.87	15.62	13.82	12.08	10.47	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
4	23.41	21.30	18.50	16.17	14.04	12.15	10.34	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
5	24.23	22.09	19.05	16.50	14.29	12.21	10.17	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
6	24.80	22.61	19.48	16.82	14.40	12.06	10.02	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
7	25.21	22.97	19.82	16.92	14.46	12.08	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
8	25.53	23.26	20.11	17.19	14.47	12.12	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
9	25.86	23.55	20.40	17.36	14.68	12.07	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.12
10	26.13	23.83	20.70	17.57	14.84	12.29	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.55
11	26.46	24.10	21.02	17.91	15.20	12.40	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.98
12	26.88	24.38	21.33	18.28	15.32	12.48	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.19	11.40
13	27.19	24.80	21.76	18.56	15.56	12.66	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.69	11.98
14	27.61	25.09	22.08	18.95	15.84	12.73	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	11.23	12.43
15	28.05	25.54	22.51	19.28	16.01	12.89	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.26	11.84	12.96
16	28.42	25.85	22.85	19.64	16.35	13.12	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.94	12.38	13.66
17	28.89	26.34	23.19	20.04	16.62	13.15	10.06	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	11.61	13.18	14.16
18	29.36	26.69	23.56	20.41	16.85	13.47	10.24	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.99	12.27	13.80	14.91
19	29.83	27.21	24.00	20.77	17.31	13.74	10.42	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.45	11.97	13.33	14.51	15.61
20	30.00	27.72	24.41	21.25	17.63	13.95	10.64	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	11.43	12.97	14.35	15.51	16.31
21	30.00	28.17	24.87	21.65	17.96	14.28	10.91	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.76	12.40	13.98	15.40	16.22	17.31
22	30.00	28.69	25.33	22.04	18.39	14.63	11.19	10.00	10.00	10.00	10.00	10.00	10.00	10.00	11.64	13.32	14.97	16.41	17.42	18.08
23	30.00	29.18	25.81	22.40	18.79	14.96	11.47	10.00	10.00	10.00	10.00	10.00	10.00	10.63	12.45	14.19	15.93	17.46	18.58	19.18
24	30.00	29.70	26.34	22.91	19.21	15.31	11.79	10.00	10.00	10.00	10.00	10.00	10.00	11.23	13.17	15.01	16.82	18.50	19.69	20.00
25	30.00	30.00	26.96	23.39	19.65	15.72	12.14	10.00	10.00	10.00	10.00	10.00	10.00	11.71	13.76	15.72	17.64	19.47	20.00	20.00
26	30.00	30.00	27.57	23.90	20.10	16.15	12.45	10.00	10.00	10.00	10.00	10.00	10.00	11.29	13.96	16.27	18.28	20.00	20.00	20.00
27	30.00	30.00	28.01	24.30	20.55	16.47	12.71	10.00	10.00	10.00	10.00	10.00	10.00	10.81	13.49	16.16	18.75	20.00	20.00	20.00
28	30.00	30.00	28.69	24.90	20.97	16.67	12.99	10.00	10.00	10.00	10.00	10.00	10.00	10.34	13.01	15.68	18.38	20.00	20.00	20.00
29	30.00	30.00	29.34	25.38	21.17	16.93	13.27	10.30	10.00	10.00	10.00	10.00	10.00	10.00	12.54	15.14	18.35	20.00	20.00	20.00
30	30.00	30.00	30.00	26.01	21.50	17.17	13.70	10.68	10.00	10.00	10.00	10.00	10.00	10.00	11.72	14.40	17.61	20.00	20.00	20.00
31	30.00	30.00	30.00	26.31	21.71	17.48	13.95	11.00	10.00	10.00	10.00	10.00	10.00	10.00	10.17	12.94	16.60	20.00	20.00	20.00
32	30.00	30.00	30.00	27.09	22.40	17.74	14.26	11.31	10.00	10.00	10.00	10.00	10.00	10.00	10.00	11.32	15.11	18.74	20.00	20.00
33	30.00	30.00	30.00	27.66	22.74	18.00	14.56	11.60	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	13.24	16.49	18.34	19.92
34	30.00	30.00	30.00	28.55	23.08	18.31	14.85	11.88	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	11.20	14.04	15.40	16.90
35	30.00	30.00	30.00	29.44	23.98	18.61	15.15	12.11	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	11.47	12.45	13.98
36	30.00	30.00	30.00	30.00	24.62	18.92	15.41	12.36	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	11.23
37	30.00	30.00	30.00	30.00	25.69	19.23	15.68	12.58	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
38	30.00	30.00	30.00	30.00	26.60	19.54	16.01	12.75	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
39	30.00	30.00	30.00	30.00	27.42	19.96	16.23	12.97	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
40	30.00	30.00	30.00	30.00	28.63	20.65	16.46	13.05	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
41	30.00	30.00	30.00	30.00	29.93	21.57	16.78	13.23	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
42	30.00	30.00	30.00	30.00	30.00	22.41	17.15	13.43	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
43	30.00	30.00	30.00	30.00	30.00	23.59	17.49	13.70	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
44	30.00	30.00	30.00	30.00	30.00	24.71	17.78	13.79	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
45	30.00	30.00	30.00	30.00	30.00	25.77	18.19	14.05	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
46	30.00	30.00	30.00	30.00	30.00	26.90	18.58	14.35	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
47	30.00	30.00	30.00	30.00	30.00	28.48	19.01	14.59	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
48	30.00	30.00	30.00	30.00	30.00	30.00	19.52	15.10	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.13
49	30.00	30.00	30.00	30.00	30.00	30.00	20.09	15.16	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.64
50	30.00	30.00	30.00	30.00	30.00	30.00	21.33	15.22	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	11.08
51	30.00	30.00	30.00	30.00	30.00	30.00	22.58	15.75	10.10	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.48	11.49
52	30.00	30.00	30.00	30.00	30.00	30.00	23.55	16.39	10.93	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.19	10.93	11.89
53	30.00	30.00	30.00	30.00	30.00	30.00	24.61	17.05	11.95	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.17	10.65	11.31	12.20
54	30.00	30.00	30.00	30.00	30.00	30.00	25.38	17.83	12.88	10.24	10.00	10.00	10.00	10.00	10.01	10.24	10.61	11.08	11.68	12.43
55	30.00	30.00	30.00	30.00	30.00	30.00	25.91	18.44	14.03	11.27	10.43	10.08	10.20	10.46	10.29	10.59	10.93	11.40	12.00	12.78
56	30.00	30.00	30.00	30.00	30.00	30.00	25.70	19.09	15.04	12.43	11.87	11.04	10.97	11.26	10.57	10.91	11.25	11.72	12.33	12.97
57	30.00	30.00	30.00	30.00	30.00	30.00	25.24	19.72	15.67	13.72	12.31	12.08	11.83	11.59	10.85	11.17	11.56	12.01	12.58	13.18
58	30.00	30.00	30.																	

TABLE D.2-7. BASE OF THE SURFICIAL AQUIFER (FEET ABOVE MSL MINUS 7000) (continued).

Row	Column																			
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	10.00	10.00	10.00	10.00	10.00	10.02	10.39	10.70	10.95	11.19	11.44	11.69	11.95	12.20	12.45	12.70	12.95	13.20	13.45	13.70
2	10.00	10.00	10.00	10.00	10.08	10.57	10.91	11.20	11.43	11.65	11.88	12.11	12.34	12.57	12.79	13.04	13.29	13.55	13.80	14.05
3	10.00	10.00	10.00	10.16	10.66	11.13	11.64	12.03	12.31	12.54	12.77	13.00	13.23	13.45	13.68	13.91	14.14	14.37	14.59	14.82
4	10.00	10.00	10.26	10.78	11.31	11.79	12.25	12.52	12.86	13.17	13.44	13.69	13.92	14.14	14.37	14.60	14.83	15.06	15.28	15.51
5	10.00	10.19	10.76	11.29	11.79	12.27	12.73	13.09	13.42	13.55	13.89	14.15	14.39	14.64	14.87	15.09	15.32	15.55	15.78	16.01
6	10.00	10.63	11.13	11.66	12.16	12.64	13.10	13.46	13.80	14.05	14.28	14.45	14.71	15.01	15.27	15.44	15.67	15.90	16.12	16.35
7	10.39	10.97	11.47	11.91	12.46	12.94	13.40	13.76	14.05	14.36	14.60	14.84	14.95	15.24	15.52	15.75	15.91	16.14	16.37	16.60
8	10.80	11.22	11.73	12.25	12.65	13.13	13.62	14.03	14.29	14.55	14.87	15.10	15.30	15.43	15.68	15.94	16.17	16.34	16.57	16.80
9	11.15	11.57	12.03	12.50	12.96	13.41	13.87	14.21	14.57	14.81	15.05	15.36	15.61	15.76	15.90	16.12	16.35	16.57	16.76	16.99
10	11.51	12.08	12.29	12.82	13.28	13.64	14.15	14.51	14.75	15.09	15.34	15.56	15.85	16.11	16.22	16.38	16.57	16.77	16.96	17.19
11	12.04	12.60	12.73	13.10	13.53	14.02	14.38	14.75	15.06	15.29	15.61	15.87	16.07	16.33	16.58	16.69	16.85	17.03	17.21	17.39
12	12.43	13.13	13.24	13.39	13.91	14.31	14.70	15.02	15.31	15.61	15.83	16.13	16.39	16.58	16.81	17.05	17.15	17.33	17.50	17.66
13	12.82	13.48	13.76	13.88	14.16	14.61	15.08	15.33	15.59	15.87	16.17	16.37	16.65	16.92	17.10	17.30	17.51	17.61	17.80	17.96
14	13.45	13.87	14.28	14.40	14.53	14.98	15.34	15.71	15.91	16.16	16.43	16.72	16.91	17.17	17.42	17.61	17.79	17.97	18.07	18.24
15	13.92	14.52	14.84	14.92	15.04	15.24	15.70	16.03	16.29	16.49	16.73	16.99	17.27	17.45	17.70	17.92	18.12	18.29	18.44	18.53
16	14.34	15.00	15.33	15.43	15.56	15.68	16.04	16.35	16.64	16.87	17.07	17.30	17.55	17.81	17.99	18.22	18.43	18.62	18.79	18.90
17	15.09	15.40	15.89	15.95	16.07	16.20	16.37	16.75	16.95	17.24	17.45	17.65	17.87	18.11	18.35	18.53	18.74	18.93	19.10	19.25
18	15.61	16.12	16.32	16.49	16.59	16.71	16.84	17.04	17.34	17.55	17.83	18.03	18.23	18.44	18.67	18.90	19.07	19.26	19.43	19.58
19	16.23	16.70	16.97	17.08	17.11	17.23	17.38	17.46	17.66	17.94	18.15	18.41	18.61	18.81	19.01	19.23	19.44	19.61	19.78	19.93
20	17.08	17.27	17.42	17.54	17.62	17.75	17.87	17.98	18.07	18.28	18.54	18.75	18.99	19.19	19.39	19.59	19.79	19.98	20.55	21.20
21	17.66	18.04	18.10	18.12	18.14	18.26	18.39	18.49	18.58	18.69	18.89	19.13	19.34	19.57	19.77	19.97	20.59	21.26	21.91	22.62
22	18.59	18.68	18.81	18.77	18.73	18.78	18.91	19.01	19.09	19.18	19.30	19.52	19.73	19.94	20.47	21.12	21.77	22.60	23.27	23.99
23	19.43	19.53	19.46	19.42	19.32	19.30	19.42	19.53	19.61	19.69	19.77	19.92	20.37	21.01	21.66	22.34	22.98	23.77	24.61	25.28
24	20.00	20.00	20.00	20.00	19.91	19.81	19.94	20.00	20.00	20.00	20.40	20.94	21.53	22.17	22.84	23.53	24.20	24.92	25.77	26.62
25	20.00	20.00	20.00	20.00	20.00	20.00	20.53	20.60	20.80	21.11	21.58	22.12	22.70	23.32	23.99	24.67	25.41	26.07	26.92	27.78
26	20.00	20.00	20.00	20.00	20.00	20.10	21.57	21.70	21.90	22.28	22.71	23.23	23.82	24.47	25.15	25.85	26.56	27.28	28.07	28.92
27	20.00	20.00	20.00	20.00	20.00	20.84	22.53	22.75	23.02	23.34	23.82	24.37	24.96	25.59	26.26	26.96	27.68	28.44	29.22	30.00
28	20.00	20.00	20.00	20.00	20.00	21.18	23.51	23.72	24.04	24.47	24.93	25.45	26.06	26.71	27.39	28.09	28.82	29.57	30.00	30.00
29	20.00	20.00	20.00	20.00	20.00	21.73	24.06	24.78	25.10	25.47	25.98	26.54	27.15	27.80	28.48	29.19	29.93	30.00	30.00	30.00
30	20.00	20.00	20.00	20.00	20.00	22.27	24.60	25.66	26.05	26.52	27.04	27.58	28.20	28.88	29.57	30.00	30.00	30.00	30.00	30.00
31	20.00	20.00	20.00	20.00	20.49	22.82	25.15	26.64	27.04	27.49	28.05	28.64	29.27	29.94	30.00	30.00	30.00	30.00	30.00	30.00
32	20.00	20.00	20.00	20.00	21.03	23.36	25.69	27.50	27.95	28.49	29.04	29.65	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
33	20.00	20.00	20.00	20.00	21.58	23.91	26.23	28.18	28.89	29.43	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
34	18.43	19.54	20.00	20.00	22.12	24.45	26.78	28.72	29.77	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
35	16.13	17.53	18.65	19.93	22.27	24.91	27.64	29.92	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
36	13.99	15.80	17.07	18.63	20.77	24.11	27.78	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
37	12.25	14.19	15.70	17.51	19.51	22.81	26.57	28.84	29.89	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
38	10.66	12.80	14.58	16.57	18.70	21.57	24.96	27.06	28.04	28.58	29.03	29.23	29.46	29.62	29.83	30.00	30.00	30.00	30.00	30.00
39	10.00	11.63	13.65	15.80	18.04	20.50	23.68	25.58	26.49	27.33	27.66	28.11	28.33	28.62	28.87	29.19	29.55	29.95	30.00	30.00
40	10.00	10.72	12.93	15.22	17.51	19.80	22.70	24.39	25.54	26.08	26.75	27.04	27.42	27.72	28.04	28.42	28.85	29.30	29.78	30.00
41	10.00	10.18	12.52	14.83	17.11	19.39	22.00	23.64	24.50	25.34	25.74	26.21	26.55	26.92	27.31	27.76	28.25	28.74	29.26	29.79
42	10.00	10.28	12.44	14.65	16.85	19.06	21.43	22.93	23.86	24.45	25.01	25.39	25.79	26.23	26.70	27.21	27.73	28.27	28.82	29.37
43	10.00	10.75	12.64	14.63	16.71	18.79	20.96	22.39	23.16	23.80	24.23	24.67	25.15	25.67	26.21	26.76	27.32	27.87	28.45	29.02
44	10.00	11.26	12.99	14.79	16.66	18.64	20.64	21.88	22.64	23.14	23.62	24.13	24.68	25.24	25.81	26.39	26.96	27.56	28.15	28.74
45	10.00	11.73	13.30	14.93	16.66	18.51	20.35	21.51	22.02	22.60	23.15	23.76	24.32	24.91	25.51	26.12	26.71	27.31	27.91	28.52
46	10.55	12.11	13.58	15.16	16.73	18.40	20.14	21.03	21.66	22.28	22.85	23.46	24.08	24.69	25.29	25.90	26.51	27.12	27.72	28.34
47	11.07	12.51	13.87	15.30	16.76	18.33	19.98	20.80	21.44	22.06	22.67	23.29	23.91	24.52	25.14	25.74	26.35	26.96	27.57	28.18
48	11.58	12.87	14.14	15.49	16.82	18.27	19.83	20.68	21.31	21.93	22.55	23.16	23.78	24.38	25.00	25.61	26.23	26.86	27.49	28.13
49	11.98	13.27	14.36	15.60	16.92	18.25	19.70	20.59	21.20	21.82	22.43	23.06	23.69	24.33	24.96	25.59	26.23	26.86	27.50	28.13
50	12.30	13.48	14.65	15.75	16.92	18.26	19.58	20.51	21.15	21.79	22.43	23.06	23.70	24.33	24.96	25.60	26.23	26.86	27.50	28.13
51	12.70	13.79	14.76	15.86	17.04	18.21	19.50	20.45	21.10	21.77	22.43	23.09	23.75	24.41	25.04	25.67	26.29	26.92	27.55	28.18
52	12.95	14.02	15.01	15.99	17.04	18.23	19.40	20.44	21.29	22.12	22.75	23.37	24.00	24.62	25.25	25.87	26.50	27.12	27.75	28.37
53	13.17	14.18	15.08	16.10	17.14	18.20	19.32	20.36	21.27	22.03	22.66	23.30	24.02	24.62	25.25	25.87	26.50	27.12	27.75	28.37
54	13.47	14.38	15.28	16.19	17.15	18.18	19.27	20.26	21.25	22.05	22.66	23.87	24.51	25.27	26.10	26.72	27.35	27.97	28.60	29.22
55	13.59	14.52	15.34	16.22	17.16	18.19	19.21	20.15	21.20	22.10	23.09	24.04	24.71	25.56	26.37	26.98	27.68	28.40	29.02	29.65
56	13.83	14.61	15.41	16.30	17.23	18.17	19.15	20.03	21.16	22.19	23.17	24.21	24.95	25.91	26.73	27.40	28.16	28.84	29.46	30.00
57	14.05	14.81	15.56	16.40	17.25	18.15	19.10	19.94	21.15	22.15	23.27	24.40	25.34	26.19	27.14	27.89	28.73	29.42	30.00	30.00
58	14.20	1																		

TABLE D.2-7. BASE OF THE SURFICIAL AQUIFER (FEET ABOVE MSL MINUS 7000) (continued).

Row	Column																			
	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
1	13.95	14.20	14.45	14.70	14.96	15.22	15.47	15.72	15.97	16.22	16.47	16.72	16.96	17.21	17.45	17.70	17.94	18.19	18.43	18.67
2	14.30	14.54	14.79	15.03	15.28	15.52	15.77	16.01	16.26	16.51	16.76	17.02	17.27	17.53	17.79	18.05	18.30	18.55	18.80	19.04
3	15.05	15.28	15.51	15.73	15.96	16.19	16.42	16.65	16.87	17.10	17.33	17.56	17.79	18.01	18.24	18.47	18.70	18.93	19.15	19.36
4	15.74	15.97	16.20	16.42	16.65	16.88	17.11	17.34	17.56	17.79	18.02	18.25	18.48	18.70	18.93	19.16	19.39	19.62	19.84	20.00
5	16.23	16.46	16.69	16.92	17.15	17.37	17.60	17.83	18.06	18.29	18.51	18.74	18.97	19.20	19.43	19.65	19.88	20.00	20.00	20.00
6	16.58	16.81	17.04	17.26	17.49	17.72	17.95	18.18	18.40	18.63	18.86	19.09	19.32	19.54	19.77	20.00	20.00	20.00	20.00	20.00
7	16.83	17.05	17.28	17.51	17.74	17.97	18.19	18.42	18.65	18.88	19.11	19.33	19.56	19.79	20.00	20.00	20.00	20.00	20.00	20.00
8	17.02	17.25	17.48	17.71	17.94	18.16	18.39	18.62	18.85	19.08	19.30	19.53	19.76	19.99	20.00	20.00	20.00	20.00	20.00	20.00
9	17.22	17.45	17.68	17.90	18.13	18.36	18.59	18.82	19.04	19.27	19.50	19.73	19.96	20.00	20.00	20.00	20.00	20.00	20.00	20.00
10	17.42	17.65	17.87	18.10	18.33	18.56	18.79	19.01	19.24	19.47	19.70	19.93	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
11	17.62	17.84	18.07	18.30	18.53	18.76	18.98	19.21	19.44	19.67	19.90	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
12	17.81	18.04	18.27	18.50	18.72	18.95	19.18	19.41	19.64	19.87	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
13	18.11	18.24	18.47	18.69	18.92	19.15	19.38	19.61	19.83	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
14	18.39	18.51	18.66	18.89	19.12	19.35	19.58	19.80	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
15	18.68	18.80	18.91	19.09	19.32	19.55	19.77	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
16	18.99	19.12	19.22	19.30	19.51	19.74	19.97	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
17	19.36	19.46	19.56	19.64	19.71	19.94	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
18	19.72	19.82	19.92	20.00	20.35	20.67	20.91	21.09	20.95	20.51	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
19	20.31	20.90	21.50	22.10	22.70	23.28	23.82	24.36	24.55	24.02	23.00	21.81	20.66	20.00	20.00	20.00	20.00	20.00	20.00	20.00
20	21.85	22.52	23.20	23.90	24.63	25.43	26.47	27.41	28.15	27.46	25.62	24.01	22.57	21.57	20.48	20.00	20.00	20.00	20.00	20.00
21	23.38	24.12	24.92	25.77	26.67	27.73	28.79	30.00	30.00	29.81	27.47	25.54	24.51	23.07	21.89	21.03	20.38	20.00	20.00	20.00
22	24.75	25.54	26.37	27.27	28.31	29.54	30.00	30.00	30.00	30.00	28.51	26.92	25.52	24.16	22.98	22.14	21.50	21.08	20.84	20.40
23	26.04	26.92	27.84	28.84	29.96	30.00	30.00	30.00	30.00	30.00	29.34	27.67	26.38	24.97	23.91	23.03	22.44	21.98	21.54	21.02
24	27.34	28.24	29.20	30.00	30.00	30.00	30.00	30.00	30.00	30.00	29.81	28.27	26.96	25.67	24.56	23.89	23.13	22.68	22.16	21.65
25	28.63	29.47	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	28.71	27.43	26.17	25.34	24.50	23.79	23.31	22.79	22.28
26	29.78	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	29.09	27.77	26.79	25.86	25.08	24.45	23.93	23.42	22.90
27	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	29.37	28.24	27.23	26.38	25.59	25.07	24.58	24.04	23.53
28	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	29.69	28.60	27.62	26.73	26.21	25.70	25.18	24.67	24.15
29	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	29.97	28.87	27.93	27.35	26.84	26.32	25.81	25.29	24.78
30	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	29.21	28.49	27.98	27.46	26.94	26.31	25.87	25.05
31	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	29.63	29.04	28.41	27.78	27.15	26.53	25.90	25.29
32	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	29.88	29.25	28.63	28.01	27.39	26.78	26.19	25.59
33	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	29.49	28.88	28.28	27.68	27.09	26.52	25.97
34	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	29.77	29.18	28.59	28.02	27.47	26.91	26.40
35	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	29.52	28.96	28.40	27.88	27.39	26.93
36	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	29.91	29.37	28.86	28.38	27.94	27.54
37	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	29.85	29.38	28.94	28.55	28.16
38	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	29.95	29.58	29.19	28.88
39	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	29.91	29.63
40	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.19	30.59	30.89	30.56
41	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.02	30.42	30.83	31.23	31.64
42	29.93	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.25	30.65	31.06	31.47	31.87	32.28
43	29.60	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.08	30.48	30.89	31.29	31.70	32.11	32.51	32.92	33.32
44	29.34	29.93	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.31	30.72	31.12	31.53	31.93	32.34	32.75	33.15	33.56	33.96
45	29.12	29.72	30.00	30.00	30.00	30.00	30.00	30.00	30.14	30.54	30.95	31.36	31.76	32.17	32.57	32.98	33.38	33.79	34.20	34.60
46	28.94	29.54	30.00	30.00	30.00	30.00	30.00	30.37	30.78	31.18	31.59	32.00	32.40	32.81	33.21	33.62	34.02	34.43	34.84	35.24
47	28.78	29.39	30.00	30.00	30.00	30.20	30.61	31.01	31.42	31.82	32.23	32.63	33.04	33.45	33.85	34.26	34.66	35.07	35.47	35.88
48	28.76	29.39	30.00	30.03	30.43	30.84	31.25	31.65	32.06	32.46	32.87	33.27	33.68	34.09	34.49	34.90	35.30	35.71	36.11	36.52
49	28.76	29.40	30.00	30.29	30.78	31.26	31.75	32.24	32.70	33.10	33.51	33.91	34.32	34.72	35.13	35.54	35.94	36.35	36.75	37.16
50	28.77	29.40	30.00	30.39	30.87	31.35	31.83	32.31	32.79	33.26	33.74	34.22	34.70	35.18	35.67	36.16	36.58	36.99	37.39	37.80
51	28.81	29.44	30.05	30.53	31.01	31.48	31.96	32.44	32.91	33.39	33.87	34.35	34.82	35.30	35.78	36.25	36.73	37.21	37.69	38.16
52	29.00	29.63	30.20	30.67	31.13	31.60	32.06	32.52	32.99	33.45	33.91	34.38	34.84	35.30	35.76	36.23	36.69	37.15	37.62	38.08
53	29.42	30.00	30.00	30.42	30.89	31.36	31.83	32.30	32.77	33.24	33.70	34.17	34.64	35.11	35.58	36.05	36.52	36.99	37.46	37.92
54	29.85	30.00	30.00	30.16	30.63	31.10	31.57	32.03	32.50	32.97	33.44	33.91	34.38	34.85	35.32	35.79	36.25	36.72	37.19	37.66
55	30.00	30.00	30.00	30.00	30.36	30.83	31.30	31.77	32.24	32.71	33.18	33.65	34.12	34.58	35.05	35.52	35.99	36.46	36.93	37.40
56	30.00	30.00	30.00	30.00	30.10	30.57	31.04	31.51	31.98	32.44	32.91	33.38	33.85	34.32	34.79	35.26	35.73	36.20	36.68	37.13
57	30.00	30.00	30.00	30.00	30.00	30.31	30.77	31.24	31.71	32.18	32.65	33.12	33.59	34.06	34.53	34.99	35.46	35.93	36.40	36.87
58	30.00																			

TABLE D.2-7. BASE OF THE SURFICIAL AQUIFER (FEET ABOVE MSL MINUS 7000) (continued).

Row	Column																			
	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
1	18.91	19.15	19.39	19.63	19.87	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
2	19.31	19.57	19.83	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
3	19.61	19.84	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
4	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
5	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
6	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
7	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
8	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
9	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
10	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
11	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	19.27	18.77	18.44	18.55	18.86	19.41	20.00	20.00
12	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	18.77	17.54	16.84	16.36	16.46	16.78	16.90	17.14
13	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	19.49	18.28	17.77	17.03	15.80	14.90	14.15	14.07	13.59
14	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	18.98	17.76	16.53	15.30	14.07	12.97	12.07	10.77	10.00
15	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	19.71	18.48	17.25	16.02	14.79	13.56	12.33	11.11	10.00	10.00
16	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	19.20	17.97	16.74	15.52	14.29	13.06	11.83	10.72	10.00	10.00
17	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	19.93	18.70	17.47	16.24	15.01	13.78	12.80	11.92	11.24	10.47	10.00
18	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	19.42	18.19	16.96	15.79	14.93	14.06	13.48	12.90	12.32	11.32	10.00
19	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	18.91	17.92	17.06	16.30	15.72	15.14	14.56	13.98	13.36	12.13	11.16
20	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	19.19	18.54	17.96	17.38	16.80	16.22	15.64	15.06	14.46	13.04	12.75
21	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	19.62	19.04	18.46	17.88	17.31	16.73	16.15	15.26	14.72	14.33
22	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	19.55	18.97	18.39	17.81	17.28	16.56	16.32	15.92
23	20.51	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	19.47	18.89	18.40	18.24	17.92	17.51
24	21.14	20.62	20.11	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
25	21.76	21.25	20.73	20.22	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
26	22.39	21.87	21.36	20.84	20.33	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
27	23.01	22.50	21.98	21.47	20.95	20.44	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
28	23.64	23.12	22.61	22.09	21.47	20.84	20.21	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
29	24.20	23.57	22.95	22.32	21.70	21.09	20.49	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
30	24.43	23.80	23.19	22.59	22.01	21.48	20.93	20.30	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.10	20.51	20.91
31	24.69	24.09	23.53	22.95	22.49	21.96	21.44	20.78	20.02	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.38	20.76	21.17	21.57
32	25.03	24.44	23.93	23.50	22.99	22.51	22.06	21.35	20.65	20.00	20.00	20.00	20.00	20.00	20.41	21.02	21.42	21.83	22.23	22.63
33	25.42	24.93	24.51	24.03	23.62	23.31	22.64	22.00	21.40	20.71	20.00	20.00	20.00	20.00	20.73	21.49	22.06	22.49	22.89	23.29
34	25.93	25.52	25.06	24.74	24.35	23.82	23.37	22.76	22.14	21.60	21.00	20.56	20.25	20.65	21.29	21.87	22.60	23.02	23.55	23.95
35	26.53	26.09	25.80	25.40	25.09	24.55	24.15	23.66	23.19	22.58	22.08	21.69	21.42	21.49	21.96	22.53	23.03	23.71	24.08	24.61
36	27.13	26.62	26.47	26.26	25.81	25.38	25.00	24.51	24.13	23.60	23.23	22.83	22.59	22.56	22.79	23.27	23.72	24.19	24.79	25.18
37	27.85	27.53	27.30	26.91	26.64	26.32	25.92	25.61	25.17	24.71	24.36	23.98	23.76	23.67	23.75	24.08	24.48	24.91	25.36	25.87
38	28.58	28.34	28.13	27.79	27.54	27.29	26.93	26.67	26.20	25.86	25.50	25.14	24.92	24.79	24.76	24.97	25.30	25.68	26.10	26.52
39	29.39	29.20	28.97	28.75	28.52	28.24	28.03	27.71	27.35	27.00	26.63	26.30	26.07	25.85	25.83	25.97	26.24	26.58	26.89	27.33
40	30.30	30.09	29.91	29.75	29.58	29.34	29.13	28.80	28.48	28.15	27.79	27.46	27.21	26.99	26.92	26.97	27.17	27.45	27.79	28.14
41	31.37	31.19	31.04	30.86	30.70	30.49	30.27	29.95	29.63	29.29	28.94	28.62	28.36	28.13	28.03	28.03	28.17	28.40	28.67	29.00
42	32.31	32.30	32.10	32.00	31.88	31.71	31.58	31.27	30.93	30.59	30.15	29.78	29.50	29.27	29.14	29.10	29.18	29.37	29.61	29.89
43	33.35	33.25	33.18	33.13	33.06	32.93	32.85	32.61	32.39	32.15	31.85	31.52	31.12	30.80	30.53	30.45	30.59	31.00	31.61	32.36
44	34.11	34.20	34.28	34.27	34.23	34.15	34.14	33.96	33.86	33.70	33.56	33.38	33.10	33.00	32.85	32.99	33.21	33.73	34.31	35.07
45	35.01	35.09	35.34	35.41	35.41	35.36	35.42	35.34	35.33	35.26	35.24	35.19	35.09	35.19	35.17	35.52	35.83	36.37	37.01	37.77
46	35.65	35.99	36.19	36.35	36.55	36.58	36.71	36.72	36.79	36.81	36.91	36.99	37.07	37.29	37.48	37.93	38.41	39.01	39.71	40.28
47	36.29	36.69	36.93	37.38	37.59	37.80	37.99	38.10	38.26	38.37	38.59	38.80	39.05	39.39	39.80	40.19	40.54	40.90	41.36	41.89
48	36.93	37.33	37.66	38.30	38.84	39.01	39.27	39.49	39.73	39.98	40.16	40.37	40.56	40.83	41.14	41.52	41.86	42.33	42.89	43.44
49	37.57	37.97	38.33	39.07	39.70	40.00	40.00	40.00	40.00	40.00	40.98	41.36	41.65	41.98	42.38	42.71	43.15	43.77	44.17	44.82
50	38.20	38.61	39.02	39.67	40.00	40.00	40.00	40.00	40.00	40.40	41.44	42.39	42.62	42.93	43.37	43.88	44.49	44.94	45.56	46.31
51	38.64	39.12	39.60	40.00	40.00	40.00	40.00	40.00	40.00	40.86	41.89	42.93	43.59	44.02	44.45	45.07	45.50	46.12	46.96	47.57
52	38.54	39.01	39.47	39.93	40.00	40.00	40.00	40.00	40.27	41.31	42.35	43.39	44.42	44.83	45.31	45.91	46.62	47.33	48.02	48.83
53	38.39	38.86	39.33	39.79	40.00	40.00	40.00	40.00	40.73	41.77	42.80	43.84	44.88	45.81	46.35	46.88	47.60	48.29	49.09	50.06
54	38.13	38.60	39.07	39.47	39.92	40.00	40.00	40.15	41.18	42.22	43.26	44.30	45.33	46.37	47.04	47.68	48.46	49.30	50.21	51.62
55	37.87	38.34	38.67	39.11	39.72	40.00	40.00	40.60	41.64	42.68	43.71	44.75	45.79	46.83	47.88	48.57	49.30	50.27	51.91	53.47
56	37.60	37.94	38.29	38.85	39.51	40.00	40.02	41.06	42.09	43.13	44.17	45.21	46.24	47.28	48.32	49.26	50.22	52.09	53.72	55.19
57	37.22	37.52	37.99	38.65	39.31	39.96	40.00	41.09	42.25	43.43	44.61	45.79	46.87	47.89	48.91	49.94	51.89	53.90	55.62	57.17
58	36.63	3																		

TABLE D.2-7. BASE OF THE SURFICIAL AQUIFER (FEET ABOVE MSL MINUS 7000) (continued).

Row	Column																				
	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	
1	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	
2	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	
3	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	
4	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	
5	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	
6	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	
7	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	
8	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	
9	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	
10	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	
11	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	
12	17.75	19.36	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	
13	11.17	10.74	12.20	15.55	19.64	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	
14	10.00	10.00	10.00	10.00	10.96	16.30	19.04	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	
15	10.00	10.00	10.00	10.00	10.00	11.43	14.81	17.54	19.84	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	
16	10.00	10.00	10.00	10.00	10.00	10.00	12.07	14.68	17.30	19.48	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	
17	10.00	10.00	10.00	10.00	10.00	10.00	12.60	15.22	16.84	18.16	19.32	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	
18	10.00	10.00	10.00	10.00	10.00	10.52	12.95	14.21	15.95	17.80	19.65	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	
19	11.03	10.90	10.70	10.17	10.00	10.74	12.59	14.44	16.28	18.13	19.98	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	
20	12.61	12.48	12.12	11.65	11.45	11.65	12.92	14.77	16.62	18.46	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	
21	14.19	14.02	13.54	13.14	12.92	13.08	13.26	15.10	16.95	18.79	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	
22	15.77	15.45	14.99	14.63	14.42	14.52	14.67	15.43	17.28	19.13	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	
23	17.32	16.90	16.46	16.12	15.91	15.92	16.08	16.27	17.61	19.46	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.04	20.64	
24	18.77	18.34	17.95	17.61	17.40	17.37	17.51	17.68	17.94	19.79	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.75	21.74
25	20.00	19.81	19.43	19.10	18.89	18.84	18.94	19.10	19.29	20.00	20.00	20.00	20.05	20.20	20.37	20.55	20.78	21.12	21.69	22.50	23.34
26	20.00	20.00	20.00	20.29	20.20	20.18	20.21	20.33	20.45	20.60	20.77	20.92	21.12	21.27	21.50	21.67	21.96	22.31	22.78	23.34	24.44
27	20.00	20.14	20.54	20.95	20.98	20.98	21.05	21.18	21.35	21.54	21.67	21.94	22.09	22.34	22.59	22.80	23.10	23.43	23.87	24.44	25.52
28	20.40	20.80	21.20	21.61	21.76	21.79	21.89	22.05	22.26	22.46	22.62	22.96	23.10	23.42	23.59	23.93	24.16	24.54	25.02	25.52	26.64
29	21.06	21.46	21.86	22.27	22.54	22.58	22.74	22.88	23.15	23.28	23.57	23.83	24.12	24.42	24.64	25.06	25.23	25.72	26.16	26.64	27.75
30	21.72	22.12	22.52	22.93	23.32	23.29	23.52	23.64	23.93	24.18	24.51	24.69	25.14	25.36	25.71	26.08	26.36	26.81	27.25	27.75	28.88
31	22.38	22.78	23.18	23.59	23.98	24.00	24.24	24.46	24.76	25.09	25.35	25.59	26.05	26.30	26.75	27.05	27.49	27.87	28.35	28.88	29.98
32	23.04	23.44	23.84	24.25	24.65	24.78	25.02	25.30	25.58	25.91	26.16	26.53	26.90	27.32	27.69	28.04	28.52	28.94	29.46	29.98	31.44
33	23.70	24.10	24.50	24.91	25.31	25.56	25.80	26.10	26.34	26.69	27.02	27.43	27.76	28.26	28.63	29.08	29.52	30.00	30.73	31.44	32.92
34	24.36	24.76	25.16	25.57	25.97	26.34	26.51	26.82	27.09	27.46	27.89	28.24	28.62	29.11	29.57	30.04	30.77	31.50	32.21	32.92	34.42
35	25.02	25.42	25.82	26.23	26.63	27.01	27.22	27.55	27.87	28.28	28.67	29.06	29.50	29.97	30.80	31.55	32.27	33.01	33.70	34.42	35.91
36	25.64	26.08	26.48	26.89	27.29	27.67	27.92	28.27	28.67	29.03	29.44	29.87	30.61	31.43	32.28	33.05	33.79	34.51	35.21	35.91	37.41
37	26.28	26.67	27.14	27.55	27.95	28.34	28.63	29.02	29.40	29.79	30.44	31.30	32.13	32.94	33.75	34.57	35.30	36.01	36.73	37.41	38.92
38	26.95	27.38	27.77	28.21	28.61	29.00	29.36	29.73	30.27	31.14	32.00	32.84	33.66	34.50	35.25	36.07	36.81	37.53	38.24	38.92	40.41
39	27.69	28.04	28.49	28.86	29.26	29.67	30.13	31.15	31.89	32.70	33.57	34.39	35.23	36.04	36.81	37.55	38.33	39.04	39.75	40.71	41.81
40	28.51	28.85	29.21	29.59	29.96	31.08	32.29	33.01	33.71	34.32	35.13	35.98	36.79	37.58	38.36	39.11	39.86	40.90	42.05	43.18	44.48
41	29.33	29.68	30.04	31.12	32.15	33.23	34.45	34.87	35.54	36.15	36.76	37.56	38.36	39.15	39.92	41.03	42.18	43.32	44.48	45.64	46.88
42	30.60	31.59	32.56	33.58	34.48	35.42	36.81	37.36	37.97	38.58	39.19	39.94	41.09	42.27	43.42	44.58	45.73	46.88	48.08	49.28	50.52
43	33.23	34.19	35.09	36.04	36.94	37.84	38.77	38.57	39.18	39.79	40.53	41.32	42.30	43.48	44.66	45.82	46.97	48.13	49.29	50.41	51.64
44	35.89	36.79	37.67	38.55	39.42	40.21	40.35	40.50	41.30	42.09	42.88	43.67	44.70	45.87	47.04	48.21	49.36	50.45	51.44	52.45	53.46
45	38.58	39.42	40.19	40.79	41.40	42.08	42.39	42.61	43.58	44.45	45.24	46.03	47.10	48.27	49.43	50.50	51.49	52.49	53.49	54.49	55.49
46	40.76	41.32	41.95	42.55	43.21	43.92	44.44	44.73	45.70	46.67	47.60	48.41	49.51	50.56	51.55	52.53	53.53	54.53	55.52	56.53	57.53
47	42.35	43.00	43.66	44.29	45.03	45.70	46.46	46.85	47.81	48.78	49.75	50.69	51.61	52.58	53.57	54.56	55.56	56.56	57.56	58.57	59.57
48	43.95	44.60	45.24	46.05	46.79	47.49	48.31	48.96	49.93	50.84	51.77	52.68	53.64	54.60	55.59	56.59	57.58	58.59	59.59	60.37	61.37
49	45.55	46.10	46.87	47.77	48.51	49.28	50.10	50.99	51.88	52.82	53.75	54.69	55.66	56.61	57.61	58.61	59.61	60.38	61.00	61.62	62.66
50	46.99	47.61	48.49	49.35	50.26	51.12	52.02	52.91	53.83	54.80	55.72	56.69	57.65	58.62	59.62	60.38	61.00	61.62	62.24	62.86	63.86
51	48.35	49.17	49.99	51.05	52.11	53.01	53.91	54.81	55.78	56.72	57.69	58.67	59.64	60.39	61.00	61.62	62.24	62.86	63.48	64.11	65.11
52	49.71	50.70	51.78	52.86	53.88	54.88	55.76	56.73	57.67	58.64	59.65	60.40	61.01	61.62	62.24	62.85	63.48	64.09	64.72	65.34	66.34
53	51.33	52.49	53.56	54.65	55.67	56.69	57.65	58.58	59.55	60.31	60.99	61.62	62.23	62.85	63.46	64.09	64.71	65.33	65.96	66.58	67.58
54	53.05	54.26	55.35	56.44	57.51	58.48	59.46	60.25	60.81	61.38	62.11	62.83	63.46	64.08	64.70	65.32	65.94	66.57	67.19	67.82	68.82
55	54.61	55.99	57.12	58.21	59.32	60.19	60.74	61.30	61.89	62.45	63.13	63.95	64.68	65.30	65.92	66.54	67.17	67.79	68.42	69.05	70.05
56	56.60	57.66	58.89	59.99	60.60	61.24	61.80	62.36	62.96	63.52	64.14	64.9									

TABLE D.2-7. BASE OF THE SURFICIAL AQUIFER (FEET ABOVE MSL MINUS 7000) (continued).

Row	Column																
	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117
1	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
2	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
3	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
4	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
5	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
6	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
7	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
8	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
9	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
10	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
11	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
12	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
13	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
14	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
15	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
16	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
17	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.04	20.00	20.00	20.00	20.00	20.00	20.00
18	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.40	20.92	20.46	20.00	20.00	20.00	20.00	20.00
19	20.00	20.00	20.00	20.00	20.00	20.00	20.03	20.45	20.87	21.29	21.81	21.36	20.29	20.00	20.00	20.00	20.00
20	20.00	20.00	20.00	20.00	20.08	20.50	20.92	21.34	21.75	22.17	22.69	22.26	21.55	20.69	20.00	20.00	20.00
21	20.00	20.00	20.13	20.55	20.97	21.38	21.80	22.22	22.64	23.06	23.58	23.21	22.87	22.50	22.04	21.83	21.54
22	20.18	20.60	21.01	21.43	21.85	22.27	22.69	23.10	23.52	23.94	24.46	24.27	24.22	24.31	24.22	24.39	24.62
23	21.06	21.48	21.90	22.32	22.73	23.15	23.57	23.99	24.41	24.83	25.30	25.33	25.57	26.12	26.40	26.95	27.69
24	21.96	22.36	22.78	23.20	23.62	24.04	24.46	24.87	25.29	25.71	26.06	26.40	26.91	27.95	28.58	29.51	30.57
25	23.15	23.36	23.66	24.09	24.50	24.92	25.34	25.76	26.18	26.60	26.96	27.48	28.26	29.89	30.69	31.81	32.88
26	24.33	24.55	24.77	24.99	25.39	25.81	26.23	26.64	27.06	27.48	27.90	28.52	29.60	31.75	32.68	34.02	35.18
27	25.02	25.74	25.96	26.17	26.39	26.68	27.11	27.53	27.95	28.37	28.83	29.58	31.20	33.44	34.67	36.24	37.46
28	26.09	26.76	27.14	27.36	27.58	27.80	28.01	28.40	28.83	29.25	29.77	31.04	32.91	35.13	36.66	38.45	39.73
29	27.19	27.74	28.33	28.55	28.77	28.98	29.20	29.42	29.70	30.25	31.32	32.76	34.61	36.83	38.65	40.99	43.00
30	28.29	28.84	29.38	29.74	29.95	30.00	30.10	30.67	31.23	32.02	33.08	34.51	36.32	38.56	41.15	44.30	46.40
31	29.41	29.95	30.16	30.37	30.78	31.35	31.92	32.48	33.05	33.83	34.87	36.28	38.04	40.48	44.88	47.70	49.76
32	30.68	31.39	31.91	32.11	32.50	33.17	33.73	34.30	34.89	35.66	36.64	38.05	39.77	43.54	48.29	50.74	52.37
33	32.16	32.84	33.54	33.86	34.17	34.88	35.55	36.12	36.72	37.50	38.47	39.82	42.69	46.60	50.87	53.00	54.93
34	33.64	34.31	35.00	35.61	35.84	36.55	37.27	37.94	38.56	39.34	40.49	42.78	45.80	49.66	52.65	55.22	57.48
35	35.11	35.81	36.46	37.14	37.55	38.22	38.94	39.65	40.63	41.86	43.50	45.82	48.89	51.62	54.48	57.43	60.02
36	36.60	37.30	37.96	38.62	39.27	39.89	41.00	42.24	43.48	44.77	46.51	48.84	51.18	53.45	56.28	59.85	61.52
37	38.11	38.78	39.45	40.18	41.35	42.57	43.75	45.05	46.29	47.68	49.41	51.15	53.04	55.30	58.09	61.11	63.01
38	39.61	40.48	41.64	42.79	44.01	45.22	46.50	47.77	49.09	50.33	51.47	53.02	54.93	57.14	59.90	62.44	64.51
39	41.86	43.04	44.19	45.40	46.60	47.86	49.16	50.34	51.28	52.20	53.33	54.89	56.80	59.01	61.27	63.76	65.96
40	44.35	45.52	46.72	47.96	49.19	50.36	51.31	52.26	53.18	54.09	55.23	56.77	58.67	60.84	62.62	65.08	67.41
41	46.81	48.00	49.24	50.37	51.35	52.30	53.24	54.18	55.08	56.01	57.11	58.64	60.39	61.98	63.96	66.42	68.86
42	49.26	50.39	51.38	52.35	53.31	54.25	55.20	56.10	57.03	57.91	59.01	60.36	61.70	63.32	65.31	67.76	70.16
43	51.41	52.40	53.37	54.35	55.28	56.24	57.14	58.07	58.97	59.85	60.83	61.67	63.01	64.66	66.67	69.09	70.93
44	53.46	54.42	55.42	56.34	57.30	58.22	59.14	60.02	60.61	61.20	61.94	62.98	64.32	65.98	68.03	70.24	71.69
45	55.50	56.49	57.43	58.39	59.32	60.15	60.73	61.31	61.90	62.50	63.24	64.28	65.63	67.29	69.39	70.98	72.45
46	57.54	58.55	59.50	60.27	60.84	61.43	62.01	62.60	63.20	63.78	64.54	65.58	66.94	68.60	70.40	71.73	73.21
47	59.58	60.36	60.96	61.53	62.12	62.70	63.29	63.89	64.47	65.08	65.84	66.89	68.24	69.91	71.10	72.47	73.98
48	60.99	61.60	62.22	62.80	63.39	63.96	64.57	65.16	65.75	66.37	67.13	68.19	69.54	70.65	71.81	73.21	74.74
49	62.23	62.84	63.46	64.07	64.64	65.24	65.83	66.43	67.04	67.64	68.41	69.48	70.45	71.34	72.51	73.96	75.50
50	63.47	64.09	64.70	65.31	65.90	66.50	67.09	67.70	68.31	68.92	69.69	70.41	71.14	72.03	73.21	74.70	76.26
51	64.72	65.33	65.95	66.56	67.16	67.76	68.36	68.97	69.58	70.06	70.50	71.08	71.84	72.72	73.92	75.41	77.03
52	65.97	66.58	67.19	67.80	68.41	69.01	69.62	70.08	70.28	70.49	71.16	71.76	72.53	73.41	74.61	76.08	77.79
53	67.21	67.83	68.44	69.05	69.65	70.09	70.30	70.50	70.71	70.94	71.70	72.39	73.22	74.11	75.27	76.81	78.54
54	68.45	69.08	69.69	70.10	70.31	70.52	70.72	70.93	71.14	71.40	72.15	73.05	73.84	74.80	75.96	77.54	79.29
55	69.68	70.11	70.32	70.53	70.74	70.94	71.15	71.36	71.57	71.86	72.61	73.66	74.51	75.49	76.66	78.26	80.03
56	70.32	70.53	70.75	70.96	71.16	71.37	71.58	71.79	71.99	72.31	73.07	74.12	75.10	76.19	77.34	78.97	80.77
57	70.74	70.96	71.18	71.38	71.59	71.80	72.01	72.21	72.42	72.77	73.52	74.58	75.76	76.85	78.01	79.65	81.52
58	71.27	71.49	71.71	71.92	72.12	72.33	72.54	72.75	72.95	73.34	74.09	75.15	76.50	77.60	78.87	80.50	82.45
59	72.01	72.23	72.45	72.66	72.87	73.08	73.29	73.49	73.70	74.14	74.89	75.95	77.30	78.66	80.08	81.70	83.75
60	72.86	73.08	73.30	73.51	73.73	73.93	74.14	74.35	74.56	75.05	75.80	76.86	78.22	79.87	81.42	83.03	85.11
61	73.71	73.93	74.14	74.36	74.58	74.79	75.00	75.20	75.41	75.96	76.72	77.77	79.13	80.79	82.62	84.39	86.47
62	74.51	74.77	74.99	75.21	75.43	75.64	75.85	76.06	76.27	76.88	77.63	78.68	80.04	81.70	83.73	85.70	87.86
63	75.24	75.54	75.84	76.06	76.28	76.49	76.70	76.91	77.18	77.79	78.54	79.60	80.95	82.61	84.72	87.06	89.19
64	76.14	76.46	76.75	77.05	77.34	77.55	77.77	77.98	78.33	78.93	79.68	80.74	82.09	83.75	85.86	88.43	90.55
65	76.77	77.21	77.63	78.06	78.48	78.88	79.22	79.48	79.92	80.53	81.28	82.33	83.69	85.35	87.52	90.19	92.06
66	76.73	77.21	77.69	78.16	78.64	79.12	79.59	80.13	80.93	81.73	82.74	84.14	85.78	87.47	89.84	91.62	93.70
67	76.97	77.50	78.03	78.56	79.10	79.64	80.32	8									

TABLE D.2-8. TOP OF THE SURFICIAL AQUIFER (FEET ABOVE MSL MINUS 7000).

