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United States Department of Energy

Final Environmental Impact Statement

REMEDIAL ACTIONS AT THE FORMER CLIMAX URANIUM COMPANY URANIUM MILL SITE GRAND JUNCTION, MESA COUNTY, COLORADO

VOLUME II - APPENDICES

DECEMBER, 1986

U.S. DEPARTMENT OF ENERGY

Uranium Mill Tailings Remedial Action Project

UMTRAP

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HYDROLOGY REPORT

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F.1.1 SURFACE-WATER FEATURES

F.1.1.1 Grand Junction tailings site

The tailings pile at the Grand Junction site is on the north side of the Colorado River about 0.75 mile upstream from its confluence with the Gunnison River (Figure F.1.1). The Colorado River is braided by several islands from the upstream end of the pile to a point about 0.5 mile past its downstream end. The northern channel of the braided segment passes extremely close to the toe of the pile.

The northern edge of the tailings varies between 4569 and 4578 feet above sea level. The stream bed of the Colorado River is about 4559 feet above sea level.

The southern side of the river banks against a steep cliff, approximately 60 feet high, with the lower segment composed of Mancos Shale.

The northern bank of the river along the site boundary is now stabilized to some degree with riprap, consisting of broken slabs and blocks of concrete, bricks, and "river-run" gravels. The crest of the protective bank is about 15 feet above the surface of the river.

There are industrial and residential developments around the tailings site. A highway and a railroad bridge are located less than 3500 feet downstream of the site and another highway bridge is located further downstream.

The only surface-water bodies at the site are two drainage ditches that divert overland runoff around the tailings pile to the Colorado River. One drainage ditch, east of the pile, extends to the east of the abandoned filtration plant (Figure F.1.2) and along the upstream face of the pile to the Colorado River. The other drainage ditch is on the west (downstream) side of the pile and runs from the mill site to the Colorado River.

The basin upstream of the site comprises 8150 square miles of steeply sloped terrain. The basin is bounded on the north by basins of the White and North Platte Rivers; on the east by basins of the South Platte and Arkansas Rivers; and on the south by the Gunnison River Basin. Major tributaries to the upper Colorado River include the Roaring Fork River, Eagle River, and Blue River. Elevations in the basin range from 4560 feet at Grand Junction to more than 14,000 feet in the highest headwater areas. Watershed boundaries are shown in Figure F.1.3. Approximate drainage areas, channel lengths, and slopes for the streams taken from USGS topographic maps are presented in Table F.1.1.

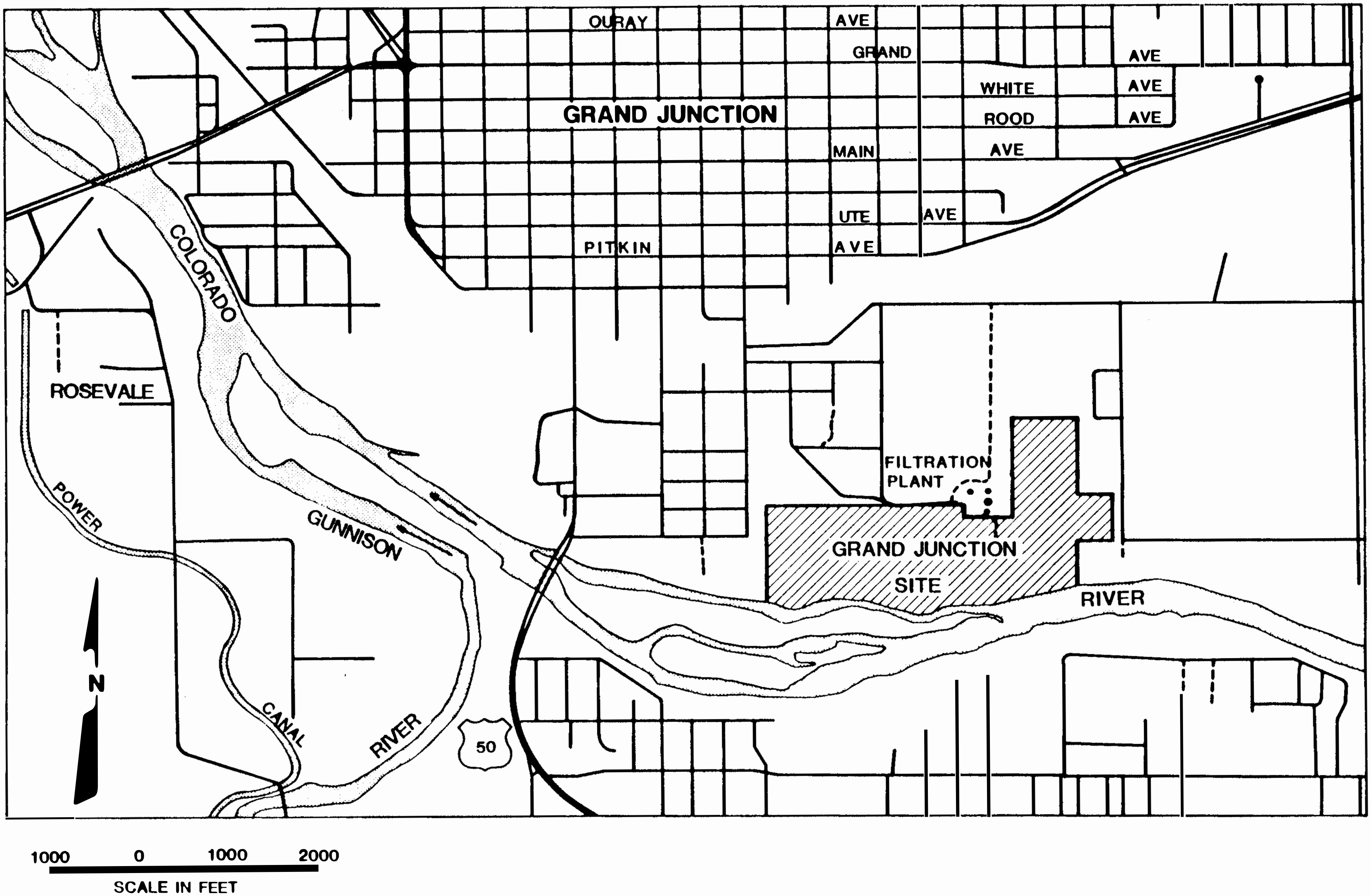


FIGURE F.1.1
LOCATION OF GRAND JUNCTION SITE

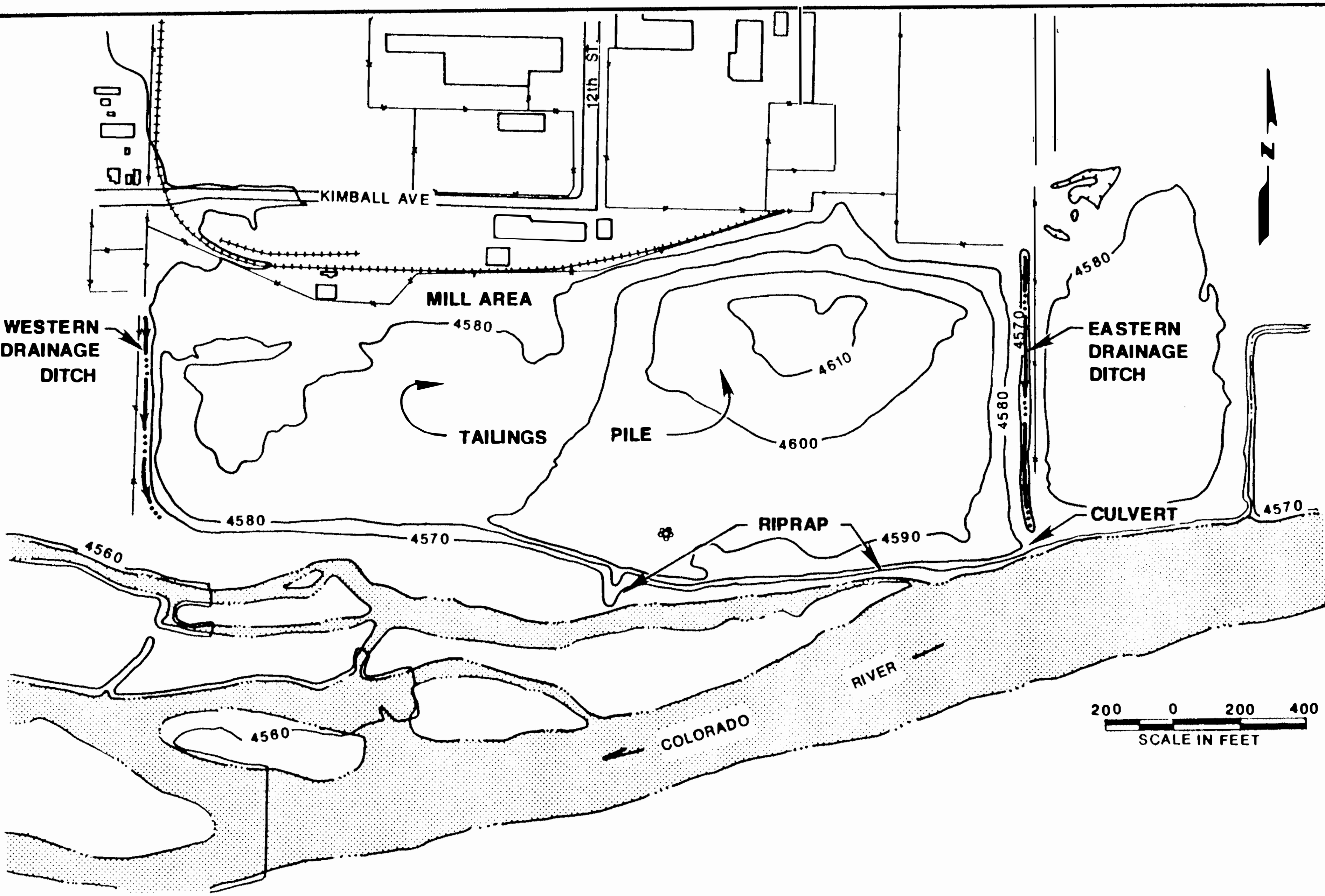


FIGURE F.1.2
DRAINAGE CHARACTERISTIC – GRAND JUNCTION SITE

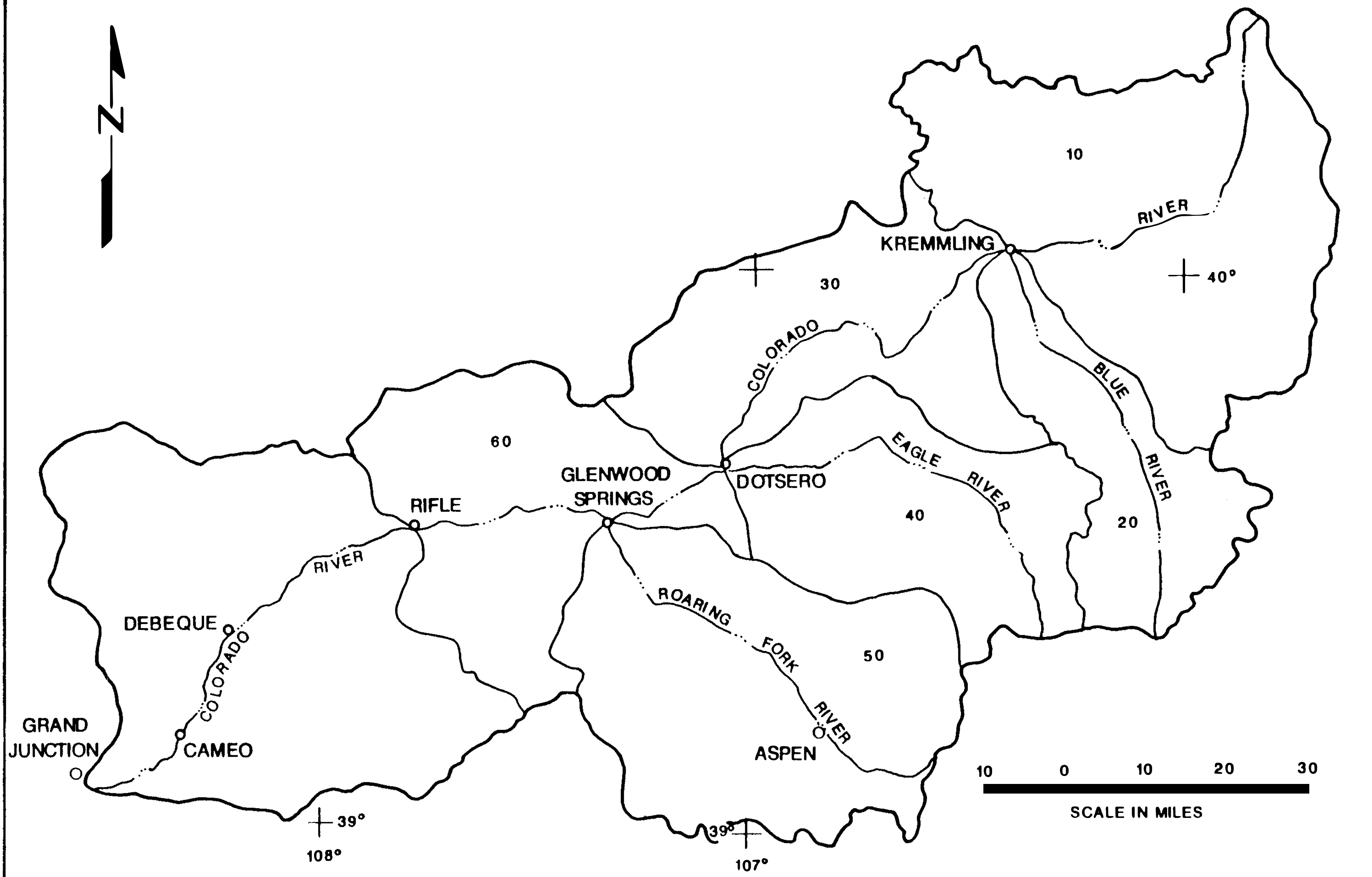


FIGURE F.1.3
WATERSHED BOUNDARY MAP OF COLORADO RIVER ABOVE GRAND JUNCTION, COLORADO

Table F.1.1 Select characteristics of subbasins of the Colorado River above Grand Junction, Colorado

Watershed	Area (square miles)	Channel length (miles)	Elevation (feet)	Slope (ft/ft)
Colorado River above Kremmling	1648	56.8	10,100-7200	0.009
Blue River	668	56.8	12,500-7200	0.017
Colorado River between Kremmling and Dotsero	1147	56.0	7200-6250	0.003
Eagle River	965	54.8	10,200-6250	0.013
Roaring Fork	1450	60.0	13,000-5700	0.022
Colorado River between Dotsero and Rifle	1072	42.0	6250-5300	0.004
Colorado River between Rifle and Grand Junction	1200	57.6	5300-4560	0.002
TOTAL	8150			

Detailed geologic descriptions of the site area and the lower portions of the drainage basin are contained in Appendix E, Soils, Geologic, and Seismic Information.

Soils in the watershed are mostly deep to moderately deep, well drained residuals of sandstones and mudstones. The Soil Conservation Service (SCS) classified most of the soils as hydrologic group B interspersed with some C soils and minor amounts of A and D soils (USDA, 1978; 1982; 1983).

The climate of the area ranges from semi-arid to mountainous, with yearly precipitation averaging about eight inches at Grand Junction, 10 to 15 inches near Rifle, and 40 inches in the headwater regions. Most of the annual precipitation in the higher elevations occurs as snow; temperatures in the lower areas are often above 90°F in the summer and below 32°F in the winter, while arctic conditions prevail in the highest areas almost year-round. Natural vegetation in valley areas consists primarily of cottonwood and willow, desert shrub, and an understory of hearty grasses. Prominent between 5000 and 8000 feet are juniper, pinion pine, oak, big sagebrush, and Douglas fir. From 8000 feet to timberline, vegetation consists mainly of aspen, spruce, sub-alpine fir, lodge pole pine, and native grasses and shrubs. Vegetation is sparse above timberline, but includes grasses, sedges, and alpine willow (COE, 1976).

The tailings site is in a meander path of the Colorado River and lies on five to 15 feet of unconsolidated alluvial material. Particle sizes of the alluvium at the site vary from cobbly gravels to gravelly sands. Given these site conditions, the river could affect the integrity of the site if not properly controlled or protected against.

As discussed by Schumm and Harvey (1983), no major shift in location of the Colorado River channel at the site has occurred in the past 100 years. The islands near the site are heavily vegetated, which indicates relative stability over the past 20 years, although some shifts in island locations were noted during the floods that occurred in 1984.

In contrast, the meandering patterns displayed both upstream and downstream of the site are characteristic of less stable rivers. Significant shifts have occurred in the reach upstream of the site as evidenced by cutoff meander loops, abandoned channels, and oxbow lakes visible on topographic maps and aerial photographs. Similar features are evident south of the confluence with the Gunnison River but not in the immediate site area probably because the much greater density of human activities in this area has obliterated natural contours.

Regarding localized erosion, the existing islands indicate that aggradation normally occurs near the site. Several factors tend to cause sediment aggradation including a decrease of channel gradient, proximity of the confluence with the Gunnison River, and the broad floodplain along the northern bank. Aggradation also would likely occur during the receding portion of a large flood.

On the other hand, erosion which is presently occurring at the southeast corner of the pile would be accelerated during major flood flows. The area to the east of the site is unprotected, except by the floodplain. High channel and overbank flows could result in significant erosion of the surficial materials in this area and result in northward channel shifts. This would redirect the flow of the river against the east boundary of the pile. The pile would act as a constriction during major flood events causing unstable flow conditions, accelerated velocities, and scouring of alluvium at the site. A detailed geomorphic analysis included is in Appendix E, Soils, Geologic, and Seismic Information.

The U.S. Army Corps of Engineers conducted its latest flood study of the Colorado River near Grand Junction and concluded that the flows for the 100-year and 500-year floods would be 63,000 and 82,000 cubic feet per second, respectively (COE, 1976). The flows for the 200-year and 1000-year floods (72,000 and 90,000 cubic feet per second, respectively) were calculated from these values by interpolation and extrapolation. The corresponding maximum flood elevations at the edge of the pile would be 4577 and 4579 feet above mean sea level, respectively. Because the flood flows at the Grand Junction site would be obstructed by the tailings pile on one side of the river and by the steep cliff on the other side, the velocity of flood water in the main channel of the floodway would be high, reaching 11.8 and 13.2 feet per second for the 200- and 1000-year floods, respectively. The velocity of flood waters immediately adjacent to the face of the pile would be somewhat lower because of friction drag.

The average monthly river flows adjacent to the tailings pile can be represented by flow measured at a U.S. Geological Survey gauging station on the Colorado River near DeBeque, approximately 30 miles upstream of the site. The average maximum monthly flow at DeBeque from 1966 through the present was 11,210 cubic feet per second, occurring in late spring, and the average minimum monthly flows are approximately 1580 cubic feet per second. Downstream from the site, at the Colorado-Utah border, the average maximum and minimum monthly flows were approximately 3140 and 16,700 cubic feet per second from 1951 through the present. These higher flows were attributable mainly to the Gunnison River. U.S. Geological Survey gauging stations are also located northeast of Cameo, approximately 22 miles upstream of the site, and at Fruita, approximately 14 miles downstream of the tailings pile.

Grand Junction has experienced a number of severe late-spring floods, the result of the rapid melting of the deep snow pack accompanied by heavy rains. Ice jams are not a flooding problem for the Colorado River in the vicinity of Grand Junction. The uniform and fairly high temperature of the Gunnison River (since the construction of flood-protection dams) prevents extensive ice formation on the Colorado River between Grand Junction and the Colorado-Utah state line.

The flooding of June-July, 1884, is considered the most severe known on the upper Colorado River (COE, 1976). This flood resulted from rapid melting of snow pack and concurrent heavy rains. In recent times, the floods of 1983 and 1984 were the most significant. The 1884 flood peak would have been approximately 73,600 cubic feet per second (cfs) at Grand Junction, if discharge versus area relationships of the 1984 flood are representative. Information relative to these past floods is shown in Table F.1.2. Other major floods on the Colorado River were recorded in 1917, 1920, 1921, 1935, 1952, and 1957.

There are no major domestic users of Colorado River water for 200 miles downstream from Grand Junction. The normal water supplies for Grand Junction are obtained from Grand Mesa surface water, the Juniata and Purdy Mesa Reservoirs being the major sources. During dry spells, Grand Junction can use Gunnison River water; the intake is approximately one mile upstream from the confluence with the Colorado River. The Ute Water District uses Colorado River water during dry spells, but its intake is just upstream of Palisade and therefore upstream from the pile.

F.1.1.2 Cheney Reservoir alternate disposal site

The Cheney Reservoir site is located on a drainage divide that gently slopes to the southwest at approximately two percent. Total relief across the proposed disposal area is approximately 60 feet. The site is located on a pediment surface that forms a divide between two small ephemeral washes, one approximately 800 feet north of the proposed pile location and one approximately 1700 feet to the south. These washes merge with Indian Creek 0.1 to 0.5 mile below the site. Indian Creek flows into Kannah Creek four to five miles below the ephemeral wash confluences, and Kannah Creek empties into the Gunnison River approximately two miles below the Indian Creek confluence. Figure F.1.4 shows the surface drainage characteristics of the Cheney Reservoir site.

An area of approximately 240 acres drains toward the Cheney Reservoir site. Slopes in the watershed range from two to five percent. Elevations range from 5250 feet to approximately 5600 feet above mean sea level. The maximum flow length is approximately 8000 feet.

Table F.1.2 Maximum recorded streamflow of the Colorado River near Grand Junction, Colorado

Station name	Basin area (square miles)	Period of record	Maximum recorded peak flow (cfs)	Date
Colorado River near Colorado-Utah state line	17,843	1951-present	68,000	June, 1984
Colorado River near Fruita	197,100	1884, 1907-1923	125,000	July, 1884
Colorado River near Cameo	8050	1933-present	39,300	June, 1984
Colorado River near DeBeque	7370	1966-present	32,000	June, 1984
Colorado River below Glenwood Springs	6013	1966-present	31,200	June, 1984

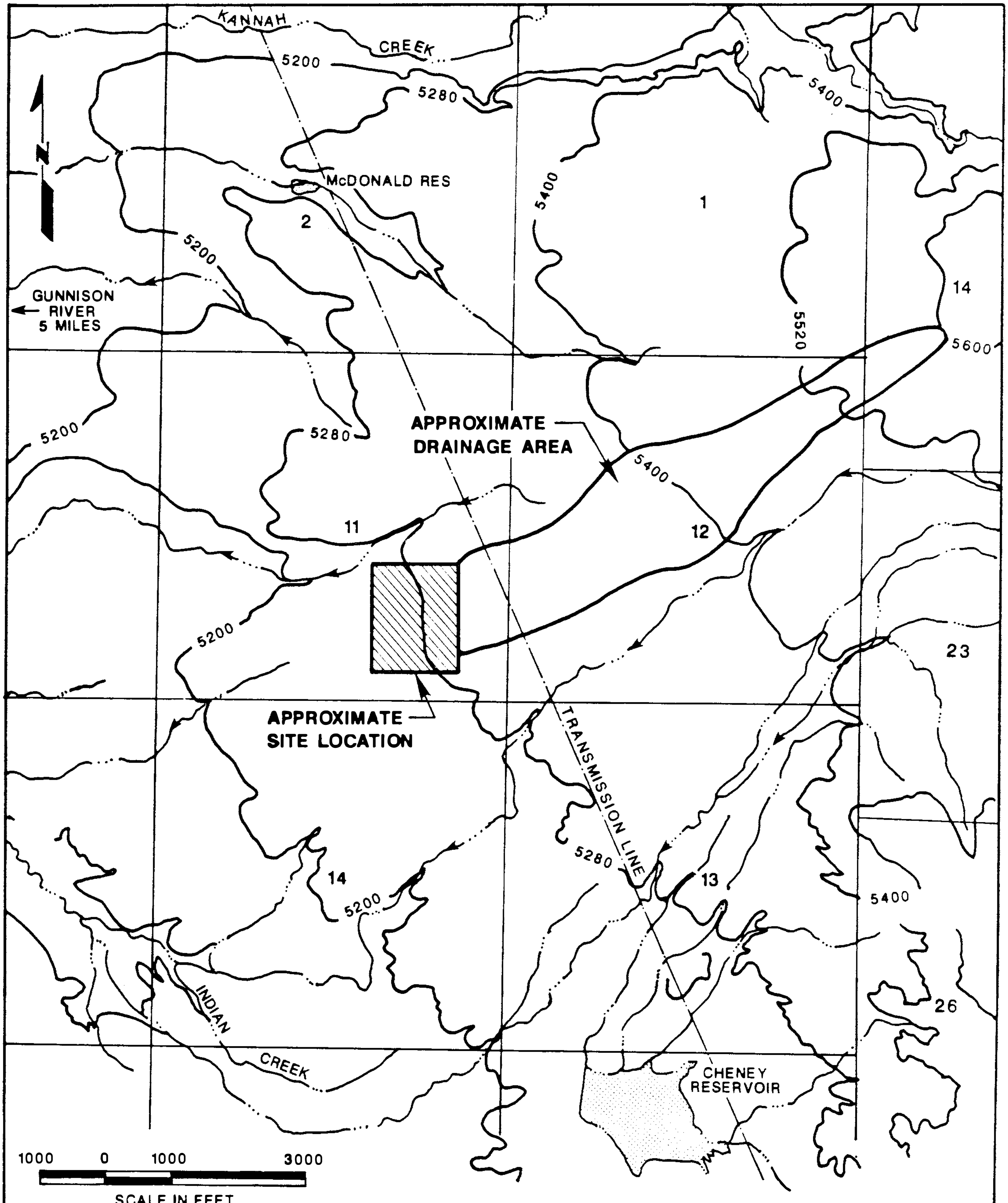


FIGURE F.1.4
SURFACE DRAINAGE CHARACTERISTICS - CHENEY RESERVOIR SITE

Soils in the watershed range from fine-grained, strongly cemented sandy, clayey silts in the site area to basalt cobbles and boulders in a fine-grained matrix of clay, silty sand, and gravel at higher elevations (above 5400 feet). Large boulders, probably deposited by glacial streams or colluvial processes, are present in some of the larger ephemeral washes in the vicinity of the site. Vegetation is sparse, consisting mainly of sagebrush and grasses.

Sheet wash and rill wash are the primary erosive forces currently active on the Cheney Reservoir site. Minor gullying is occurring on the small ephemeral washes that flank the site. Moderate to intense gullying was observed along Indian Creek. Most of the Cheney Reservoir site is classified as having only a moderate potential for future erosion (CGS, 1982). A detailed geomorphic description of the disposal site is provided in Appendix E, Soils, Geologic, and Seismic Information.

No data exist on historical floods for the Cheney Reservoir site.

F.1.1.3 Two Road alternate disposal site

The Two Road site is located in the Upper Colorado subbasin of the Colorado River basin. There are no major streams, lakes, springs, or irrigation ditches on or within two miles of the Two Road site. Several ephemeral creeks occur in the area. The site lies on a drainage divide between two unnamed ephemeral creeks. These creeks join Bitter Creek 0.5 to one mile below the site. McDonald Creek flows approximately 1.5 miles east of the site. West Salt Wash and Badger Wash combine approximately six miles southeast of the disposal area. The Colorado River flows over 10 miles south of the site.

An area of only 35 acres drains toward the site. Elevations in the watershed range from 4945 to 4965 feet above mean sea level.

The surface of the Two Road site is gently rolling, and covered by short grasses and shrubs. Deeply incised gullies are not present at the site, but flank it approximately 1500 feet to the east and west. Due to the narrow highland character of the site, it is subject to erosion by gully systems advancing headward into the site from all sides; however, the surface of the site is supported by resistant pediment gravels which cap the underlying Mancos Shale. Erosion occurs along slopes where the less resistant Mancos Shale is exposed. A detailed geomorphic description of the disposal site is provided in Appendix E, Soils, Geologic, and Seismic Information. Drainage characteristics of the Two Road site are shown in Figure F.1.5.

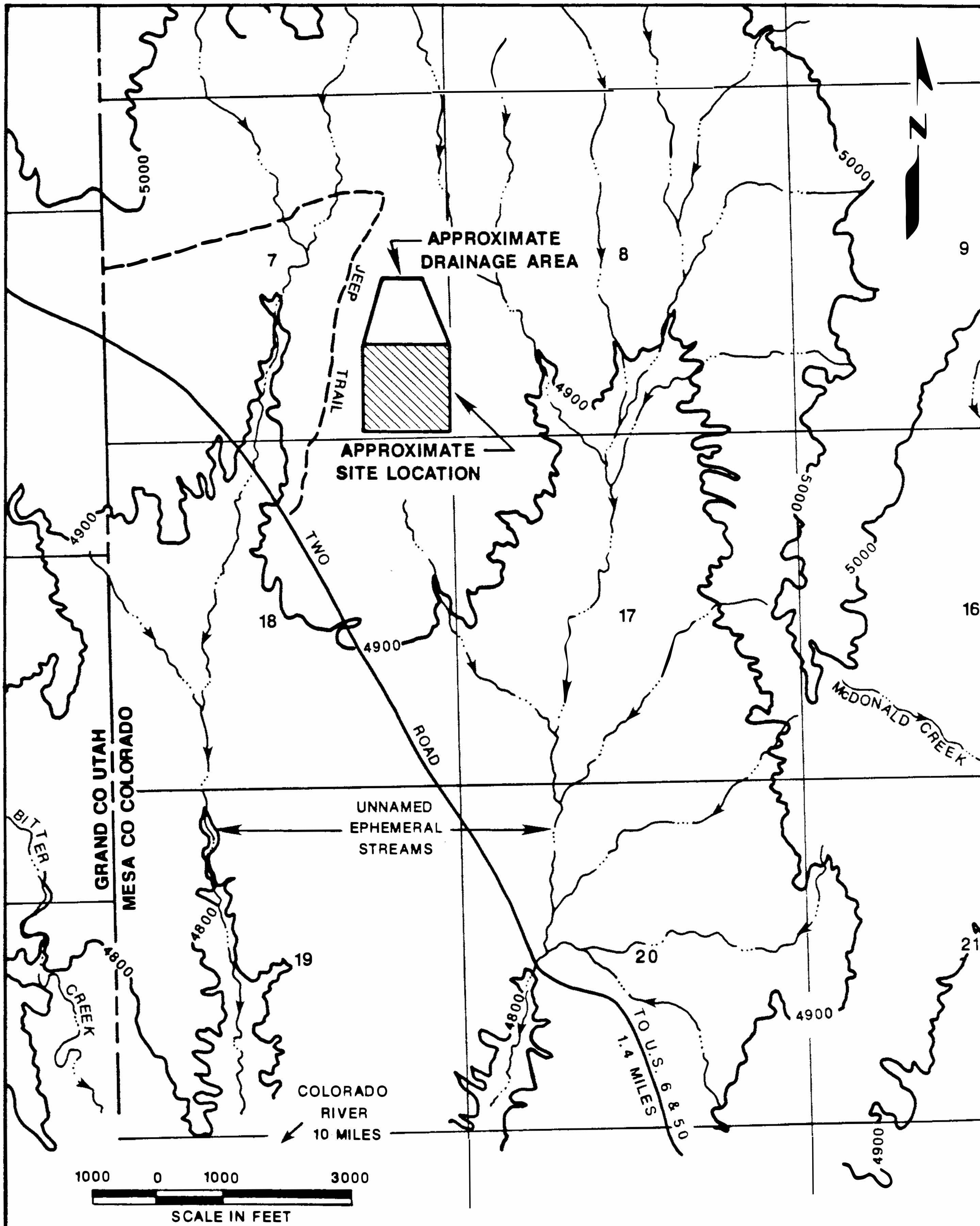


FIGURE F.1.5

SURFACE DRAINAGE CHARACTERISTICS, TWO ROAD SITE

No data on historical floods exist for the Two Road site.

F.1.1.4 Borrow sites

The 32 and C½ Road borrow areas are located on private land along the south bank of the Colorado River east of the Grand Junction tailings site. The area is approximately 80 to 120 feet above the river surface. Four ephemeral channels drain Central Orchard Mesa in the borrow site area, two on either side of 32 Road. The discussion on Colorado River flows in Section F.1.1.1 is applicable to this borrow area.

The Fruita borrow areas are also located adjacent to the Colorado River, south of the town of the Fruita, Colorado. The area is approximately 11 miles downstream of the Colorado River and Gunnison River confluence. The site is located on private land on the northeast bank of the river. The area is drained by Little Salt Wash to the northwest and Adobe Creek to the southeast. There are a number of irrigation ditches and canals in the area. Maximum stream flows from a USGS gauge located on the Colorado River near Fruita are provided in Table F.1.2.

The Unaweep Canyon borrow area is located west of the Unaweep Divide in Unaweep Canyon. West Creek flows toward the Dolores River in the vicinity of the borrow site. East of of Unaweep Divide, East Creek flows toward Whitewater, Colorado, where it flows into the Gunnison River. A number of small creeks and ephemeral streams drain the upland area adjacent to Unaweep Canyon and feed East and West Creeks. Borrow site activities would be located to avoid these drainages and to minimize the potential for flooding of the site.

F.1.2 FLOOD ANALYSIS

F.1.2.1 Grand Junction tailings site

A flood analysis has been performed to assure that the remedial action design for the uranium mill tailings site at Grand Junction, Colorado, satisfactorily addresses short-term and long-term flood protection. Short-term flood protection simply defines the extent of the 100-year and 500-year floods and the impacts, if any, on the stabilized tailings or on remedial action construction activities. The primary purpose of this part of the analysis is for compliance with floodplain and wetlands environmental review requirements in 10 CFR Part 1022. To accomplish the objective of long-term flood protection, the standard design approach of the DOE is to determine the magnitude and potential impacts resulting from a Probable Maximum Flood (PMF) event. If a design is not practical, then alternative design events or solutions are assessed.

The use of the PMF as the design flood event to achieve long-term control of uranium tailings is not clearly defined. The EPA standards (Appendix A, EPA Standards) require that control of the uranium tailings must be effective for 1000 years (to the extent reasonably achievable) and, in any case, for at least 200 years. The standards do not specifically state that a PMF event must be used for design in order to achieve the stated containment life. An analysis of exceedence probabilities for various events with respect to the containment life (Junge and Dezman, 1983) suggests that design events with a very long return period (e.g., 10,000 years) must be used to meet a long-term containment objective. However, the limited statistical data that are available cannot be extrapolated accurately to such long return periods. The generally accepted alternative, therefore, is to use maximum credible events, such as the PMF, for design purposes. Since a maximum credible event has a very small chance of being exceeded; a tailings disposal system designed to withstand these events would have a very small risk of failure and, thus, would meet both the intent and long-term containment objective of the EPA standards.

The PMF analysis, for this site, first requires the use of Hydrometeorological Report No. 49 (USDOC, 1977) to determine the appropriate Probable Maximum Precipitation (PMP) that could occur over the contributing drainage basins. The analysis then involves the consecutive use of the U.S. Army Corps of Engineers HEC-1 (COE, 1981) and HEC-2 (COE, 1982) models. The HEC-1 model is designed to simulate the runoff response (i.e., PMF) of a river basin to precipitation (i.e., PMP) by representing the basin as an interconnected system of hydrologic and hydraulic components. Then a determination of stream hydraulics, resulting in water-surface elevations and velocity gradients at the tailings site, is developed for the PMF flows using the dynamic HEC-2 model.

The 100-year and 500-year discharges were estimated with a methodology developed by McCain and Jarrett (1976). As in the PMF analysis, water-surface profiles and velocities were estimated with the HEC-2 model.

100-year and 500-year floods

Estimates of the 100-year and 500-year floods were prepared in order to comply with 10 CFR Part 1022 and to compare major historic and predictable floods with the PMF estimate. Peak discharges and depths for various return intervals were approximated by use of a multiple regression analysis of flood data from stream gauges in the vicinity of the study area (McCain and Jarrett, 1976). The method is based on correlating results of Log Pearson III analysis for 90 gauging stations in the region. Of the 90 gauging stations utilized, only eight stations were for basin areas greater than 1000 square miles. The results of the approximations are, therefore, expected to overestimate the flood peaks for large watersheds. Predicted peak flows and depths for select recurrence intervals for the Colorado River at Grand Junction are presented in Table F.1.3.

A 100-year flow of 61,600 cfs and a 500-year flow of 84,200 cfs were used for the Colorado River at the site. These flows compared favorably with the results of the U.S. Army Corps of Engineers estimate in which the 100-year and 500-year flood flows were estimated to be 63,000 and 82,000 cfs, respectively (COE, 1976). The Corps of Engineers have a revised flood study underway on the Colorado River near Grand Junction; however, the completion date of their report is beyond the expected completion date of this Environmental Impact Statement. Cross-section data prepared for their study have served as a basis in the HEC-2 model for this analysis and the PMF analysis.

Values of Mannings roughness coefficients "n" were varied to account for conveyance differences and to impose constrictions where topography alone would not adequately define flow paths. The basis of determination of n values was 0.020 to 0.025 for clear channels and 0.060 to 0.100 for floodplains including mid-channel islands. Published values for the Colorado River near Grand Junction are 0.017 to 0.040 for the main channel, and 0.035 to 0.070 for the floodplain (FEMA, 1982). Some artificially high n values were used in some of the floodplains in order to model dead spots due to constrictions.

As previously stated, highway and railroad bridges cross the Colorado River downstream of the site. Since the tailings pile was in the 100-year and 500-year floodplains even without backwater effects from the bridges and since the PMF would likely destroy the bridges before the peak would occur (the bridges would be overtopped by more than 20 feet of water) no attempt was made to model for bridge effects.

As shown in Figure F.1.6, the HEC-2 model indicates that the site is within the 100-year floodplain (Figure F.1.6 also shows HEC-2 cross-section locations). The water surface at the site varies from 4572 to 4576 along the pile with mean velocities of six to 10 fps. The approximate boundaries of the 500-year floodplain are shown in Figure F.1.7. The water surface at the site varies from 4574 to 4578 along the pile with mean velocities of six to 12 fps. The expected elevation of scour ranges from three to 3.5 feet below the present channel bottom for the 500-year event.

<u>PMF hydrologic analysis</u>. The PMF estimate at Grand Junction is based on a HEC-1 model of the Colorado River watershed above Rifle which was prepared as part of the design

Table F.1.3 Peak flows and depths of selected recurrence-interval floods for the Colorado River at Grand Junction with a basin area of 8150 square miles

Regression equation[a]	Standard error of[a] estimate in percent	Discharge (cfs)	Depth (feet)
$Q_{10} = 59.7A^{0.709}$	47	35,400	--
$Q_{50} = 89.1A^{0.709}$	50	52,830	--
$Q_{100} = 103A^{0.710}$	53	61,600	--
$Q_{500} = 137A^{0.713}$	65	84,200	--
$D_{10} = 1.25A^{0.261}$	25	--	13.1
$D_{50} = 1.54A^{0.254}$	34	--	15.2
$D_{100} = 1.64A^{0.254}$	36	--	16.2
$D_{500} = 1.98A^{0.239}$	44	--	17.0

[a]Taken from McCain and Jarrett (1976).