Row	Column																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
1	35.00	33.32	31.33	29.78	28.38	27.06	25.80	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	
2	35.80	34.34	32.07	30.17	28.61	27.04	25.62	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	
3	37.27	35.31	32.87	30.62	28.82	27.08	25.47	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	
4	38.41	36.30	33.50	31.17	29.04	27.15	25.34	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	
5	39.23	37.09	34.05	31.50	29.29	27.21	25.17	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	
6	39.80	37.61	34.48	31.82	29.40	27.06	25.02	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	
7	40.21	37.97	34.82	31.92	29.46	27.08	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	
8	40.53	38.26	35.11	32.19	29.47	27.12	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	
9	40.86	38.55	35.40	32.36	29.68	27.07	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.12	
10	41.13	38.83	35.70	32.57	29.84	27.29	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.55	
11	41.46	39.10	36.02	32.91	30.20	27.40	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.98	
12	41.88	39.38	36.33	33.28	30.32	27.48	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.19	26.40	
13	42.19	39.80	36.76	33.56	30.56	27.66	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.69	26.98	
14	42.61	40.09	37.08	33.95	30.84	27.73	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	26.23	27.43	
15	43.05	40.54	37.51	34.28	31.01	27.89	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.26	26.84	27.96	
16	43.42	40.85	37.85	34.64	31.35	28.12	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.94	27.38	28.66	
17	43.89	41.34	38.19	35.04	31.62	28.15	25.06	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	26.61	28.18	29.16	
18	44.36	41.69	38.56	35.41	31.85	28.47	25.24	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.99	27.27	28.80	29.91	
19	44.83	42.21	39.00	35.77	32.31	28.74	25.42	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.45	26.97	28.33	29.51	30.61	
20	45.00	42.72	39.41	36.25	32.63	28.95	25.64	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	26.43	27.97	29.35	30.51	31.31	
21	45.00	43.17	39.87	36.65	32.96	29.28	25.91	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.76	27.40	28.98	30.40	31.22	32.31	
22	45.00	43.69	40.33	37.04	33.39	29.63	26.19	25.00	25.00	25.00	25.00	25.00	25.00	25.00	26.64	28.32	29.97	31.41	32.42	33.08	
23	45.00	44.18	40.81	37.40	33.79	29.98	26.47	25.00	25.00	25.00	25.00	25.00	25.00	25.63	27.45	29.19	30.93	32.46	33.58	34.18	
24	45.00	44.70	41.34	37.91	34.21	30.31	26.79	25.00	25.00	25.00	25.00	25.00	25.00	26.23	28.17	30.01	31.82	33.50	34.69	35.00	
25	45.00	45.00	41.96	38.39	34.65	30.72	27.14	25.00	25.00	25.00	25.00	25.00	25.00	26.71	28.76	30.72	32.64	34.47	35.00	35.00	
26	45.00	45.00	42.57	38.90	35.10	31.15	27.45	25.00	25.00	25.00	25.00	25.00	25.00	26.29	28.96	31.27	33.28	35.00	35.00	35.00	
27	45.00	45.00	43.01	39.30	35.55	31.47	27.71	25.00	25.00	25.00	25.00	25.00	25.00	25.81	28.49	31.16	33.75	35.00	35.00	35.00	
28	45.00	45.00	43.69	39.90	35.97	31.67	27.99	25.00	25.00	25.00	25.00	25.00	25.00	25.34	28.01	30.68	33.38	35.00	35.00	35.00	
29	45.00	45.00	44.34	40.38	36.17	31.93	28.27	25.30	25.00	25.00	25.00	25.00	25.00	25.00	27.54	30.14	33.35	35.00	35.00	35.00	
30	45.00	45.00	45.00	41.01	36.50	32.17	28.70	25.68	25.00	25.00	25.00	25.00	25.00	25.00	26.72	29.40	32.61	35.00	35.00	35.00	
31	45.00	45.00	45.00	41.31	36.71	32.48	28.95	26.00	25.00	25.00	25.00	25.00	25.00	25.00	25.17	27.94	31.60	35.00	35.00	35.00	
32	45.00	45.00	45.00	42.09	37.40	32.74	29.26	26.31	25.00	25.00	25.00	25.00	25.00	25.00	25.00	26.32	30.11	33.74	35.00	35.00	
33	45.00	45.00	45.00	42.66	37.74	33.00	29.56	26.60	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	28.24	31.49	33.34	34.92
34	45.00	45.00	45.00	43.55	38.08	33.31	29.85	26.88	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	26.20	29.04	30.40	31.90
35	45.00	45.00	45.00	44.44	38.98	33.61	30.15	27.11	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	26.47	27.45	28.98	
36	45.00	45.00	45.00	45.00	39.62	33.92	30.41	27.36	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	26.23	
37	45.00	45.00	45.00	45.00	40.69	34.23	30.68	27.58	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	
38	45.00	45.00	45.00	45.00	41.60	34.54	31.01	27.75	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	
39	45.00	45.00	45.00	45.00	42.42	34.96	31.23	27.97	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	
40	45.00	45.00	45.00	45.00	43.63	35.85	31.46	28.05	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	
41	45.00	45.00	45.00	45.00	44.93	36.57	31.78	28.23	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	
42	45.00	45.00	45.00	45.00	45.00	37.41	32.15	28.43	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	
43	45.00	45.00	45.00	45.00	45.00	38.59	32.49	28.70	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	
44	45.00	45.00	45.00	45.00	45.00	39.71	32.78	28.79	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	
45	45.00	45.00	45.00	45.00	45.00	40.77	33.19	29.05	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	
46	45.00	45.00	45.00	45.00	45.00	41.90	33.58	29.35	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	
47	45.00	45.00	45.00	45.00	45.00	43.48	34.01	29.59	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	
48	45.00	45.00	45.00	45.00	45.00	45.00	34.52	30.10	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.13	
49	45.00	45.00	45.00	45.00	45.00	45.00	35.09	30.16	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.64	
50	45.00	45.00	45.00	45.00	45.00	45.00	36.33	30.22	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	26.08	
51	45.00	45.00	45.00	45.00	45.00	45.00	37.58	30.75	25.10	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.48	26.49	
52	45.00	45.00	45.00	45.00	45.00	45.00	38.55	31.39	25.93	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.19	25.93	26.89	
53	45.00	45.00	45.00	45.00	45.00	45.00	39.61	32.05	26.95	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.17	25.65	26.31	27.20	
54	45.00	45.00	45.00	45.00	45.00	45.00	40.38	32.83	27.88	25.24	25.00	25.00	25.00	25.00	25.01	25.24	25.61	26.08	26.88	27.43	
55	45.00	45.00	45.00	45.00	45.00	45.00	40.91	33.44	29.03	26.27	25.43	25.08	25.20	25.46	25.29	25.59	25.93	26.40	27.00	27.78	
56	45.00	45.00	45.00	45.00	45.00	45.00	40.70	34.09	30.04	27.43	26.87	26.04	25.97	26.28	25.57	25.91	26.25	26.72	27.33	27.97	
57	45.00	45.00	45.00	45.00	45.00	45.00	40.24	34.72	30.67	28.72	27.31	27.08	26.83	26.59	25.85	26.17	26.56	27.01	27.58	28.18	
58	45.																				

TABLE D.2-8. TOP OF THE SURFICIAL AQUIFER (FEET ABOVE MSL MINUS 7000) (continued).

Row	Column																			
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	25.00	25.00	25.00	25.00	25.00	25.02	25.39	25.70	25.95	26.19	26.44	26.69	26.95	27.20	27.45	27.70	27.95	28.20	28.45	28.70
2	25.00	25.00	25.00	25.00	25.08	25.57	25.91	26.20	26.43	26.65	26.88	27.11	27.34	27.57	27.79	28.04	28.29	28.55	28.80	29.05
3	25.00	25.00	25.00	25.16	25.66	26.13	26.64	27.03	27.31	27.54	27.77	28.00	28.23	28.45	28.68	28.91	29.14	29.37	29.59	29.82
4	25.00	25.00	25.26	25.78	26.31	26.79	27.25	27.52	27.86	28.17	28.44	28.69	28.92	29.14	29.37	29.60	29.83	30.06	30.28	30.51
5	25.00	25.19	25.76	26.29	26.79	27.27	27.73	28.09	28.42	28.55	28.89	29.15	29.39	29.64	29.87	30.09	30.32	30.55	30.78	31.01
6	25.00	25.63	26.13	26.66	27.16	27.64	28.10	28.46	28.80	29.05	29.28	29.45	29.71	30.01	30.27	30.44	30.67	30.90	31.12	31.35
7	25.39	25.97	26.47	26.91	27.46	27.94	28.40	28.76	29.05	29.36	29.60	29.84	29.95	30.24	30.52	30.75	30.91	31.14	31.37	31.60
8	25.80	26.22	26.73	27.25	27.65	28.13	28.62	29.03	29.29	29.55	29.87	30.10	30.30	30.43	30.68	30.94	31.17	31.34	31.57	31.80
9	26.15	26.57	27.03	27.50	27.96	28.41	28.87	29.21	29.57	29.81	30.05	30.36	30.61	30.76	30.90	31.12	31.35	31.57	31.76	31.99
10	26.51	27.08	27.29	27.82	28.28	28.64	29.15	29.51	29.75	30.09	30.34	30.56	30.85	31.11	31.22	31.38	31.57	31.77	31.96	32.19
11	27.04	27.60	27.73	28.10	28.53	29.02	29.36	29.75	30.06	30.29	30.61	30.87	31.07	31.33	31.58	31.69	31.85	32.03	32.21	32.39
12	27.43	28.13	28.24	28.39	28.91	29.31	29.70	30.02	30.31	30.61	30.83	31.13	31.39	31.58	31.81	32.05	32.15	32.33	32.50	32.66
13	27.82	28.48	28.76	28.88	29.16	29.61	30.08	30.33	30.59	30.87	31.17	31.37	31.65	31.92	32.10	32.30	32.51	32.61	32.80	32.96
14	28.45	28.87	29.28	29.40	29.53	29.98	30.34	30.71	30.91	31.16	31.43	31.72	31.91	32.17	32.42	32.61	32.79	32.97	33.07	33.24
15	28.92	29.52	29.84	29.92	30.04	30.24	30.70	31.03	31.29	31.49	31.73	31.99	32.27	32.45	32.70	32.92	33.12	33.29	33.44	33.53
16	29.34	30.00	30.33	30.43	30.56	30.68	31.04	31.35	31.64	31.87	32.07	32.30	32.55	32.81	32.99	33.22	33.43	33.62	33.79	33.90
17	30.09	30.40	30.69	30.95	31.07	31.20	31.37	31.75	31.95	32.24	32.45	32.65	32.87	33.11	33.35	33.53	33.74	33.93	34.10	34.25
18	30.61	31.12	31.32	31.49	31.59	31.71	31.84	32.04	32.34	32.55	32.83	33.03	33.23	33.44	33.67	33.90	34.07	34.26	34.43	34.58
19	31.23	31.70	31.97	32.08	32.11	32.23	32.36	32.46	32.66	32.94	33.15	33.41	33.61	33.81	34.01	34.23	34.44	34.61	34.78	34.93
20	32.08	32.27	32.42	32.54	32.62	32.75	32.87	32.98	33.07	33.28	33.54	33.75	33.99	34.19	34.39	34.59	34.79	34.98	35.55	36.20
21	32.66	33.04	33.10	33.12	33.14	33.26	33.39	33.49	33.58	33.69	33.89	34.13	34.34	34.57	34.77	34.97	35.59	36.26	36.91	37.62
22	33.59	33.68	33.81	33.77	33.73	33.78	33.91	34.01	34.09	34.18	34.30	34.52	34.73	34.94	35.47	36.12	36.77	37.60	38.27	38.99
23	34.43	34.53	34.48	34.42	34.32	34.30	34.42	34.53	34.61	34.69	34.77	34.92	35.37	36.01	36.66	37.34	37.98	38.77	39.61	40.28
24	35.00	35.00	35.00	35.00	34.91	34.81	34.94	35.00	35.00	35.00	35.00	35.40	35.94	36.53	37.17	37.84	38.53	39.20	39.92	40.77
25	35.00	35.00	35.00	35.00	35.00	35.00	35.53	35.60	35.80	36.11	36.58	37.12	37.70	38.32	38.99	39.67	40.41	41.07	41.92	42.78
26	35.00	35.00	35.00	35.00	35.00	35.10	36.57	36.70	36.90	37.28	37.71	38.23	38.82	39.47	40.15	40.85	41.56	42.28	43.07	43.92
27	35.00	35.00	35.00	35.00	35.00	35.84	37.53	37.75	38.02	38.34	38.82	39.37	39.96	40.59	41.26	41.96	42.88	43.44	44.22	45.00
28	35.00	35.00	35.00	35.00	35.00	36.18	38.51	38.72	39.04	39.47	39.93	40.45	41.06	41.71	42.39	43.09	43.82	44.57	45.00	45.00
29	35.00	35.00	35.00	35.00	35.00	36.73	39.06	39.78	40.10	40.47	40.98	41.54	42.15	42.80	43.48	44.19	44.93	45.00	45.00	45.00
30	35.00	35.00	35.00	35.00	35.00	37.27	39.60	40.66	41.05	41.52	42.04	42.58	43.20	43.88	44.57	45.00	45.00	45.00	45.00	45.00
31	35.00	35.00	35.00	35.00	35.49	37.82	40.15	41.64	42.04	42.49	43.05	43.64	44.27	44.94	45.00	45.00	45.00	45.00	45.00	45.00
32	35.00	35.00	35.00	35.00	36.03	38.36	40.69	42.50	42.95	43.49	44.04	44.65	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00
33	35.00	35.00	35.00	35.00	36.58	38.91	41.23	43.18	43.89	44.43	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00
34	33.43	34.54	35.00	35.00	37.12	39.45	41.78	43.72	44.77	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00
35	31.13	32.53	33.65	34.93	37.27	39.91	42.64	44.92	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00
36	28.99	30.80	32.07	33.63	35.77	39.11	42.78	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00
37	27.25	29.19	30.70	32.51	34.51	37.81	41.57	43.84	44.89	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00
38	25.66	27.80	29.58	31.57	33.70	36.57	39.96	42.06	43.04	43.58	44.03	44.23	44.46	44.62	44.83	45.00	45.00	45.00	45.00	45.00
39	25.00	26.63	28.65	30.80	33.04	35.50	38.68	40.58	41.49	42.33	42.66	43.11	43.33	43.62	43.87	44.19	44.55	44.95	45.00	45.00
40	25.00	25.72	27.93	30.22	32.51	34.80	37.70	39.39	40.54	41.08	41.75	42.04	42.42	42.72	43.04	43.42	43.85	44.30	44.78	45.00
41	25.00	25.18	27.52	29.83	32.11	34.39	37.00	38.64	39.50	40.34	40.74	41.21	41.55	41.92	42.31	42.76	43.25	43.74	44.26	44.79
42	25.00	25.28	27.44	29.65	31.85	34.06	36.43	37.93	38.86	39.45	40.01	40.39	40.79	41.23	41.70	42.21	42.73	43.27	43.82	44.37
43	25.00	25.75	27.64	29.63	31.71	33.79	35.96	37.39	38.16	38.80	39.23	39.67	40.15	40.67	41.21	41.76	42.32	42.87	43.45	44.02
44	25.00	26.26	27.99	29.79	31.66	33.64	35.64	36.88	37.64	38.14	38.62	39.13	39.68	40.24	40.81	41.39	41.96	42.56	43.15	43.74
45	25.00	26.73	28.30	29.93	31.66	33.51	35.35	36.51	37.02	37.60	38.15	38.76	39.32	39.91	40.51	41.12	41.71	42.31	42.91	43.52
46	25.55	27.11	28.58	30.16	31.73	33.40	35.14	36.03	36.66	37.26	37.85	38.46	39.08	39.69	40.29	40.90	41.51	42.12	42.72	43.34
47	26.07	27.51	28.87	30.30	31.76	33.33	34.98	35.80	36.44	37.06	37.67	38.29	38.91	39.52	40.14	40.74	41.35	41.96	42.57	43.18
48	26.58	27.87	29.14	30.49	31.82	33.27	34.83	35.68	36.31	36.93	37.55	38.16	38.78	39.38	40.00	40.61	41.23	41.86	42.49	43.13
49	26.98	28.27	29.38	30.60	31.92	33.25	34.70	35.59	36.20	36.82	37.43	38.06	38.69	39.33	39.96	40.59	41.23	41.86	42.50	43.13
50	27.30	28.48	29.65	30.75	31.92	33.26	34.58	35.51	36.15	36.79	37.43	38.09	38.75	39.41	40.04	40.67	41.29	41.92	42.55	43.18
51	27.70	28.79	29.76	30.86	32.04	33.21	34.50	35.45	36.10	36.77	37.43	38.09	38.75	39.41	40.04	40.67	41.29	41.92	42.55	43.18
52	27.95	29.02	30.01	30.99	32.04	33.23	34.40	35.44	36.29	37.12	37.75	38.37	39.00	39.62	40.25	40.87	41.50	42.12	42.75	43.37
53	28.17	29.18	30.08	31.10	32.14	33.20	34.32	35.36	36.27	37.03	37.86	38.70	39.42	40.05	40.67	41.30	41.92	42.55	43.17	43.80
54	28.47	29.38	30.28	31.19	32.15	33.18	34.27	35.26	36.25	37.05	37.96	38.87	39.51	40.27	41.10	41.72	42.35	42.97	43.60	44.22
55	28.59	29.52	30.34	31.22	32.18	33.19	34.21	35.15	36.20	37.10	38.09	39.04	39.71	40.56	41.37	41.98	42.68	43.40	44.02	44.65
56	28.83	29.61	30.41	31.30	32.23	33.17	34.15	35.03	36.16	37.19	38.17	39.21	39.95	40.91	41.73	42.40	43.16	43.84	44.46	45.00
57	29.05	29.81	30.56	31.40	32.25	33.15	34.10	34.94	36.15	37.15	38.27	39.40	40.34	41.19	42.14	42.89	43.73	44.42	45.00	45.00
58	29.20	2																		

TABLE D.2-8. TOP OF THE SURFICIAL AQUIFER (FEET ABOVE MSL MINUS 7000) (continued).

Row	Column																			
	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
1	28.95	29.20	29.45	29.70	29.96	30.22	30.47	30.72	30.97	31.22	31.47	31.72	31.96	32.21	32.45	32.70	32.94	33.19	33.43	33.67
2	29.30	29.54	29.79	30.03	30.28	30.52	30.77	31.01	31.26	31.51	31.76	32.02	32.27	32.53	32.79	33.05	33.30	33.55	33.80	34.05
3	30.05	30.28	30.51	30.73	30.96	31.19	31.42	31.65	31.87	32.10	32.33	32.56	32.79	33.02	33.25	33.48	33.70	33.93	34.15	34.36
4	30.74	30.97	31.20	31.42	31.65	31.88	32.11	32.34	32.56	32.79	33.02	33.25	33.48	33.70	33.93	34.16	34.39	34.62	34.84	35.00
5	31.23	31.46	31.69	31.92	32.15	32.37	32.60	32.83	33.06	33.29	33.51	33.74	33.97	34.20	34.43	34.65	34.88	35.00	35.00	35.00
6	31.58	31.81	32.04	32.26	32.49	32.72	32.95	33.18	33.40	33.63	33.86	34.09	34.32	34.54	34.77	35.00	35.00	35.00	35.00	35.00
7	31.83	32.05	32.28	32.51	32.74	32.97	33.19	33.42	33.65	33.88	34.11	34.33	34.56	34.79	35.00	35.00	35.00	35.00	35.00	35.00
8	32.02	32.25	32.48	32.71	32.94	33.16	33.39	33.62	33.85	34.08	34.30	34.53	34.76	34.99	35.00	35.00	35.00	35.00	35.00	35.00
9	32.22	32.45	32.68	32.90	33.13	33.36	33.59	33.82	34.04	34.27	34.50	34.73	34.96	35.00	35.00	35.00	35.00	35.00	35.00	35.00
10	32.42	32.65	32.87	33.10	33.33	33.56	33.79	34.01	34.24	34.47	34.70	34.93	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
11	32.62	32.84	33.07	33.30	33.53	33.76	33.98	34.21	34.44	34.67	34.90	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
12	32.81	33.04	33.27	33.50	33.72	33.95	34.18	34.41	34.64	34.87	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
13	33.11	33.24	33.47	33.69	33.92	34.15	34.38	34.61	34.83	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
14	33.39	33.51	33.66	33.89	34.12	34.35	34.58	34.80	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
15	33.68	33.80	33.91	34.09	34.32	34.55	34.77	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
16	33.99	34.12	34.22	34.30	34.51	34.74	34.97	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
17	34.36	34.46	34.56	34.64	34.71	34.94	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
18	34.72	34.82	34.92	35.00	35.35	35.67	35.91	36.09	35.95	35.51	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
19	35.31	35.90	36.50	37.10	37.70	38.28	38.82	39.36	39.55	39.02	38.00	36.81	35.66	35.00	35.00	35.00	35.00	35.00	35.00	35.00
20	36.85	37.52	38.20	38.90	39.63	40.43	41.47	42.41	43.15	42.46	40.62	39.01	37.57	36.57	35.48	35.00	35.00	35.00	35.00	35.00
21	38.38	39.12	39.92	40.77	41.67	42.73	43.79	45.00	45.00	44.81	42.47	40.54	39.51	38.07	36.89	36.03	35.38	35.00	35.00	35.00
22	39.75	40.54	41.37	42.27	43.31	44.54	45.00	45.00	45.00	45.00	43.51	41.92	40.52	39.16	37.98	37.14	36.50	36.08	35.84	35.40
23	41.04	41.92	42.84	43.84	44.96	45.00	45.00	45.00	45.00	45.00	44.34	42.67	41.38	39.97	38.91	38.03	37.44	36.98	36.54	36.02
24	42.34	43.24	44.20	45.00	45.00	45.00	45.00	45.00	45.00	45.00	44.81	43.27	41.96	40.67	39.56	38.89	38.13	37.68	37.16	36.65
25	43.63	44.47	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	43.71	42.43	41.17	40.34	39.50	38.79	38.31	37.79	37.20
26	44.78	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	44.09	42.77	41.79	40.86	40.08	39.45	38.93	38.42	37.80
27	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	44.37	43.24	42.23	41.36	40.59	40.07	39.56	39.04	38.53
28	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	44.69	43.80	42.82	41.73	41.21	40.70	40.18	39.67	39.15
29	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	44.97	43.87	42.93	42.35	41.84	41.32	40.81	40.29	39.78
30	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	44.21	43.49	42.98	42.46	41.94	41.31	40.87	40.35	39.83
31	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	44.63	44.04	43.41	42.78	42.15	41.53	40.90	40.29	39.68
32	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	44.88	44.25	43.63	43.01	42.39	41.78	41.19	40.59	39.98
33	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	44.49	43.88	43.28	42.68	42.09	41.52	40.97	40.40
34	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	44.77	44.18	43.59	43.02	42.47	41.91	41.40	40.89	40.38
35	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	44.52	43.96	43.40	42.88	42.39	41.93	41.44
36	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	44.91	44.37	43.86	43.38	42.94	42.54	42.14
37	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	44.85	44.38	43.94	43.55	43.16	42.77
38	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	44.95	44.56	44.19	43.88	43.57
39	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	44.91	44.63
40	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.19	45.59	45.89	45.56
41	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.02	45.42	45.83	46.23	46.64	46.61
42	44.93	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.25	45.65	46.06	46.47	46.87	47.28	47.50
43	44.60	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.08	45.48	45.89	46.29	46.70	47.11	47.51	47.92	48.32
44	44.34	44.93	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.31	45.72	46.12	46.53	46.93	47.34	47.75	48.15	48.56	48.96
45	44.12	44.72	45.00	45.00	45.00	45.00	45.00	45.00	45.14	45.54	45.95	46.36	46.76	47.17	47.57	47.98	48.38	48.79	49.20	49.60
46	43.94	44.54	45.00	45.00	45.00	45.00	45.00	45.37	45.78	46.18	46.59	47.00	47.41	47.81	48.21	48.62	49.02	49.43	49.84	50.24
47	43.78	44.39	45.00	45.00	45.00	45.20	45.61	46.01	46.42	46.82	47.23	47.63	48.04	48.45	48.85	49.26	49.66	50.07	50.47	50.88
48	43.76	44.39	45.00	45.03	45.43	45.84	46.25	46.65	47.06	47.46	47.87	48.27	48.68	49.09	49.49	49.90	50.30	50.71	51.11	51.52
49	43.76	44.40	45.00	45.29	45.78	46.26	46.75	47.24	47.70	48.10	48.51	48.91	49.32	49.72	50.13	50.54	50.94	51.35	51.75	52.16
50	43.77	44.40	45.00	45.39	45.87	46.35	46.83	47.31	47.79	48.26	48.74	49.22	49.70	50.18	50.67	51.16	51.58	51.99	52.39	52.80
51	43.81	44.44	45.05	45.53	46.01	46.48	46.96	47.44	47.91	48.39	48.87	49.35	49.82	50.30	50.78	51.25	51.73	52.21	52.69	53.16
52	44.00	44.63	45.20	45.67	46.13	46.60	47.06	47.52	47.99	48.45	48.91	49.38	49.84	50.30	50.76	51.23	51.69	52.15	52.62	53.08
53	44.42	45.00	45.00	45.42	45.89	46.36	46.83	47.30	47.77	48.24	48.70	49.17	49.64	50.11	50.58	51.05	51.52	51.99	52.46	52.92
54	44.85	45.00	45.00	45.16	45.63	46.10	46.57	47.03	47.50	47.97	48.44	48.91	49.38	49.85	50.32	50.79	51.25	51.72	52.19	52.66
55	45.00	45.00	45.00	45.00	45.36	45.83	46.30	46.77	47.24	47.71	48.18	48.65	49.12	49.58	50.05	50.52	50.99	51.46	51.93	52.40
56	45.00	45.00	45.00	45.00	45.10	45.57	46.04	46.51	46.98	47.44	47.91	48.38	48.85	49.32	49.79	50.26	50.73	51.20	51.66	52.13
57	45.00	45.00	45.00	45.00	45.00	45.31	45.77	46.24	46.71	47.18	47.65	48.12	48.59	49.06	49.53	49.99	50.46	50.93	51.40	51.87
58	45.00																			

TABLE D.2-8. TOP OF THE SURFICIAL AQUIFER (FEET ABOVE MSL MINUS 7000) (continued).

Row	Column																			
	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
1	33.91	34.15	34.39	34.63	34.87	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
2	34.31	34.57	34.83	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
3	34.61	34.84	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
4	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
5	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
6	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
7	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
8	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
9	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
10	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
11	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	34.27	33.77	33.44	33.55	33.86	34.41	35.00	35.00
12	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	33.77	32.54	31.84	31.36	31.46	31.78	31.90	32.14
13	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	34.49	33.26	32.03	30.80	29.90	29.15	29.07	28.59	27.66
14	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	33.98	32.76	31.53	30.30	29.07	27.97	27.07	25.77	25.00
15	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	34.71	33.48	32.25	31.02	29.79	28.56	27.33	26.11	25.00	25.00
16	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	34.20	32.97	31.74	30.52	29.29	28.06	26.83	25.72	25.00	25.00
17	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	34.93	33.70	32.47	31.24	30.01	28.78	27.50	26.92	26.24	25.47	25.00
18	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	34.42	33.19	31.96	30.79	29.93	29.06	28.48	27.90	27.32	26.32	25.00
19	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	33.91	32.92	32.08	31.30	30.72	30.14	29.56	28.98	28.36	27.13	26.16
20	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	34.19	33.54	32.96	32.38	31.80	31.22	30.64	30.06	29.46	28.04	27.75
21	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	34.62	34.04	33.46	32.88	32.31	31.73	31.15	30.26	29.72	29.33	29.33
22	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	34.55	33.97	33.39	32.81	32.26	31.56	31.32	30.92
23	35.51	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	34.47	33.89	33.40	33.24	32.92	32.51	32.51
24	36.14	35.62	35.11	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	34.98	34.98	35.00	34.87	34.51	34.09
25	36.76	36.25	35.73	35.22	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
26	37.39	36.87	36.36	35.84	35.33	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
27	38.01	37.50	36.98	36.47	35.95	35.44	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
28	38.64	38.12	37.61	37.09	36.47	35.84	35.21	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
29	39.20	38.57	37.95	37.32	36.70	36.09	35.49	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.25	35.65
30	39.43	38.80	38.19	37.59	37.01	36.48	35.93	35.30	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.10	35.51	35.91	36.31
31	39.69	39.09	38.53	37.95	37.49	36.96	36.44	35.78	35.02	35.00	35.00	35.00	35.00	35.00	35.00	35.36	35.76	36.17	36.57	36.97
32	40.03	39.44	38.93	38.50	37.99	37.51	37.06	36.35	35.65	35.00	35.00	35.00	35.00	35.00	35.41	36.02	36.42	36.83	37.23	37.63
33	40.42	39.93	39.51	39.03	38.62	38.31	37.64	37.00	36.40	35.71	35.00	35.00	35.00	35.00	35.73	36.49	37.08	37.49	37.89	38.29
34	40.93	40.52	40.06	39.74	39.35	38.82	38.37	37.76	37.14	36.60	36.00	35.56	35.25	35.65	36.29	36.87	37.60	38.02	38.55	38.95
35	41.53	41.09	40.80	40.40	40.09	39.55	39.15	38.66	38.19	37.58	37.08	36.69	36.42	36.49	36.96	37.53	38.03	38.71	39.08	39.61
36	42.13	41.82	41.47	41.26	40.81	40.38	40.00	39.51	39.13	38.60	38.23	37.83	37.59	37.56	37.79	38.27	38.72	39.19	39.79	40.18
37	42.85	42.53	42.30	41.91	41.64	41.32	40.92	40.61	40.17	39.71	39.36	38.98	38.76	38.67	38.75	39.08	39.48	39.91	40.36	40.87
38	43.58	43.34	43.13	42.79	42.54	42.29	41.93	41.67	41.20	40.86	40.50	40.14	39.92	39.79	39.76	39.97	40.30	40.88	41.10	41.52
39	44.39	44.20	43.97	43.75	43.52	43.24	43.03	42.71	42.35	42.00	41.63	41.30	41.07	40.85	40.83	40.97	41.24	41.58	41.89	42.33
40	45.30	45.09	44.91	44.75	44.58	44.34	44.13	43.80	43.48	43.15	42.79	42.46	42.21	41.99	41.92	41.97	42.17	42.45	42.79	43.14
41	46.37	46.19	46.04	45.86	45.70	45.49	45.27	44.95	44.63	44.29	43.94	43.62	43.36	43.13	43.03	43.17	43.40	43.67	44.00	44.00
42	47.31	47.30	47.10	47.00	46.88	46.71	46.56	46.27	45.93	45.59	45.15	44.78	44.50	44.27	44.14	44.10	44.18	44.37	44.61	44.89
43	48.35	48.25	48.18	48.13	48.06	47.93	47.85	47.61	47.39	47.15	46.85	46.52	46.12	45.80	45.53	45.45	45.59	46.00	46.61	47.38
44	49.11	49.20	49.28	49.27	49.23	49.15	49.14	48.96	48.86	48.70	48.56	48.38	48.10	48.00	47.85	47.99	48.21	48.73	49.31	50.07
45	50.01	50.09	50.34	50.41	50.41	50.35	50.42	50.34	50.33	50.26	50.24	50.19	50.09	50.19	50.17	50.52	50.83	51.37	52.01	52.77
46	50.65	50.99	51.19	51.35	51.55	51.58	51.71	51.72	51.79	51.81	51.91	51.99	52.07	52.29	52.48	52.93	53.41	54.01	54.71	55.28
47	51.29	51.69	51.93	52.38	52.59	52.80	52.99	53.10	53.26	53.37	53.59	53.80	54.05	54.39	54.80	55.19	55.54	55.90	56.36	56.89
48	51.93	52.33	52.86	53.30	53.64	54.01	54.27	54.49	54.73	54.98	55.16	55.37	55.56	55.83	56.14	56.52	56.86	57.33	57.89	58.44
49	52.57	52.97	53.33	54.07	54.70	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00
50	53.20	53.61	54.02	54.67	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00
51	53.64	54.12	54.60	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00
52	53.54	54.01	54.47	54.93	55.00	55.00	55.00	55.00	55.00	55.27	56.31	57.35	58.39	59.42	59.83	60.31	60.91	61.62	62.33	63.02
53	53.39	53.86	54.33	54.79	55.00	55.00	55.00	55.00	55.73	56.77	57.80	58.84	59.88	60.81	61.35	61.88	62.60	63.29	64.09	65.06
54	53.13	53.60	54.07	54.47	54.92	55.00	55.00	55.15	56.18	57.22	58.28	59.30	60.33	61.37	62.04	62.68	63.46	64.30	65.21	66.62
55	52.87	53.34	53.67	54.11	54.72	55.00	55.00	55.60	56.64	57.68	58.71	59.75	60.79	61.83	62.88	63.57	64.30	65.27	66.91	68.47
56	52.60	52.94	53.29	53.85	54.51	55.00	55.02	56.06	57.09	58.13	59.17	60.21	61.24	62.28	63.32	64.26	65.22	67.09	68.72	70.19
57	52.22	52.52	52.99	53.65	54.31	54.96	55.00	56.09	57.25	58.43	59.61	60.79	61.87	62.89	63.91	64.94	66.89	68.90	70.62	72.17
58	51.63	5																		

TABLE D.2-8. TOP OF THE SURFICIAL AQUIFER (FEET ABOVE MSL MINUS 7000) (continued).

Row	Column																			
	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
2	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
3	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
4	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
5	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
6	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
7	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
8	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
9	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
10	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
11	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
12	32.75	34.36	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
13	26.17	26.74	27.20	30.55	34.64	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
14	25.00	25.00	25.00	25.00	25.96	31.30	34.04	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
15	25.00	25.00	25.00	25.00	25.00	26.43	29.81	32.54	34.84	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
16	25.00	25.00	25.00	25.00	25.00	27.07	29.68	32.30	34.48	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
17	25.00	25.00	25.00	25.00	25.00	25.00	27.60	30.22	31.84	33.16	34.32	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
18	25.00	25.00	25.00	25.00	25.00	25.52	27.95	29.21	30.95	32.80	34.65	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
19	26.03	25.90	25.70	25.17	25.00	25.74	27.59	29.44	31.28	33.13	34.98	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
20	27.61	27.48	27.12	26.65	26.45	26.65	27.92	29.77	31.62	33.46	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
21	29.19	29.02	28.54	28.14	27.92	28.08	28.26	30.10	31.95	33.79	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
22	30.77	30.45	29.99	29.63	29.42	29.52	29.67	30.43	32.28	34.13	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
23	32.32	31.90	31.46	31.12	30.91	30.92	31.08	31.27	32.61	34.46	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.04	35.64
24	33.77	33.34	32.95	32.61	32.40	32.37	32.51	32.68	32.94	34.79	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.75	36.74
25	35.00	34.81	34.43	34.10	33.89	33.84	33.94	34.10	34.29	35.00	35.00	35.00	35.05	35.20	35.37	35.55	35.78	36.12	36.69	37.50
26	35.00	35.00	35.00	35.29	35.20	35.18	35.21	35.33	35.45	35.60	35.77	35.92	36.12	36.27	36.50	36.67	36.98	37.31	37.76	38.34
27	35.00	35.14	35.54	35.95	35.98	35.98	36.05	36.18	36.35	36.54	36.67	36.94	37.09	37.34	37.59	37.80	38.10	38.43	38.87	39.44
28	35.40	35.80	36.20	36.61	36.76	36.79	36.89	37.05	37.26	37.46	37.62	37.96	38.10	38.42	38.59	38.93	39.16	39.54	40.02	40.52
29	36.06	36.46	36.86	37.27	37.54	37.58	37.74	37.88	38.15	38.28	38.57	38.83	39.12	39.42	39.64	40.06	40.23	40.72	41.16	41.64
30	36.72	37.12	37.52	37.93	38.32	38.29	38.52	38.64	38.93	39.18	39.51	39.69	40.14	40.36	40.71	41.06	41.36	41.81	42.25	42.75
31	37.38	37.78	38.18	38.59	38.98	39.00	39.24	39.46	39.76	40.09	40.35	40.59	41.05	41.30	41.75	42.05	42.49	42.87	43.35	43.88
32	38.04	38.44	38.84	39.25	39.65	39.78	40.02	40.30	40.58	40.91	41.16	41.53	41.90	42.32	42.69	43.04	43.52	43.94	44.46	44.98
33	38.70	39.10	39.50	39.91	40.31	40.56	40.80	41.10	41.34	41.69	42.02	42.43	42.76	43.26	43.63	44.08	44.52	45.00	45.73	46.44
34	39.36	39.76	40.16	40.57	40.97	41.34	41.51	41.82	42.09	42.46	42.89	43.24	43.62	44.11	44.57	45.04	45.77	46.50	47.21	47.92
35	40.02	40.42	40.82	41.23	41.63	42.01	42.22	42.55	42.87	43.28	43.67	44.06	44.50	44.97	45.80	46.55	47.27	48.01	48.70	49.42
36	40.64	41.04	41.48	41.89	42.29	42.67	42.92	43.27	43.67	44.03	44.44	44.87	45.61	46.43	47.28	48.05	48.79	49.51	50.21	50.91
37	41.28	41.67	42.14	42.55	42.95	43.34	43.63	44.02	44.40	44.79	45.44	46.30	47.13	47.94	48.75	49.57	50.30	51.01	51.73	52.41
38	41.95	42.38	42.77	43.21	43.61	44.00	44.36	44.73	45.27	46.14	47.00	47.84	48.66	49.50	50.25	51.07	51.81	52.53	53.24	53.92
39	42.69	43.04	43.49	43.86	44.26	44.67	45.13	46.15	46.89	47.70	48.57	49.39	50.23	51.04	51.81	52.55	53.33	54.04	54.75	55.71
40	43.51	43.85	44.21	44.59	44.96	46.08	47.29	48.01	48.71	49.32	50.13	50.96	51.79	52.58	53.36	54.11	54.86	55.90	57.05	58.18
41	44.33	44.68	45.04	46.12	47.15	48.23	49.45	49.87	50.54	51.15	51.76	52.56	53.36	54.15	54.92	56.03	57.18	58.32	59.48	60.64
42	45.60	46.59	47.56	48.58	49.48	50.42	51.61	51.74	52.36	52.97	53.68	54.19	54.94	56.09	57.27	58.42	59.58	60.73	61.88	63.08
43	48.23	49.19	50.09	51.04	51.94	52.84	53.77	53.57	54.18	54.79	55.53	56.32	57.30	58.48	59.66	60.82	61.97	63.13	64.29	65.41
44	50.89	51.79	52.67	53.55	54.42	55.21	55.35	55.50	56.30	57.09	57.88	58.67	59.70	60.87	62.04	63.21	64.36	65.45	66.44	67.45
45	53.58	54.42	55.19	55.79	56.40	57.08	57.39	57.81	58.58	59.45	60.24	61.03	62.10	63.27	64.43	65.50	66.49	67.49	68.49	69.49
46	55.76	56.32	56.95	57.55	58.21	58.92	59.44	59.73	60.70	61.67	62.60	63.41	64.51	65.56	66.56	67.53	68.53	69.53	70.52	71.53
47	57.35	58.00	58.66	59.29	60.03	60.70	61.46	61.85	62.81	63.78	64.75	65.69	66.61	67.58	68.57	69.56	70.56	71.56	72.56	73.57
48	58.95	59.60	60.24	61.05	61.79	62.49	63.31	63.96	64.93	65.84	66.77	67.68	68.64	69.60	70.59	71.59	72.58	73.59	74.59	75.37
49	60.55	61.10	61.87	62.77	63.51	64.28	65.10	65.99	66.88	67.82	68.75	69.69	70.66	71.61	72.61	73.61	74.61	75.38	76.00	76.61
50	61.99	62.61	63.49	64.35	65.28	66.12	67.02	67.91	68.83	69.80	70.72	71.69	72.65	73.62	74.62	75.38	76.00	76.62	77.24	77.86
51	63.35	64.17	64.99	66.05	67.11	68.01	68.91	69.81	70.78	71.72	72.69	73.67	74.64	75.39	76.00	76.62	77.24	77.86	78.48	79.11
52	64.71	65.70	66.78	67.86	68.88	69.88	70.76	71.73	72.67	73.64	74.65	75.40	76.01	76.62	77.24	77.85	78.48	79.09	79.72	80.34
53	66.33	67.49	68.56	69.65	70.67	71.69	72.65	73.58	74.55	75.51	76.45	77.39	78.32	79.23	79.85	80.33	80.83	81.33	81.83	82.33
54	68.05	69.26	70.35	71.44	72.51	73.48	74.46	75.25	75.81	76.38	77.11	77.83	78.46	79.08	79.70	80.32	80.94	81.57	82.19	82.82
55	69.61	70.99	72.12	73.21	74.32	75.19	75.74	76.30	76.89	77.45	78.13	78.95	79.68	80.30	80.92	81.54	82.17	82.79	83.42	84.05
56	71.60	72.66	73.89	74.99	75.80	76.24	76.80	77.36	77.96	78.52	79.14	79.96	80.79	81.53	82.15	82.77	83.40	84.02	84.65	85.10
57	73.47	74.67	75.36	75.93	76.56	77.17	77.86	78.42	78.99	79.59	80.16	80.98	81.80	82.62	83.37	83.99	84.62	85.09	85.30	85.52
58	75.41																			

TABLE D.2-8. TOP OF THE SURFICIAL AQUIFER (FEET ABOVE MSL MINUS 7000) (continued).

Row	Column																
	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117
1	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
2	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
3	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
4	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
5	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
6	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
7	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
8	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
9	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
10	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
11	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
12	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
13	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
14	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
15	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
16	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
17	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
18	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.40	35.92	35.46	35.00	35.00	35.00	35.00	35.00
19	35.00	35.00	35.00	35.00	35.00	35.00	35.03	35.45	35.87	36.29	36.81	36.36	35.29	35.00	35.00	35.00	35.00
20	35.00	35.00	35.00	35.00	35.08	35.50	35.92	36.34	36.75	37.17	37.69	37.26	36.55	35.69	35.00	35.00	35.00
21	35.00	35.00	35.13	35.55	35.97	36.38	36.80	37.22	37.64	38.06	38.58	38.21	37.87	37.50	37.04	36.83	36.54
22	35.18	35.60	36.01	36.43	36.85	37.27	37.69	38.10	38.52	38.94	39.46	39.27	39.22	39.31	39.22	39.39	39.82
23	36.06	36.48	36.90	37.32	37.73	38.15	38.57	38.99	39.41	39.83	40.30	40.33	40.57	41.12	41.40	41.95	42.69
24	36.96	37.36	37.78	38.20	38.62	39.04	39.46	39.87	40.29	40.71	41.06	41.40	41.91	42.95	43.58	44.51	45.57
25	38.15	38.36	38.66	39.09	39.50	39.92	40.34	40.76	41.18	41.60	41.96	42.46	43.26	44.89	45.69	46.81	47.88
26	39.33	39.55	39.77	39.99	40.39	40.81	41.23	41.64	42.06	42.48	42.90	43.52	44.60	46.75	47.68	49.02	50.18
27	40.02	40.74	40.96	41.17	41.39	41.68	42.11	42.53	42.95	43.37	43.83	44.58	46.20	48.44	49.67	51.24	52.46
28	41.09	41.76	42.14	42.36	42.58	42.80	43.01	43.40	43.83	44.25	44.77	46.04	47.91	50.13	51.66	53.45	54.73
29	42.19	42.74	43.33	43.55	43.77	43.98	44.20	44.42	44.70	45.25	46.32	47.76	49.61	51.83	53.65	55.99	58.00
30	43.29	43.84	44.38	44.74	44.95	45.00	45.10	45.67	46.23	47.02	48.08	49.51	51.32	53.56	56.15	59.30	61.40
31	44.41	44.95	45.16	45.37	45.78	46.35	46.92	47.48	48.05	48.83	49.87	51.28	53.04	55.48	59.88	62.70	64.76
32	45.68	46.39	46.91	47.11	47.50	48.17	48.73	49.30	49.89	50.66	51.64	53.05	54.77	58.54	63.29	65.74	67.37
33	47.16	47.84	48.54	48.86	49.17	49.88	50.55	51.12	51.72	52.50	53.47	54.82	57.89	61.60	65.87	68.00	69.93
34	48.64	49.31	50.00	50.61	50.84	51.55	52.27	52.94	53.66	54.34	55.49	57.78	60.80	64.66	67.65	70.22	72.48
35	50.11	50.81	51.46	52.14	52.55	53.22	53.94	54.65	55.63	56.86	58.50	60.82	63.89	66.62	69.46	72.43	75.02
36	51.60	52.30	52.96	53.62	54.27	54.89	56.00	57.24	58.48	59.77	61.51	63.84	66.18	68.45	71.28	74.65	76.52
37	53.11	53.78	54.45	55.18	56.35	57.57	58.75	60.05	61.29	62.68	64.41	66.15	68.04	70.30	73.09	76.11	78.01
38	54.61	55.48	56.64	57.79	59.01	60.22	61.50	62.77	64.09	65.33	66.47	68.02	69.93	72.14	74.90	77.44	79.51
39	56.86	58.04	59.19	60.40	61.60	62.86	64.16	65.34	66.28	67.20	68.33	69.89	71.80	74.01	76.27	78.76	80.96
40	59.35	60.52	61.72	62.96	64.19	65.38	66.31	67.26	68.18	69.09	70.23	71.77	73.67	75.64	77.62	80.08	82.41
41	61.81	63.00	64.24	65.37	66.35	67.30	68.24	69.18	70.08	71.01	72.11	73.64	75.39	76.98	78.96	81.42	83.86
42	64.26	65.39	66.38	67.35	68.31	69.25	70.20	71.10	72.03	72.91	74.01	75.36	76.70	78.32	80.31	82.76	85.16
43	66.41	67.40	68.37	69.35	70.28	71.24	72.14	73.07	73.97	74.85	75.63	76.67	78.01	79.66	81.67	84.09	85.93
44	68.46	69.42	70.42	71.34	72.30	73.22	74.14	75.02	75.61	76.20	76.94	77.98	79.32	80.96	83.03	85.24	86.69
45	70.50	71.49	72.43	73.39	74.32	75.15	75.73	76.31	76.90	77.50	78.24	79.28	80.63	82.29	84.39	85.98	87.45
46	72.54	73.55	74.50	75.27	75.84	76.43	77.01	77.60	78.20	78.78	79.54	80.58	81.94	83.60	85.40	86.73	88.21
47	74.58	75.36	75.96	76.53	77.12	77.70	78.29	78.89	79.47	80.08	80.84	81.89	83.24	84.91	86.10	87.47	88.98
48	75.99	76.80	77.22	77.80	78.39	78.96	79.57	80.16	80.75	81.37	82.13	83.19	84.54	85.65	86.81	88.21	89.74
49	77.23	77.84	78.46	79.07	79.64	80.24	80.83	81.43	82.04	82.64	83.41	84.48	85.45	86.34	87.51	88.96	90.50
50	78.47	79.09	79.70	80.31	80.90	81.50	82.09	82.70	83.31	83.92	84.69	85.41	86.14	87.03	88.21	89.70	91.26
51	79.72	80.33	80.95	81.56	82.16	82.76	83.36	83.97	84.58	85.06	85.50	86.08	86.84	87.72	88.92	90.41	92.03
52	80.97	81.58	82.19	82.80	83.41	84.01	84.62	85.08	85.28	85.49	86.16	86.76	87.53	88.41	89.61	91.08	92.79
53	82.21	82.83	83.44	84.05	84.65	85.09	85.30	85.50	85.71	85.94	86.70	87.39	88.22	89.11	90.27	91.81	93.54
54	83.45	84.08	84.69	85.10	85.31	85.52	85.72	85.93	86.14	86.40	87.15	88.05	88.84	89.80	90.96	92.54	94.29
55	84.68	85.11	85.32	85.53	85.74	85.94	86.15	86.36	86.57	86.86	87.61	88.66	89.51	90.49	91.66	93.26	95.03
56	85.32	85.53	85.75	85.96	86.16	86.37	86.58	86.79	86.99	87.31	88.07	89.12	90.10	91.19	92.34	93.97	95.77
57	85.74	85.96	86.18	86.38	86.59	86.80	87.01	87.21	87.42	87.77	88.52	89.58	90.76	91.85	93.01	94.65	96.52
58	86.27	86.49	86.71	86.92	87.12	87.33	87.54	87.75	87.95	88.34	89.09	90.15	91.50	92.60	93.87	95.50	97.45
59	87.01	87.23	87.45	87.66	87.87	88.08	88.29	88.49	88.70	89.14	89.89	90.95	92.30	93.66	95.08	96.70	98.75
60	87.86	88.08	88.30	88.51	88.73	88.93	89.14	89.35	89.56	90.05	90.80	91.86	93.22	94.87	96.42	98.03	100.11
61	88.71	88.93	89.14	89.36	89.58	89.79	90.00	90.20	90.41	90.96	91.72	92.77	94.13	95.79	97.62	99.39	101.47
62	89.51	89.77	89.99	90.21	90.43	90.64	90.85	91.06	91.27	91.88	92.63	93.68	95.04	96.70	98.73	100.70	102.86
63	90.24	90.54	90.84	91.06	91.28	91.49	91.70	91.91	92.18	92.79	93.54	94.60	95.95	97.61	99.72	102.06	104.19
64	91.14	91.46	91.75	92.05	92.34	92.55	92.77	92.98	93.33	93.93	94.68	95.74	97.09	98.75	100.86	103.43	105.55
65	91.77	92.21	92.63	93.06	93.48	93.88	94.22	94.48	94.92	95.53	96.28	97.33	98.69	100.35	102.52	105.19	107.06
66	91.73	92.21	92.69	93.16	93.64	94.12	94.59	95.13	95.93	96.73	97.74	99.14	100.76	102.47	104.64	106.62	108.70
67	91.97	92.50	93.03	93.56	94.10	94.64	95.32										

TABLE D.2-9. INITIAL WATER-LEVEL ELEVATION IN THE SURFICIAL AQUIFER (FEET ABOVE MSL MINUS 7000).

Row	Column																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	60.65	59.81	58.68	57.56	56.49	55.45	54.47	53.58	52.66	51.88	51.25	50.62	49.98	49.35	48.73	48.11	47.50	46.91	46.33	45.77
2	60.41	59.53	58.37	57.23	56.14	55.07	54.06	53.15	52.20	51.38	50.72	50.06	49.40	48.75	48.11	47.47	46.85	46.24	45.65	45.1
3	60.06	59.12	57.91	56.73	55.61	54.52	53.47	52.52	51.51	50.63	49.92	49.21	48.52	47.84	47.18	46.52	45.87	45.22	44.58	43.9
4	59.70	58.68	57.42	56.19	55.05	53.94	52.87	51.88	50.81	49.85	49.06	48.28	47.53	46.84	46.19	45.54	44.87	44.15	43.40	42.66
5	59.40	58.31	56.99	55.74	54.57	53.45	52.37	51.37	50.26	49.21	48.32	47.41	46.58	45.91	45.35	44.78	44.11	43.33	42.40	41.01
6	59.18	58.02	56.66	55.38	54.20	53.07	52.00	51.00	49.86	48.76	47.76	46.66	45.73	45.12	44.72	44.25	43.63	42.83	41.91	41.45
7	59.01	57.80	56.40	55.11	53.91	52.78	51.72	50.73	49.59	48.46	47.37	46.03	44.81	44.34	44.28	43.92	43.33	42.40	42.00	41.93
8	58.87	57.61	56.18	54.88	53.67	52.53	51.49	50.51	49.38	48.24	47.11	45.29	44.98	44.42	43.93	43.71	42.85	42.44	42.42	42.34
9	58.73	57.42	55.95	54.64	53.41	52.27	51.25	50.30	49.18	48.07	46.97	45.39	45.20	44.78	44.29	43.49	42.95	42.56	42.85	42.78
10	58.59	57.22	55.71	54.40	53.14	51.99	51.01	50.08	48.99	47.93	46.91	45.56	45.46	45.15	44.70	44.03	43.10	43.24	43.35	43.25
11	58.45	57.00	55.45	54.14	52.86	51.70	50.76	49.87	48.81	47.81	46.91	45.81	45.76	45.53	45.15	44.60	43.99	43.91	43.88	43.73
12	58.31	56.78	55.19	53.88	52.56	51.38	50.50	49.65	48.62	47.70	46.94	46.09	46.09	45.94	45.62	45.19	44.73	44.54	44.42	44.23
13	58.16	56.55	54.90	53.61	52.25	51.04	50.23	49.44	48.43	47.57	46.96	46.35	46.44	46.36	46.11	45.75	45.38	45.15	44.96	44.73
14	58.02	56.31	54.60	53.33	51.91	50.61	49.96	49.24	48.19	47.39	46.97	46.31	46.82	46.81	46.61	46.31	45.99	45.73	45.50	45.24
15	57.88	56.06	54.29	53.06	51.53	50.18	49.67	49.06	47.94	47.43	46.98	47.06	47.31	47.30	47.12	46.85	46.55	46.28	46.02	45.74
16	57.74	55.80	53.95	52.79	51.14	50.25	49.39	48.91	47.96	47.95	47.74	47.75	47.85	47.81	47.63	47.38	47.10	46.82	46.54	46.23
17	57.61	55.53	53.52	52.50	51.15	50.70	49.47	48.76	48.07	48.51	48.43	48.41	48.41	48.33	48.15	47.91	47.63	47.34	47.04	46.72
18	57.47	55.21	53.64	52.38	51.24	51.19	50.21	49.55	49.00	49.15	49.09	49.03	48.98	48.86	48.42	48.14	47.85	47.54	47.20	46.87
19	57.72	55.66	53.79	52.34	51.93	51.73	50.92	50.32	49.84	49.82	49.74	49.65	49.54	49.39	49.19	48.93	48.65	48.34	48.02	47.67
20	57.98	56.10	54.36	53.06	52.60	52.30	51.80	51.05	50.61	50.49	50.37	50.24	50.10	49.92	49.70	49.43	49.14	48.82	48.49	48.13
21	58.25	56.53	54.92	53.74	53.24	52.88	52.26	51.75	51.33	51.14	50.99	50.83	50.65	50.44	50.20	49.92	49.62	49.29	48.95	48.58
22	58.52	56.95	55.46	54.38	53.87	53.46	52.91	52.43	52.02	51.78	51.60	51.40	51.19	50.96	50.69	50.40	50.08	49.75	49.40	49.03
23	58.80	57.35	55.98	54.99	54.47	54.05	53.53	53.08	52.67	52.40	52.19	51.97	51.73	51.47	51.18	50.87	50.54	50.19	49.83	49.46
24	59.09	57.74	56.48	55.56	55.05	54.62	54.14	53.71	53.30	53.00	52.76	52.51	52.25	51.96	51.65	51.33	50.98	50.63	50.26	49.88
25	59.38	58.13	56.96	56.11	55.62	55.19	54.74	54.32	53.91	53.59	53.32	53.05	52.76	52.45	52.12	51.77	51.41	51.04	50.67	50.29
26	59.68	58.51	57.43	56.64	56.16	55.75	55.32	54.91	54.50	54.16	53.87	53.57	53.26	52.92	52.57	52.20	51.83	51.45	51.07	50.69
27	59.99	58.89	57.87	57.14	56.69	56.30	55.89	55.49	55.07	54.71	54.41	54.08	53.74	53.38	53.00	52.62	52.23	51.83	51.45	51.08
28	60.28	59.26	58.31	57.62	57.20	56.84	56.44	56.05	55.63	55.25	54.93	54.58	54.21	53.83	53.43	53.02	52.61	52.19	51.81	51.46
29	60.58	59.63	58.74	58.07	57.70	57.36	56.99	56.61	56.18	55.78	55.44	55.07	54.68	54.26	53.84	53.40	52.98	52.53	52.15	51.85
30	60.88	60.00	59.16	58.52	58.18	57.87	57.52	57.15	56.71	56.30	55.94	55.55	55.12	54.67	54.23	53.77	53.36	52.87	52.54	52.36
31	61.18	60.36	59.58	58.98	58.66	58.37	58.04	57.68	57.23	56.81	56.44	56.03	55.56	55.07	54.64	54.16	53.66	53.33	53.19	53.41
32	61.48	60.71	59.99	59.44	59.15	58.88	58.56	58.20	57.74	57.32	56.92	56.50	56.02	55.51	55.20	54.78	54.34	62.12	64.08	71.53
33	61.78	61.06	60.39	59.91	59.66	59.42	59.10	58.72	58.25	57.82	57.43	57.04	56.62	56.17	55.73	64.50	74.53	81.83	83.75	90.84
34	62.07	61.40	60.79	60.39	60.18	60.00	59.70	59.30	58.78	58.37	58.06	57.83	58.01	65.91	75.71	84.08	92.56	92.42	92.17	92.00
35	62.35	61.73	61.19	60.88	60.74	60.63	60.37	59.97	59.41	59.09	58.98	59.71	74.81	84.36	92.59	92.80	92.68	92.50	92.18	92.13
36	62.63	62.05	61.58	61.37	61.31	61.33	61.15	60.78	60.21	60.11	61.15	76.82	92.37	92.76	92.67	92.91	92.82	92.61	92.14	91.94
37	62.89	62.36	61.96	61.85	61.90	62.11	62.07	61.82	61.27	62.22	77.61	92.51	92.58	92.85	92.63	92.68	92.59	92.37	92.02	91.75
38	63.15	62.66	62.33	62.32	62.52	62.97	63.15	63.23	62.98	78.15	92.51	92.65	92.58	92.66	92.53	92.50	92.38	92.17	91.88	91.6
39	63.39	62.94	62.68	62.79	63.16	63.95	64.46	65.38	78.18	92.69	92.59	92.78	92.54	92.51	92.41	92.33	92.20	91.99	91.74	91.50
40	63.62	63.21	63.02	63.24	63.84	65.07	66.11	70.19	92.22	92.82	92.57	92.60	92.46	92.38	92.28	92.18	92.03	91.83	91.60	91.37
41	63.84	63.46	63.34	63.68	64.54	66.40	68.38	81.74	92.43	92.61	92.50	92.46	92.35	92.26	92.15	92.03	91.90	91.73	91.54	91.32
42	64.03	63.69	63.63	64.09	65.26	68.03	72.68	91.99	92.51	92.48	92.40	92.34	92.24	92.15	92.03	91.90	91.73	91.54	91.32	91.10
43	64.20	63.90	63.90	64.47	65.95	70.01	82.39	92.09	92.37	92.35	92.29	92.23	92.13	92.03	91.91	91.77	91.60	91.40	91.19	90.97
44	64.34	64.08	64.14	64.81	66.56	72.73	91.24	92.13	92.26	92.24	92.19	92.12	92.03	91.92	91.79	91.65	91.47	91.27	91.06	90.85
45	64.47	64.23	64.34	65.09	67.00	74.66	91.53	92.18	92.16	92.14	92.09	92.02	91.92	91.81	91.68	91.53	91.35	91.15	90.94	90.72
46	64.55	64.34	64.51	65.31	67.23	75.91	91.60	92.04	92.07	92.04	91.99	91.92	91.82	91.71	91.57	91.42	91.24	91.03	90.82	90.61
47	64.60	64.42	64.62	65.47	67.37	77.36	91.65	91.94	91.98	91.95	91.90	91.82	91.72	91.61	91.47	91.31	91.12	90.92	90.70	90.49
48	64.80	64.46	64.68	65.54	67.63	79.11	91.68	91.87	91.90	91.87	91.81	91.73	91.63	91.51	91.37	91.21	91.02	90.81	90.60	90.38
49	64.60	64.49	64.73	65.60	68.08	80.55	91.69	91.81	91.83	91.79	91.72	91.64	91.54	91.41	91.27	91.11	90.92	90.71	90.49	90.27
50	64.60	64.53	64.77	65.68	69.33	81.82	91.68	91.77	91.76	91.71	91.64	91.55	91.44	91.32	91.17	91.01	90.82	90.61	90.39	90.17
51	64.61	64.56	64.82	65.82	70.92	82.60	91.67	91.74	91.70	91.64	91.56	91.47	91.35	91.23	91.08	90.92	90.73	90.52	90.30	90.07
52	64.61	64.58	64.86	66.08	72.28	82.95	91.59	91.71	91.65	91.57	91.49	91.38	91.27	91.14	90.99	90.83	90.64	90.44	90.22	89.98
53	64.62	64.61	64.90	66.83	73.52	82.89	90.77	91.68	91.60	91.51	91.41	91.30	91.18	91.05	90.90	90.74	90.56	90.36	90.14	89.90
54	64.63	64.64	64.97	67.83	74.48	82.83	89.77	91.66	91.55	91.44	91.34	91.22	91.09	90.95	90.82	90.66	90.49	90.29	90.08	89.83
55	64.64	64.66	65.07	68.74	75.24	82.76	89.02	91.63	91.51	91.38	91.26	91.14	91.00	90.86	90.73	90.59	90.42	90.24	90.02	89.77
56	64.65	64.69	65.35	69.58	75.86	82.70	88.29	91.38	91.48	91.32	91.19	91.05	90.91	90.77	90.64	90.51	90.36	90.19	89.99	89.74
57	64.67	64.72	65.86	70.36	76.37	82.62	87.75	91.20	91.45	91.26	91.12	90.96	90.81	90.67	90.56	90.44	90.31	90.15	89.97	89.74
58	64.69	64.78																		

TABLE D.2-9. INITIAL WATER-LEVEL ELEVATION IN THE SURFICIAL AQUIFER (FEET ABOVE MSL MINUS 7000) (continued).

Row	Column																																							
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40																				
1	45.22	44.76	44.37	43.99	43.62	43.26	42.89	42.60	42.36	42.12	41.89	41.66	41.42	41.19	40.96	40.73	40.49	40.26	40.03	39.80																				
2	44.53	44.08	43.71	43.34	42.98	42.63	42.28	42.00	41.77	41.54	41.31	41.08	40.86	40.63	40.40	40.17	39.94	39.71	39.48	39.25																				
3	43.45	43.03	42.69	42.36	42.03	41.70	41.38	41.11	40.89	40.67	40.46	40.24	40.03	39.81	39.59	39.36	39.13	38.91	38.67	38.44																				
4	42.17	41.87	41.61	41.33	41.04	40.74	40.44	40.18	39.97	39.77	39.57	39.37	39.18	38.97	38.76	38.54	38.31	38.07	37.83	37.59																				
5	40.83	40.94	40.77	40.51	40.22	39.94	39.69	39.37	39.14	38.95	38.80	38.65	38.49	38.31	38.10	37.88	37.64	37.38	37.12	36.85																				
6	41.21	40.58	40.22	39.88	39.56	39.25	38.95	38.61	38.34	38.10	38.02	38.03	38.03	37.86	37.66	37.43	37.16	36.87	36.56	36.24																				
7	41.67	41.23	40.88	40.54	40.20	39.87	39.58	39.10	38.72	38.32	37.84	37.80	37.76	37.59	37.38	37.12	36.83	36.17	35.51	35.27																				
8	42.09	41.72	41.39	41.04	40.69	40.33	39.93	39.47	39.04	38.54	37.84	37.75	37.63	37.40	37.07	36.78	36.11	35.89	35.70	35.43																				
9	42.53	42.20	41.88	41.54	41.18	40.78	40.34	39.87	39.43	38.92	38.31	37.62	37.51	37.22	36.89	36.43	36.27	36.05	36.06	35.87																				
10	43.00	42.68	42.37	42.03	41.65	41.25	40.78	40.31	39.89	39.40	38.83	38.18	37.38	37.03	36.84	36.57	36.72	36.67	36.58	36.39																				
11	43.47	43.16	42.85	42.51	42.13	41.72	41.25	40.79	40.38	39.93	39.42	38.87	38.27	37.72	36.91	37.26	37.36	37.32	37.20	36.99																				
12	43.95	43.64	43.33	42.99	42.61	42.20	41.73	41.29	40.91	40.50	40.05	39.58	39.11	38.66	38.25	38.18	38.13	38.03	37.88	37.67																				
13	44.44	44.12	43.81	43.47	43.09	42.68	42.23	41.81	41.46	41.08	40.69	40.29	39.89	39.53	39.23	39.05	38.92	38.78	38.62	38.40																				
14	44.93	44.60	44.29	43.95	43.57	43.17	42.73	42.34	42.01	41.66	41.31	40.97	40.63	40.33	40.07	39.87	39.71	39.55	39.37	39.17																				
15	45.41	45.08	44.76	44.42	44.05	43.66	43.23	42.86	42.55	42.24	41.92	41.62	41.33	41.06	40.83	40.64	40.47	40.31	40.14	39.95																				
16	45.89	45.55	45.24	44.89	44.53	44.14	43.73	43.37	43.08	42.79	42.51	42.23	41.98	41.74	41.54	41.37	41.21	41.07	40.91	40.75																				
17	46.37	46.02	45.70	45.36	44.99	44.61	44.21	43.87	43.60	43.33	43.06	42.82	42.59	42.38	42.21	42.06	41.93	41.81	41.69	41.54																				
18	46.84	46.48	46.16	45.82	45.45	45.07	44.68	44.35	44.09	43.84	43.59	43.36	43.15	42.97	42.83	42.71	42.62	42.54	42.46	42.30																				
19	47.30	46.94	46.61	46.27	45.90	45.53	45.14	44.82	44.57	44.32	44.09	43.87	43.68	43.52	43.40	43.32	43.28	43.26	43.19	43.00																				
20	47.75	47.39	47.05	46.71	46.34	45.97	45.58	45.27	45.02	44.77	44.54	44.33	44.15	44.01	43.91	43.87	43.90	43.93	43.87	43.66																				
21	48.19	47.82	47.49	47.14	46.77	46.39	46.01	45.69	45.44	45.20	44.97	44.76	44.57	44.43	44.35	44.35	44.41	44.50	44.57	44.32																				
22	48.63	48.25	47.91	47.56	47.18	46.80	46.42	46.09	45.84	45.59	45.36	45.13	44.94	44.77	44.68	44.67	44.74	44.94	45.44	44.99																				
23	49.06	48.68	48.33	47.97	47.59	47.20	46.81	46.48	46.22	45.96	45.71	45.47	45.24	45.04	44.89	44.82	44.84	44.96	45.20	45.50																				
24	49.47	49.09	48.74	48.37	47.98	47.58	47.18	46.84	46.58	46.31	46.05	45.78	45.52	45.25	45.01	44.87	44.82	44.83	44.89	44.93																				
25	49.88	49.50	49.14	48.76	48.36	47.95	47.53	47.19	46.92	46.64	46.36	46.07	45.78	45.45	45.11	44.86	44.71	44.63	44.58	44.52																				
26	50.29	49.90	49.53	49.14	48.73	48.30	47.87	47.52	47.24	46.96	46.67	46.37	46.04	45.66	45.19	44.80	44.56	44.38	44.25	44.13																				
27	50.68	50.29	49.92	49.52	49.08	48.63	48.19	47.83	47.55	47.28	47.00	46.69	46.35	45.94	45.28	44.71	44.36	44.10	43.89	43.70																				
28	51.07	50.69	50.32	49.91	49.45	48.98	48.52	48.16	47.88	47.61	47.34	47.05	46.74	46.46	45.51	44.55	44.14	43.77	43.45	43.19																				
29	51.50	51.14	50.78	50.37	49.90	49.40	48.92	48.55	48.27	48.00	47.74	47.47	47.15	46.76	46.16	44.96	44.01	43.41	42.93	42.56																				
30	52.10	51.80	51.48	51.07	50.57	49.98	49.46	49.08	48.79	48.52	48.27	48.02	47.73	47.34	46.74	45.58	44.34	43.00	42.29	41.64																				
31	53.34	53.15	52.92	52.70	52.23	51.33	50.59	50.12	49.79	49.47	49.16	48.92	48.77	48.56	48.19	47.75	45.19	42.62	41.52	38.99																				
32	72.40	72.44	72.27	71.79	69.71	63.23	61.47	60.84	60.49	60.15	59.71	58.88	56.95	54.52	53.01	52.43	49.38	43.85	42.35	41.07																				
33	91.16	91.18	90.96	90.59	89.02	82.92	81.12	80.70	80.46	80.25	79.92	79.25	77.35	74.69	72.54	70.21	63.03	57.20	54.82	53.58																				
34	91.68	91.58	91.35	91.22	90.96	90.80	90.69	90.57	90.48	90.38	90.25	90.09	89.87	89.60	89.21	87.82	82.42	78.96	77.44	76.64																				
35	91.71	91.73	91.39	91.37	90.98	90.81	90.75	90.60	90.52	90.46	90.31	90.18	89.95	89.75	89.58	89.32	89.11	88.90	88.53	88.16																				
36	91.64	91.51	91.29	91.15	90.89	90.78	90.85	90.60	90.52	90.60	90.35	90.32	89.96	89.77	89.74	89.36	89.14	88.99	88.63	88.30																				
37	91.53	91.35	91.16	90.98	90.74	90.66	90.61	90.46	90.37	90.30	90.16	90.02	89.81	89.62	89.46	89.22	89.01	88.82	88.55	88.31																				
38	91.40	91.21	91.03	90.85	90.66	90.54	90.43	90.30	90.20	90.09	89.96	89.81	89.63	89.45	89.27	89.06	88.86	88.65	88.41	88.18																				
39	91.27	91.07	90.90	90.72	90.55	90.41	90.27	90.14	90.03	89.91	89.78	89.63	89.46	89.29	89.11	88.91	88.71	88.50	88.28	88.04																				
40	91.14	90.94	90.77	90.60	90.43	90.28	90.13	89.99	89.88	89.75	89.62	89.47	89.31	89.14	88.96	88.77	88.57	88.37	88.15	87.92																				
41	91.01	90.81	90.64	90.48	90.31	90.15	89.99	89.85	89.73	89.61	89.47	89.33	89.17	89.00	88.83	88.64	88.45	88.25	88.03	87.80																				
42	90.88	90.68	90.52	90.35	90.19	90.03	89.86	89.72	89.60	89.47	89.34	89.20	89.04	88.88	88.71	88.53	88.34	88.14	87.93	87.71																				
43	90.75	90.56	90.39	90.23	90.07	89.90	89.74	89.59	89.48	89.35	89.22	89.08	88.93	88.77	88.60	88.43	88.24	88.04	87.84	87.62																				
44	90.63	90.44	90.27	90.11	89.95	89.78	89.62	89.48	89.36	89.24	89.11	88.97	88.82	88.67	88.51	88.34	88.15	87.96	87.76	87.54																				
45	90.51	90.32	90.15	89.99	89.83	89.67	89.50	89.36	89.25	89.13	89.00	88.87	88.73	88.58	88.43	88.26	88.08	87.89	87.69	87.48																				
46	90.39	90.20	90.03	89.87	89.71	89.55	89.39	89.26	89.14	89.03	88.91	88.78	88.65	88.50	88.35	88.19	88.02	87.83	87.64	87.43																				
47	90.27	90.08	89.91	89.75	89.59	89.43	89.28	89.15	89.04	88.93	88.82	88.70	88.57	88.43	88.29	88.13	87.97	87.79	87.60	87.39																				
48	90.16	89.96	89.79	89.63	89.47	89.32	89.17	89.05	88.95	88.84	88.74	88.62	88.50	88.37	88.23	88.08	87.93	87.75	87.57	87.37																				
49	90.04	89.84	89.67	89.50	89.35	89.20	89.07	88.95	88.86	88.76	88.66	88.55	88.44	88.32	88.19	88.05	87.89	87.73	87.55	87.36																				
50	89.93	89.72	89.55	89.37	89.22	89.08	88.96	88.86	88.77	88.68	88.59	88.49	88.38	88.27	88.15	88.02	87.87	87.71	87.54	87.36																				
51	89.83	89.60	89.42	89.24	89.08	88.96	88.86	88.76	88.69	88.61	88.53	88.46	88.38	88.30	88.20	88.10	87.99	87.86	87.72	87.57																				
52	89.72	89.48	89.29	89.10	88.93	88.83	88.75	88.68	88.61	88.53	88.46	88.38	88.30	88.20	88.10	87.99	87.86	87.72	87.57	87.40																				
53	89.62	89.36	89.16	88.95	88.74	88.70	88.66	88.59	88.53	88.47	88.40	88.34	88.29	88.23	88.17	88.09	87.98	87.87	87.74	87.49																				
54	89.53	89.23	89.04	88.80	88.49	88.57	88.57	88.52	88.46	88.40	88.34	88.29	88.23	88.17	88.09	88.01	87.92	87.81	87.69	87.55																				
55	89.45	89.06	88.95	88.69	88.06	88.47	88.52	88.47	88.39	88.32	88.28	88.25	88.21	88.16	88.09	88.01	87.92	87.81	87.69	87.55																				
56	89.40	88.81	88.92	88.75	88.46	88.54	88.53	88.44	88.33	88.20	88.22	88.23	88.21	88.17	88.11	88.04	87.96	87.86	87.75	87.63																				
57	89.44	89.08	89.01	88.86	88.68	88.64	88.58	88.45	88.28	87.94	88.16	88.22	88.22	88.19	88.14	88.08	88.01	87.92	87.83	87.72																				
58	89.52																																							

TABLE D.2-9. INITIAL WATER-LEVEL ELEVATION IN THE SURFICIAL AQUIFER (FEET ABOVE MSL MINUS 7000) (continued).

Row	Column																			
	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
1	39.57	39.34	39.10	38.87	38.64	38.41	38.18	37.95	37.72	37.49	37.26	37.03	36.80	36.58	36.35	36.12	35.90	35.67	35.45	35.23
2	39.02	38.79	38.55	38.32	38.08	37.85	37.62	37.38	37.15	36.91	36.68	36.45	36.22	35.99	35.77	35.55	35.33	35.11	34.89	34.66
3	38.21	37.97	37.73	37.50	37.26	37.02	36.78	36.54	36.29	36.05	35.81	35.57	35.33	35.10	34.87	34.64	34.43	34.22	34.01	33.81
4	37.35	37.12	36.88	36.64	36.40	36.16	35.91	35.66	35.40	35.13	34.87	34.60	34.34	34.09	33.85	33.61	33.38	33.17	32.96	32.75
5	36.60	36.37	36.15	35.93	35.70	35.46	35.21	34.94	34.66	34.37	34.07	33.76	33.45	33.14	32.84	32.56	32.31	32.08	31.88	31.69
6	35.99	35.75	35.57	35.39	35.19	34.96	34.71	34.44	34.14	33.81	33.46	33.09	32.73	32.41	32.10	31.82	31.58	31.37	31.20	31.04
7	35.09	34.98	34.99	35.01	34.84	34.62	34.37	34.09	33.77	33.41	33.03	32.69	32.41	31.99	31.74	31.09	31.00	30.88	30.75	30.60
8	35.25	34.86	34.72	34.65	34.57	34.37	34.12	33.83	33.50	33.15	32.85	32.60	32.13	31.66	31.45	31.18	31.02	30.90	30.76	30.60
9	35.60	35.18	34.56	34.43	34.28	34.13	33.88	33.60	33.31	33.05	32.76	32.50	32.05	31.86	31.61	31.81	31.83	31.78	31.68	31.52
10	36.09	35.66	35.07	34.27	34.16	33.90	33.68	33.40	33.36	33.13	32.86	32.40	32.24	32.04	32.36	32.54	32.60	32.59	32.52	32.38
11	36.69	36.29	35.75	35.06	34.12	33.69	33.44	33.21	33.40	33.21	32.91	32.46	32.45	32.87	33.13	33.28	33.34	33.35	33.31	33.21
12	37.39	37.03	36.58	36.07	35.55	35.17	34.83	34.38	33.64	33.37	33.17	33.08	33.47	33.74	33.91	34.02	34.07	34.08	34.05	34.00
13	38.14	37.83	37.47	37.08	36.69	36.31	35.87	35.38	34.90	34.61	34.43	34.37	34.47	34.59	34.68	34.74	34.77	34.77	34.76	34.72
14	38.93	38.66	38.36	38.02	37.62	37.19	36.75	36.31	35.91	35.64	35.46	35.37	35.36	35.38	35.41	35.43	35.44	35.44	35.42	35.40
15	39.74	39.50	39.21	38.84	38.42	37.99	37.57	37.16	36.81	36.54	36.35	36.22	36.16	36.13	36.11	36.11	36.10	36.08	36.07	36.06
16	40.56	40.31	39.98	39.58	39.16	38.74	38.33	37.95	37.62	37.35	37.15	37.00	36.90	36.83	36.79	36.76	36.73	36.71	36.70	36.69
17	41.34	41.04	40.67	40.28	39.86	39.44	39.05	38.68	38.36	38.09	37.87	37.71	37.59	37.50	37.43	37.38	37.34	37.31	37.30	37.29
18	42.05	41.72	41.34	40.94	40.53	40.12	39.72	39.35	39.03	38.76	38.54	38.37	38.23	38.04	37.97	37.92	37.89	37.89	37.87	37.87
19	42.71	42.38	42.00	41.60	41.18	40.77	40.36	39.98	39.64	39.36	39.15	38.98	38.83	38.71	38.61	38.54	38.48	38.44	38.42	38.41
20	43.36	43.02	42.64	42.24	41.82	41.40	41.00	40.61	40.25	39.95	39.72	39.55	39.40	39.27	39.16	39.07	39.01	38.96	38.93	38.93
21	44.02	43.67	43.29	42.88	42.47	42.05	41.65	41.27	40.91	40.58	40.30	40.10	39.94	39.80	39.68	39.58	39.50	39.45	39.42	39.41
22	44.68	44.35	43.96	43.52	43.11	42.72	42.32	41.92	41.55	41.20	40.89	40.64	40.45	40.30	40.16	40.06	39.97	39.90	39.87	39.85
23	45.35	45.05	44.68	44.12	43.75	43.39	43.00	42.55	42.15	41.79	41.45	41.17	40.95	40.76	40.62	40.52	40.41	40.32	40.32	40.20
24	44.84	44.67	44.52	44.54	44.35	44.08	43.71	43.12	42.72	42.36	42.01	41.69	41.42	41.20	41.03	40.97	40.82	40.64	40.36	40.20
25	44.42	44.29	44.18	44.09	43.94	43.75	43.55	43.51	43.24	42.91	42.56	42.20	41.88	41.59	41.31	40.96	40.73	40.52	40.33	40.19
26	44.01	43.89	43.78	43.69	43.56	43.40	43.22	43.07	42.83	42.55	42.24	41.93	41.64	41.36	41.10	40.83	40.61	40.42	40.27	40.16
27	43.54	43.42	43.36	43.30	43.19	43.05	42.87	42.69	42.47	42.21	41.93	41.66	41.39	41.14	40.90	40.68	40.48	40.31	40.19	40.11
28	43.00	42.84	42.91	42.92	42.85	42.71	42.52	42.34	42.13	41.89	41.63	41.39	41.15	40.93	40.71	40.51	40.33	40.18	40.09	40.03
29	42.34	41.91	42.40	42.55	42.53	42.38	42.15	42.00	41.81	41.58	41.32	41.12	40.92	40.72	40.52	40.33	40.17	40.04	39.96	39.92
30	41.78	41.86	42.10	42.27	42.27	42.08	41.83	41.67	41.53	41.29	40.91	40.85	40.69	40.51	40.32	40.14	39.99	39.87	39.80	39.77
31	41.04	41.55	41.71	42.06	42.15	42.00	41.67	41.44	41.33	41.12	40.85	40.65	40.48	40.29	40.11	39.94	39.79	39.67	39.60	39.58
32	41.42	41.44	40.63	42.02	42.30	42.11	41.66	41.01	41.18	41.01	40.71	40.41	40.26	40.08	39.90	39.74	39.59	39.45	39.34	39.30
33	53.17	52.42	50.09	45.71	44.30	43.11	42.14	41.62	41.40	41.05	40.59	39.91	40.04	39.89	39.68	39.55	39.39	39.21	39.00	38.82
34	76.11	75.35	73.47	68.27	65.37	61.01	52.57	45.18	42.39	41.42	40.85	40.30	40.07	39.78	39.38	39.39	39.25	39.02	38.62	37.73
35	87.84	87.48	87.09	86.60	85.98	83.64	76.31	68.02	61.82	51.18	42.41	40.75	40.28	39.92	39.58	39.41	39.24	39.04	38.81	38.61
36	88.03	87.67	87.35	87.08	86.85	86.55	86.25	85.84	84.41	75.50	63.76	50.50	40.27	39.80	39.51	39.31	39.16	39.03	38.97	38.99
37	88.22	87.72	87.40	87.17	87.10	86.67	86.37	86.12	85.79	85.44	84.68	74.60	58.97	42.66	40.21	39.70	39.46	39.33	39.25	39.18
38	87.95	87.63	87.34	87.10	86.89	86.61	86.38	86.29	85.83	85.50	85.22	84.79	83.91	67.95	50.55	40.29	39.70	39.56	39.52	39.52
39	87.79	87.52	87.25	87.00	86.76	86.51	86.27	86.04	85.74	85.48	85.34	84.83	84.47	84.17	72.91	51.55	40.44	39.87	39.85	39.89
40	87.67	87.41	87.15	86.90	86.65	86.40	86.14	85.88	85.60	85.32	85.05	84.70	84.42	84.32	83.75	72.74	51.61	40.75	40.29	40.37
41	87.56	87.31	87.05	86.80	86.55	86.29	86.03	85.75	85.46	85.16	84.85	84.52	84.20	83.89	83.47	83.06	72.22	51.52	41.09	41.12
42	87.47	87.22	86.96	86.71	86.46	86.19	85.92	85.64	85.34	85.02	84.68	84.33	83.97	83.60	83.20	82.89	82.18	71.43	51.26	42.89
43	87.38	87.14	86.89	86.64	86.38	86.11	85.83	85.54	85.24	84.90	84.55	84.17	83.77	83.34	82.86	82.36	81.69	80.84	67.30	50.09
44	87.31	87.07	86.82	86.57	86.31	86.05	85.77	85.47	85.15	84.81	84.44	84.05	83.62	83.14	82.61	82.01	81.27	80.22	78.36	67.57
45	87.26	87.02	86.77	86.52	86.26	86.00	85.71	85.42	85.10	84.76	84.38	83.98	83.53	83.03	82.47	81.82	81.09	80.16	78.80	75.36
46	87.21	86.98	86.74	86.49	86.23	85.96	85.68	85.39	85.08	84.74	84.37	83.96	83.51	83.00	82.41	81.72	81.10	80.33	79.33	77.87
47	87.18	86.95	86.71	86.46	86.21	85.95	85.67	85.39	85.08	84.75	84.39	84.00	83.56	83.05	82.43	81.57	81.24	80.66	79.92	78.95
48	87.16	86.93	86.70	86.46	86.20	85.95	85.68	85.40	85.11	84.80	84.46	84.09	83.67	83.21	82.68	82.10	81.64	81.13	80.57	79.97
49	87.15	86.93	86.70	86.46	86.21	85.96	85.70	85.44	85.17	84.88	84.56	84.21	83.84	83.42	82.98	82.52	82.09	81.66	81.23	80.85
50	87.16	86.94	86.71	86.47	86.22	85.97	85.73	85.49	85.24	84.98	84.69	84.37	84.03	83.67	83.29	82.91	82.54	82.18	81.86	81.60
51	87.18	86.96	86.74	86.49	86.23	85.98	85.77	85.56	85.34	85.10	84.84	84.55	84.25	83.93	83.61	83.28	82.97	82.68	82.43	82.24
52	87.21	87.00	86.78	86.52	86.24	85.94	85.80	85.64	85.45	85.24	85.01	84.75	84.49	84.21	83.92	83.64	83.38	83.14	82.93	82.78
53	87.26	87.06	86.84	86.58	86.25	85.75	85.84	85.75	85.59	85.41	85.20	84.97	84.73	84.49	84.24	84.00	83.77	83.56	83.39	83.26
54	87.32	87.14	86.94	86.71	86.45	86.17	86.05	85.92	85.77	85.59	85.40	85.20	84.99	84.77	84.55	84.34	84.15	83.97	83.82	83.70
55	87.40	87.24	87.05	86.85	86.64	86.44	86.28	86.13	85.97	85.80	85.62	85.43	85.24	85.05	84.86	84.67	84.50	84.34	84.20	84.09
56	87.50	87.35	87.18	87.01	86.83	86.65	86.49	86.33	86.18	86.01	85.85	85.67	85.50	85.32	85.15	84.98	84.83	84.69	84.56	84.45
57	87.60	87.46	87.32	87.16	87.01	86.85	86.69	86.54	86.39	86.23	86.07	85.91	85.75	85.59	85.43	85.28	85.14	85.01	84.89	84.79
58	87.7																			

TABLE D.2-9. INITIAL WATER-LEVEL ELEVATION IN THE SURFICIAL AQUIFER (FEET ABOVE MSL MINUS 7000) (continued).

Row	Column																			
	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
1	35.00	34.78	34.55	34.33	34.09	33.84	33.58	33.32	33.07	32.82	32.58	32.35	32.12	31.91	31.70	31.50	31.30	31.11	30.92	30.75
2	34.47	34.26	34.04	33.81	33.58	33.35	33.10	32.85	32.61	32.38	32.16	31.94	31.73	31.53	31.34	31.15	30.97	30.79	30.62	30.45
3	33.60	33.39	33.18	32.97	32.75	32.53	32.32	32.11	31.90	31.70	31.51	31.32	31.15	30.98	30.82	30.66	30.50	30.35	30.19	30.04
4	32.55	32.35	32.15	31.94	31.73	31.50	31.27	31.05	30.83	30.64	30.47	30.33	30.20	30.08	29.96	29.84	29.71	29.57	29.43	29.28
5	31.52	31.36	31.20	31.03	30.83	30.59	30.35	30.13	29.92	29.76	29.65	29.58	29.52	29.46	29.37	29.26	29.12	28.97	28.81	28.64
6	30.89	30.77	30.68	30.57	30.41	30.21	30.00	29.80	29.24	29.20	29.17	29.16	29.22	29.26	29.29	29.01	28.73	28.65	28.56	28.38
7	30.44	30.32	30.55	30.50	30.36	30.16	29.65	29.58	29.30	29.20	29.13	29.09	29.32	29.40	29.24	28.93	28.73	28.56	28.42	28.23
8	30.39	30.20	30.44	30.52	30.41	30.01	29.72	29.78	30.21	30.27	30.18	29.98	29.51	29.58	29.37	28.91	28.72	28.54	28.43	28.24
9	31.22	30.60	30.67	30.67	30.59	30.29	30.82	31.03	31.18	31.19	31.09	30.88	30.52	29.93	29.69	29.71	29.45	29.25	29.23	29.18
10	32.15	31.72	30.94	30.74	30.82	31.54	31.88	32.03	32.07	32.02	31.89	31.69	31.43	31.11	30.82	30.53	30.10	30.03	30.02	30.00
11	33.07	32.85	32.58	32.48	32.54	32.74	32.88	32.93	32.90	32.80	32.64	32.44	32.21	31.95	31.68	31.34	30.92	30.77	30.77	30.75
12	33.91	33.82	33.71	33.66	33.68	33.74	33.77	33.75	33.68	33.54	33.37	33.16	32.92	32.67	32.40	32.11	31.81	31.59	31.41	31.40
13	34.68	34.64	34.60	34.58	34.58	34.58	34.56	34.51	34.41	34.27	34.08	33.86	33.62	33.37	33.10	32.82	32.53	32.27	32.05	32.00
14	35.38	35.37	35.36	35.36	35.35	35.33	35.28	35.20	35.10	34.96	34.77	34.55	34.32	34.07	33.81	33.53	33.23	32.89	32.74	32.62
15	36.05	36.04	36.05	36.06	36.05	36.01	35.95	35.87	35.76	35.62	35.45	35.25	35.02	34.79	34.54	34.27	33.95	33.59	33.40	33.24
16	36.68	36.69	36.71	36.71	36.69	36.65	36.60	36.51	36.41	36.28	36.13	35.94	35.73	35.51	35.31	35.04	34.72	34.33	34.02	33.85
17	37.29	37.31	37.33	37.32	37.30	37.26	37.21	37.14	37.05	36.93	36.79	36.62	36.45	36.22	35.93	35.66	35.36	35.00	34.67	34.45
18	37.87	37.90	37.91	37.90	37.88	37.84	37.80	37.74	37.68	37.59	37.44	37.25	37.01	36.78	36.54	36.31	36.06	35.71	35.34	35.03
19	38.42	38.44	38.44	38.43	38.41	38.39	38.35	38.33	38.23	38.06	37.90	37.73	37.53	37.33	37.14	37.00	36.98	36.49	36.05	35.67
20	38.94	38.94	38.93	38.93	38.91	38.92	38.86	38.73	38.62	38.49	38.36	38.22	38.06	37.89	37.73	37.66	37.80	37.41	37.00	36.60
21	39.42	39.39	39.37	39.39	39.34	39.23	39.16	39.08	39.01	38.93	38.83	38.73	38.60	38.45	38.33	38.29	38.45	38.97	38.60	38.22
22	39.88	39.81	39.73	39.61	39.55	39.50	39.46	39.42	39.40	39.37	39.32	39.26	39.17	39.05	38.96	38.97	39.22	39.94	41.18	40.51
23	40.01	39.91	39.84	39.78	39.74	39.73	39.73	39.75	39.79	39.82	39.83	39.81	39.76	39.69	39.64	39.73	40.13	40.90	41.88	42.96
24	40.07	39.99	39.94	39.91	39.91	39.93	39.97	40.05	40.17	40.31	40.36	40.39	40.38	40.37	40.40	40.59	41.07	41.72	42.47	43.28
25	40.10	40.04	40.01	40.01	40.04	40.09	40.18	40.31	40.51	40.86	40.92	41.00	41.04	41.12	41.25	41.50	41.93	42.44	43.00	43.59
26	40.10	40.06	40.06	40.08	40.13	40.21	40.32	40.48	40.70	41.01	41.42	41.66	41.74	41.97	42.17	42.41	42.75	43.10	43.48	43.88
27	40.07	40.06	40.08	40.12	40.19	40.29	40.41	40.58	40.80	41.08	41.41	41.78	42.39	42.96	43.14	43.36	43.56	43.74	43.94	44.17
28	40.01	40.02	40.06	40.13	40.21	40.32	40.46	40.63	40.83	41.09	41.40	41.78	42.29	42.96	44.11	44.39	44.37	44.36	44.38	44.43
29	39.92	39.96	40.02	40.10	40.20	40.32	40.46	40.63	40.83	41.07	41.37	41.75	42.23	42.89	43.90	45.70	45.17	44.93	44.78	44.67
30	39.80	39.86	39.95	40.05	40.16	40.29	40.44	40.61	40.80	41.03	41.32	41.68	42.15	42.78	43.75	45.58	45.63	45.41	45.13	44.89
31	39.64	39.73	39.85	39.97	40.10	40.23	40.38	40.56	40.75	40.97	41.24	41.59	42.03	42.61	43.40	44.59	46.35	45.95	45.45	45.05
32	39.42	39.58	39.73	39.88	40.01	40.15	40.31	40.48	40.67	40.89	41.15	41.49	41.90	42.41	43.07	43.95	45.15	46.56	45.65	45.14
33	39.13	39.40	39.60	39.76	39.90	40.05	40.21	40.39	40.58	40.79	41.05	41.37	41.75	42.22	42.79	43.52	44.48	45.76	45.47	45.11
34	38.81	39.26	39.49	39.64	39.77	39.93	40.10	40.28	40.47	40.68	40.94	41.24	41.60	42.03	42.53	43.15	43.90	44.74	45.41	45.10
35	38.95	39.25	39.43	39.53	39.59	39.79	39.97	40.17	40.36	40.57	40.82	41.11	41.44	41.83	42.29	42.82	43.43	44.10	44.70	45.17
36	39.08	39.30	39.44	39.44	39.22	39.64	39.84	40.05	40.26	40.46	40.70	40.97	41.28	41.65	42.06	42.53	43.05	43.62	44.19	44.77
37	39.05	39.41	39.56	39.60	39.58	39.68	39.66	39.94	40.17	40.37	40.58	40.82	41.12	41.46	41.85	42.27	42.72	43.21	43.70	44.14
38	39.55	39.69	39.78	39.81	39.82	39.85	39.85	39.86	40.13	40.30	40.47	40.66	40.94	41.28	41.65	42.04	42.46	42.88	43.31	43.68
39	39.95	40.01	40.05	40.05	40.05	40.04	40.05	40.08	40.18	40.27	40.34	40.41	40.75	41.11	41.48	41.86	42.24	42.62	43.00	43.33
40	40.39	40.39	40.36	40.32	40.28	40.24	40.23	40.23	40.26	40.27	40.21	39.87	40.53	40.95	41.34	41.71	42.08	42.43	42.77	43.07
41	41.02	40.84	40.71	40.61	40.52	40.45	40.40	40.37	40.36	40.36	40.33	40.30	40.55	40.82	41.22	41.60	41.95	42.29	42.60	42.88
42	42.10	41.56	41.15	40.94	40.77	40.65	40.56	40.50	40.48	40.46	40.46	40.48	40.56	40.53	41.10	41.51	41.86	42.18	42.47	42.73
43	44.19	42.73	41.82	41.32	41.04	40.85	40.71	40.63	40.59	40.57	40.58	40.61	40.70	40.82	41.15	41.49	41.80	42.10	42.37	42.62
44	51.97	44.52	42.79	41.79	41.33	41.03	40.81	40.73	40.69	40.68	40.69	40.73	40.81	40.96	41.20	41.48	41.77	42.04	42.29	42.53
45	62.05	48.32	44.07	42.41	41.61	41.19	40.76	40.41	40.79	40.78	40.79	40.82	40.90	41.04	41.24	41.48	41.74	41.99	42.23	42.46
46	70.73	55.66	45.72	43.07	41.94	41.43	41.04	40.97	40.93	40.90	40.89	40.91	40.97	41.09	41.27	41.48	41.72	41.95	42.18	42.41
47	77.17	67.12	50.18	43.50	42.24	41.77	41.46	41.15	41.10	41.04	41.00	40.99	41.03	41.14	41.30	41.50	41.72	41.94	42.16	42.39
48	79.32	77.02	59.13	43.19	42.29	41.90	41.74	41.48	41.37	41.29	41.19	41.11	41.15	41.25	41.42	41.67	41.95	42.37	42.92	43.46
49	80.58	80.58	72.85	51.73	42.43	42.08	41.88	41.74	41.65	41.58	41.48	41.43	41.73	42.03	42.42	42.74	43.17	43.68	43.75	43.21
50	81.46	81.50	81.74	63.09	43.18	42.40	42.14	42.02	41.94	41.86	41.81	42.18	42.70	43.01	43.44	43.90	44.11	44.04	43.29	42.96
51	82.14	82.16	82.30	74.66	53.31	42.92	42.55	42.39	42.31	42.25	42.26	42.93	43.63	44.05	44.48	44.40	44.32	43.58	42.93	42.72
52	82.70	82.70	82.77	82.92	69.53	46.72	43.20	42.94	42.81	42.79	42.88	43.45	44.01	44.49	44.69	44.61	43.87	43.12	42.80	42.47
53	83.18	83.16	83.18	83.24	82.83	59.79	44.16	43.63	43.48	43.48	43.61	43.96	44.49	44.98	44.90	44.15	43.41	42.67	42.55	42.22
54	83.62	83.58	83.57	83.58	83.60	66.57	46.18	44.53	44.35	44.30	44.34	44.50	45.13	45.19	44.44	43.70	42.95	42.40	42.31	42.14
55	84.01	83.96	83.93	83.92	83.93	76.44	55.95	47.45	46.11	45.37	45.16	45.15	45.47	44.73	43.98	43.24	42.50	42.28	42.06	42.03
56	84.37	84.31	84.27	84.24	84.22	84.20	67.47	51.87	49.35	47.67	46.28	45.76	45.02	44.27	43.53	42.78	42.04	42.14	41.81	41.92
57	84.70	84.63	84.58	84.54	84.51	84.47	71.98	55.61	51.97	50.41	48.42	45.22	44.56	43.81	43.07	42.33	41.86	41.90	41.73	41.80
58	85.09																			

TABLE D.2-9. INITIAL WATER-LEVEL ELEVATION IN THE SURFICIAL AQUIFER (FEET ABOVE MSL MINUS 7000) (continued).