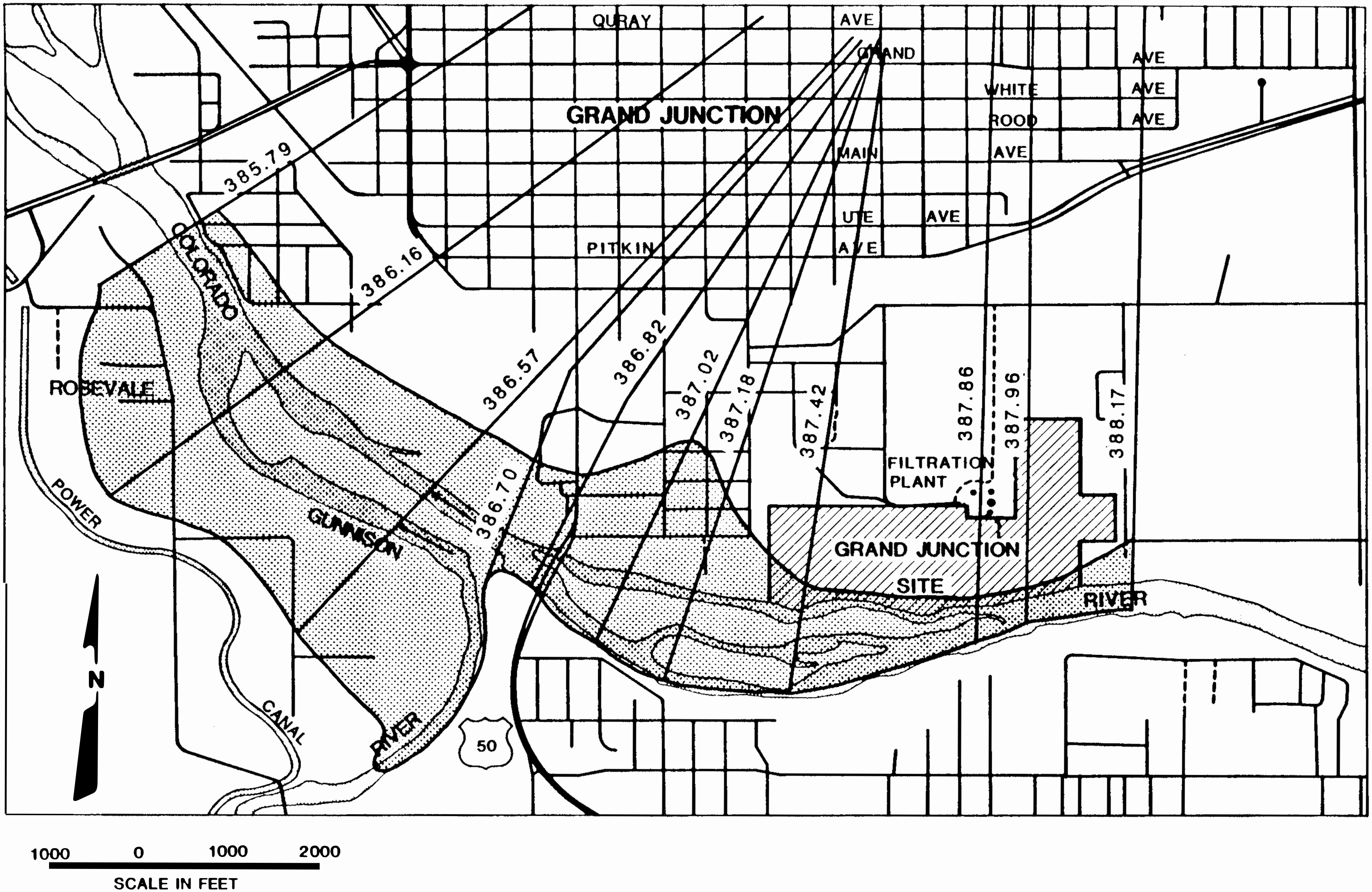


FIGURE F.1.6
LOCATION OF CROSS SECTIONS & FLOODPLAIN BOUNDARIES
OF THE 100-YEAR FLOOD EVENT

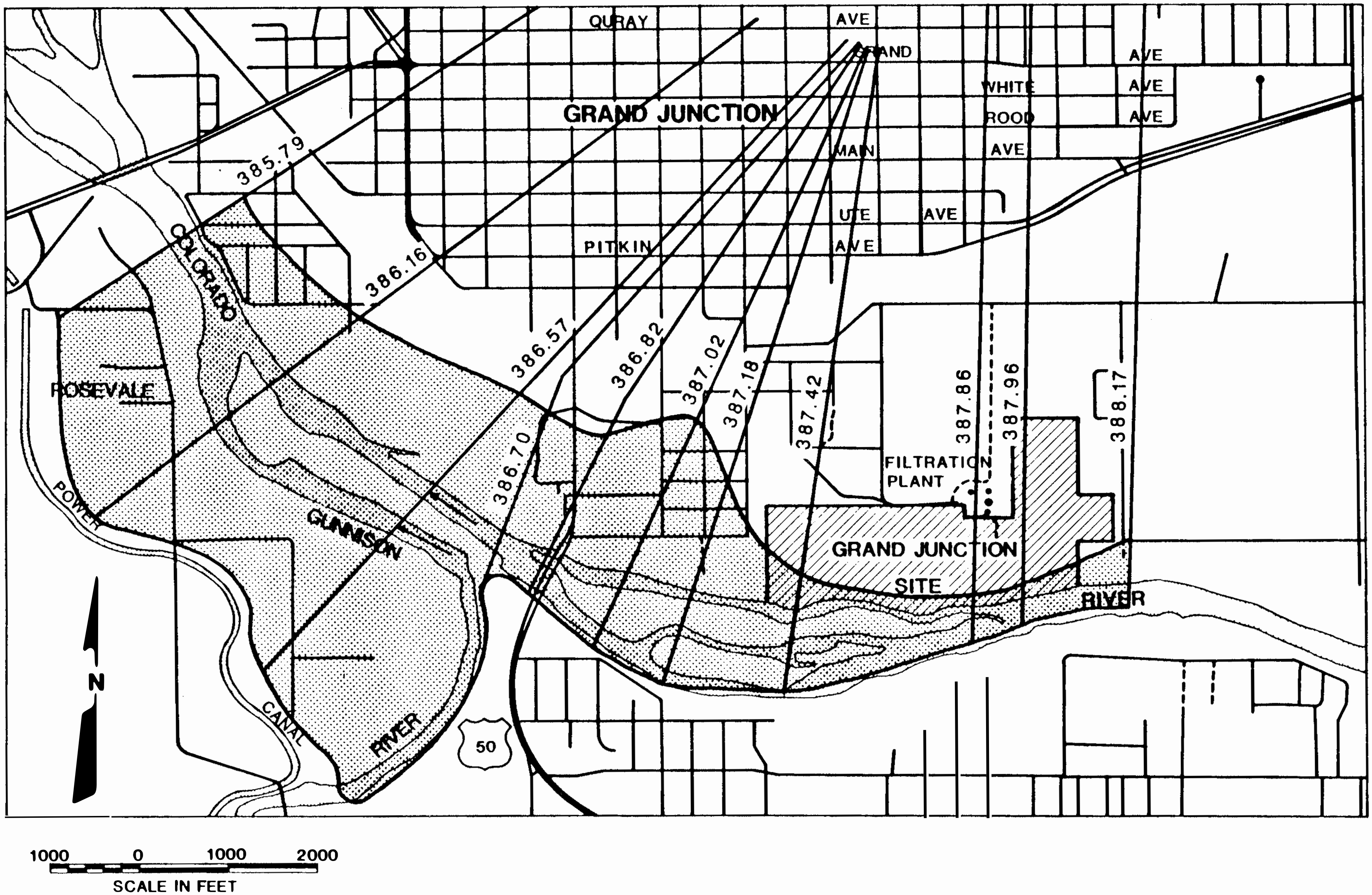


FIGURE F.1.7
LOCATION OF CROSS SECTIONS & FLOODPLAIN BOUNDARIES OF THE 500-YEAR FLOOD EVENT

effort for the two existing tailings sites at Rifle. The larger watershed above Grand Junction was not modelled because a Probable Maximum Precipitation (PMP) could not be readily estimated with any degree of certainty. Hydrometeorological Report (HMR) No. 49 (USDOC, 1977) presents procedures for PMP estimates for the project area; however, the procedures are limited to areas of less than 5000 square miles. Extrapolating the PMP to the study area of 8150 square miles could not be done any more reliably than extrapolating the PMF from the Rifle watershed.

A description of the HEC-1 analysis for Rifle is followed by a discussion of the method used to extrapolate the Rifle PMF. The HEC-1 model is designed to simulate the runoff response of a river basin to precipitation by representing the basin as an interconnected system of hydrologic and hydraulic components. Four parameters were estimated to model the basin: (1) the amount and temporal distribution of the Probable Maximum Precipitation (PMP); (2) the lag time of runoff within the basin; (3) computation interval for the hydrograph; and (4) loss rate of precipitation within the basin.

The PMP was determined according to procedures outlined in Hydrometeorological Report (HMR) No. 49 (USDOC, 1977). The month with the highest 72-hour precipitation was found to be June with 13.4 inches, indicating that the rainfall would likely occur on snow or on a very wet watershed. The PMP was distributed temporally by arranging three-hour incremental amounts in a sequence such that they decrease progressively to either side of the greatest three-hour increment. Since the total volume of flow is not critical in this study, only the greatest 24-hour increment of the 72-hour storm was modeled.

Lag times were computed by assuming bank full velocities. Each subbasin was assumed to have three conveyance components:

- o Overland flow and upland channel flow with velocities of 3.5 feet per second and eight feet per second, respectively, for slopes of 12 to 15 percent (DOI, 1973). Allowance was also made for detention time due to lakes and ponds.

- o Secondary channels draining areas of 42 to 103 square miles with velocities of 10 to 12 feet per second.

- o Primary channels with velocities varying from 12 to 14 feet per second.

Lag times for each subbasin are shown in Table F.1.4.

The shortest lag time is 3.8 hours, which corresponds to a time of concentration of 6.3 hours. A selection of a compu-

Table F.1.4 Lag time estimation for subbasins of the Colorado River above Rifle

Watershed	Time overland flow (hrs)	Secondary channel			Main channel			Total	
		L (mi)	v (fps)	t (hrs)	L (mi)	v (fps)	t (hrs)	T_C (hrs)	T_L (hrs)
Colorado River above Kremmling	1.6	25	10	3.7	30	12	3.7	9.0	5.4
Blue River	2.1	15	12	1.8	45	14	4.7	8.6	5.1
Colorado River between Kremmling and Dotsero	0.9	24	16	2.2	35	11	4.7	7.8	4.7
Eagle River	0.6	29	12	3.5	29	12	3.5	7.6	4.5
Roaring Fork	0.7	23	11	3.1	40	14	4.2	8.0	4.8
Colorado River near Rifle	0.5	25	11	3.3	22	13	2.5	6.3	3.8

Velocities were estimated using Mannings equation: $T_L = 0.6 * T_C$

L = Length

v = velocity

t = flow time

T_C = time of concentration

T_L = Lag time

tation interval, "T", of one hour meets the criteria that it be less than 0.25 x TPEAK (COE, 1981),

where

$1.7 \times TPEAK = T + T_C$

Soils in the Rifle watershed, as with those in the Grand Junction watershed, are classified by the Soil Conservation Services (SCS) as hydrologic group B interspersed with some C soils and traces of A and D soils (USDA, 1978; 1982; 1983). B and C soils have moderate to slow infiltration rates (0.08 to 0.30 inch/hour) when thoroughly wetted.

Although actual major floods are the result of rain on top of the snow pack, the volume of runoff resulting from snow melt is small in comparison to the volume of runoff resulting from the intense rainfall. However, the presence of the snow pack creates severe hydrologic soil conditions. Therefore, runoff resulting from snow melt was not estimated in the analysis because the magnitude of the PMP would make snow melt a minor component of the flood. To account for the severe hydrological conditions created by the presence of snow, no initial loss of precipitation was assumed, and a uniform loss rate based on saturated "B-C" soils of 0.20-inch per hour was selected (DOI, 1973). This value was also selected by the U.S. Army Corps of Engineers for the "C" soils in the lower basin (COE, 1976).

Flows were routed through primary channel reaches by use of the Modified Puls method available in the HEC-1 model. Reach characteristics were determined by field inspection and from topographic maps.

McCain and Jarrett (1976) found that discharge varied with area raised to a power ranging from 0.709 to 0.713 depending on the return interval. The 1984 flood discharges in the Colorado River varied with area raised to a power of 0.68. Therefore, a power of 0.70 was used for the extrapolation estimates at Grand Junction. Two PMF discharges were estimated. The first is for a PMF on the Colorado River only and the second is for a PMF on the Gunnison River and Colorado River combined. The discharges are shown in Table F.1.5.

Crippen and Bue (1977) prepared curves which envelop maximum measured flood flows for regions in the conterminous United States. Grand Junction is in Region 14 near the division with Region 13. The maximum flood peak in the Colorado River near Grand Junction is given as 130,000 cfs for Region 14 and 380,000 cfs for Region 13.

Table F.1.5 Probable Maximum Flood discharges in the Colorado River near Grand Junction, Colorado

Location	Basin area (square miles)	Discharges[a] (cfs)
Rifle	6950	795,200
Grand Junction above Gunnison River	8150	889,000
Grand Junction below Gunnison River	17,100	1,493,500

[a]Notes: $Q = 795,200 \times \left(\frac{A}{6950}\right)^{0.70}$

Flow in the Colorado River above the confluence is assumed to be proportional with the 1984 flood; therefore, the flow in the Gunnison River is 630,300 cfs and the flow in the Colorado River above the confluence is 863,200 cfs.

The estimated PMF at Grand Junction of 889,000 cfs is approximately 2.5 to seven times the maximum expected discharge estimated by Crippen and Bue, 11 times the estimated 500-year peak, and 12 times the maximum recorded flow.

PMF hydraulic analysis. Hydraulic characteristics of the river at flood stage are important design considerations for stabilization of the tailings. Water surface profiles were estimated with the HEC-2 model to obtain flow depths and velocities during flood stage. These values were then used to estimate scour depths and riprap requirements. An empirical formula suitable for the Colorado River was utilized to calculate the scour depth (Pemberton and Lara, 1984):

$$D_S = Z \times d_{fo}$$

where

D_S = depth of scour below ELMIN (from HEC-2) in feet

d_{fo} = depth for zero bed sediment transport in feet

Z = 0.6, coefficient developed by the U.S. Bureau of Reclamation for use on moderate river bends

$$d_{fo} = \frac{q_f^{2/3}}{F_{bo}^{1/3}}$$

q_f = design discharge per unit width in ft^3/s per foot.

F_{bo} = Blench's "zero bed factor" in ft/s^2

Values of Mannings roughness coefficients, "n", were varied to account for conveyance differences and to impose constrictions where topography alone would not adequately define flow paths. Values (n) of 0.020 to 0.025 for clear channels and 0.060 to 0.100 for floodplains including mid-channel islands were used. Published values for the Colorado River near Grand Junction are 0.017 to 0.040 for the main channel, and 0.035 to 0.070 for the floodplain (FEMA, 1982).

The Colorado River banks were extended beyond the normal bank locations to account for a dramatically different river regime during PMF conditions. It was assumed that normal floodplains would be covered at great depth, and that vegetation, buildings, and other topographic features would be submerged or removed, greatly reducing n values. As a rule, an n value of 0.025 was used where depths were greater than five feet and 0.060 where less than five feet, although some variance from this rule occurred in order to achieve reasonable conveyance values for differing topographic conditions along the profile. Values of n in the widened channel varied from 0.022 to 0.030, while some artificially high n values were used in some of the floodplains to model dead spots due to constrictions.

A PMF occurring in only the Colorado River above the site was found to be slightly more critical than a PMF occurring in the Gunnison River and Colorado River simultaneously. At the tailings pile the velocity for a PMF of only the Colorado River was slightly greater than for the combined PMF (19.2 to 18.4 fps); however, the water surface elevation was slightly lower (4595.6 to 4595.8 feet). Upstream and downstream of the pile the situation was reversed. Therefore, the rock erosion protection and scour analysis was performed using the higher velocities encountered during a PMF of only the Colorado River. For this first condition, a floodway of 4000 to 8000 feet wide as shown in Figure F.1.8 would be required to convey the PMF. Many residential and industrial structures would be inundated, and all sides of the site would be exposed to channel flow. The peak water surface elevation was estimated to vary from 4589 to 4600 along the pile and mean channel velocities were estimated to be approximately 12 to 19 fps.

Floodway constrictions at the site cause unstable flow conditions in the form of near critical flow to occur. The river will attempt to moderate the steep energy grade slope the model shows occurring and stabilize the flow by scouring alluvium. A depth of zero sediment transport of 12.4 feet below the channel bottom was determined using the previously described equation. The expected elevation is therefore 4544.4 at station 387.42, 4547.7 at station 387.86, and 4548.7 at station 387.96. A cross-section at station 387.86 presented in Figure F.1.9 shows maximum water surface and scour elevations for the PMF event.

F.1.2.2 Cheney Reservoir alternate disposal site

There are no major streams or rivers within 2.4 miles of the Cheney Reservoir site. The site is at least five miles from the floodplain of the Gunnison River. Kannah Creek and Indian Creek flow at an elevation approximately 200 feet below the site. The Gunnison River flows approximately 500 feet below the site at its closest point.

No data on historical floods exist for the Cheney Reservoir site and because of the distance from and differences in elevation between any major flows and the site, the site is not subject to river flooding.

The effects of a PMP over the pile and the contributing drainage areas are analyzed in order to design erosion protection requirements. Preliminary calculations for the Cheney Reservoir site using very conservative assumptions, indicate

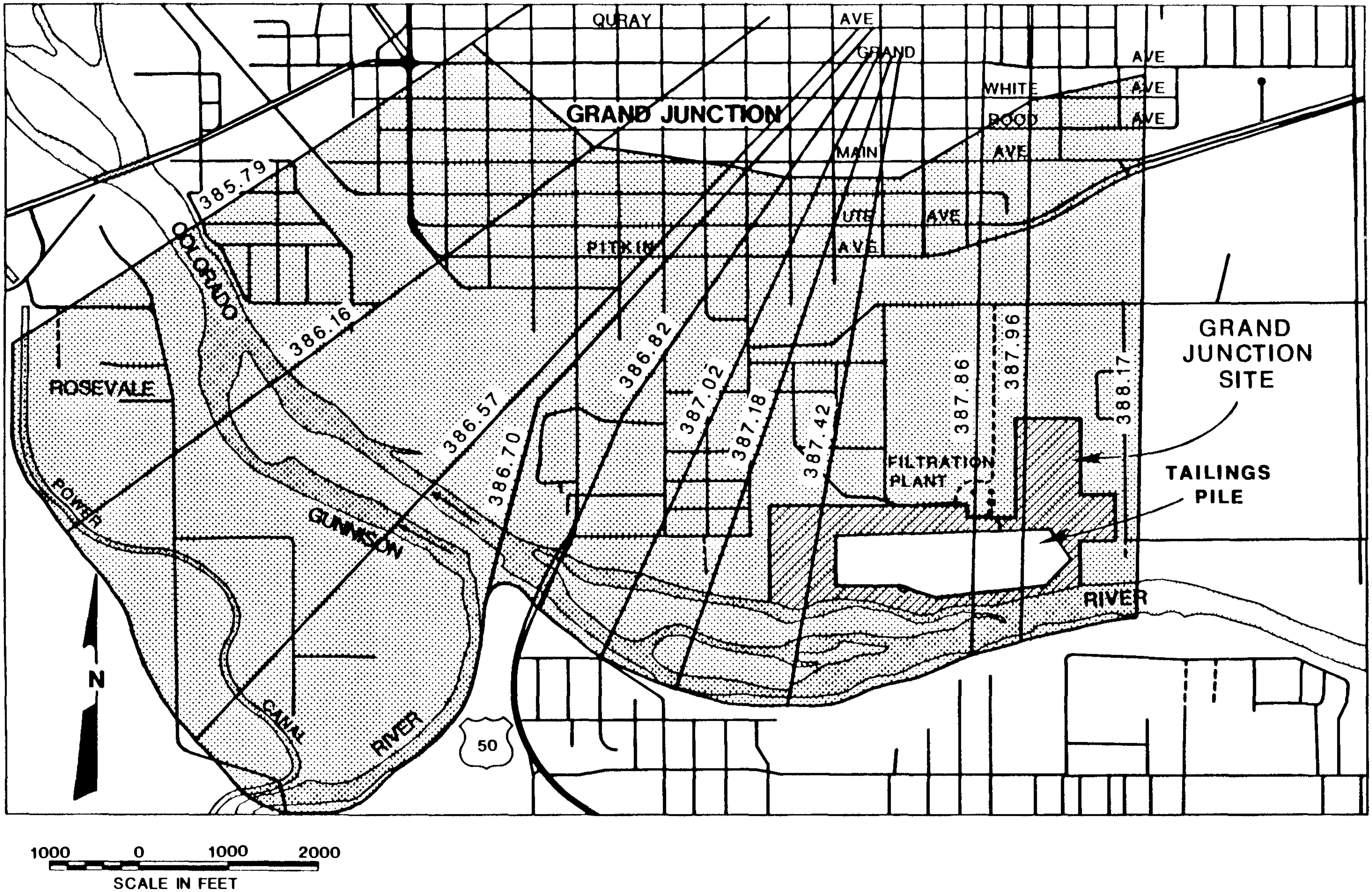


FIGURE F.1.8
LOCATION OF CROSS SECTIONS & FLOODPLAIN BOUNDARIES OF THE PMF EVENT AFTER STABILIZATION ON SITE

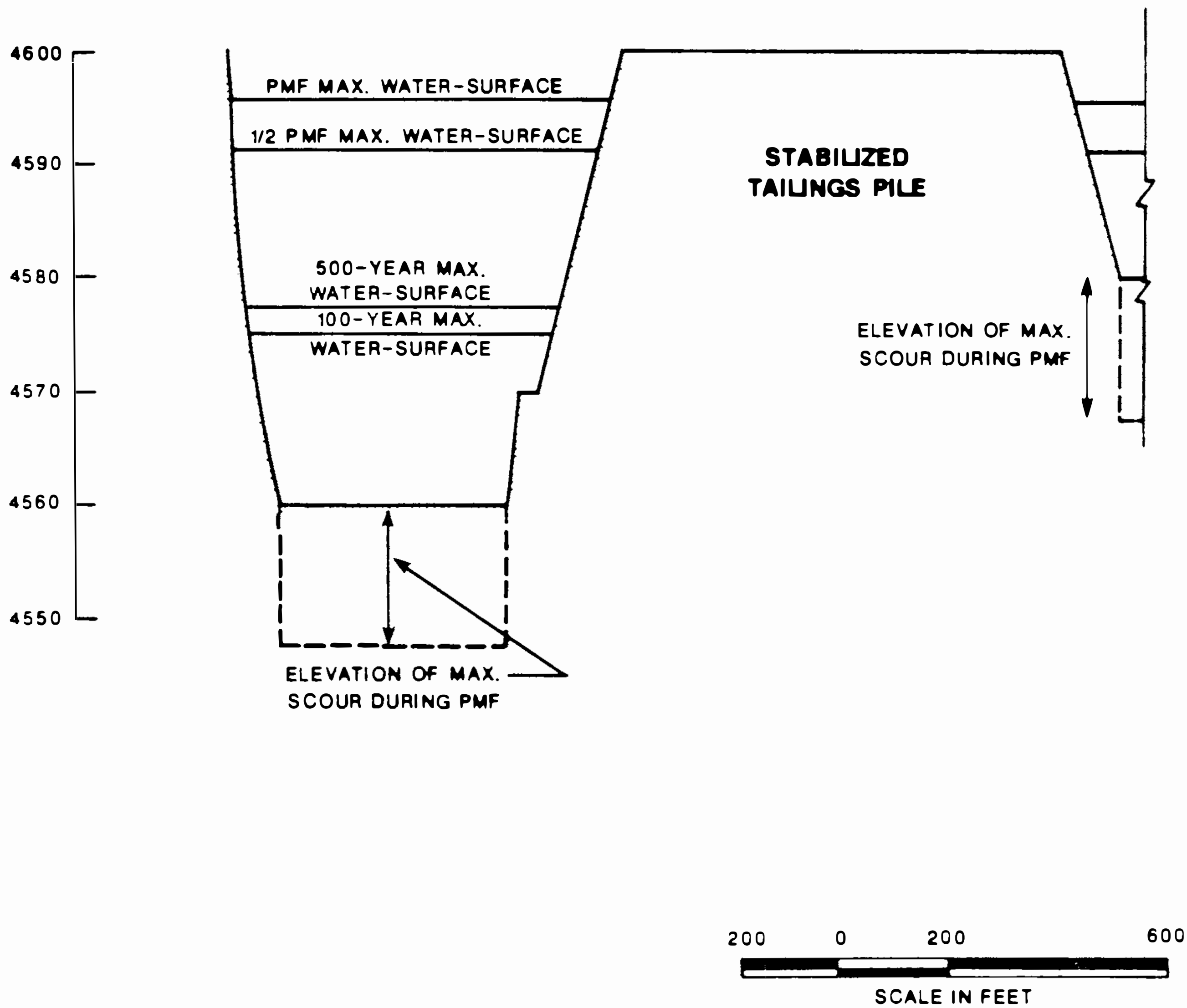


FIGURE F.1.9

CROSS SECTION AT STATION 387.86 AFTER STABILIZATION ON SITE

that the flow resulting from the occurrence of a PMP (8.5 inches in one hour) over the Cheney Reservoir watershed would be in excess of 2000 cfs. Details are provided in Appendix B, Engineering Designs.

F.1.2.3 Two Road alternate disposal site

There are no major streams or rivers in the vicinity of the Two Road site. The site is at least 10 miles from the floodplain of the Colorado River, and over 500 feet higher in elevation. The ephemeral streams in the site area, including Bitter Creek and McDonald Creek, have small watersheds and do not present a flood hazard to the site.

As with the Cheney Reservoir design, the effects of the occurrence of a PMP were analyzed to determine erosion protection requirements. Preliminary calculations indicate that a flow in excess of 350 cfs would result from the occurrence of a PMP over the Two Road site watershed. Details are provided in Appendix B, Engineering Designs.

F.1.2.4 Borrow sites

Both the Fruita and 32 and C½ Road borrow areas may be affected by flooding of the Colorado River; however, a separate flood analysis of these sites would not be performed. Since the sites are on privately owned land and are either active or have been recently active, it is expected that the operator of the site would take the appropriate measures to control flooding and minimize impacts to their own structures and equipment.

Due to the high canyon walls separating the site from West Creek and the relatively small watershed above the borrow area, flood flows are not expected to impact the borrow site in Unaweep Canyon.

F.1.3 SURFACE-WATER QUALITY

F.1.3.1 Grand Junction tailings site

In general, the quality of water in the Colorado River depends on the flow, and the flow is determined by the source of water. During low-flow periods, when surface runoff is low and the river flow is basically discharged ground water, the concentration of metals and inorganics leached from the soil is high. During high-flow periods, when the river flow is mainly surface runoff, the concentration of metals and inorganics is low and the concentration of organics and suspended solids is high (DOE, 1983).

The results of measurements made at Cameo, approximately 15 miles upstream from the site, show that the mean concentrations of all constituents except mercury are within the Colorado drinking-water standards; however, the maximum concentrations of many constituents (e.g., cadmium and chloride) exceed the standards. A comparison of the Cameo data with data collected at Fruita, approximately 15 miles downstream from the site, does not indicate any effects of the existing pile on the quality of river water.

It is difficult to draw any conclusions regarding the change in water quality along the Colorado River; however, certain observations are possible. For example, mixing of the Gunnison River, which has a flow approximately equivalent to that of the Colorado River, results in decreases in chloride and molybdenum concentrations in the Colorado River and increases in the concentrations of selenium, fluoride, sulfate, and total dissolved solids. The concentration of total iron appears to increase significantly along the Colorado River independent of the mixing with Gunnison River water.

Additional discussions on water quality are provided in Section F.2, Ground Water.

F.1.3.2 Cheney Reservoir alternate disposal site

No surface-water quality data exist for the ephemeral streams in the vicinity of the Cheney Reservoir site. Limited data exist for Kannah Creek and the Gunnison River downgradient of the site; however, these data indicate that the quality of these bodies is influenced more by ground-water recharge than the flow that enters from the small creeks and ephemeral streams in the Cheney Reservoir disposal site area. A detailed discussion of the quality of the ground water in the Cheney Reservoir site area is included in Section F.2, Ground Water.

F.1.3.3 Two Road alternate disposal site

No water-quality monitoring gauging stations exist on any of the creeks or ephemeral streams in the Two Road alternate disposal site area. Data taken on West Salt Creek east of the site indicate that the major chemical constituents of the water are sodium, magnesium, calcium, and sulfate. During flow events TDS values were high, ranging from several hundred mg/l to over 10,000 mg/l. It is expected that the water quality during flow events would be similar in the drainages adjacent to the site (URS, 1983).

F.1.3.4 <u>Borrow sites</u>

The discussion on water quality of the Colorado River (Section F.1.3.1) is also applicable to the Fruita and 32 and C½ Road borrow areas. No water-quality data exist for the streams and creeks in the vicinity of the Unaweep Canyon borrow area.

F.2 GROUND WATER

F.2.1 INTRODUCTION

EPA standards (40 CFR Part 192) require site characterization of the hydrogeologic regime at and around each UMTRA Project site. These regulations state that "judgements on the possible need for remedial or protective actions for ground water aquifers should be guided by relevant considerations described in EPA's hazardous waste management system (47 CFR 32274)."

On September 3, 1985, the United States Tenth Circuit Court of Appeals set aside EPA's water protection standards, 40 CFR Part 192.20 (a)(2)-(3), and EPA has not yet reissued these standards. When EPA issues revisions to the water protection standards, DOE will re-evaluate the ground-water issues at the site to assure that the revised standards are met. Performing remedial actions to stabilize the tailings prior to EPA issuing new standards will not affect the measures that are ultimately required to meet the revised water protection EPA standards.

On this basis, it has been determined that fourteen primary items must be addressed during a ground-water characterization at an UMTRA Project site (Brinkman et al., 1985). These fourteen items are:

- Applicable water-quality standards.
- Characterization of the potentially affected hydrogeologic environment.
- Proximity of the site to surface water.
- Physical and chemical characterization of waste in terms of contaminant migration in ground water and hydraulically connected surface water.
- Effect of climate on the movement of contaminants.
- Impact of contaminant sources other than those attributable from the UMTRA Project site.
- Proximity, withdrawal rates, uses, and sources of presently used water.
- Present value of affected water resource.
- Availability of alternate water supplies.
- Potential and expected use of affected resource.
- Future value of affected water resource.
- Potential health risks to humans and potential damage to wildlife, crops, and vegetation caused by exposure to contaminants in ground or surface water.

- o Persistence and permanence of adverse effects.

- o Aquifer restoration or protection.

Following is a discussion of these fourteen items, for the processing site and alternate disposal sites.

F.2.2 APPLICABLE WATER-QUALITY STANDARDS

The Grand Junction uranium mill tailings are located in Colorado. There are two sets of water-quality standards applicable to characterization of affected or potentially affected ground-water systems: Federal and State of Colorado. Federal and State of Colorado drinking water standards are shown in Table F.2.1. The State of Colorado has no ground-water quality standards in place at this time, but has proposed standards for ground water. Colorado surface-water and proposed ground-water quality standards are based on a classification system which establishes use categories. Both standards include an antidegradation standard which protects existing use classifications of waters, thereby protecting both existing and potential uses of water.

Applicable surface-water quality standards for the State of Colorado are shown in Table F.2.2. In addition, all surface waters of the Colorado River Basin are subject to a policy for uranium. This can be summarized as:

- o Uranium levels in surface waters shall be maintained at the lowest practicable level.

- o In waters assigned a water supply classification, uranium concentration shall not exceed 40 pCi/l. The Colorado River from immediately below the confluence with Parachute Creek to immediately above the confluence of the Gunnison River is assigned a water supply classification (CDH, 1983).

Table F.2.1 State of Colorado and EPA National Drinking Water Standards (40 CFR 141,143)

Parameter	EPA Drinking water standards[a] Primary	Secondary	Colorado[b] primary drinking water standards[a]
Arsenic	0.05	--	0.05
Barium	1.0	--	1.0
Cadmium	0.01	--	0.010
Chromium	0.05	--	0.05
Copper	--	1.0	--
Fluoride	1.4-2.4[c]	--	1.4-2.4[c]
Lead	0.05	--	0.05
Mercury	0.002	--	0.002
Nitrate	10.0	--	10.0
Selenium	0.01	--	0.01
Silver	0.05	--	0.05
Zinc	--	5.0	--
Chloride	--	250.0	--
Iron	--	0.3	--
Manganese	--	0.05	--
pH (standard unit)	--	6.5-8.5	--
Sulfate	--	250.0	--
TDS	--	500.0	--
Radium 226-228 combined (in picocuries per liter)	5.0	--	--
Gross alpha[d] (in picocuries per liter)	15.0	--	--

[a]All values in mg/l unless otherwise noted.
[b]Ref. CDH, 1981.
[c]Standard varies depending on water temperature.
[d]Does not include uranium or radon.

Table F.2.2 State of Colorado surface-water standards for water-quality parameters of interest[a]

Constituent	Colorado River between Parachute Creek and Gunnison River (Permissible concentration mg/liter)	Colorado River between Gunnison River and Colorado-Utah state line	Tributaries between Parachute Creek and Colorado-Utah state line[b]
Aluminum, soluble	0.1[c]	0.1[c]	--
Ammonia	0.06	0.06	--
Arsenic	0.05	0.05	0.1[d]
Cadmium	0.0017	0.001	0.01[d]
Chloride	250		
Copper	0.018	0.012	0.2[d]
Iron			
soluble	0.3		--
total	1.0	1.5	
Lead	0.025	0.025	0.1[d]
Manganese			
soluble	0.05		
total	1.0	1.0	0.2[d]
Mercury	0.00005	0.00005	--
Selenium	0.02	0.02	0.02[d]
Sulfate	250	--	--
Zinc	0.07	0.085	2.0[d]
pH(standard unit)	6.5-9.0	6.5-9.0	6.5-9.0

[a]No numerical standards have been established by the State of Colorado for calcium, carbonate, molybdenum, sodium, and vanadium. A dash indicates that the permissible concentration is to be established on a case-by-case basis, by the Colorado Department of Health.

[b]Except Wallace, Roan, Plateau, and Rapid Creeks and Little Dolores River.

[c]Colorado Water Quality Standards, Part 1, Table III, Aquatic Life Class I, April, 1981.

[d]Colorado Water Quality Standards, Part 1, Table III, Agricultural Uses, April, 1981.

F.3 POTENTIALLY AFFECTED HYDROGEOLOGIC ENVIRONMENT-PROCESSING SITE

F.3.1 CHARACTERIZATION OF HYDROGEOLOGIC ENVIRONMENT

F.3.1.1 Previous investigations

Several previous investigators have reported on regional and site-specific hydrogeology in the vicinity of the Grand Junction tailings site. The U.S. Geological Survey conducted a national study on the distribution of uranium and radium in ground water (Scott and Barker, 1962). The U.S. Geological Survey investigated the geology and artesian water supply of the Grand Junction area (Lohman, 1965). The U.S. Bureau of Reclamation has studied shallow ground water in the Grand Valley as part of the Colorado River Water Quality Improvement Program. The Bureau of Reclamation published a report for Phase I of its study, for the area surrounding Fruita; however it has not yet published a report for the area surrounding Grand Junction. Data from this study include stratigraphic information, water-quality analyses, and water-level measurements (U.S. Bureau of Reclamation, no date).

Surface water has also been studied on both a regional and a site-specific basis for the Grand Junction tailings environment. The EPA monitored concentrations of radionuclides along the Colorado River mainstream both upstream and downstream of the Grand Junction tailings from 1961 through 1972 (EPA, 1973). The U.S. Geological Survey also reports water-quality data for the Colorado River Basin (USGS, various dates). The occurrence of molybdenum, a substance associated with uranium mill tailings, has been studied for the surface waters of Colorado (Voegeli and King, 1969). On a site-specific basis, an assessment was made of the potential for contamination of the Colorado River by the Grand Junction tailings (Bush et al., 1980).

Extensive research connected with low-level nuclear waste disposal and the UMTRA Project has centered on or included the Grand Junction tailings. Ambient soil moistures were reported for the Grand Junction area (Rogers et al., 1981). Research on cover design has included studies on movement of water in the unsaturated zone of the Grand Junction tailings (Beedlow, 1984; Mayer et al., 1981).

The geochemistry of the tailings and of the ambient environment has been extensively interpreted (Markos and Bush, 1983a) and reported (Markos and Bush, 1983b), including statistical evaluation of contaminant transport mechanisms (Bush and Markos, 1982). A geotechnical characterization of the tailings included extensive information on stratigraphy, water levels, and hydraulic properties (Nelson and Wardwell, 1982).

Ford, Bacon, and Davis Utah, Inc. (FBDU) reported on the site-specific hydrogeology and hydrogeologic setting of the tailings at a reconnaissance level, and also reported limited site-specific data (FBDU, 1981; FBDU, no date). A site-specific study of the hydrogeology of the tailings and the surrounding area was based on an extensive field program (Doty and Versaw, 1984).

Additional data relating to the area surrounding the tailings were gathered from various investigators. Geotechnical borings for the Highway 50 bridge were obtained from the State of Colorado Department of Highways, (Colorado Department of Highways, 1964), and helped to define the stratigraphy of the area. Drillers logs for the Grand Junction area were obtained from the State of Colorado (Colorado Division of Water Resources, no date), although these provided little information not reported by the U.S. Geological Survey (Lohman, 1965).

F.3.1.2 Recent investigations

Recent investigations have included exploratory drilling, hydraulic testing, monitoring well installation, and water sampling in two phases. The first phase was begun with drilling in October, 1982, to January, 1983, February and March, 1985, and July, 1986.

In the first phase, eight exploratory borings were drilled and sampled for stratigraphic logging and to obtain samples for laboratory testing. An additional 10 borings were drilled for the installation of monitoring wells.

In the second phase, 23 borings were drilled and sampled for stratigraphic logging. Packer-permeability tests were conducted in three of the borings. Monitoring wells were installed in 22 of the borings. Well-construction details for both phases are presented in Table F.3.1, and monitoring well locations are presented in Figure F.3.1.