Row	Column																			
	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	30.57	30.40	30.23	30.07	29.91	29.76	29.61	29.47	29.33	29.19	29.05	28.92	28.79	28.67	28.54	28.42	28.30	28.19	28.08	27.96
2	30.29	30.13	29.97	29.82	29.67	29.53	29.39	29.25	29.12	28.98	28.86	28.73	28.61	28.48	28.36	28.24	28.13	28.01	27.89	27.7
3	29.89	29.74	29.60	29.46	29.32	29.18	29.05	28.93	28.81	28.69	28.57	28.46	28.35	28.24	28.12	28.01	27.89	27.78	27.65	27.53
4	29.13	28.98	28.83	28.68	28.54	28.41	28.28	28.16	28.06	27.96	27.86	27.76	27.66	27.57	27.47	27.36	27.25	27.13	27.00	26.86
5	28.47	28.29	28.12	27.96	27.80	27.65	27.50	27.36	27.25	27.13	27.03	26.94	26.86	26.78	26.71	26.63	26.52	26.39	26.24	26.08
6	28.19	28.00	27.81	27.63	27.46	27.29	27.10	26.92	26.74	26.59	26.48	26.38	26.30	26.22	26.13	26.02	25.87	25.71	25.53	25.34
7	28.00	27.75	27.50	27.29	27.16	26.93	26.66	26.42	26.22	26.10	26.15	26.19	26.09	25.97	25.82	25.66	25.48	25.30	25.10	24.88
8	27.99	27.72	27.46	27.20	27.17	26.90	26.62	26.37	26.16	26.02	25.99	26.08	26.03	25.87	25.72	25.56	25.38	25.19	24.98	24.77
9	29.05	28.84	28.55	28.13	27.35	26.89	26.57	26.31	26.07	25.89	25.96	25.98	25.97	25.84	25.66	25.47	25.31	25.12	24.86	24.61
10	29.90	29.71	29.44	29.07	28.57	28.13	27.75	27.40	27.05	26.64	26.00	25.99	25.96	25.82	25.59	25.37	25.19	24.99	24.74	24.45
11	30.66	30.47	30.23	29.91	29.52	29.13	28.74	28.36	27.96	27.49	26.88	26.03	25.97	25.76	25.55	25.37	25.21	25.04	24.85	24.61
12	31.32	31.17	30.96	30.70	30.36	29.99	29.61	29.23	28.83	28.37	27.82	27.11	26.10	25.73	25.52	25.36	25.22	25.07	24.93	24.86
13	31.90	31.77	31.60	31.39	31.11	30.78	30.43	30.05	29.66	29.24	28.77	28.24	27.70	27.32	27.05	26.85	26.70	26.57	26.46	26.39
14	32.49	32.34	32.16	31.96	31.73	31.46	31.17	30.83	30.46	30.07	29.66	29.24	28.84	28.51	28.23	27.99	27.80	27.65	27.52	27.42
15	33.09	32.92	32.74	32.53	32.30	32.04	31.79	31.52	31.21	30.85	30.48	30.13	29.78	29.47	29.20	28.96	28.74	28.56	28.41	28.28
16	33.69	33.50	33.31	33.10	32.87	32.61	32.36	32.12	31.87	31.58	31.25	30.91	30.60	30.31	30.04	29.79	29.56	29.37	29.19	29.04
17	34.26	34.07	33.88	33.67	33.44	33.20	32.95	32.71	32.47	32.22	31.93	31.63	31.33	31.05	30.78	30.53	30.30	30.09	29.90	29.72
18	34.79	34.61	34.44	34.24	34.03	33.79	33.55	33.31	33.07	32.83	32.57	32.29	32.00	31.72	31.45	31.20	30.96	30.74	30.54	30.35
19	35.37	35.15	34.99	34.82	34.63	34.40	34.17	33.92	33.68	33.43	33.18	32.91	32.63	32.35	32.08	31.83	31.58	31.35	31.14	30.92
20	36.22	35.92	35.68	35.47	35.27	35.04	34.80	34.54	34.29	34.04	33.78	33.51	33.23	32.96	32.69	32.43	32.18	31.93	31.70	31.47
21	37.73	37.25	36.80	36.37	36.00	35.72	35.46	35.19	34.91	34.64	34.37	34.10	33.82	33.55	33.27	33.01	32.74	32.48	32.23	31.98
22	39.80	39.08	38.37	37.68	36.99	36.47	36.14	35.84	35.54	35.25	34.97	34.69	34.41	34.13	33.85	33.56	33.29	33.01	32.74	32.47
23	41.97	41.02	40.10	39.20	38.30	37.46	36.90	36.53	36.21	35.89	35.59	35.29	34.99	34.69	34.40	34.10	33.81	33.52	33.23	32.94
24	44.09	42.92	41.81	40.73	39.68	38.66	37.82	37.29	36.91	36.55	36.22	35.89	35.56	35.25	34.93	34.62	34.31	34.00	33.70	33.40
25	44.19	44.77	43.47	42.23	41.03	39.88	38.84	38.12	37.64	37.23	36.85	36.49	36.14	35.79	35.46	35.12	34.79	34.47	34.16	33.85
26	44.29	44.69	45.08	43.67	42.33	41.07	39.90	39.00	38.40	37.92	37.49	37.09	36.71	36.34	35.98	35.63	35.28	34.95	34.62	34.30
27	44.40	44.63	44.85	45.05	43.55	42.14	40.92	39.92	39.20	38.63	38.14	37.70	37.29	36.89	36.51	36.13	35.77	35.42	35.07	34.73
28	44.50	44.58	44.64	44.68	44.68	43.09	41.78	40.77	39.98	39.35	38.80	38.31	37.86	37.44	37.03	36.63	36.25	35.88	35.52	35.16
29	44.60	44.53	44.45	44.34	44.15	43.87	42.52	41.49	40.68	40.00	39.43	38.91	38.42	37.97	37.53	37.12	36.72	36.33	35.95	35.59
30	44.68	44.49	44.29	44.06	43.78	43.46	43.09	42.08	41.27	40.59	39.99	39.45	38.95	38.47	38.02	37.59	37.17	36.77	36.38	35.99
31	44.73	44.45	44.17	43.87	43.56	43.24	42.91	42.56	41.77	41.10	40.50	39.95	39.43	38.94	38.48	38.03	37.60	37.19	36.78	36.39
32	44.75	44.41	44.08	43.76	43.44	43.13	42.82	42.51	42.19	41.55	40.95	40.39	39.87	39.37	38.90	38.45	38.02	37.59	37.18	36.77
33	44.73	44.38	44.04	43.71	43.39	43.09	42.80	42.52	42.25	41.97	41.36	40.78	40.25	39.76	39.29	38.84	38.40	37.98	37.56	37.15
34	44.71	44.34	44.01	43.69	43.38	43.09	42.82	42.57	42.33	42.16	41.71	41.09	40.57	40.09	39.64	39.20	38.77	38.34	37.93	37.52
35	44.67	44.30	43.97	43.66	43.37	43.10	42.85	42.61	42.36	42.10	41.73	41.27	40.82	40.38	39.96	39.53	39.11	38.70	38.29	37.89
36	44.52	44.22	43.93	43.65	43.38	43.13	42.89	42.65	42.40	42.13	41.80	41.43	41.04	40.64	40.24	39.84	39.43	39.03	38.64	38.25
37	44.43	44.16	43.89	43.63	43.39	43.16	42.93	42.70	42.46	42.19	41.90	41.58	41.24	40.88	40.50	40.12	39.74	39.35	38.98	38.61
38	43.95	44.13	43.87	43.62	43.39	43.17	42.96	42.74	42.52	42.28	42.01	41.73	41.42	41.08	40.74	40.38	40.03	39.66	39.31	38.97
39	43.58	43.76	43.86	43.57	43.37	43.18	42.99	42.79	42.58	42.36	42.13	41.86	41.58	41.28	40.96	40.63	40.30	39.98	39.55	39.16
40	43.31	43.46	43.53	43.44	43.31	43.17	43.01	42.84	42.65	42.45	42.23	41.99	41.73	41.45	41.16	40.84	40.56	40.13	39.74	39.36
41	43.10	43.26	43.33	43.32	43.26	43.16	43.03	42.88	42.71	42.52	42.32	42.11	41.88	41.62	41.37	41.10	40.71	40.33	39.94	39.55
42	42.95	43.10	43.20	43.23	43.21	43.14	43.04	42.91	42.76	42.60	42.41	42.22	42.02	41.81	41.39	41.00	40.65	40.31	39.96	39.61
43	42.83	42.99	43.10	43.16	43.16	43.12	43.05	42.94	42.82	42.66	42.50	42.35	42.11	41.68	41.26	40.90	40.55	40.20	39.86	39.51
44	42.73	42.90	43.02	43.10	43.13	43.12	43.07	42.99	42.90	42.77	42.66	42.40	41.95	41.54	41.12	40.79	40.45	40.10	39.75	39.41
45	42.66	42.83	42.96	43.06	43.11	43.13	43.12	43.11	43.61	43.16	42.70	42.25	41.79	41.41	41.00	40.69	40.35	40.00	39.65	39.31
46	42.61	42.78	42.92	43.03	43.23	43.35	43.40	43.45	43.45	43.00	42.54	42.09	41.63	41.28	40.94	40.59	40.24	39.90	39.55	39.20
47	42.60	43.04	43.09	43.14	43.19	43.24	43.28	43.34	43.30	42.84	42.39	41.93	41.56	41.14	40.83	40.49	40.14	39.79	39.45	39.10
48	43.13	42.93	42.97	43.02	43.07	43.12	43.17	43.26	43.14	42.68	42.23	41.78	41.43	41.01	40.73	40.38	40.04	39.69	39.35	39.00
49	42.88	42.81	42.86	42.91	42.96	43.01	43.06	43.18	42.98	42.53	42.07	41.62	41.30	40.90	40.63	40.28	39.94	39.59	39.24	38.90
50	42.63	42.70	42.75	42.80	42.84	42.89	42.99	43.10	42.82	42.37	41.92	41.46	41.16	40.87	40.53	40.18	39.83	39.49	39.14	38.79
51	42.54	42.58	42.63	42.68	42.73	42.79	42.91	43.02	42.67	42.21	41.76	41.42	41.03	40.77	40.42	40.08	39.73	39.38	39.04	38.69
52	42.42	42.47	42.52	42.57	42.62	42.72	42.83	42.94	42.51	42.06	41.60	41.32	40.90	40.67	40.32	39.97	39.63	39.28	38.94	38.59
53	42.31	42.36	42.40	42.45	42.52	42.64	42.75	42.81	42.35	41.90	41.44	41.19	40.80	40.57	40.22	39.87	39.53	39.18	38.83	38.49
54	42.19	42.24	42.29	42.34	42.45	42.56	42.67	42.65	42.20	41.74	41.29	41.05	40.78	40.46	40.12	39.77	39.42	39.08	38.73	38.39
55	42.08	42.13	42.18	42.24	42.37	42.48	42.59	42.49	42.04	41.58	41.24	40.92	40.71	40.36	40.01	39.67	39.32	38.98	38.63	38.28
56	41.97	42.01	42.06	42.17	42.29	42.40	42.51	42.34	41.88	41.43	41.21	40.79	40.61	40.26	39.91	39.57	39.22	38.87	38.53	38.18
57	41.85	41.90	41.97	42.10	42.22	42.32	42.43	42.18	41.72	41.27	41.07	40.70	40.50	40.16	39.81	39.46	39.12	38.77	38.42	38.08
58	41.																			

TABLE D.2-9. INITIAL WATER-LEVEL ELEVATION IN THE SURFICIAL AQUIFER (FEET ABOVE MSL MINUS 7000) (continued).

Row	Column																
	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117
1	27.66	27.75	27.65	27.55	27.46	27.37	27.29	27.21	27.14	27.08	27.00	26.91	26.82	26.73	26.63	26.50	26.38
2	27.66	27.55	27.44	27.33	27.23	27.13	27.04	26.96	26.89	26.83	26.77	26.71	26.68	26.68	26.66	19.81	20.00
3	27.40	27.26	27.12	26.97	26.82	26.68	26.56	26.46	26.39	26.33	26.30	26.30	26.40	19.92	18.99	17.60	20.00
4	26.71	26.56	26.40	26.25	26.09	25.94	25.81	25.69	25.58	25.53	25.56	25.75	19.64	19.01	17.99	19.73	20.34
5	25.90	25.70	25.49	25.27	25.05	24.85	24.67	24.53	24.44	24.49	24.70	19.74	19.23	18.94	26.20	25.66	21.09
6	25.13	24.89	24.64	24.39	24.15	23.92	23.73	23.56	23.46	23.43	19.85	19.53	19.61	26.20	26.21	25.08	21.60
7	24.66	24.44	24.21	23.97	23.74	23.41	23.24	22.67	22.65	22.61	19.78	19.90	26.01	26.20	26.21	23.86	21.87
8	24.53	24.25	23.98	23.70	23.12	23.00	22.85	22.69	22.66	22.59	24.39	25.39	25.99	26.22	26.22	23.00	22.09
9	24.15	24.07	23.75	23.43	23.19	23.07	22.94	22.62	22.69	23.81	24.76	25.53	26.05	26.28	26.23	22.81	22.32
10	24.18	24.01	23.86	23.65	23.23	23.09	23.14	23.90	24.26	24.70	25.23	25.77	26.18	26.38	26.23	22.99	22.53
11	24.16	24.00	23.90	23.90	24.45	24.61	24.74	24.96	25.17	25.41	25.72	26.08	26.38	26.52	26.20	23.24	22.73
12	25.32	25.40	25.40	25.43	25.54	25.62	25.68	25.78	25.89	26.02	26.20	26.42	26.61	26.69	25.77	23.45	22.92
13	26.43	26.43	26.41	26.40	26.41	26.42	26.44	26.47	26.51	26.57	26.66	26.77	26.87	26.88	25.15	23.68	23.13
14	27.36	27.30	27.24	27.19	27.15	27.12	27.09	27.08	27.07	27.08	27.09	27.12	27.14	27.08	24.88	23.93	23.34
15	28.17	28.07	27.97	27.89	27.81	27.74	27.68	27.63	27.58	27.54	27.50	27.46	27.42	27.29	24.95	24.18	23.55
16	28.89	28.76	28.64	28.52	28.41	28.31	28.22	28.13	28.05	27.98	27.89	27.79	27.69	27.50	25.18	24.44	23.76
17	29.55	29.39	29.24	29.09	28.96	28.83	28.71	28.59	28.48	28.37	28.24	28.10	27.96	27.70	25.46	24.70	23.96
18	30.16	29.97	29.79	29.62	29.46	29.30	29.16	29.01	28.88	28.74	28.58	28.40	28.20	27.89	25.72	24.95	24.15
19	30.72	30.51	30.31	30.11	29.92	29.74	29.57	29.41	29.25	29.10	28.91	28.68	28.43	28.05	25.93	25.19	24.33
20	31.24	31.01	30.79	30.57	30.36	30.15	29.96	29.79	29.62	29.45	29.24	28.97	28.66	28.19	26.08	25.41	24.49
21	31.73	31.48	31.24	31.00	30.77	30.55	30.35	30.16	29.97	29.80	29.57	29.25	28.89	28.30	26.18	25.59	24.62
22	32.20	31.93	31.67	31.42	31.18	30.94	30.73	30.52	30.33	30.14	29.89	29.54	29.12	28.39	26.22	25.81	24.89
23	32.65	32.37	32.10	31.83	31.57	31.33	31.10	30.88	30.67	30.47	30.21	29.82	29.34	28.21	26.50	26.02	25.10
24	33.09	32.80	32.51	32.23	31.96	31.70	31.46	31.22	31.00	30.79	30.52	30.11	29.53	28.10	26.76	26.24	25.31
25	33.53	33.22	32.92	32.63	32.34	32.07	31.81	31.56	31.33	31.11	30.82	30.40	29.69	28.26	27.01	26.45	25.51
26	33.97	33.64	33.32	33.01	32.71	32.42	32.15	31.90	31.65	31.43	31.12	30.67	29.84	28.42	27.27	26.67	25.72
27	34.40	34.06	33.72	33.38	33.07	32.78	32.48	32.22	31.97	31.74	31.42	30.88	29.87	28.58	27.52	26.88	25.93
28	34.82	34.47	34.11	33.76	33.41	33.09	32.79	32.52	32.27	32.03	31.71	30.43	29.90	28.75	27.78	27.09	26.14
29	35.23	34.87	34.50	34.12	33.76	33.41	33.09	32.80	32.54	32.30	31.95	30.02	29.93	28.91	28.04	27.31	26.34
30	35.61	35.24	34.86	34.47	34.09	33.72	33.38	33.07	32.79	32.57	31.76	30.62	29.96	29.07	28.29	27.52	26.55
31	35.99	35.59	35.19	34.80	34.41	34.03	33.67	33.37	33.18	32.64	31.97	31.02	29.99	29.23	28.55	27.74	26.76
32	36.37	35.96	35.53	35.11	34.73	34.36	34.06	34.32	33.77	33.22	32.53	31.56	30.32	29.46	28.78	27.94	26.97
33	36.74	36.33	35.90	35.44	35.08	34.94	34.56	34.17	33.79	33.40	32.92	32.07	30.83	29.69	28.98	28.14	27.17
34	37.12	36.72	36.32	35.87	35.64	35.21	34.78	34.35	33.92	33.49	32.96	32.15	31.24	29.92	29.18	28.33	27.38
35	37.49	37.10	36.76	36.33	35.90	35.47	35.04	34.62	34.19	33.76	33.22	32.47	31.51	30.28	29.39	28.53	27.59
36	37.85	37.47	37.04	36.62	36.19	35.77	35.34	34.92	34.49	34.06	33.53	32.79	31.83	30.66	29.59	28.73	27.80
37	38.23	37.81	37.39	36.96	36.54	36.12	35.70	35.28	34.85	34.43	33.90	33.17	32.22	31.06	29.80	28.93	28.01
38	38.55	38.14	37.72	37.30	36.88	36.47	36.05	35.63	35.22	34.80	34.28	33.55	32.61	31.47	30.00	29.12	28.21
39	38.78	38.39	38.00	37.62	37.23	36.84	36.45	36.06	35.64	35.22	34.70	33.97	33.03	31.89	30.43	29.32	28.42
40	38.97	38.58	38.20	37.81	37.42	37.04	36.65	36.26	35.87	35.49	35.00	34.33	33.45	32.31	30.85	29.52	28.63
41	39.16	38.78	38.39	38.00	37.62	37.23	36.84	36.45	36.07	35.68	35.20	34.52	33.65	32.58	31.23	29.72	28.84
42	39.27	38.92	38.57	38.23	37.88	37.54	37.19	36.83	36.44	36.05	35.56	34.88	34.01	32.94	31.58	29.91	29.05
43	39.16	38.82	38.47	38.13	37.78	37.43	37.09	36.74	36.39	36.05	35.61	35.01	34.23	33.28	31.97	30.22	29.26
44	39.06	38.72	38.37	38.02	37.68	37.33	36.98	36.64	36.29	35.95	35.51	34.91	34.13	33.17	31.96	30.40	29.46
45	38.96	38.61	38.27	37.92	37.57	37.23	36.88	36.54	36.19	35.84	35.41	34.80	34.03	33.07	31.86	30.31	29.67
46	38.86	38.51	38.17	37.82	37.47	37.13	36.78	36.43	36.09	35.74	35.31	34.70	33.92	32.97	31.76	30.45	29.88
47	38.76	38.41	38.06	37.72	37.37	37.02	36.68	36.33	35.99	35.64	35.21	34.60	33.82	32.87	31.66	30.59	30.06
48	38.65	38.31	37.96	37.61	37.27	36.92	36.58	36.23	35.88	35.54	35.10	34.50	33.72	32.77	31.55	30.73	30.19
49	38.55	38.20	37.86	37.51	37.17	36.82	36.47	36.13	35.78	35.43	35.00	34.40	33.62	32.66	31.45	30.87	30.33
50	38.45	38.10	37.76	37.41	37.06	36.72	36.37	36.02	35.68	35.33	34.90	34.29	33.51	32.56	31.45	31.00	30.46
51	38.35	38.00	37.65	37.31	36.96	36.62	36.27	35.92	35.58	35.23	34.80	34.19	33.41	32.46	31.59	31.14	30.60
52	38.24	37.90	37.55	37.21	36.86	36.51	36.17	35.82	35.47	35.13	34.69	34.09	33.31	32.36	31.73	31.27	30.72
53	38.14	37.79	37.45	37.10	36.76	36.41	36.06	35.72	35.37	35.03	34.59	33.99	33.21	32.25	31.86	31.40	30.83
54	38.04	37.69	37.35	37.00	36.65	36.31	35.96	35.62	35.27	34.92	34.49	33.88	33.11	32.36	31.99	31.54	30.96
55	37.94	37.59	37.24	36.90	36.55	36.21	35.86	35.51	35.17	34.82	34.39	33.78	33.00	32.49	32.13	31.66	31.10
56	37.83	37.49	37.14	36.80	36.45	36.10	35.76	35.41	35.06	34.72	34.29	33.68	32.92	32.62	32.26	31.79	31.23
57	37.73	37.39	37.04	36.69	36.35	36.00	35.65	35.31	34.96	34.62	34.18	33.58	33.05	32.76	32.39	31.92	31.36
58	37.61	37.26	36.91	36.57	36.22	35.87	35.53	35.18	34.83	34.49	34.06	33.46	33.21	32.91	32.54	32.06	31.53
59	37.43	37.08	36.73	36.39	36.04	35.69	35.35	35.00	34.66	34.31	33.88	33.68	33.44	33.13	32.77	32.23	31.77
60	37.22	36.88	36.53	36.18	35.84	35.49	35.14	34.80	34.45	34.27	34.13	33.94	33.69	33.39	33.02	32.49	32.07
61	37.02	36.67	36.32	35.98	35.63	35.29	34.94	34.74	34.63	34.52	34.39	34.19	33.94	33.63	33.21	32.76	32.37
62	36.81	36.47	36.12	35.77	35.43	35.23	35.11	34.99	34.88	34.77	34.63	34.43	34.18	33.87	33.41	33.02	32.67
63	36.61	36.26	35.92	35.71	35.58	35.47	35.36	35.24	35.13	35.01	34.87	34.67	34.42	34.06	33.67	33.29	32.97
64	36.38	36.24	36.13	36.01	35.90	35.77	35.65	35.54	35.42	35.31	35.16	34.97	34.67	34.31	34.00	33.62	33.35
65	36.77	36.66	36.54	36.42	36.30	36.17	36.06	35.94	35.83	35.71	35.54	35.31	35.01	34.76	34.47	34.09	33.88
66	37.23	37.11	36.98	36.87	36.74	36.62	36.49	36.36	36.23	36.10	35.93	35.71	35.52	35.29	35.00	34.62	34.49
67	37.67	37.54	37.41	37.28	37.15	37.01	36.88	36.75	3								

D.3 MODEL DRAINS, RIVERS AND WELLS

A combination of drain cells, river cells, and well cells were used to model the exchange of water with both the tailings and Surficial aquifers. River cells were used to model water exchange between the Surficial aquifer and Spring Creek. Drain cells were used to model water exchange between the Surficial aquifer and Mine Creek. Well cells were used to model all collection, injection and recharge line operation in both the Surficial and tailings aquifers.

D.3.1 SPRING CREEK RIVER CELLS

The river cells used in the simulation of ground-water exchange for Spring Creek are shown in Figure D.3-1. The elevation of each of the cells was derived from surface topography and a total of 143 river cells were used. The depth of water in Spring Creek was assumed to be one foot (see Table D.3-1). Spring Creek is a receiving stream in the modeled reach.

D.3.2 MINE CREEK DRAIN CELLS

Drain cells were used to model the discharge to Mine Creek. Drain cells were used rather than river cells because the model output summary tabulations of discharge to the drain cells are separate. Table D.3-2 presents the row, column, drain elevation and conductance for the Mine Creek drain cells. This allowed distinction between ground water discharging to Spring Creek and ground water discharging to Mine Creek.

D.3.3 COLLECTION WELLS

Collection wells have been used to intercept seepage-impacted Surficial water for over 16 years. Table D.3-3 presents the row, column, and extraction rates for the Surficial collection wells. The collection rates represent average 1999 values in ft³/day.

D.3.4 RECHARGE LINES

Recharge lines are used to create hydraulic barriers to further seepage in the Surficial aquifer and to reverse gradients back to collection wells. Although the recharge lines are constructed as buried perforated pipelines, the lines were modeled as adjacent wells. This allowed precise control of the flux into the drain lines which is not possible with a drain cell approach. Table D.3-4 presents the row, column, and injection rates for the Surficial recharge lines in the Mine Creek area. The injection rates into the lines represent average 1999 values in ft³/day.

D.3.5 INJECTION WELLS

Injection wells are used to create a hydraulic barrier in the Surficial aquifer on the crest of the No. 5 dam. Table D.3-5 presents the row, column, and injection rates for the Surficial injection wells. The injection rates represent a total average 1999 value in ft³/day which is uniformly distributed along the injection well line.

D.3.6 DEWATERING WELLS

Dewatering wells are the primary means of removing water from the tailings. The locations of the existing dewatering wells and initial (baseline) dewatering rates are presented in Table D.3-6. These dewatering rates were reduced from measured well yields to reflect some offset of dewatering effect by ongoing recharge. The dewatering rates were also reduced with time in the various simulations to reflect the reduction in well yields as the water level in the tailings is lowered.

D.3.7 RECHARGE

Recharge to the Surficial aquifer is occurring in areas outside of the immediate tailings area due to precipitation and ponding of runoff or other fresh waters. In the modeling, the active areas of recharge were the area south of the tailings, and the area between the tailings and Spring Creek. No recharge was used in areas where the Surficial aquifer is not present or active, or on the northeast side of Spring Creek. There may be a small recharge contribution on the northeast side of Spring Creek, but this quantity is considered trivial in comparison to the contribution from the southwest side of Spring

Creek. The recharge rate is increased in the industrial pond area to reflect the current ponding and the eventual use of the area as a surge pond. The recharge is reduced slightly in the Spring Creek area to reflect the usage of water by vegetation. Table D.3-7 presents the recharge to the Surficial aquifer.

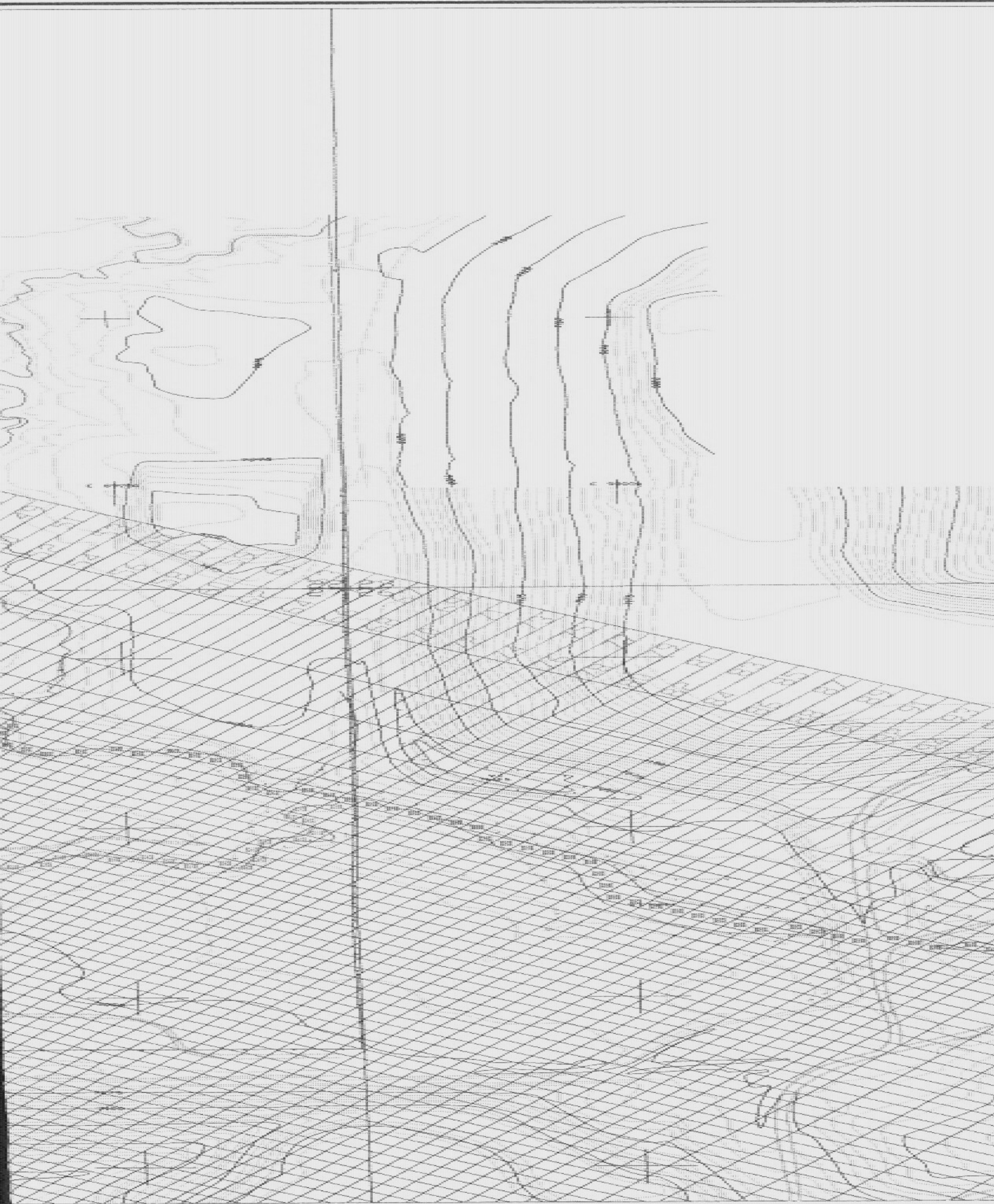


TABLE D.3-1. SPRING CREEK RIVER CELLS

Row Number	Column Number	Water Elevation (ft above MSL-7000)	Conductance (ft ² /day)	Channel Elevation (ft above MSL-7000)	Row Number	Column Number	Water Elevation (ft above MSL-7000)	Conductance (ft ² /day)	Channel Elevation (ft above MSL-7000)
18	1	57.43	2000	56.43	12	49	32.7	200	31.7
18	2	55.14	1600	54.04	12	50	32.52	200	31.52
19	3	53.72	1200	52.72	12	51	32.34	200	31.34
18	3	53.63	1200	52.63	12	52	32.15	200	31.15
17	3	53.51	1200	52.51	11	52	31.77	200	30.77
17	4	52.52	1000	51.52	11	53	31.52	200	30.52
18	4	52.36	1000	51.36	10	54	31.21	200	30.21
19	4	52.22	1000	51.22	9	55	30.92	200	29.92
16	5	51.14	800	50.14	8	56	30.76	200	29.76
18	5	51.14	800	50.14	8	57	30.49	200	29.49
17	5	51.13	800	50.13	8	58	30.33	200	29.33
16	6	50.19	800	49.19	8	59	30.18	200	29.18
15	6	50.17	800	49.17	8	60	30.02	200	29.02
17	7	49.36	600	48.36	8	61	29.86	200	28.86
16	7	49.36	600	48.36	8	62	29.69	200	28.69
17	8	48.64	600	47.64	9	62	29.67	200	28.67
15	9	47.95	600	46.95	10	63	29.47	200	28.47
16	9	47.94	600	46.94	10	64	29.3	200	28.3
17	9	47.92	600	46.92	10	65	29.13	200	28.13
14	10	47.38	400	46.38	9	66	28.96	200	27.96
15	10	47.36	400	46.36	8	67	28.79	200	27.79
15	11	46.84	400	45.84	8	68	28.61	200	27.61
13	12	46.39	400	45.39	7	69	28.55	200	27.55
14	12	46.17	400	45.17	7	70	28.33	200	27.33
12	12	46.09	400	45.09	7	71	28.12	200	27.12
11	12	45.8	400	44.8	7	72	27.96	200	26.96
10	12	45.55	400	44.55	8	73	27.81	200	26.81
9	12	45.38	400	44.38	9	74	27.66	200	26.66
8	12	45.29	400	44.29	9	75	27.5	200	26.5
7	13	44.8	400	43.8	8	76	27.35	200	26.35
8	14	44.37	400	43.37	8	77	27.2	200	26.2
7	14	44.31	400	43.31	8	78	27.04	200	26.04
8	15	43.86	400	42.86	8	79	26.89	200	25.89
9	16	43.4	400	42.4	8	80	26.74	200	25.74
10	17	42.95	400	41.95	8	81	26.59	200	25.59
9	17	42.92	400	41.92	8	82	26.43	200	25.43
9	18	42.45	400	41.45	8	83	26.27	200	25.27
8	18	42.43	400	41.43	8	84	26.11	200	25.11
7	18	42.41	400	41.41	9	85	25.97	200	24.97
7	19	41.93	400	40.93	9	86	25.82	200	24.82
6	19	41.92	600	40.92	9	87	25.68	200	24.68
6	20	41.43	600	40.43	9	88	25.52	200	24.52
5	20	41	800	40	9	89	25.36	200	24.36
5	21	40.8	800	39.8	9	90	25.2	200	24.2
6	22	40.51	450	39.51	10	91	25.06	200	24.06
6	23	40.16	450	39.16	11	92	24.86	200	23.86
6	24	39.83	450	38.83	12	93	24.69	200	23.69
6	25	39.5	450	38.5	12	94	24.53	200	23.53
6	26	39.17	450	38.17	12	95	24.38	200	23.38
6	27	39.32	450	37.82	12	96	24.23	200	23.23
6	28	38.53	300	37.53	12	97	24.08	200	23.08
6	29	38.3	300	37.3	12	98	23.92	200	22.92
6	30	38.06	300	37.06	12	99	23.78	200	22.78
7	31	37.75	200	36.75	12	100	23.5	200	22.5
8	31	37.68	200	36.68	11	101	23.33	200	22.33
9	32	37.42	200	36.42	11	102	23.14	200	22.14
10	33	37.16	200	36.16	11	103	23	200	22
10	34	36.9	200	35.9	11	104	22.8	200	21.8
11	35	36.55	200	35.55	10	105	22.59	200	21.59
10	36	36.42	200	35.42	10	106	22.34	200	21.34
9	37	36.21	200	35.21	10	107	22.15	200	21.15
9	38	35.94	200	34.94	9	108	22.04	200	21.04
8	39	35.66	200	34.66	9	109	21.77	200	20.77
8	40	35.37	200	34.37	8	110	21.75	200	20.75
7	41	35.05	200	34.05	7	111	21.6	300	20.6
8	42	34.76	200	33.76	6	112	21.36	600	20.36
9	43	34.39	200	33.39	5	113	21.08	1000	20.08
10	44	34.03	200	33.03	4	114	20.47	1800	19.47
11	45	33.82	200	32.72	3	115	19.45	3200	18.45
11	46	33.42	200	32.42	3	116	18.63	4000	17.63
11	47	33.17	200	32.17	3	117	17.49	4800	16.49
11	48	32.89	200	31.89					

TABLE D.3-2. MINE CREEK DRAIN CELLS

<u>Row Number</u>	<u>Column Number</u>	<u>Drain Elevation (ft above MSL-7000)</u>	<u>Conductance (ft²/day)</u>
23	70	42	100
22	71	41.16	100
21	72	40.32	100
20	72	39.48	100
19	73	38.63	100
19	74	37.79	100
18	75	36.95	100
18	76	36.11	100
18	77	35.26	100
17	78	34.42	100
17	79	33.58	100
16	79	32.74	100
15	78	31.9	100
14	78	31.05	100
13	79	30.21	100
12	79	29.37	100
11	78	28.53	100
11	77	27.69	100
10	77	26.84	100
9	78	26.04	100

TABLE D.3-3. SURFICIAL COLLECTION WELLS

Row Number	Column Number	Well Extraction Rate (ft ³ /day)	Well Name
44	58	-25.45	TWI-21
47	56	-271.89	TWI-23
67	34	-28.8	TW4-1B
68	22	-33.26	TW4-2B
65	21	-46.66	TW4-3B
61	34	-333.05	TW4-4B
65	45	-58	TW4-5B
63	36	-148.14	TW4-6B
69	34	-68.06	TW4-8B
70	33	-319.25	TW4-9B
63	25	-29.88	TW4-11B
62	29	-135.9	TW4-10B
53	46	-253.1	TW5-1B
37	25	-28.94	TW5-2B
60	14	-154.69	TW5S-2
56	22	-235.02	TW5S-3
55	25	-383.44	TW5S-4
57	30	-238.07	TW5S-5
28	35	-286.06	P-1
40	72	-1146.61	P-3
37	67	-636.85	P-4
42	74	-533.63	P-6
38	68	-505.39	P-7
34	60	-1588.19	P-8A
30	47	-100.75	P-9
29	42	-149.23	P-10
30	51	-87.82	P-11
31	37	-111.26	P-12
31	40	-243.94	P-14
32	43	-84.9	P-15
32	48	-90.47	P-16
33	52	-116.24	P-17
34	55	-111.66	P-18
37	61	-376.25	P-19
45	67	-299.21	P-20
47	67	-1037.48	P-21
36	65	-1192.08	5-A-1

TABLE D.3-4. SURFICIAL RECHARGE LINES

Row Number	Column Number	Cell Injection Rate (ft ³ /day)	Row Number	Column Number	Cell Injection Rate (ft ³ /day)
22	39	155	39	83	320
23	40	155	38	82	320
23	41	155	37	81	350
23	42	155	36	80	350
23	43	155	35	80	400
24	44	155	34	79	400
24	45	155	33	78	400
24	46	155	32	78	450
24	47	155	31	77	500
25	48	155	30	76	550
25	49	155	29	76	550
25	50	155	28	75	550
25	51	155	27	74	550
25	52	155	27	73	550
25	53	155	26	72	550
25	54	155	26	71	550
25	55	155	25	70	550
24	56	155			
24	57	155			
24	58	155			
23	59	155			
23	60	155			
22	61	155			
22	62	155			
22	63	155			
21	64	155			
21	65	155			
20	66	155			
20	67	155			
19	68	155			
19	69	155			
18	70	155			
18	71	155			
18	72	155			
17	73	155			
17	74	155			
16	75	155			
16	76	155			
16	77	155			
34	91	200			
34	90	220			
33	90	240			
32	89	260			
31	88	280			
30	87	300			
29	86	320			
28	85	340			
27	84	360			
26	83	380			
25	82	400			
24	81	420			
23	80	440			
22	79	460			
21	78	480			
20	77	500			
19	77	520			

TABLE D.3-5. SURFICIAL INJECTION WELLS

Row Number	Column Number	Well Injection Rate (ft ³ /day)	Well Name
45	8	110.3	TWI-1
42	9	110.3	TWI-2
40	10	110.3	TWI-3
39	12	110.3	TWI-4
36	16	110.3	TWI-5
36	18	110.3	TWI-6
35	20	110.3	TWI-7
35	22	110.3	TWI-8
36	17	110.3	TWI-9
36	27	110.3	TWI-10
35	24	110.3	TWI-11
36	30	110.3	TWI-12
36	32	110.3	TWI-13
36	35	110.3	TWI-14
37	41	110.3	TWI-15
37	45	110.3	TWI-16
38	48	110.3	TWI-17
39	51	110.3	TWI-18
40	54	110.3	TWI-19
42	56	110.3	TWI-20
36	38	110.3	TWI-22
37	14	110.3	NS-1

TABLE D.3-6. TAILINGS DEWATERING WELLS

Row Number	Column Number	Well Extraction Rate (ft ³ /day)	Well Name
51	49	-230.01	TW5-9C
50	47	-5.92	TW5-8C
55	49	-143.8	TW5-7C
54	61	-170.87	TW5-6C
49	54	-208.74	TW5-5CA
47	55	-441.28	TW5-5C
43	46	-31.08	TW5-4CA
41	53	-130.64	TW5-4C
46	59	-1018.52	TW5-3
38	25	-10.08	TW5-2C
37	18	-98.67	TW5-24C
52	24	-113.09	TW5-23C
52	33	-30.73	TW5-22C
61	47	-896.39	TW5-21C
38	14	-25.11	TW5-20C
52	46	-168.18	TW5-1C
37	21	-514.21	TW5-19C
40	22	-116.51	TW5-18C
40	32	-99.56	TW5-17C
39	40	-783.03	TW5-16C
43	31	0	TW5-14C
47	50	0	TW5-11C
57	58	0	TW5-10C
71	33	-192.51	TW4-9CA
70	33	-379.96	TW4-9C
67	34	-377.15	TW4-8CC
68	33	-296.88	TW4-8CB
69	33	-178.6	TW4-8CA
69	34	-217.26	TW4-8C
67	24	-49.05	TW4-7C
63	32	-376.05	TW4-6CA
63	35	-1010.61	TW4-6C
65	45	-99.86	TW4-5C
62	32	-493.69	TW4-4CA
61	35	0	TW4-4C
65	21	-91.67	TW4-3C
68	22	-76.38	TW4-2C
67	35	-530.98	TW4-1C
60	23	-45.78	TW4-15C
64	40	0	TW4-13C
68	29	0	TW4-12C
63	30	0	TW4-11CC
63	23	-26.47	TW4-11CB
63	25	-110.61	TW4-11CA
63	26	-365	TW4-11C
62	29	-339.58	TW4-10CA
62	28	-274.4	TW4-10C
62	27	-208.47	TW4-10CB
69	19	-130.69	TW4-21C

D.4 CALIBRATION/STABILIZATION

The calibration procedure consisted of matching a stable modeled piezometric surface in the Surficial aquifer with a steady state operational surface. Additional calibration comparisons included the modeled seepage from the tailings with estimated seepage rates based on water quality. Parameters that were varied during the calibration included the recharge rate, the hydraulic conductivity of the Surficial aquifer, and the vertical conductance between the tailings and the Surficial aquifer. The tailings dewatering program was not used during the calibration to allow a pseudo steady-state piezometric surface to develop in the Surficial aquifer. These preliminary simulations were run for periods of up to 20 years to reach a near steady-state condition. The Surficial aquifer hydraulic conductivity matrix was adjusted to correct discrepancies between the stable model piezometric surface and the measured surface. Successive model runs were conducted until the changes in the piezometric surface for the Surficial aquifer were very small.

The modeled leakage rates from the tailings were calculated by comparing the heads in tailings cells at the end of simulations with initial heads in the tailings. The historic water quality in severely impacted Surficial wells indicates a dilution factor of Surficial aquifer water to tailings seepage of approximately 3:1 to 5:1. This is based primarily on the chloride concentrations in tailings wells when compared to maximum observed concentrations in Surficial wells. The upgradient recharge to the Surficial aquifer was estimated at 10 gpm, and the previously discussed recharge modeling produced a comparable rate of approximately 10 gpm of recharge from the same area. The simulations indicated a short-term seepage rate from the tailings of approximately 5 gpm, giving a 2:1 dilution of upgradient Surficial recharge to tailings seepage.

D.5 MODELING SCENARIOS

Three scenarios were evaluated with the modeling to reflect three potential ground-water remediation scenarios. The three scenarios reflect various degrees of continuation of the current ground-water remediation and dewatering programs. The current ground-water remediation system is functioning as a successful seepage containment system and the water quality restoration in accessible areas of the Surficial aquifer is virtually complete. Thus, dramatic changes in the system operation or additions to the system have little potential benefit.

D.5.1 SCENARIO #1

The modeling for scenario #1 was done with the assumption that the dewatering and ground-water remediation systems are shut down immediately. The modeled time period was twelve years using nine stress periods. The stored water in the tailings at the start of simulation was 137 Mgal. The seepage rates from the tailings were determined by comparing tailings head matrices from the MODFLOW output at the end of each stress period. Initial seepage rates from the tailings were approximately 5 gpm. As the stored volume in the tailings declined, the seepage rate from the tailings also declined to approximately 3.4 gpm at the end of the simulation. The fresh-water mound over the recharge lines and in the vicinity of the injection wells also decayed over a 2-3 year period.

The ground-water discharge to the drain cells simulating Mine Creek declined from a maximum of 3.9 gpm to a steady rate of 1.7 gpm after 12 years. The ground-water discharge to the river cells in Spring Creek declined from 56 gpm to approximately 24 gpm over the simulation period. Figure D.5-1 presents a summary of the ground/surface water exchange flux rates for this simulation. A generalization of the results of the simulation for scenario #1 is that the remaining volume in the tailings is relatively large and is draining at a slow and steady rate, which will produce a nearly steady-state seepage condition that will last for decades. The proportion of tailings seepage to other ground-water discharge is not changing appreciably at the end of the simulation.

D.5.2 SCENARIO #2

The modeling for scenario #2 was done with the assumption that the current dewatering and ground-water remediation systems are operated until mid 2001. The modeled time period was fifty years using fourteen stress periods. The stored water in the tailings at the start of simulation was 137 Mgal. The dewatering rates are reduced slightly during year 2000 to reflect some expected declines in well yields with the declining water levels in the tailings. Table D.5-1 presents the scenario #2 dewatering rates for individual wells in feet³/day. The dewatering program removes approximately 39 Mgal of tailings water. The seepage rates from the tailings following cessation of dewatering ranged from a maximum of 2.59 gpm 1½ years after the dewatering is discontinued to 0.9 gpm in 2050. The removal of a substantial portion of the tailings water reduces head in the tailings and the size of the saturated "footprint" of the tailings, thereby dramatically reducing seepage rates. The fresh-water mound over the recharge lines and in the vicinity of the injection wells also decayed over a 2-3 year period following cessation of the injection system operation.

The ground-water discharge to the drain cells simulating Mine Creek declined from a maximum of 12 gpm to a steady rate of 1.5 to 1.6 gpm after 50 years. The ground-water discharge to the river cells in Spring Creek declined from 81 gpm to approximately 23 gpm over the simulation period. Figure D.5-2 presents a summary of the ground/surface water exchange flux rates for this simulation. A generalization of the results of the simulation for scenario #2 is that the dewatering removes enough of the volume in the tailings to cause a measurable reduction in the long-term seepage rate

A variation of scenario #2 was modeled with the assumption that all fresh water injection and the Surficial collection below the toe of the No. 5 dam is discontinued at the end of year 2000. With this variation, the decay of the ground-water mound near the injection systems decays sooner, but the implications to tailings seepage rates are minor.

D.5.3 SCENARIO #3

Scenario #3 represents an extended and intensive continuation of both the dewatering and ground-water remediation system operations. The key component in this scenario is a further reduction in the remaining volume of tailings water. With this reduction comes a further reduction in eventual seepage rates. However, dewatering becomes more difficult with every gallon removed, and the well yields were progressively reduced in the modeling. In reality, many of the tailings dewatering wells would likely require replacement or extensive rehabilitation to sustain the modeled extraction rates. In the modeling scenario, the dewatering program was extended to the end of year 2004. The simulated dewatering program removes approximately 75 Mgal of tailings water. Table D.5-2 presents the scenario #3 dewatering rates for individual wells in feet³/day. The seepage rates from the tailings following cessation of dewatering reached a maximum of 0.79 gpm 10 years the dewatering is discontinued. The injection well operation is discontinued in mid 2001, and the Surficial collection and recharge line operation is discontinued at the end of 2002. The decay of the fresh-water mound over the recharge lines and in the vicinity of the injection wells followed cessation of the operation of the systems.

The ground-water discharge to the drain cells simulating Mine Creek declined from a maximum of 12 gpm to a steady rate of 1.5 gpm over the simulation period of 19 years. The ground-water discharge to the river cells in Spring Creek declined from 81 gpm to approximately 22 gpm over the simulation period. Figure D.5-3 presents a summary of the ground/surface water exchange flux rates for this simulation. A generalization of the results of the simulation for scenario #3 is that the dewatering removes nearly all of the tailings water that can be reasonably extracted. However, the dewatering rates diminish very quickly after roughly one-half of the 75 Mgal extraction volume is removed, and the effort and expense of dewatering will likely increase dramatically.