All field and laboratory work was performed in accordance with standard operating procedures. The first phase was conducted in accordance with a Work Plan for geotechnical and ground-water hydrology work (Golder Associates, 1982). The second phase was performed in accordance with standard operating procedures on file with the DOE UMTRA Project Office in Albuquerque, New Mexico.

F.3.1.3 Stratigraphy

The stratigraphy at the processing site has been defined through a series of borings (Figures F.3.1 through F.3.9). The

Table F.3.1 Grand Junction processing site borehole and well information

LOCATION[a] ID	NORTH COORDINATE[b]	EAST COORDINATE[b]	WELL DIAMETER [IN.]	TOTAL DEPTH [FT.]	SURFACE ELEVATION [FTMSL]	TOP OF CASING [FTMSL]	SCREENED INTERVAL BEG DP [FTFD]	SCREENED INTERVAL LENGTH [FT.]	BOREHOLE DEPTH [FTFD]	ZONE OF COMPLETION
581	59439.6	33674.9	2.000	31.00	4585.20	4586.33	27.00	4.0	35.00	Alluvium
582	59310.4	33151.8	2.000	43.20	4585.30	4586.22	35.70	7.5	42.50	Alluvium
583	59316.8	33141.5	2.000	33.73	4585.10	4587.04	28.73	5.0	32.00	Alluvium
584	59321.0	33153.8	2.000	26.70	4585.40	4586.73	24.70	2.0	25.50	Alluvium
585	59179.4	32541.9	2.000	13.90	4566.00	4567.38	11.90	2.0	13.50	Alluvium
586	59191.9	32539.8	2.000	9.50	4566.20	4567.77	5.50	4.0	8.70	Alluvium
587	60599.9	34829.2	4.000	13.10	4575.00	4575.00	7.60	5.5	15.50	Alluvium
588	59447.6	35959.7	4.000	17.90	4571.50	4571.45	7.90	10.0	17.00	Alluvium
589	59399.1	31876.9	4.000	17.90	4566.80	4566.84	5.90	12.0	18.00	Alluvium
590	59531.2	31295.8	4.000	15.20	4564.70	4566.19	7.20	8.0	15.50	Alluvium
591	59404.6	32728.1			4581.60				20.00	Alluvium
592	59215.1	33788.2	2.000	34.90	4590.90	4592.80	29.90	5.0	33.00	Alluvium
593	59245.2	34957.7			4589.60				27.00	Alluvium
594	59789.8	34559.6	2.000	61.40	4612.40	4614.34	56.40	5.0	59.50	Alluvium
595	59845.7	33863.1	2.000	25.30	4579.80	4583.31	20.30	5.0	21.80	Alluvium
596	59767.3	32805.2	2.000	23.40	4581.60	4583.00	18.40	5.0	22.00	Alluvium
597	59530.7	34098.0	2.000	39.60	4596.70	4598.30	34.60	5.0	38.00	Alluvium
710[c]	59541.5	36658.1	72.000	40.00	4574.35	4574.35			40.00	Alluvium
711[d]	58650.0	49280.0		24.50	4600.00	4601.00			23.50	Alluvium
712[d]	60780.0	49410.0		30.80	4608.00	4608.80			30.00	Alluvium
724	59894.5	31371.5	2.000	143.00	4564.70	4566.50	131.00	10.0	142.00	Dakota SS
725	59394.9	31268.0	2.000	101.00	4566.80	4567.30	69.00	30.0	140.00	Dakota SS
726	59393.0	31257.3	4.000	141.00	4566.80	4566.83	110.50	30.0	140.00	Dakota SS
727	59380.3	31265.3	2.000	56.20	4566.40	4567.10	44.00	10.0	55.20	Mancos Shale
728	59518.5	31296.1	2.000	19.00	4565.00	4565.38	12.00	5.0	17.00	Mancos/Alluvium
729	59738.7	32572.3	2.000	67.00	4565.30	4567.21	55.00	10.0	65.00	Mancos Shale
730	60200.0	33200.0			4575.00				67.00	Mancos Shale
731	60671.6	29820.3	2.000	36.50	4559.70	4561.34	25.50	10.0	46.00	Mancos Shale
732	60659.1	29817.6	2.000	23.00	4559.50	4561.80	16.00	5.0	21.00	Mancos/Alluvium
733	60997.4	28704.7	2.000	23.00	4556.40	4558.00	16.00	5.0	21.00	Mancos/Alluvium
735	60211.6	31261.7	2.000	40.00	4564.70	4566.36	26.00	10.0	50.00	Mancos Shale
736	60197.9	31270.5	2.000	17.00	4564.70	4566.50	10.00	5.0	15.00	Mancos/Alluvium
737	61898.9	32967.7	2.000	29.00	4575.30	4577.30	22.00	5.0	27.00	Mancos/Alluvium
738	60039.1	30049.4	2.000	20.00	4561.00	4563.60	13.00	5.0	18.00	Mancos/Alluvium
739	60273.6	31970.1	2.000	32.00	4572.90	4574.90	25.00	5.0	30.00	Alluvium
740	59908.3	32001.1	2.000	19.00	4566.10	4568.11	12.00	5.0	17.00	Mancos/Alluvium
741	60796.0	33048.8	2.000	47.00	4572.90	4574.64	35.00	10.0	45.00	Mancos Shale
742	60774.6	33047.2	2.000	25.00	4572.70	4574.78	18.00	5.0	23.00	Mancos/Alluvium
743	59491.7	37069.7	2.000	37.00	4575.10	4576.70	25.00	10.0	35.00	Mancos Shale
744	59492.2	37051.3	2.000	17.00	4574.80	4576.78	10.00	5.0	15.00	Mancos/Alluvium
745	61040.0	36958.2	2.000	22.00	4579.40	4581.31	15.00	5.0	20.00	Mancos/Alluvium
746	62365.1	35806.3	2.000	26.90	4586.90	4588.50	19.60	5.0	25.00	Alluvium
747	60207.8	36378.8	2.000	19.00	4574.30	4576.07	12.00	5.0	17.00	Alluvium

[a] 581-590 correspond to GWGJ-1 through GWGJ-10 in DOE(1983); 591-597 correspond to GGJ-1 through GGJ-7 in DOE(1983).

[b] Site coordinate system is based on a truncation of modified Colorado coordinate system.

[c] 710 is an industrial drainage well.

[d] 711 and 712 are U.S. Bureau of Reclamation monitoring wells.

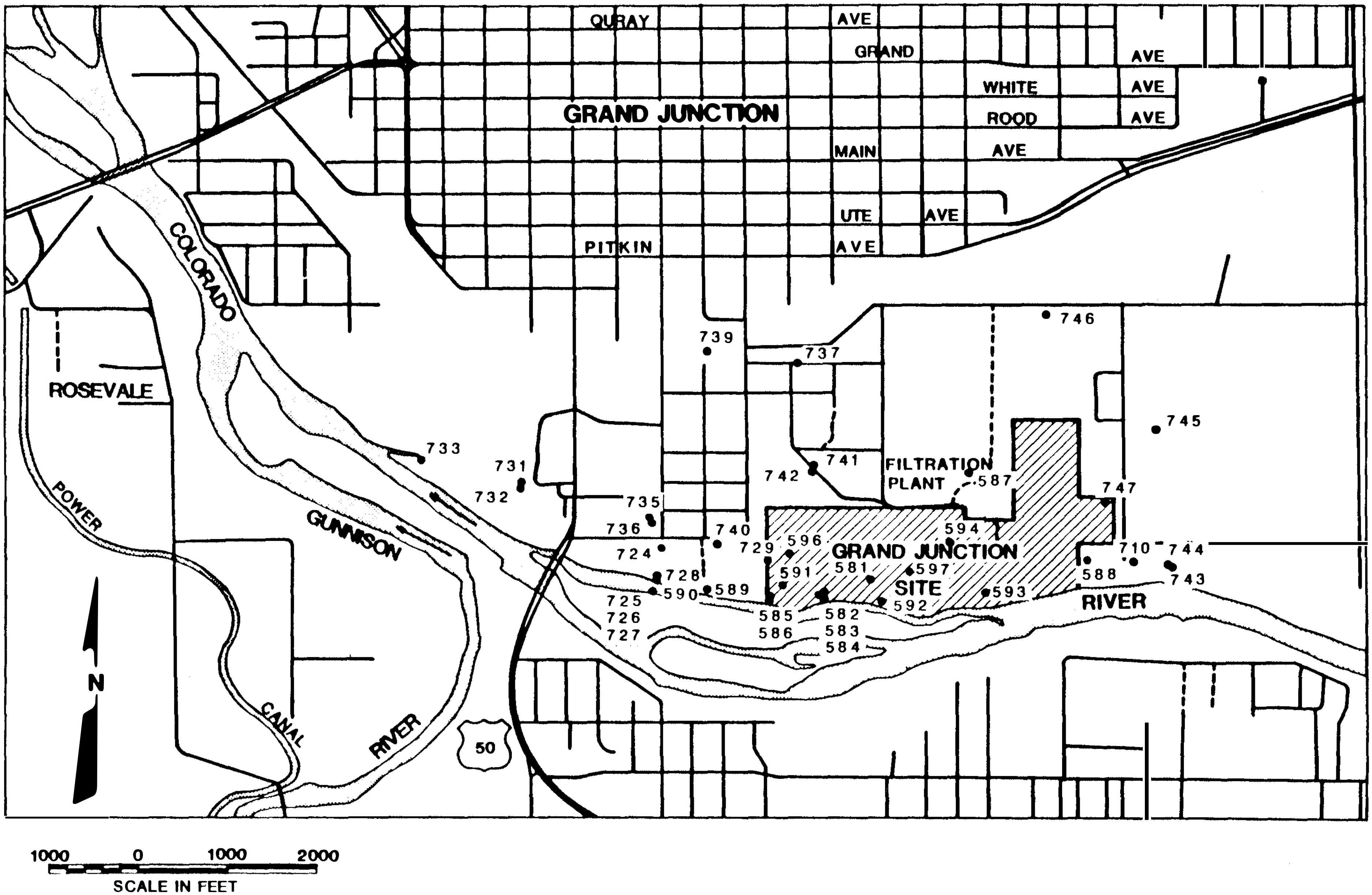


FIGURE F.3.1
MONITORING WELL LOCATIONS NEAR GRAND JUNCTION SITE

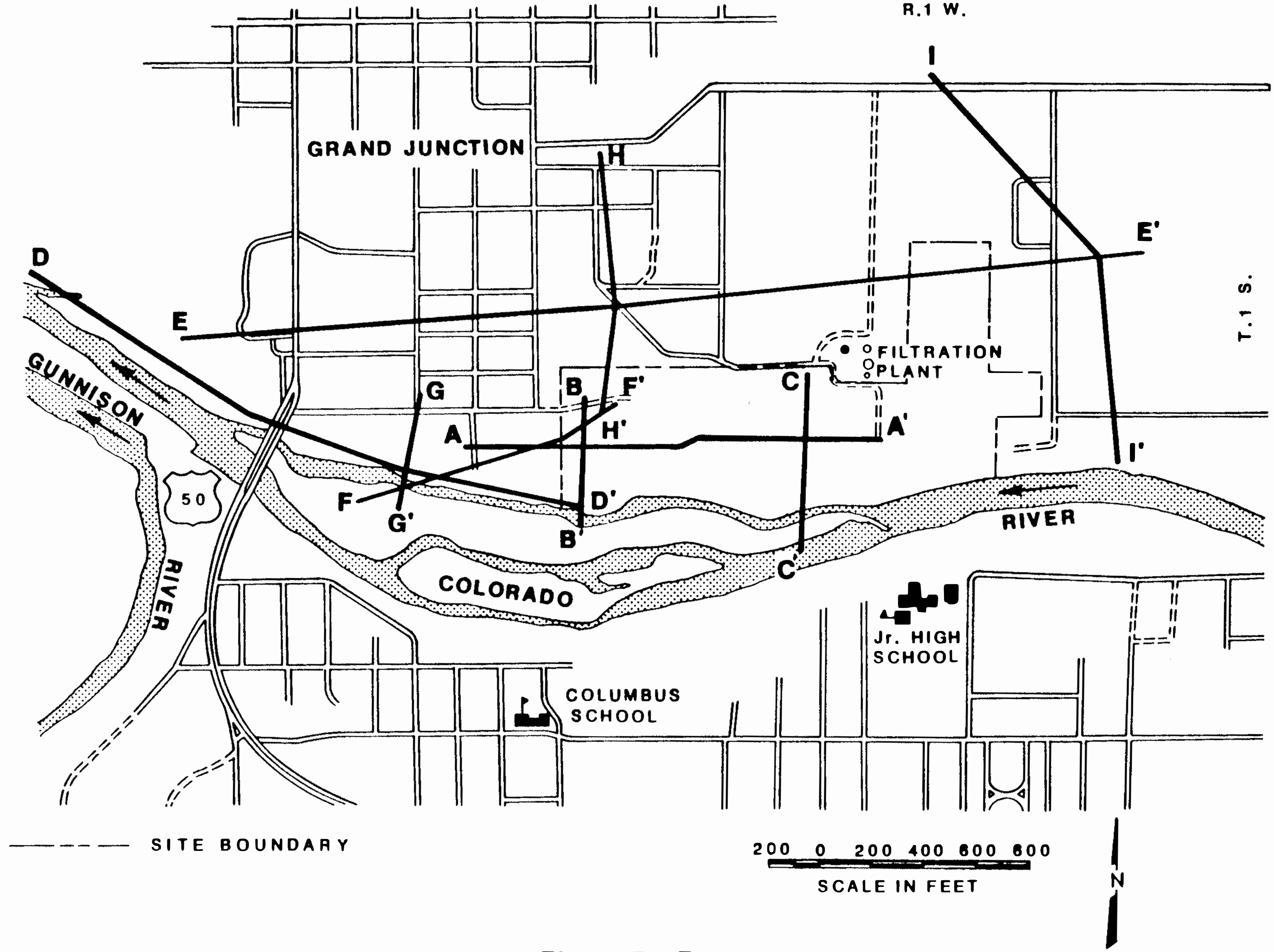


FIGURE F.3.2
CROSS-SECTION LOCATIONS FOR PROCESSING SITE

CROSS-SECTIONS A-A', B-B', C-C' REF: NELSON AND WARDWELL (1982)

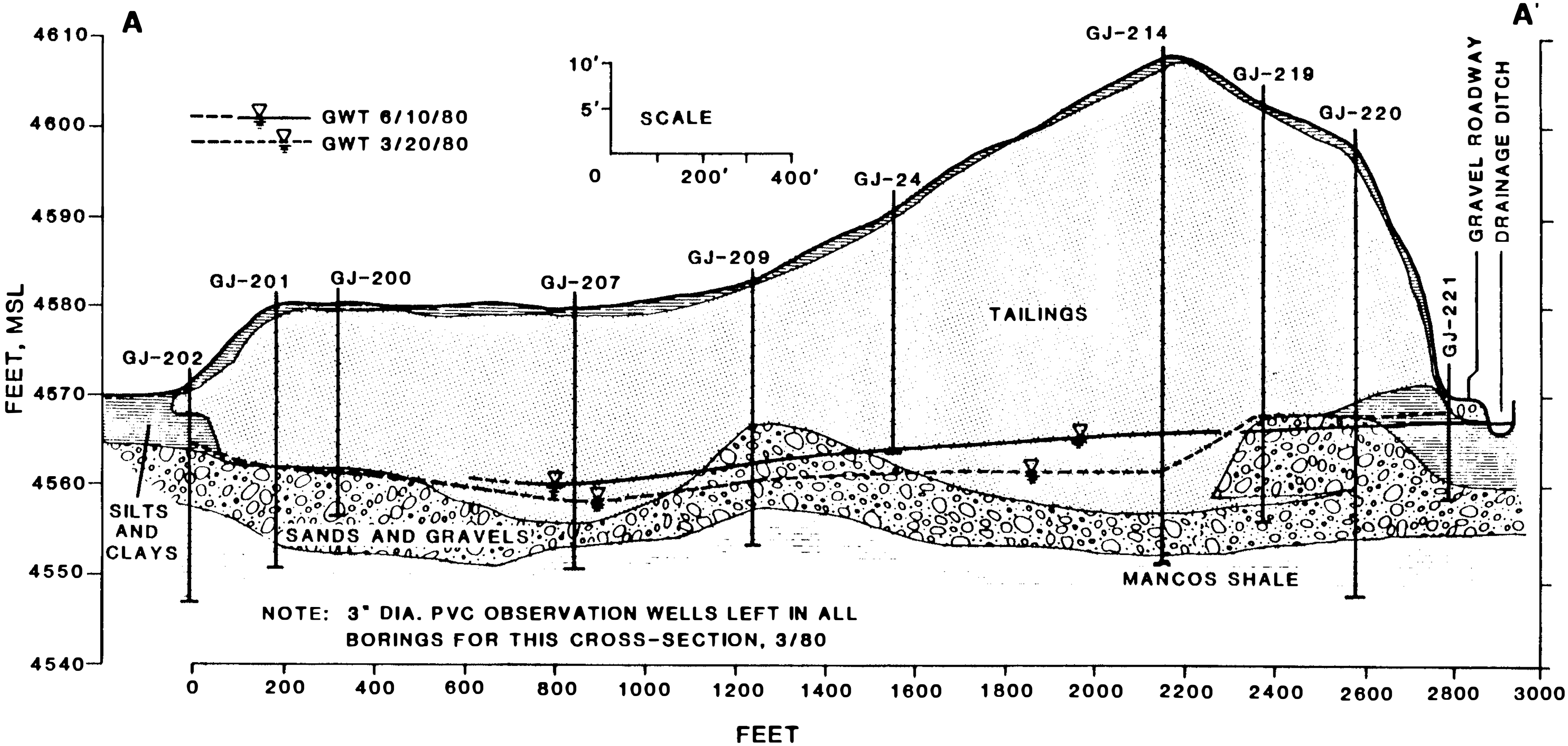
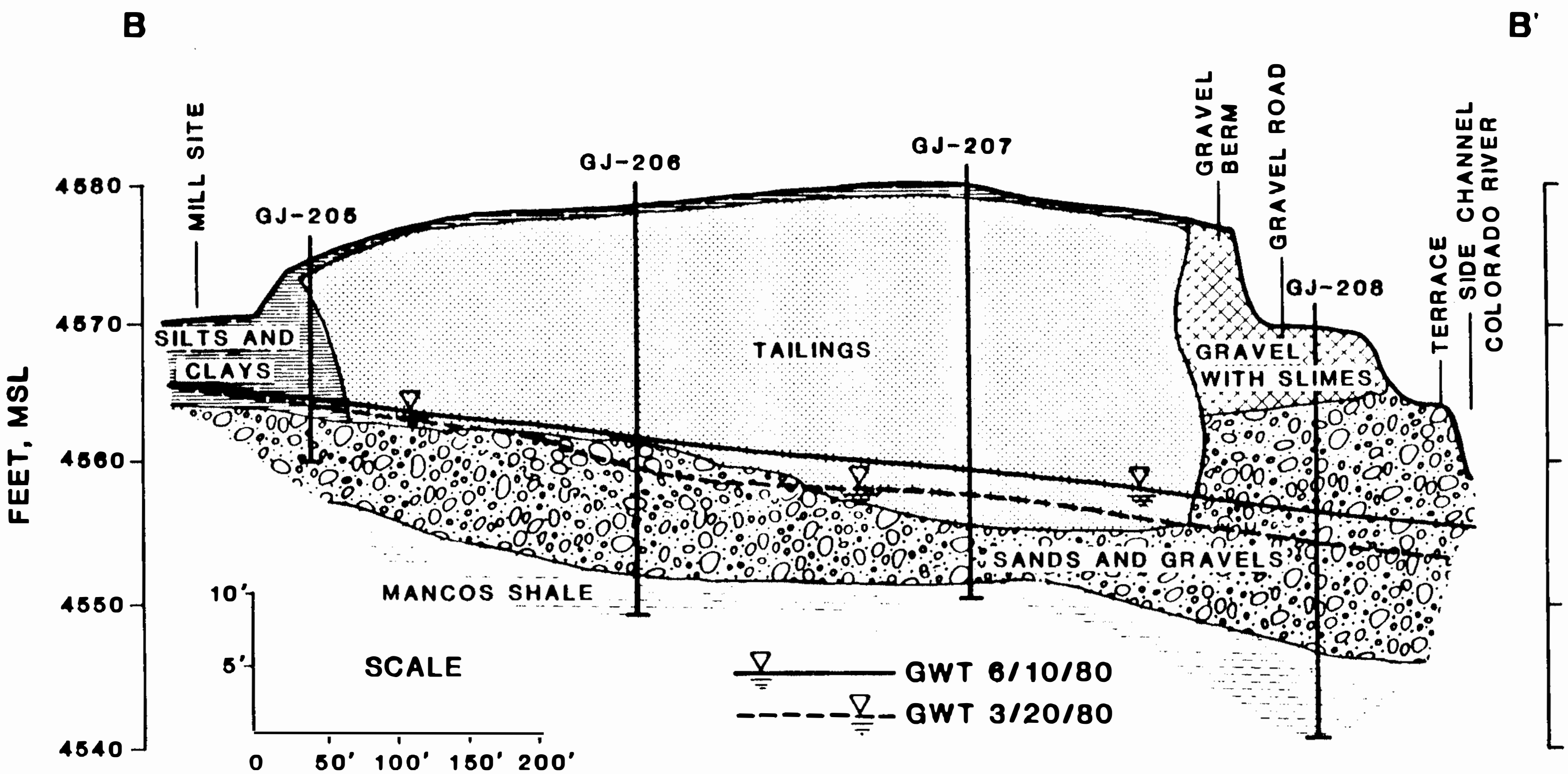


FIGURE F.3.3
GEOLOGIC CROSS SECTION: SECTION A-A'

REFERENCE: NELSON AND WARDWELL (1982)



NOTE: 3" DIA. PVC OBSERVATION WELLS LEFT IN ALL BORINGS FOR THIS CROSS-SECTION, 3/80

FIGURE F.3.4
GEOLOGIC PROFILE: SECTION B-B'

REFERENCE: NELSON AND WARDWELL (1982)

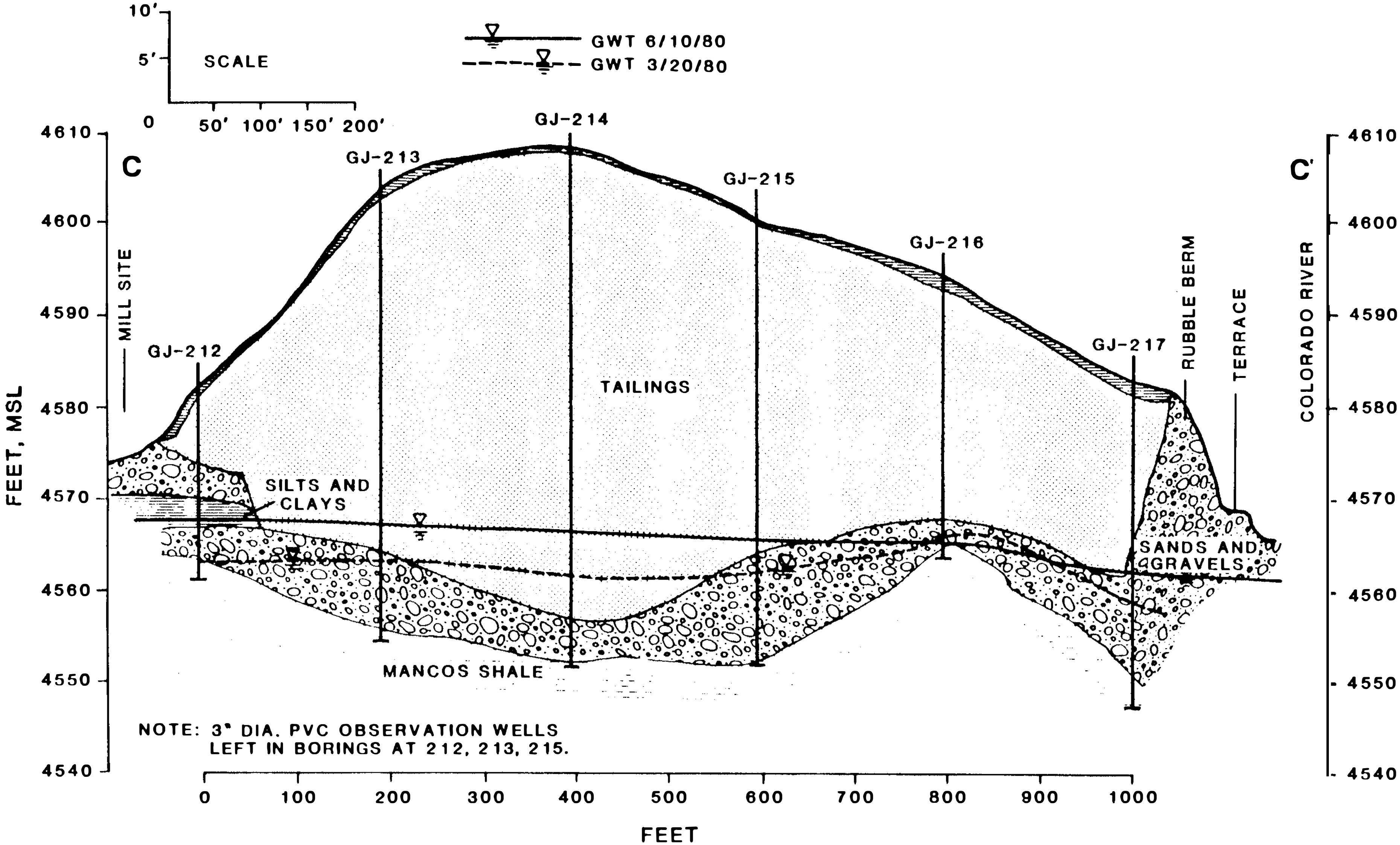


FIGURE F.3.5
GEOLOGIC PROFILE: SECTION C-C'

REFERENCE: NELSON AND WARDWELL (1982)

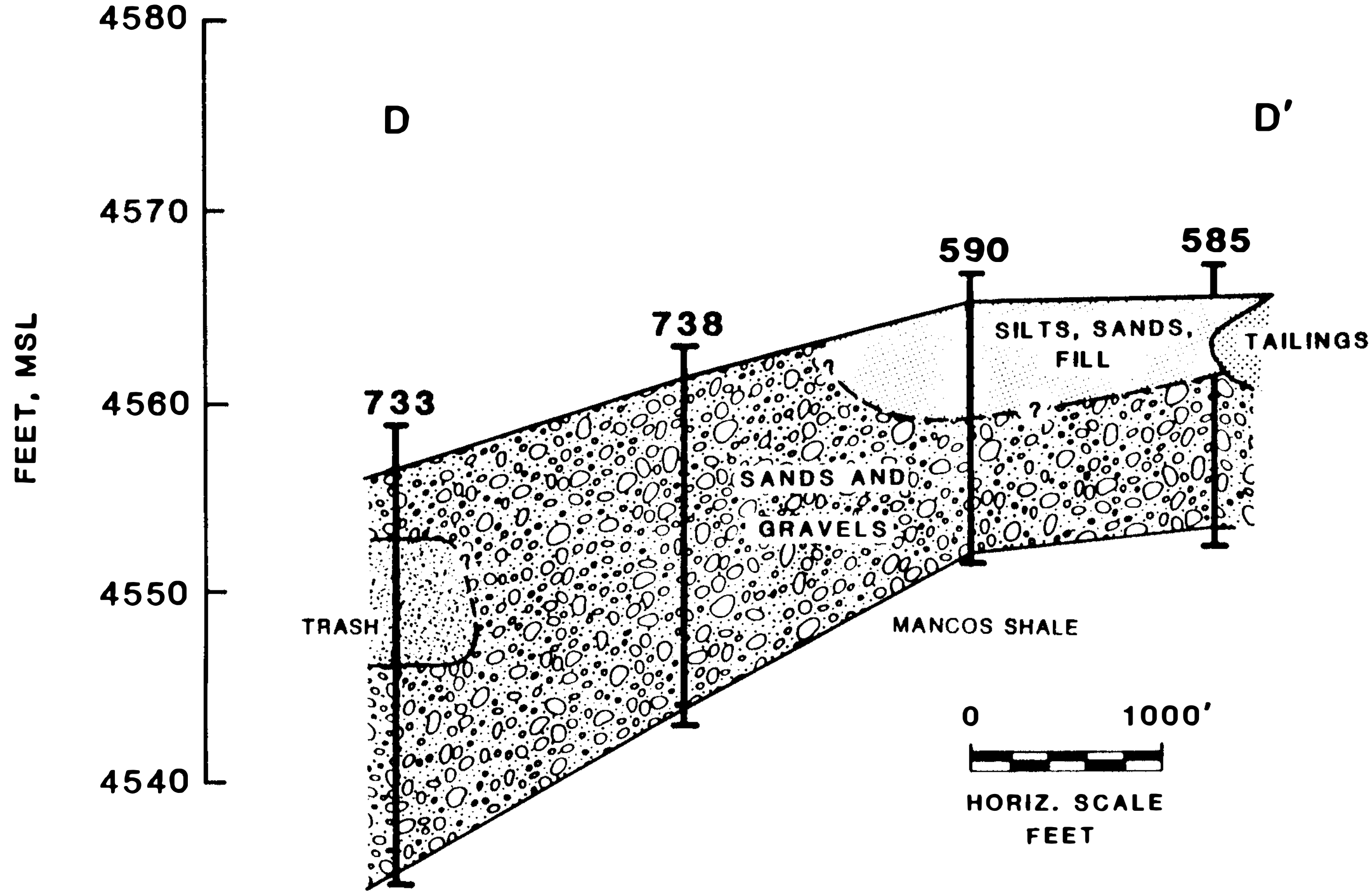


FIGURE F.3.6
GEOLOGIC CROSS SECTION D-D'

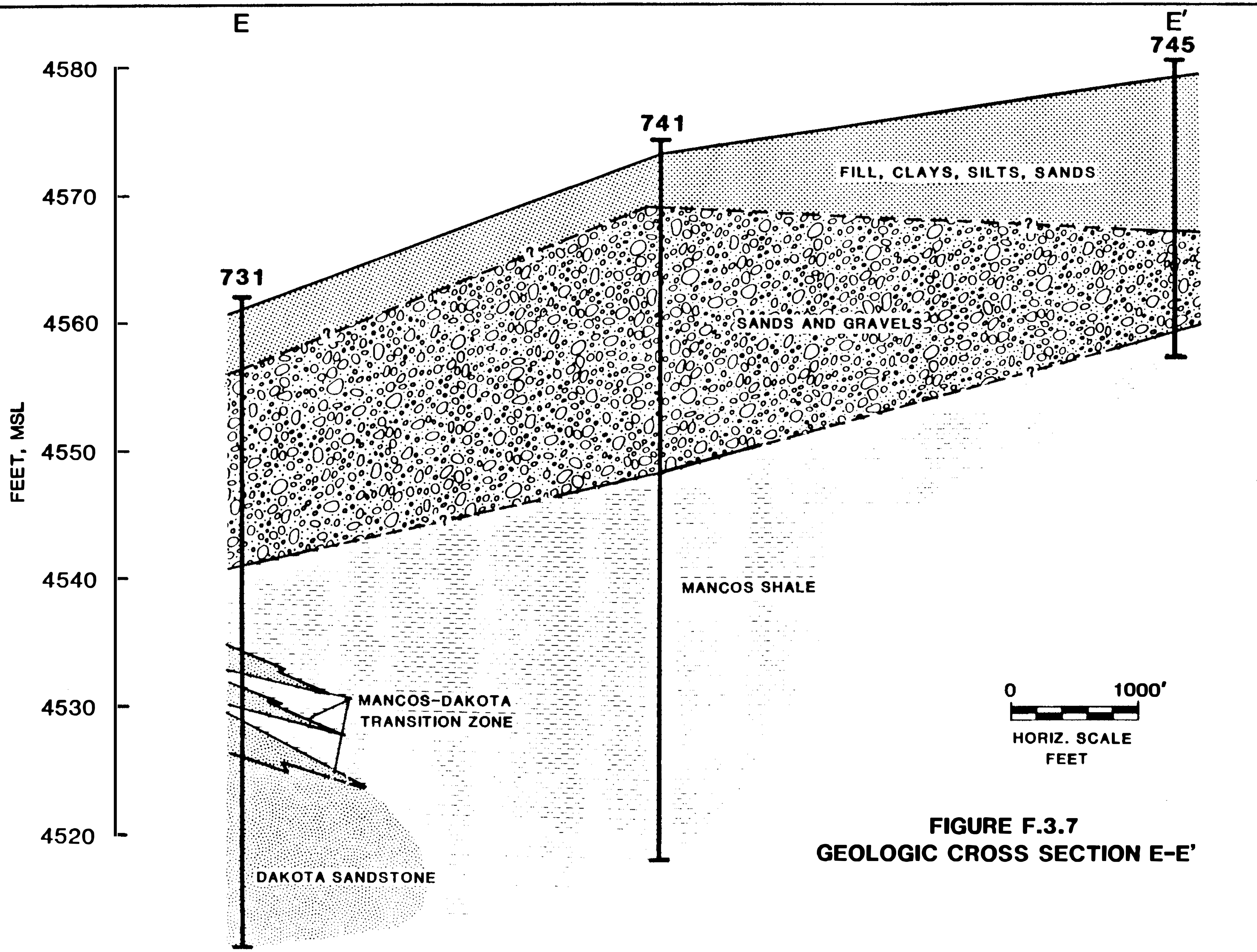


FIGURE F.3.7
GEOLOGIC CROSS SECTION E-E'

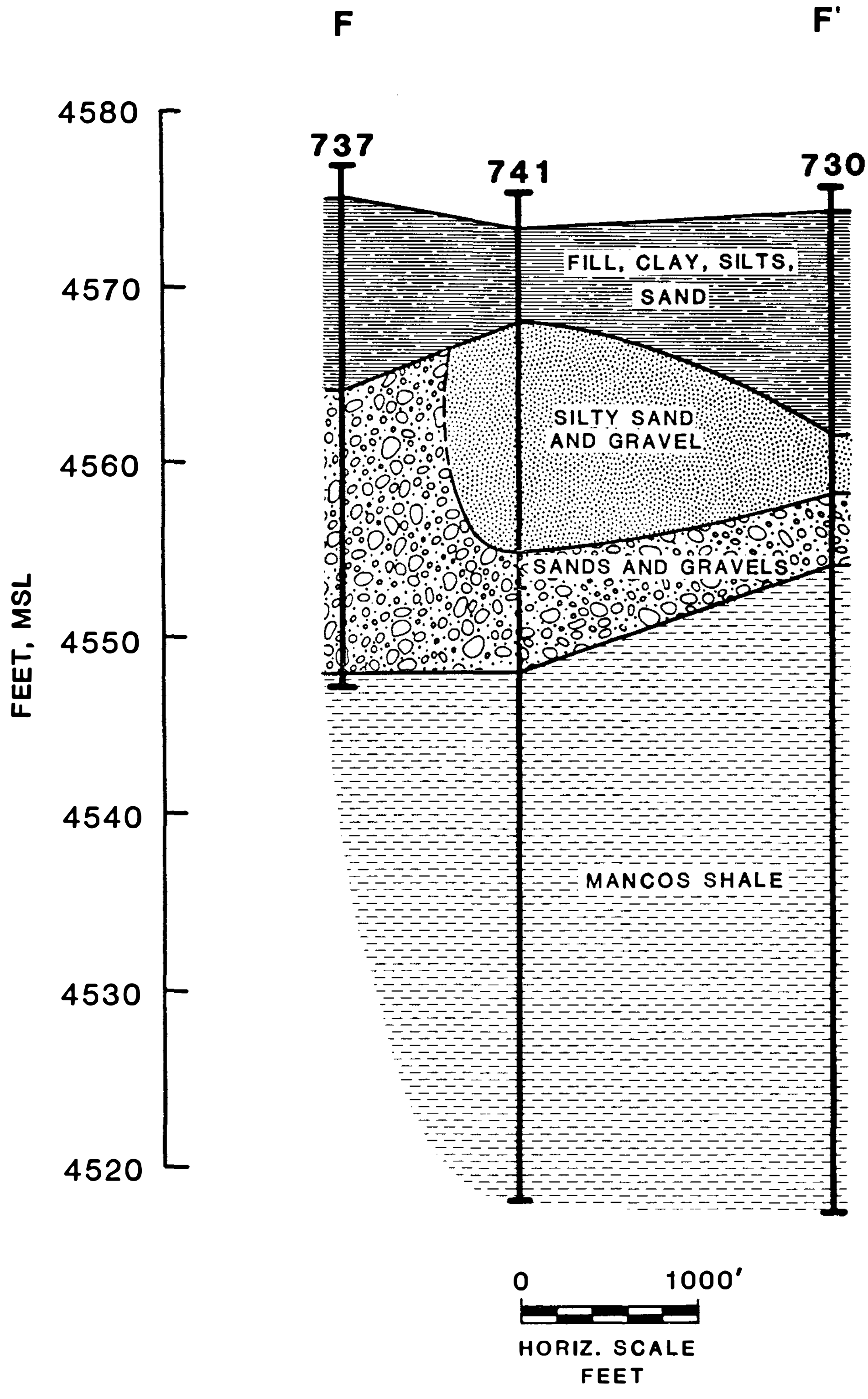


FIGURE F.3.8
GEOLOGIC CROSS SECTION F-F'

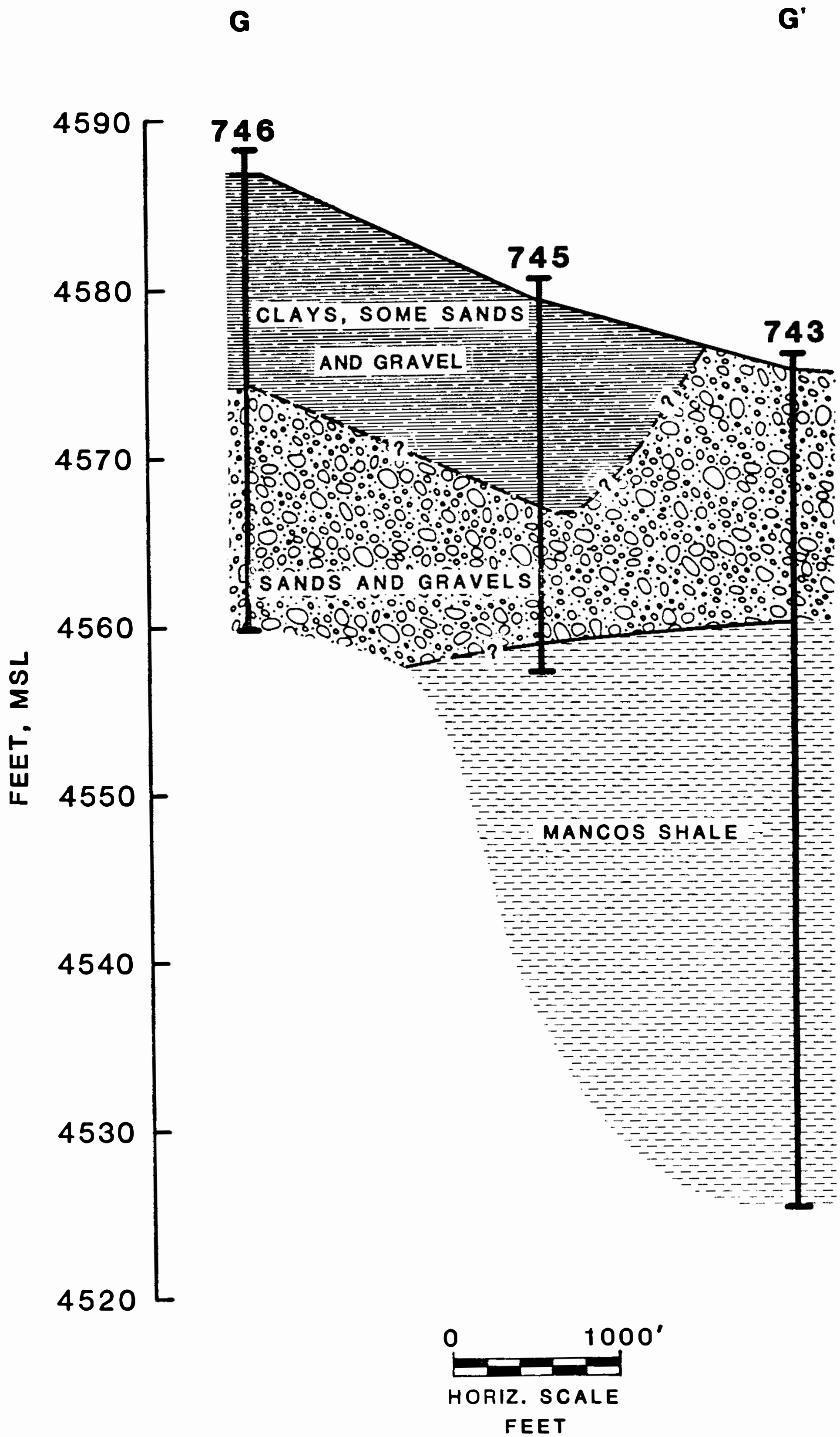


FIGURE F.3.9
GEOLOGIC CROSS SECTION G-G'

shallow stratigraphy near the Grand Junction site consists of three zones. From top to bottom these are:

- o A surficial disturbed zone.
- o A zone of unconsolidated alluvial sediments.
- o A sequence of consolidated sedimentary formations.

The surficial zone includes a variety of soil classifications and material types which have been deposited or altered through the action of man. It varies in depth from less than one to more than 50 feet. These include the tailings, which are shown in cross-section on Figures F.3.3 through F.3.5; trash, shown on Figure F.3.6; and fill, shown on Figures F.3.6 through F.3.8. The tailings consist of a series of interbedded sands and slimes which have been described in more detail by other investigators (Nelson and Wardwell, 1982).

Underlying or adjacent to the surficial zone is a zone of alluvial deposits (Figures F.3.3 through F.3.9). In the vicinity of the tailings this includes zones of mixed gravel, sand, and silty layers ranging in depth from less than seven to more than 21 feet. In general, the alluvium in this portion of the Grand Valley can be categorized into two types, as described below:

> "In deeper sections of the Colorado River paleochannel is a stratum of gravel and cobbles overlying the Mancos Shale referred to as the cobble aquifer. Overlying the cobble aquifer is a layer of alluvium that extends over the entire Grand Valley." (U.S. Bureau of Reclamation, 1978)

In this report these two types of alluvial deposits will be grouped together and referred to as "alluvium."

The "cobble aquifer" borders the Colorado River in a strip two to three miles wide from Palisade to Loma, with a northern boundary approximately 0.5 mile south of the Government Highline Canal shown in Figure F.3.10.

The bottom of the cobble aquifer is formed by the erosional surface of the Mancos Shale which slopes gently (about five feet per mile) to the north where it abuts the base of the Book Cliffs (U.S. Bureau of Reclamation, no date).

Underlying the alluvial deposits is a sequence of consolidated sedimentary rocks, which are, in descending order, (Lohman, 1965):

Mancos Shale
Dakota Sandstone*
Burro Canyon Formation*
Morrison Formation (Salt Wash*
and Brushy Basin Members)

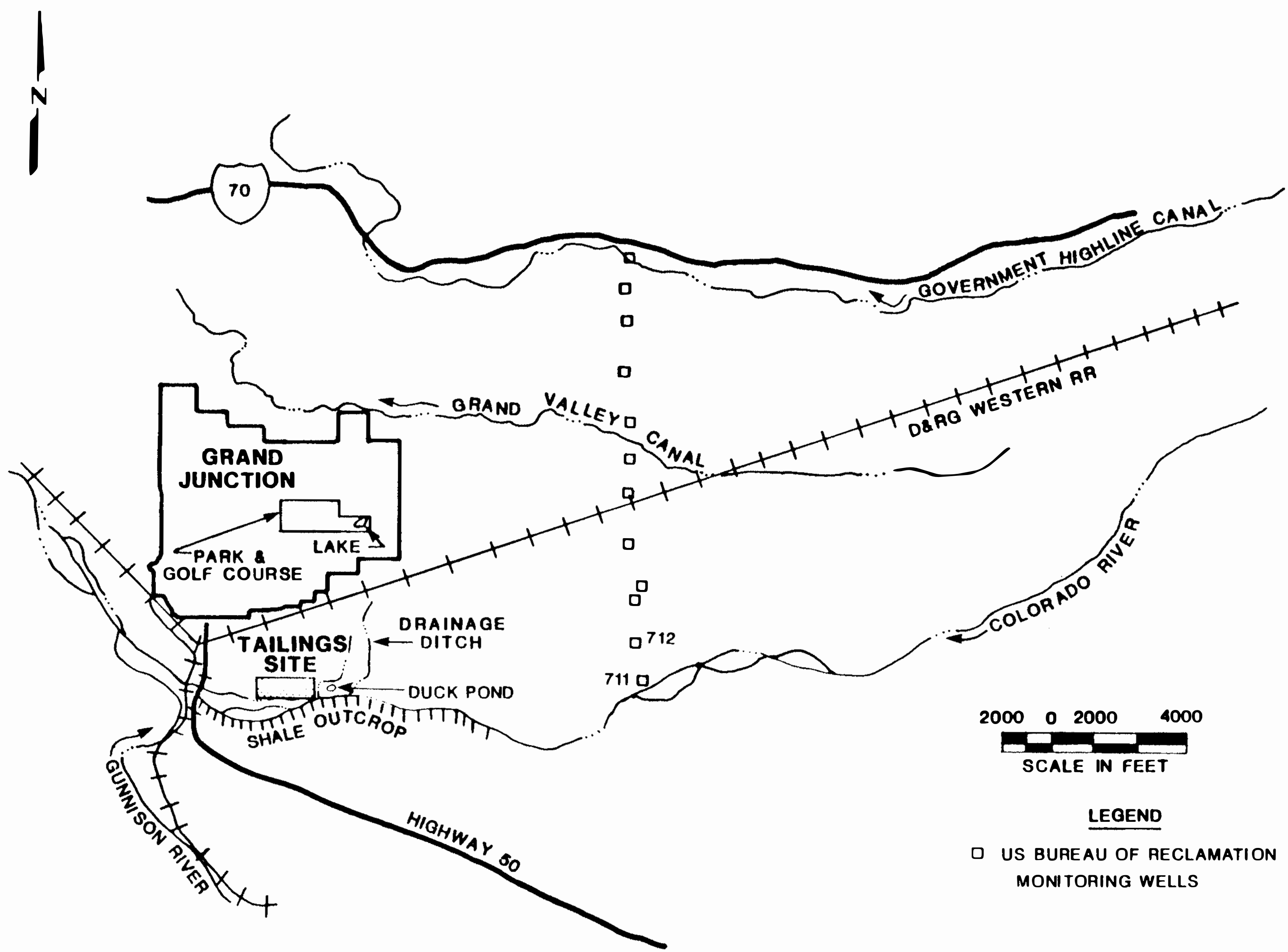


FIGURE F.3.10
HYDROLOGIC SETTING GRAND JUNCTION SITE

Summerville Formation*
Entrada Sandstone
Kayenta Formation*
Wingate Sandstone
Chinle Formation

The formations shown with an asterisk above are tapped as aquifers in the Grand Junction area. The Dakota Sandstone and Burro Canyon Formation are grouped together as one water-bearing unit; however, the Dakota Sandstone is not an important source of water (Lohman, 1965).

Among the consolidated sedimentary formations, only the Mancos Shale and the Dakota Sandstone are of interest with respect to the tailings. The Mancos Shale is of interest because it is a low-permeability unit which can provide a barrier to downward migration of contamination. The Dakota Sandstone is of interest because it is the uppermost known bedrock aquifer and potentially could be impacted by the tailings.

The Mancos Shale is a thick sequence of shale which includes some sandy layers and thin sandstone beds. It not only underlies all of the Grand Valley but forms most of the Book Cliffs to the north. The Mancos Shale and the Dakota Sandstone intertongue and the contact between the two appears to be conformable and gradational (Lohman, 1965).

The thickness of the Mancos Shale underlying the tailings exceeds 50 feet (boring #729), while 0.5 mile west of the site at the Highway 50 bridge, it appears to thin to the extent that the Dakota Sandstone locally subcrops to the alluvium (Colorado Department of Highways, 1964). The Mancos Shale dips to the northeast, so that at a well approximately 1.5 miles northeast of the tailings it is 638 feet thick (Lohman, 1965).

The Dakota Sandstone consists of beds of sandstone, conglomeratic sandstone, shale, and coal. It is generally grouped with the underlying Burro Canyon Formation as one hydrogeologic unit, and is the least important of the four artesian aquifers in the Grand Junction area (Lohman, 1965). "The sandstone beds of the Burro Canyon Formation and Dakota Sandstone are tightly cemented, lenticular, and generally thin, hence they yield only small amounts of water, generally under insufficient head to flow at the surface." Below the tailings it is more than 65 feet below land surface (boring 729). The log of a well in the NE 1/4 SW 1/4 of section 24, a location approximately the same as the east end of the tailings, reported the top of the Dakota at 168 feet below land surface (Lohman, 1965).

Faulting. A seismic risk evaluation of the Grand Junction site has concluded that the probability of active faulting near or under the site cannot be quantified. Regardless, the effects of possible faults (if present) on the existing hydrogeologic regime appear to be minimal. The differences in water quality between the contaminated alluvial system and the Dakota Sandstone (Section F.3.1.6), and the presence of entrapped oil in the Dakota Sandstone (boring #725) indicate minimal communication between the two systems near the processing site. The presence of oil shows that the overlying rock is so low in permeability as to trap the oil, whereas a fault zone could be a more permeable area along which oil could escape. A more detailed discussion of seismic risk is presented in Appendix E, Soils, Geologic, and Seismic Information.

F.3.1.4 Unsaturated zone hydraulics

The Grand Junction tailings have been extensively characterized in terms of hydraulic properties. The data produced by the characterizations are too many to report, but have been reported or summarized elsewhere (Veyera, 1980; Martin et al., 1980; Veyera and Nelson, 1981).

After cessation of operations (milling) the tailings are expected to have drained relatively rapidly (Veyera and Nelson, 1981). Based on this conclusion and the periodic flux of ground water through the tailings during seasonally high water levels, the importance of the unsaturated zone in the existing hydrologic regime is relatively minor. The main driving force for migration of contaminants in the existing environment is flow of ground water through those portions of the tailings which are below the water table.

F.3.1.5 Saturated zone hydraulics

Dakota Sandstone. No known published quantitative data are available for the Dakota Sandstone in the vicinity of the tailings. An extensive study of the hydrogeology of the Grand Junction area produced no quantitative data (Lohman, 1965).

Results from two slug tests of the upper Dakota Sandstone near the processing site show that it has relatively low permeability, comparable to the Mancos Shale (Table F.3.2). In addition to the slug test data, qualitative observations regarding the hydraulic properties of the Dakota Sandstone indicate that it has a relatively low yield. For example:

- o A four-inch diameter well (30-foot screen) installed during the 1985 field program yielded insufficient water (less than one gpm) to conduct a pump test.
- o "The sandstone beds of the Burro Canyon Formation and Dakota Sandstone are tightly cemented, lenticular, and generally thin, hence they yield only small amounts of water. . ." (Lohman, 1965).

Table F.3.2 Slug testing results for the Grand Junction site

Well Location ID[b]	Hydraulic conductivity[a] by methods: CBP[c]	F-K[d]	Skibitzke[e]	Storage coefficient[c]
724	--	--	4.6×10^{-5}	--
725	2.6×10^{-5} 4.4×10^{-5}	7.9×10^{-6}	--	10^{-3} 10^{-5}
727	5.5×10^{-6}	7.3×10^{-7}	7.7×10^{-7}	10^{-5}
729	--	--	1.9×10^{-7}	--
731	--	--	9.4×10^{-7}	--
735	--	--	3.9×10^{-7}	--
741	5.8×10^{-5}	1.4×10^{-5}	2.4×10^{-5}	10^{-4}
743	4.9×10^{-4}	1.35×10^{-4}	--	10^{-3}

[a]In cm/sec converted from transmissivity by assuming effective thickness of aquifer equal to thickness of gravel pack.

[b]All wells except 724 and 725 completed in Mancos Shale. 724 and 725 are completed in Dakota Sandstone.

[c]Cooper-Bredehoeft-Papadopulos; Ref. Lohman, 1972.

[d]Ferris-Knowles; Ref. Ferris and Knowles, 1963.

[e]Ref. Skibitzke, 1963.

Mancos Shale. As reported by various authors, the Mancos Shale on a regional basis is generally accepted as a low-permeability formation which is "not water bearing" or transmits only very limited quantities of water (Lohman, 1965; Cooley et al., 1969). One boring into the Mancos Shale (location #735) encountered artesian flow which lasted for 10 minutes. The U.S. Bureau of Reclamation, at a site approximately 20 miles west of the tailings, characterized an artesian zone in the Mancos Shale with a thickness of 1.5 feet, hydraulic conductivity of 210 to 650 feet/day (0.074 to 0.23 cm/sec), and a storage coefficient of 10^{-5} (U.S. Bureau of Reclamation, 1978).

The artesian flow encountered in monitor well 735 was a unique occurrence among the more than 10 monitoring wells drilled at least 30 to 40 feet into the Mancos Shale. The bedrock units beneath the Grand Junction site strike approximately N 45° W and dip 7° to the northeast off the Uncompaghre Uplift into the Piceance Creek Basin. The artesian zone observed in well 735 was not found in wells 729, 730, 741, and 743 since these wells were located down-dip, and their total depths were too shallow to encounter this zone. Note that the chances are good that the artesian zone may have thinned and/or the permeability may have decreased significantly if these wells had been drilled deeper. Well 724 was drilled approximately 400 feet along the structural strike of well 735, and it did not encounter any artesian flow. Ground elevations for wells 724 and 735 are within 0.2 foot. This is the evidence for the discontinuous nature of thin Mancos Shale sandstone units. Wells 725, 726, 727, 731, and 733 were drilled up-dip from well 735. The artesian zone was not encountered in these wells since erosion had removed the interval.

Slug-withdrawal tests of hydraulic conductivity confirm the low permeability of the Mancos Shale (Table F.3.2.). The calculated storage coefficients for Mancos Shale appear to be consistent within an order of magnitude of that reported by the U.S. Bureau of Reclamation, although the determination of storage coefficient by this method has questionable reliability (Cooper et al., 1967).

Packer-permeability tests, analyzed using methods of the U.S. Bureau of Reclamation (U.S. Bureau of Reclamation, 1981), for the Mancos Shale (Table F.3.3) indicate a generally higher permeability than do the slug tests (Table F.3.2). Only one value of hydraulic conductivity is available for a location, 729, at which packer testing was completed. The differing results between slug- and packer-testing can be attributed to the following factors:

- Packer tests are described as semi-quantitative (U.S. Bureau of Reclamation, 1981).

Table F.3.3 Packer-testing results[a] for the Grand Junction site

Borehole	Test Interval[c] (feet)	Permeability x10^{-6} cm/sec for different test pressures[b] P1	P2	P3
726[e]	28-33	107	163	480
	33-38	46	50	53
	38-43	61	63	53
	43-48	61	50	53
	48-53	61	63	53
	53-58	76	63	53
	58-63	61	75	80
	63-68	46	50	63
	68-73	0[d]	0[d]	32
729[f]	26-31	244	265	315
	31-36	305	265	290
	36-41	285	265	164
	42-47	122	125	151
	47-52	163	171	87
	52-57	- unable to set packers-		
	57-62	51	93	126
730	29-34	113	147	---
	34-39	132	103	144
	39-44	169	117	108
	44-49	188	235	216
	49-54	123	161	156
	54-59	188	103	84
	59-64	75	88	96

[a] Double-packer tests of open boreholes completed March, 1985.
[b] Net test pressure, at packers in feet of water;
for borehole 726: P1 = 52.5 P2 = 64.0 P3 = 75.5
for borehole 729: P1 = 37.5 P2 = 49.0 P3 = 60.5
for borehole 730: P1 = 40.5 P2 = 52.0 P3 = 63.5
Tests analyzed using methods of the U.S. Bureau of Reclamation (1981).
[c] 729 and 730 entirely in Mancos Shale. Lower tests in 726 are in Mancos-Dakota transition zone or Dakota Sandstone.
[d] Flow-meter reset after tests; may have been inoperational during tests.
[e] Static water level, May, 1985: 10.5 feet.
[f] Static water level, May, 1985: 34 feet.

- o Based on later water-level measurements, some of the packer tests may have been completed in a partially-saturated zone of the Mancos Shale. Permeabilities in Table F.3.3 were calculated assuming the test section was below the water table. Inaccuracies are associated with the application of U.S. Bureau of Reclamation methods to tests above the water table (Stephens and Neuman, 1982).

Despite the drawbacks associated with the packer-permeability tests, they can be used semi-quantitatively to conclude that:

- o The Mancos Shale appears to be relatively uniform with respect to horizontal permeability in the area of the site.
- o There is a small decrease in the horizontal permeability of the shale with increasing depth. This is confirmed by the results of the slug tests, which show decreasing hydraulic conductivity with increasing depth (Tables F.3.1 and F.3.2).

Water levels in the Mancos Shale are generally within a few tenths of a foot of water levels in adjacent alluvial wells. Flow direction in the shallow Mancos Shale is essentially parallel to flow in the overlying alluvium.

Alluvium. Results of hydraulic testing in the saturated alluvium are reported in Table F.3.4. In general, it can be concluded that the alluvium has a relatively high permeability compared to the underlying shale. Water level iso-contour maps are presented in Figures F.3.11 through F.3.13. A contour of the saturated thickness of the alluvium is presented in Figure F.3.14.

The quantity of ground-water flux through the alluvium and tailings at the site can be calculated using Darcy's law (Davis and DeWiest, 1966):

$$Q = KA \frac{h_1 - h_2}{dl}$$

where

Q = flow rate (l^3/t)

K = hydraulic conductivity (l/t)

h_1, h_2 = hydraulic head at two points

dl = length of the flow path between points at which the head is given

Table F.3.4 Well-development and hydrologic-test methods for the Grand Junction site

Well	Development method	Hydrologic-test method	Analytical method	Hydraulic conductivity (cm/sec)[a]
581	Air lift and bailing	--	--	--
582	Air lift and river water circulation	--	--	--
583	Bailing	--	--	--
584	Bailing	--	--	--
585	Bailing inside steel casing and suction pump	Stable drawdown with probe	Steady state	2.5×10^{-2}
586	Suction pump	Stable drawdown with probe	Steady state	2.3×10^{-2}
587	Submersible pump	Transient drawdown with transducer	Transient	4.2×10^{-2}
588	Submersible pump	Transient drawdown with transducer	Transient	1.5×10^{-2}
589	Submersible pump	Transient drawdown with transducer	Transient	2.0×10^{-2}
590	Submersible pump	Stable flow, assumed drawdown	Steady state	$>3.3 \times 10^{-2}$

[a]Centimeters per second.

Ref. NUS, 1983.

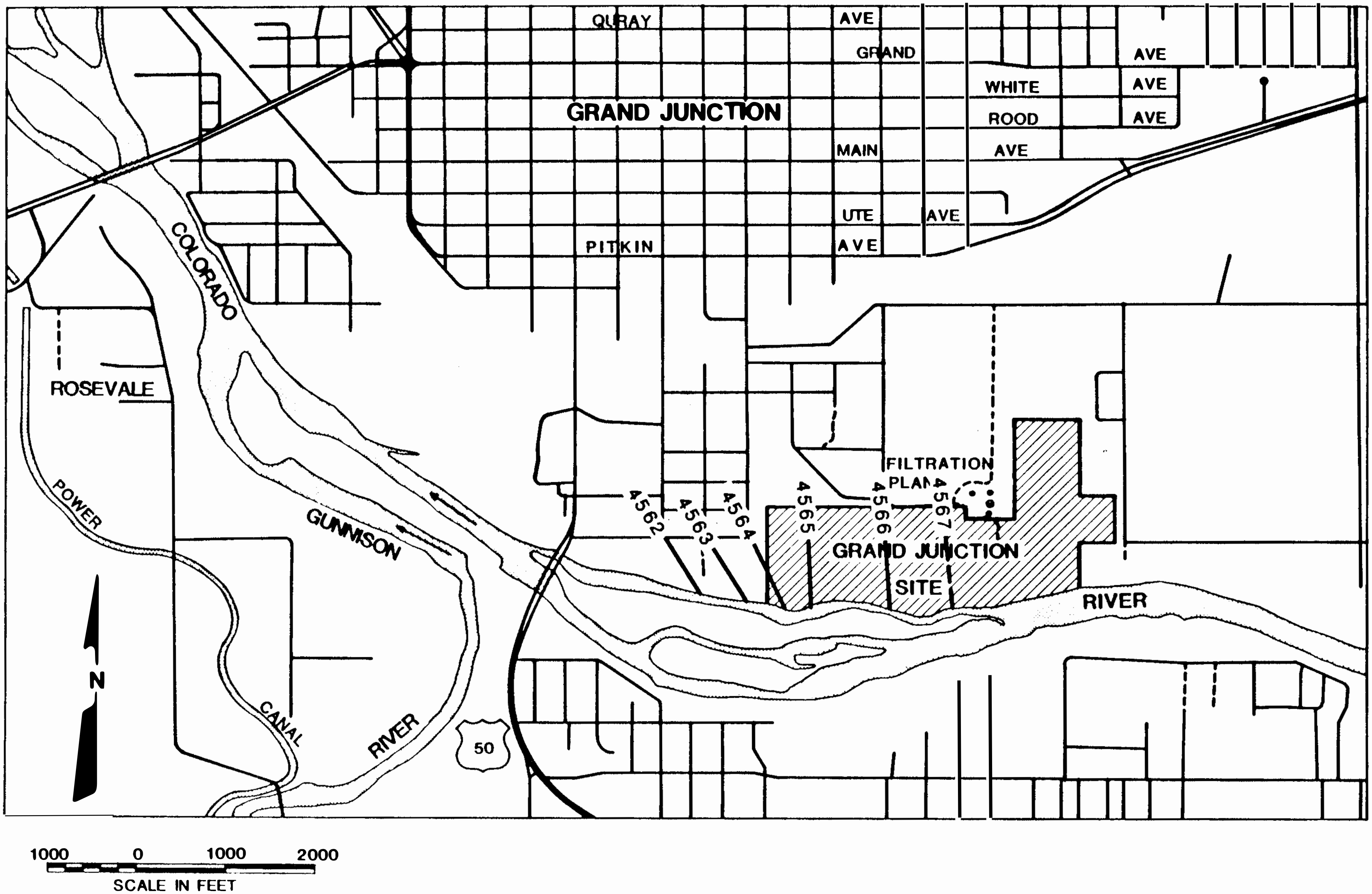


FIGURE F.3.11
JUNE, 1983 WATER LEVELS IN THE ALLUVIAL SYSTEM

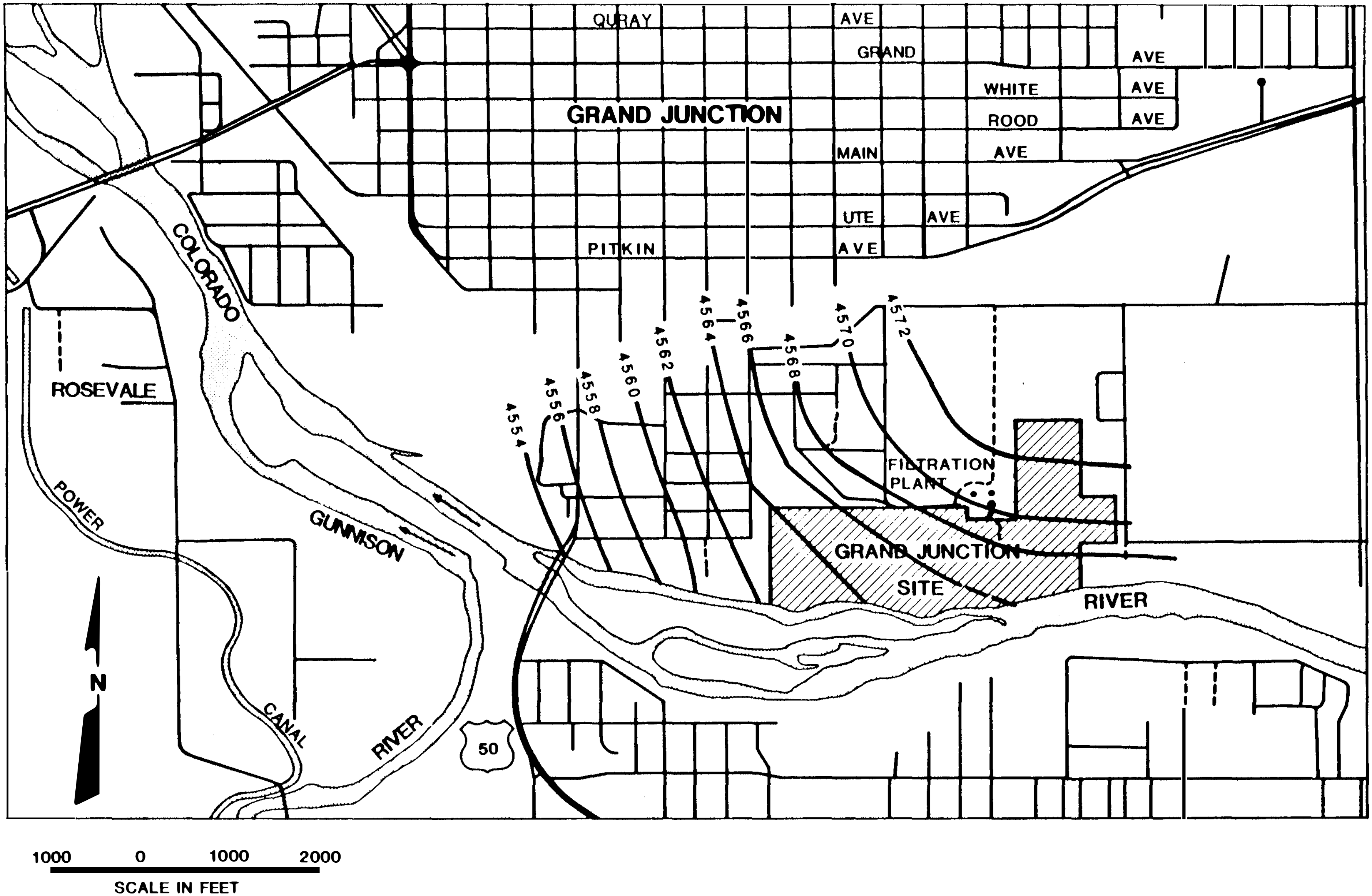


FIGURE F.3.12
MARCH, 1985 WATER LEVELS IN THE ALLUVIAL SYSTEM

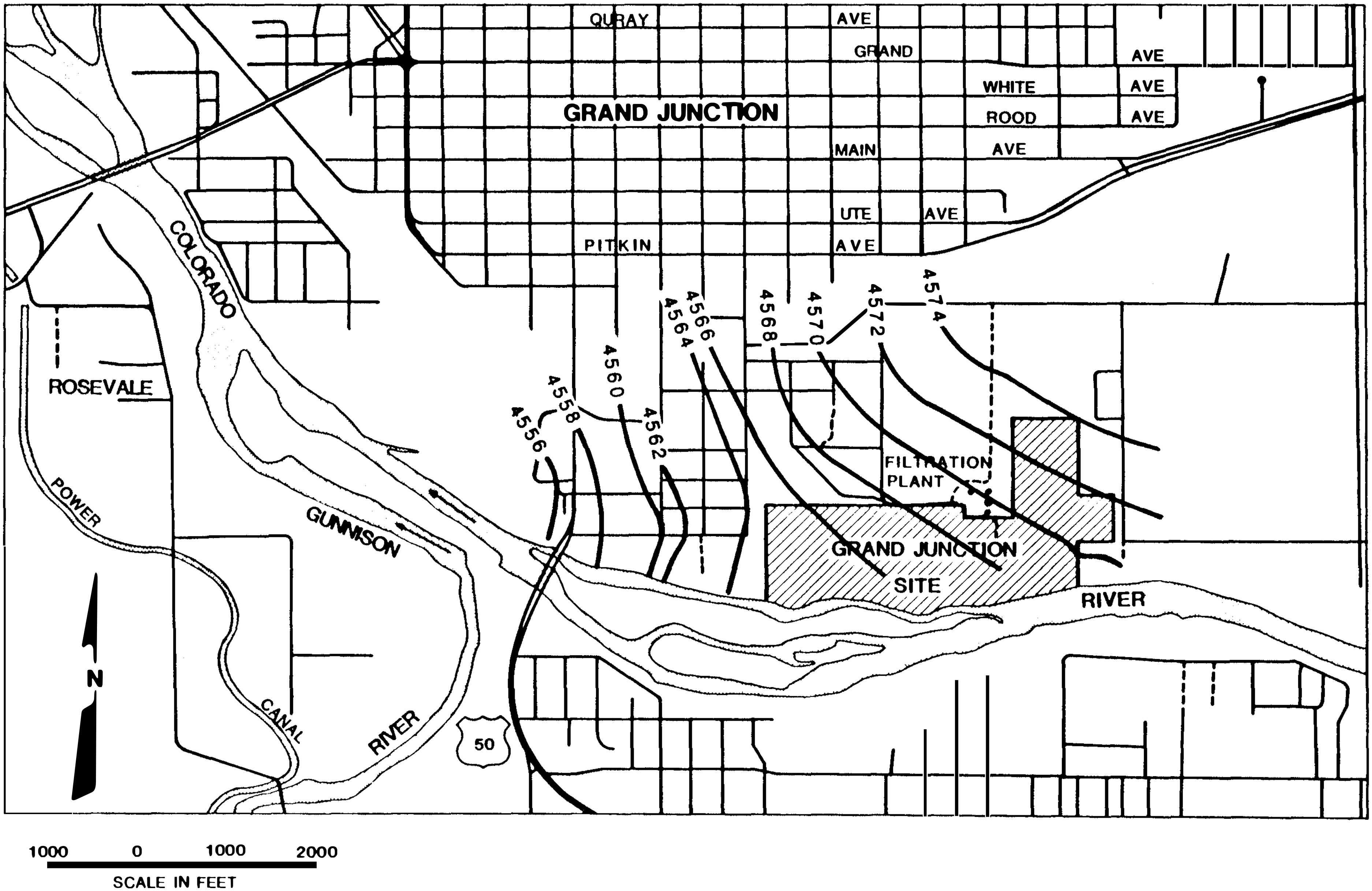
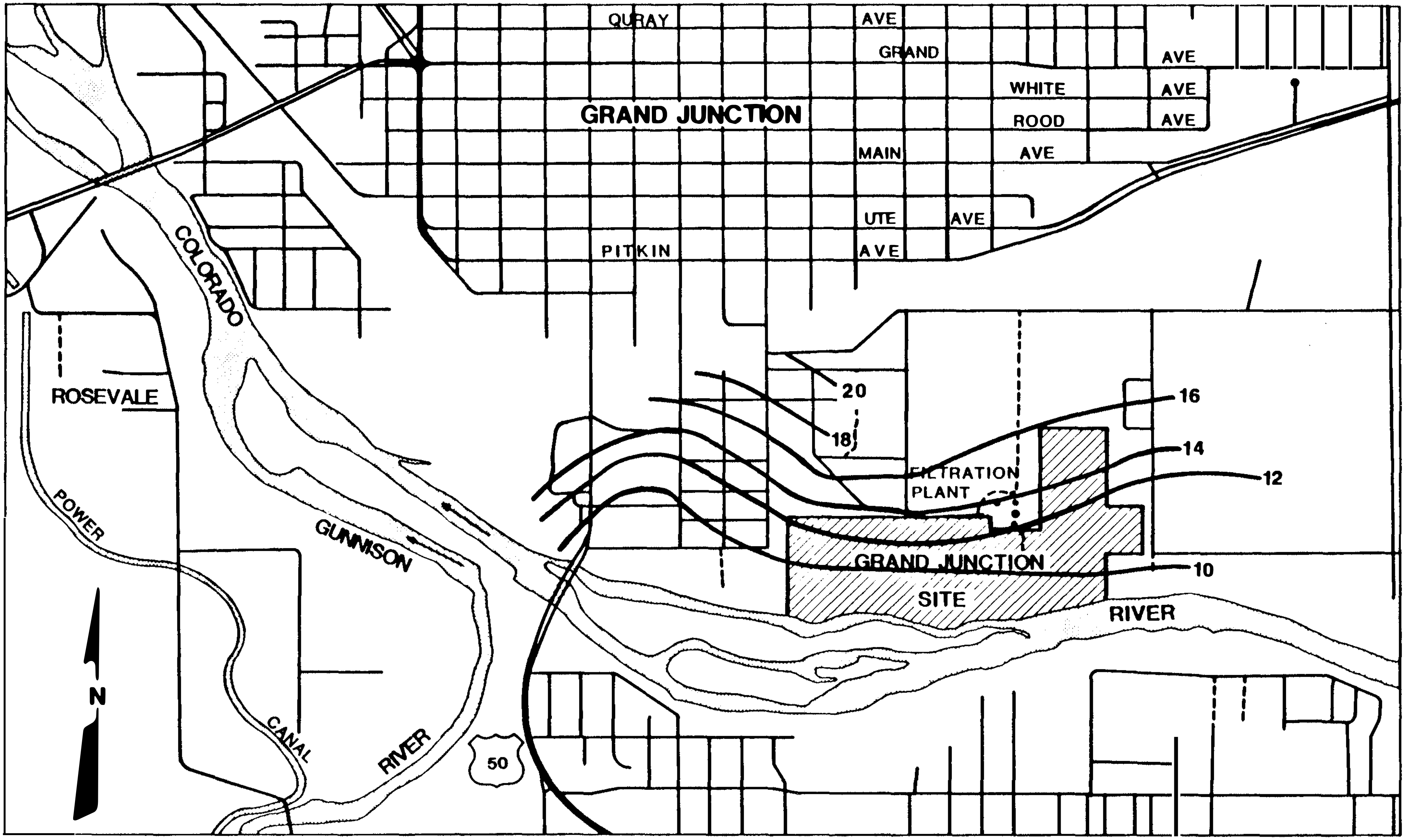


FIGURE F.3.13
MAY, 1985 WATER LEVELS IN THE ALLUVIAL SYSTEM



NOTE: THICKNESS IN FEET

FIGURE F.3.14
SATURATED THICKNESS OF ALLUVIUM MARCH, 1985

The rate of ground-water flux varies seasonally. Flux calculations for water levels measured in March, 1985, (Figure F.3.12) and May, 1985, (Figure F.3.13) are summarized in Table F.3.5.

The average velocity of the ground water can be used to estimate migration rates of contaminants, or the time needed to flush contaminants from a ground-water system. It can be calculated as follows (Bear, 1979):

$$V = Q/n_{ef}\ A$$

where

V = average velocity (l/t)
Q = flow rate (l^3/t)

n_{ef} = effective porosity

A = cross-sectional area (l^2)

No measurements of effective porosity were available, so calculations were made assuming that effective porosity is equal to the specific yield. Calculations of average velocity are summarized in Table F.3.5.

The volume of alluvial ground water directly below the tailings can be calculated using the formula

$$V = A \times b \times Sy$$

where

V = volume (l^3)

A = horizontal area (l^2)

b = average thickness of the saturated zone (l)

Sy = specific yield (ft^3/ft^3)

Volume calculations are summarized in Table F.3.6, and will be used in the assessment of impacts on ground water of various remedial action alternatives.

Tailings. The tailings are saturated in the lower portions of the pile. Laboratory permeability tests have been reported by other investigators (see Section F.3.1.1). These are in the range of $>10^{-5}$ to $>10^{-3}$ cm/sec, depending on the composition of the tailings samples (Nelson and Wardwell, 1982).

Vertical hydraulic gradients. Measured water levels in the shallow Mancos Shale for March and May, 1985, were generally within 0.1 foot to one foot of water levels in adjacent alluvial wells. Calculated gradients (where "+" indicates a

Table F.3.5 Ground-water flux rate

Date	3/85	6/83	6/83
K (cm/sec):	4.2×10^{-2}	4.2×10^{-2}	1.5×10^{-2}
A (ft^2)	20,000	10,000	10,000
h_1	4570	4567	4567
h_2	4564	4565	4565
dl (ft)	1450	1550	1550
Q (ft^3/yr)	3.6×10^6	5.6×10^5	2.00×10^5
Q (liters/yr)	1×10^8	1.6×10^7	5.67×10^6
V^a (n_{ef} = 0.10)	1800	560	200
V^a (n_{ef} = 0.20)	900	280	100
V^a (n_{ef} = 0.35)	514	160	57

[a]V = velocity (ft/yr) = $k \left(\frac{h_1 - h_2}{dl}\right) \left(\frac{1}{n_{ef}}\right)$

Table F.3.6 Volume of alluvial ground water below the tailings

Area (acres)	b(ft)[a]	Sy(ft^3/ft^3)[b]	Volume(ft^3)	Volume (liters)
57	10	0.10	2.48×10^6	7×10^7
57	10	0.20	4.96×10^6	1.4×10^8
57	10	0.35	8.69×10^6	2.5×10^8

[a]From Figure F.3.14.
[b]Range of values for alluvium selected from Todd, 1980; Davis and DeWiest, 1966.

downward gradient) in March were slightly upward and ranged from -0.030 to +0.104 ft/ft. Calculated gradients in May were downward, in the range +0.021 to +0.201 ft/ft. Anomalous gradients of +2.0 ft/ft were calculated (wells 735 and 736), but this may reflect slow recovery of a well completed in the shale, consequent to well development and water sampling. Studies elsewhere have shown that wells completed in the Mancos Shale may require several months to recover after being developed (Dames and Moore, 1984) or sampled (DOE, 1985). It can be concluded that the gradient between the bedrock and the alluvium is slight, however definite conclusions about the absolute rate and direction of vertical ground-water movement would require additional water-level measurements in wells undisturbed by sampling.