D.5-4

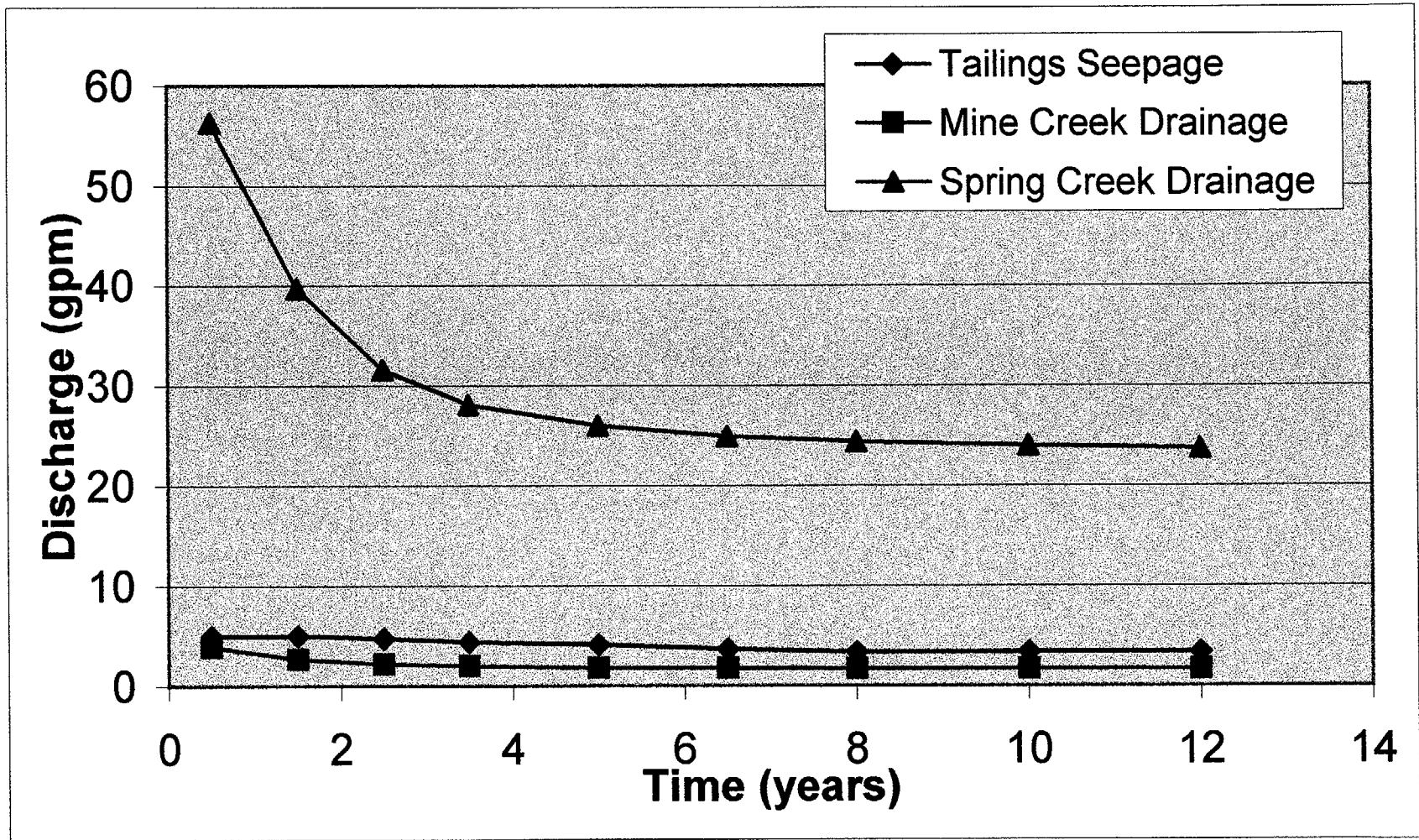


FIGURE D.5-1. SCENARIO #1 FLUX RATE SUMMARY

D.5-5

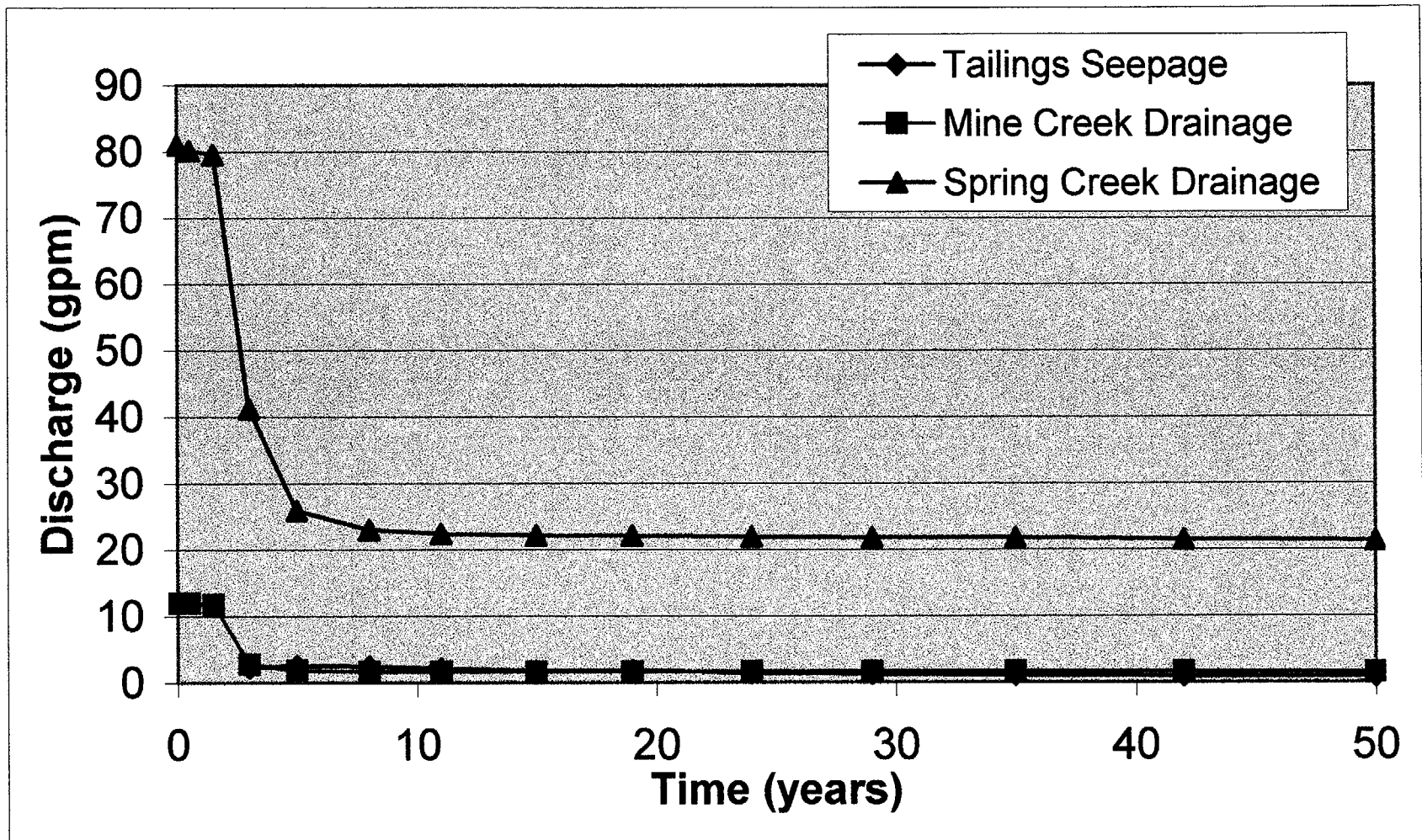


FIGURE D.5-2. SCENARIO #2 FLUX RATE SUMMARY

D.5-6

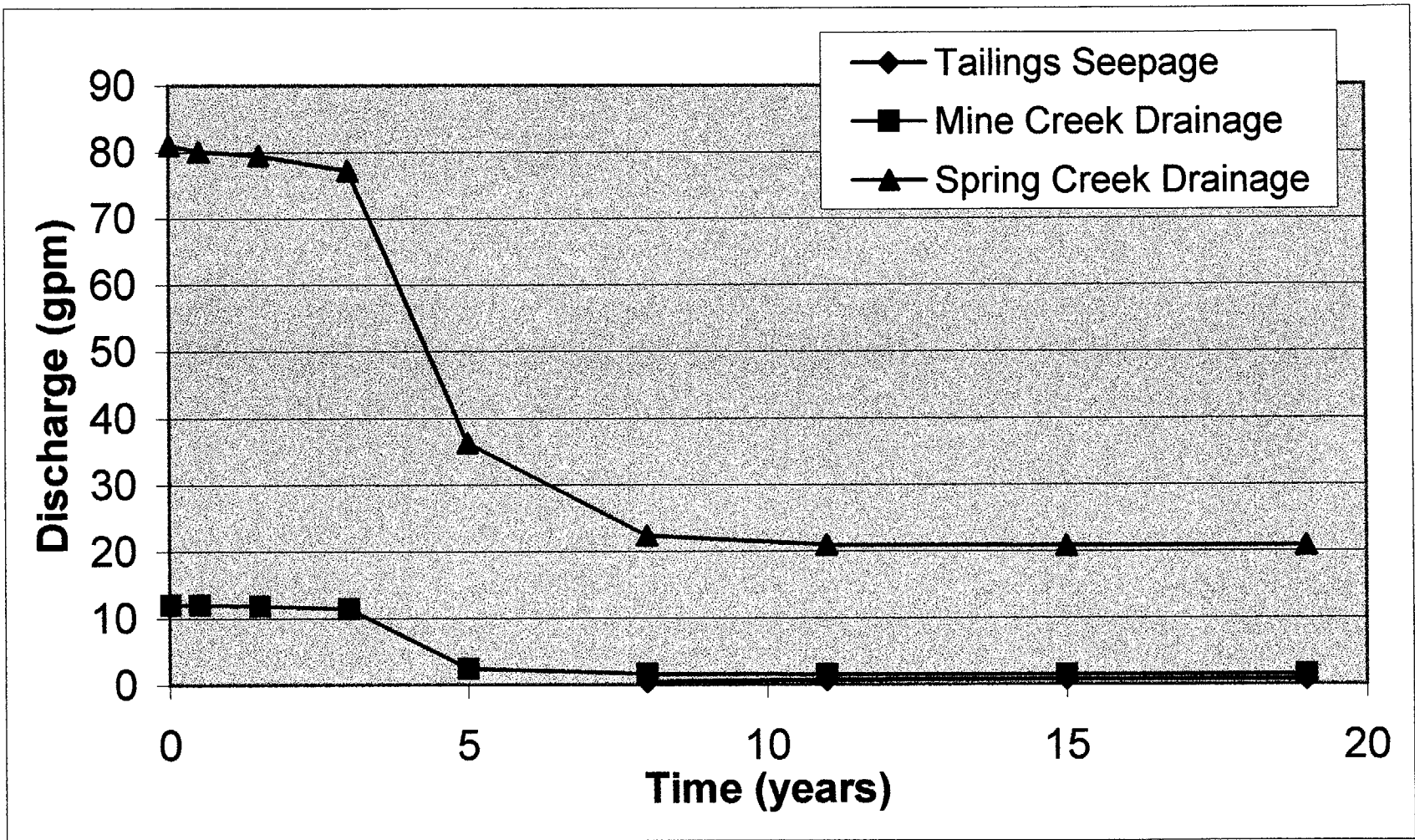


FIGURE D.5-3. SCENARIO #3 FLUX RATE SUMMARY

TABLE D.5-1. SCENARIO #2 TAILINGS DEWATERING RATES

Row Number	Column Number	Well Extraction Rate Jan. 2000 -June 2000 (ft ³ /day)	Well Extraction Rate July 2000 -Late 2001 (ft ³ /day)	Well Name
51	49	-230.01	-153.34	TW5-9C
50	47	-5.92	-3.95	TW5-8C
55	49	-143.8	-95.86	TW5-7C
54	61	-170.87	-113.91	TW5-6C
49	54	-208.74	-139.16	TW5-5CA
47	55	-441.28	-294.19	TW5-5C
43	46	-31.08	-20.72	TW5-4CA
41	53	-130.64	-87.09	TW5-4C
46	59	-1018.52	-679.01	TW5-3
38	25	-10.08	-6.72	TW5-2C
37	18	-98.67	-65.78	TW5-24C
52	24	-113.09	-75.39	TW5-23C
52	33	-30.73	-20.48	TW5-22C
61	47	-896.39	-597.59	TW5-21C
38	14	-25.11	-16.74	TW5-20C
52	46	-168.18	-112.12	TW5-1C
37	21	-514.21	-342.8	TW5-19C
40	22	-116.51	-77.67	TW5-18C
40	32	-99.56	-66.38	TW5-17C
39	40	-783.03	-522.02	TW5-16C
43	31	0	0	TW5-14C
47	50	0	0	TW5-11C
57	58	0	0	TW5-10C
71	33	-192.51	-128.34	TW4-9CA
70	33	-379.96	-253.31	TW4-9C
67	34	-377.15	-251.43	TW4-8CC
68	33	-296.88	-197.92	TW4-8CB
69	33	-178.6	-119.07	TW4-8CA
69	34	-217.26	-144.84	TW4-8C
67	24	-49.05	-32.7	TW4-7C
63	32	-376.05	-250.7	TW4-6CA
63	35	-1010.61	-673.74	TW4-6C
65	45	-99.86	-66.57	TW4-5C
62	32	-493.69	-329.13	TW4-4CA
61	35	0	0	TW4-4C
65	21	-91.67	-61.11	TW4-3C
68	22	-76.38	-50.92	TW4-2C
67	35	-530.98	-353.99	TW4-1C
60	23	-45.78	-30.52	TW4-15C
64	40	0	0	TW4-13C
68	29	0	0	TW4-12C
63	30	0	0	TW4-11CC
63	23	-26.47	-17.65	TW4-11CB
63	25	-110.61	-73.74	TW4-11CA
63	26	-365	-243.33	TW4-11C
62	29	-339.58	-226.38	TW4-10CA
62	28	-274.4	-182.94	TW4-10C
62	27	-208.47	-138.98	TW4-10CB
69	19	-130.69	-87.13	TW4-21C
Sum (ft ³ /day)		-11108	-7405	
Sum (gpm)		-58	-38	

TABLE D.5-2. SCENARIO #3 TAILINGS DEWATERING RATES

Row Number	Column Number	Well Extraction Rate Jan. 2000 -June 2000 (ft ³ /day)	Well Extraction Rate July 2000 -June 2001 (ft ³ /day)	Well Extraction Rate June 2001 -Dec. 2002 (ft ³ /day)	Well Extraction Rate Dec. 2002 -Dec. 2004 (ft ³ /day)	Well Name
51	49	-230.01	-153.34	-97.58	-66.22	TW5-9C
50	47	-5.92	-3.95	-2.51	-1.7	TW5-8C
55	49	-143.8	-95.86	-61	-41.4	TW5-7C
54	61	-170.87	-113.91	-72.49	-49.19	TW5-6C
49	54	-208.74	-139.16	-88.56	-60.09	TW5-5CA
47	55	-441.28	-294.19	-187.21	-127.03	TW5-5C
43	46	-31.08	-20.72	-13.19	-8.95	TW5-4CA
41	53	-130.64	-87.09	-33.25	-22.57	TW5-4C
46	59	-1018.52	-679.01	-432.1	-293.21	TW5-3
38	25	-10.08	-6.72	-4.28	-2.9	TW5-2C
37	18	-98.67	-65.78	-41.86	-28.41	TW5-24C
52	24	-113.09	-75.39	-47.98	-32.55	TW5-23C
52	33	-30.73	-20.48	-13.04	-8.85	TW5-22C
61	47	-896.39	-597.59	-380.29	-258.05	TW5-21C
38	14	-25.11	-16.74	-10.65	-7.23	TW5-20C
52	46	-168.18	-112.12	-42.81	-29.05	TW5-1C
37	21	-514.21	-342.8	-218.15	-148.03	TW5-19C
40	22	-116.51	-77.67	-49.43	-33.54	TW5-18C
40	32	-99.56	-66.38	-42.24	-28.66	TW5-17C
39	40	-783.03	-522.02	-332.19	-225.42	TW5-16C
43	31	0	0	0	0	TW5-14C
47	50	0	0	0	0	TW5-11C
57	58	0	0	0	0	TW5-10C
71	33	-192.51	-128.34	-28.58	-19.4	TW4-9CA
70	33	-379.96	-253.31	-40.3	-27.35	TW4-9C
67	34	-377.15	-251.43	-40	-27.14	TW4-8CC
68	33	-296.88	-197.92	-62.97	-42.73	TW4-8CB
69	33	-178.6	-119.07	-26.52	-18	TW4-8CA
69	34	-217.26	-144.84	-46.09	-31.27	TW4-8C
67	24	-49.05	-32.7	-20.81	-14.12	TW4-7C
63	32	-376.05	-250.7	-79.77	-54.13	TW4-6CA
63	35	-1010.61	-673.74	-385.87	-261.84	TW4-6C
65	45	-99.86	-66.57	-42.36	-28.75	TW4-5C
62	32	-493.69	-329.13	-209.45	-142.12	TW4-4CA
61	35	0	0	0	0	TW4-4C
65	21	-91.67	-61.11	-38.89	-26.39	TW4-3C
68	22	-76.38	-50.92	-32.4	-21.99	TW4-2C
67	35	-530.98	-353.99	-135.16	-91.72	TW4-1C
60	23	-45.78	-30.52	-5.83	-3.95	TW4-15C
64	40	0	0	0	0	TW4-13C
68	29	0	0	0	0	TW4-12C
63	30	0	0	0	0	TW4-11CC
63	23	-26.47	-17.65	-11.23	-7.62	TW4-11CB
63	25	-110.61	-73.74	-42.23	-28.66	TW4-11CA
63	26	-365	-243.33	-108.39	-73.55	TW4-11C
62	29	-339.58	-226.38	-72.03	-48.88	TW4-10CA
62	28	-274.4	-182.94	-29.1	-19.75	TW4-10C
62	27	-208.47	-138.98	-30.95	-21	TW4-10CB
69	19	-130.69	-87.13	-13.86	-9.41	TW4-21C
Sum (ft ³ /day)		-11108	-7405	-3674	-2493	
Sum (gpm)		-58	-38	-19	-13	

D.6 SUMMARY AND CONCLUSIONS

The three scenarios present a broad range of potential dewatering and Surficial aquifer remediation options. Each successive addition of dewatering or remediation efforts adds some benefit in terms of reduction in the proportion of tailings seepage in the total ground-water discharge to surface waters. This reduction in the tailings seepage proportion translates to a reduction in concentrations of constituents in the surface water.

Although the benefits of additional dewatering are reduced rates and volumes of seepage from the tailings, the difficulty associated with dewatering increases dramatically as the water level in the tailings declines. This is illustrated dramatically in a comparison between the volumes extracted with scenario #2 and scenario #3. A total of 39 Mgal of water is extracted with 18 months of dewatering for scenario #2, while extended the dewatering by 42 months to a total of 5 years results in an additional extraction of 36 Mgal for scenario #3. The efficiency of the dewatering process diminishes rapidly as evidenced by the roughly three-fold increase in the time necessary to extract similar volumes. The projected dewatering rate at the end of year 2004 has declined to 22% of anticipated dewatering rates for the year 2000. The preceding comparison indicates that scenario #2 takes advantage of the reasonably productive dewatering period, while the productivity of extending dewatering beyond mid 2001 is relatively poor.

D.7 REFERENCES

McDonald, M.G. and A.W. Harbaugh, 1988. A Modular Three-Dimensional Finite-Difference Ground-Water Flow Model (MODFLOW), Book 6, Modeling Techniques, United States Geological Survey.

APPENDIX E

MT3D TRANSPORT MODELING

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E.1 INTRODUCTION

The MT3D model (S.S. Papodopolous & Assoc. 1992) was used to model transport of constituents in ground-water flow in the Surficial aquifer at the Shirley Basin site. The MT3D used the cell by cell flow terms produced by the MODFLOW model. The same features incorporated in the MODFLOW are incorporated in the flow modeling. Cell references are relative to the modeling grid described in Appendix D. An updated version of the MT3D model that incorporates an implicit solution was used for the modeling described in this appendix.

The MT3D modeling was based on the scenario #2 ground-water flow modeling described in Appendix D. The modeling start time was assumed to be January, 2000, with 1½ years of continued dewatering system and collection/injection system operation.

The unit of time used in the modeling was days, and the unit of length was feet. Units of hydraulic conductivity and recharge were ft/day. The unit of flow for wells was ft³/day and the unit of conductance for river cells and drain cells was ft²/day. The unit of vertical conductance is day⁻¹. Units of concentration were the same as those used in the body of this report (mg/l for Uranium and pCi/l for Thorium-230) and were multiplied by a factor of 10 in the MT3D modeling to allow a simpler numeric format. The concentration is relative to a unit volume of water, and thus the units of concentration used in the modeling can be converted in this manner unless degradation, decay or reaction processes are used. These processes were not used in the modeling.

E.2 TRANSPORT MODELING

The tailings was the source of elevated concentrations of uranium and elevated Th-230 activity. Seepage from the tailings carries these constituents to the Surficial aquifer, where they mix with resident water. There are natural measurable concentrations of the two modeled constituents and these were incorporated in the modeling.

E.2.1 DISPERSION AND ATTENUATING PROCESSES

With the extremely heterogeneous hydraulic conductivity in the Surficial aquifer and the resulting non-uniform flow field, the dispersivity of the Surficial aquifer does have some impact on the transport process. However this impact is moderated by the long duration of the source term. The seepage from the tailings will approach a steady-state rate lasting for decades. This has the effect of dramatically reducing the influence of longitudinal dispersivity, and to a lesser extent, transverse and vertical dispersivity. The longitudinal dispersivity used in the modeling was 10 feet for both the tailings and Surficial aquifers. The ratio of transverse or vertical dispersivity to longitudinal dispersivity was set at 0.2 for both aquifers. The initial concentration for constituents in the tailings was assumed to be uniform, so the dispersion process has virtually no impact. The diffusion coefficient was set at zero because diffusion is trivial in comparison to convection driven processes.

The adsorption process was not considered in the general transport modeling to add a measure of conservatism. Adsorption/desorption processes in the absence of decay processes act to slow down constituent migration and to spread a "pulse" of the constituent. The spreading does reduce peak concentrations at downgradient locations, with the reduction proportional to the effective length of the pulse and the distance downgradient. Decay processes or other permanent removal processes were not considered in the modeling. With a retardation factor of one, the constituents were assumed to migrate at the same rate as the convective velocity. This is a conservative approach in that a retardation factor greater than one reduces peak concentrations.

E.2.2 AQUIFER PROPERTIES

The effective porosity for the tailings and the Surficial aquifer were set at 0.12 and 0.10, respectively. These values are equivalent to the specific yield values used in the flow modeling. The top of the tailings elevation is presented in Table E.2-1. The thickness of tailings is presented in Table E.2-2, and the thickness of the Surficial aquifer is presented in Table E.2-3.

E.2.3 INITIAL CONCENTRATIONS

The initial concentrations in the tailings were set to reflect the mobile concentrations as evidenced by the measured concentrations in the Surficial aquifer. Geochemical processes described in Section 2.1.1 limit the mobile concentration of uranium and the mobile activity of thorium-230. Table E.2-4 presents the initial uranium concentration in the tailings, and Table E.2-5 presents the initial thorium-230 activity in the tailings.

The baseline concentrations in the Surficial aquifer were set at the average background concentrations except directly beneath or directly adjacent to the tailings. In these areas, the concentrations were increased in direct proportion to proximity with the original Mine Creek channel. Table E.2-6 presents the initial uranium concentration in the Surficial aquifer, and Table E.2-7 presents the initial thorium-230 activity in the Surficial aquifer. Recharge and injection to the Surficial aquifer were at the average background concentration or activity.

TABLE E.2-1. TOP OF TAILINGS (FEET ABOVE MSL MINUS 7000).

Row	Column																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	73.58	72.25	70.92	69.60	68.73	67.52	66.56	65.38	63.45	61.08
2	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	74.96	71.93	69.58	67.24	64.90	62.68	61.35	60.24	59.21	58.24	57.19	55.82
3	75.00	75.00	75.00	71.71	73.20	75.00	75.00	72.63	68.78	65.97	63.95	62.25	60.56	58.87	57.17	54.79	53.07	52.29	51.24	50.19
4	75.00	75.00	75.00	69.24	68.00	71.95	72.03	68.43	64.36	61.15	58.81	56.79	55.10	53.40	51.71	50.02	50.00	50.00	50.00	48.11
5	75.00	75.00	75.00	67.47	64.29	67.82	67.82	65.45	61.45	58.10	55.43	53.09	51.19	50.00	50.00	50.00	50.00	50.00	49.98	42.98
6	75.00	75.00	75.00	66.24	61.69	64.90	64.48	62.96	59.37	56.03	53.35	50.67	50.00	50.00	50.00	50.00	50.00	47.00	43.06	41.04
7	75.00	75.00	75.00	65.36	59.83	62.71	62.23	60.71	57.89	54.55	51.87	50.00	50.00	50.00	50.00	50.00	48.65	47.61	43.31	41.33
8	75.00	75.00	74.78	64.65	58.35	60.96	60.43	58.91	56.70	53.36	50.68	50.00	50.00	50.00	50.00	50.00	46.73	44.75	40.74	45.42
9	75.00	75.00	74.07	63.94	56.86	59.26	58.63	57.11	55.33	52.18	50.00	50.00	50.00	50.00	48.57	44.80	42.27	43.56	46.75	47.70
10	75.00	75.00	73.37	63.24	55.84	57.56	58.83	56.31	53.79	50.99	50.00	50.00	50.00	50.00	47.88	43.32	41.88	48.83	50.00	50.00
11	75.00	75.00	72.66	62.53	54.93	55.86	55.03	53.51	51.99	50.00	50.00	50.00	50.00	50.00	49.90	46.62	48.46	50.56	51.01	50.55
12	75.00	75.00	71.95	61.82	54.01	54.15	53.24	51.71	50.19	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.73	51.80	52.08
13	75.00	75.00	71.25	61.12	53.09	52.45	51.44	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.14	50.80	51.80	52.65	53.15
14	75.00	75.00	70.54	60.41	52.17	50.75	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.58	51.31	51.99	52.83	53.69	54.22	53.76
15	75.00	75.00	69.84	59.70	51.41	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	51.22	52.16	53.10	53.75	54.38	55.04	55.69
16	75.00	75.00	69.13	59.00	50.71	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	51.22	52.16	53.10	53.75	54.38	55.04	55.69
17	75.00	75.00	68.42	58.29	50.99	50.00	50.00	50.00	50.00	50.67	51.24	52.48	53.42	54.36	54.98	55.57	56.31	56.65	57.38	56.97
18	75.00	75.00	67.72	57.58	52.78	50.74	50.00	50.00	51.07	52.48	52.84	53.78	54.68	55.62	56.25	56.77	57.40	57.75	58.42	58.05
19	75.00	75.00	67.01	56.88	54.46	52.75	50.37	50.41	52.87	54.29	54.40	54.92	55.94	56.88	57.53	57.96	58.60	58.97	59.47	59.12
20	75.00	75.00	66.30	57.04	56.17	54.77	52.39	52.24	54.68	56.10	55.96	56.09	57.20	58.14	58.81	59.16	59.81	60.15	60.51	60.19
21	75.00	75.00	65.60	58.03	57.92	56.79	54.40	54.08	56.49	57.90	57.52	57.60	58.51	59.40	60.09	60.32	61.01	61.19	61.55	61.26
22	75.00	75.00	64.89	59.74	59.67	58.81	56.42	55.91	58.15	59.71	59.22	59.24	59.87	60.66	61.41	61.71	62.20	62.53	62.56	62.33
23	75.00	75.00	64.18	61.46	61.41	60.82	58.43	57.76	59.82	61.52	60.95	61.02	61.92	62.73	63.09	63.40	63.89	63.66	63.40	63.40
24	75.00	75.00	63.49	63.18	63.16	62.84	60.62	59.99	61.70	63.33	62.71	62.87	62.42	63.23	64.05	64.36	64.59	65.17	64.88	64.47
25	75.00	75.00	62.79	64.90	64.90	64.86	62.87	62.22	63.64	65.13	64.51	64.43	63.98	64.64	65.37	65.64	65.78	66.37	66.09	65.53
26	75.00	74.96	66.83	66.61	66.65	66.87	65.11	64.45	65.57	66.94	66.31	66.02	65.58	65.95	66.64	66.92	66.98	67.98	67.53	66.44
27	75.00	74.25	68.54	68.33	68.39	68.89	67.34	66.69	67.40	68.75	68.11	67.81	67.58	67.34	67.95	68.68	69.24	68.05	66.76	65.92
28	75.00	73.55	70.26	70.05	70.14	70.91	69.56	68.92	69.24	70.56	69.91	69.41	68.96	68.99	69.77	70.68	69.61	67.28	65.93	65.30
29	75.00	73.23	71.98	71.87	71.89	72.87	71.77	71.15	71.08	72.36	71.71	71.13	70.99	71.25	71.87	72.72	69.69	66.50	65.12	64.64
30	75.00	74.67	73.69	73.79	73.63	74.57	74.00	73.39	73.07	74.17	73.51	73.64	72.59	73.39	73.85	74.79	69.77	66.01	64.35	63.90
31	75.00	83.89	75.00	75.06	75.00	77.08	76.50	74.81	75.00	76.10	75.40	75.00	74.10	75.00	74.58	72.88	67.70	66.05	65.53	65.67
32	75.00	95.54	75.00	75.88	75.00	79.99	79.34	71.66	76.52	78.37	75.26	75.00	75.00	72.25	72.57	75.43	74.82	71.88	72.64	73.39
33	78.14	105.93	75.00	76.49	75.00	82.86	81.91	71.98	78.00	80.00	75.87	74.48	72.26	77.69	82.23	85.89	82.54	84.03	87.32	91.02
34	86.32	116.02	75.72	77.09	75.00	84.70	80.30	75.00	82.24	80.50	75.51	73.42	79.78	86.52	91.04	95.17	97.92	102.94	105.52	105.95
35	93.92	126.20	79.98	80.14	78.64	85.83	84.29	75.00	83.36	80.72	75.15	78.97	88.96	95.34	99.76	106.87	110.34	109.48	109.34	108.44
36	100.38	136.77	84.24	83.20	80.82	86.25	85.38	80.91	82.10	77.86	77.72	89.96	98.42	104.75	110.49	108.49	105.57	104.55	105.69	105.07
37	109.03	148.11	88.49	86.25	83.16	87.35	86.74	85.55	79.93	77.57	90.99	101.84	109.87	107.81	106.10	105.64	105.75	106.60	106.74	104.21
38	118.17	159.03	92.75	88.37	85.53	88.57	88.03	85.25	79.58	91.35	103.78	109.43	105.90	105.18	104.76	103.63	107.34	107.79	107.60	103.67
39	128.13	168.29	96.28	89.77	87.87	89.76	89.56	82.07	85.92	104.28	110.06	105.65	104.54	102.99	102.58	101.74	107.72	108.79	107.64	103.50
40	137.68	176.61	99.23	91.23	90.21	91.98	91.53	78.61	99.34	107.71	105.14	104.34	102.24	100.66	100.41	100.07	106.99	109.79	107.47	103.34
41	147.97	184.96	104.96	93.57	92.54	94.63	88.56	88.97	109.34	105.34	103.84	102.39	100.08	98.99	98.83	100.00	108.71	110.00	107.44	103.17
42	160.52	193.86	111.47	95.91	94.88	96.89	84.24	102.49	106.31	104.72	101.90	100.18	98.44	97.51	97.58	99.40	107.98	110.00	108.19	103.26
43	173.94	202.15	117.78	98.24	97.22	99.88	87.87	110.18	105.28	103.32	100.42	98.87	98.91	95.92	96.50	98.25	106.06	110.00	106.35	102.21
44	187.31	208.33	123.82	99.51	99.55	101.52	102.58	107.62	104.59	101.95	99.86	97.90	96.30	95.00	95.00	95.14	97.35	103.17	109.05	104.42
45	200.21	214.42	132.83	97.51	98.39	101.26	110.33	106.43	104.53	101.85	99.67	97.59	95.50	95.00	95.00	96.60	99.92	105.42	101.50	98.06
46	208.44	219.79	142.79	96.46	96.64	100.00	109.25	105.75	104.16	102.08	99.83	97.82	96.26	95.20	95.00	96.12	98.71	101.37	98.97	95.94
47	216.00	226.21	152.38	98.33	97.80	110.80	108.15	105.63	103.78	102.06	100.00	98.40	96.59	95.86	95.61	95.00	97.07	98.47	96.74	95.00
48	223.57	234.51	161.23	100.00	99.12	109.98	107.13	105.46	103.41	101.70	100.13	98.36	97.12	96.53	96.27	95.00	95.42	96.11	95.00	95.00
49	232.49	240.18	168.58	100.00	103.10	108.83	105.72	105.08	103.03	101.32	100.04	98.70	97.65	97.19	96.40	95.00	95.00	95.00	95.00	95.00
50	241.76	238.03	175.90	108.76	109.67	108.75	105.00	104.71	102.66	101.23	100.10	99.23	98.18	97.86	96.49	95.00	95.00	95.00	95.22	95.58
51	250.00	235.27	184.37	115.12	113.01	109.59	105.00	104.42	102.78	101.40	100.25	99.76	98.80	98.18	96.58	95.00	95.00	95.00	95.40	98.58
52	250.00	237.04	192.28	121.23	117.81	109.95	105.00	104.69	103.01	101.70	101.46	100.00	99.44	98.27	96.68	95.08	95.00	95.00	96.82	100.00
53	250.00	239.52	199.17	129.27	120.93	110.85	106.04	104.98	103.41	102.07	102.86	101.18	99.96	98.37	96.77	95.17	95.00	95.23	98.78	100.47
54	250.00	240.68	204.71	139.30	123.17	111.54	107.68	105.00	103.80	103.99	104.39	102.90	100.70	99.07	97.43	95.95	95.00	96.72	99.48	102.82
55	250.00	241.97	207.78	149.66	125.00	111.89	109.14	105.00	104.19	106.34	105.95	104.59	102.28	99.90	98.47	96.67	95.83	97.79	100.00	106.78
56	250.00	242.09	213.32	159.84	127.57	110.00	110.77	107.23	105.97	108.46	107.58	106.08	104.13	100.10	99.70	97.69	96.78	98.37	100.00	107.

TABLE E.2-1. TOP OF TAILINGS (FEET ABOVE MSL MINUS 7000) (continued).

Row	Column																			
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	60.06	59.02	58.12	57.23	56.34	55.44	54.55	53.81	53.21	52.62	52.02	51.43	50.83	50.24	50.00	50.00	50.00	50.00	50.00	50.00
2	54.45	53.41	52.51	51.62	50.73	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
3	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
4	47.53	50.00	50.00	50.00	50.00	49.92	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
5	40.06	42.18	41.54	42.28	42.70	43.35	41.87	41.18	42.37	44.23	47.18	49.14	50.00	49.99	49.69	49.44	49.68	50.00	50.00	50.00
6	40.56	39.57	39.40	38.16	37.88	37.44	36.98	36.42	35.91	38.34	40.66	43.26	43.98	45.37	45.16	44.28	44.28	44.05	44.59	44.70
7	43.23	42.69	42.13	40.19	39.92	39.09	39.30	38.40	37.68	36.48	36.97	39.60	41.36	42.08	41.89	41.51	40.40	39.68	39.37	38.14
8	45.37	45.21	44.31	42.38	41.88	40.78	41.28	40.38	39.66	38.11	38.19	36.95	39.00	39.47	39.27	39.08	37.45	36.60	35.49	34.71
9	47.55	47.72	45.99	44.46	43.67	42.51	43.22	42.36	41.64	39.74	38.12	35.97	36.65	36.85	36.66	36.46	35.56	35.41	35.46	34.94
10	49.94	50.00	47.90	46.42	45.40	44.25	44.74	44.34	43.30	41.80	40.01	38.46	38.73	35.37	35.31	35.19	36.12	38.57	37.90	37.34
11	50.00	50.00	49.80	48.29	47.14	45.98	46.41	46.31	44.93	44.04	42.82	41.69	39.13	37.81	37.64	39.19	39.28	41.20	40.33	39.77
12	50.60	50.00	50.00	50.00	48.87	47.72	48.12	48.29	47.41	46.43	45.87	44.62	42.77	41.61	41.62	43.19	42.45	43.68	42.77	42.20
13	51.68	50.79	50.03	50.00	50.00	49.45	49.83	50.00	50.00	49.81	49.38	47.82	46.57	45.35	43.60	47.36	45.86	46.16	45.20	44.64
14	52.75	51.86	51.06	50.17	50.09	50.27	50.10	50.00	50.00	50.00	50.00	50.00	47.28	45.05	46.59	50.00	49.93	48.63	47.64	46.81
15	53.82	52.93	52.06	51.18	51.02	51.09	50.84	50.32	50.05	50.00	50.00	50.00	47.72	48.43	50.00	50.00	50.00	50.00	49.94	48.39
16	54.89	54.00	53.06	52.19	51.95	51.90	51.59	51.07	50.65	50.23	50.09	50.02	49.08	50.00	50.00	50.00	50.00	50.00	50.00	49.67
17	55.96	55.03	54.07	53.19	52.89	52.72	52.34	51.81	51.40	50.98	50.56	50.19	50.21	50.08	50.02	50.00	50.00	50.00	50.00	50.00
18	57.03	55.28	55.08	54.19	53.82	53.54	53.08	52.56	52.14	51.73	51.31	50.89	50.43	50.28	50.12	50.06	50.01	50.00	50.00	50.00
19	58.10	56.51	56.08	55.19	54.75	54.35	53.83	53.30	52.89	52.47	52.05	51.53	51.62	51.32	51.17	51.01	50.86	50.70	50.47	50.00
20	59.17	57.74	57.08	56.20	55.68	55.17	54.61	54.05	53.63	53.22	52.78	52.38	52.59	52.21	52.06	51.90	51.75	51.59	51.00	50.50
21	60.23	58.97	58.08	57.20	56.62	55.98	55.40	54.80	54.38	53.96	53.29	53.39	53.57	53.12	52.94	52.79	52.64	52.29	51.86	51.26
22	60.37	60.07	59.08	58.20	57.55	56.87	56.19	55.54	55.12	54.48	54.02	54.40	54.54	54.19	53.83	53.68	53.52	53.04	52.62	52.35
23	60.56	61.07	60.07	59.21	58.48	57.80	56.98	56.29	55.73	55.05	55.03	55.38	55.51	55.27	54.72	54.57	54.21	53.90	53.49	53.46
24	61.80	62.07	61.07	60.21	59.42	58.72	57.77	56.99	56.18	55.70	56.04	56.35	56.49	56.34	55.67	55.41	55.08	54.74	54.60	54.57
25	62.94	63.03	62.03	61.13	60.51	60.01	59.21	58.15	57.37	57.17	57.56	57.58	57.49	57.33	56.65	56.17	55.88	55.66	55.67	55.68
26	62.69	62.57	62.63	61.30	61.04	60.90	60.88	60.12	59.81	59.72	59.51	59.26	58.61	57.86	57.08	56.57	56.08	55.70	55.53	55.48
27	62.42	62.22	62.19	60.97	60.47	60.24	60.01	59.51	59.49	59.38	59.24	59.00	58.37	57.61	56.90	56.38	55.97	55.63	55.46	55.35
28	62.36	61.84	61.74	60.76	59.93	59.62	59.39	59.15	59.16	59.07	58.96	58.75	58.13	57.37	56.71	56.20	55.86	55.55	55.38	55.22
29	62.27	61.46	61.26	60.56	59.50	59.03	58.81	58.89	58.81	58.76	58.69	58.49	57.88	57.12	56.53	56.06	55.74	55.48	55.29	55.09
30	62.20	61.08	60.79	60.35	59.08	59.43	58.22	58.60	58.44	58.44	58.41	58.23	57.63	56.89	56.34	55.94	55.62	55.40	55.19	54.96
31	65.60	65.33	65.51	64.92	65.07	65.60	67.19	66.83	61.12	59.34	58.15	57.98	57.39	56.70	56.15	55.81	55.51	55.32	55.09	54.84
32	73.86	73.52	72.69	71.92	71.69	71.66	77.55	78.88	69.41	68.20	67.64	67.00	65.97	64.87	63.47	62.22	62.76	59.82	58.34	56.76
33	92.20	91.23	89.06	87.68	85.74	85.16	87.91	90.94	82.51	81.31	79.84	80.39	79.22	77.12	75.30	77.35	77.86	71.93	69.75	67.46
34	110.24	109.82	109.53	108.58	107.39	105.40	105.17	103.98	104.58	102.27	100.92	100.00	99.10	98.47	92.87	93.38	92.95	88.57	86.74	81.79
35	107.94	107.50	108.08	107.60	110.20	110.56	109.63	111.32	110.56	111.00	111.07	111.27	111.48	111.81	111.16	110.32	107.85	107.39	106.22	102.25
36	104.95	105.03	104.91	104.65	105.16	105.39	105.57	105.61	105.63	105.58	105.51	106.51	107.42	108.09	107.81	108.13	109.72	108.22	110.19	110.28
37	104.07	103.56	103.60	102.55	103.18	103.74	103.90	104.00	104.10	104.36	104.43	104.53	104.80	105.17	105.55	105.99	106.31	106.26	106.41	106.26
38	103.18	102.73	102.26	100.55	101.32	102.09	102.20	102.39	102.58	103.04	103.11	103.34	103.42	103.79	104.05	104.48	104.75	104.92	104.92	105.01
39	102.30	101.76	100.79	99.89	100.00	100.42	100.47	100.77	101.15	101.66	101.79	102.13	102.04	102.34	102.54	102.99	103.19	103.56	103.46	103.72
40	101.41	100.78	100.00	97.45	98.09	98.21	98.60	99.10	99.73	100.25	100.63	100.91	100.83	100.89	101.03	101.52	101.89	102.08	102.10	102.41
41	100.46	100.00	99.16	95.92	95.40	96.00	96.72	98.08	98.53	98.98	99.96	100.00	100.00	100.00	100.00	100.10	100.66	100.61	100.74	101.12
42	99.00	99.71	100.00	95.94	95.00	95.00	96.10	96.90	97.94	98.98	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
43	97.67	98.18	98.99	100.00	99.14	96.63	95.67	96.96	98.00	99.04	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
44	96.92	96.62	97.35	100.00	100.00	98.87	96.22	97.02	98.06	99.10	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
45	95.76	95.60	96.48	98.56	100.00	100.00	98.06	97.21	98.12	99.16	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
46	95.00	95.00	96.35	97.33	99.14	99.05	99.90	98.10	98.24	99.22	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.26
47	95.00	95.00	96.01	97.55	97.17	96.61	98.93	99.81	99.15	99.28	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.21	100.66
48	95.00	95.59	96.85	98.39	97.88	95.96	96.63	98.45	99.91	100.16	100.27	100.11	100.00	100.00	100.00	100.00	100.15	100.60	101.05	101.05
49	95.86	96.78	97.96	99.15	98.87	97.58	98.19	100.00	100.77	101.43	101.55	101.16	100.75	100.32	100.00	100.00	100.10	101.26	101.69	102.13
50	97.40	98.51	99.26	99.92	100.02	100.00	100.31	101.01	102.08	102.77	102.59	102.21	101.78	101.38	101.24	101.09	101.47	102.20	103.05	103.48
51	99.52	100.07	100.13	101.38	101.31	101.41	101.94	102.96	103.80	103.99	103.72	103.27	102.89	102.66	102.51	102.35	103.70	103.44	104.38	104.83
52	101.00	102.04	102.04	102.85	102.59	102.92	103.45	104.32	104.88	105.25	104.78	104.58	104.09	103.93	103.77	103.62	105.71	104.77	105.43	106.19
53	102.12	103.81	103.96	104.06	103.84	104.43	104.69	105.39	105.83	106.44	106.13	105.52	105.36	105.20	105.04	104.88	105.74	106.20	106.76	107.39
54	104.68	105.32	105.78	104.78	105.09	105.15	105.53	106.66	107.07	107.83	106.95	106.78	106.62	106.47	106.31	106.15	106.00	109.77	108.14	108.73
55	106.56	106.64	107.42	107.33	107.41	107.03	106.87	106.88	107.08	108.15	108.69	108.23	107.89	107.73	107.58	107.42	107.26	110.88	109.48	110.09
56	109.07	109.95	108.97	108.82	109.26	109.31	108.86	108.96	108.22											

TABLE E.2-1. TOP OF TAILINGS (FEET ABOVE MSL MINUS 7000) (continued).

Row	Column																			
	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
1	50.00	50.00	50.00	50.00	50.00	48.34	46.11	50.00	53.37	56.55	59.72	63.12	66.08	68.90	70.97	72.92	73.73	75.00	75.00	75.00
2	50.00	50.00	50.00	50.00	50.00	50.00	50.00	49.46	46.57	43.17	40.20	47.40	47.85	50.19	50.64	51.10	51.55	52.23	53.70	54.28
3	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
4	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
5	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
6	43.82	44.56	45.97	47.74	48.44	48.55	48.55	49.15	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	47.84	45.01	41.64	38.27
7	36.05	37.84	41.63	43.46	44.08	44.96	45.04	45.57	46.84	47.13	47.13	47.96	48.40	47.13	47.19	42.96	39.25	38.92	34.05	30.92
8	34.88	34.34	37.78	40.15	41.12	42.08	42.22	42.71	43.61	43.88	43.48	44.08	43.13	40.52	37.00	31.59	28.98	28.82	32.28	29.88
9	34.61	33.50	34.49	36.83	38.16	39.21	39.41	39.93	40.38	40.63	39.91	39.98	38.48	35.48	31.64	31.12	32.15	31.70	30.93	30.94
10	36.77	36.21	35.56	33.42	35.20	36.36	36.60	37.06	37.15	37.15	36.33	35.46	34.30	31.81	31.38	34.63	35.00	35.00	35.10	34.84
11	39.21	38.65	37.43	36.18	35.00	33.02	33.88	32.49	33.36	34.24	33.80	32.93	32.73	35.23	35.76	36.07	36.17	36.27	36.29	36.03
12	41.64	40.56	39.30	38.07	37.02	35.98	35.31	35.18	33.65	32.23	32.06	35.10	35.85	36.61	37.13	37.33	37.43	37.53	37.36	37.10
13	43.68	42.42	41.13	40.09	38.66	37.14	36.89	36.73	35.17	34.88	36.11	36.58	37.26	37.98	38.50	38.60	38.70	38.69	38.43	38.02
14	45.41	44.20	42.84	41.31	39.78	38.60	38.48	38.14	36.52	37.25	37.60	38.07	38.66	39.35	39.77	39.87	39.97	39.76	39.42	38.91
15	47.02	45.49	43.96	42.42	40.89	40.19	40.03	39.56	37.87	38.84	39.08	39.56	40.06	40.72	41.03	41.13	41.09	40.82	40.31	39.80
16	48.14	46.60	45.07	43.54	42.16	41.77	41.44	40.97	39.22	40.38	40.57	41.04	41.47	42.09	42.30	42.40	42.16	41.71	41.20	40.69
17	49.25	47.72	46.18	44.65	43.52	43.33	42.86	42.39	40.59	41.92	42.14	42.53	42.87	43.46	43.56	43.49	43.11	42.60	42.09	41.58
18	50.00	48.83	47.30	45.82	45.07	44.74	44.27	43.80	42.35	43.46	43.71	44.01	44.27	44.73	44.83	44.51	44.00	43.49	42.98	42.49
19	50.00	49.94	48.41	47.18	46.63	46.16	45.69	45.22	44.35	45.00	45.25	45.50	45.67	45.99	45.90	45.40	44.89	44.38	43.88	43.45
20	50.07	50.01	49.52	48.54	48.04	47.57	47.10	46.63	46.41	46.55	46.78	46.98	47.05	47.23	46.80	46.29	45.78	45.28	44.77	44.40
21	51.19	51.04	50.60	49.83	49.46	48.99	48.51	48.04	47.92	48.09	48.32	48.47	48.42	48.20	47.69	47.18	46.67	46.17	45.66	45.35
22	52.30	52.07	51.57	50.96	50.06	50.00	49.93	49.46	49.47	49.63	49.85	50.00	49.60	49.09	48.58	48.07	47.57	47.06	46.55	46.30
23	53.41	53.10	52.55	52.02	51.19	50.78	50.69	50.53	50.51	50.56	50.38	50.29	50.06	49.98	49.47	48.97	48.46	47.95	47.44	47.24
24	54.52	54.14	53.66	53.08	52.52	52.25	52.01	51.33	51.38	51.40	50.81	50.69	50.32	50.00	50.00	49.86	49.35	48.84	48.37	48.17
25	55.59	55.17	54.77	54.33	53.97	53.74	53.39	52.15	52.28	52.26	51.43	51.05	50.79	50.31	50.00	50.00	50.00	49.73	49.32	49.09
26	55.62	55.27	54.94	54.57	54.03	53.50	52.90	52.34	52.28	52.16	51.71	51.77	51.68	51.90	51.83	51.58	50.92	50.64	50.30	50.00
27	55.43	55.08	54.68	54.36	53.80	53.17	52.54	52.10	51.88	51.69	52.02	52.32	52.32	52.21	52.15	51.98	51.71	51.67	50.90	50.09
28	55.22	54.79	54.36	54.10	53.55	52.92	52.48	51.74	51.53	51.60	51.73	51.76	51.98	51.87	51.86	51.80	51.55	51.81	51.40	50.06
29	55.01	54.49	54.04	53.76	53.30	52.67	52.41	51.37	51.18	51.22	51.43	51.21	51.63	51.54	51.54	51.46	51.03	50.47	50.00	51.02
30	54.76	54.18	53.72	53.43	53.05	52.51	52.20	51.01	50.83	50.86	51.13	50.85	51.29	51.22	51.26	51.08	50.52	50.00	50.00	49.98
31	54.46	53.88	53.35	53.10	52.80	52.46	51.98	50.84	50.67	50.59	50.84	50.09	50.94	50.89	50.94	50.56	50.00	50.00	50.00	50.00
32	54.74	53.58	52.94	52.77	52.55	52.40	51.76	50.27	50.61	50.31	50.30	49.50	50.60	50.61	50.60	50.05	50.00	50.00	50.00	50.00
33	66.56	64.61	64.93	60.27	59.25	57.62	55.10	51.74	50.51	50.04	49.69	48.85	50.25	50.33	50.10	50.00	50.00	50.00	50.00	50.00
34	80.88	81.23	80.08	72.63	69.63	67.80	64.93	66.17	61.07	57.61	54.62	51.16	47.95	50.05	50.00	50.00	50.00	50.00	50.00	49.41
35	101.26	97.84	95.24	88.67	85.48	81.08	81.16	79.80	74.39	69.09	66.05	62.53	58.31	53.66	48.76	50.00	50.00	50.00	49.57	47.61
36	110.62	111.14	111.43	109.35	104.65	101.12	98.03	93.34	88.75	84.12	79.10	73.69	69.14	64.40	59.06	53.31	47.47	49.74	47.77	46.42
37	106.65	107.44	108.06	108.62	109.49	110.42	110.95	111.80	107.16	102.47	98.26	92.08	84.43	74.96	69.59	63.95	57.57	50.67	44.50	46.18
38	105.37	105.67	105.99	106.31	106.61	106.34	106.58	108.10	109.49	110.24	109.91	109.48	103.79	96.65	85.11	73.95	67.65	60.28	53.84	47.84
39	104.06	104.41	104.91	105.18	105.80	105.94	106.39	107.19	107.48	107.32	107.98	109.49	110.65	110.58	103.87	91.68	79.56	70.40	64.18	56.17
40	102.75	103.56	103.83	104.42	105.03	105.64	105.75	106.55	106.93	107.48	108.14	107.90	107.46	108.55	109.72	108.36	96.94	84.23	72.70	65.01
41	101.68	102.48	103.04	103.66	104.27	104.88	105.45	105.87	106.07	106.28	106.76	107.65	108.44	107.81	107.76	109.33	110.84	99.86	86.37	73.80
42	100.84	101.52	102.28	102.89	103.50	104.11	104.73	105.22	105.21	105.28	106.21	107.05	107.69	108.23	108.19	108.62	109.69	110.52	99.77	86.35
43	100.01	100.91	101.52	102.13	102.74	103.35	104.07	104.79	105.00	105.00	105.66	106.27	106.84	107.43	108.13	108.33	108.23	108.87	108.31	99.73
44	100.00	100.45	101.15	101.87	102.60	103.32	104.04	104.76	105.00	105.00	105.30	105.98	106.70	107.42	108.13	108.74	108.36	109.21	111.66	112.07
45	100.32	100.77	101.46	102.05	102.74	103.43	104.12	104.81	105.00	105.00	105.44	106.13	106.78	107.42	108.14	108.41	108.32	109.12	110.62	112.01
46	100.72	101.17	101.62	102.07	102.86	103.71	104.35	105.00	105.00	105.00	105.46	106.21	106.96	107.65	108.22	108.06	108.72	109.29	110.07	111.03
47	101.11	101.56	102.01	102.46	102.91	103.40	104.26	105.00	105.00	105.00	105.50	106.08	106.66	107.24	107.84	108.14	108.90	109.73	110.27	110.43
48	101.50	101.95	102.40	102.86	103.31	103.76	104.21	104.80	105.00	105.17	105.67	106.28	106.89	107.51	107.95	108.29	108.73	109.76	110.57	109.10
49	102.56	103.00	103.44	103.87	104.31	104.74	105.18	105.53	105.49	105.75	105.99	106.63	107.24	107.85	108.18	108.49	108.89	109.29	109.77	108.18
50	103.92	104.35	104.79	105.23	105.66	106.10	106.45	106.48	105.37	106.33	106.59	106.97	107.58	108.20	108.49	108.69	109.09	109.49	109.91	108.83
51	105.27	105.71	106.14	106.58	107.01	107.41	106.68	103.46	104.98	106.57	107.16	107.21	107.93	108.54	108.85	108.89	109.28	109.87	109.95	109.57
52	106.62	107.06	107.49	107.93	108.37	108.25	105.54	102.99	104.59	106.18	107.74	107.91	108.20	108.89	109.20	109.08	109.49	109.96	109.63	109.57
53	107.97	108.41	108.85	109.28	109.13	107.75	104.40	102.60	104.20	105.79	107.39	108.57	108.42	109.20	109.56	109.29	109.89	109.44	109.41	109.44
54	109.33	109.76	110.20	110.01	109.92	106.61	103.26	102.21	103.81	105.40	106.99	108.59	109.17	109.42	109.34	109.34	109.34	109.34	109.34	109.38
55	110.68	111.12	110.92	110.98	108.81	105.47	102.12	101.82	103.42	105.01	106.60	108.20	109.79	109.34	109.34	109.34	109.34	109.34	109.47	109.26
56	109.61	109.38	110.34	111.02	107.67	104.32	100.98	101.43</												

TABLE E.2-1. TOP OF TAILINGS (FEET ABOVE MSL MINUS 7000) (continued).