In summary, it has been concluded that:

- Based on qualitative evidence, the low permeability of the Dakota Sandstone limits its utility as an aquifer.
- The Mancos Shale is generally acknowledged as a formation which inhibits the movement of water. Upper weathered portions and very localized zones transmit moderate quantities of water, relative to the alluvium.
- The alluvium in the vicinity of the site and the tailings can transmit large quantities of water, relative to the Mancos Shale.

F.3.1.6 Water quality

Data on ground-water chemistry for samples collected on various dates are presented in Tables F.3.7 through F.3.16. On these tables, the cation/anion balances are shown for each analysis under the parameter heading "BALANCE". Several of the balances have an absolute value beyond the five percent accuracy criterion. Most of these analyses were performed in 1983 prior to the present quality assurance program. A few other analyses performed in 1985 have balances beyond five percent. These were performed by a laboratory that was not qualified in the present quality assurance program.

Tables F.3.17 through F.3.20 include all analyses for each parameter which exceed the statistical maximum of background values. The statistical maximum is the greater of the maximum value from background samples and the average value plus two standard deviations. Background samples were all samples collected from wells 711 and 712. All upgradient, on-site, cross-gradient, and downgradient samples from alluvial wells are compared to the background values. Tables F.3.21 through F.3.30 include all analyses whose values exceed the EPA primary or secondary drinking water standards (The State of Colorado drinking water standards are identical to the EPA standards).

SITE: GRAND JUNCTION
03/26/85 TO 09/10/85

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: BACKGROUND

		LOCATION ID - SAMPLE ID AND LOG DATE				
		711-01 03/27/85	711-01 06/07/85	711-01 09/10/85	712-01 03/26/85	712-01 06/07/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	385.	737.	536.	1016.	494.
ALUMINUM	MG/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
AMMONIUM	MG/L	2.1	0.34	0.1	0.29	15.7
ANTIMONY	MG/L	< 0.003	0.008	< 0.003	< 0.003	< 0.003
ARSENIC	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
BALANCE	%	-1.33	-1.38	-1.43	-4.46	-1.6
BARIUM	MG/L	< 0.1	< 0.1	< 0.05	< 0.1	< 0.1
BORON	MG/L	0.07	0.81	0.6	0.58	0.64
CADMIUM	MG/L	< 0.002	< 0.001	< 0.001	< 0.002	< 0.001
CALCIUM	MG/L	390.	313.	331.	350.	241.
CHLORIDE	MG/L	300.	316.	328.	350.	208.
CHROMIUM	MG/L	< 0.01	< 0.01	< 0.01	0.02	< 0.01
COBALT	MG/L	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05
CONDUCTANCE	UMHO/CM	3400.	4880.	5392.	5400.	2379.
COPPER	MG/L	0.01	< 0.02	0.05	< 0.01	< 0.02
CYANIDE	MG/L	< 0.01	< 0.01	-	< 0.01	< 0.01
FLUORIDE	MG/L	0.4	0.8	0.87	0.9	0.4
GROSS ALPHA	PCI/L	90.	-	-	50.	-
GROSS BETA	PCI/L	< 50.	-	-	< 50.	-
HYD. SULFIDE	MG/L	< 0.2	-	< 0.1	< 0.2	-
IRON	MG/L	0.1	0.76	0.32	1.2	0.89
LEAD	MG/L	< 0.01	< 0.01	-	< 0.01	< 0.01
MAGNESIUM	MG/L	140.	420.	370.	360.	97.1
MANGANESE	MG/L	1.4	1.55	1.33	1.1	8.74
MERCURY	MG/L	0.0003	< 0.0002	< 0.0002	< 0.0002	< 0.0002
MOLYBDENUM	MG/L	0.01	0.05	0.04	0.06	< 0.01
NICKEL	MG/L	< 0.04	< 0.04	0.06	< 0.04	0.05
NITRATE	MG/L	2.	< 1.	3.6	8.	< 1.
ORG. CARBON	MG/L	5.4	26.1	14.	53.6	17.7
PB-210	PCI/L	2.3	< 1.5	-	< 1.5	< 1.5
PH	SU	6.7	7.1	7.	7.1	7.1
PHOSPHATE	MG/L	< 0.1	< 0.1	-	< 0.1	2.04
PO-210	PCI/L	< 1.	< 1.	-	< 1.	< 1.
POTASSIUM	MG/L	12.	13.1	11.4	12.	15.3
RA-226	PCI/L	< 1.	< 1.	< 1.	< 1.	< 1.
RA-228	PCI/L	< 1.	< 1.	-	< 1.	< 1.
SELENIUM	MG/L	< 0.005	0.014	0.005	0.009	0.005
SILICA	MG/L	9.	9.8	16.9	8.1	7.7
SILVER	MG/L	< 0.01	< 0.01	-	< 0.01	< 0.01
SODIUM	MG/L	340.	662.	690.	730.	231.
STRONTIUM	MG/L	3.2	3.41	3.72	3.8	2.1
SULFATE	MG/L	1500.	2780.	2860.	2700.	831.
SULFIDE	MG/L	-	< 0.1	-	-	< 0.1
TEMPERATURE	C - DEGREE	11.5	15.	15.	11.	15.
TH-230	PCI/L	< 1.	< 1.	-	< 1.	< 1.
TIN	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
TOTAL SOLIDS	MG/L	3008.	5486.	5370.	5382.	2072.

Table F.3.7 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/26/85 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: BACKGROUND

		LOCATION ID - SAMPLE ID AND LOG DATE				
		711-01 03/27/85	711-01 06/07/85	711-01 09/10/85	712-01 03/26/85	712-01 06/07/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE +/-UNCERTAINTY	PARAMETER VALUE +/-UNCERTAINTY	PARAMETER VALUE +/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
TOX	MG/L	< 0.1	0.2	-	< 0.1	< 0.01
U-234	PCI/L	9.	25.	28.	23.	9.
U-238	PCI/L	8.	16.	18.	17.	6.
VANADIUM	MG/L	< 0.01	0.02	< 0.01	< 0.01	< 0.01
ZINC	MG/L	0.06	0.018	0.009	< 0.05	< 0.005

Table F.3.7 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/26/85 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: BACKGROUND

		LOCATION ID - SAMPLE ID AND LOG DATE				
		712-01 09/06/85				
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	446.				
ALUMINUM	MG/L	< 0.1				
AMMONIUM	MG/L	1.8				
ANTIMONY	MG/L	< 0.003				
ARSENIC	MG/L	< 0.01				
BALANCE	%	-3.73				
BARIUM	MG/L	< 0.05				
BORON	MG/L	0.05				
CADMIUM	MG/L	< 0.001				
CALCIUM	MG/L	274.				
CHLORIDE	MG/L	241.				
CHROMIUM	MG/L	< 0.01				
COBALT	MG/L	< 0.05				
CONDUCTANCE	UMHO/CM	2925.				
COPPER	MG/L	0.02				
CYANIDE	MG/L	-				
FLUORIDE	MG/L	0.76				
GROSS ALPHA	PCI/L	-				
GROSS BETA	PCI/L	-				
HYD. SULFIDE	MG/L	1.2				
IRON	MG/L	0.06				
LEAD	MG/L	-				
MAGNESIUM	MG/L	105.				
MANGANESE	MG/L	0.93				
MERCURY	MG/L	< 0.0002				
MOLYBDENUM	MG/L	0.02				
NICKEL	MG/L	< 0.04				
NITRATE	MG/L	2.6				
ORG. CARBON	MG/L	16.6				
PB-210	PCI/L	-				
PH	SU	7.3				
PHOSPHATE	MG/L	-				
PO-210	PCI/L	-				
POTASSIUM	MG/L	10.8				
RA-226	PCI/L	< 1.				
RA-228	PCI/L	< 1.				
SELENIUM	MG/L	< 0.005				
SILICA	MG/L	18.6				
SILVER	MG/L	-				
SODIUM	MG/L	251.				
STRONTIUM	MG/L	2.38				
SULFATE	MG/L	980.				
SULFIDE	MG/L	-				
TEMPERATURE	C - DEGREE	17.				
TH-230	PCI/L	-				
TIN	MG/L	< 0.005				
TOTAL SOLIDS	MG/L	2340.				

Table F.3.7 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/26/85 TO 09/10/85 (Concluded)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: BACKGROUND

		LOCATION ID - SAMPLE ID AND LOG DATE
		712-01 09/06/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE +/-UNCERTAINTY
TOX	MG/L	-
U-234	PCI/L	10.
U-238	PCI/L	7.
VANADIUM	MG/L	< 0.01
ZINC	MG/L	0.005

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FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		588-01 02/01/83	588-01 06/07/85	588-01 09/04/85	710-01 03/21/85	710-01 06/07/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	281.	265.	299.	535.	507.
ALUMINUM	MG/L	-	< 0.1	< 0.1	< 0.1	< 0.1
AMMONIUM	MG/L	-	9.87	11.8	45.	24.9
ANTIMONY	MG/L	-	< 0.003	< 0.003	< 0.003	< 0.003
ARSENIC	MG/L	0.004	0.01	0.01	< 0.01	< 0.01
BALANCE	%	5.65	3.81	-2.08	-.66	3.86
BARIUM	MG/L	0.04	< 0.1	0.05	< 0.1	< 0.1
BORON	MG/L	-	0.07	0.04	0.31	0.37
CADMIUM	MG/L	-	< 0.001	< 0.001	< 0.002	< 0.001
CALCIUM	MG/L	118.	94.	46.1	590.	524.
CHLORIDE	MG/L	167.	143.	82.6	770.	607.
CHROMIUM	MG/L	0.002	< 0.01	< 0.01	0.02	< 0.01
COBALT	MG/L	< 0.001	< 0.05	< 0.05	< 0.01	< 0.05
CONDUCTANCE	UMHO/CM	-	910.	944.	6700.	4300.
COPPER	MG/L	0.0111	< 0.02	< 0.02	0.02	< 0.02
CYANIDE	MG/L	-	< 0.01	-	< 0.01	< 0.01
FLUORIDE	MG/L	-	0.4	0.49	1.	1.1
GROSS ALPHA	PCI/L	-	-	-	< 70.	-
GROSS BETA	PCI/L	-	-	-	100.	-
HYD. SULFIDE	MG/L	-	-	0.2	< 0.2	-
IRON	MG/L	2.3	0.33	0.29	0.1	0.11
LEAD	MG/L	-	< 0.01	-	< 0.01	< 0.01
MAGNESIUM	MG/L	42.8	35.	19.5	330.	327.
MANGANESE	MG/L	0.16	0.15	0.15	2.7	2.91
MERCURY	MG/L	-	< 0.0002	< 0.0002	0.0003	< 0.0002
MOLYBDENUM	MG/L	< 0.03	< 0.01	0.03	0.08	0.07
NICKEL	MG/L	-	< 0.04	< 0.04	< 0.04	< 0.04
NITRATE	MG/L	< 0.1	< 1.	1.6	3.	< 1.
NITROGEN,KJL	MG/L	7.7	-	-	-	-
ORG. CARBON	MG/L	64.5	4.6	5.	7.2	8.9
PB-210	PCI/L	-	< 1.5	-	< 1.5	< 1.5
PH	SU	7.1	7.8	7.7	7.1	6.85
PHOSPHATE	MG/L	-	< 0.1	-	< 0.1	< 0.1
PO-210	PCI/L	-	< 1.	-	< 1.	< 1.
POTASSIUM	MG/L	9.	12.4	9.77	24.	23.6
RA-226	PCI/L	-	< 1.	< 1.	< 1.	< 1.
RA-228	PCI/L	-	< 1.	< 1.	1.	< 1.
SELENIUM	MG/L	< 0.002	< 0.005	< 0.005	< 0.005	< 0.005
SILICA	MG/L	-	6.2	17.3	7.8	8.2
SILVER	MG/L	-	< 0.01	-	< 0.01	< 0.01
SODIUM	MG/L	141.	111.	96.1	780.	665.
STRONTIUM	MG/L	-	0.75	0.55	6.1	5.81
SULFATE	MG/L	184.	142.	50.4	3000.	2430.
SULFIDE	MG/L	-	< 0.1	-	-	< 0.1
TEMPERATURE	C - DEGREE	-	18.	19.5	11.5	16.
TH-230	PCI/L	-	< 1.	-	< 1.	< 1.
TIN	MG/L	-	< 0.005	< 0.005	< 0.005	< 0.005

Table F.3.8 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
02/01/83 TO 09/05/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		588-01 02/01/83	588-01 06/07/85	588-01 09/04/85	710-01 03/21/85	710-01 06/07/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
TOTAL SOLIDS	MG/L	878.	656.	492.	6204.	5658.
TOTAL U	PPM	0.01	-	-	-	-
TOX	MG/L	-	0.1	-	0.2	0.21
U-234	PCI/L	-	1.	4.	29.	36.
U-238	PCI/L	-	1.	1.	23.	30.7
VANADIUM	MG/L	0.006	< 0.01	< 0.01	< 0.01	< 0.01
ZINC	MG/L	< 0.01	< 0.005	0.023	0.05	< 0.005

Table F.3.8 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
02/01/83 TO 09/05/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

PARAMETER	UNIT OF MEASURE	740-01 09/04/85 PARAMETER VALUE+/-UNCERTAINTY	744-01 03/21/85 PARAMETER VALUE+/-UNCERTAINTY	744-01 06/07/85 PARAMETER VALUE+/-UNCERTAINTY	744-02 06/07/85 PARAMETER VALUE+/-UNCERTAINTY	744-03 06/07/85 PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	498.	462.	332.	332.	332.
ALUMINUM	MG/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
AMMONIUM	MG/L	62.1	1.6	1.2	1.2	2.2
ANTIMONY	MG/L	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
ARSENIC	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
BALANCE	%	0.62	-4.37	1.86	2.22	2.57
BARIUM	MG/L	< 0.05	< 0.1	< 0.1	< 0.1	< 0.1
BORON	MG/L	0.43	0.25	0.23	0.23	0.24
CADMIUM	MG/L	< 0.001	< 0.002	< 0.001	< 0.001	< 0.001
CALCIUM	MG/L	503.	260.	842.	234.	237.
CHLORIDE	MG/L	783.	450.	202.	204.	199.
CHROMIUM	MG/L	< 0.01	0.07	< 0.01	< 0.01	< 0.01
COBALT	MG/L	< 0.05	< 0.01	< 0.05	< 0.05	< 0.05
CONDUCTANCE	UMHO/CM	6613.	3200.	2150.	2150.	2150.
COPPER	MG/L	< 0.02	0.01	< 0.02	< 0.02	< 0.02
CYANIDE	MG/L	-	< 0.01	< 0.01	< 0.01	< 0.01
FLUORIDE	MG/L	1.2	0.4	0.6	0.6	0.6
GROSS ALPHA	PCI/L	-	80.	-	-	-
GROSS BETA	PCI/L	-	50.	-	-	-
HYD. SULFIDE	MG/L	< 0.1	< 0.2	-	-	-
IRON	MG/L	3.04	1.	0.1	0.11	0.12
LEAD	MG/L	-	< 0.01	< 0.01	< 0.01	< 0.01
MAGNESIUM	MG/L	325.	140.	144.	144.	142.
MANGANESE	MG/L	2.86	2.	1.19	1.16	1.15
MERCURY	MG/L	0.0003	< 0.0002	< 0.0002	< 0.0002	< 0.0002
MOLYBDENUM	MG/L	0.1	0.02	0.02	< 0.01	< 0.01
NICKEL	MG/L	0.09	< 0.04	< 0.04	< 0.04	< 0.04
NITRATE	MG/L	< 1.	< 1.	< 1.	< 1.	< 1.
NITROGEN,KJL	MG/L	-	-	-	-	-
ORG. CARBON	MG/L	7.4	10.2	9.4	9.8	10.4
PB-210	PCI/L	-	< 1.5	< 1.5	-	-
PH	SU	6.8	7.05	7.4	7.4	7.4
PHOSPHATE	MG/L	-	< 0.1	< 0.1	< 0.1	< 0.1
PO-210	PCI/L	-	< 1.	< 1.	-	-
POTASSIUM	MG/L	29.7	8.9	9.02	9.1	8.97
RA-226	PCI/L	< 1.	< 1.	< 1.	-	-
RA-228	PCI/L	< 1.	< 1.	< 1.	-	-
SELENIUM	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
SILICA	MG/L	19.5	8.2	6.7	6.7	6.6
SILVER	MG/L	-	< 0.01	< 0.01	< 0.01	< 0.01
SODIUM	MG/L	853.	470.	309.	312.	310.
STRONTIUM	MG/L	5.6	2.8	2.41	2.36	2.33
SULFATE	MG/L	2880.	1200.	1150.	1120.	1110.
SULFIDE	MG/L	-	-	< 0.1	< 0.1	< 0.1
TEMPERATURE	C - DEGREE	18.	10.5	14.	14.	14.
TH-230	PCI/L	-	< 1.	< 1.	-	-
TIN	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005

Table F.3.8 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
02/01/83 TO 09/05/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		740-01 09/04/85	744-01 03/21/85	744-01 06/07/85	744-02 06/07/85	744-03 06/07/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
TOTAL SOLIDS	MG/L	6320.	4462.	2386.	2410.	2456.
TOTAL U	PPM	-	-	-	-	-
TOX	MG/L	-	8.2	0.31	0.29	0.29
U-234	PCI/L	28.	19.	19.3	-	-
U-238	PCI/L	20.	14.	13.4	-	-
VANADIUM	MG/L	0.01	< 0.01	0.02	0.02	< 0.01
ZINC	MG/L	0.018	0.09	< 0.005	< 0.005	< 0.005

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		744-04 06/07/85	744-05 06/07/85	744-01 09/04/85	744-02 09/04/85	744-03 09/04/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	332.	332.	440.	440.	440.
ALUMINUM	MG/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
AMMONIUM	MG/L	1.3	1.6	1.7	1.6	1.6
ANTIMONY	MG/L	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
ARSENIC	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
BALANCE	%	1.53	1.26	0.	-2.	-1.21
BARIUM	MG/L	< 0.1	< 0.1	< 0.05	< 0.05	< 0.05
BORON	MG/L	0.23	0.24	0.26	0.26	0.25
CADMIUM	MG/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
CALCIUM	MG/L	240.	236.	253.	250.	252.
CHLORIDE	MG/L	204.	202.	296.	302.	306.
CHROMIUM	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
COBALT	MG/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
CONDUCTANCE	UMHO/CM	2150.	2150.	3719.	3719.	3719.
COPPER	MG/L	< 0.02	< 0.02	0.02	< 0.02	0.02
CYANIDE	MG/L	< 0.01	< 0.01	-	-	-
FLUORIDE	MG/L	0.6	0.6	0.56	0.57	0.57
GROSS ALPHA	PCI/L	-	-	-	-	-
GROSS BETA	PCI/L	-	-	-	-	-
HYD. SULFIDE	MG/L	-	-	< 0.1	< 0.1	< 0.1
IRON	MG/L	0.11	0.12	< 0.03	< 0.03	< 0.03
LEAD	MG/L	< 0.01	< 0.01	-	-	-
MAGNESIUM	MG/L	142.	143.	156.	158.	158.
MANGANESE	MG/L	1.19	1.2	1.34	1.35	1.38
MERCURY	MG/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
MOLYBDENUM	MG/L	0.01	0.02	0.02	0.02	0.02
NICKEL	MG/L	0.04	< 0.04	< 0.04	0.04	0.05
NITRATE	MG/L	< 1.	< 1.	4.	3.8	3.6
NITROGEN,KJL	MG/L	-	-	-	-	-
ORG. CARBON	MG/L	9.4	9.2	6.3	6.8	6.9
PB-210	PCI/L	-	-	-	-	-
PH	SU	7.4	7.4	6.8	6.8	6.8
PHOSPHATE	MG/L	< 0.1	< 0.1	-	-	-
PO-210	PCI/L	-	-	-	-	-
POTASSIUM	MG/L	9.05	8.89	10.2	10.4	10.4
RA-226	PCI/L	-	-	< 1.	< 1.	< 1.
RA-228	PCI/L	-	-	< 1.	< 1.	< 1.
SELENIUM	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
SILICA	MG/L	6.7	6.6	19.3	19.5	19.9
SILVER	MG/L	< 0.01	< 0.01	-	-	-
SODIUM	MG/L	312.	304.	425.	425.	423.
STRONTIUM	MG/L	2.37	2.28	3.14	3.1	3.12
SULFATE	MG/L	1150.	1140.	1300.	1380.	1340.
SULFIDE	MG/L	< 0.1	< 0.1	-	-	-
TEMPERATURE	C - DEGREE	14.	14.	19.5	19.5	19.5
TH-230	PCI/L	-	-	-	-	-
TIN	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005

Table F.3.8 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
02/01/83 TO 09/05/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		744-04 06/07/85	744-05 06/07/85	744-01 09/04/85	744-02 09/04/85	744-03 09/04/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
TOTAL SOLIDS	MG/L	2438.	2430.	3080.	3080.	4000.
TOTAL U	PPM	-	-	-	-	-
TOX	MG/L	< 0.1	< 0.1	-	-	-
U-234	PCI/L	-	-	20.	20.	21.
U-238	PCI/L	-	-	14.	16.	16.
VANADIUM	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	0.01
ZINC	MG/L	< 0.005	< 0.005	0.013	0.017	0.012

Table F.3.8 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
02/01/83 TO 09/05/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		744-04 09/04/85	744-05 09/04/85	745-01 03/30/85	745-01 06/07/85	745-01 09/05/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	440.	440.	460.	343.	415.
ALUMINUM	MG/L	< 0.1	< 0.1	0.3	< 0.1	< 0.1
AMMONIUM	MG/L	1.6	1.7	0.64	0.51	0.2
ANTIMONY	MG/L	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
ARSENIC	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
BALANCE	%	5.14	-3.28	2.88	5.08	-.97
BARIUM	MG/L	< 0.05	< 0.05	< 0.1	< 0.1	< 0.05
BORON	MG/L	0.26	0.25	0.6	0.58	0.55
CADMIUM	MG/L	< 0.001	< 0.001	< 0.002	< 0.001	< 0.001
CALCIUM	MG/L	252.	250.	490.	431.	366.
CHLORIDE	MG/L	283.	323.	344.	390.	352.
CHROMIUM	MG/L	< 0.01	0.02	0.02	< 0.01	< 0.01
COBALT	MG/L	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05
CONDUCTANCE	UMHO/CM	3719.	3719.	5300.	3900.	5002.
COPPER	MG/L	0.04	< 0.02	0.02	< 0.02	0.03
CYANIDE	MG/L	-	-	< 0.01	< 0.01	-
FLUORIDE	MG/L	0.57	0.58	0.7	0.8	0.82
GROSS ALPHA	PCI/L	-	-	80.	-	-
GROSS BETA	PCI/L	-	-	< 50.	-	-
HYD. SULFIDE	MG/L	< 0.1	< 0.1	< 0.2	-	< 0.1
IRON	MG/L	< 0.03	< 0.03	2.2	1.24	0.49
LEAD	MG/L	-	-	< 0.01	< 0.01	-
MAGNESIUM	MG/L	193.	162.	340.	401.	297.
MANGANESE	MG/L	1.37	1.34	1.8	1.47	1.29
MERCURY	MG/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0002
MOLYBDENUM	MG/L	0.03	0.03	0.04	0.01	0.03
NICKEL	MG/L	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
NITRATE	MG/L	3.4	3.7	< 1.	< 1.	< 1.
NITROGEN,KJL	MG/L	-	-	-	-	-
ORG. CARBON	MG/L	6.7	6.3	9.1	11.2	8.9
PB-210	PCI/L	-	-	< 1.5	< 1.5	-
PH	SU	6.8	6.8	6.7	6.8	7.1
PHOSPHATE	MG/L	-	-	< 0.1	< 0.1	-
PO-210	PCI/L	-	-	< 1.	< 1.	-
POTASSIUM	MG/L	10.5	10.2	6.8	7.94	5.85
RA-226	PCI/L	< 1.	< 1.	< 1.	< 1.	< 1.
RA-228	PCI/L	1.1	< 1.	< 1.	< 1.	< 1.
SELENIUM	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
SILICA	MG/L	19.3	19.5	10.4	7.9	16.5
SILVER	MG/L	-	-	< 0.01	< 0.01	-
SODIUM	MG/L	425.	418.	620.	585.	576.
STRONTIUM	MG/L	3.21	3.12	4.8	4.89	4.3
SULFATE	MG/L	1240.	1410.	2700.	2620.	2450.
SULFIDE	MG/L	-	-	-	< 0.1	-
TEMPERATURE	C - DEGREE	19.5	19.5	10.	16.5	15.
TH-230	PCI/L	-	-	< 1.	< 1.	-
TIN	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005

Table F.3.8 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
02/01/83 TO 09/05/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		744-04 09/04/85	744-05 09/04/85	745-01 03/30/85	745-01 06/07/85	745-01 09/05/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
TOTAL SOLIDS	MG/L	4000.	3090.	5458.	5376.	4760.
TOTAL U	PPM	-	-	-	-	-
TOX	MG/L	-	-	0.3	0.13	-
U-234	PCI/L	19.	21.	17.	19.	19.
U-238	PCI/L	14.	14.	11.	12.	13.
VANADIUM	MG/L	0.01	< 0.01	< 0.01	0.01	< 0.01
ZINC	MG/L	0.009	0.013	1.	< 0.005	0.019

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		746-01 03/22/85	746-01 06/07/85	746-01 09/05/85		
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	417.	464.	431.		
ALUMINUM	MG/L	< 0.1	< 0.1	< 0.1		
AMMONIUM	MG/L	0.29	0.34	0.2		
ANTIMONY	MG/L	< 0.003	< 0.003	< 0.003		
ARSENIC	MG/L	< 0.01	< 0.01	< 0.01		
BALANCE	%	1.57	5.37	0.43		
BARIUM	MG/L	< 0.1	< 0.1	< 0.05		
BORON	MG/L	0.58	0.83	0.68		
CADMIUM	MG/L	< 0.002	< 0.001	< 0.001		
CALCIUM	MG/L	490.	595.	472.		
CHLORIDE	MG/L	460.	637.	656.		
CHROMIUM	MG/L	< 0.01	< 0.01	< 0.01		
COBALT	MG/L	< 0.01	< 0.05	< 0.05		
CONDUCTANCE	UMHO/CM	5500.	5000.	7735.		
COPPER	MG/L	< 0.01	< 0.02	0.03		
CYANIDE	MG/L	< 0.01	< 0.01	-		
FLUORIDE	MG/L	1.1	1.5	1.6		
GROSS ALPHA	PCI/L	230.	-	-		
GROSS BETA	PCI/L	< 50.	-	-		
HYD. SULFIDE	MG/L	< 0.2	-	< 0.1		
IRON	MG/L	0.8	1.15	0.41		
LEAD	MG/L	< 0.01	< 0.01	-		
MAGNESIUM	MG/L	380.	570.	484.		
MANGANESE	MG/L	2.3	1.77	1.42		
MERCURY	MG/L	< 0.0002	< 0.0002	< 0.0002		
MOLYBDENUM	MG/L	0.12	0.11	0.15		
NICKEL	MG/L	< 0.04	< 0.04	0.07		
NITRATE	MG/L	< 1.	< 1.	< 1.		
NITROGEN,KJL	MG/L	-	-	-		
ORG. CARBON	MG/L	525.	17.4	17.2		
PB-210	PCI/L	< 1.5	< 1.5	-		
PH	SU	6.7	7.25	7.5		
PHOSPHATE	MG/L	< 0.1	< 0.1	-		
PO-210	PCI/L	< 1.	< 1.	-		
POTASSIUM	MG/L	12.	11.5	9.72		
RA-226	PCI/L	< 1.	< 1.	< 1.		
RA-228	PCI/L	< 1.	< 1.	1.1		
SELENIUM	MG/L	< 0.005	< 0.005	< 0.005		
SILICA	MG/L	10.5	9.9	17.8		
SILVER	MG/L	< 0.01	< 0.01	-		
SODIUM	MG/L	650.	747.	793.		
STRONTIUM	MG/L	5.6	5.87	6.84		
SULFATE	MG/L	2900.	3410.	3370.		
SULFIDE	MG/L	-	< 0.1	-		
TEMPERATURE	C - DEGREE	13.	16.	16.		
TH-230	PCI/L	< 1.	< 1.	-		
TIN	MG/L	< 0.005	< 0.005	< 0.005		

Table F.3.8 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
02/04/83 TO 09/05/85 (Concluded)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE		
		746-01 03/22/85	746-01 06/07/85	746-01 09/05/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
TOTAL SOLIDS	MG/L	6038.	6878.	6930.
TOTAL U	PPM	-	-	-
TOX	MG/L	0.1	< 0.1	-
U-234	PCI/L	22.	30.	35.
U-238	PCI/L	16.	20.	27.
VANADIUM	MG/L	< 0.01	0.01	< 0.01
ZINC	MG/L	< 0.05	< 0.005	0.016

MAPPER INPUT FILE: GRJ01*UDPGWQ100373

Table F.3.9 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

		LOCATION ID - SAMPLE ID AND LOG DATE				
		581-01 02/07/83	581-01 06/09/83	581-01 09/22/83	581-01 03/26/85	581-01 06/07/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	485.	450.	490.	568.	521.
ALUMINUM	MG/L	-	-	0.004	< 0.1	< 0.1
AMMONIA	MG/L	-	88.33	-	-	-
AMMONIUM	MG/L	-	-	232.	166.	205.
ANTIMONY	MG/L	-	-	< 0.005	< 0.003	< 0.003
ARSENIC	MG/L	< 0.001	< 0.001	0.008	0.016	0.01
BALANCE	%	-12.54	-8.69	0.14	0.53	-.9
BARIUM	MG/L	< 0.02	0.03	0.062	< 0.1	< 0.1
BORON	MG/L	-	-	-	0.34	0.4
CADMIUM	MG/L	-	-	0.001	< 0.002	< 0.001
CALCIUM	MG/L	360.	654.	420.	550.	483.
CHLORIDE	MG/L	515.	640.	530.	490.	563.
CHROMIUM	MG/L	0.001	0.005	0.002	0.02	-
COBALT	MG/L	< 0.001	0.053	0.001	< 0.01	< 0.05
COND, IN-SITU	UMHO/CM	4180.	5200.	-	-	-
CONDUCTANCE	UMHO/CM	-	-	-	6300.	6000.
COPPER	MG/L	0.011	< 0.0005	< 0.0005	0.05	< 0.02
CYANIDE	MG/L	-	-	-	< 0.01	< 0.01
FLUORIDE	MG/L	-	-	4.4	4.7	4.3
GROSS ALPHA	PCI/L	-	-	-	160.	-
GROSS BETA	PCI/L	-	-	-	70.	-
HYD. SULFIDE	MG/L	-	-	-	< 0.2	-
IRON	MG/L	3.24	1.31	3.72	12.	11.2
LEAD	MG/L	-	-	0.01	< 0.01	< 0.01
MAGNESIUM	MG/L	189.	210.	310.	200.	202.
MANGANESE	MG/L	2.72	2.85	4.5	5.	4.59
MERCURY	MG/L	-	-	< 0.0002	< 0.0002	< 0.0002
MOLYBDENUM	MG/L	0.31	0.25	0.078	0.13	0.12
NICKEL	MG/L	-	-	-	< 0.04	0.08
NITRATE	MG/L	0.12	-	0.19	< 1.	< 1.
NITROGEN,KJL	MG/L	188.	-	-	-	-
ORG. CARBON	MG/L	96.3	88.2	113.	10.5	10.
PB-210	PCI/L	-	-	-	< 1.5	1.8
PH	SU	7.3	7.3	7.2	6.9	7.1
PHOSPHATE	MG/L	-	-	-	< 0.1	< 0.1
PHOSPHORUS	MG/L	-	-	< 0.04	-	-
PO-210	PCI/L	-	-	-	< 1.	< 1.
POTASSIUM	MG/L	66.4	56.	52.	57.	61.2
RA-226	PCI/L	-	-	-	1.4	1.
RA-228	PCI/L	-	-	-	< 1.	< 1.
SELENIUM	MG/L	0.02	< 0.002	< 0.002	< 0.005	< 0.005
SILICA	MG/L	-	-	22.	12.4	11.9
SILVER	MG/L	-	-	< 0.002	< 0.01	< 0.01
SODIUM	MG/L	819.	870.	520.	720.	664.
STRONTIUM	MG/L	-	-	-	6.7	6.49
SULFATE	MG/L	3215.	3800.	2800.	2900.	2810.
SULFIDE	MG/L	-	-	-	-	< 0.1

Table F.3.9 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

		LOCATION ID - SAMPLE ID AND LOG DATE				
		581-01 02/07/83	581-01 06/09/83	581-01 09/22/83	581-01 03/26/85	581-01 06/07/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
TEMP, IN-SITU	C-DEGREE	10.	17.5	-	-	-
TEMPERATURE	C - DEGREE	-	-	-	14.	16.
TH-230	PCI/L	-	-	-	< 1.	< 1.
TIN	MG/L	-	-	-	0.008	< 0.005
TOTAL SOLIDS	MG/L	5260.	5610.	5200.	5394.	5464.
TOTAL U	PPM	0.189	0.096	0.112	-	-
TOX	MG/L	-	-	-	0.3	0.2
U-234	PCI/L	-	-	-	-	23.
U-238	PCI/L	-	-	-	-	23.
URANIUM	MG/L	-	-	-	0.056	-
VANADIUM	MG/L	0.074	0.078	0.018	0.02	0.02
ZINC	MG/L	0.03	0.04	0.04	0.1	< 0.005

SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

		LOCATION ID - SAMPLE ID AND LOG DATE				
		581-02 06/07/85	581-03 06/07/85	581-04 06/07/85	581-05 06/07/85	581-01 09/11/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	521.	521.	521.	521.	1375.
ALUMINUM	MG/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
AMMONIA	MG/L	-	-	-	-	-
AMMONIUM	MG/L	206.	199.	202.	201.	204.
ANTIMONY	MG/L	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
ARSENIC	MG/L	0.01	0.01	0.01	0.01	0.01
BALANCE	%	-.43	-1.46	-3.69	-1.64	-8.35
BARIUM	MG/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.05
BORON	MG/L	0.45	0.44	0.45	0.43	0.42
CADMIUM	MG/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
CALCIUM	MG/L	481.	474.	477.	474.	535.
CHLORIDE	MG/L	573.	564.	576.	579.	579.
CHROMIUM	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
COBALT	MG/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
COND, IN-SITU	UMHO/CM	-	-	-	-	-
CONDUCTANCE	UMHO/CM	6000.	6000.	6000.	6000.	6765.
COPPER	MG/L	< 0.02	< 0.02	< 0.02	< 0.02	0.02
CYANIDE	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	-
FLUORIDE	MG/L	4.2	4.3	4.3	4.1	4.8
GROSS ALPHA	PCI/L	-	-	-	-	-
GROSS BETA	PCI/L	-	-	-	-	-
HYD. SULFIDE	MG/L	-	-	-	-	< 0.1
IRON	MG/L	11.1	11.5	11.1	11.4	9.88
LEAD	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	-
MAGNESIUM	MG/L	221.	226.	190.	229.	202.
MANGANESE	MG/L	4.56	4.61	4.58	4.54	4.72
MERCURY	MG/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0002
MOLYBDENUM	MG/L	0.08	0.08	0.1	0.09	0.13
NICKEL	MG/L	0.09	0.08	0.03	0.08	0.08
NITRATE	MG/L	< 1.	< 1.	< 1.	< 1.	< 1.
NITROGEN,KJL	MG/L	-	-	-	-	-
ORG. CARBON	MG/L	10.	9.9	9.6	10.2	10.1
PB-210	PCI/L	-	-	-	-	-
PH	SU	7.1	7.1	7.1	7.1	7.
PHOSPHATE	MG/L	< 0.1	< 0.1	< 0.1	< 0.1	-
PHOSPHORUS	MG/L	-	-	-	-	-
PO-210	PCI/L	-	-	-	-	-
POTASSIUM	MG/L	61.2	60.8	60.	60.4	58.9
RA-226	PCI/L	-	-	-	-	1.4
RA-228	PCI/L	-	-	-	-	-
SELENIUM	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
SILICA	MG/L	12.5	12.8	11.6	12.8	26.7
SILVER	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	-
SODIUM	MG/L	654.	658.	669.	662.	704.
STRONTIUM	MG/L	6.5	6.03	6.57	5.74	6.48
SULFATE	MG/L	2810.	2900.	2960.	2920.	2860.
SULFIDE	MG/L	< 0.1	< 0.1	< 0.1	< 0.1	-

Table F.3.9 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

		LOCATION ID - SAMPLE ID AND LOG DATE				
		581-02 06/07/85	581-03 06/07/85	581-04 06/07/85	581-05 06/07/85	581-01 09/11/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
TEMP,IN-SITU	C-DEGREE	-	-	-	-	-
TEMPERATURE	C - DEGREE	16.	16.	16.	16.	14.5
TH-230	PCI/L	-	-	-	-	-
TIN	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
TOTAL SOLIDS	MG/L	5498.	5482.	5460.	5482.	5490.
TOTAL U	PPM	-	-	-	-	-
TOX	MG/L	0.14	0.2	< 0.1	< 0.1	-
U-234	PCI/L	-	-	-	-	25.
U-238	PCI/L	-	-	-	-	25.
URANIUM	MG/L	-	-	-	-	-
VANADIUM	MG/L	0.03	0.01	0.02	0.03	< 0.01
ZINC	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	0.015

Table F.3.9 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

		LOCATION ID - SAMPLE ID AND LOG DATE				
		581-02 09/11/85	581-03 09/11/85	581-04 09/11/85	581-05 09/11/85	583-01 02/07/83
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	1375.	1375.	1375.	1375.	504.
ALUMINUM	MG/L	< 0.1	< 0.1	< 0.1	< 0.1	-
AMMONIA	MG/L	-	-	-	-	-
AMMONIUM	MG/L	210.	204.	206.	210.	-
ANTIMONY	MG/L	< 0.003	< 0.003	< 0.003	< 0.003	-
ARSENIC	MG/L	0.01	0.01	0.01	0.01	0.006
BALANCE	%	-8.94	-8.	-7.84	-7.91	-10.4
BARIUM	MG/L	< 0.05	< 0.05	< 0.05	< 0.05	0.05
BORON	MG/L	0.42	0.42	0.41	0.42	-
CADMIUM	MG/L	< 0.001	< 0.001	< 0.001	< 0.001	-
CALCIUM	MG/L	541.	548.	546.	540.	555.
CHLORIDE	MG/L	598.	580.	537.	567.	760.
CHROMIUM	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.001
COBALT	MG/L	< 0.05	< 0.05	< 0.05	< 0.05	0.03
COND, IN-SITU	UMHO/CM	-	-	-	-	6800.
CONDUCTANCE	UMHO/CM	6765.	6765.	6765.	6765.	-
COPPER	MG/L	0.02	0.03	< 0.02	< 0.02	0.044
CYANIDE	MG/L	-	-	-	-	-
FLUORIDE	MG/L	4.7	4.9	4.9	4.7	-
GROSS ALPHA	PCI/L	-	-	-	-	-
GROSS BETA	PCI/L	-	-	-	-	-
HYD. SULFIDE	MG/L	< 0.1	< 0.1	< 0.1	< 0.1	-
IRON	MG/L	9.91	9.85	10.	9.88	0.49
LEAD	MG/L	-	-	-	-	-
MAGNESIUM	MG/L	204.	205.	202.	195.	334.
MANGANESE	MG/L	4.64	4.65	4.75	4.61	3.1
MERCURY	MG/L	0.0002	0.0002	< 0.0002	0.0002	-
MOLYBDENUM	MG/L	0.14	0.13	0.12	0.14	0.53
NICKEL	MG/L	0.11	0.09	0.07	0.12	-
NITRATE	MG/L	< 1.	< 1.	< 1.	< 1.	0.19
NITROGEN, KJL	MG/L	-	-	-	-	346.
ORG. CARBON	MG/L	10.6	10.2	11.3	10.2	111.
PB-210	PCI/L	-	-	-	-	-
PH	SU	7.	7.	7.	7.	7.2
PHOSPHATE	MG/L	-	-	-	-	-
PHOSPHORUS	MG/L	-	-	-	-	-
PO-210	PCI/L	-	-	-	-	-
POTASSIUM	MG/L	59.6	59.6	59.8	58.5	104.
RA-226	PCI/L	1.2	1.3	1.4	1.3	-
RA-228	PCI/L	-	-	-	-	-
SELENIUM	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	0.092
SILICA	MG/L	24.6	26.1	26.3	25.2	-
SILVER	MG/L	-	-	-	-	-
SODIUM	MG/L	712.	702.	698.	691.	890.
STRONTIUM	MG/L	6.48	6.4	6.5	6.38	-
SULFATE	MG/L	2960.	2870.	2890.	2800.	4200.
SULFIDE	MG/L	-	-	-	-	-

Table F.3.9 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

		LOCATION ID - SAMPLE ID AND LOG DATE				
		581-02 09/11/85	581-03 09/11/85	581-04 09/11/85	581-05 09/11/85	583-01 02/07/83
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
TEMP,IN-SITU	C-DEGREE	-	-	-	-	13.
TEMPERATURE	C - DEGREE	14.5	14.5	14.5	14.5	-
TH-230	PCI/L	-	-	-	-	-
TIN	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	-
TOTAL SOLIDS	MG/L	5560.	5370.	5460.	5400.	6420.
TOTAL U	PPM	-	-	-	-	0.229
TOX	MG/L	-	-	-	-	-
U-234	PCI/L	26.	23.	26.	23.	-
U-238	PCI/L	24.	22.	23.	23.	-
URANIUM	MG/L	-	-	-	-	-
VANADIUM	MG/L	0.01	0.01	< 0.01	0.01	1.6
ZINC	MG/L	0.015	0.015	0.015	0.017	0.87

SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

		LOCATION ID - SAMPLE ID AND LOG DATE				
		583-01 06/07/83	583-01 09/21/83	583-01 03/26/85	583-01 06/07/85	583-01 09/11/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	360.	570.	547.	464.	560.
ALUMINUM	MG/L	-	0.17	< 0.1	< 0.1	< 0.1
AMMONIA	MG/L	254.1	-	-	-	-
AMMONIUM	MG/L	-	335.	357.	274.	456.
ANTIMONY	MG/L	-	< 0.005	< 0.003	< 0.003	< 0.003
ARSENIC	MG/L	0.011	0.077	0.019	0.02	0.03
BALANCE	%	-3.57	-3.19	0.54	1.84	1.22
BARIUM	MG/L	0.002	0.17	< 0.1	< 0.1	< 0.05
BORON	MG/L	-	-	0.57	0.66	0.56
CADMIUM	MG/L	-	0.072	0.01	0.008	0.014
CALCIUM	MG/L	475.	520.	520.	492.	545.
CHLORIDE	MG/L	770.	790.	660.	787.	862.
CHROMIUM	MG/L	0.01	0.004	0.01	< 0.01	0.01
COBALT	MG/L	0.049	0.53	0.02	0.05	< 0.05
COND,IN-SITU	UMHO/CM	6100.	-	-	-	-
CONDUCTANCE	UMHO/CM	-	-	8600.	7320.	9516.
COPPER	MG/L	0.008	0.067	0.11	< 0.02	0.07
CYANIDE	MG/L	-	-	< 0.01	< 0.01	-
FLUORIDE	MG/L	-	4.4	4.2	3.	4.2
GROSS ALPHA	PCI/L	-	-	255.	-	-
GROSS BETA	PCI/L	-	-	140.	-	-
HYD. SULFIDE	MG/L	-	-	< 0.2	-	< 0.1
IRON	MG/L	0.018	0.071	1.8	1.08	1.91
LEAD	MG/L	-	< 0.001	< 0.01	< 0.01	-
MAGNESIUM	MG/L	178.	450.	230.	185.	249.
MANGANESE	MG/L	1.75	10.	4.3	2.56	4.15
MERCURY	MG/L	-	< 0.0002	0.0004	< 0.0002	0.0002
MOLYBDENUM	MG/L	0.4	0.19	0.3	0.13	0.26
NICKEL	MG/L	-	-	0.18	0.18	0.23
NITRATE	MG/L	-	50.	< 1.	< 1.	4.4
NITROGEN,KJL	MG/L	-	-	-	-	-
ORG. CARBON	MG/L	84.2	129.	11.7	10.5	12.5
PB-210	PCI/L	-	-	< 1.5	< 1.5	-
PH	SU	7.	6.9	6.8	7.1	7.
PHOSPHATE	MG/L	-	-	< 0.1	< 0.1	-
PHOSPHORUS	MG/L	-	0.1	-	-	-
PO-210	PCI/L	-	-	< 1.	< 1.	-
POTASSIUM	MG/L	49.	96.	96.	69.2	93.1
RA-226	PCI/L	-	29.	4.5	5.	6.9
RA-228	PCI/L	-	-	1.6	2.2	-
SELENIUM	MG/L	0.013	0.12	< 0.005	0.005	0.011
SILICA	MG/L	-	23.	11.7	8.8	21.2
SILVER	MG/L	-	0.002	< 0.01	< 0.01	-
SODIUM	MG/L	1090.	980.	920.	1130.	944.
STRONTIUM	MG/L	-	-	4.3	3.55	4.7
SULFATE	MG/L	3100.	4900.	3700.	3390.	3750.
SULFIDE	MG/L	-	-	-	< 0.1	-

Table F.3.9 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

		LOCATION ID - SAMPLE ID AND LOG DATE				
		583-01 06/07/83	583-01 09/21/83	583-01 03/26/85	583-01 06/07/85	583-01 09/11/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
TEMP,IN-SITU	C-DEGREE	19.	-	-	-	-
TEMPERATURE	C - DEGREE	-	-	13.	15.	15.
TH-230	PCI/L	-	< 1.1	< 1.	< 1.	-
TIN	MG/L	-	-	< 0.005	< 0.005	< 0.005
TOTAL SOLIDS	MG/L	5830.	8000.	6606.	6150.	6890.
TOTAL U	PPM	0.524	0.075	-	-	-
TOX	MG/L	-	-	0.3	0.33	-
U-234	PCI/L	-	-	-	41.	64.
U-238	PCI/L	-	-	-	42.	66.
URANIUM	MG/L	-	-	0.185	-	-
VANADIUM	MG/L	1.7	7.6	0.6	0.28	1.14
ZINC	MG/L	0.51	23.	0.6	0.267	0.72

Table F.3.9 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

		LOCATION ID - SAMPLE ID AND LOG DATE				
		584-01 02/08/83	584-01 06/08/83	584-01 09/21/83	584-01 03/26/85	584-01 06/07/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	286.	530.	560.	582.	540.
ALUMINUM	MG/L	-	-	0.51	< 0.1	< 0.1
AMMONIA	MG/L	-	544.5	-	-	-
AMMONIUM	MG/L	-	-	374.	439.	440.
ANTIMONY	MG/L	-	-	< 0.005	< 0.003	< 0.003
ARSENIC	MG/L	0.007	0.045	0.07	0.18	0.09
BALANCE	%	-17.31	-16.31	-3.15	-.1	-1.28
BARIUM	MG/L	-	< 0.02	0.083	< 0.1	-
BORON	MG/L	-	-	-	0.5	0.63
CADMIUM	MG/L	-	-	0.42	0.097	0.073
CALCIUM	MG/L	556.	585.	470.	530.	605.
CHLORIDE	MG/L	822.	970.	790.	720.	791.
CHROMIUM	MG/L	0.001	0.007	0.004	0.03	< 0.01
COBALT	MG/L	0.16	0.15	0.66	0.05	0.07
COND, IN-SITU	UMHO/CM	7000.	6200.	-	-	-
CONDUCTANCE	UMHO/CM	-	-	-	7600.	7564.
COPPER	MG/L	0.12	0.049	0.2	0.15	0.076
CYANIDE	MG/L	-	-	-	< 0.01	< 0.01
FLUORIDE	MG/L	-	-	4.3	3.7	3.7
GROSS ALPHA	PCI/L	-	-	-	230.	-
GROSS BETA	PCI/L	-	-	-	155.	-
HYD. SULFIDE	MG/L	-	-	-	< 0.2	-
IRON	MG/L	0.189	0.019	0.066	< 0.05	0.06
LEAD	MG/L	-	-	< 0.001	< 0.01	< 0.01
MAGNESIUM	MG/L	25.1	220.	470.	260.	220.
MANGANESE	MG/L	4.22	3.04	8.1	4.	3.4
MERCURY	MG/L	-	-	< 0.0002	< 0.0002	< 0.0002
MOLYBDENUM	MG/L	0.42	0.38	0.17	0.28	0.22
NICKEL	MG/L	-	-	-	0.29	0.28
NITRATE	MG/L	0.3	-	41.	< 1.	< 1.
NITROGEN, KJL	MG/L	388.	-	-	-	-
ORG. CARBON	MG/L	120.	84.6	139.	10.4	11.6
PB-210	PCI/L	-	-	-	2.8	2.7
PH	SU	7.2	7.2	6.8	6.8	7.1
PHOSPHATE	MG/L	-	-	-	< 0.1	< 0.1
PHOSPHORUS	MG/L	-	-	0.08	-	-
PO-210	PCI/L	-	-	-	1.1	< 1.
POTASSIUM	MG/L	113.	97.	99.	106.	99.6
RA-226	PCI/L	-	-	15.	7.5	6.
RA-228	PCI/L	-	-	-	< 1.	1.9
SELENIUM	MG/L	0.051	0.027	0.22	0.24	0.178
SILICA	MG/L	-	-	29.	13.3	12.6
SILVER	MG/L	-	-	0.002	< 0.01	< 0.01
SODIUM	MG/L	1210.	930.	950.	970.	860.
STRONTIUM	MG/L	-	-	-	4.6	3.87
SULFATE	MG/L	4440.	4200.	4900.	4100.	3960.
SULFIDE	MG/L	-	-	-	-	0.1

Table F.3.9 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

		LOCATION ID - SAMPLE ID AND LOG DATE				
		584-01 02/08/83	584-01 06/08/83	584-01 09/21/83	584-01 03/26/85	584-01 06/07/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
TEMP, IN-SITU	C-DEGREE	13.	15.5	-	-	-
TEMPERATURE	C - DEGREE	-	-	-	14.	15.
TH-230	PCI/L	-	-	0.95	< 1.	< 1.
TIN	MG/L	-	-	-	0.005	< 0.005
TOTAL SOLIDS	MG/L	6350.	6380.	8100.	7186.	6716.
TOTAL U	PPM	0.148	0.913	0.181	-	-
TOX	MG/L	-	-	-	0.6	0.14
U-234	PCI/L	-	-	-	-	47.
U-238	PCI/L	-	-	-	-	49.
URANIUM	MG/L	-	-	-	0.165	-
VANADIUM	MG/L	6.	5.2	9.	7.48	6.75
ZINC	MG/L	6.7	4.9	37.	4.1	2.56

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

		LOCATION ID - SAMPLE ID AND LOG DATE				
		584-01 09/11/85	587-01 01/31/83	587-01 06/08/83	587-01 09/21/83	747-01 03/22/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	575.	381.	340.	400.	520.
ALUMINUM	MG/L	< 0.1	-	-	0.011	< 0.1
AMMONIA	MG/L	-	-	37.51	-	-
AMMONIUM	MG/L	521.	-	-	32.3	95.9
ANTIMONY	MG/L	< 0.003	-	-	< 0.005	< 0.003
ARSENIC	MG/L	0.11	< 0.001	0.007	< 0.001	< 0.01
BALANCE	%	0.8	-1.73	-2.05	8.85	1.2
BARIUM	MG/L	< 0.05	0.026	0.03	0.036	0.1
BORON	MG/L	0.54	-	-	-	0.42
CADMIUM	MG/L	0.142	-	-	0.004	< 0.002
CALCIUM	MG/L	523.	454.	505.	410.	580.
CHLORIDE	MG/L	869.	375.	520.	400.	740.
CHROMIUM	MG/L	< 0.01	0.002	0.001	0.001	0.02
COBALT	MG/L	0.13	< 0.001	0.038	0.001	0.01
COND,IN-SITU	UMHO/CM	-	2800.	3800.	-	-
CONDUCTANCE	UMHO/CM	10004.	-	-	-	7000.
COPPER	MG/L	0.11	0.0119	< 0.0005	< 0.0025	0.03
CYANIDE	MG/L	-	-	-	-	< 0.01
FLUORIDE	MG/L	3.9	-	-	1.	0.4
GROSS ALPHA	PCI/L	-	-	-	-	< 65.
GROSS BETA	PCI/L	-	-	-	-	90.
HYD. SULFIDE	MG/L	< 0.1	-	-	-	< 0.2
IRON	MG/L	< 0.03	0.37	0.0152	0.064	3.4
LEAD	MG/L	-	-	-	< 0.001	< 0.01
MAGNESIUM	MG/L	307.	292.	330.	350.	300.
MANGANESE	MG/L	3.92	0.46	7.1	1.91	4.
MERCURY	MG/L	< 0.0002	-	-	< 0.0002	< 0.0002
MOLYBDENUM	MG/L	0.35	0.14	0.128	0.076	< 0.01
NICKEL	MG/L	0.38	-	-	-	0.08
NITRATE	MG/L	23.	0.64	-	< 0.1	2.
NITROGEN,KJL	MG/L	-	24.	-	-	-
ORG. CARBON	MG/L	12.7	99.9	63.5	87.4	-
PB-210	PCI/L	-	-	-	-	< 1.5
PH	SU	6.9	7.	7.2	7.1	6.8
PHOSPHATE	MG/L	-	-	-	-	< 0.1
PHOSPHORUS	MG/L	-	-	-	< 0.04	-
PO-210	PCI/L	-	-	-	-	< 1.
POTASSIUM	MG/L	101.	12.9	14.4	15.	36.
RA-226	PCI/L	7.	-	-	-	< 1.
RA-228	PCI/L	-	-	-	-	< 1.
SELENIUM	MG/L	0.199	< 0.002	< 0.002	0.002	< 0.005
SILICA	MG/L	24.8	-	-	22.	10.3
SILVER	MG/L	-	-	-	< 0.002	< 0.01
SODIUM	MG/L	940.	419.	490.	490.	880.
STRONTIUM	MG/L	4.7	-	-	-	6.
SULFATE	MG/L	4100.	2370.	2700.	2000.	3100.
SULFIDE	MG/L	-	-	-	-	-

Table F.3.9 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
04/31/83 TO 09/11/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

		LOCATION ID - SAMPLE ID AND LOG DATE				
		584-01 09/11/85	587-01 04/31/83	587-01 06/08/83	587-01 09/21/83	747-01 03/22/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
TEMP, IN-SITU	C-DEGREE	-	11.	18.5	-	-
TEMPERATURE	C - DEGREE	15.	-	-	-	10.
TH-230	PCI/L	-	-	-	-	< 1.
TIN	MG/L	< 0.005	-	-	-	< 0.005
TOTAL SOLIDS	MG/L	7440.	4220.	4570.	4790.	6780.
TOTAL U	PPM	-	0.081	0.076	0.085	-
TOX	MG/L	-	-	-	-	0.7
U-234	PCI/L	47.	-	-	-	29.
U-238	PCI/L	50.	-	-	-	19.
URANIUM	MG/L	-	-	-	-	-
VANADIUM	MG/L	13.8	0.049	0.062	0.03	< 0.01
ZINC	MG/L	4.14	0.02	0.06	0.11	0.1

Table F.3.9 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

		LOCATION ID - SAMPLE ID AND LOG DATE				
		747-01 06/07/85	747-01 09/05/85			
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	571.	530.			
ALUMINUM	MG/L	< 0.1	0.2			
AMMONIA	MG/L	-	-			
AMMONIUM	MG/L	128.	129.			
ANTIMONY	MG/L	< 0.003	< 0.003			
ARSENIC	MG/L	< 0.01	< 0.01			
BALANCE	%	3.95	1.85			
BARIUM	MG/L	< 0.1	< 0.05			
BORON	MG/L	0.58	0.57			
CADMIUM	MG/L	< 0.001	< 0.001			
CALCIUM	MG/L	645.	502.			
CHLORIDE	MG/L	1030.	1000.			
CHROMIUM	MG/L	< 0.01	< 0.01			
COBALT	MG/L	< 0.05	< 0.05			
COND,IN-SITU	UMHO/CM	-	-			
CONDUCTANCE	UMHO/CM	5500.	9200.			
COPPER	MG/L	< 0.02	0.04			
CYANIDE	MG/L	< 0.01	-			
FLUORIDE	MG/L	0.6	0.65			
GROSS ALPHA	PCI/L	-	-			
GROSS BETA	PCI/L	-	-			
HYD. SULFIDE	MG/L	-	< 0.1			
IRON	MG/L	2.01	0.44			
LEAD	MG/L	< 0.01	-			
MAGNESIUM	MG/L	434.	386.			
MANGANESE	MG/L	3.13	2.5			
MERCURY	MG/L	< 0.0002	< 0.0002			
MOLYBDENUM	MG/L	< 0.01	0.06			
NICKEL	MG/L	0.04	0.08			
NITRATE	MG/L	< 1.	< 1.			
NITROGEN,KJL	MG/L	-	-			
ORG. CARBON	MG/L	12.8	13.3			
PB-210	PCI/L	< 1.5	-			
PH	SU	7.	6.9			
PHOSPHATE	MG/L	< 0.1	-			
PHOSPHORUS	MG/L	-	-			
PO-210	PCI/L	< 1.	-			
POTASSIUM	MG/L	39.7	41.8			
RA-226	PCI/L	< 1.	< 1.			
RA-228	PCI/L	< 1.	1.1			
SELENIUM	MG/L	0.005	< 0.005			
SILICA	MG/L	5.8	18.2			
SILVER	MG/L	< 0.01	-			
SODIUM	MG/L	1000.	1050.			
STRONTIUM	MG/L	5.81	5.88			
SULFATE	MG/L	3360.	3260.			
SULFIDE	MG/L	< 0.1	-			

Table F.3.9 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Concluded)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

		LOCATION ID - SAMPLE ID AND LOG DATE				
		747-01 06/07/85	747-01 09/05/85			
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY			
TEMP, IN-SITU	C-DEGREE	-	-			
TEMPERATURE	C - DEGREE	13.	18.			
TH-230	PCI/L	< 1.	-			
TIN	MG/L	< 0.005	< 0.005			
TOTAL SOLIDS	MG/L	7174.	7130.			
TOTAL U	PPM	-	-			
TOX	MG/L	0.65	-			
U-234	PCI/L	36.	36.			
U-238	PCI/L	24.	25.			
URANIUM	MG/L	-	-			
VANADIUM	MG/L	< 0.01	< 0.01			
ZINC	MG/L	< 0.005	0.01			

MAPPER INPUT FILE: GRJ01*UDPGWQ100371

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: CROSS GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		737-01 03/22/85	737-01 06/07/85	737-01 09/06/85	739-01 03/22/85	739-01 06/07/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	470.	463.	468.	486.	498.
ALUMINUM	MG/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
AMMONIUM	MG/L	0.54	0.57	6.6	0.42	0.44
ANTIMONY	MG/L	< 0.003	< 0.003	< 0.003	0.004	< 0.003
ARSENIC	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
BALANCE	%	4.47	4.86	-.73	1.82	5.09
BARIUM	MG/L	< 0.1	< 0.1	< 0.05	< 0.1	< 0.1
BORON	MG/L	0.69	0.83	0.7	0.77	0.79
CADMIUM	MG/L	< 0.002	< 0.001	< 0.001	< 0.002	< 0.001
CALCIUM	MG/L	550.	640.	489.	540.	630.
CHLORIDE	MG/L	880.	1080.	1100.	970.	1130.
CHROMIUM	MG/L	0.03	< 0.01	< 0.01	0.03	< 0.01
COBALT	MG/L	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05
CONDUCTANCE	UMHO/CM	8900.	7800.	9000.	8300.	8024.
COPPER	MG/L	0.02	< 0.02	< 0.02	0.01	< 0.02
CYANIDE	MG/L	< 0.01	< 0.01	-	< 0.01	< 0.01
FLUORIDE	MG/L	1.	1.1	1.2	0.9	1.
GROSS ALPHA	PCI/L	185.	-	-	< 90.	-
GROSS BETA	PCI/L	60.	-	-	< 50.	-
HYD. SULFIDE	MG/L	< 0.2	-	< 0.1	< 0.2	-
IRON	MG/L	1.7	0.6	0.3	3.4	1.47
LEAD	MG/L	< 0.01	< 0.01	-	< 0.01	< 0.01
MAGNESIUM	MG/L	540.	625.	533.	520.	600.
MANGANESE	MG/L	2.6	2.42	2.19	1.8	1.76
MERCURY	MG/L	< 0.0002	< 0.0002	0.0002	< 0.0002	< 0.0002
MOLYBDENUM	MG/L	0.11	0.08	0.14	0.11	0.14
NICKEL	MG/L	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
NITRATE	MG/L	< 1.	< 1.	< 1.	< 1.	< 1.
ORG. CARBON	MG/L	18.	13.3	14.3	14.2	23.3
PB-210	PCI/L	< 1.5	< 1.5	-	< 1.5	< 1.5
PH	SU	6.6	7.1	7.4	6.9	7.3
PHOSPHATE	MG/L	< 0.1	< 0.1	-	< 0.1	< 0.1
PO-210	PCI/L	< 1.	< 1.	-	< 1.	< 1.
POTASSIUM	MG/L	12.	15.1	12.8	11.	12.8
RA-226	PCI/L	< 1.	< 1.	< 1.	< 1.	< 1.
RA-228	PCI/L	< 1.	< 1.	-	< 1.	< 1.
SELENIUM	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
SILICA	MG/L	8.7	8.5	17.8	10.	8.8
SILVER	MG/L	< 0.01	< 0.01	-	< 0.01	< 0.01
SODIUM	MG/L	1190.	1070.	1140.	1260.	1150.
STRONTIUM	MG/L	7.3	7.19	7.32	7.4	6.93
SULFATE	MG/L	3800.	3770.	3820.	4000.	3680.
SULFIDE	MG/L	-	< 0.1	-	-	< 0.1
TEMPERATURE	C - DEGREE	12.	16.	15.5	14.	17.
TH-230	PCI/L	< 1.	< 1.	-	< 1.	< 1.
TIN	MG/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005
TOTAL SOLIDS	MG/L	8134.	8300.	8340.	8324.	8444.

Table F.3.10 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/22/85 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: CROSS GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		737-01 03/22/85	737-01 06/07/85	737-01 09/06/85	739-01 03/22/85	739-01 06/07/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
TOX	MG/L	0.6	0.11	-	0.6	0.13
U-234	PCI/L	36.	40.	39.	34.	36.
U-238	PCI/L	24.	26.	26.	24.	24.
VANADIUM	MG/L	< 0.01	0.02	< 0.01	< 0.01	0.03
ZINC	MG/L	0.09	< 0.005	0.006	0.06	< 0.005

Table F.3.10 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/22/85 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: CROSS GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		739-01 09/05/85	742-01 03/22/85	742-01 06/07/85	742-01 09/10/85	
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	471.	535.	502.	471.	
ALUMINUM	MG/L	0.2	< 0.1	< 0.1	< 0.1	
AMMONIUM	MG/L	0.31	0.51	0.54	0.47	
ANTIMONY	MG/L	< 0.003	< 0.003	0.003	< 0.003	
ARSENIC	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	
BALANCE	%	-2.16	1.01	5.59	0.32	
BARIUM	MG/L	< 0.05	< 0.1	< 0.1	< 0.05	
BORON	MG/L	0.7	0.7	0.79	0.72	
CADMIUM	MG/L	< 0.001	< 0.002	< 0.001	< 0.001	
CALCIUM	MG/L	506.	570.	655.	499.	
CHLORIDE	MG/L	1250.	590.	673.	705.	
CHROMIUM	MG/L	0.02	0.03	< 0.01	0.01	
COBALT	MG/L	< 0.05	< 0.01	< 0.05	< 0.05	
CONDUCTANCE	UMHO/CM	9360.	6900.	6100.	7605.	
COPPER	MG/L	0.04	0.01	< 0.02	0.04	
CYANIDE	MG/L	-	< 0.01	< 0.01	-	
FLUORIDE	MG/L	1.1	0.7	0.8	0.9	
GROSS ALPHA	PCI/L	-	< 60.	-	-	
GROSS BETA	PCI/L	-	80.	-	-	
HYD. SULFIDE	MG/L	< 0.1	< 0.2	-	0.36	
IRON	MG/L	0.47	5.7	0.56	0.68	
LEAD	MG/L	-	< 0.01	< 0.01	-	
MAGNESIUM	MG/L	535.	460.	550.	448.	
MANGANESE	MG/L	1.58	4.6	2.77	2.45	
MERCURY	MG/L	0.0002	< 0.0002	< 0.0002	< 0.0002	
MOLYBDENUM	MG/L	0.11	0.04	0.01	0.05	
NICKEL	MG/L	< 0.04	< 0.04	< 0.04	0.06	
NITRATE	MG/L	< 1.	< 1.	2.	< 1.	
ORG. CARBON	MG/L	19.7	562.	13.4	508.	
PB-210	PCI/L	-	< 1.5	< 1.5	-	
PH	SU	7.3	6.7	7.	6.9	
PHOSPHATE	MG/L	-	< 0.1	< 0.1	-	
PO-210	PCI/L	-	< 1.	< 1.	-	
POTASSIUM	MG/L	10.6	9.6	11.4	9.48	
RA-226	PCI/L	< 1.	< 1.	< 1.	< 1.	
RA-228	PCI/L	< 1.	< 1.	< 1.	-	
SELENIUM	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	
SILICA	MG/L	18.	11.1	9.7	18.8	
SILVER	MG/L	-	< 0.01	< 0.01	-	
SODIUM	MG/L	1200.	870.	800.	900.	
STRONTIUM	MG/L	7.24	6.5	5.82	6.44	
SULFATE	MG/L	3960.	3600.	3460.	3420.	
SULFIDE	MG/L	-	-	< 0.1	-	
TEMPERATURE	C - DEGREE	17.	12.	15.	17.	
TH-230	PCI/L	-	< 1.	< 1.	-	
TIN	MG/L	< 0.005	0.005	< 0.005	< 0.005	
TOTAL SOLIDS	MG/L	8530.	6828.	7426.	7070.	

Table F.3.10 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/22/85 TO 09/10/85 (Concluded)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: CROSS GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE			
		739-01 09/05/85	742-01 03/22/85	742-01 06/07/85	742-01 09/10/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
TOX	MG/L	-	0.5	0.49	-
U-234	PCI/L	36.	41.	31.	45.
U-238	PCI/L	27.	31.	31.	33.
VANADIUM	MG/L	< 0.01	< 0.01	< 0.01	0.02
ZINC	MG/L	0.005	0.08	< 0.005	0.009

MAPPER INPUT FILE: GRJ01*UDPGWQ100375

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		585-01 02/03/83	585-01 06/09/83	585-01 09/20/83	585-01 03/25/85	585-01 06/07/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	540.	540.	570.	592.	585.
ALUMINUM	MG/L	-	-	0.012	< 0.1	< 0.1
AMMONIA	MG/L	-	471.9	-	-	-
AMMONIUM	MG/L	-	-	335.	383.	369.
ANTIMONY	MG/L	-	-	< 0.005	< 0.003	< 0.003
ARSENIC	MG/L	0.008	< 0.001	0.018	0.015	< 0.01
BALANCE	%	1.31	-13.71	1.87	3.49	3.63
BARIUM	MG/L	< 0.02	0.03	0.051	< 0.1	< 0.1
BORON	MG/L	-	-	-	0.62	0.66
CADMIUM	MG/L	-	-	< 0.0005	< 0.002	< 0.001
CALCIUM	MG/L	556.	584.	540.	540.	625.
CHLORIDE	MG/L	790.	800.	810.	850.	868.
CHROMIUM	MG/L	0.001	0.007	0.003	0.03	< 0.01
COBALT	MG/L	0.004	0.082	0.005	< 0.01	< 0.05
COND,IN-SITU	UMHO/CM	5900.	7200.	-	-	-
CONDUCTANCE	UMHO/CM	-	-	-	5300.	8296.
COPPER	MG/L	0.0082	< 0.0005	0.009	0.04	< 0.02
CYANIDE	MG/L	-	-	-	< 0.01	< 0.01
FLUORIDE	MG/L	-	-	3.2	3.1	3.2
GROSS ALPHA	PCI/L	-	-	-	380.	-
GROSS BETA	PCI/L	-	-	-	200.	-
HYD. SULFIDE	MG/L	-	-	-	< 0.2	-
IRON	MG/L	4.03	2.64	2.71	13.	11.2
LEAD	MG/L	-	-	< 0.001	< 0.01	< 0.01
MAGNESIUM	MG/L	620.	280.	310.	310.	354.
MANGANESE	MG/L	3.42	3.38	4.8	4.8	4.05
MERCURY	MG/L	-	-	< 0.0002	< 0.0002	< 0.0002
MOLYBDENUM	MG/L	0.44	0.29	0.21	0.27	0.18
NICKEL	MG/L	-	-	-	0.15	0.05
NITRATE	MG/L	0.1	-	< 0.01	< 1.	< 1.
NITROGEN,KJL	MG/L	340.	-	-	-	-
ORG. CARBON	MG/L	64.7	103.	99.1	9.8	-
PB-210	PCI/L	-	-	-	< 1.5	< 1.5
PH	SU	7.6	7.3	7.2	6.9	7.1
PHOSPHATE	MG/L	-	-	-	< 0.1	< 0.1
PHOSPHORUS	MG/L	-	-	< 0.04	-	-
PO-210	PCI/L	-	-	-	< 1.	< 1.
POTASSIUM	MG/L	99.5	97.	100.	95.	98.4
RA-226	PCI/L	-	-	18.	< 1.	< 1.
RA-228	PCI/L	-	-	-	4.5	< 1.
SELENIUM	MG/L	0.004	< 0.002	< 0.002	< 0.005	< 0.005
SILCON	MG/L	-	-	-	-	-
SILICA	MG/L	-	-	21.	11.6	10.6
SILVER	MG/L	-	-	0.004	< 0.01	< 0.01
SODIUM	MG/L	1020.	960.	990.	970.	916.
STRONTIUM	MG/L	-	-	-	4.7	5.22
SULFATE	MG/L	4320.	4500.	3800.	3600.	3780.

Table F.3.11 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		585-01 02/03/83	585-01 06/09/83	585-01 09/20/83	585-01 03/25/85	585-01 06/07/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
SULFIDE	MG/L	-	-	-	-	< 0.1
TEMP,IN-SITU	C-DEGREE	10.	18.5	-	-	-
TEMPERATURE	C - DEGREE	-	-	-	12.5	15.
TH-230	PCI/L	-	-	5.4	< 1.	< 1.
TIN	MG/L	-	-	-	0.005	< 0.005
TOTAL SOLIDS	MG/L	6440.	6520.	6640.	7198.	7310.
TOTAL U	PPM	0.24	0.225	0.193	-	-
TOX	MG/L	-	-	-	0.9	-
U-234	PCI/L	-	-	-	-	84.
U-238	PCI/L	-	-	-	-	84.
URANIUM	MG/L	-	-	-	0.31	-
VANADIUM	MG/L	0.027	0.141	0.097	0.11	0.09
ZINC	MG/L	0.03	0.03	0.01	0.05	< 0.005

Table F.3.11 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		585-01 09/10/85	586-01 02/02/83	586-01 06/09/83	586-01 09/20/83	586-01 03/25/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	650.	562.	570.	610.	618.
ALUMINUM	MG/L	< 0.1	-	-	0.011	< 0.1
AMMONIA	MG/L	-	-	484.	-	-
AMMONIUM	MG/L	411.	-	-	310.	393.
ANTIMONY	MG/L	< 0.003	-	-	< 0.005	0.012
ARSENIC	MG/L	0.02	0.004	0.027	0.11	0.018
BALANCE	%	0.03	-11.27	-3.27	0.7	4.55
BARIUM	MG/L	< 0.05	0.074	0.303	0.099	< 0.1
BORON	MG/L	0.67	-	-	-	0.56
CADMIUM	MG/L	< 0.001	-	-	0.0005	< 0.002
CALCIUM	MG/L	484.	487.	589.	570.	550.
CHLORIDE	MG/L	854.	805.	860.	820.	740.
CHROMIUM	MG/L	< 0.01	0.002	0.011	0.003	0.02
COBALT	MG/L	< 0.05	0.001	0.017	0.003	< 0.01
COND, IN-SITU	UMHO/CM	-	6200.	5900.	-	-
CONDUCTANCE	UMHO/CM	10080.	-	-	-	8900.
COPPER	MG/L	0.02	0.0098	< 0.0005	0.004	0.07
CYANIDE	MG/L	-	-	-	-	< 0.01
FLUORIDE	MG/L	3.7	-	-	3.4	3.1
GROSS ALPHA	PCI/L	-	-	-	-	490.
GROSS BETA	PCI/L	-	-	-	-	180.
HYD. SULFIDE	MG/L	< 0.1	-	-	-	< 0.2
IRON	MG/L	11.	13.5	6.09	4.77	16.
LEAD	MG/L	-	-	-	< 0.001	< 0.01
MAGNESIUM	MG/L	292.	323.	270.	290.	310.
MANGANESE	MG/L	4.31	4.07	334.	4.6	4.8
MERCURY	MG/L	< 0.0002	-	-	< 0.0002	< 0.0002
MOLYBDENUM	MG/L	0.29	0.47	0.36	0.36	0.23
NICKEL	MG/L	0.14	-	-	-	0.12
NITRATE	MG/L	< 1.	0.19	-	< 0.1	< 1.
NITROGEN,KJL	MG/L	-	389.	-	-	-
ORG. CARBON	MG/L	-	118.	96.9	78.6	10.1
PB-210	PCI/L	-	-	-	-	< 1.5
PH	SU	6.9	7.3	7.3	7.1	7.
PHOSPHATE	MG/L	-	-	-	-	< 0.1
PHOSPHORUS	MG/L	-	-	-	0.14	-
PO-210	PCI/L	-	-	-	-	< 1.
POTASSIUM	MG/L	98.	110.	94.	120.	94.
RA-226	PCI/L	< 1.	-	-	18.	1.1
RA-228	PCI/L	-	-	-	-	2.5
SELENIUM	MG/L	< 0.005	< 0.005	< 0.002	< 0.002	< 0.005
SILCON	MG/L	-	-	-	-	-
SILICA	MG/L	25.9	-	-	23.	12.6
SILVER	MG/L	-	-	-	0.002	< 0.01
SODIUM	MG/L	980.	1070.	940.	1000.	990.
STRONTIUM	MG/L	4.96	-	-	-	4.7
SULFATE	MG/L	3820.	4320.	4400.	3800.	3700.

Table F.3.11 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		585-01 09/10/85	586-01 02/02/83	586-01 06/09/83	586-01 09/20/83	586-01 03/25/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
SULFIDE	MG/L	-	-	-	-	-
TEMP, IN-SITU	C-DEGREE	-	10.	17.	-	-
TEMPERATURE	C - DEGREE	19.	-	-	-	12.5
TH-230	PCI/L	-	-	-	4.2	< 1.
TIN	MG/L	< 0.005	-	-	-	< 0.005
TOTAL SOLIDS	MG/L	7120.	6760.	6620.	6530.	7276.
TOTAL U	PPM	-	0.386	0.147	0.229	-
TOX	MG/L	-	-	-	-	0.5
U-234	PCI/L	72.	-	-	-	-
U-238	PCI/L	73.	-	-	-	-
URANIUM	MG/L	-	-	-	-	0.445
VANADIUM	MG/L	0.1	0.14	0.4	0.25	0.13
ZINC	MG/L	0.015	0.3	0.05	0.01	0.05

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		586-01 06/07/85	586-01 09/10/85	589-01 02/01/83	589-01 06/08/83	589-01 09/22/83
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	609.	650.	479.	570.	510.
ALUMINUM	MG/L	< 0.1	< 0.1	-	-	0.19
AMMONIA	MG/L	-	-	-	118.58	-
AMMONIUM	MG/L	384.	438.	-	-	10.4
ANTIMONY	MG/L	0.003	< 0.003	-	-	< 0.005
ARSENIC	MG/L	0.04	0.02	< 0.001	< 0.001	0.022
BALANCE	%	4.66	0.5	-1.89	-3.29	8.32
BARIUM	MG/L	< 0.1	< 0.05	0.08	0.06	0.13
BORON	MG/L	0.67	0.71	-	-	-
CADMIUM	MG/L	< 0.001	< 0.001	-	-	0.003
CALCIUM	MG/L	630.	471.	574.	581.	480.
CHLORIDE	MG/L	860.	898.	749.	840.	860.
CHROMIUM	MG/L	< 0.01	< 0.01	0.001	0.005	0.004
COBALT	MG/L	< 0.05	< 0.05	< 0.001	0.071	< 0.001
COND,IN-SITU	UMHO/CM	-	-	4600.	6100.	-
CONDUCTANCE	UMHO/CM	7320.	10080.	-	-	-
COPPER	MG/L	< 0.02	0.04	0.116	0.0077	0.003
CYANIDE	MG/L	< 0.01	-	-	-	-
FLUORIDE	MG/L	3.3	3.7	-	-	0.54
GROSS ALPHA	PCI/L	-	-	-	-	-
GROSS BETA	PCI/L	-	-	-	-	-
HYD. SULFIDE	MG/L	-	< 0.1	-	-	-
IRON	MG/L	12.8	15.4	2.72	0.08	3.42
LEAD	MG/L	< 0.01	-	-	-	0.01
MAGNESIUM	MG/L	364.	282.	303.	260.	360.
MANGANESE	MG/L	4.02	4.33	1.2	1.11	1.61
MERCURY	MG/L	< 0.0002	< 0.0002	-	-	< 0.0002
MOLYBDENUM	MG/L	0.2	0.22	0.2	0.093	0.012
NICKEL	MG/L	0.14	0.17	-	-	-
NITRATE	MG/L	< 1.	< 1.	0.98	-	< 0.1
NITROGEN,KJL	MG/L	-	-	58.	-	-
ORG. CARBON	MG/L	-	-	116.	92.	118.
PB-210	PCI/L	2.7	-	-	-	-
PH	SU	7.	6.9	7.	7.4	7.3
PHOSPHATE	MG/L	< 0.1	-	-	-	-
PHOSPHORUS	MG/L	-	-	-	-	< 0.04
PO-210	PCI/L	< 1.	-	-	-	-
POTASSIUM	MG/L	101.	100.	52.5	53.	53.
RA-226	PCI/L	2.	2.1	-	-	-
RA-228	PCI/L	< 1.	-	-	-	-
SELENIUM	MG/L	< 0.005	< 0.005	0.012	< 0.002	< 0.002
SILCON	MG/L	-	-	-	-	-
SILICA	MG/L	11.8	27.8	-	-	17.
SILVER	MG/L	< 0.01	-	-	-	0.004
SODIUM	MG/L	914.	990.	1090.	1000.	1300.
STRONTIUM	MG/L	4.63	4.64	-	-	-
SULFATE	MG/L	3740.	3730.	3630.	3700.	2900.