Row	Column																			
	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
1	74.84	74.62	74.40	74.18	73.96	73.73	73.51	73.29	74.34	87.27	101.96	112.78	123.78	133.79	143.57	153.52	163.02	173.23	175.00	175.00
2	54.24	54.21	54.17	54.13	54.10	54.06	53.99	53.77	54.07	54.46	61.13	67.59	74.22	86.14	98.62	107.54	114.50	121.35	129.43	141.3
3	48.32	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	49.43	45.67	45.82	50.00	50.00	55.54	65.21	74.79	84.92	92.01	94.66
4	37.34	42.58	47.05	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	46.47	43.49	40.52	47.21	50.00	44.00	42.53	46.03	47.91
5	33.77	36.22	39.51	42.63	43.21	43.36	44.36	45.17	44.96	43.68	43.71	42.06	40.41	38.76	38.26	43.80	47.69	50.00	50.00	50.00
6	31.96	35.00	34.89	36.91	36.06	35.74	36.05	35.99	34.96	35.12	36.55	35.64	34.98	34.27	33.62	36.92	40.11	40.67	42.55	44.06
7	29.83	32.95	32.79	33.72	33.31	31.77	32.16	30.00	28.62	27.85	27.85	26.97	33.00	34.81	33.27	31.70	32.73	32.33	31.31	33.41
8	28.55	29.71	31.36	32.22	31.61	29.45	28.14	28.29	29.26	31.11	30.37	29.31	27.28	31.03	27.70	26.96	27.37	27.19	27.46	26.94
9	30.49	29.07	29.69	30.72	30.07	27.73	30.06	31.95	32.84	33.45	33.05	31.95	30.63	28.86	27.82	28.18	26.88	27.76	29.66	29.88
10	33.89	31.76	28.49	28.87	28.13	29.69	33.36	34.89	35.27	35.28	35.22	34.40	33.45	33.81	32.98	30.01	27.56	29.99	29.89	30.07
11	35.73	35.46	35.26	35.22	35.28	35.36	35.47	35.67	35.96	36.11	36.09	35.69	35.26	35.00	35.00	34.49	27.76	29.43	29.77	31.81
12	36.62	36.41	36.19	36.04	36.10	36.05	36.25	36.35	36.66	36.95	36.92	36.59	36.50	35.76	35.00	35.00	31.06	30.11	29.70	30.60
13	37.57	37.36	37.11	36.83	36.92	36.97	36.96	37.13	37.32	37.64	37.75	37.50	37.56	37.03	36.26	35.50	33.25	29.91	29.77	34.55
14	38.51	38.30	38.04	37.73	37.75	37.80	37.56	37.86	38.02	38.34	38.59	38.41	38.56	38.31	37.54	36.72	35.04	29.70	34.03	35.00
15	39.46	39.25	38.96	38.65	38.57	38.62	38.52	38.46	38.77	38.92	39.32	39.32	39.53	39.44	38.81	37.82	36.10	32.66	35.00	35.00
16	40.41	40.19	39.88	39.57	39.29	39.47	39.49	39.09	39.37	39.68	39.93	40.23	40.50	40.50	39.95	38.26	36.80	34.25	35.00	33.42
17	41.35	41.11	40.80	40.49	40.18	40.31	40.31	39.98	39.97	40.28	40.58	40.97	40.84	39.15	37.69	36.71	35.19	33.69	33.03	35.00
18	42.30	42.03	41.72	41.41	41.10	41.03	41.18	41.15	40.63	40.88	41.19	40.51	36.95	36.19	35.06	32.90	33.41	34.57	35.24	35.62
19	43.25	42.95	42.64	42.33	42.02	41.75	42.05	42.01	41.46	41.47	41.83	38.49	34.17	34.37	35.25	35.44	35.70	36.24	36.31	38.55
20	44.18	43.87	43.56	43.25	42.94	42.63	42.77	42.90	42.61	42.15	39.87	34.88	34.94	35.70	36.80	36.99	37.14	37.69	37.58	37.50
21	45.10	44.79	44.48	44.17	43.86	43.56	43.50	43.79	43.36	40.35	37.27	34.87	35.93	37.20	38.35	38.55	38.58	39.13	38.85	38.74
22	46.02	45.71	45.40	45.09	44.78	44.48	44.22	44.45	41.39	37.70	35.84	36.16	37.43	38.69	39.90	40.10	40.03	40.58	40.12	40.01
23	46.94	46.63	46.32	46.01	45.71	45.40	45.09	41.69	37.67	35.59	36.11	37.62	38.92	40.19	41.45	41.65	41.47	41.88	41.39	41.28
24	47.86	47.55	47.24	46.93	46.60	46.18	45.36	41.48	36.45	35.86	37.45	39.05	40.42	41.68	42.95	43.18	42.92	43.17	42.66	42.55
25	48.78	48.47	48.09	47.65	47.18	46.56	43.29	39.48	36.32	37.19	38.79	40.39	41.90	43.18	44.44	44.66	44.36	44.47	43.93	43.82
26	49.60	49.19	48.50	47.81	45.81	46.01	43.07	39.33	36.94	38.53	40.13	41.73	43.33	44.67	45.94	46.14	45.81	45.76	45.20	45.09
27	50.03	49.47	48.13	46.92	45.23	45.70	43.38	39.60	36.97	39.20	41.43	43.07	44.67	46.27	47.43	47.61	47.26	47.05	46.47	46.36
28	50.07	50.01	49.12	47.41	46.56	45.62	42.40	38.38	38.06	40.05	41.74	43.73	45.74	47.61	48.92	49.09	48.74	48.35	47.74	47.63
29	50.01	49.90	50.09	48.50	46.87	45.66	41.75	37.69	39.34	41.37	43.26	44.95	46.64	48.47	50.00	50.00	50.00	49.64	49.01	49.90
30	50.00	49.28	49.63	49.19	47.45	45.42	41.22	38.96	40.87	42.81	44.68	46.47	48.16	49.85	50.00	50.00	50.00	50.00	50.00	50.00
31	49.79	49.48	49.11	48.61	48.21	46.11	40.80	40.87	42.65	44.36	46.28	47.98	49.68	50.00	50.00	50.00	50.00	50.00	50.00	50.00
32	50.00	49.72	49.44	48.77	48.18	47.63	44.20	43.21	44.20	45.96	47.86	49.76	50.15	50.45	50.44	50.22	50.00	50.00	50.00	50.00
33	49.47	50.00	49.16	48.30	45.77	48.01	47.35	46.49	47.49	48.48	49.47	50.17	50.53	50.88	51.12	50.91	50.68	50.46	50.24	50.02
34	48.78	49.81	49.07	45.00	45.00	45.00	47.57	46.88	47.56	48.48	49.64	50.44	50.90	51.25	51.52	51.59	51.37	51.15	50.93	50.69
35	48.11	49.14	49.71	46.02	45.00	45.00	45.12	47.25	47.42	48.62	49.97	50.58	51.18	51.63	51.98	52.18	52.05	51.83	51.61	51.12
36	47.44	49.42	50.00	47.50	45.00	45.00	48.35	48.47	49.12	50.13	50.73	51.32	51.92	52.35	52.63	52.73	52.51	52.29	51.62	
37	48.21	50.00	50.00	48.81	46.39	45.00	45.00	47.44	49.18	50.02	50.85	51.54	51.47	52.06	52.66	53.08	53.27	53.20	52.59	52.33
38	47.42	50.00	50.00	49.08	47.30	45.00	45.00	47.76	50.27	50.97	52.07	52.72	53.13	53.15	52.93	53.40	53.73	53.88	53.52	54.31
39	51.22	44.54	48.02	48.68	47.85	46.85	45.82	46.34	50.70	52.71	53.25	54.00	54.59	54.85	54.99	54.77	54.92	55.74	56.43	56.67
40	59.19	51.68	47.82	43.97	48.37	48.57	47.28	45.48	50.98	54.57	54.73	55.28	55.93	56.46	56.72	56.89	57.15	57.98	58.87	59.11
41	66.19	60.00	54.64	49.75	44.32	43.15	47.66	50.13	53.06	55.51	56.25	56.71	56.86	57.92	58.49	59.25	59.50	59.98	61.04	62.01
42	73.19	66.12	58.65	51.54	48.85	46.42	44.21	49.06	53.33	54.47	55.48	57.85	56.96	58.71	60.58	61.02	62.01	62.19	63.06	64.10
43	85.17	72.07	64.85	57.94	53.31	49.35	46.79	48.50	53.60	54.21	55.05	59.04	58.12	59.95	62.15	62.83	63.80	64.71	64.97	66.15
44	98.98	81.92	70.56	64.50	58.94	51.90	49.31	49.74	54.63	54.92	55.36	58.27	58.99	61.19	63.39	64.80	65.45	66.58	67.31	68.05
45	109.59	95.49	78.01	69.15	61.87	54.58	50.01	54.15	56.12	56.21	56.21	57.84	60.24	62.44	64.64	66.84	67.26	68.23	69.36	70.00
46	111.62	107.14	88.99	73.58	66.11	58.01	51.69	52.53	57.11	57.00	56.88	58.27	60.78	63.68	65.88	68.08	69.20	69.89	71.01	72.14
47	110.56	111.93	99.88	82.61	70.16	61.37	54.45	55.98	57.71	57.64	57.74	58.98	61.81	64.38	67.01	69.33	71.13	71.69	72.67	73.80
48	107.47	109.72	106.74	92.98	79.06	69.02	58.89	56.38	58.32	59.05	59.18	59.92	61.94	64.98	68.02	70.33	72.77	73.63	74.32	78.53
49	105.67	107.50	111.34	102.04	88.49	71.98	62.91	57.84	58.44	59.27	60.47	61.35	66.46	69.55	71.20	72.86	74.51	75.00	80.13	90.57
50	106.56	105.00	108.28	106.46	93.32	74.78	67.52	60.23	59.70	61.26	62.44	62.97	68.41	75.00	75.00	75.00	75.00	75.00	87.74	98.73
51	107.33	105.00	106.23	109.68	101.08	82.34	70.49	63.40	61.43	62.39	63.29	64.02	71.45	75.00	75.00	75.00	75.00	80.84	92.30	102.99
52	107.65	105.16	105.00	107.78	106.16	89.31	73.29	66.73	63.30	63.98	65.19	65.29	73.91	75.00	75.00	75.00	75.00	87.04	99.03	108.26
53	108.40	105.58	105.00	105.00	109.58	96.47	77.49	69.34	64.82	66.37	67.80	67.41	75.00	75.00	75.00	75.00	79.73	92.30	104.16	114.78
54	109.41	105.92	105.00	105.00	108.93	103.00	84.93	71.82	66.98	70.27	71.01	69.48	74.19	75.00	75.00	75.00	83.71	97.73	109.13	120.12
55	109.18	108.06	105.00	105.00	106.57	108.80	92.24	74.64	71.92	72.79	72.94	71.36	75.00	75.00	75.00	75.00	86.97	101.35	113.60	125.20
56	109.14	105.44	105.00	105.00	105.00	109.87	96.77	80.07	75.00	75.25	75.02	74.90	75.20	75.34	76.86	81.82	90.97	104.73	117.42	129.35
57	108.94	107.03	105.00	105.00	105.00	109.91	103.03	86.70	78.54	76.42	75.67	75.99	76.13	79.49	83.18					

TABLE E.2-1. TOP OF TAILINGS (FEET ABOVE MSL MINUS 7000) (continued).

Row	Column																			
	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	175.00	175.00	175.00	175.00	175.00	175.00	175.00	175.00	175.00	175.00	175.00	175.00	169.82	162.37	154.15	145.17	136.00	127.12	122.67	121.92
2	147.96	151.24	153.06	155.98	159.28	161.72	161.17	156.88	150.85	143.27	135.48	126.88	117.06	106.42	98.04	92.15	84.66	77.18	72.65	68.74
3	95.68	96.36	97.88	96.31	96.43	95.46	96.23	96.54	93.86	90.31	88.02	87.51	86.25	81.92	79.70	76.95	74.28	68.86	63.44	58.10
4	47.96	47.96	47.07	48.98	50.00	50.50	50.00	51.97	55.23	58.49	56.37	53.16	50.00	52.66	56.49	59.05	63.05	63.03	59.20	55.67
5	50.00	50.00	50.00	49.32	49.93	50.00	50.00	50.00	50.00	49.74	49.08	48.43	47.77	47.12	47.81	50.72	53.96	53.93	55.72	55.00
6	43.68	42.69	41.67	42.12	42.03	42.95	44.64	45.76	46.71	45.49	44.77	43.50	42.86	42.20	41.55	42.23	44.16	45.74	50.37	52.00
7	34.54	33.74	34.46	35.23	35.84	36.43	37.58	38.96	39.84	40.03	40.33	39.50	38.86	38.22	37.57	38.15	37.75	39.52	42.78	48.31
8	27.17	28.16	29.29	28.63	29.82	30.56	31.76	33.06	33.68	34.94	35.73	36.38	35.66	35.02	35.00	34.42	34.26	33.86	34.50	39.19
9	29.84	29.64	29.28	28.66	28.19	28.09	28.09	28.09	28.09	28.09	28.09	31.05	33.27	34.37	33.73	32.82	32.65	31.64	31.77	33.95
10	31.83	31.77	31.46	30.80	30.35	30.27	29.10	28.58	28.33	28.09	28.09	28.09	28.09	28.09	28.71	28.09	28.09	28.60	28.30	28.09
11	33.79	33.97	33.65	32.40	31.83	31.77	31.27	30.52	29.51	28.81	28.09	28.09	28.09	28.09	28.71	28.09	28.09	28.60	28.30	28.09
12	35.00	35.00	35.00	33.99	33.31	33.27	32.85	32.20	30.93	29.82	29.27	28.09	28.09	28.09	28.09	28.09	28.09	28.09	28.09	28.09
13	35.00	35.00	34.97	35.00	34.81	34.78	34.49	33.88	32.77	32.53	31.30	32.52	31.45	31.07	30.97	30.94	31.52	31.98	32.30	33.27
14	35.00	34.45	34.50	35.00	35.00	35.00	35.00	35.00	35.00	35.00	34.12	32.72	31.45	31.07	30.97	30.94	31.52	31.98	32.30	33.27
15	33.93	34.34	35.00	35.00	35.00	35.13	35.52	35.90	35.73	35.14	35.00	35.00	34.63	34.31	35.00	35.00	35.20	35.66	35.75	35.68
16	35.00	35.00	35.00	35.30	35.68	36.06	36.45	36.83	36.62	36.03	35.44	35.00	35.00	35.00	35.34	35.90	36.45	37.01	37.42	37.52
17	35.07	35.46	35.84	36.23	36.61	37.00	37.38	37.76	37.51	36.92	36.33	35.75	35.36	36.03	36.59	37.15	37.70	38.26	38.82	39.19
18	38.01	36.39	36.77	37.16	37.54	37.93	38.31	38.70	38.40	37.81	37.22	36.64	36.31	36.90	37.82	38.40	38.95	39.51	40.07	40.63
19	36.94	37.32	37.71	38.09	38.47	38.86	39.24	39.63	39.29	38.70	38.11	37.55	37.30	37.59	38.44	39.30	40.20	40.76	41.32	41.88
20	37.87	38.25	38.64	39.02	39.41	39.79	40.17	40.56	40.18	39.59	39.00	38.61	38.30	38.37	39.13	39.99	40.84	41.75	42.57	43.13
21	38.80	39.18	39.57	39.95	40.34	40.72	41.11	41.49	41.07	40.48	39.89	39.61	39.31	39.36	39.82	40.68	41.53	42.38	43.23	44.29
22	39.90	40.12	40.50	40.88	41.27	41.65	42.04	42.42	41.96	41.37	40.78	40.63	40.32	40.36	40.53	41.37	42.22	43.07	43.92	44.78
23	41.17	41.09	41.43	41.82	42.20	42.58	42.97	43.35	42.85	42.26	41.95	41.64	41.33	41.36	41.42	42.06	42.91	43.76	44.61	45.47
24	42.44	42.33	42.38	42.75	43.13	43.51	43.90	44.28	43.74	43.15	42.92	42.65	42.34	42.36	42.42	42.75	43.60	44.45	45.30	46.16
25	43.71	43.60	43.49	43.68	44.06	44.45	44.83	45.21	44.63	44.20	43.98	43.67	43.36	43.35	43.41	43.57	44.29	45.14	45.99	46.85
26	44.98	44.87	44.76	44.69	44.99	45.38	45.76	46.11	45.52	45.28	45.00	44.68	44.37	44.35	44.41	44.47	44.98	45.83	46.68	47.54
27	46.25	46.14	46.03	45.92	45.99	46.31	46.89	47.00	46.42	46.33	46.01	45.70	45.38	45.35	45.41	45.47	45.72	46.52	47.37	48.23
28	47.52	47.41	47.30	47.19	47.07	47.26	47.62	47.89	47.53	47.36	47.02	46.71	46.40	46.35	46.41	46.47	46.61	47.21	48.06	48.92
29	48.79	48.68	48.57	48.46	48.34	48.28	48.56	48.78	48.61	48.37	48.04	47.72	47.41	47.35	47.41	47.47	47.53	47.90	48.75	49.61
30	50.00	49.95	49.84	49.73	49.61	49.50	49.60	49.75	49.67	49.36	49.05	48.74	48.43	48.35	48.41	48.47	48.53	48.77	49.44	50.00
31	50.00	50.00	50.00	50.00	50.00	50.00	50.31	50.37	50.34	50.13	50.00	49.75	49.44	49.34	49.40	49.46	49.52	49.66	50.00	50.00
32	50.00	50.00	50.00	50.00	50.11	50.54	50.83	50.97	50.83	50.53	50.45	50.10	49.98	49.99	50.00	50.00	50.71	50.00	50.00	50.00
33	50.00	50.00	50.00	50.08	50.77	51.14	51.35	51.48	51.23	51.21	51.17	50.81	50.07	49.93	50.60	53.26	56.31	58.38	56.84	56.95
34	50.25	50.02	50.14	50.86	51.44	51.73	51.93	51.94	51.93	51.96	51.90	51.12	50.57	51.67	54.98	58.30	61.33	64.21	65.78	66.16
35	51.08	50.83	50.44	50.68	52.00	52.95	52.62	52.65	52.67	52.70	52.39	51.62	53.63	56.73	60.02	63.33	66.34	69.22	72.11	75.58
36	51.95	50.82	51.76	52.20	52.51	52.82	53.89	53.53	53.51	53.16	52.64	55.59	58.69	61.78	65.01	68.37	71.36	74.24	81.29	90.42
37	52.71	53.05	54.21	54.93	55.24	55.56	55.87	56.37	55.22	56.16	57.68	60.41	63.68	66.84	69.97	73.40	79.07	87.61	96.15	100.00
38	55.38	55.86	56.66	57.67	57.98	58.29	58.60	59.54	58.40	61.32	62.46	65.39	68.40	71.63	74.93	83.39	91.38	99.36	100.00	100.00
39	57.70	58.80	59.09	60.25	60.72	61.03	61.34	62.70	63.59	65.39	68.02	70.08	73.17	78.37	86.29	95.28	100.00	100.00	100.00	100.00
40	59.92	61.05	62.11	62.70	63.46	63.77	64.08	65.87	67.93	69.45	72.08	74.67	82.17	89.93	97.79	106.13	105.38	100.00	100.00	100.00
41	62.19	63.33	64.45	65.26	66.19	66.50	67.14	69.04	71.59	73.51	78.24	85.69	93.81	101.58	109.33	116.52	112.34	102.49	100.00	100.00
42	64.70	65.52	66.72	67.91	68.74	69.24	70.31	72.20	74.74	82.24	89.73	97.21	105.13	113.19	120.97	125.00	115.68	101.31	100.00	100.00
43	67.17	67.72	68.93	70.11	71.36	71.98	73.47	76.42	84.43	92.88	100.82	108.26	116.19	124.26	127.67	125.00	115.79	100.27	100.00	100.00
44	69.24	70.28	71.12	72.34	73.56	74.74	81.25	88.38	95.16	103.15	111.32	119.29	126.84	133.49	136.71	128.49	117.92	102.91	100.00	100.00
45	71.14	72.33	73.31	74.54	79.16	86.27	93.33	100.26	106.69	114.05	122.15	129.54	135.83	142.59	145.76	136.48	121.99	107.08	100.00	100.00
46	73.03	74.23	77.74	84.25	90.84	98.01	104.76	111.39	117.99	125.15	132.17	138.85	144.81	150.00	150.00	140.97	126.13	112.66	100.89	100.00
47	74.92	82.29	90.06	96.55	102.47	108.89	115.47	122.08	128.39	134.79	141.79	148.15	152.74	152.47	150.00	144.94	130.51	117.83	105.85	100.00
48	87.36	95.61	102.51	108.32	113.93	119.44	125.97	132.06	138.11	144.46	150.93	154.96	158.93	157.41	152.97	146.29	133.67	120.45	105.84	100.00
49	100.28	107.60	114.01	119.84	125.33	129.85	135.67	141.76	147.82	152.67	157.18	161.16	165.13	162.35	156.47	145.66	134.58	123.23	108.15	100.00
50	108.22	116.84	124.66	130.23	134.75	139.30	145.38	150.99	155.08	159.06	163.28	167.89	171.20	165.97	155.52	145.17	134.64	123.59	109.41	100.00
51	114.34	124.10	132.31	138.18	143.77	149.01	154.03	158.35	161.62	165.62	169.30	173.89	174.96	165.49	155.29	144.93	134.65	124.38	110.57	100.00
52	118.31	129.66	138.77	146.08	151.65	157.16	161.70	165.82	168.54	172.18	175.00	175.00	170.29	162.94	154.97	146.09	135.67	125.30	112.69	100.00
53	123.79	134.91	146.06	153.74	159.50	165.05	169.54	173.28	175.00	175.00	175.00	174.59	169.84	165.01	160.19	155.37	150.55	140.30	129.45	118.09
54	131.37	142.16	152.35	160.74	167.27	172.87	175.00	175.00	175.00	175.00	172.19	168.18	164.17	160.17	156.16	152.18	145.72	135.61	125.27	112.15
55	137.27	149.33	157.97	166.39	174.75	175.00	175.00	175.00	175.00	175.00	172.38	169.35	166.49	163.81	161.14	158.47	155.80	153.12	150.45	141.85
56	140.67	151.56	160.83	170.18	175.00	175.00	175.00	175.00	175.00	175.00	172.38	169.35	166.49	163.81	1					

TABLE E.2-2. THICKNESS OF THE TAILINGS AQUIFER (FEET).

Row	Column																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.52	4.41	7.76
36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.33	18.31	24.75	29.01	30.07
37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.64	30.75	31.60	31.74	30.42
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.73	25.47	27.66	28.63	32.34	32.79	31.65	30.25	30.25
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.85	23.94	26.57	26.74	32.72	33.06	30.98	30.37	30.37
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.05	23.68	24.34	22.73	22.30	24.35	24.28	31.01	32.62	30.97	30.60
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.34	22.62	22.39	20.78	20.93	21.76	22.59	30.79	31.22	31.28	30.66
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.72	19.73	19.45	19.25	19.29	19.10	20.58	28.14	31.09	32.79	31.10
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.32	17.16	17.48	17.45	16.80	16.99	17.90	24.43	31.72	31.35	30.28
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.95	15.45	14.84	16.30	15.05	13.20	14.02	21.53	30.29	29.54	28.64
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.43	18.18	15.73	12.91	10.85	12.51	11.33	10.00	11.97	18.58	26.17	26.50	27.43
46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.75	16.46	14.33	10.90	7.82	10.78	9.49	10.00	11.12	15.83	21.37	23.97	20.96
47	0.00	0.00	0.00	0.00	0.00	0.00	18.15	15.63	14.50	12.68	9.77	8.39	8.60	8.59	10.29	9.99	12.38	16.71	16.74	19.09
48	0.00	0.00	0.00	0.00	0.00	0.00	16.85	15.08	12.73	10.92	9.35	7.75	6.97	7.69	8.86	8.47	10.84	15.22	20.06	20.52
49	0.00	0.00	0.00	0.00	0.00	0.00	14.38	13.40	11.13	9.57	8.55	7.50	7.01	7.19	8.12	9.73	11.66	14.22	20.05	20.24
50	0.00	0.00	0.00	0.00	0.00	0.00	12.60	11.78	9.59	8.49	7.85	7.90	8.07	8.35	7.56	8.16	9.00	9.73	16.61	18.67
51	0.00	0.00	0.00	0.00	0.00	0.00	11.66	10.29	8.55	8.25	7.93	8.55	7.66	7.90	7.30	6.49	7.21	8.18	9.70	15.38
52	0.00	0.00	0.00	0.00	0.00	0.00	10.72	7.23	7.80	8.23	9.01	7.77	7.45	7.30	6.85	5.89	6.23	6.97	9.59	13.41
53	0.00	0.00	0.00	0.00	0.00	0.00	10.61	4.80	6.94	8.26	10.14	7.54	7.14	6.72	6.20	5.26	5.25	6.05	10.08	11.17
54	0.00	0.00	0.00	0.00	0.00	0.00	9.51	4.48	6.78	10.01	9.71	8.02	7.17	6.87	6.04	5.09	4.32	6.42	9.41	12.05
55	0.00	0.00	0.00	0.00	0.00	0.00	8.86	4.37	7.21	11.79	10.28	9.21	8.28	7.09	6.21	4.77	4.05	6.40	8.50	14.34
56	0.00	0.00	0.00	0.00	0.00	0.00	10.25	6.97	9.47	12.77	11.07	10.65	9.52	6.67	6.57	4.74	3.90	5.84	7.05	13.39
57	0.00	0.00	0.00	0.00	0.00	15.34	10.34	11.27	11.89	13.38	11.78	12.62	10.66	8.26	5.91	5.23	3.87	5.59	9.29	13.07
58	0.00	0.00	0.00	0.00	0.00	14.93	6.40	10.91	13.04	12.71	12.42	15.20	13.05	11.48	8.79	5.55	3.32	4.22	0.00	0.00
59	0.00	0.00	0.00	0.00	0.00	9.55	3.03	4.24	3.57	4.68	3.57	6.82	14.25	12.43	12.06	0.00	0.00	0.00	0.00	19.43
60	0.00	0.00	0.00	0.00	0.00	4.72	4.00	4.55	4.19	3.93	2.92	3.41	2.80	0.00	0.00	1.06	13.80	20.38	23.48	25.51
61	0.00	0.00	0.00	0.00	0.00	4.40	4.53	6.61	4.46	4.27	3.07	0.00	0.00	0.00	2.24	4.27	11.41	21.27	26.06	28.50
62	0.00	0.00	0.00	0.00	0.00	3.35	4.35	5.22	4.80	0.00	0.00	0.00	1.98	4.84	10.90	16.38	27.70	32.55	32.84	33.69
63	0.0																			

TABLE E.2-2. THICKNESS OF THE TAILINGS AQUIFER (FEET) (continued).

Row	Column																			
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35	8.93	9.45	10.85	8.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
36	30.54	33.11	32.30	31.47	31.54	30.77	28.10	26.02	24.40	22.63	20.58	19.38	17.76	15.98	13.36	11.59	10.76	6.22	0.00	0.00
37	34.07	34.92	36.18	37.55	38.18	37.15	33.78	33.89	34.00	34.36	34.43	34.53	34.80	35.17	35.55	35.38	33.63	31.60	28.98	25.56
38	33.87	35.22	36.45	35.55	36.32	34.92	31.58	31.79	32.23	33.04	33.11	33.34	33.42	33.79	34.31	35.71	36.53	37.12	39.96	40.64
39	33.52	35.32	35.79	34.89	34.83	32.65	29.59	29.88	30.65	31.56	31.79	32.13	32.11	32.82	33.94	35.68	36.65	38.02	39.60	41.25
40	32.73	35.11	35.00	32.45	31.49	29.72	27.71	27.98	29.07	29.98	30.63	31.39	31.82	32.64	33.76	35.39	36.96	38.56	39.30	40.10
41	32.01	34.68	34.16	28.91	26.43	26.24	25.32	26.44	27.46	28.49	30.07	30.95	31.87	32.65	33.25	34.22	35.70	36.00	36.84	37.56
42	30.46	34.43	34.18	26.79	24.34	24.25	24.26	24.73	26.42	28.13	29.87	30.43	30.83	31.25	31.73	32.28	34.37	35.00	35.00	35.17
43	28.48	31.91	31.92	29.62	27.32	24.94	23.11	24.21	25.96	27.71	29.32	30.00	30.00	30.00	30.22	30.45	30.83	31.16	31.79	32.40
44	26.92	28.78	28.65	28.51	27.09	26.05	22.82	23.79	25.55	27.19	28.42	29.10	29.03	29.21	29.63	30.26	33.08	33.39	33.62	33.81
45	25.76	26.20	26.48	25.93	25.76	26.03	24.89	23.42	26.22	27.84	29.29	29.39	29.14	29.78	30.00	30.85	31.03	31.35	32.06	32.83
46	17.45	18.75	20.97	22.33	25.87	26.72	28.36	23.98	23.44	24.22	25.00	25.27	27.18	28.40	29.62	30.22	31.06	31.97	32.85	33.98
47	20.21	20.83	22.64	24.81	24.61	23.89	25.97	25.27	24.15	24.28	25.00	25.00	26.21	27.46	28.72	30.02	30.48	31.11	32.16	33.36
48	21.01	21.85	23.31	25.03	24.64	22.57	22.55	23.41	24.49	24.87	25.10	25.07	25.77	26.79	27.96	29.13	29.72	30.32	31.69	32.66
49	21.29	22.44	23.84	25.17	24.99	23.58	23.36	23.98	24.15	24.87	25.12	25.07	25.38	26.13	26.87	27.38	28.33	31.18	31.72	32.66
50	21.39	23.58	24.55	25.31	25.50	25.38	25.03	23.96	24.44	24.94	24.89	25.05	25.27	25.99	26.38	26.75	28.37	30.64	31.89	32.74
51	19.86	22.44	24.51	26.18	25.52	25.17	24.73	25.14	25.05	24.89	24.93	24.83	25.25	25.94	26.38	26.67	28.86	29.21	30.28	31.37
52	15.64	21.27	23.28	24.41	23.69	23.93	24.29	24.97	24.91	24.96	24.78	24.76	25.16	25.97	26.41	26.74	29.70	28.79	29.64	31.00
53	14.81	17.40	18.26	18.98	18.71	19.42	21.01	23.04	23.39	24.23	24.60	24.76	25.37	25.99	26.44	27.18	28.96	30.31	31.37	32.38
54	15.44	16.74	17.53	17.14	17.63	18.09	18.97	20.87	22.19	23.79	23.89	24.76	26.08	27.00	29.07	30.18	30.61	35.32	36.08	38.72
55	15.40	15.69	16.54	17.04	17.63	17.90	18.13	18.97	20.00	23.08	24.20	25.88	27.77	29.50	31.46	33.54	35.18	40.46	41.84	45.31
56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.74	23.49	24.68	26.96	30.65	32.44	34.78	37.32	39.41	43.59	45.77
57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.46	20.40	26.02	29.67	31.81	34.28	37.98	41.25	43.17	46.60	49.02	55.87
58	0.00	0.00	0.00	20.18	19.73	19.33	0.00	0.00	0.00	0.00	0.00	25.48	37.31	37.97	41.10	43.88	49.14	54.66	57.49	59.26
59	20.60	23.95	26.73	27.58	25.39	24.10	26.12	28.77	30.53	0.00	0.00	13.46	28.99	44.47	52.13	54.90	56.05	55.57	54.72	
60	28.29	31.63	33.04	30.00	29.15	28.21	29.40	34.18	37.81	41.08	46.16	0.00	0.00	0.00	22.15	38.78	51.88	50.29	48.14	
61	32.69	35.92	37.60	34.69	34.40	37.14	42.37	44.25	46.84	49.73	52.63	55.16	57.91</							

TABLE E.2-2. THICKNESS OF THE TAILINGS AQUIFER (FEET) (continued).

Row	Column																			
	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
37	22.59	19.35	15.05	9.49	4.20	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
38	41.61	42.12	38.50	32.39	28.12	23.38	18.28	13.30	8.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
39	43.67	44.41	44.91	45.14	45.68	45.94	42.94	37.72	31.98	26.23	19.37	9.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40	40.84	42.03	42.24	42.87	43.74	44.78	45.75	47.21	47.61	49.93	43.62	36.07	22.94	10.98	0.00	0.00	0.00	0.00	0.00	0.00
41	38.13	39.18	39.56	40.40	41.56	44.44	45.45	46.57	48.51	50.36	51.76	52.65	43.05	32.76	0.00	0.00	0.00	0.00	0.00	0.00
42	35.89	35.96	37.13	37.89	39.72	42.20	43.41	44.78	45.26	49.45	51.21	52.05	52.69	53.10	37.94	24.52	0.00	0.00	0.00	0.00
43	35.25	36.82	38.89	39.34	40.18	42.14	43.86	46.90	49.47	48.00	48.13	50.39	51.84	52.43	53.13	43.47	0.00	0.00	0.00	0.00
44	33.94	34.28	35.12	36.55	38.25	40.29	42.29	44.36	46.20	48.39	49.76	50.98	51.04	52.42	53.31	54.05	49.11	30.34	11.57	0.00
45	34.46	35.77	36.77	38.32	40.17	41.76	42.89	44.49	44.89	45.27	45.44	47.98	51.78	52.89	54.31	54.48	54.44	52.23	33.91	0.00
46	35.28	36.43	37.39	38.29	39.59	40.91	41.75	43.19	43.24	43.99	44.86	46.04	49.44	52.72	55.39	58.17	58.12	59.25	50.20	27.97
47	34.53	35.85	37.05	37.77	38.55	39.47	40.41	41.51	41.63	42.75	43.99	45.47	47.98	51.15	54.75	57.23	58.61	59.73	60.27	42.61
48	33.78	35.09	36.15	37.02	37.83	38.68	39.21	39.73	40.26	41.69	43.88	45.78	49.82	53.08	55.50	58.27	58.73	58.83	55.82	54.19
49	33.70	34.87	35.81	36.79	37.57	38.32	39.00	39.85	41.52	43.58	45.32	47.46	52.34	54.70	56.85	58.49	58.89	57.57	54.77	54.10
50	33.81	34.86	35.78	36.92	37.65	40.84	42.24	41.71	44.72	46.44	49.08	51.54	54.17	56.21	57.89	58.69	59.09	59.49	55.90	53.58
51	32.97	34.55	36.26	38.48	43.12	46.27	50.33	48.94	54.11	53.64	53.84	55.14	57.19	58.54	58.85	58.89	59.28	59.87	57.93	53.34
52	33.47	36.98	40.09	44.63	51.24	54.69	55.54	52.99	54.59	56.18	57.74	57.91	58.20	58.89	59.20	59.08	59.49	59.96	56.80	54.57
53	36.90	41.43	45.90	52.80	57.25	57.75	54.40	52.60	54.20	55.79	57.39	58.57	58.42	59.20	59.56	58.00	57.00	56.79	54.97	50.15
54	42.51	46.91	52.54	58.64	59.92	56.61	52.67	51.28	53.05	54.86	56.99	58.59	59.17	58.47	57.39	56.07	53.40	52.80	54.25	49.38
55	48.67	54.07	59.11	60.98	58.81	54.57	50.39	49.64	51.47	52.95	54.92	56.14	57.82	56.51	55.46	53.34	49.11	49.50	50.62	47.98
56	53.49	59.04	60.34	61.02	57.03	52.26	48.15	47.99	49.73	51.12	52.18	53.05	54.48	54.19	50.93	47.88	46.65	46.94	47.45	46.52
57	57.86	59.83	57.67	56.59	56.10	47.97	45.94	45.89	48.13	50.10	51.44	50.99	50.63	48.49	46.97	45.19	43.80	43.90	44.50	44.85
58	58.86	56.42	55.09	53.84	55.05	49.15	43.55	46.99	49.62	49.97	49.93	46.72	46.21	44.82	43.57	41.89	40.32	39.72	39.73	38.91
59	53.92	52.34	51.05	50.09	51.83	53.93	53.61	49.82	49.70	49.95	47.99	47.93	40.20	39.59	38.71	36.56	34.45	34.50	34.48	33.10
60	47.14	46.54	46.20	45.97	48.20	51.42	48.78	46.87	45.13	45.22	44.94	40.54	38.25	36.01	31.34	27.76	25.54	27.67	26.55	24.90
61	41.32	41.85	41.88	42.02	42.93	44.96	47.30	41.43	38.49	38.43	38.40	37.77	38.02	33.53	32.71	24.79	22.			

TABLE E.2-3. THICKNESS OF THE SURFICIAL AQUIFER (FEET).

Row	Column																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	56.50	58.19	60.17	61.72	63.12	64.44	65.70	66.50	66.50	66.50	65.08	63.75	62.42	61.10	60.23	59.02	58.06	56.88	54.95	52.58
2	55.70	57.16	59.43	61.33	62.89	64.46	65.88	66.50	66.46	63.43	61.08	58.74	56.40	54.18	52.85	51.74	50.71	49.74	48.69	47.32
3	54.23	56.19	58.63	57.60	60.88	64.42	66.03	64.12	60.28	57.47	55.45	53.75	52.06	50.37	48.67	46.29	44.57	43.79	42.74	41.69
4	53.09	55.20	58.00	54.57	55.46	61.30	63.19	59.93	55.86	52.65	50.31	48.29	46.60	44.90	43.21	41.52	41.50	41.50	41.50	39.61
5	52.27	54.41	57.45	52.48	51.50	57.10	58.95	56.95	52.95	49.60	46.93	44.59	42.69	41.50	41.50	41.50	41.50	41.50	41.50	34.48
6	51.70	53.89	57.02	50.91	48.79	54.33	55.96	54.46	50.87	47.53	44.85	42.17	41.50	41.50	41.50	41.50	41.50	41.50	38.50	32.54
7	51.29	53.53	56.68	49.94	46.87	52.13	53.73	52.21	49.39	46.05	43.37	41.50	41.50	41.50	41.50	40.15	39.11	34.81	32.83	34.84
8	50.97	53.24	56.17	48.96	45.38	50.34	51.93	50.41	48.20	44.86	42.18	41.50	41.50	41.50	41.50	38.23	36.25	32.24	35.54	36.92
9	50.64	52.95	55.17	48.09	43.68	48.69	50.13	48.61	46.83	43.68	41.50	41.50	41.50	41.50	40.07	36.30	33.77	35.06	38.25	39.08
10	50.37	52.67	54.17	47.17	42.50	46.77	48.33	46.81	45.29	42.49	41.50	41.50	41.50	41.50	39.38	34.82	33.38	40.33	41.50	40.95
11	50.04	52.40	53.14	46.12	41.23	44.96	46.53	45.01	43.49	41.50	41.50	41.50	41.50	41.50	41.40	38.12	39.96	42.06	42.51	41.07
12	49.62	52.12	52.13	45.05	40.19	43.17	44.74	43.21	41.69	41.50	41.50	41.50	41.50	41.50	41.50	41.50	42.23	43.10	43.39	41.72
13	49.31	51.70	50.99	44.05	39.04	41.29	42.94	41.50	41.50	41.50	41.50	41.50	41.50	41.50	41.50	41.64	42.30	43.30	44.15	43.96
14	48.89	51.41	49.96	42.96	37.83	39.52	41.50	41.50	41.50	41.50	41.50	41.50	41.50	42.08	42.81	43.49	44.33	45.19	44.49	42.83
15	48.45	50.96	48.83	41.93	36.91	38.61	41.50	41.50	41.50	41.50	41.50	41.50	42.40	43.34	43.94	44.69	45.37	45.95	44.95	43.37
16	48.08	50.65	47.78	40.86	35.86	38.39	41.50	41.50	41.50	41.50	41.50	42.72	43.66	44.60	45.25	45.88	46.54	46.25	45.45	43.75
17	47.61	50.16	46.73	39.75	35.87	38.35	41.44	41.50	41.50	42.17	42.74	43.98	44.92	45.86	46.48	47.07	47.80	46.54	45.70	44.32
18	47.14	49.81	45.65	38.68	37.42	38.76	41.26	41.50	42.57	43.98	44.34	45.28	46.18	47.12	47.75	48.27	47.92	46.99	46.12	44.64
19	46.88	49.29	44.51	37.60	38.65	40.51	41.45	41.91	44.37	45.79	45.90	46.42	47.44	48.38	49.03	49.01	48.13	47.13	46.46	45.01
20	46.50	48.78	43.40	37.29	40.04	42.32	43.24	43.74	46.18	47.60	47.46	47.59	48.70	49.64	50.31	49.23	48.33	47.30	46.50	45.38
21	46.50	48.33	42.23	37.88	41.46	44.00	45.00	45.58	47.99	49.40	49.02	49.10	50.01	50.90	50.83	49.42	48.53	47.29	46.83	45.45
22	46.50	47.81	41.06	39.20	42.77	45.68	46.73	47.41	49.65	51.21	50.72	50.74	51.37	52.16	51.26	49.89	48.73	47.62	46.64	45.75
23	46.50	47.32	39.87	40.57	44.12	47.36	48.46	49.26	51.32	53.02	52.45	52.63	52.52	52.80	51.78	50.40	48.96	47.93	46.59	45.72
24	46.50	46.80	39.45	41.77	45.45	49.02	50.34	51.49	53.20	54.83	54.21	54.37	53.92	53.50	52.38	50.85	49.27	48.17	46.69	45.97
25	46.50	46.50	39.83	43.00	46.75	50.63	52.22	53.72	55.14	56.63	56.01	55.93	55.48	54.43	53.11	51.41	49.65	48.40	47.59	47.03
26	46.50	46.46	40.76	44.22	48.05	52.22	54.16	55.95	57.07	58.44	57.81	57.52	57.08	56.16	54.19	52.15	50.20	49.48	49.03	48.06
27	46.50	45.75	42.04	45.53	49.35	53.93	56.14	58.19	58.90	60.25	59.61	59.31	58.75	58.03	55.96	54.02	51.25	49.36	48.38	48.04
28	46.50	45.05	43.07	46.65	50.67	55.74	58.06	60.42	60.74	62.06	61.41	60.91	60.46	60.15	58.26	56.49	50.24	48.28	47.65	47.56
29	46.50	44.73	44.13	47.99	52.22	57.44	60.00	62.35	62.58	63.86	63.21	62.63	62.49	62.75	60.83	59.08	51.50	47.17	46.89	46.88
30	46.50	46.17	45.19	49.28	53.64	58.90	61.80	64.21	64.57	65.67	65.01	65.14	64.09	64.89	63.63	61.88	53.89	51.50	51.50	51.45
31	46.50	55.39	46.50	50.25	54.79	61.10	64.05	65.31	66.50	67.60	66.90	66.50	65.60	65.60	65.90	60.08	51.97	46.50	46.50	47.59
32	46.50	67.04	46.50	50.28	54.10	63.76	66.58	61.85	68.02	69.87	66.76	66.50	66.50	63.75	64.07	65.07	59.06	52.06	53.55	54.90
33	49.64	77.43	46.50	50.33	53.76	66.36	68.85	61.89	69.50	71.50	67.37	65.98	63.76	67.38	69.72	71.19	68.57	67.29	69.96	71.39
34	57.82	87.52	47.22	50.04	53.42	67.89	66.94	64.62	73.74	72.00	67.01	64.92	68.40	70.25	74.95	80.55	87.53	92.73	94.97	94.60
35	65.42	97.70	51.48	52.20	56.16	68.72	70.64	64.39	74.86	72.22	66.65	68.70	73.96	80.35	90.72	100.45	101.50	100.03	93.98	88.20
36	71.88	108.27	55.74	54.70	57.70	68.82	71.47	70.05	73.60	69.36	68.75	77.57	87.47	99.41	101.50	90.66	78.76	71.30	68.18	65.27
37	80.53	119.61	59.99	57.75	58.97	69.62	72.56	74.47	71.43	69.07	81.03	92.60	101.50	91.92	74.04	66.50	66.50	66.50	66.50	65.29
38	89.67	130.53	64.25	59.87	60.44	70.53	73.52	73.99	71.08	82.92	93.81	101.05	80.67	71.21	68.60	66.50	66.50	66.50	67.26	64.93
39	99.63	139.79	67.78	61.27	61.95	71.30	74.83	70.60	77.82	96.16	101.50	73.61	71.20	70.55	67.51	66.50	66.50	67.24	68.17	64.63
40	109.18	148.11	70.73	62.73	63.08	72.83	76.57	67.06	91.77	101.25	72.96	71.50	71.01	69.86	67.56	67.29	67.49	68.67	68.00	64.24
41	119.47	156.46	76.46	65.07	64.11	74.56	73.28	77.24	101.01	76.50	72.72	71.50	70.81	69.56	68.57	68.92	69.42	70.28	67.66	64.01
42	132.02	165.36	82.97	67.41	66.38	75.98	68.60	89.55	80.73	76.50	73.67	72.23	70.69	69.72	69.98	70.32	71.34	70.41	66.90	63.66
43	145.44	173.65	89.28	69.74	68.72	77.59	71.88	96.17	76.50	76.50	74.76	72.89	70.96	70.62	71.01	71.85	73.14	69.78	66.50	63.43
44	158.81	179.83	95.32	71.01	71.05	78.31	83.74	77.71	76.50	76.50	75.91	74.56	71.50	71.45	73.44	74.83	73.14	70.26	66.38	62.87
45	171.71	185.92	104.33	69.01	69.89	76.98	91.20	77.45	77.85	77.62	78.26	78.24	74.50	75.18	76.50	76.13	72.85	70.75	66.50	62.13
46	179.94	191.29	114.29	67.96	68.14	74.60	72.92	77.16	79.20	79.25	80.43	81.50	76.99	77.21	76.50	76.50	74.38	71.50	66.50	66.48
47	187.50	197.71	123.88	69.83	69.30	79.88	72.49	76.91	80.78	80.88	81.73	81.51	79.49	78.77	76.82	76.51	76.19	73.26	71.50	67.41
48	195.07	206.01	132.73	71.50	70.62	68.93	72.26	76.78	82.18	82.28	82.28	82.11	81.65	80.34	78.91	78.03	76.08	72.39	66.45	65.85
49	203.99	211.68	140.08	71.50	74.60	64.72	72.76	78.02	83.40	83.25	82.99	82.70	82.14	81.50	79.78	76.77	74.84	72.28	66.45	65.62
50	213.26	209.53	147.40	80.26	81.17	64.58	72.57	79.21	84.57	84.24	83.75	82.83	81.62	81.01	80.43	78.34	77.50	76.77	70.11	67.33
51	221.50	206.77	155.87	86.62	84.42	64.65	72.27	79.88	85.63	84.65	83.82	82.71	82.64	81.78	80.78	80.01	79.29	78.32	76.72	73.21
52	221.50	208.54	163.78	92.73	89.29	64.71	72.23	82.57	85.78	84.97	83.96	83.73	83.50	82.48	81.33	80.69	80.28	79.35	77.81	76.20
53	221.50	211.02	170.67	100.77	92.14	64.84	72.32	84.63	86.02	85.32	84.22	85.14	84.32	83.15	82.07	81.41	81.09	80.03	78.90	78.60
54	221.50	212.18	176.21	110.80	93.85	65.12	74.30	84.20	85.64	85.25	86.18	86.38	85.03	83.70	82.98	82.12	81.58	80.73	79.89	79.84
55	221.50	213.47	179.28	121.16	96.50	65.40	75.87	83.70	84.45	84.78	86.75	86.80	85.30	83.85	83.47	82.81	82.36	81.50	81.00	81.14
56	221.50	213.59	184.82	131.34	97.11	65.74	76.32	82.68	82.97	84.75	86.14	85.89	85.14	83.67	84.06	83.54	83.13	82.32	82.12	82.60
57	221.50	213.56	189.71	139.89	100.82	66.16	76.81	81.13	82.28	84.56	86.72	84.50	84.67	84.08	84.76	84.32	83.92	83.22		

TABLE E.2-3. THICKNESS OF THE SURFICIAL AQUIFER (FEET) (continued).

Row	Column																			
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	51.56	50.52	49.62	48.73	47.84	46.93	45.66	44.61	43.77	42.92	42.08	41.24	40.38	39.54	39.05	38.80	38.55	38.30	38.05	37.80
2	45.95	44.91	44.01	43.12	42.14	40.93	40.59	40.30	40.08	39.85	39.62	39.39	39.16	38.94	38.71	38.46	38.21	37.95	37.70	37.44
3	41.50	41.50	41.50	41.34	40.84	40.37	39.86	39.47	39.19	38.96	38.73	38.50	38.28	38.05	37.82	37.59	37.36	37.14	36.91	36.68
4	39.03	41.50	41.24	40.72	40.20	39.64	39.25	38.98	38.64	38.33	38.06	37.81	37.58	37.36	37.13	36.90	36.67	36.44	36.22	35.99
5	31.56	33.48	32.28	32.50	32.41	32.57	30.64	29.59	30.44	32.18	34.78	36.50	37.11	36.85	36.32	35.85	35.86	35.95	35.72	35.49
6	32.06	30.45	29.77	28.01	27.22	26.30	25.37	24.46	23.61	25.78	27.88	30.32	30.77	31.86	31.40	30.34	30.11	29.66	29.97	29.84
7	34.34	33.22	32.16	29.79	28.95	27.65	27.40	26.14	25.13	23.63	23.87	26.27	27.91	28.35	27.87	27.26	25.99	25.04	24.50	23.04
8	36.07	35.49	34.08	31.63	30.72	29.15	29.16	27.85	26.87	25.06	22.82	23.35	25.20	25.54	25.10	24.64	22.78	21.76	20.42	19.42
9	37.90	37.65	35.46	33.46	32.20	30.60	30.85	29.65	28.57	26.42	24.57	22.11	22.54	22.59	22.25	21.85	20.71	20.34	20.20	19.46
10	39.94	39.42	37.11	35.10	33.62	32.10	32.10	31.33	30.05	28.21	26.17	24.40	22.38	20.76	20.59	20.31	21.05	23.30	22.43	21.65
11	39.46	38.90	38.57	36.70	35.11	33.46	33.55	33.06	31.37	30.25	28.71	27.32	24.56	22.98	22.56	24.00	23.93	25.67	24.62	23.88
12	39.67	38.37	38.26	38.11	36.46	34.91	34.91	34.77	33.60	32.31	31.55	29.99	27.88	26.53	26.30	27.65	26.80	27.85	26.77	26.04
13	40.35	38.80	37.77	37.62	37.34	36.34	36.25	36.17	35.91	35.44	34.71	32.95	31.42	29.93	28.01	31.57	29.85	30.05	28.90	28.18
14	40.80	39.49	38.28	37.27	37.06	36.80	36.26	35.79	35.59	35.34	35.07	34.78	31.88	29.38	30.67	33.89	33.64	32.16	31.06	30.07
15	41.40	39.91	38.72	37.77	37.48	37.34	36.64	35.79	35.26	35.01	34.77	34.51	31.95	32.48	33.80	33.58	33.38	33.21	33.01	31.35
16	42.05	40.51	39.23	38.25	37.90	37.72	37.05	36.21	35.52	34.86	34.51	34.22	33.03	33.69	33.51	33.28	33.07	32.88	32.71	32.27
17	42.37	41.13	39.88	38.74	38.31	38.02	37.46	36.57	35.94	35.24	34.61	34.03	33.84	33.46	33.17	32.97	32.76	32.57	32.40	32.25
18	42.92	40.66	40.26	39.20	38.73	38.32	37.74	37.02	36.30	35.68	34.98	34.36	33.85	33.50	33.11	32.73	32.49	32.25	32.07	31.92
19	43.37	41.30	40.61	39.61	39.14	38.62	37.97	37.35	36.73	36.03	35.41	34.63	34.51	34.01	33.66	33.28	32.92	32.60	32.19	31.57
20	43.59	41.97	41.16	40.16	39.56	38.92	38.23	37.57	37.06	36.44	35.74	35.13	35.11	34.52	34.16	33.81	33.46	33.12	31.95	30.80
21	44.07	42.43	41.48	40.58	39.98	39.22	38.51	37.80	37.30	36.77	35.90	35.76	35.72	35.06	34.67	34.32	33.55	32.53	31.45	30.14
22	43.28	42.89	41.77	40.94	40.32	39.59	38.78	38.03	37.53	36.81	36.21	36.38	36.31	35.75	34.87	34.06	33.26	31.94	30.85	29.86
23	42.63	43.05	42.11	41.29	40.66	40.00	39.06	38.26	37.63	36.86	36.75	36.95	36.64	35.76	34.56	33.73	32.73	31.63	30.38	29.68
24	43.30	43.57	42.57	41.71	41.00	40.41	39.33	38.49	37.68	37.20	37.13	36.91	36.45	35.87	34.34	33.38	32.37	31.32	30.33	29.45
25	44.44	44.53	43.53	42.63	42.01	41.51	40.18	39.05	38.07	37.56	37.48	36.97	36.29	35.51	34.16	33.00	31.97	31.09	30.25	29.40
26	44.51	44.44	44.61	42.80	42.62	42.45	40.72	40.07	39.51	39.04	38.41	37.63	36.38	34.97	33.51	32.24	31.02	29.92	28.96	28.06
27	45.09	45.05	45.21	42.92	42.23	41.56	39.49	38.94	38.42	38.03	37.41	36.70	35.54	34.27	33.10	31.91	30.76	29.20	27.61	26.79
28	45.66	45.65	45.81	43.50	41.83	40.68	38.28	37.90	37.44	36.97	36.42	35.82	34.89	33.60	32.67	31.54	30.50	28.73	27.09	26.62
29	46.22	46.25	46.38	44.82	41.50	39.77	37.50	36.75	36.40	36.03	35.51	34.93	34.23	33.20	32.29	31.29	30.25	28.97	27.89	26.50
30	51.50	49.37	44.85	41.50	41.50	39.23	36.90	35.84	35.45	34.98	34.46	33.92	33.30	32.62	31.90	31.37	30.84	30.12	28.35	26.50
31	49.11	48.25	46.56	44.54	43.42	40.89	39.63	38.87	34.67	34.01	33.45	32.86	32.23	31.56	31.50	31.50	30.22	27.21	26.50	
32	55.50	54.06	51.46	50.25	48.94	43.48	40.81	42.27	39.25	37.88	37.41	35.78	34.59	34.20	34.29	32.99	31.90	29.18	27.70	27.15
33	72.72	72.19	70.49	68.44	65.75	62.78	59.69	56.43	54.32	52.76	51.20	50.06	48.69	47.20	45.84	44.08	42.28	39.46	37.71	35.87
34	93.07	91.96	91.50	91.50	89.38	85.37	80.80	76.87	75.21	73.83	72.63	71.76	70.59	69.75	68.48	66.56	64.29	61.78	58.47	54.93
35	84.39	82.03	80.09	80.85	80.99	80.78	81.20	81.52	81.50	81.50	81.50	81.50	81.50	81.50	81.50	81.50	81.50	81.13	79.47	77.34
36	61.92	57.62	57.04	56.06	54.34	52.00	51.19	51.09	52.73	54.46	56.43	58.63	61.16	63.81	65.96	68.04	70.46	73.50	76.80	79.77
37	59.25	55.96	53.22	48.99	47.00	45.28	45.05	42.77	41.71	41.50	41.50	41.50	41.50	41.50	41.50	42.11	44.18	46.16	48.94	52.20
38	60.16	56.21	52.73	49.93	47.80	47.10	47.16	45.04	43.79	42.92	42.47	42.27	42.04	41.88	41.41	40.28	39.72	39.31	36.46	35.94
39	60.28	56.31	52.86	50.70	48.63	48.77	48.70	46.81	45.51	44.26	43.84	43.39	43.10	42.41	41.23	39.62	38.49	37.09	35.36	33.98
40	60.18	56.45	53.57	51.28	50.59	50.20	49.68	48.23	46.62	45.68	44.75	43.99	43.09	42.04	40.74	39.21	37.58	35.72	34.52	33.81
41	59.95	56.64	53.98	53.68	53.37	51.87	50.91	49.49	48.06	46.65	45.65	44.33	43.08	41.93	40.94	39.61	38.22	37.37	36.15	35.28
42	60.04	56.50	54.88	56.00	55.30	53.19	51.91	50.75	49.16	47.91	46.63	45.68	44.89	44.02	43.07	42.02	39.40	38.23	37.68	36.96
43	60.69	57.02	55.93	57.25	56.61	54.40	53.10	51.87	50.38	49.03	47.95	46.83	46.35	45.83	45.08	44.30	43.36	42.47	41.27	40.08
44	61.50	58.08	57.22	58.20	57.76	55.69	54.26	52.86	51.37	50.27	49.47	48.27	47.80	47.05	46.06	44.86	41.46	40.56	39.73	38.95
45	61.50	59.17	58.20	59.19	59.08	56.95	54.32	53.79	51.38	50.22	49.06	48.35	48.05	46.81	45.99	44.53	43.76	42.84	41.52	40.16
46	68.49	65.63	63.30	61.34	58.04	55.44	52.90	54.59	54.65	54.24	53.65	52.77	50.24	48.42	46.59	45.38	43.93	42.41	40.93	39.45
47	65.22	63.16	61.01	58.94	57.31	55.90	54.48	55.24	55.06	54.44	53.83	53.21	51.38	49.53	47.65	45.74	44.67	43.43	41.99	40.62
48	63.91	62.38	60.90	59.37	57.92	56.62	55.75	55.86	55.61	54.87	54.12	53.38	51.95	50.33	48.54	46.77	45.56	44.47	42.92	41.76
49	64.10	62.57	61.27	59.89	58.45	57.25	56.63	56.93	56.92	56.24	55.50	54.54	53.18	51.37	49.67	48.53	47.05	44.72	43.98	42.84
50	65.21	62.95	61.57	60.36	59.10	57.87	57.20	58.04	57.99	57.54	56.78	55.60	54.31	52.56	51.40	50.25	48.37	46.20	45.16	44.11
51	68.47	65.34	62.36	60.84	60.25	59.53	59.22	58.87	59.15	58.83	57.87	56.85	55.39	53.82	52.60	51.52	50.05	48.81	48.05	46.78
52	73.92	68.26	65.25	63.95	63.36	62.25	61.26	60.41	60.18	59.67	58.75	57.95	56.43	54.84	53.62	52.50	51.01	50.36	49.55	48.31
53	75.64	73.73	72.09	70.47	69.49	68.31	65.85	63.50	62.67	61.68	60.18	58.56	57.07	55.66	54.43	52.91	51.35	49.85	48.72	47.71
54	77.27	75.71	74.47	72.95	71.82	70.38	68.79	67.03	65.14	63.49	61.60	59.65	57.54	55.71	52.65	50.75	49.55	47.97	44.97	42.28
55	79.06	77.93	77.04	75.57	74.12	72.44	71.03	69.26	67.38	64.47	62.91	59.81	56.91	54.17	51.25	48.40	45.91	43.52	40.13	36.63
56	80.98	80.25	79.85	79.28	78.88	77.92	76.49	71.71	69.83	64.40	63.33	60.09	55.28	52.16	49.03	45.47	42.46	39.98	36.85	29.41
57	87.86	94.17	96.76	98.10	97.25	96.35	95.40	93.04	82.09	68.78	61.64	56.58	53.65	50.07	45.54	41.51	38.76	36.42	32.94	25.83
58	93.11	80.54	77.																	

TABLE E.2-3. THICKNESS OF THE SURFICIAL AQUIFER (FEET) (continued).

Row	Column																			
	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
1	37.55	37.30	37.05	36.80	36.54	34.62	32.14	35.78	38.90	41.83	44.76	47.90	50.62	53.19	55.01	56.72	57.29	58.32	58.07	57.83
2	37.21	36.96	36.71	36.47	36.22	35.98	35.73	34.95	31.81	28.16	24.94	31.88	32.08	34.16	34.36	34.55	34.74	35.18	36.40	36.73
3	36.45	36.22	35.99	35.77	35.54	35.31	35.08	34.85	34.63	34.40	34.17	33.94	30.38	27.08	24.75	22.43	20.09	18.81	21.33	25.39
4	35.76	35.53	35.30	35.08	34.85	34.62	34.39	34.16	33.94	33.71	33.48	33.25	33.02	31.75	29.38	26.85	24.24	21.58	19.07	16.64
5	35.27	35.04	34.81	34.58	34.35	34.13	33.90	33.67	33.44	33.21	32.99	32.76	32.53	32.30	32.07	29.69	26.63	23.14	19.77	16.50
6	28.74	29.25	30.44	31.98	32.45	32.33	32.10	32.48	33.10	32.87	32.64	32.41	32.19	31.96	31.73	30.80	26.23	21.67	16.94	12.80
7	20.72	22.29	25.85	27.45	27.84	28.49	28.34	28.65	29.69	29.75	29.53	30.13	30.34	28.84	28.69	24.46	20.75	20.42	15.55	12.42
8	19.35	18.58	21.80	23.94	24.69	25.42	25.33	25.59	26.26	26.30	25.68	26.05	24.87	22.04	18.50	13.09	10.48	10.32	13.78	11.38
9	18.89	17.55	18.31	20.42	21.53	22.35	22.32	22.61	22.83	22.86	21.91	21.75	20.03	16.98	13.14	12.62	13.65	13.20	12.43	12.44
10	20.86	20.07	19.19	16.82	18.37	19.30	19.31	19.54	19.40	19.18	18.13	17.03	15.80	13.31	12.88	16.13	16.50	16.50	16.60	16.34
11	23.09	22.30	20.86	19.38	17.97	15.76	16.40	14.78	15.42	16.07	15.40	14.43	14.23	16.73	17.26	17.57	17.67	17.77	17.79	17.53
12	25.33	24.02	22.53	21.07	19.80	18.53	17.62	17.27	15.52	13.87	13.56	16.60	17.35	18.11	18.63	18.83	18.93	19.03	18.86	18.60
13	27.07	25.69	24.16	22.90	21.24	19.49	19.01	18.62	16.84	16.38	17.61	18.08	18.76	19.48	20.00	20.10	20.20	20.19	19.93	19.52
14	28.53	27.19	25.68	23.92	22.16	20.75	20.40	19.84	18.02	18.75	19.10	19.57	20.16	20.85	21.27	21.37	21.47	21.26	20.92	20.41
15	29.85	28.19	26.55	24.83	23.07	22.14	21.76	21.06	19.37	20.34	20.58	21.06	21.56	22.22	22.53	22.63	22.59	22.32	21.81	21.30
16	30.64	28.99	27.35	25.73	24.14	23.53	22.97	22.47	20.72	21.88	22.07	22.54	22.97	23.59	23.80	23.90	23.66	23.21	22.70	22.19
17	31.39	29.76	28.13	26.51	25.31	24.89	24.36	23.89	22.09	23.42	23.64	24.03	24.37	24.96	25.06	24.99	24.61	24.10	23.59	23.08
18	31.78	30.51	28.88	27.32	26.22	25.57	24.86	24.21	22.91	24.45	25.21	25.51	25.77	26.23	26.33	26.01	25.50	24.99	24.48	23.99
19	31.19	30.54	28.41	26.58	25.43	24.37	23.37	22.36	21.30	22.48	23.75	25.19	26.52	27.49	27.40	26.90	26.39	25.88	25.38	24.95
20	29.72	28.99	27.82	26.13	24.91	23.64	22.13	20.72	19.76	20.59	22.66	24.47	25.98	27.16	27.82	27.79	27.28	26.77	26.27	25.90
21	29.31	28.42	27.18	25.66	24.29	22.76	21.23	19.54	19.42	19.78	22.35	24.43	25.41	26.63	27.30	27.65	27.79	27.67	27.16	26.85
22	29.05	28.03	26.70	25.19	23.24	21.96	21.43	20.96	20.97	21.13	22.84	24.58	25.58	26.43	27.10	27.43	27.56	27.48	27.20	27.40
23	28.87	27.69	26.22	24.68	22.73	22.28	22.19	22.03	22.01	22.06	22.54	24.13	25.18	26.52	27.07	27.43	27.52	27.46	27.40	27.72
24	28.69	27.39	25.97	24.58	24.02	23.75	23.51	23.52	22.83	22.88	22.90	23.92	24.86	25.83	26.94	27.47	27.72	27.66	27.71	28.02
25	28.46	27.20	26.27	25.83	25.47	24.89	23.85	23.78	23.76	22.93	23.83	24.85	25.64	26.16	27.00	27.71	27.92	28.03	28.31	28.31
26	27.34	26.77	26.44	26.07	25.53	25.00	24.40	23.84	23.78	23.66	23.21	24.18	25.41	26.61	27.47	28.00	27.98	28.21	28.39	28.60
27	26.94	26.63	26.41	26.10	25.68	25.07	24.41	24.17	23.99	23.67	23.94	24.86	25.94	26.72	27.29	27.89	28.14	28.61	28.35	28.07
28	26.76	26.56	26.37	26.12	25.88	25.33	24.81	24.67	24.57	24.48	24.84	25.52	26.59	27.48	28.24	28.35	28.23	28.39	27.15	27.40
29	26.58	26.53	26.43	26.16	26.07	25.59	25.25	25.17	25.14	25.28	25.64	26.20	27.33	28.45	29.01	29.23	29.24	27.99	27.22	27.89
30	26.50	26.50	26.49	26.36	26.27	25.85	25.70	25.66	25.72	26.03	26.41	26.50	27.29	28.01	28.52	29.04	29.56	30.20	29.46	26.94
31	26.50	26.50	26.50	26.50	26.46	26.24	26.15	26.16	26.30	26.50	26.50	26.50	26.87	27.46	28.09	28.72	29.35	29.97	29.95	27.17
32	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.62	27.25	27.87	28.49	29.11	29.72	30.31	29.33
33	32.15	30.54	29.63	29.01	28.29	26.50	26.50	21.50	21.50	22.67	24.32	26.50	26.50	27.01	27.62	28.22	28.82	29.41	29.75	28.46
34	51.14	47.45	44.97	42.26	37.38	33.84	31.35	28.98	25.49	23.74	22.27	20.01	16.50	23.14	27.32	27.91	28.48	29.04	28.82	27.49
35	73.75	69.83	65.89	62.04	57.97	53.52	49.25	44.81	40.60	37.29	31.27	26.19	24.43	22.24	18.35	21.78	28.10	28.62	27.98	27.46
36	81.50	81.50	81.50	81.50	78.25	74.05	68.89	64.35	59.85	54.64	49.16	44.11	36.95	29.00	25.18	23.07	17.64	23.87	28.56	28.24
37	55.56	59.59	64.51	70.64	76.79	81.50	81.50	81.50	81.50	80.16	70.59	64.41	57.29	47.69	38.29	27.90	24.75	20.31	17.95	28.34
38	35.26	35.06	38.99	45.42	50.00	54.46	59.80	66.30	74.60	81.50	81.50	81.50	77.95	65.98	55.45	43.91	32.60	26.32	23.88	17.62
39	31.89	31.50	31.50	31.54	31.62	31.50	34.95	40.98	47.00	52.60	60.11	71.28	81.50	81.50	76.92	62.91	49.65	37.24	27.44	24.62
40	33.41	33.03	33.09	33.06	32.80	32.37	31.50	30.84	30.83	29.05	36.02	43.33	56.02	69.08	81.50	81.50	68.13	52.38	38.39	27.99
41	35.05	34.80	34.99	34.77	34.22	31.94	31.50	30.81	29.07	27.43	26.50	26.50	36.89	46.55	62.81	80.78	80.67	71.27	54.27	38.93
42	36.52	37.06	36.65	36.50	35.28	33.42	32.82	31.94	31.45	27.33	26.50	26.50	26.50	26.38	41.09	56.54	78.60	79.63	71.34	53.95
43	36.66	35.59	34.13	34.29	34.06	32.71	31.71	29.39	27.03	28.50	29.03	27.31	26.02	25.61	25.21	34.67	52.01	73.57	78.58	69.40
44	38.22	37.74	37.53	36.83	35.85	34.53	33.25	31.90	30.31	28.11	26.73	25.78	26.03	24.97	24.39	23.85	28.01	47.22	68.04	77.54
45	38.24	36.78	36.19	35.23	34.07	33.17	32.74	31.82	31.47	30.68	30.55	28.30	24.74	23.87	22.76	22.45	22.00	24.60	44.01	69.57
46	38.01	36.70	35.73	35.28	34.77	34.30	34.10	32.94	32.49	31.33	30.52	29.68	26.62	23.62	21.12	19.77	18.08	17.12	16.43	16.03
47	39.31	37.82	36.46	36.20	35.86	35.23	34.75	33.98	33.45	31.92	30.79	29.47	27.14	24.15	20.74	18.16	17.12	16.43	16.03	33.44
48	40.46	38.97	37.75	37.31	36.55	35.74	35.25	34.92	34.18	32.52	30.43	28.72	24.90	21.84	19.46	16.63	16.20	16.72	20.14	19.89
49	41.60	40.24	39.13	38.29	37.46	36.67	35.93	34.94	32.78	30.57	28.66	26.76	22.09	19.93	17.71	15.96	15.56	16.87	19.75	18.42
50	42.84	41.60	40.51	39.41	38.64	35.41	33.88	31.96	29.37	28.13	25.27	22.71	20.22	18.31	16.44	15.34	14.92	14.51	18.11	18.95
51	44.99	43.22	41.33	38.07	34.39	31.16	25.90	23.58	19.46	21.04	20.95	19.23	17.42	16.20	15.72	15.25	14.77	14.29	15.84	19.56
52	45.66	41.95	38.71	34.13	27.50	23.47	19.44	18.98	18.51	18.05	17.59	17.13	16.66	16.20	15.74	15.27	14.81	14.35	16.72	18.42
53	43.45	38.48	34.45	27.56	22.49	20.14	19.67	19.20	18.73	18.27	17.80	17.33	16.86	16.39	15.92	16.74	17.87	17.17	18.48	22.86
54	38.48	34.35	29.16	22.72	20.87	20.40	20.52	20.40	19.76	19.07	18.06	17.59	17.12	17.60	18.13	18.99	21.19	21.33	19.75	23.84
55	33.51	28.55	23.32	21.50	21.14	21.57	21.93	21.92	21.21	20.85	20.01	19.91	19.36	19.75	20.33	21.99	25.74	24.92	23.39	25.53
56	27.62	21.84	21.50	21.50	22.04	22.99	23.29	23.43	22.81	22.54	22.30	22.96	22.52	22.33	25.12	27.71	28.47	27.84	26.85	27.03
57	23.49	21.50	22.38	23.46	24.13	24.37	24.79	24.92	24.50	24.22	24.59	26.74	26.63	28.30	29.35	30.66	31.58	30.96	29.94	29.02
58	23.14	23.72																		

TABLE E.2-3. THICKNESS OF THE SURFICIAL AQUIFER (FEET) (continued).

Row\	Column																			
	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
1	57.44	56.97	56.51	56.05	55.59	55.23	55.01	54.79	55.84	68.77	83.46	94.28	105.28	115.29	125.07	135.02	144.52	154.73	156.50	156.50
2	36.43	36.14	35.84	35.63	35.60	35.56	35.49	35.27	35.57	35.95	42.63	49.09	55.72	67.64	80.12	89.04	96.00	102.85	110.93	122.1
3	30.21	31.66	31.50	31.50	31.50	31.50	31.50	31.50	31.50	30.93	27.17	27.32	31.50	31.50	37.04	46.71	56.29	66.42	73.51	76.16
4	18.84	24.08	28.55	31.50	31.50	31.50	31.50	31.50	31.50	31.50	31.50	27.97	24.99	22.02	28.71	31.50	25.50	24.03	27.53	29.41
5	15.27	17.72	21.01	24.13	24.71	24.86	25.86	26.67	26.46	25.18	25.21	23.56	21.91	20.26	19.76	25.30	29.19	31.50	31.50	31.50
6	13.46	16.50	16.39	18.41	17.56	17.24	17.55	17.49	16.46	18.62	18.05	17.14	16.48	15.77	15.12	18.42	21.61	22.17	24.05	25.56
7	11.33	14.45	14.29	15.22	14.81	13.27	13.66	11.50	10.12	9.35	9.35	8.47	14.50	16.31	14.77	13.20	14.23	13.83	12.81	14.91
8	10.05	11.21	12.86	13.72	13.11	10.95	9.64	9.79	10.76	12.61	11.87	10.81	8.78	12.53	9.20	8.46	8.87	8.69	8.96	8.44
9	11.99	10.57	11.19	12.22	11.57	9.23	11.56	13.45	14.34	14.95	14.55	13.45	12.13	10.36	9.32	9.68	8.38	9.26	11.16	11.38
10	15.39	13.26	9.99	10.37	9.63	11.19	14.86	16.39	16.77	16.78	16.72	15.90	14.95	15.31	14.48	11.51	9.06	11.49	11.39	11.57
11	17.23	16.96	16.76	16.72	16.78	16.86	16.97	17.17	17.46	17.61	17.59	17.19	17.48	17.73	18.06	17.44	10.40	11.53	11.27	13.31
12	18.12	17.91	17.69	17.54	17.60	17.55	17.75	17.85	18.16	18.45	18.42	18.10	19.23	19.72	19.67	20.14	16.09	14.84	14.31	14.96
13	19.07	18.86	18.61	18.33	18.42	18.47	18.46	18.63	18.82	19.14	19.25	19.51	20.80	21.50	21.86	22.09	20.61	17.34	17.68	23.39
14	20.01	19.80	19.54	19.23	19.25	19.30	19.06	19.36	19.52	19.84	20.09	20.93	22.30	23.28	23.74	24.15	23.57	19.14	24.76	26.50
15	20.96	20.75	20.46	20.15	20.07	20.12	20.02	19.96	20.27	20.42	21.11	22.34	23.78	24.92	25.52	25.75	25.27	23.05	26.50	26.50
16	21.91	21.69	21.38	21.07	20.79	20.97	20.99	20.59	20.87	21.18	22.23	23.75	25.28	26.49	27.16	26.70	26.47	25.03	26.50	24.92
17	22.85	22.61	22.30	21.99	21.68	21.81	21.81	21.48	21.47	21.85	23.38	25.00	26.10	25.64	25.41	25.41	24.77	23.95	24.06	26.50
18	23.80	23.53	23.22	22.91	22.60	22.53	22.68	22.85	22.13	22.96	24.49	25.05	22.66	22.76	22.50	20.92	22.01	23.75	25.42	27.12
19	24.75	24.45	24.14	23.83	23.52	23.25	23.55	23.51	22.96	24.06	25.41	22.93	19.37	20.15	21.61	22.38	23.22	24.38	25.68	26.89
20	25.68	25.37	25.06	24.75	24.44	24.13	24.27	24.40	24.11	24.46	22.83	18.42	19.06	20.40	22.08	22.85	23.58	24.73	26.05	26.26
21	26.60	26.29	25.98	25.67	25.36	25.06	25.00	24.86	21.85	19.14	17.33	18.97	20.81	22.55	23.32	23.94	25.37	25.64	25.91	
22	27.52	27.21	26.90	26.59	26.28	25.98	25.72	25.95	22.89	19.20	17.34	17.66	19.38	21.23	23.02	23.79	24.27	25.52	25.30	25.59
23	27.93	28.13	27.82	27.51	27.21	26.90	26.59	23.19	19.17	17.09	17.61	19.12	20.42	21.69	23.48	24.26	24.57	25.14	24.97	25.28
24	28.22	28.43	28.64	28.43	28.10	27.68	26.86	22.98	17.95	17.36	18.95	20.55	21.92	23.18	24.45	24.70	24.42	24.80	24.85	24.96
25	28.52	28.73	28.86	28.94	28.68	28.06	24.79	20.98	17.82	18.69	20.29	21.89	23.40	24.68	25.94	26.16	25.86	25.97	25.43	25.32
26	28.72	28.82	28.64	28.47	28.98	27.51	24.57	20.83	18.44	20.03	21.63	23.23	24.83	26.17	27.44	27.64	27.31	27.26	26.70	26.59
27	28.52	28.47	27.65	26.95	25.77	26.76	24.88	21.10	18.47	20.70	22.93	24.57	26.17	27.77	28.93	29.11	28.76	28.55	27.97	27.86
28	27.93	28.39	28.01	28.81	26.59	26.28	23.69	19.88	19.56	21.55	23.24	25.23	27.24	29.11	30.42	30.59	30.24	29.85	29.24	29.13
29	27.31	27.83	28.64	27.69	26.67	26.07	22.76	19.19	20.84	22.87	24.76	26.45	28.14	29.97	31.50	31.50	31.50	31.14	30.26	29.75
30	27.05	26.98	27.93	28.10	26.93	25.44	21.79	20.16	22.37	24.31	26.18	27.97	29.66	31.35	31.50	31.50	31.40	30.99	30.59	30.19
31	26.64	26.93	27.10	27.16	27.22	25.65	20.86	21.59	24.13	25.86	27.78	29.48	31.18	31.50	31.50	31.14	30.74	30.33	29.93	29.53
32	26.48	26.86	27.00	26.78	26.68	26.62	23.64	23.36	25.05	27.46	29.36	31.26	31.65	31.95	31.53	30.70	30.08	29.67	29.27	28.87
33	27.35	26.57	26.15	23.77	23.65	26.20	26.20	25.99	27.58	29.27	30.97	31.67	32.03	32.38	31.89	30.91	30.10	29.48	28.85	28.23
34	26.32	25.98	24.76	21.76	22.15	22.68	25.70	25.62	26.92	28.38	30.15	31.38	32.15	32.10	31.74	31.22	30.27	29.62	28.88	28.23
35	26.88	26.17	24.65	21.94	21.41	21.95	22.47	25.09	25.73	27.54	29.38	30.39	31.26	31.64	31.52	31.16	30.52	29.62	29.03	28.01
36	27.64	26.68	25.12	22.42	20.70	21.12	21.50	25.34	25.84	27.02	28.40	29.40	30.23	30.86	31.06	30.86	30.52	29.82	29.01	27.94
37	28.44	26.58	24.20	22.82	21.01	20.18	20.58	23.33	25.51	26.82	27.99	29.06	29.20	29.89	30.41	30.50	30.29	29.79	28.73	27.96
38	18.26	26.69	23.37	22.17	20.56	19.21	19.57	22.60	25.57	26.61	28.07	29.08	29.71	29.87	29.67	29.93	29.92	29.70	28.91	29.21
39	22.11	17.30	20.87	20.14	18.44	18.26	18.47	20.13	24.85	27.21	28.12	29.20	30.02	30.50	30.66	30.29	30.18	30.66	31.04	30.84
40	21.20	21.41	16.59	16.75	16.92	17.16	18.05	18.16	24.00	27.92	28.44	29.32	30.21	30.97	31.29	31.42	31.48	32.03	32.59	32.47
41	26.17	20.84	18.05	16.47	13.92	12.10	16.54	21.63	24.93	27.72	28.81	29.59	30.01	31.29	31.96	32.72	32.83	33.07	33.88	34.52
42	37.78	24.29	20.09	17.69	16.58	14.79	9.97	17.18	23.90	25.38	26.83	29.57	28.96	30.93	32.94	33.41	34.33	34.32	34.95	35.71
43	51.84	35.08	22.71	18.69	17.20	14.89	13.57	19.15	21.02	22.31	24.70	29.01	28.50	30.65	33.12	33.88	34.71	35.20	34.86	35.29
44	65.71	46.97	30.88	20.30	17.27	17.36	13.89	20.89	18.24	19.67	22.88	26.39	27.39	29.69	32.05	33.31	33.74	34.35	34.50	34.48
45	76.49	59.83	40.84	25.01	16.09	16.14	16.08	20.35	18.61	18.67	21.64	24.15	26.65	28.74	30.97	32.82	32.93	33.36	33.85	33.73
46	75.85	72.48	52.72	33.40	18.45	14.92	14.79	19.78	19.71	19.55	21.03	22.77	25.21	27.89	29.90	31.66	32.28	32.38	32.80	33.36
47	55.44	74.81	64.43	43.01	24.90	17.51	14.83	18.40	18.45	19.59	20.31	21.68	24.26	26.49	28.71	30.64	32.09	32.29	32.81	33.41
48	40.10	63.92	72.98	52.38	33.35	18.33	16.75	17.37	18.81	19.80	20.38	21.06	22.88	25.65	28.38	30.31	32.42	32.80	32.93	36.59
49	29.09	49.81	73.17	62.22	41.05	22.70	17.39	17.51	19.65	21.55	21.20	21.48	26.31	29.06	30.32	31.65	32.86	32.73	37.46	47.25
50	19.69	37.01	63.83	71.83	50.41	31.08	20.67	21.50	21.50	21.70	22.34	22.09	27.30	33.57	33.13	32.62	32.01	33.00	43.68	53.92
51	22.86	26.89	51.45	71.50	60.15	38.33	23.09	21.50	21.50	21.06	22.73	22.59	29.36	32.48	32.05	31.43	31.00	36.22	46.84	56.92
52	22.50	22.49	39.72	68.46	68.81	46.84	29.05	23.74	21.63	21.59	24.27	23.40	30.99	31.67	31.19	30.59	29.88	41.21	52.52	60.93
53	23.11	22.64	29.30	57.10	71.50	54.66	34.02	26.50	24.89	24.17	26.47	25.07	31.62	30.69	30.15	29.63	33.63	45.52	56.57	66.23
54	23.83	25.30	27.28	46.97	71.58	63.60	40.55	28.42	27.19	27.90	29.25	26.68	30.35	30.13	29.46	28.82	36.75	49.93	60.43	70.00
55	27.88	27.41	27.83	37.62	67.99	70.44	48.54	31.54	29.86	30.36	30.72	28.11	30.71	29.67	28.64	27.93	39.17	52.57	63.19	73.23
56	28.90	29.09	30.08	30.63	56.81	71.50	55.86	34.85	30.33	32.01	32.36	31.19	30.45	29.56	30.04	34.06	42.26	54.13	65.19	75.66
57	30.89	33.91	33.51	32.85	46.69	71.54	62.73	40.15	34.25	33.44	32.56	31.69	30.76	33.10	35.77	38.44	45.08	55.56	66.83	77.32
58	34.87	34.42	36.89	37.94																

TABLE E.2-3. THICKNESS OF THE SURFICIAL AQUIFER (FEET) (continued).

Row	Column																			
	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	156.50	156.50	156.50	156.50	156.50	156.50	156.50	156.50	156.50	156.50	156.50	156.50	151.32	143.87	135.65	126.67	117.50	108.62	104.17	103.42
2	129.46	132.74	134.56	137.48	140.78	143.22	142.67	138.38	132.35	124.77	116.98	108.38	98.56	87.92	79.54	73.65	66.16	58.68	54.15	50.24
3	77.18	77.86	79.37	77.81	77.93	76.96	77.73	78.04	75.36	71.81	69.52	69.01	67.75	63.42	61.20	58.45	55.78	50.36	44.94	39.60
4	29.46	29.46	28.57	30.48	31.50	32.00	31.50	33.47	36.73	39.99	37.87	34.66	31.50	34.16	37.99	40.55	44.55	44.53	40.70	37.17
5	31.50	31.50	31.50	30.82	31.43	31.50	31.50	31.50	31.50	31.50	31.24	30.58	29.93	29.27	28.62	29.31	32.22	35.46	35.43	37.22
6	25.18	24.19	23.17	23.62	23.53	24.45	26.14	27.26	28.21	26.99	26.27	25.00	24.36	23.70	23.05	23.73	25.66	27.24	31.87	33.50
7	16.04	15.24	15.96	16.73	17.34	17.93	19.08	20.46	21.34	21.53	21.83	21.00	20.36	19.72	19.07	19.65	19.25	21.02	24.28	29.81
8	8.67	9.66	10.79	10.13	11.32	12.06	13.26	14.56	15.18	16.44	17.23	17.88	17.16	16.52	16.50	15.92	15.76	15.36	18.00	20.69
9	11.34	11.14	10.78	10.16	9.69	9.59	9.59	9.59	9.59	9.59	9.59	9.59	12.55	14.77	15.87	15.23	14.32	14.15	13.14	13.27
10	13.33	13.27	12.96	12.30	11.85	11.77	10.60	10.08	9.83	9.59	9.59	9.59	11.14	12.74	12.94	12.88	11.90	11.04	11.02	11.86
11	15.29	15.47	15.15	13.90	13.33	13.27	12.77	12.02	11.01	10.31	9.59	9.59	9.59	9.59	10.21	9.59	9.59	10.10	9.80	9.59
12	18.75	17.14	16.50	15.49	14.81	14.77	14.35	13.70	12.43	11.32	10.77	9.59	9.59	9.59	9.59	9.59	9.59	9.59	9.59	9.59
13	25.33	25.76	24.27	20.95	16.68	16.28	15.99	15.38	14.27	14.03	12.80	11.47	10.17	9.59	9.59	9.59	9.59	9.59	9.59	10.61
14	26.50	25.95	26.00	26.50	25.54	20.20	17.46	16.50	16.50	16.50	15.62	14.22	12.95	12.57	12.47	12.44	13.02	13.48	13.80	14.77
15	25.43	25.84	26.50	26.50	26.50	25.20	22.21	19.86	17.39	16.64	16.50	16.50	16.13	15.81	16.50	16.50	16.70	17.16	17.25	17.18
16	26.50	26.50	26.50	26.80	27.18	27.56	25.88	23.65	20.82	18.05	16.94	16.50	16.50	16.84	17.40	17.95	18.51	18.92	19.01	
17	26.57	26.96	27.34	27.73	28.11	28.50	26.28	24.05	22.16	20.27	18.52	17.25	16.86	17.53	18.09	18.65	19.20	19.76	20.32	20.69
18	27.51	27.89	28.27	28.66	29.04	28.90	26.86	25.99	23.95	21.51	19.08	18.14	17.81	18.40	19.32	19.90	20.45	21.01	21.57	22.13
19	27.41	27.92	28.50	29.42	29.97	29.62	28.15	26.69	24.51	22.07	19.63	19.05	18.80	19.09	19.94	20.80	21.70	22.26	22.82	23.38
20	26.76	27.27	28.01	28.87	29.46	29.64	28.75	27.29	25.06	22.63	20.50	20.11	19.80	19.87	20.63	21.49	22.34	23.25	24.07	24.63
21	26.11	26.66	27.53	28.31	28.91	29.14	29.35	27.89	25.62	23.19	21.39	21.11	20.81	20.86	21.32	22.18	23.03	23.88	24.73	25.79
22	25.63	26.16	27.01	27.76	28.35	28.63	28.87	28.49	26.18	23.75	22.37	22.13	21.82	21.86	22.03	22.87	23.72	24.57	25.42	26.28
23	25.35	25.69	26.47	27.20	27.79	28.16	28.38	28.58	26.74	24.31	23.45	23.14	22.83	22.86	22.92	23.56	24.41	25.26	26.07	26.32
24	25.17	25.48	25.94	26.64	27.23	27.64	27.89	28.10	27.30	24.87	24.49	24.15	23.84	23.86	23.92	24.25	25.10	25.95	26.05	25.92
25	25.21	25.29	25.56	26.08	26.67	27.10	27.39	27.62	26.85	25.70	25.48	25.17	24.81	24.66	24.54	24.53	25.01	25.52	25.80	25.84
26	26.48	26.37	26.26	25.90	26.29	26.70	27.05	27.28	26.58	26.18	25.73	25.26	24.75	24.58	24.41	24.30	24.52	25.02	25.43	25.70
27	27.75	27.50	26.98	26.47	26.51	26.83	27.14	27.32	26.57	26.29	25.84	25.26	24.80	24.51	24.32	24.17	24.13	24.59	25.00	25.28
28	28.62	28.11	27.59	27.08	26.82	26.97	27.23	27.34	26.77	26.41	25.90	25.25	24.80	24.43	24.32	24.04	23.95	24.17	24.54	24.89
29	29.23	28.72	28.20	27.69	27.30	27.19	27.31	27.40	26.96	26.59	25.97	25.39	24.79	24.43	24.27	23.91	23.80	23.69	24.10	24.47
30	29.78	29.33	28.81	28.30	27.80	27.71	27.58	27.61	27.24	26.68	26.04	25.55	24.79	24.49	24.19	23.91	23.67	23.46	23.69	23.75
31	29.12	28.72	28.32	27.91	27.52	27.50	27.56	27.41	27.08	26.54	26.15	25.67	24.89	24.54	24.15	23.92	23.54	23.28	23.15	22.62
32	28.46	28.06	27.66	27.25	26.96	27.26	27.32	27.16	26.75	26.12	25.78	25.07	24.57	24.18	23.81	23.46	23.69	22.56	22.04	21.53
33	27.80	27.40	27.00	26.68	26.96	27.08	27.04	26.89	26.40	26.03	25.65	24.68	23.80	23.17	23.47	25.68	28.29	29.88	27.61	27.01
34	27.39	26.76	26.48	26.80	26.97	26.88	26.92	26.62	26.34	26.00	25.51	24.37	23.45	24.06	26.91	29.76	32.05	34.20	35.06	34.73
35	27.57	26.91	26.12	25.96	26.87	27.44	26.90	26.60	26.31	25.93	25.22	24.07	25.63	28.26	30.71	33.29	35.57	37.72	39.91	42.66
36	27.81	26.04	26.78	26.81	26.72	26.64	27.47	26.76	26.34	25.62	24.69	27.22	29.58	31.86	34.23	36.82	39.07	41.23	47.58	56.01
37	27.94	27.88	28.57	28.89	28.79	28.72	28.74	28.85	27.32	27.87	28.74	30.61	33.03	35.40	37.73	40.33	45.27	53.10	60.92	64.09
38	29.93	29.98	30.40	30.96	30.87	30.79	30.74	31.31	30.63	31.69	31.95	34.05	36.24	38.63	41.19	48.82	58.08	63.33	63.26	62.58
39	31.52	32.25	32.10	32.89	32.96	32.86	32.71	33.06	33.20	34.19	35.95	37.19	39.44	43.83	50.99	59.23	63.17	62.46	61.75	60.79
40	32.90	33.70	34.41	34.61	34.99	34.19	33.29	34.36	35.72	36.63	38.45	40.19	46.87	53.85	60.93	68.53	67.02	60.60	59.45	58.32
41	34.36	35.15	35.91	35.64	35.54	34.77	34.19	35.66	37.56	38.87	42.98	49.63	56.95	63.93	70.91	76.99	71.66	60.67	57.02	55.86
42	35.60	35.43	35.66	35.82	35.77	35.32	35.20	36.97	38.88	45.77	52.65	59.52	66.69	73.60	80.19	83.08	72.60	57.07	54.62	53.42
43	35.44	35.03	35.34	35.57	35.93	35.64	36.20	39.34	46.74	54.59	61.79	68.45	75.38	82.27	84.51	80.68	70.32	53.64	52.21	51.09
44	34.85	35.00	34.95	35.29	35.64	36.04	42.40	49.38	55.35	62.56	69.94	77.12	83.64	89.12	91.17	81.79	70.06	53.96	50.06	49.05
45	34.05	34.41	34.63	35.25	39.27	45.70	52.43	59.15	64.61	71.10	78.41	85.01	90.23	95.83	97.83	87.48	71.99	56.10	48.01	47.01
46	33.77	34.41	37.29	43.20	49.12	55.60	61.82	68.16	73.79	79.98	86.07	91.94	96.80	100.94	99.95	89.94	74.10	59.63	46.66	44.97
47	34.07	40.79	47.90	53.78	58.94	64.68	70.50	76.73	82.08	87.51	93.54	98.96	102.62	101.39	97.93	91.88	76.45	62.78	49.78	42.93
48	44.91	52.51	58.76	63.77	68.65	73.45	79.16	84.60	89.68	95.12	100.66	103.78	106.79	104.31	98.89	91.20	77.59	63.36	47.75	41.13
49	56.23	63.00	68.64	73.57	78.31	82.07	87.07	92.27	97.44	101.34	104.92	107.97	110.97	107.24	100.36	88.55	76.47	64.36	48.65	39.89
50	62.73	70.73	77.66	82.37	85.99	89.68	94.87	99.58	102.74	105.77	109.06	112.70	115.05	108.85	97.40	86.29	75.14	63.47	48.67	38.64
51	67.48	78.43	83.82	88.64	93.17	97.50	101.61	105.04	107.34	110.41	113.11	116.73	116.82	106.60	95.79	84.81	73.91	63.02	48.59	37.39
52	70.10	80.45	88.49	94.72	99.28	103.78	107.44	110.59	112.38	115.04	118.65	116.10	110.78	102.82	94.23	84.74	73.70	62.71	49.47	36.16
53	73.96	83.92	94.00	100.59	105.33	109.86	113.40	116.20	116.95	116.19	115.10	109.71	104.28	98.84	93.41	87.96	77.09	65.62	53.63	39.06
54	79.82	89.40	98.50	105.80	111.26	115.89	117.04	116.25	115.69	115.12	114.61	113.16	108.48	103.90	100.07	96.35	92.65	88.98	85.30	76.90
55	84.16	94.84	102.35	109.67	116.93	116.32	115.76	115.20	114.61	113.16	108.48	103.90	100.07	96.35	92.65	88.98	85.30	76.90	66.13	55.44
56	85.57	95.40	103.45	111.69	115.90	115.26	114.70	114.14	113.54	110.36	106.70	103.02	99.53	96.12	92.82	89.52	86.23	82.93	73.69	64.74
57	87.58	96.78	105.57	114.48	114.94	114.33	113.64	113.08	110.85	107.64	104.67	101.45	98.23	95.00	91.85	88				

TABLE E.2-3. THICKNESS OF THE SURFICIAL AQUIFER (FEET) (continued).