Table F.3.11 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
02/04/83 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		586-01 06/07/85	586-01 09/10/85	589-01 02/04/83	589-01 06/08/83	589-01 09/22/83
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
SULFIDE	MG/L	0.2	-	-	-	-
TEMP, IN-SITU	C-DEGREE	-	-	13.	18.5	-
TEMPERATURE	C - DEGREE	15.	19.	-	-	-
TH-230	PCI/L	< 1.	-	-	-	-
TIN	MG/L	< 0.005	< 0.005	-	-	-
TOTAL SOLIDS	MG/L	7186.	7170.	6400.	6030.	6150.
TOTAL U	PPM	-	-	0.277	0.147	0.302
TOX	MG/L	-	-	-	-	-
U-234	PCI/L	118.	67.	-	-	-
U-238	PCI/L	116.	68.	-	-	-
URANIUM	MG/L	-	-	-	-	-
VANADIUM	MG/L	0.27	0.13	0.027	0.058	0.11
ZINC	MG/L	< 0.005	0.017	0.05	0.08	0.39

Table F.3.11 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		589-01 03/25/85	589-01 06/07/85	589-01 09/09/85	590-01 02/02/83	590-01 06/07/83
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	522.	633.	598.	449.	390.
ALUMINUM	MG/L	< 0.1	< 0.1	< 0.1	-	-
AMMONIA	MG/L	-	-	-	-	12.1
AMMONIUM	MG/L	124.	148.	149.	-	-
ANTIMONY	MG/L	< 0.003	< 0.003	< 0.003	-	-
ARSENIC	MG/L	< 0.01	< 0.01	< 0.01	< 0.001	< 0.001
BALANCE	%	1.72	2.32	-1.29	1.51	-1.96
BARIUM	MG/L	< 0.1	< 0.1	< 0.05	0.019	0.03
BORON	MG/L	0.6	0.6	0.54	-	-
CADMIUM	MG/L	< 0.002	< 0.001	< 0.001	-	-
CALCIUM	MG/L	590.	665.	611.	500.	493.
CHLORIDE	MG/L	930.	1100.	1260.	736.	990.
CHROMIUM	MG/L	0.02	< 0.01	< 0.01	0.002	0.003
COBALT	MG/L	< 0.01	< 0.05	< 0.05	< 0.001	0.052
COND, IN-SITU	UMHO/CM	-	-	-	4810.	3480.
CONDUCTANCE	UMHO/CM	7200.	7800.	9512.	-	-
COPPER	MG/L	0.05	< 0.02	0.06	0.0122	< 0.0005
CYANIDE	MG/L	< 0.01	< 0.01	-	-	-
FLUORIDE	MG/L	0.3	0.4	0.38	-	-
GROSS ALPHA	PCI/L	260.	-	-	-	-
GROSS BETA	PCI/L	130.	-	-	-	-
HYD. SULFIDE	MG/L	< 0.2	-	< 0.1	-	-
IRON	MG/L	1.1	3.79	3.05	0.0183	0.056
LEAD	MG/L	< 0.01	< 0.01	-	-	-
MAGNESIUM	MG/L	340.	360.	326.	407.	254.
MANGANESE	MG/L	2.	2.18	2.08	0.36	0.38
MERCURY	MG/L	< 0.0002	< 0.0002	0.0002	-	-
MOLYBDENUM	MG/L	0.06	0.01	0.04	0.13	0.101
NICKEL	MG/L	< 0.04	0.11	0.13	-	-
NITRATE	MG/L	39.	< 1.	< 1.	3.6	-
NITROGEN, KJL	MG/L	-	-	-	8.5	-
ORG. CARBON	MG/L	16.	13.7	19.	81.9	79.7
PB-210	PCI/L	< 1.5	< 1.5	-	-	-
PH	SU	6.9	7.	7.4	7.1	7.1
PHOSPHATE	MG/L	< 0.1	0.1	-	-	-
PHOSPHORUS	MG/L	-	-	-	-	-
PO-210	PCI/L	< 1.	< 1.	-	-	-
POTASSIUM	MG/L	52.	66.4	63.7	22.2	17.2
RA-226	PCI/L	< 1.	< 1.	< 1.	-	-
RA-228	PCI/L	< 1.	< 1.	-	-	-
SELENIUM	MG/L	< 0.005	< 0.005	< 0.005	< 0.002	< 0.002
SILCON	MG/L	-	-	-	-	-
SILICA	MG/L	7.1	7.2	14.9	-	-
SILVER	MG/L	< 0.01	< 0.01	-	-	-
SODIUM	MG/L	1120.	1060.	1180.	1030.	700.
STRONTIUM	MG/L	6.1	5.94	6.68	-	-
SULFATE	MG/L	3400.	3350.	3560.	3410.	2100.

Table F.3.11 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		589-01 03/25/85	589-01 06/07/85	589-01 09/09/85	590-01 02/02/83	590-01 06/07/83
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
SULFIDE	MG/L	-	< 0.1	-	-	-
TEMP,IN-SITU	C-DEGREE	-	-	-	10.	15.5
TEMPERATURE	C - DEGREE	13.	13.	17.5	-	-
TH-230	PCI/L	< 1.	< 1.	-	-	-
TIN	MG/L	0.01	< 0.005	< 0.005	-	-
TOTAL SOLIDS	MG/L	7302.	7184.	7550.	6560.	4670.
TOTAL U	PPM	-	-	-	0.376	0.135
TOX	MG/L	0.6	0.22	-	-	-
U-234	PCI/L	-	99.	86.	-	-
U-238	PCI/L	-	89.	79.	-	-
URANIUM	MG/L	0.27	-	-	-	-
VANADIUM	MG/L	< 0.01	0.01	< 0.01	< 0.01	0.055
ZINC	MG/L	0.1	0.031	0.024	0.02	0.04

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		590-01 09/22/83	590-01 03/25/85	590-01 06/07/85	590-01 09/09/85	732-01 03/26/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	460.	522.	498.	498.	466.
ALUMINUM	MG/L	0.018	< 0.1	< 0.1	< 0.1	< 0.1
AMMONIA	MG/L	-	-	-	-	-
AMMONIUM	MG/L	18.1	17.4	8.36	18.5	0.29
ANTIMONY	MG/L	< 0.005	0.004	< 0.003	< 0.003	0.003
ARSENIC	MG/L	< 0.001	< 0.01	< 0.01	< 0.01	< 0.01
BALANCE	%	9.06	-.69	1.37	2.54	2.13
BARIUM	MG/L	0.07	< 0.1	< 0.1	< 0.05	< 0.1
BORON	MG/L	-	0.56	0.41	0.59	0.51
CADMIUM	MG/L	0.001	< 0.002	< 0.001	< 0.001	< 0.002
CALCIUM	MG/L	480.	580.	316.	495.	540.
CHLORIDE	MG/L	670.	830.	459.	759.	930.
CHROMIUM	MG/L	0.002	0.02	< 0.01	< 0.01	0.02
COBALT	MG/L	< 0.001	< 0.01	< 0.05	< 0.05	< 0.01
COND, IN-SITU	UMHO/CM	-	-	-	-	-
CONDUCTANCE	UMHO/CM	-	6700.	2700.	6960.	7600.
COPPER	MG/L	0.005	0.01	< 0.02	0.05	0.01
CYANIDE	MG/L	-	< 0.01	< 0.01	-	< 0.01
FLUORIDE	MG/L	0.53	0.3	0.5	0.65	0.9
GROSS ALPHA	PCI/L	-	240.	-	-	105.
GROSS BETA	PCI/L	-	110.	-	-	60.
HYD. SULFIDE	MG/L	-	< 0.2	-	< 0.1	< 0.2
IRON	MG/L	0.062	1.1	< 0.03	0.15	0.2
LEAD	MG/L	0.02	< 0.01	< 0.01	-	< 0.01
MAGNESIUM	MG/L	420.	340.	177.	299.	500.
MANGANESE	MG/L	1.23	1.5	0.74	1.57	1.
MERCURY	MG/L	< 0.0002	< 0.0002	< 0.0002	0.0002	< 0.0002
MOLYBDENUM	MG/L	0.015	0.02	0.01	0.04	0.04
NICKEL	MG/L	-	< 0.04	< 0.04	0.07	< 0.04
NITRATE	MG/L	0.11	12.	< 1.	7.4	< 1.
NITROGEN,KJL	MG/L	-	-	-	-	-
ORG. CARBON	MG/L	98.1	3.7	9.9	10.7	-
PB-210	PCI/L	-	< 1.5	< 1.5	-	< 1.5
PH	SU	7.1	6.7	7.	7.2	6.95
PHOSPHATE	MG/L	-	< 0.1	-	-	< 0.1
PHOSPHORUS	MG/L	0.1	-	-	-	-
PO-210	PCI/L	-	< 1.	< 1.	-	< 1.
POTASSIUM	MG/L	19.1	20.	15.7	23.1	9.5
RA-226	PCI/L	< 0.6	< 1.	< 1.	< 1.	< 1.
RA-228	PCI/L	-	< 1.	< 1.	-	< 1.
SELENIUM	MG/L	< 0.002	< 0.005	< 0.005	< 0.005	< 0.005
SILCON	MG/L	-	-	-	-	-
SILICA	MG/L	20.	8.5	7.9	18.8	6.7
SILVER	MG/L	< 0.002	< 0.01	< 0.01	-	< 0.01
SODIUM	MG/L	830.	940.	498.	840.	980.
STRONTIUM	MG/L	-	5.9	2.97	5.72	6.8
SULFATE	MG/L	2500.	3200.	1370.	2520.	3400.

Table F.3.11 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		590-01 09/22/83	590-01 03/25/85	590-01 06/07/85	590-01 09/09/85	732-01 03/26/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
SULFIDE	MG/L	-	-	< 0.1	-	-
TEMP, IN-SITU	C-DEGREE	-	-	-	-	-
TEMPERATURE	C - DEGREE	-	13.	13.	17.5	12.
TH-230	PCI/L	-	< 1.	< 1.	-	< 1.
TIN	MG/L	-	< 0.005	< 0.005	< 0.005	< 0.005
TOTAL SOLIDS	MG/L	5600.	6566.	3292.	6020.	7504.
TOTAL U	PPM	0.162	-	-	-	-
TOX	MG/L	-	0.5	0.28	-	< 0.1
U-234	PCI/L	-	-	31.	56.	53.
U-238	PCI/L	-	-	28.	51.	36.
URANIUM	MG/L	-	0.205	-	-	-
VANADIUM	MG/L	0.004	< 0.1	0.02	0.02	< 0.01
ZINC	MG/L	0.07	0.05	< 0.005	0.022	< 0.05

Table F.3.11 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

PARAMETER	UNIT OF MEASURE	732-01 06/07/85 PARAMETER VALUE+/-UNCERTAINTY	732-01 09/06/85 PARAMETER VALUE+/-UNCERTAINTY	733-01 03/25/85 PARAMETER VALUE+/-UNCERTAINTY	733-01 06/07/85 PARAMETER VALUE+/-UNCERTAINTY	733-01 09/06/85 PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	509.	460.	690.	568.	616.
ALUMINUM	MG/L	< 0.1	< 0.1	< 0.1	< 0.1	0.1
AMMONIA	MG/L	-	-	-	-	-
AMMONIUM	MG/L	0.51	0.2	0.86	0.54	0.58
ANTIMONY	MG/L	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
ARSENIC	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
BALANCE	%	2.73	-.41	1.34	3.61	-1.69
BARIUM	MG/L	< 0.1	< 0.05	< 0.1	< 0.1	< 0.05
BORON	MG/L	0.7	0.68	0.81	0.84	0.77
CADMIUM	MG/L	< 0.001	< 0.001	< 0.002	< 0.001	< 0.001
CALCIUM	MG/L	665.	392.	510.	610.	464.
CHLORIDE	MG/L	1130.	872.	1100.	1250.	1270.
CHROMIUM	MG/L	< 0.01	< 0.01	0.03	< 0.01	< 0.01
COBALT	MG/L	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05
COND, IN-SITU	UMHO/CM	-	-	-	-	-
CONDUCTANCE	UMHO/CM	6000.	7140.	-	6800.	9360.
COPPER	MG/L	< 0.02	0.04	0.01	< 0.02	< 0.02
CYANIDE	MG/L	< 0.01	-	< 0.01	< 0.01	-
FLUORIDE	MG/L	0.9	0.99	0.5	0.7	0.76
GROSS ALPHA	PCI/L	-	-	185.	-	-
GROSS BETA	PCI/L	-	-	60.	-	-
HYD. SULFIDE	MG/L	-	< 0.1	< 0.2	-	< 0.1
IRON	MG/L	0.08	< 0.03	4.2	2.04	1.31
LEAD	MG/L	< 0.01	-	< 0.01	< 0.01	-
MAGNESIUM	MG/L	585.	361.	480.	555.	475.
MANGANESE	MG/L	0.85	0.66	2.2	2.17	1.89
MERCURY	MG/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
MOLYBDENUM	MG/L	0.03	0.07	0.03	< 0.01	0.03
NICKEL	MG/L	< 0.04	0.04	< 0.04	0.06	0.04
NITRATE	MG/L	< 1.	< 1.	< 1.	< 1.	< 1.
NITROGEN, KJL	MG/L	-	-	-	-	-
ORG. CARBON	MG/L	12.	10.	522.	20.7	31.8
PB-210	PCI/L	< 1.5	-	< 1.5	< 1.5	-
PH	SU	7.	7.35	6.8	6.8	7.3
PHOSPHATE	MG/L	< 0.1	-	< 0.1	< 0.1	-
PHOSPHORUS	MG/L	-	-	-	-	-
PO-210	PCI/L	< 1.	-	< 1.	< 1.	-
POTASSIUM	MG/L	12.2	9.65	12.	12.8	10.8
RA-226	PCI/L	< 1.	< 1.	< 1.	< 1.	< 1.
RA-228	PCI/L	< 1.	< 1.	< 1.	< 1.	< 1.
SELENIUM	MG/L	0.007	< 0.005	< 0.005	< 0.005	< 0.005
SILCON	MG/L	-	-	9.2	-	-
SILICA	MG/L	6.8	14.8	-	7.8	18.4
SILVER	MG/L	< 0.01	-	< 0.01	< 0.01	-
SODIUM	MG/L	1060.	990.	1230.	1190.	1220.
STRONTIUM	MG/L	6.87	5.28	7.9	7.1	7.24
SULFATE	MG/L	3790.	2860.	3400.	3490.	3430.

Table F.3.11 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		732-01 06/07/85	732-01 09/06/85	733-01 03/25/85	733-01 06/07/85	733-01 09/06/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
SULFIDE	MG/L	< 0.1	-	-	< 0.1	-
TEMP, IN-SITU	C-DEGREE	-	-	-	-	-
TEMPERATURE	C - DEGREE	14.5	16.	15.	18.	17.
TH-230	PCI/L	< 1.	-	< 1.	< 1.	-
TIN	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
TOTAL SOLIDS	MG/L	7864.	6390.	7922.	8092.	7850.
TOTAL U	PPM	-	-	-	-	-
TOX	MG/L	0.16	-	-	0.39	-
U-234	PCI/L	58.	39.	39.	43.	44.
U-238	PCI/L	38.	28.	25.	29.	29.
URANIUM	MG/L	-	-	-	-	-
VANADIUM	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
ZINC	MG/L	< 0.005	0.013	0.05	< 0.005	0.005

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

PARAMETER	UNIT OF MEASURE	736-01 03/22/85 PARAMETER VALUE+/-UNCERTAINTY	736-01 06/07/85 PARAMETER VALUE+/-UNCERTAINTY	736-01 09/10/85 PARAMETER VALUE+/-UNCERTAINTY	738-01 03/25/85 PARAMETER VALUE+/-UNCERTAINTY	738-01 06/07/85 PARAMETER VALUE+/-UNCERTAINTY
		LOCATION ID - SAMPLE ID AND LOG DATE				
ALKALINITY	MG/L CACO3	581.	579.	595.	603.	643.
ALUMINUM	MG/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
AMMONIA	MG/L	-	-	-	-	-
AMMONIUM	MG/L	0.37	0.3	0.34	0.66	0.75
ANTIMONY	MG/L	< 0.003	< 0.003	< 0.003	0.004	< 0.003
ARSENIC	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
BALANCE	%	2.49	3.94	-.05	4.2	2.6
BARIUM	MG/L	< 0.1	< 0.1	< 0.05	< 0.1	< 0.1
BORON	MG/L	0.73	0.77	0.9	0.76	0.92
CADMIUM	MG/L	< 0.002	< 0.001	< 0.001	< 0.002	< 0.001
CALCIUM	MG/L	570.	665.	496.	470.	422.
CHLORIDE	MG/L	890.	1060.	997.	670.	944.
CHROMIUM	MG/L	0.03	< 0.01	< 0.01	0.03	< 0.01
COBALT	MG/L	< 0.01	< 0.05	< 0.05	< 0.01	< 0.05
COND,IN-SITU	UMHO/CM	-	-	-	-	-
CONDUCTANCE	UMHO/CM	9300.	7930.	10780.	7000.	5500.
COPPER	MG/L	0.02	< 0.02	0.03	0.04	< 0.02
CYANIDE	MG/L	< 0.01	< 0.01	-	< 0.01	< 0.01
FLUORIDE	MG/L	0.5	0.8	0.86	0.4	0.6
GROSS ALPHA	PCI/L	345.	-	-	170.	-
GROSS BETA	PCI/L	60.	-	-	125.	-
HYD. SULFIDE	MG/L	< 0.2	-	< 0.1	< 0.2	-
IRON	MG/L	0.5	0.09	0.03	10.	9.97
LEAD	MG/L	< 0.01	< 0.01	-	< 0.01	< 0.01
MAGNESIUM	MG/L	490.	575.	421.	330.	415.
MANGANESE	MG/L	2.7	3.	2.16	1.6	1.4
MERCURY	MG/L	0.0004	< 0.0002	0.0002	0.0009	< 0.0002
MOLYBDENUM	MG/L	0.03	< 0.01	0.02	0.02	< 0.01
NICKEL	MG/L	0.1	0.04	0.09	< 0.04	< 0.04
NITRATE	MG/L	25.	34.	19.	< 1.	< 1.
NITROGEN,KJL	MG/L	-	-	-	-	-
ORG. CARBON	MG/L	55.3	21.	15.1	11.3	10.8
PB-210	PCI/L	< 1.5	< 1.5	-	< 1.5	< 1.5
PH	SU	6.8	7.	6.8	7.	7.15
PHOSPHATE	MG/L	< 0.1	< 0.1	-	< 0.1	< 0.1
PHOSPHORUS	MG/L	-	-	-	-	-
PO-210	PCI/L	< 1.	< 1.	-	< 1.	< 1.
POTASSIUM	MG/L	15.	15.6	14.7	18.	21.6
RA-226	PCI/L	< 1.	< 1.	< 1.	< 1.	< 1.
RA-228	PCI/L	< 1.	< 1.	-	< 1.	< 1.
SELENIUM	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	0.005
SILCON	MG/L	10.3	-	-	-	-
SILICA	MG/L	-	11.2	22.5	12.3	11.4
SILVER	MG/L	< 0.01	< 0.01	-	< 0.01	< 0.01
SODIUM	MG/L	1370.	1200.	1350.	1110.	1200.
STRONTIUM	MG/L	6.5	7.49	6.66	5.8	5.56
SULFATE	MG/L	4100.	3890.	3760.	2900.	3050.

Table F.3.11 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		736-01 03/22/85	736-01 06/07/85	736-01 09/10/85	738-01 03/25/85	738-01 06/07/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
SULFIDE	MG/L	-	< 0.1	-	-	0.1
TEMP, IN-SITU	C-DEGREE	-	-	-	-	-
TEMPERATURE	C - DEGREE	10.	15.	20.	13.	15.
TH-230	PCI/L	< 1.	< 1.	-	< 1.	< 1.
TIN	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
TOTAL SOLIDS	MG/L	8728.	8792.	8220.	12134.	6870.
TOTAL U	PPM	-	-	-	-	-
TOX	MG/L	0.5	0.17	-	0.4	0.16
U-234	PCI/I	66.	60.	71.	54.	52.
U-238	PCI/L	49.	60.	53.	41.	40.
URANIUM	MG/L	-	-	-	-	-
VANADIUM	MG/L	< 0.01	0.02	< 0.01	< 0.01	0.02
ZINC	MG/L	0.06	< 0.005	0.012	0.2	< 0.005

Table F.3.11 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		738-01 09/09/85	740-01 03/22/85	740-01 06/07/85	740-01 09/09/85	
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	676.	508.	503.	511.	
ALUMINUM	MG/L	< 0.1	< 0.1	< 0.1	< 0.1	
AMMONIA	MG/L	-	-	-	-	
AMMONIUM	MG/L	1.	49.	42.7	50.3	
ANTIMONY	MG/L	< 0.003	< 0.003	0.003	< 0.003	
ARSENIC	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	
BALANCE	%	-1.24	0.85	5.31	0.26	
BARIUM	MG/L	< 0.05	< 0.1	< 0.1	< 0.05	
BORON	MG/L	0.91	0.67	0.67	0.74	
CADMIUM	MG/L	< 0.001	< 0.002	< 0.001	< 0.001	
CALCIUM	MG/L	515.	510.	600.	498.	
CHLORIDE	MG/L	1000.	650.	707.	755.	
CHROMIUM	MG/L	< 0.01	0.02	< 0.01	< 0.01	
COBALT	MG/L	< 0.05	< 0.01	< 0.05	< 0.05	
COND,IN-SITU	UMHO/CM	-	-	-	-	
CONDUCTANCE	UMHO/CM	8424.	7000.	6344.	7080.	
COPPER	MG/L	< 0.02	0.02	< 0.02	0.02	
CYANIDE	MG/L	-	< 0.01	< 0.01	-	
FLUORIDE	MG/L	0.63	0.6	0.6	0.76	
GROSS ALPHA	PCI/L	-	245.	-	-	
GROSS BETA	PCI/L	-	100.	-	-	
HYD. SULFIDE	MG/L	< 0.1	< 0.2	-	< 0.1	
IRON	MG/L	10.3	0.4	0.08	0.06	
LEAD	MG/L	-	< 0.01	< 0.01	-	
MAGNESIUM	MG/L	382.	410.	470.	384.	
MANGANESE	MG/L	1.42	3.7	2.96	3.27	
MERCURY	MG/L	0.0002	< 0.0002	< 0.0002	< 0.0002	
MOLYBDENUM	MG/L	0.04	0.11	0.05	0.12	
NICKEL	MG/L	< 0.04	< 0.04	< 0.04	0.07	
NITRATE	MG/L	< 1.	2.	< 1.	< 1.	
NITROGEN,KJL	MG/L	-	-	-	-	
ORG. CARBON	MG/L	-	11.4	11.4	14.4	
PB-210	PCI/L	-	< 1.5	< 1.5	-	
PH	SU	7.4	6.8	6.9	7.2	
PHOSPHATE	MG/L	-	< 0.1	< 0.1	-	
PHOSPHORUS	MG/L	-	-	-	-	
PO-210	PCI/L	-	< 1.	< 1.	-	
POTASSIUM	MG/L	21.8	27.	29.4	31.	
RA-226	PCI/L	< 1.	< 1.	< 1.	< 1.	
RA-228	PCI/L	-	< 1.	< 1.	-	
SELENIUM	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	
SILCON	MG/L	-	-	-	-	
SILICA	MG/L	25.2	9.4	8.2	19.3	
SILVER	MG/L	-	< 0.01	< 0.01	-	
SODIUM	MG/L	1142.	980.	853.	936.	
STRONTIUM	MG/L	6.42	5.4	5.38	5.36	
SULFATE	MG/L	3340.	3600.	3260.	3300.	

Table F.3.11 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Concluded)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE			
		738-01 09/09/85	740-01 03/22/85	740-01 06/07/85	740-01 09/09/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
SULFIDE	MG/L	-	-	< 0.1	-
TEMP, IN-SITU	C-DEGREE	-	-	-	-
TEMPERATURE	C - DEGREE	17.	10.	15.	16.5
TH-230	PCI/L	-	< 1.	< 1.	-
TIN	MG/L	< 0.005	< 0.005	< 0.005	< 0.005
TOTAL SOLIDS	MG/L	7430.	6876.	6872.	6790.
TOTAL U	PPM	-	-	-	-
TOX	MG/L	-	< 0.1	< 0.1	-
U-234	PCI/L	69.	75.	65.	72.
U-238	PCI/L	58.	70.	65.	69.
URANIUM	MG/L	-	-	-	-
VANADIUM	MG/L	< 0.01	< 0.01	< 0.01	< 0.01
ZINC	MG/L	0.009	0.07	< 0.005	0.008

MAPPER INPUT FILE: GRJ01*UDPGWQ100372

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		727-01 03/29/85	727-01 06/07/85	727-01 09/16/85	743-01 03/21/85	743-01 06/07/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	1600.	1468.	1615.	447.	325.
ALUMINUM	MG/L	< 0.1	< 0.1	0.1	< 0.1	< 0.1
AMMONIUM	MG/L	0.29	0.01	0.45	6.05	5.42
ANTIMONY	MG/L	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
ARSENIC	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
BALANCE	%	-3.21	-1.96	-4.15	-3.55	-4.64
BARIUM	MG/L	0.4	0.51	0.47	< 0.1	< 0.1
BORON	MG/L	0.6	0.64	0.54	0.33	0.26
CADMIUM	MG/L	< 0.002	< 0.001	< 0.001	< 0.002	< 0.001
CALCIUM	MG/L	18.	7.1	7.	66.	92.
CHLORIDE	MG/L	360.	317.	325.	650.	838.
CHROMIUM	MG/L	< 0.01	< 0.01	< 0.01	0.04	< 0.01
COBALT	MG/L	< 0.01	< 0.05	0.05	< 0.01	< 0.05
CONDUCTANCE	UMHO/CM	3200.	3150.	3328.	5900.	4500.
COPPER	MG/L	< 0.01	< 0.02	< 0.02	0.03	< 0.02
CYANIDE	MG/L	< 0.01	< 0.01	-	< 0.01	< 0.01
FLUORIDE	MG/L	2.8	2.4	2.9	0.3	0.4
GROSS ALPHA	PCI/L	45.	-	-	< 40.	-
GROSS BETA	PCI/L	< 50.	-	-	< 50.	-
HYD. SULFIDE	MG/L	< 0.2	-	0.11	< 0.2	-
IRON	MG/L	< 0.05	0.06	< 0.03	< 0.05	0.11
LEAD	MG/L	< 0.01	< 0.01	-	< 0.01	< 0.01
MAGNESIUM	MG/L	6.	1.85	2.12	24.	4.07
MANGANESE	MG/L	< 0.05	0.02	0.08	< 0.05	< 0.01
MERCURY	MG/L	0.0003	< 0.0002	< 0.0002	< 0.0002	0.0003
MOLYBDENUM	MG/L	< 0.01	< 0.01	< 0.01	0.02	< 0.01
NICKEL	MG/L	0.05	< 0.04	< 0.04	< 0.04	< 0.04
NITRATE	MG/L	< 1.	< 1.	< 1.	< 1.	< 1.
ORG. CARBON	MG/L	5.1	5.4	8.6	7.7	5.6
PB-210	PCI/L	< 1.5	< 1.5	-	< 1.5	< 1.5
PH	SU	8.6	8.2	8.3	10.2	11.4
PHOSPHATE	MG/L	< 0.1	< 0.1	-	< 0.1	< 0.1
PO-210	PCI/L	< 1.	< 1.	-	< 1.	< 1.
POTASSIUM	MG/L	6.8	7.08	4.35	12.	13.3
RA-226	PCI/L	< 1.	< 1.	< 1.	< 1.	< 1.
RA-228	PCI/L	< 1.	< 1.	-	< 1.	< 1.
SELENIUM	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	0.009
SILICA	MG/L	5.8	5.	8.8	5.5	4.2
SILVER	MG/L	< 0.01	< 0.01	-	< 0.01	< 0.01
SODIUM	MG/L	880.	840.	870.	1340.	1340.
STRONTIUM	MG/L	0.4	0.36	0.36	3.9	3.74
SULFATE	MG/L	9.	12.7	2.1	2000.	1900.
SULFIDE	MG/L	-	0.2	-	-	0.6
TEMPERATURE	C - DEGREE	7.	14.	13.	13.5	13.5
TH-230	PCI/L	< 1.	< 1.	-	< 1.	< 1.
TIN	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
TOTAL SOLIDS	MG/L	2098.	2118.	2150.	4034.	4316.

Table F.3.12 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/21/85 TO 07/25/86 (Continued)

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

PARAMETER	UNIT OF MEASURE	727-01 03/29/85 PARAMETER VALUE+/-UNCERTAINTY	727-01 06/07/85 PARAMETER VALUE+/-UNCERTAINTY	727-01 09/16/85 PARAMETER VALUE+/-UNCERTAINTY	743-01 03/21/85 PARAMETER VALUE+/-UNCERTAINTY	743-01 06/07/85 PARAMETER VALUE+/-UNCERTAINTY
TOX	MG/L	0.1	< 0.1	-	0.6	0.15
U-234	PCI/L	2.9	3.	2.	< 1.	< 1.
U-238	PCI/L	1.8	2.	1.	< 1.	< 1.
URANIUM	MG/L	-	-	-	-	-
VANADIUM	MG/L	< 0.01	0.05	0.01	< 0.01	0.01
ZINC	MG/L	< 0.05	< 0.005	0.014	< 0.05	< 0.005

Table F.3.12 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/24/85 TO 07/25/86 (Continued)

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		743-01 09/10/85	743-01 07/25/86			
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	311.	298.			
ALUMINUM	MG/L	0.1	0.3			
AMMONIUM	MG/L	2.	1.4			
ANTIMONY	MG/L	< 0.003	-			
ARSENIC	MG/L	< 0.01	< 0.01			
BALANCE	%	-1.51	-.02			
BARIUM	MG/L	< 0.05	-			
BORON	MG/L	0.52	-			
CADMIUM	MG/L	< 0.001	-			
CALCIUM	MG/L	32.2	67.3			
CHLORIDE	MG/L	955.	930.			
CHROMIUM	MG/L	0.01	0.03			
COBALT	MG/L	< 0.05	-			
CONDUCTANCE	UMHO/CM	578.	4500.			
COPPER	MG/L	0.04	-			
CYANIDE	MG/L	-	-			
FLUORIDE	MG/L	0.56	-			
GROSS ALPHA	PCI/L	-	-			
GROSS BETA	PCI/L	-	-			
HYD. SULFIDE	MG/L	< 0.1	-			
IRON	MG/L	0.06	0.05			
LEAD	MG/L	-	-			
MAGNESIUM	MG/L	13.6	19.4			
MANGANESE	MG/L	0.07	0.04			
MERCURY	MG/L	< 0.0002	-			
MOLYBDENUM	MG/L	< 0.01	0.1			
NICKEL	MG/L	0.08	0.07			
NITRATE	MG/L	< 1.	< 1.			
ORG. CARBON	MG/L	79.2	-			
PB-210	PCI/L	-	-			
PH	SU	10.2	8.52			
PHOSPHATE	MG/L	-	-			
PO-210	PCI/L	-	-			
POTASSIUM	MG/L	7.17	8.33			
RA-226	PCI/L	< 1.	-			
RA-228	PCI/L	-	-			
SELENIUM	MG/L	< 0.005	< 0.005			
SILICA	MG/L	11.1	-			
SILVER	MG/L	-	-			
SODIUM	MG/L	1490.	1530.			
STRONTIUM	MG/L	3.16	-			
SULFATE	MG/L	1760.	1900.			
SULFIDE	MG/L	-	-			
TEMPERATURE	C - DEGREE	16.5	14.			
TH-230	PCI/L	-	-			
TIN	MG/L	< 0.005	-			
TOTAL SOLIDS	MG/L	4450.	4110.			

Table F.3.12 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/24/85 TO 07/25/86 (Concluded)

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE	
		743-01 09/10/85	743-01 07/25/86
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
TOX	MG/L	-	-
U-234	PCI/L	1.	-
U-238	PCI/L	< 1.	-
URANIUM	MG/L	-	0.0027
VANADIUM	MG/L	0.03	0.34
ZINC	MG/L	0.007	0.022

MAPPER INPUT FILE: GRJ01*UDPGWQ100378

Table F.3.13 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
02/08/83 TO 09/11/85

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

PARAMETER	UNIT OF MEASURE	582-01 02/08/83 PARAMETER VALUE+/-UNCERTAINTY	582-01 03/30/85 PARAMETER VALUE+/-UNCERTAINTY	582-01 06/07/85 PARAMETER VALUE+/-UNCERTAINTY	582-01 09/11/85 PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	412.	477.	542.	520.	
ALUMINUM	MG/L	-	< 0.1	< 0.1	0.2	
AMMONIUM	MG/L	-	18.	27.2	81.7	
ANTIMONY	MG/L	-	< 0.003	0.047	< 0.003	
ARSENIC	MG/L	< 0.001	< 0.01	< 0.01	0.01	
BALANCE	%	-1.76	1.61	-2.89	-2.32	
BARIUM	MG/L	0.11	< 0.1	< 0.1	< 0.05	
BORON	MG/L	-	0.76	0.1	0.72	
CADMIUM	MG/L	-	< 0.002	< 0.001	< 0.001	
CALCIUM	MG/L	106.	190.	143.	293.	
CHLORIDE	MG/L	496.	590.	698.	723.	
CHROMIUM	MG/L	< 0.001	0.05	< 0.01	< 0.01	
COBALT	MG/L	< 0.001	< 0.01	< 0.05	< 0.05	
CONDUCTANCE	UMHO/CM	-	7300.	6100.	8750.	
COPPER	MG/L	< 0.0005	0.06	< 0.02	< 0.02	
CYANIDE	MG/L	-	< 0.01	< 0.01	-	
FLUORIDE	MG/L	-	1.2	1.3	1.7	
GROSS ALPHA	PCI/L	-	200.	-	-	
GROSS BETA	PCI/L	-	< 50.	-	-	
HYD. SULFIDE	MG/L	-	< 0.2	-	< 0.1	
IRON	MG/L	0.5	0.06	0.19	1.07	
LEAD	MG/L	-	< 0.01	< 0.01	-	
MAGNESIUM	MG/L	23.	59.	53.4	101.	
MANGANESE	MG/L	0.16	0.3	0.13	0.75	
MERCURY	MG/L	-	< 0.0002	< 0.0002	< 0.0002	
MOLYBDENUM	MG/L	0.14	0.13	< 0.01	0.17	
NICKEL	MG/L	-	0.06	0.1	0.11	
NITRATE	MG/L	< 0.1	< 1.	< 1.	< 1.	
NITROGEN,KJL	MG/L	10.	-	-	-	
ORG. CARBON	MG/L	71.8	8.9	20.4	9.7	
PB-210	PCI/L	-	< 1.5	< 1.5	-	
PH	SU	7.5	7.3	7.3	7.1	
PHOSPHATE	MG/L	-	< 0.1	< 0.1	-	
PO-210	PCI/L	-	< 1.	< 1.	-	
POTASSIUM	MG/L	13.2	14.	18.4	26.6	
RA-226	PCI/L	-	< 1.	< 1.	< 1.	
RA-228	PCI/L	-	< 1.	< 1.	-	
SELENIUM	MG/L	0.017	< 0.005	0.005	< 0.005	
SILICA	MG/L	-	6.2	5.3	15.2	
SILVER	MG/L	-	< 0.01	< 0.01	-	
SODIUM	MG/L	1090.	1590.	1450.	1480.	
STRONTIUM	MG/L	-	10.2	8.04	12.2	
SULFATE	MG/L	1665.	2700.	2440.	3190.	
SULFIDE	MG/L	-	-	< 0.1	-	
TEMPERATURE	C - DEGREE	-	11.	15.	14.	
TH-230	PCI/L	-	< 1.	< 1.	-	
TIN	MG/L	-	< 0.005	< 0.005	< 0.005	

Table F.3.13 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
02/08/83 TO 09/11/85 (Concluded)

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

		LOCATION ID - SAMPLE ID AND LOG DATE			
		582-01 02/08/83	582-01 03/30/85	582-01 06/07/85	582-01 09/11/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
TOTAL SOLIDS	MG/L	3320.	5540.	5480.	6470.
TOTAL U	PPM	0.072	-	-	-
TOX	MG/L	-	0.4	0.14	-
U-234	PCI/L	-	-	3.	22.
U-238	PCI/L	-	-	2.	21.
URANIUM	MG/L	-	0.036	-	-
VANADIUM	MG/L	0.032	0.03	0.05	0.05
ZINC	MG/L	0.05	0.2	0.01	0.082

MAPPER INPUT FILE: GRJ01*UDPGW0100380

Table F.3.14 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/26/85 TO 07/25/86

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: CROSS GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		741-01 03/26/85	741-01 06/07/85	741-01 09/13/85	741-01 07/25/86	
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	177.	325.	265.	281.	
ALUMINUM	MG/L	< 0.1	< 0.1	0.2	0.3	
AMMONIUM	MG/L	3.2	1.9	1.9	0.9	
ANTIMONY	MG/L	< 0.003	< 0.003	< 0.003	-	
ARSENIC	MG/L	0.01	< 0.01	< 0.01	< 0.01	
BALANCE	%	1.2	-4.81	0.61	0.27	
BARIUM	MG/L	0.2	0.26	0.36	-	
BORON	MG/L	0.72	0.63	0.66	-	
CADMIUM	MG/L	< 0.002	< 0.001	< 0.001	-	
CALCIUM	MG/L	42.3	41.4	30.8	36.4	
CHLORIDE	MG/L	1900.	2020.	2060.	1900.	
CHROMIUM	MG/L	< 0.01	< 0.01	0.01	0.03	
COBALT	MG/L	< 0.01	< 0.05	< 0.05	-	
CONDUCTANCE	UMHO/CM	6200.	5000.	7020.	5000.	
COPPER	MG/L	< 0.01	< 0.02	0.03	-	
CYANIDE	MG/L	< 0.01	< 0.01	-	-	
FLUORIDE	MG/L	0.9	0.9	0.9	-	
GROSS ALPHA	PCI/L	< 50.	-	-	-	
GROSS BETA	PCI/L	< 50.	-	-	-	
HYD. SULFIDE	MG/L	< 0.2	-	< 0.1	-	
IRON	MG/L	< 0.05	< 0.03	< 0.03	0.05	
LEAD	MG/L	< 0.01	< 0.01	-	-	
MAGNESIUM	MG/L	7.5	1.94	6.4	6.72	
MANGANESE	MG/L	< 0.05	< 0.01	0.06	0.04	
MERCURY	MG/L	< 0.0002	< 0.0002	< 0.0002	-	
MOLYBDENUM	MG/L	< 0.01	0.02	0.01	0.12	
NICKEL	MG/L	< 0.04	< 0.04	0.06	< 0.04	
NITRATE	MG/L	< 1.	< 1.	< 1.	< 1.	
ORG. CARBON	MG/L	1.3	4.6	2.5	-	
PB-210	PCI/L	< 1.5	< 1.5	-	-	
PH	SU	9.2	8.7	8.4	8.21	
PHOSPHATE	MG/L	0.1	< 0.1	-	-	
PO-210	PCI/L	< 1.	< 1.	-	-	
POTASSIUM	MG/L	9.	15.7	5.56	7.47	
RA-226	PCI/L	< 1.	< 1.	< 1.	-	
RA-228	PCI/L	< 1.	< 1.	-	-	
SELENIUM	MG/L	< 0.005	0.005	< 0.005	< 0.005	
SILICA	MG/L	9.9	5.8	8.6	-	
SILVER	MG/L	< 0.01	< 0.01	-	-	
SODIUM	MG/L	1300.	1280.	1427.	1310.	
STRONTIUM	MG/L	1.6	1.84	2.36	-	
SULFATE	MG/L	46.	25.9	4.	2.9	
SULFIDE	MG/L	-	< 0.1	-	-	
TEMPERATURE	C - DEGREE	14.5	15.	17.	16.5	
TH-230	PCI/L	< 1.	< 1.	-	-	
TIN	MG/L	< 0.005	< 0.005	< 0.005	-	
TOTAL SOLIDS	MG/L	3308.	3798.	3680.	3690.	