Row	Column																
	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117
1	99.53	94.34	89.38	82.83	76.05	69.85	64.42	61.19	58.85	57.24	55.77	56.50	58.25	59.90	62.34	63.35	62.35
2	45.06	40.29	31.90	30.32	29.03	27.43	25.39	22.41	21.50	21.50	21.50	21.50	21.50	27.05	31.50	32.66	32.59
3	34.27	31.50	30.40	29.01	30.00	31.50	31.50	31.50	32.18	31.50	31.50	30.86	27.59	21.30	1.14	7.18	12.95
4	33.02	30.66	31.50	31.50	36.55	38.25	36.86	33.98	30.00	27.12	26.35	25.03	14.76	4.37	12.31	17.34	6.50
5	31.88	31.50	31.50	29.19	31.41	30.93	27.86	24.13	21.40	19.96	16.69	12.50	2.42	10.89	19.22	6.50	6.50
6	33.77	31.94	25.96	18.84	18.63	18.94	18.63	18.32	14.58	11.18	7.38	5.51	6.50	13.01	16.22	6.50	6.50
7	32.54	31.50	25.92	20.93	16.50	17.33	17.53	15.11	11.71	8.15	4.60	8.33	10.42	15.63	10.92	6.50	6.50
8	27.63	31.69	29.70	24.21	18.87	18.50	16.09	10.40	8.48	4.68	7.59	9.98	13.02	17.56	6.50	6.50	6.50
9	20.12	26.14	31.50	28.47	23.64	20.81	12.79	3.74	4.92	7.53	9.26	11.34	14.22	18.27	6.50	6.50	6.50
10	12.83	15.98	26.62	32.61	26.34	22.77	8.12	8.63	9.30	9.50	11.00	13.24	15.77	16.79	6.50	6.50	6.50
11	9.59	9.59	16.13	26.20	27.54	23.40	14.22	13.05	11.64	12.20	13.01	15.19	17.73	14.68	6.50	6.50	6.50
12	9.83	12.26	15.30	22.25	27.45	26.69	19.62	15.88	14.34	14.89	15.58	17.16	19.80	13.68	6.50	6.50	6.50
13	11.43	14.25	16.50	17.54	22.50	26.07	23.19	19.30	17.03	17.58	18.27	19.30	21.89	12.41	6.50	6.50	6.50
14	14.24	16.48	16.50	16.50	17.88	21.91	24.56	21.21	19.72	20.28	20.97	21.94	23.53	11.19	6.50	6.50	6.50
15	16.73	16.50	16.50	16.50	16.50	17.89	22.15	23.13	22.42	22.97	23.66	24.63	23.60	9.91	6.50	6.50	6.50
16	18.73	18.33	17.80	16.76	16.50	16.50	20.96	24.46	23.58	23.88	24.39	25.71	23.46	6.50	6.50	6.50	6.50
17	20.72	20.27	19.90	19.02	17.48	16.50	19.23	22.86	24.77	24.31	25.16	26.61	21.46	6.50	6.50	6.50	6.50
18	22.45	22.26	22.00	21.28	19.68	16.62	18.75	21.10	23.44	24.34	24.86	26.90	18.92	6.50	6.50	6.50	6.50
19	24.04	24.22	23.98	23.54	21.87	19.91	21.17	22.04	22.91	23.78	23.76	25.94	16.82	6.50	6.50	6.50	6.50
20	25.19	25.89	25.80	25.67	23.99	22.72	23.59	24.47	25.34	25.06	24.98	24.47	15.56	6.50	6.50	6.50	6.50
21	26.44	27.00	27.53	27.23	25.30	25.15	26.02	26.53	25.82	25.10	24.40	22.10	13.43	6.50	6.50	6.50	6.50
22	27.00	27.65	27.79	27.90	26.89	27.58	27.29	26.57	25.85	25.04	23.69	20.13	12.08	6.50	6.50	6.50	6.50
23	26.76	27.19	27.82	28.30	28.76	28.04	27.33	26.61	25.89	24.94	23.18	18.79	10.99	6.50	6.50	6.50	6.50
24	26.55	26.99	27.43	27.90	27.88	27.46	27.04	26.63	25.93	24.29	22.63	17.56	9.95	6.50	6.50	6.50	6.50
25	26.05	26.89	27.24	27.41	27.00	26.58	26.16	25.74	25.32	23.63	22.64	16.55	8.47	6.50	6.50	6.50	6.50
26	25.56	26.19	26.73	26.51	26.11	25.69	25.27	24.86	24.44	24.05	22.57	16.32	6.50	6.50	6.50	6.50	6.50
27	25.55	25.69	25.54	25.33	25.11	24.82	24.39	23.97	23.55	23.14	22.11	16.81	6.50	6.50	6.50	6.50	6.50
28	25.18	24.74	24.36	24.14	23.92	23.70	23.49	23.10	22.67	22.25	21.70	15.89	6.50	6.50	6.50	6.50	6.50
29	24.31	23.77	23.17	22.95	22.73	22.55	22.30	22.08	21.80	21.25	20.18	16.21	6.50	6.50	6.50	6.50	6.50
30	23.21	22.66	22.12	24.88	26.11	25.68	25.36	24.58	23.80	22.80	18.81	17.14	6.50	6.50	6.50	6.50	6.50
31	22.10	22.72	27.68	31.70	30.07	28.47	27.69	26.91	26.12	24.11	20.11	16.36	6.50	6.50	6.50	6.50	6.50
32	23.86	29.24	33.59	35.57	33.15	30.80	30.02	29.24	28.24	24.42	22.98	15.35	12.75	6.50	6.50	6.50	6.50
33	31.96	36.66	40.19	38.92	36.27	33.56	32.34	31.56	28.60	27.35	25.18	20.91	14.38	6.50	6.50	6.50	6.50
34	40.00	45.80	48.62	43.63	39.45	36.56	34.77	32.62	30.89	31.00	27.79	22.82	14.07	6.50	6.50	6.50	6.50
35	51.05	56.02	57.04	52.16	47.15	41.23	36.86	34.64	34.31	33.97	30.96	23.92	14.75	6.50	6.50	6.50	6.50
36	63.87	64.20	63.54	61.55	56.20	50.41	44.50	39.45	37.24	36.19	32.31	25.37	16.83	6.50	6.50	6.50	6.50
37	63.39	62.72	62.05	61.32	60.15	58.82	52.94	47.95	45.16	41.36	37.23	29.79	19.00	9.45	6.50	6.50	6.50
38	61.89	61.02	59.86	58.71	57.49	56.28	55.00	53.73	51.28	46.80	42.70	38.51	21.14	12.17	6.50	6.50	6.50
39	59.64	58.47	57.31	56.10	54.90	53.64	52.34	51.16	50.22	49.30	48.17	46.61	28.61	13.57	6.50	6.50	6.50
40	57.15	55.98	54.78	53.54	52.31	51.14	50.19	49.24	48.32	47.41	46.27	44.73	35.64	15.27	6.50	6.50	6.50
41	54.70	53.50	52.27	51.13	50.15	49.20	48.26	47.32	46.42	45.49	44.39	42.86	37.30	18.72	8.56	6.50	6.50
42	52.24	51.11	50.12	49.15	48.19	47.25	46.30	45.40	44.48	43.59	42.49	41.14	32.78	18.98	10.87	6.50	6.50
43	50.09	49.10	48.13	47.15	46.22	45.26	44.36	43.43	42.53	41.65	40.87	38.44	29.59	18.72	12.72	6.50	6.50
44	48.04	47.08	46.08	45.16	44.20	43.28	42.36	41.48	40.89	40.30	39.56	37.78	28.88	18.00	13.59	6.50	6.50
45	46.00	45.01	44.07	43.11	42.18	41.35	40.77	40.19	39.60	39.00	38.26	37.06	28.17	17.30	13.89	8.11	6.50
46	43.96	42.95	42.04	41.23	40.66	40.07	39.49	38.90	38.30	37.72	36.96	35.92	27.47	16.59	14.66	14.91	6.50
47	41.92	41.14	40.54	39.97	39.38	38.80	38.21	37.61	37.03	36.42	35.66	34.61	26.77	16.06	15.73	15.77	6.50
48	40.51	39.90	39.28	38.70	38.11	37.54	36.93	36.34	35.75	35.13	34.38	33.31	26.07	17.57	16.77	16.73	6.50
49	39.27	38.66	38.04	37.44	36.86	36.26	35.67	35.08	34.46	33.86	33.09	32.02	25.77	19.12	17.87	17.52	6.50
50	38.03	37.41	36.80	36.19	35.60	35.00	34.41	33.80	33.19	32.58	31.81	31.09	25.68	20.45	19.00	18.09	6.50
51	36.78	36.17	35.56	34.94	34.34	33.75	33.14	32.53	31.92	31.44	31.00	30.42	25.59	21.40	20.15	18.70	10.72
52	35.53	34.92	34.31	33.70	33.09	32.49	31.88	31.42	31.22	31.01	30.34	29.74	25.50	22.34	21.27	19.09	15.34
53	34.29	33.67	33.06	32.45	31.85	31.41	31.20	31.00	30.79	30.56	29.80	29.11	25.41	23.28	22.27	19.43	16.07
54	33.05	32.42	31.81	31.40	31.19	30.98	30.78	30.57	30.36	30.10	29.35	28.45	25.96	24.22	22.91	19.76	16.11
55	44.16	36.27	32.51	30.97	30.76	30.56	30.35	30.14	29.93	29.64	28.89	27.84	26.97	25.16	23.02	19.78	16.13
56	57.87	49.97	45.50	40.38	35.35	32.03	30.88	29.72	29.51	29.19	30.93	31.57	26.40	25.31	23.00	19.84	16.15
57	69.14	62.53	57.50	52.68	48.66	44.85	42.70	40.35	38.93	37.04	35.88	36.51	25.74	24.65	23.11	19.92	16.18
58	80.66	76.85	70.83	65.72	62.21	59.29	56.57	54.47	51.28	45.26	42.06	37.75	26.32	23.90	22.50	20.03	16.21
59	79.49	79.27	79.05	78.84	78.21	74.05	71.76	68.96	63.25	55.19	47.74	38.84	27.41	22.84	21.37	19.85	16.25
60	78.64	78.42	78.20	77.99	77.77	77.57	77.36	77.15	75.40	65.23	54.61	44.38	27.97	21.63	20.04	18.32	16.42
61	77.79	77.57	77.36	77.14	76.92	76.71	76.51	76.30	76.09	71.36	62.55	50.06	24.85	20.71	18.85	17.00	14.56
62	76.99	76.73	76.51	76.29	76.07	75.86	75.65	75.44	75.23	69.70	62.21	52.05	33.97	19.80	17.75	15.70	11.58
63	76.26	75.96	75.66	75.44	75.22	75.01	74.80	74.59	74.32	71.10	64.47	56.52	47.72	26.87	16.78	14.88	6.50
64	75.36	75.04	74.75	74.45	74.16	73.95	73.73	73.52	73.17	72.57	71.82	69.05	60.96	50.13	24.66	13.25	6.50
65	74.73	74.29	73.87	73.45	73.02	72.62	72.28	72.03	71.58	70.97	70.22	65.76	62.29	66.68	40.21	19.96	6.50
66	74.77	74.29	73.82	73.34	72.86	72.38	71.91	71.37	70.57	69.77	68.76	68.41	75.64	65.80	40.23	23.64	6.50
67	74.53	74.00	73.47	72.94	72.40	71.86	71.18	70.37	69.57	68.77	67.76	66.04	57.73	47.17	33.98	20.92	6.50
68	74.81	74.24	73.66	73.09	72.51	72.05	71.13	70.20									

E.3 MODEL RESULTS

A series of monitoring points were included in the modeling to allow analysis of constituent migration and the eventual concentrations in Surficial discharge to surface water. The monitoring points included wells, drain cells representing Mine Creek, and river cells representing Spring Creek. The transport of constituents is concentrated primarily in the Mine Creek area. The bulk of the seepage from the tailings migrates in the more transmissive areas of the Surficial aquifer.

E.3.1 URANIUM TRANSPORT

Figures E.3-1 and E.3-2 present the predicted uranium concentration in the POC wells and two other wells in the general Mine Creek area. The two POC wells, RPI-19B and NP01, and well RPI-20A are located near the Mine Creek channel. The predicted peak concentrations in these wells are similar and the shape of the concentration curves reflects the distance from the tailings and a lateral distance from the heart of the Mine Creek channel.

Figures E.3-3 and E.3-4 present the predicted uranium concentration in selected drain cells and river cells, respectively. Discharge from the drain and river cells enters Spring Creek and combines with the base flow to give a composite concentration. The concentration curve for each of the cells is a function of hydraulic remoteness from the tailings source and the ratio of tailings seepage to natural recharge. In Figure E.3-3, the slight difference in the concentration curves for the ten Mine Creek drain cells results primarily from the increasing distance from the tailings with descending row number. Each of the drain cells is located in the heart of the Mine Creek channel in relatively similar materials.

The Spring Creek river cells are distributed along the model reach with a concentration of cells in the vicinity of Mine Creek. The large differences in concentration curves for the ground-water discharge to the river cells reflect the heterogeneity of hydraulic properties and the resulting differences in hydraulic remoteness of cells. Cell 18, 4 is on the upgradient reach of the Spring Creek and shows virtually no impact from tailings

seepage. Cell 11,35 is located slightly north and west of the historic Mine Creek plume area and shows dramatically delayed and attenuated impacts (Figure E.3-4). As the cells get closer to the more transmissive region of the Mine Creek channel, the concentration curve becomes more similar to those of the Mine Creek drain cells with a larger peak concentration and generally a shorter time to the decay of the concentration curve.

The combination of the ground-water discharge to Mine Creek and Spring Creek and the base flow in Spring Creek gives a composite uranium concentration. Baseline uranium concentration in Spring Creek is low (approximately 0.02 mg/l) and the majority of the uranium concentration comes from the ground-water discharge in the Mine Creek area. The analysis of the composite uranium concentration was done by averaging the concentration in 12 river cells at the middle and end of each stress period in the modeling. The concentration in 10 drain cells was also averaged at the middle and end of each stress period. The ground-water discharge rate for the river and drain cells for each stress period was then multiplied by the corresponding average concentration, and numerically composited with a Spring Creek base flow of 290 gpm. This compositing technique gives a maximum uranium concentration in Spring Creek of 0.15 mg/l in approximately 2011.

E.3.2 THORIUM-230 TRANSPORT

Figures E.3-5 and E.3-6 present the predicted thorium-230 activity in the POC wells and two other wells in the general Mine Creek area. The two POC wells, RPI-19B and NP01, and well RPI-20A are located near the Mine Creek channel. The predicted peak concentrations in these wells are similar and the shape of the concentration curves reflects the distance from the tailings and a lateral distance from the heart of the Mine Creek channel.

Figures E.3-7 and E.3-8 present the predicted thorium-230 activity in selected drain cells and river cells, respectively. The technique for compositing the ground-water discharge and base flow in Spring Creek was described in the previous section. This compositing

technique gives a maximum thorium-230 activity in Spring Creek of 0.28 pCi/l in approximately 2011. This value was rounded to 0.30 pCi/l because of the measurement resolution for thorium-230 activity.

C-31

E.3-5

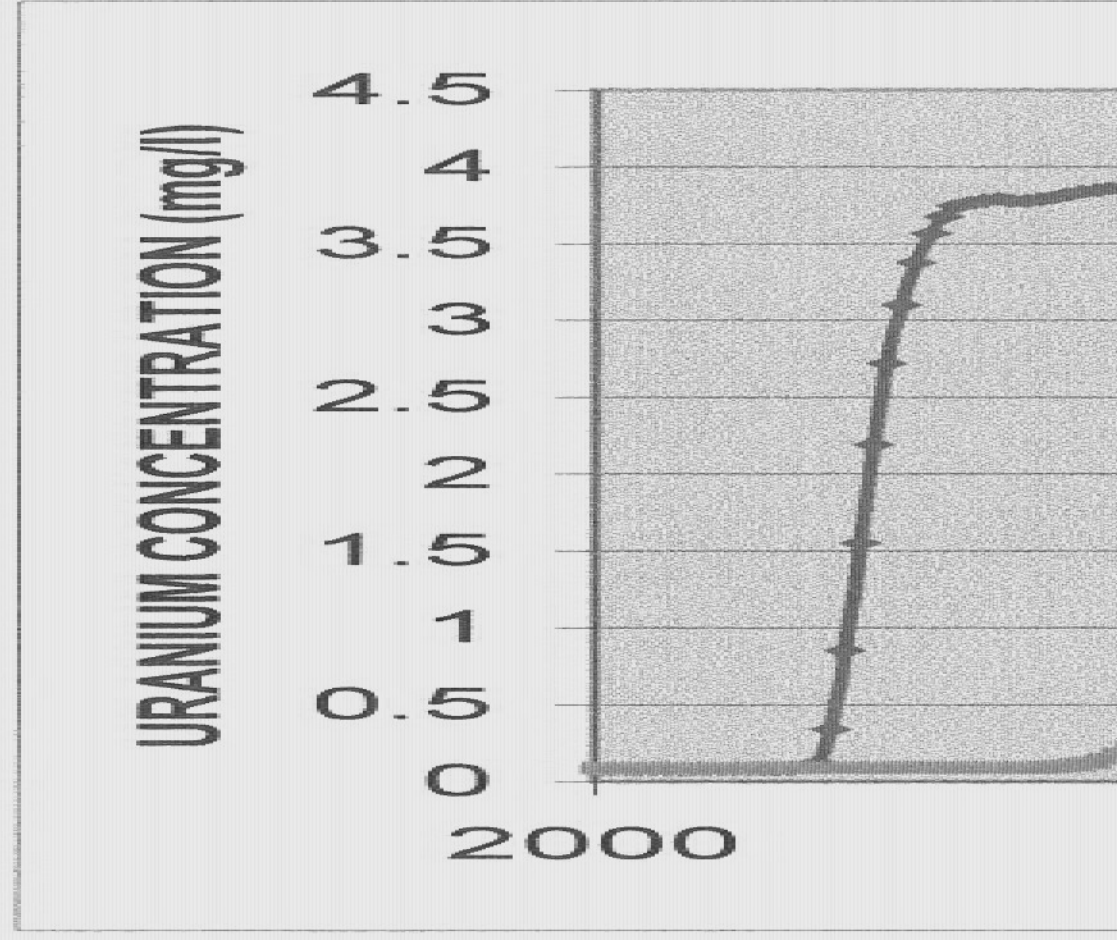


FIGURE E.3-2. PRED

(32

E.3-6

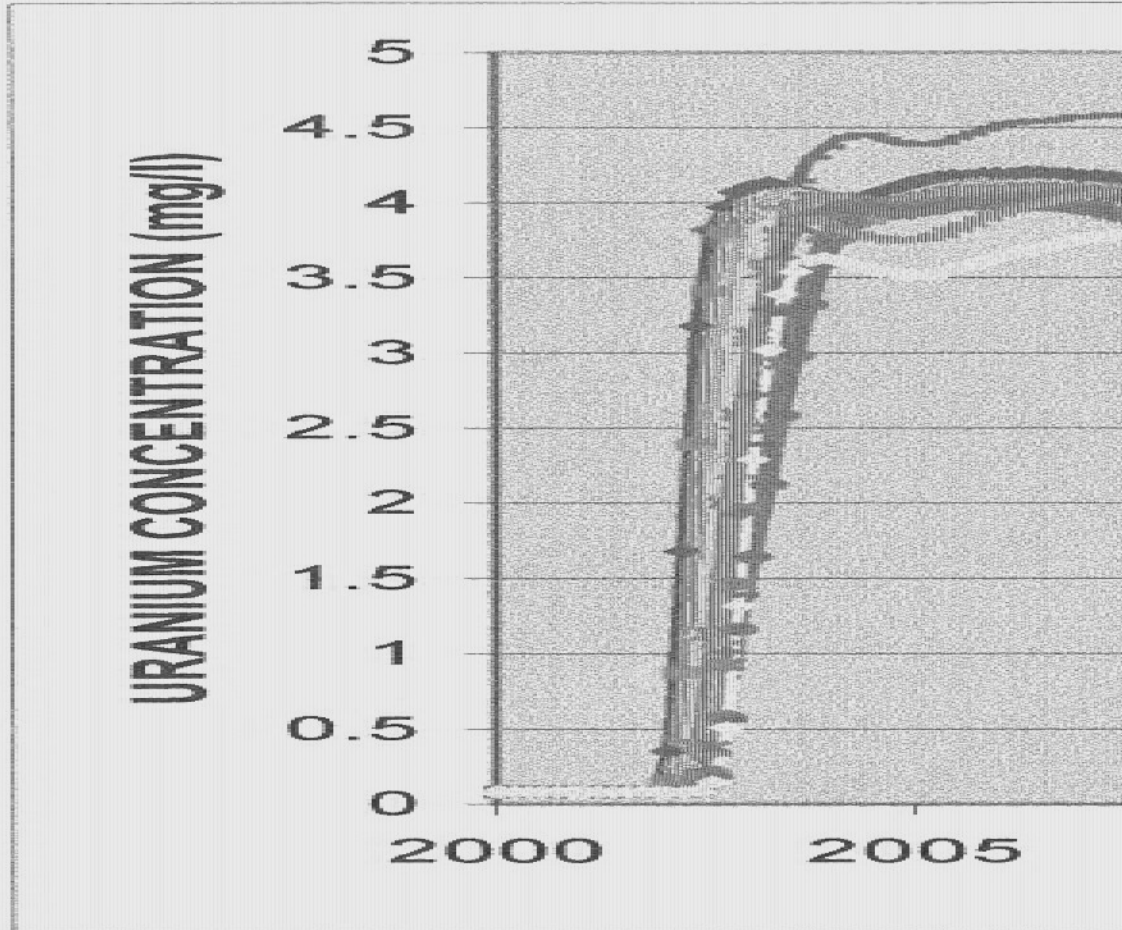


FIGURE E.3-3. PREDICTE

E-37

E.3-7

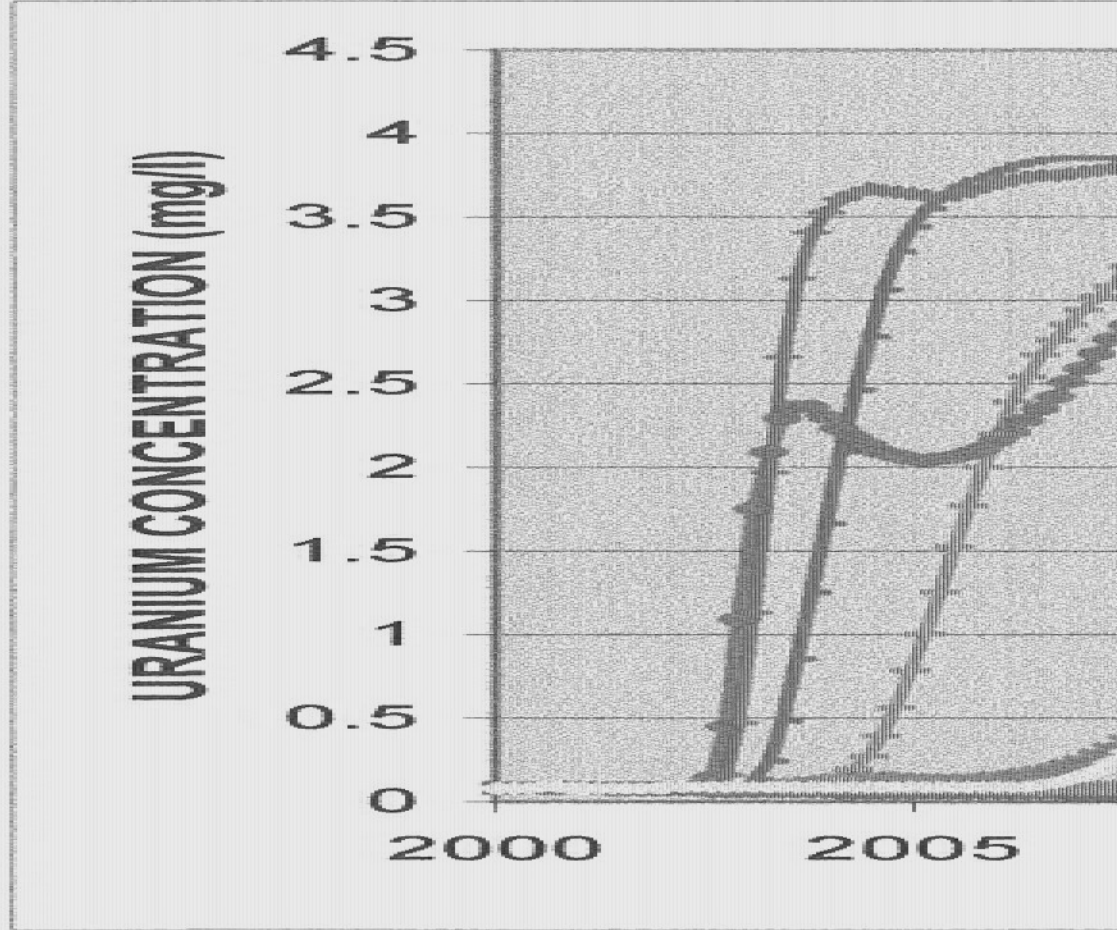


FIGURE E.3-4. PREDICTED URANIUM CONCENTRATION AT SELECTED MONITORING POINTS

E-34

E.3-8

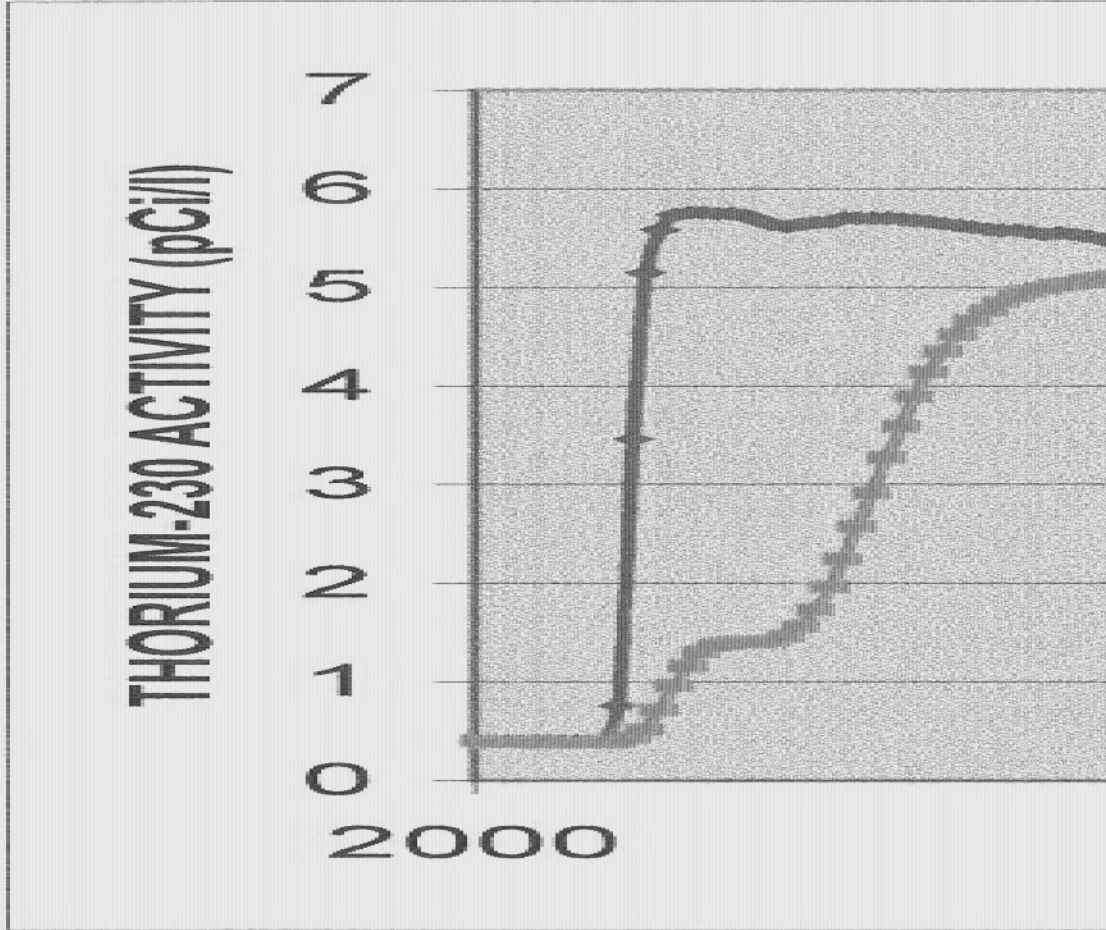


FIGURE E.3-5. PREP

6-35

E.3-9

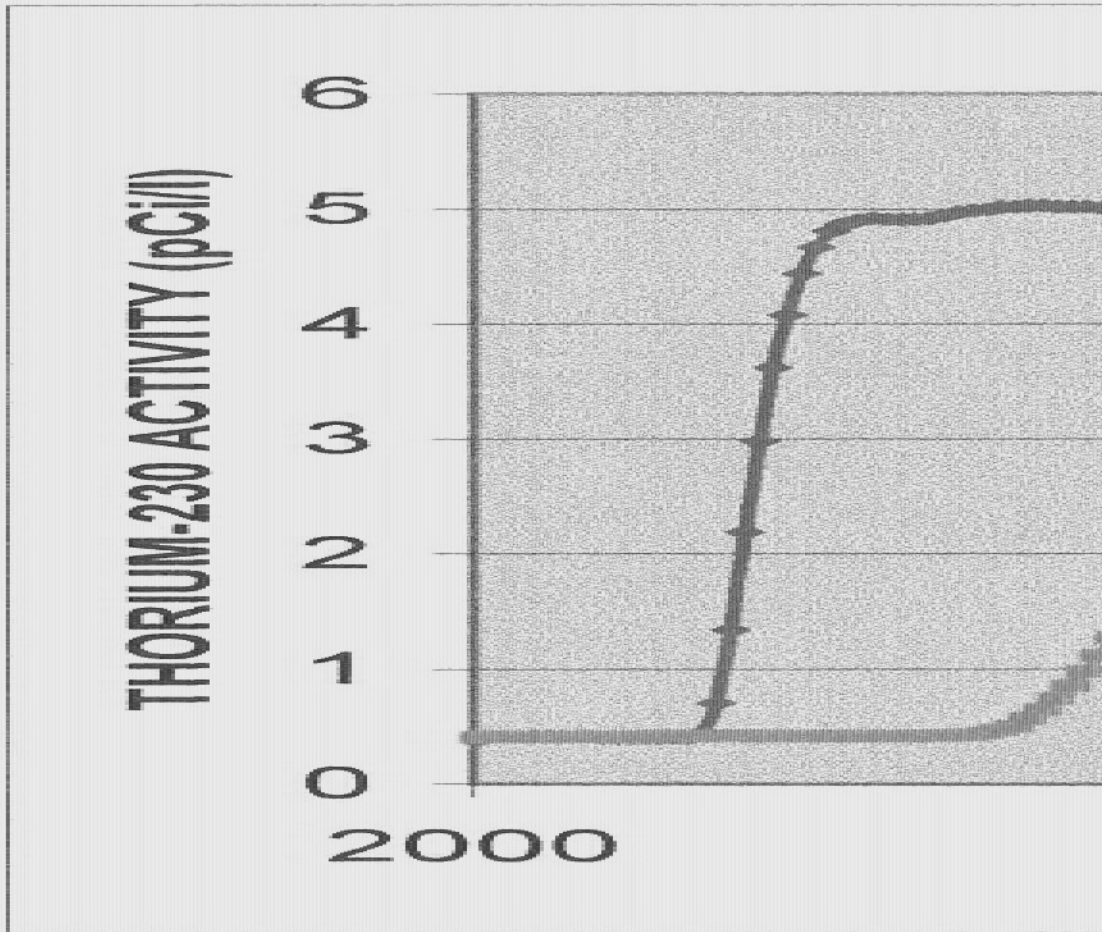


FIGURE E.3-6. PRED

C-26

E.3-10

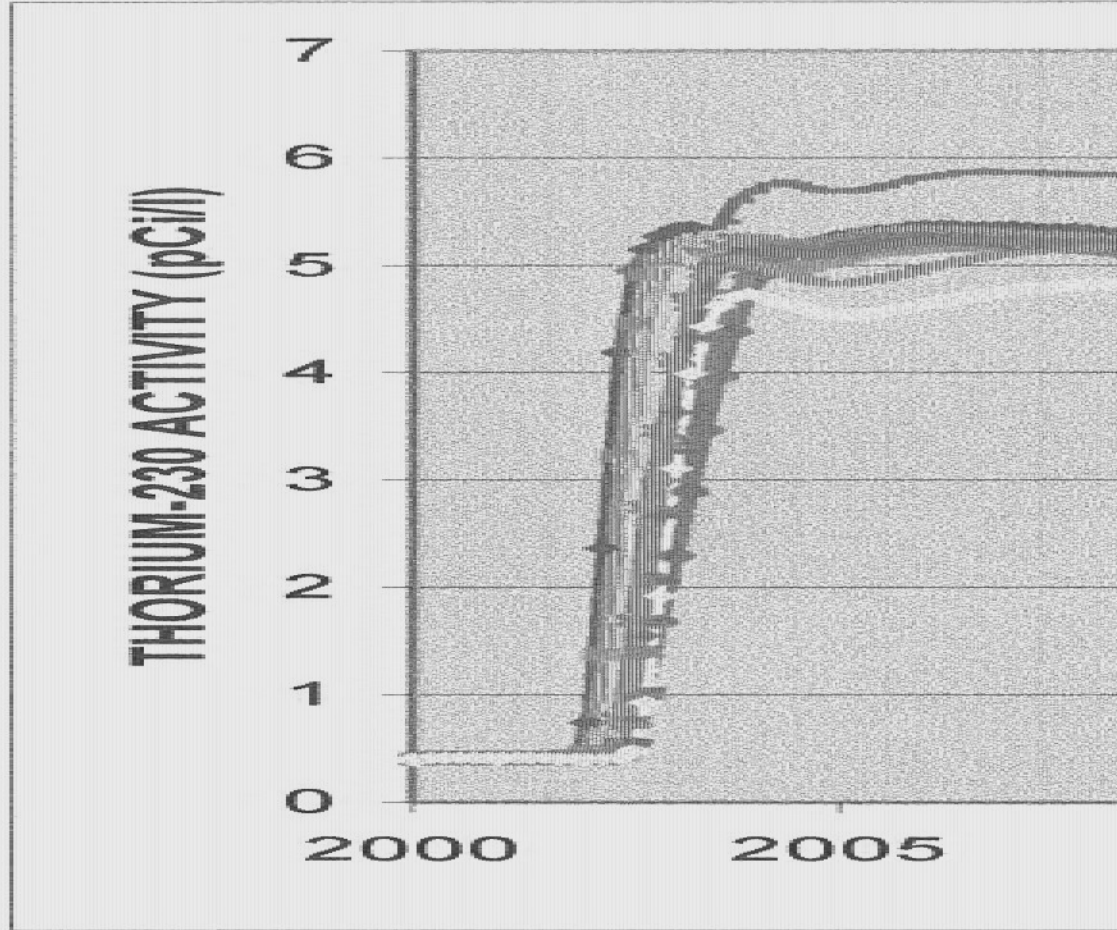


FIGURE E.3-7. PREDIC

0.37

E.3-11

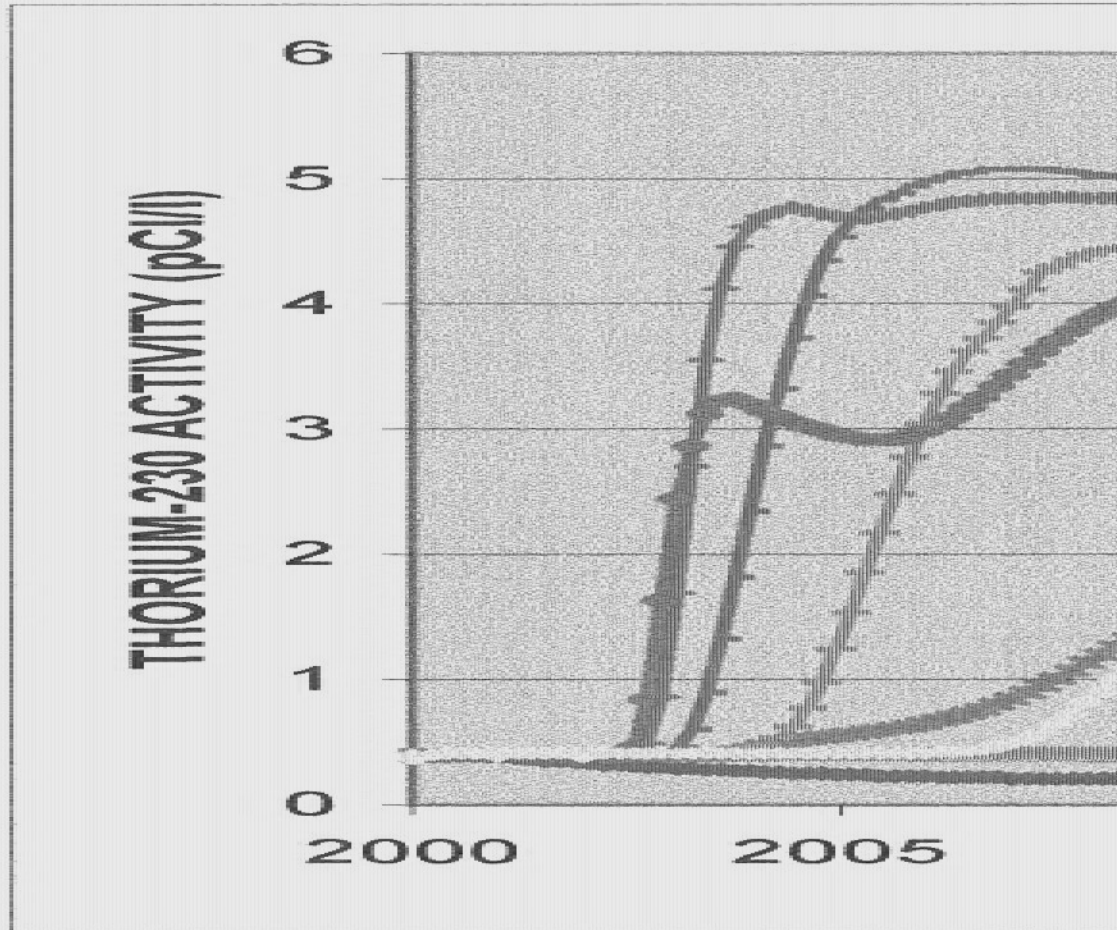


FIGURE E.3-8. PREDICTED THORIUM-230 ACTIVITY AT SELECTED LOCATIONS

E.4 SUMMARY AND CONCLUSION

The modeling of uranium and thorium-230 transport produced results that indicate the critical combination of ground-water discharge and base flow will occur in approximately 2011. The compositing of the ground-water discharge with the Spring Creek base flow is done with conservative assumptions of a modest late season flow and no retardation or attenuation of the constituent transport. Any attenuating processes will slow down constituent migration, or in some cases, reduce the concentration or activity of constituents by a permanent absorption or precipitation process. These conservative approaches combine to produce an upper bound estimate of the maximum constituent concentrations or activities in Spring Creek. The variation of scenario #2 described in Appendix D was also considered as an additional sensitivity test. This variation reduced the operational time of the injection/recharge systems and the collection below the toe of the No. 5 Dam by six months to the end of year 2000. No changes were made in the MT3D modeling approach. Rather, the differences in contaminant migration resulted from the minor changes in the flow components of the modeling. The maximum predicted uranium concentration at the POE under this variation increased to 0.153 mg/l from 0.150 mg/l predicted by the original scenario #2 simulation. This increase is within measurement resolution as well as the modeling resolution with conservative assumptions. This leads to the conclusion that the variation of the proposed corrective action program is an acceptable alternative.

E.5 REFERENCES

S.S. Papadopoulos and Associates, Inc., 1992. MT3D, A Modular Three-Dimensional Transport Model, Version 1.5. Bethesda, Maryland, 20814.

APPENDIX F

SUMMARY WATER QUALITY STATISTICS

TABLE F-1. SUMMARY STATISTICS FOR WELL MC14

TABLE F-1. SUMMARY STATISTICS FOR WELL MC14.

	WELL MC14 CHLORIDE		WELL MC14 SULFATE		WELL MC14 TDS		WELL MC14 CONDUCTIVITY	
Percentage Non-detects	3.80	Percentage Non-detects	0	Percentage Non-detects	0	Percentage Non-detects	0	
Largest Value	17.9	Largest Value	129	Largest Value	594	Largest Value	1122	
2nd Largest Value	16	2nd Largest Value	51	2nd Largest Value	508	2nd Largest Value	792	
3rd Largest Value	14	3rd Largest Value	47.5	3rd Largest Value	478	3rd Largest Value	726	
4th Largest Value	12	4th Largest Value	45.7	4th Largest Value	476	4th Largest Value	725	
5th Largest Value	10	5th Largest Value	41.7	5th Largest Value	453	5th Largest Value	708	
	<i>Column1</i>		<i>Column1</i>		<i>Column1</i>		<i>Column1</i>	
Mean	6.035949	Mean	26.05696	Mean	350.0423	Mean	565.0822	
Standard Error	0.343212	Standard Error	1.505772	Standard Error	6.928216	Standard Error	13.77631	
Median	5.3	Median	24	Median	347	Median	536	
Mode	8	Mode	24	Mode	350	Mode	485	
Standard Deviation	3.050531	Standard Deviation	13.3836	Standard Deviation	58.37818	Standard Deviation	117.7049	
Sample Variance	9.30574	Sample Variance	179.1207	Sample Variance	3408.012	Sample Variance	13854.44	
Kurtosis	3.46012	Kurtosis	45.73876	Kurtosis	5.098815	Kurtosis	5.352978	
Skewness	1.241894	Skewness	6.141932	Skewness	1.091804	Skewness	1.563144	
Range	17.4	Range	116.6	Range	408	Range	707	
Minimum	0.5	Minimum	12.4	Minimum	186	Minimum	415	
Maximum	17.9	Maximum	129	Maximum	594	Maximum	1122	
Sum	476.84	Sum	2058.5	Sum	24853	Sum	41251	
Count	79	Count	79	Count	71	Count	73	
Confidence Level(95.0%)	0.683282	Confidence Level(95.0%)	2.997763	Confidence Level(95.0%)	13.81788	Confidence Level(95.0%)	27.46256	
Non-parametric		Non-parametric		Non-parametric		Non-parametric		
Upper 95th % Mean Value	6.719231	Upper 95th % Mean Value	29.05473	Upper 95th % Mean Value	363.8601	Upper 95th % Mean Value	592.5448	
Parametric 95% EPA		Parametric 95% EPA		Parametric 95% EPA		Parametric 95% EPA		
Table 5 K Value	1.969	Table 5 K Value	1.969	Table 5 K Value	1.989508	Table 5 K Value	1.98403	
Parametric 95%		Parametric 95%		Parametric 95%		Parametric 95%		
Upper Tolerance Limit	12.04244	Upper Tolerance Limit	52.40927	Upper Tolerance Limit	466.1861	Upper Tolerance Limit	798.6122	

TABLE F-1. SUMMARY STATISTICS FOR WELL MC14 (continued).

	WELL MC14 URANIUM		WELL MC14 THORIUM-230		WELL MC14 RADIUM-226 + RADIUM-228		WELL MC14 SELENIUM	
Percentage Non-detects	0.00	Percentage Non-detects	34.69388	Percentage Non-detects	54.16667	Percentage Non-detects	86.84211	
Largest Value	0.13*	Largest Value	3**	Largest Value	19.5	Largest Value	0.015	
2nd Largest Value	0.12	2nd Largest Value	1.2	2nd Largest Value	11.7	2nd Largest Value	0.002	
3rd Largest Value	0.112	3rd Largest Value	1	3rd Largest Value	6.3	3rd Largest Value	0.001	
4th Largest Value	0.11	4th Largest Value	0.8	4th Largest Value	5.5	4th Largest Value	0	
5th Largest Value	0.1	5th Largest Value	0.7	5th Largest Value	5.2	5th Largest Value	0	
	<i>Column1</i>		<i>Column1</i>		<i>Column1</i>		<i>Column1</i>	
Mean	0.082842	Mean	0.404082	Mean	2.985417	Mean	0.001763	
Standard Error	0.002709	Standard Error	0.068509	Standard Error	0.89483	Standard Error	0.000737	
Median	0.08	Median	0.2	Median	1.475	Median	0.0005	
Mode	0.08	Mode	0.1	Mode	0.6	Mode	0.0005	
Standard Deviation	0.021161	Standard Deviation	0.479565	Standard Deviation	4.383752	Standard Deviation	0.004542	
Sample Variance	0.000448	Sample Variance	0.229983	Sample Variance	19.21728	Sample Variance	2.06E-05	
Kurtosis	1.619818	Kurtosis	17.48346	Kurtosis	8.902309	Kurtosis	20.81171	
Skewness	-0.073028	Skewness	3.544521	Skewness	2.856629	Skewness	4.508126	
Range	0.12	Range	2.9	Range	19.3	Range	0.0245	
Minimum	0.01	Minimum	0.1	Minimum	0.2	Minimum	0.0005	
Maximum	0.13	Maximum	3	Maximum	19.5	Maximum	0.025	
Sum	5.05338	Sum	19.8	Sum	71.65	Sum	0.067	
Count	61	Count	49	Count	24	Count	38	
Confidence Level(95.0%)	0.00542	Confidence Level(95.0%)	0.137747	Confidence Level(95.0%)	1.851093	Confidence Level(95.0%)	0.001493	
Non-parametric		Non-parametric		Non-parametric		Non-parametric		
Upper 95th % Mean Value	0.088262	Upper 95th % Mean Value	0.541829	Upper 95th % Mean Value	4.83651	Upper 95th % Mean Value	0.003256	
Parametric 95% EPA		Parametric 95% EPA		Parametric 95% EPA		Parametric 95% EPA		
Table 5 K Value	2.021358	Table 5 K Value	2.073833	Table 5 K Value	2.325465	Table 5 K Value	2.146734	
Parametric 95%		Parametric 95%		Parametric 95%		Parametric 95%		
Upper Tolerance Limit	0.125616	Upper Tolerance Limit	1.39862	Upper Tolerance Limit	13.17968	Upper Tolerance Limit	0.011514	

* One outlier (0.68 mg/l) removed

** One outlier (6.2 pCi/l) removed

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TABLE F-1. SUMMARY STATISTICS FOR WELL MC14 (continued).

	WELL MC14 GROSS ALPHA		WELL MC14 BARIUM		WELL MC14 BERYLLIUM		WELL MC14 CADMIUM	
Percentage Non-detects	45.83	Percentage Non-detects	76	Percentage Non-detects	95.83333	Percentage Non-detects	100	
Largest Value	25.6	Largest Value	0.5	Largest Value	0.03	Largest Value	0	
2nd Largest Value	23	2nd Largest Value	- 0.21	2nd Largest Value	0	2nd Largest Value	0	
3rd Largest Value	18.4	3rd Largest Value	0.16	3rd Largest Value	0	3rd Largest Value	0	
4th Largest Value	14.3	4th Largest Value	0.15	4th Largest Value	0	4th Largest Value	0	
5th Largest Value	7.3	5th Largest Value	0.12	5th Largest Value	0	5th Largest Value	0	
	<i>Column1</i>		<i>Column1</i>		<i>Column1</i>		<i>Column1</i>	
Mean	5.333333	Mean	0.0896	Mean	0.008542	Mean	0.004567	
Standard Error	1.512049	Standard Error	0.019403	Standard Error	0.002412	Standard Error	0.000275	
Median	2.2	Median	0.05	Median	0.005	Median	0.005	
Mode	0.5	Mode	0.05	Mode	0.005	Mode	0.005	
Standard Deviation	7.407497	Standard Deviation	0.097017	Standard Deviation	0.011816	Standard Deviation	0.001507	
Sample Variance	54.87101	Sample Variance	0.009412	Sample Variance	0.00014	Sample Variance	2.27E-06	
Kurtosis	2.342008	Kurtosis	13.91064	Kurtosis	6.203345	Kurtosis	5.092252	
Skewness	1.805511	Skewness	3.496886	Skewness	2.512693	Skewness	0.996435	
Range	25.1	Range	0.45	Range	0.0475	Range	0.008	
Minimum	0.5	Minimum	0.05	Minimum	0.0025	Minimum	0.002	
Maximum	25.6	Maximum	0.5	Maximum	0.05	Maximum	0.01	
Sum	128	Sum	2.24	Sum	0.205	Sum	0.137	
Count	24	Count	25	Count	24	Count	30	
Confidence Level(95.0%)	3.127907	Confidence Level(95.0%)	0.040047	Confidence Level(95.0%)	0.00499	Confidence Level(95.0%)	0.000563	
Non-parametric		Non-parametric		Non-parametric		Non-parametric		
Upper 95th % Mean Value	8.461241	Upper 95th % Mean Value	0.129647	Upper 95th % Mean Value	0.013531	Upper 95th % Mean Value	0.005129	
Parametric 95% EPA		Parametric 95% EPA		Parametric 95% EPA		Parametric 95% EPA		
Table 5 K Value	2.325465	Table 5 K Value	2.306392	Table 5 K Value	2.325465	Table 5 K Value	2.229565	
Parametric 95%		Parametric 95%		Parametric 95%		Parametric 95%		
Upper Tolerance Limit	22.55921	Upper Tolerance Limit	0.31336	Upper Tolerance Limit	0.03602	Upper Tolerance Limit	0.007927	

TABLE F-1. SUMMARY STATISTICS FOR WELL MC14 (continued).

WELL MC14 CHROMIUM		WELL MC14 LEAD		WELL MC14 MOLYDENUM		WELL MC14 NICKEL	
Percentage Non-detects	100.00	Percentage Non-detects	100	Percentage Non-detects	100	Percentage Non-detects	96.77419
Largest Value	0	Largest Value	0	Largest Value	0	Largest Value	0.05
2nd Largest Value	0	2nd Largest Value	0	2nd Largest Value	0	2nd Largest Value	0
3rd Largest Value	0	3rd Largest Value	0	3rd Largest Value	0	3rd Largest Value	0
4th Largest Value	0	4th Largest Value	0	4th Largest Value	0	4th Largest Value	0
5th Largest Value	0	5th Largest Value	0	5th Largest Value	0	5th Largest Value	0
<i>Column 1</i>		<i>Column 1</i>		<i>Column 1</i>		<i>Column 1</i>	
Mean	0.020403	Mean	0.024231	Mean	0.043871	Mean	0.025484
Standard Error	0.001556	Standard Error	0.000769	Standard Error	0.0026	Standard Error	0.001379
Median	0.025	Median	0.025	Median	0.05	Median	0.025
Mode	0.025	Mode	0.025	Mode	0.05	Mode	0.025
Standard Deviation	0.008663	Standard Deviation	0.003922	Standard Deviation	0.014475	Standard Deviation	0.007676
Sample Variance	7.5E-06	Sample Variance	1.54E-06	Sample Variance	0.00021	Sample Variance	5.89E-06
Kurtosis	-0.062114	Kurtosis	26	Kurtosis	2.607388	Kurtosis	7.365802
Skewness	-1.388722	Skewness	-5.09902	Skewness	-2.068377	Skewness	1.540505
Range	0.0225	Range	0.02	Range	0.045	Range	0.045
Minimum	0.0025	Minimum	0.005	Minimum	0.005	Minimum	0.005
Maximum	0.025	Maximum	0.025	Maximum	0.05	Maximum	0.05
Sum	0.6325	Sum	0.63	Sum	1.36	Sum	0.79
Count	31	Count	26	Count	31	Count	31
Confidence Level(95.0%)	0.003177	Confidence Level(95.0%)	0.001584	Confidence Level(95.0%)	0.005309	Confidence Level(95.0%)	0.002816
Non-parametric		Non-parametric		Non-parametric		Non-parametric	
Upper 95th % Mean Value	0.023581	Upper 95th % Mean Value	0.025815	Upper 95th % Mean Value	0.04918	Upper 95th % Mean Value	0.0283
Parametric 95% EPA		Parametric 95% EPA		Parametric 95% EPA		Parametric 95% EPA	
Table 5 K Value	2.217044	Table 5 K Value	2.288753	Table 5 K Value	2.217044	Table 5 K Value	2.217044
Parametric 95%		Parametric 95%		Parametric 95%		Parametric 95%	
Upper Tolerance Limit	0.039609	Upper Tolerance Limit	0.033208	Upper Tolerance Limit	0.075962	Upper Tolerance Limit	0.042502

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