Table F.3.14 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/26/85 TO 07/25/86 (Concluded)

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: CROSS GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE			
		741-01 03/26/85	741-01 06/07/85	741-01 09/13/85	741-01 07/25/86
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
TOX	MG/L	0.1	0.65	-	-
U-234	PCI/L	< 1.	1.	< 1.	-
U-238	PCI/L	< 1.	< 1.	< 1.	-
URANIUM	MG/L	-	-	-	0.0027
VANADIUM	MG/L	0.05	< 0.01	0.07	0.3
ZINC	MG/L	< 0.05	< 0.005	0.006	0.025

MAPPER INPUT FILE: GRJ01*UDPGWQ100377

Table F.3.15 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/25/85 TO 09/16/85

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		728-01 03/25/85	728-01 06/07/85	728-02 06/07/85	728-03 06/07/85	728-04 06/07/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	441.	558.	558.	558.	558.
ALUMINUM	MG/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
AMMONIUM	MG/L	47.1	7.92	7.81	7.23	7.44
ANTIMONY	MG/L	0.003	< 0.003	< 0.003	< 0.003	< 0.003
ARSENIC	MG/L	< 0.01	< 0.51	< 0.01	< 0.01	< 0.01
BALANCE	%	-.78	2.41	1.52	3.07	2.08
BARIUM	MG/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
BORON	MG/L	0.51	-	0.49	0.49	0.48
CADMIUM	MG/L	< 0.002	< 0.001	< 0.001	< 0.001	< 0.001
CALCIUM	MG/L	548.	328.	328.	324.	320.
CHLORIDE	MG/L	800.	436.	436.	422.	432.
CHROMIUM	MG/L	0.02	< 0.01	< 0.01	< 0.01	< 0.01
COBALT	MG/L	< 0.01	< 0.05	< 0.05	< 0.05	< 0.05
CONDUCTANCE	UMHO/CM	6300.	2820.	2820.	2820.	2820.
COPPER	MG/L	0.01	< 0.02	< 0.02	< 0.02	< 0.02
CYANIDE	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
FLUORIDE	MG/L	0.4	0.5	0.5	0.5	0.5
GROSS ALPHA	PCI/L	120.	-	-	-	-
GROSS BETA	PCI/L	90.	-	-	-	-
HYD. SULFIDE	MG/L	< 0.2	-	-	-	-
IRON	MG/L	2.5	1.58	1.58	1.45	1.53
LEAD	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
MAGNESIUM	MG/L	368.	186.	182.	190.	188.
MANGANESE	MG/L	1.7	0.95	0.9	0.95	0.94
MERCURY	MG/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
MOLYBDENUM	MG/L	0.03	< 0.01	< 0.01	< 0.01	0.01
NICKEL	MG/L	< 0.04	< 0.04	0.04	< 0.04	0.04
NITRATE	MG/L	18.	< 1.	< 1.	< 1.	< 1.
ORG. CARBON	MG/L	110.	12.2	12.	12.	11.2
PB-210	PCI/L	< 1.5	< 1.5	-	-	-
PH	SU	8.	7.2	7.2	7.2	7.2
PHOSPHATE	MG/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
PO-210	PCI/L	< 1.	< 1.	-	-	-
POTASSIUM	MG/L	21.2	16.9	16.8	17.	16.7
RA-226	PCI/L	< 1.	< 1.	-	-	-
RA-228	PCI/L	< 1.	< 1.	-	-	-
SELENIUM	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
SILCON	MG/L	-	-	-	-	-
SILICA	MG/L	8.9	8.7	8.3	8.9	8.7
SILVER	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
SODIUM	MG/L	960.	536.	531.	526.	531.
STRONTIUM	MG/L	6.3	3.19	3.3	3.2	3.14
SULFATE	MG/L	3400.	1430.	1450.	1400.	1430.
SULFIDE	MG/L	-	< 0.1	< 0.1	< 0.1	< 0.1
TEMPERATURE	C - DEGREE	11.	12.	12.	12.	12.
TH 230	PCI/L	< 1.	< 1.		-	-
TH-230	PCI/G	-	-	-	-	-

Table F.3.15 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/25/85 TO 09/16/85 (Continued)

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

PARAMETER	UNIT OF MEASURE	728-01 03/25/85 PARAMETER VALUE+/-UNCERTAINTY	728-01 06/07/85 PARAMETER VALUE+/-UNCERTAINTY	728-02 06/07/85 PARAMETER VALUE+/-UNCERTAINTY	728-03 06/07/85 PARAMETER VALUE+/-UNCERTAINTY	728-04 06/07/85 PARAMETER VALUE+/-UNCERTAINTY
TIN	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
TOTAL SOLIDS	MG/L	6600.	3638.	3684.	3668.	3638.
TOX	MG/L	-	0.24	0.29	< 0.1	0.43
U-234	PCI/L	61.	33.	-	-	-
U-238	PCI/L	47.	28.	-	-	-
VANADIUM	MG/L	< 0.01	0.02	< 0.01	< 0.01	< 0.01
ZINC	MG/L	< 0.05	< 0.005	< 0.005	< 0.005	< 0.005

Table F.3.15 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
04/25/85 TO 09/16/85 (Continued)

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		728-05 06/07/85	728-01 09/09/85	728-02 09/09/85	728-03 09/09/85	728-04 09/09/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	558.	542.	542.	542.	542.
ALUMINUM	MG/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
AMMONIUM	MG/L	7.58	18.	17.9	17.5	17.3
ANTIMONY	MG/L	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
ARSENIC	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
BALANCE	%	-2.8	0.51	-1.27	-1.82	0.31
BARIUM	MG/L	< 0.1	< 0.05	< 0.05	< 0.05	< 0.05
BORON	MG/L	0.5	0.59	0.6	0.6	0.58
CADMIUM	MG/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
CALCIUM	MG/L	311.	486.	480.	489.	466.
CHLORIDE	MG/L	463.	716.	730.	801.	697.
CHROMIUM	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
COBALT	MG/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
CONDUCTANCE	UMHO/CM	2820.	6900.	6900.	6900.	6900.
COPPER	MG/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
CYANIDE	MG/L	< 0.01	-	-	-	-
FLUORIDE	MG/L	0.5	0.63	0.64	0.62	0.63
GROSS ALPHA	PCI/L	-	-	-	-	-
GROSS BETA	PCI/L	-	-	-	-	-
HYD. SULFIDE	MG/L	-	< 0.1	< 0.1	< 0.1	< 0.1
IRON	MG/L	1.51	0.17	0.19	0.18	0.17
LEAD	MG/L	< 0.01			-	-
MAGNESIUM	MG/L	179.	289.	292.	289.	288.
MANGANESE	MG/L	0.9	1.61	1.56	1.59	1.61
MERCURY	MG/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0002
MOLYBDENUM	MG/L	< 0.01	0.03	0.04	0.03	0.04
NICKEL	MG/L	< 0.04	0.04	0.04	0.05	0.04
NITRATE	MG/L	< 1.	6.7	6.7	6.7	6.8
ORG. CARBON	MG/L	11.8	15.2	14.3	13.6	13.7
PB-210	PCI/L	-	-	-	-	-
PH	SU	7.2	7.4	7.4	7.4	7.4
PHOSPHATE	MG/L	< 0.1	-	-	-	-
PO-210	PCI/L	-	-	-	-	-
POTASSIUM	MG/L	16.9	22.8	22.7	22.6	22.8
RA-226	PCI/L	-	< 1.	< 1.	< 1.	< 1.
RA-228	PCI/L	-	-	-	-	-
SELENIUM	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
SILICON	MG/L	-	-	-	-	-
SILICA	MG/L	8.1	19.3	19.3	19.	18.4
SILVER	MG/L	< 0.01	-	-	-	-
SODIUM	MG/L	522.	850.	870.	870.	870.
STRONTIUM	MG/L	3.16	5.9	5.54	5.72	5.64
SULFATE	MG/L	1570.	2650.	2820.	2780.	2680.
SULFIDE	MG/L	< 0.1	-	-	-	-
TEMPERATURE	C - DEGREE	12.	18.	18.	18.	18.
TH-230	PCI/L	-	-		-	-
TH-230	PCI/L	-	-		-	-

Table F.3.15 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/25/85 TO 09/16/85 (Continued)

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		728-05 06/07/85	728-01 09/09/85	728-02 09/09/85	728-03 09/09/85	728-04 09/09/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
TIN	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
TOTAL SOLIDS	MG/L	3672.	5930.	5950.	5850.	5870.
TOX	MG/L	0.14	-	-	-	-
U-234	PCI/L	-	55.	52.	56.	58.
U-238	PCI/L	-	49.	44.	54.	53.
VANADIUM	MG/L	0.02	< 0.01	< 0.01	< 0.01	0.02
ZINC	MG/L	< 0.005	0.017	0.016	0.016	0.016

Table F.3.15 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/25/85 TO 09/16/85 (Continued)

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

PARAMETER	UNIT OF MEASURE	728-05 09/09/85 PARAMETER VALUE+/-UNCERTAINTY	729-01 04/01/85 PARAMETER VALUE+/-UNCERTAINTY	729-01 06/07/85 PARAMETER VALUE+/-UNCERTAINTY	729-01 09/16/85 PARAMETER VALUE+/-UNCERTAINTY	731-01 03/26/85 PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	512.	400.	435.	245.	1900.
ALUMINUM	MG/L	< 0.1	0.2	< 0.1	< 0.1	0.2
AMMONIUM	MG/L	17.2	11.5	4.45	3.2	3.68
ANTIMONY	MG/L	< 0.003	0.003	< 0.004	< 0.003	< 0.003
ARSENIC	MG/L	< 0.01	0.013	0.01	0.01	< 0.01
BALANCE	%	-1.54	2.66	-3.56	-2.6	3.58
BARIUM	MG/L	< 0.05	0.2	0.31	0.31	0.8
BORON	MG/L	0.58	0.32	0.53	0.54	0.02
CADMIUM	MG/L	< 0.001	< 0.002	< 0.001	< 0.001	< 0.002
CALCIUM	MG/L	467.	110.	37.6	25.8	320.
CHLORIDE	MG/L	765.	2300.	3480.	4010.	300.
CHROMIUM	MG/L	0.01	0.03	< 0.01	< 0.01	< 0.01
COBALT	MG/L	< 0.05	< 0.01	< 0.05	< 0.05	< 0.01
CONDUCTANCE	UMHO/CM	6900.	9000.	8000.	11590.	9900.
COPPER	MG/L	< 0.02	0.04	< 0.02	< 0.02	0.03
CYANIDE	MG/L	-	< 0.01	< 0.01	-	< 0.01
FLUORIDE	MG/L	0.62	2.6	1.3	1.2	0.8
GROSS ALPHA	PCI/L	-	70.	-	-	< 40.
GROSS BETA	PCI/L	-	< 50.	-	-	160.
HYD. SULFIDE	MG/L	< 0.1	3.2	-	< 0.1	5.
IRON	MG/L	0.18	< 0.05	< 0.03	< 0.03	< 0.05
LEAD	MG/L	-	< 0.01	< 0.01	-	< 0.01
MAGNESIUM	MG/L	277.	0.2	4.72	7.64	< 0.01
MANGANESE	MG/L	1.6	< 0.05	< 0.01	0.05	< 0.05
MERCURY	MG/L	< 0.0002	0.0002	< 0.0002	0.0002	< 0.0002
MOLYBDENUM	MG/L	0.04	0.12	< 0.01	0.02	0.06
NICKEL	MG/L	0.07	< 0.04	< 0.04	< 0.04	< 0.04
NITRATE	MG/L	6.8	< 1.	< 1.	< 1.	1.
ORG. CARBON	MG/L	14.8	-	3.6	2.8	20.6
PB-210	PCI/L	-	< 1.5	< 1.5	-	< 1.5
PH	SU	7.4	11.5	9.2	9.1	12.6
PHOSPHATE	MG/L	-	< 0.1	< 0.1	-	< 0.1
PO-210	PCI/L	-	< 1.	< 1.	-	< 1.
POTASSIUM	MG/L	22.7	22.	15.4	15.1	169.
RA-226	PCI/L	< 1.	< 1.	< 1.	< 1.	< 1.
RA-228	PCI/L	-	< 1.	< 1.	-	< 1.
SELENIUM	MG/L	< 0.005	0.011	0.008	< 0.005	< 0.005
SILICON	MG/L	-	-	-	-	1.6
SILICA	MG/L	19.5	12.3	5.3	11.6	-
SILVER	MG/L	-	< 0.01	< 0.01	-	< 0.01
SODIUM	MG/L	870.	1780.	2780.	2550.	790.
STRONTIUM	MG/L	5.5	2.4	2.64	3.27	18.7
SULFATE	MG/L	2700.	330.	99.	59.4	240.
SULFIDE	MG/L	-	-	< 0.1	-	-
TEMPERATURE	C - DEGREE	18.	14.	15.	15.	13.
TH-230	PCI/L	-	-	< 1.	-	< 1.
TH-230	PCI/G	-	< 1.	-	-	-

Table F.3.15 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/25/85 TO 09/16/85 (Continued)

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		728-05 09/09/85	729-01 04/01/85	729-01 06/07/85	729-01 09/16/85	731-01 03/26/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
TIN	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
TOTAL SOLIDS	MG/L	5820.	4842.	6280.	6650.	2994.
TOX	MG/L	-	-	0.54	-	0.2
U-234	PCI/L	51.	< 1.	7.	13.	< 1.
U-238	PCI/L	47.	< 1.	2.	4.	< 1.
VANADIUM	MG/L	< 0.01	0.11	0.01	0.03	0.01
ZINC	MG/L	0.017	2.9	< 0.005	0.005	< 0.05

Table F.3.15 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/25/85 TO 09/16/85 (Continued)

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		731-01 06/07/85	731-01 09/13/85	735-01 03/29/85	735-01 06/07/85	735-01 09/16/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	1505.	1595.	350.	393.	335.
ALUMINUM	MG/L	0.23	0.2	0.7	< 0.1	0.3
AMMONIUM	MG/L	5.39	4.2	18.1	9.04	1.5
ANTIMONY	MG/L	< 0.003	< 0.003	< 0.003	0.008	0.012
ARSENIC	MG/L	< 0.01	< 0.01	0.011	0.02	0.06
BALANCE	%	0.61	-3.87	-	-	-3.59
BARIUM	MG/L	0.49	0.5	< 0.1	< 0.1	< 0.05
BORON	MG/L	< 0.01	0.05	0.19	0.63	0.72
CADMIUM	MG/L	< 0.001	< 0.001	< 0.002	< 0.001	< 0.001
CALCIUM	MG/L	194.	257.	48.	16.3	4.52
CHLORIDE	MG/L	554.	718.	270.	500.	690.
CHROMIUM	MG/L	< 0.01	< 0.01	0.03	< 0.01	< 0.01
COBALT	MG/L	< 0.05	< 0.05	< 0.01	< 0.05	< 0.05
CONDUCTANCE	UMHO/CM	7000.	8449.	2400.	2415.	2928.
COPPER	MG/L	0.03	0.06	0.22	< 0.02	0.02
CYANIDE	MG/L	< 0.01	-	< 0.01	-	-
FLUORIDE	MG/L	0.5	0.56	2.1	3.4	4.7
GROSS ALPHA	PCI/L	-	-	-	-	-
GROSS BETA	PCI/L	-	-	-	-	-
HYD. SULFIDE	MG/L	-	0.23	< 0.2	-	< 0.1
IRON	MG/L	< 0.03	< 0.03	0.1	< 0.03	0.22
LEAD	MG/L	< 0.01	-	< 0.01	< 0.01	-
MAGNESIUM	MG/L	< 0.01	< 0.03	0.2	< 0.01	0.36
MANGANESE	MG/L	< 0.01	0.05	< 0.05	< 0.01	0.06
MERCURY	MG/L	< 0.0002	< 0.0002	0.0009	< 0.0002	< 0.0002
MOLYBDENUM	MG/L	0.02	0.05	0.12	0.06	0.04
NICKEL	MG/L	< 0.04	0.11	< 0.04	0.05	< 0.04
NITRATE	MG/L	1.	1.	1.	< 1.	< 1.
ORG. CARBON	MG/L	20.8	17.3	-	-	24.4
PB-210	PCI/L	< 1.5	-	-	< 1.5	-
PH	SU	12.5	12.4	11.8	10.8	9.6
PHOSPHATE	MG/L	< 0.1	-	< 0.1	< 0.1	-
PO-210	PCI/L	< 1.	-	-	< 1.	-
POTASSIUM	MG/L	96.8	66.7	6.5	5.58	3.26
RA-226	PCI/L	< 1.	< 1.	-	-	< 1.
RA-228	PCI/L	< 1.	-	-	-	-
SELENIUM	MG/L	0.007	< 0.005	0.024	0.016	0.007
SILICON	MG/L	-	-	-	-	-
SILICA	MG/L	1.2	2.6	20.4	21.6	25.5
SILVER	MG/L	< 0.01	-	< 0.01	< 0.01	-
SODIUM	MG/L	824.	842.	370.	575.	640.
STRONTIUM	MG/L	10.9	12.	0.7	0.3	0.13
SULFATE	MG/L	107.	176.	210.	342.	184.
SULFIDE	MG/L	0.3	-	-	-	-
TEMPERATURE	C - DEGREE	18.	16.	13.	17.	15.
TH-230	PCI/L	< 1.	-	-	< 1.	-
TH-230	PCI/G	-	-	-	-	-

Table F.3.15 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/25/85 TO 09/16/85 (Concluded)

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		731-01 06/07/85	731-01 09/13/85	735-01 03/29/85	735-01 06/07/85	735-01 09/16/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
TIN	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
TOTAL SOLIDS	MG/L	2740.	2830.	-	-	1810.
TOX	MG/L	0.15	-	-	-	-
U-234	PCI/L	< 1.	< 1.	-	< 1.	11.
U-238	PCI/L	< 1.	< 1.	-	< 1.	3.
VANADIUM	MG/L	< 0.01	< 0.01	0.23	0.15	0.21
ZINC	MG/L	0.005	0.017	< 5.3	< 0.005	0.015

MAPPER INPUT FILE: GRJ01*UDPGWQ100379

Table F.3.16 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/29/85 TO 07/22/86

FORMATION OF COMPLETION: SANDSTONE
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		724-01 03/30/85	724-01 06/07/85	724-02 06/07/85	724-03 06/07/85	724-04 06/07/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	2014.	1785.	1785.	1785.	1785.
ALUMINUM	MG/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
AMMONIUM	MG/L	1.2	1.	1.7	1.7	1.7
ANTIMONY	MG/L	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
ARSENIC	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	0.01
BALANCE	%	-3.59	-1.58	-2.7	-2.52	-1.54
BARIUM	MG/L	5.1	5.54	5.29	5.32	5.49
BORON	MG/L	0.76	0.91	0.85	0.85	0.86
CADMIUM	MG/L	< 0.002	< 0.001	< 0.001	< 0.001	< 0.001
CALCIUM	MG/L	26.	22.4	20.8	21.1	21.8
CHLORIDE	MG/L	1600.	1520.	1510.	1560.	1500.
CHROMIUM	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
COBALT	MG/L	< 0.01	< 0.05	< 0.05	< 0.05	< 0.05
CONDUCTANCE	UMHO/CM	6900.	5300.	5300.	5300.	5300.
COPPER	MG/L	0.02	< 0.02	< 0.02	< 0.02	< 0.02
CYANIDE	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
FLUORIDE	MG/L	2.6	2.1	2.1	2.2	2.1
GROSS ALPHA	PCI/L	< 60.	-	-	-	-
GROSS BETA	PCI/L	< 50.	-	-	-	-
HYD. SULFIDE	MG/L	< 0.2	-	-	-	-
IRON	MG/L	0.2	0.152	0.161	0.152	0.148
LEAD	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
MAGNESIUM	MG/L	7.8	7.33	7.34	7.1	7.37
MANGANESE	MG/L	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01
MERCURY	MG/L	0.0003	< 0.0002	< 0.0002	< 0.0002	< 0.0002
MOLYBDENUM	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
NICKEL	MG/L	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
NITRATE	MG/L	< 1.	< 1.	< 1.	< 1.	< 1.
ORG. CARBON	MG/L	38.2	16.6	17.	17.2	17.
PB-210	PCI/L	< 1.5	< 1.5	-	-	-
PH	SU	7.5	7.7	7.7	7.7	7.7
PHOSPHATE	MG/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
PO-210	PCI/L	< 1.	< 1.	-	-	-
POTASSIUM	MG/L	7.	31.1	18.2	30.	21.6
RA-226	PCI/L	1.6	3.	-	-	-
RA-228	PCI/L	1.2	< 1.	-	-	-
SELENIUM	MG/L	< 0.005	0.006	0.006	0.005	0.007
SILICON	MG/L	-	-	-	-	-
SILICA	MG/L	4.5	4.7	4.4	4.4	4.6
SILVER	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
SODIUM	MG/L	1780.	1700.	1660.	1690.	1690.
STRONTIUM	MG/L	3.7	3.64	3.49	3.46	3.54
SULFATE	MG/L	6.	20.3	10.4	10.2	9.6
SULFIDE	MG/L	-	< 0.1	< 0.1	< 0.1	< 0.1
TEMPERATURE	C - DEGREE	14.	15.	15.	15.	15.
TH-230	PCI/L	< 1.	< 1.	-	-	-
TIN	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005

Table F.3.16 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/29/85 TO 07/27/86 (Continued)

FORMATION OF COMPLETION: SANDSTONE
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		724-01 03/30/85	724-01 06/07/85	724-02 06/07/85	724-03 06/07/85	724-04 06/07/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
TOTAL SOLIDS	MG/L	4576.	4438.	4450.	4428.	4430.
TOX	MG/L	0.1	< 0.1	0.18	0.2	< 0.1
U-234	PCI/L	5.	< 1.	-	-	-
U-238	PCI/L	4.	< 1.	-	-	-
URANIUM	MG/L	-	-	-	-	-
VANADIUM	MG/L	< 0.01	0.01	< 0.01	0.01	< 0.01
ZINC	MG/L	0.08	< 0.005	< 0.005	< 0.005	< 0.005

Table F.3.16 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/29/85 TO 07/22/86 (Continued)

FORMATION OF COMPLETION: SANDSTONE
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		724-05 06/07/85	724-01 09/13/85	724-02 09/13/85	724-03 09/13/85	724-04 09/13/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	1785.	1385.	1385.	1385.	1385.
ALUMINUM	MG/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
AMMONIUM	MG/L	1.4	0.76	0.73	0.73	0.76
ANTIMONY	MG/L	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
ARSENIC	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
BALANCE	%	-3.17	-.14	-.44	-.37	0.15
BARIUM	MG/L	5.93	0.22	0.22	0.22	0.23
BORON	MG/L	0.86	0.72	0.74	0.74	0.74
CADMIUM	MG/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
CALCIUM	MG/L	22.9	10.9	10.9	10.6	11.1
CHLORIDE	MG/L	1600.	893.	914.	903.	922.
CHROMIUM	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
COBALT	MG/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
CONDUCTANCE	UMHO/CM	5300.	5312.	5312.	5312.	5312.
COPPER	MG/L	< 0.02	0.04	0.04	0.04	0.04
CYANIDE	MG/L	< 0.01	-	-	-	-
FLUORIDE	MG/L	2.	2.1	2.1	2.1	2.1
GROSS ALPHA	PCI/L	-	-	-	-	-
GROSS BETA	PCI/L	-	-	-	-	-
HYD. SULFIDE	MG/L	-	8.1	8.5	8.6	8.7
IRON	MG/L	< 0.03	0.03	0.03	0.04	0.04
LEAD	MG/L	< 0.01	-	-	-	-
MAGNESIUM	MG/L	6.4	3.58	3.56	3.48	3.64
MANGANESE	MG/L	< 0.01	0.07	0.07	0.06	0.07
MERCURY	MG/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
MOLYBDENUM	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
NICKEL	MG/L	< 0.04	0.06	0.06	< 0.04	0.07
NITRATE	MG/L	< 1.	< 1.	< 1.	< 1.	< 1.
ORG. CARBON	MG/L	16.5	6.6	6.1	6.6	6.6
PB-210	PCI/L	-	-	-	-	-
PH	SU	7.7	7.8	7.8	7.8	7.8
PHOSPHATE	MG/L	< 0.1	-	-	-	-
PO-210	PCI/L	-	-	-	-	-
POTASSIUM	MG/L	31.1	4.37	4.38	4.38	4.37
RA-226	PCI/L	-	< 1.	< 1.	< 1.	< 1.
RA-228	PCI/L	-	-	-	-	-
SELENIUM	MG/L	0.007	< 0.005	< 0.005	< 0.005	< 0.005
SILCON	MG/L	-	-	-	-	-
SILICA	MG/L	4.4	9.4	9.4	9.6	10.3
SILVER	MG/L	< 0.01	-	-	-	-
SODIUM	MG/L	1690.	1300.	1300.	1300.	1320.
STRONTIUM	MG/L	3.72	1.4	1.44	1.42	1.4
SULFATE	MG/L	10.	229.	217.	227.	216.
SULFIDE	MG/L	< 0.1	-	-	-	-
TEMPERATURE	C - DEGREE	15.	13.	13.	13.	13.
TH-230	PCI/L	-	-	-	-	-
TIN	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005

Table F.3.16 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/29/85 TO 07/22/86 (Continued)

FORMATION OF COMPLETION: SANDSTONE
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		724-05 06/07/85	724-01 09/13/85	724-02 09/13/85	724-03 09/13/85	724-04 09/13/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
TOTAL SOLIDS	MG/L	4468.	2950.	2980.	3110.	3070.
TOX	MG/L	0.14	-	-	-	-
U-234	PCI/L	-	< 1.	< 1.	< 1.	< 1.
U-238	PCI/L	-	< 1.	< 1.	< 1.	< 1.
URANIUM	MG/L	-	-	-	-	-
VANADIUM	MG/L	0.01	< 0.01	0.01	< 0.01	< 0.01
ZINC	MG/L	< 0.005	0.009	0.008	0.01	0.009

Table F.3.16 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/29/85 TO 07/22/86 (Continued)

FORMATION OF COMPLETION: SANDSTONE
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		724-05 09/13/85	724-01 07/25/86	724-02 07/25/86	724-03 07/25/86	724-04 07/25/86
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	1385.	1650.	1650.	1650.	1650.
ALUMINUM	MG/L	0.2	0.4	0.3	0.3	0.3
AMMONIUM	MG/L	1.	0.8	0.4	0.4	0.4
ANTIMONY	MG/L	< 0.003	-	-	-	-
ARSENIC	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
BALANCE	%	0.11	-.54	-.43	-.43	-.43
BARIUM	MG/L	0.23	-	-	-	-
BORON	MG/L	0.74	-	-	-	-
CADMIUM	MG/L	< 0.001	-	-	-	-
CALCIUM	MG/L	10.8	19.	19.2	19.2	19.2
CHLORIDE	MG/L	925.	1900.	1800.	1800.	1800.
CHROMIUM	MG/L	< 0.01	0.04	0.03	0.03	0.03
COBALT	MG/L	< 0.05	-	-	-	-
CONDUCTANCE	UMHO/CM	5312.	4600.	4600.	4600.	4600.
COPPER	MG/L	0.04	-	-	-	-
CYANIDE	MG/L	-	-	-	-	-
FLUORIDE	MG/L	2.2	-	-	-	-
GROSS ALPHA	PCI/L	-	-	-	-	-
GROSS BETA	PCI/L	-	-	-	-	-
HYD. SULFIDE	MG/L	8.9	-	-	-	-
IRON	MG/L	0.05	0.07	0.08	0.08	0.08
LEAD	MG/L	-	-	-	-	-
MAGNESIUM	MG/L	3.52	4.91	5.01	5.01	5.01
MANGANESE	MG/L	0.07	0.03	0.03	0.03	0.03
MERCURY	MG/L	< 0.0002	-	-	-	-
MOLYBDENUM	MG/L	< 0.01	0.08	0.1	0.1	0.1
NICKEL	MG/L	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
NITRATE	MG/L	< 1.	< 1.	< 1.	< 1.	< 1.
ORG. CARBON	MG/L	6.7	-	-	-	-
PB-210	PCI/L	-	-	-	-	-
PH	SU	7.8	7.62	7.62	7.62	7.62
PHOSPHATE	MG/L	-	-	-	-	-
PO-210	PCI/L	-	-	-	-	-
POTASSIUM	MG/L	4.4	7.36	7.82	7.82	7.82
RA-226	PCI/L	< 1.	-	-	-	-
RA-228	PCI/L	-	-	-	-	-
SELENIUM	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
SILCON	MG/L	-	-	-	-	-
SILICA	MG/L	10.1	-	-	-	-
SILVER	MG/L	-	-	-	-	-
SODIUM	MG/L	1370.	1950.	1890.	1890.	1890.
STRONTIUM	MG/L	1.38	-	-	-	-
SULFATE	MG/L	243.	33.3	34.9	34.7	34.9
SULFIDE	MG/L	-	-	-	-	-
TEMPERATURE	C - DEGREE	13.	15.	15.	15.	15.
TH-230	PCI/L	-	-	-	-	-
TIN	MG/L	< 0.005	-	-	-	-

Table F.3.16 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/29/85 TO 07/27/86 (Continued)

FORMATION OF COMPLETION: SANDSTONE
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		724-05 09/13/85	724-01 07/25/86	724-02 07/25/86	724-03 07/25/86	724-04 07/25/86
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
TOTAL SOLIDS	MG/L	3380.	3930.	3930.	3920.	3920.
TOX	MG/L	-	-	-	-	-
U-234	PCI/L	< 1.	-	-	-	-
U-238	PCI/L	< 1.	-	-	-	-
URANIUM	MG/L	-	0.0027	0.003	0.0033	0.003
VANADIUM	MG/L	< 0.01	0.25	0.3	0.3	0.3
ZINC	MG/L	0.01	0.034	0.028	0.028	0.028

SITE: GRAND JUNCTION
03/29/85 TO 07/22/86 (Continued)

FORMATION OF COMPLETION: SANDSTONE
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

PARAMETER	UNIT OF MEASURE	724-05 07/25/86 PARAMETER VALUE +/-UNCERTAINTY	725-01 03/29/85 PARAMETER VALUE +/-UNCERTAINTY	725-02 03/29/85 PARAMETER VALUE +/-UNCERTAINTY	725-01 06/07/85 PARAMETER VALUE +/-UNCERTAINTY	725-01 09/12/85 PARAMETER VALUE +/-UNCERTAINTY
ALKALINITY	MG/L CACO3	1650.	2000.	2000.	835.	360.
ALUMINUM	MG/L	0.3	< 0.1	< 0.1	< 0.1	0.2
AMMONIUM	MG/L	0.4	2.3	2.2	2.	1.8
ANTIMONY	MG/L	-	< 0.003	< 0.003	< 0.003	< 0.003
ARSENIC	MG/L	< 0.01	< 0.01	< 0.01	0.01	0.02
BALANCE	%	-.43	3.92	1.87	0.87	-2.82
BARIUM	MG/L	-	1.8	1.8	1.05	0.62
BORON	MG/L	-	0.07	0.08	0.36	0.56
CADMIUM	MG/L	-	< 0.002	< 0.002	< 0.001	< 0.001
CALCIUM	MG/L	19.2	540.	574.	210.	44.2
CHLORIDE	MG/L	1800.	2400.	2300.	3720.	4150.
CHROMIUM	MG/L	0.03	< 0.01	< 0.01	< 0.01	< 0.01
COBALT	MG/L	-	< 0.01	< 0.01	< 0.05	< 0.05
CONDUCTANCE	UMHO/CM	4600.	17000.	17000.	13250.	13000.
COPPER	MG/L	-	< 0.01	< 0.01	< 0.02	0.04
CYANIDE	MG/L	-	< 0.01	< 0.01	< 0.01	-
FLUORIDE	MG/L	-	0.8	0.8	0.5	1.1
GROSS ALPHA	PCI/L	-	220.	100.	-	-
GROSS BETA	PCI/L	-	90.	< 50.	-	-
HYD. SULFIDE	MG/L	-	4.7	3.4	-	0.23
IRON	MG/L	0.08	< 0.05	< 0.05	111.	< 0.03
LEAD	MG/L	-	< 0.01	< 0.01	< 0.01	-
MAGNESIUM	MG/L	5.01	0.04	4.2	< 0.01	0.56
MANGANESE	MG/L	0.03	< 0.05	< 0.05	< 0.01	0.03
MERCURY	MG/L	-	0.0006	0.0007	0.0002	0.0002
MOLYBDENUM	MG/L	0.1	0.08	0.9	0.03	0.02
NICKEL	MG/L	< 0.04	< 0.04	< 0.04	< 0.04	0.06
NITRATE	MG/L	< 1.	< 1.	< 1.	< 1.	< 1.
ORG. CARBON	MG/L	-	7.1	7.	4.4	3.7
PB-210	PCI/L	-	< 1.5	< 1.5	< 1.5	-
PH	SU	7.62	12.6	12.6	11.9	11.9
PHOSPHATE	MG/L	-	< 0.1	< 0.1	< 0.1	-
PO-210	PCI/L	-	< 1.	< 1.	< 1.	-
POTASSIUM	MG/L	7.82	59.	57.2	37.4	22.2
RA-226	PCI/L	-	5.	4.	2.	1.1
RA-228	PCI/L	-	< 1.	1.3	< 1.	-
SELENIUM	MG/L	< 0.005	< 0.005	< 0.005	0.016	< 0.005
SILICON	MG/L	-	-	1.8	-	-
SILICA	MG/L	-	1.8	-	5.5	36.4
SILVER	MG/L	-	< 0.01	< 0.01	< 0.01	-
SODIUM	MG/L	1890.	2000.	1900.	2530.	2700.
STRONTIUM	MG/L	-	11.	10.6	4.47	2.27
SULFATE	MG/L	34.9	120.	190.	79.2	140.
SULFIDE	MG/L	-	-	-	0.2	-
TEMPERATURE	C - DEGREE	15.	12.	12.	14.	12.
TH-230	PCI/L	-	< 1.	< 1.	< 1.	-
TIN	MG/L	-	< 0.005	< 0.005	< 0.005	< 0.005

Table F.3.16 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/29/85 TO 07/22/86 (Continued)

FORMATION OF COMPLETION: SANDSTONE
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		724-05 07/25/86	725-01 03/29/85	725-02 03/29/85	725-01 06/07/85	725-01 09/12/85
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
TOTAL SOLIDS	MG/L	3920.	6174.	6178.	7164.	6930.
TOX	MG/L	-	0.2	< 0.1	< 0.1	-
U-234	PCI/L	-	< 1.	< 1.	< 1.	< 1.
U-238	PCI/L	-	< 1.	< 1.	< 1.	< 1.
URANIUM	MG/L	0.0031	-	-	-	-
VANADIUM	MG/L	0.3	< 0.01	< 0.01	0.03	0.05
ZINC	MG/L	0.028	0.1	0.09	< 0.005	0.008

Table F.3.16 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/29/85 TO 07/27/86 (Continued)

FORMATION OF COMPLETION: SANDSTONE
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		725-01 07/27/86	726-01 07/25/86			
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	733.	1014.			
ALUMINUM	MG/L	0.3	0.3			
AMMONIUM	MG/L	0.6	0.7			
ANTIMONY	MG/L	-	-			
ARSENIC	MG/L	< 0.01	< 0.01			
BALANCE	%	-1.46	-.4			
BARIUM	MG/L	-	-			
BORON	MG/L	-	-			
CADMIUM	MG/L	-	-			
CALCIUM	MG/L	43.3	82.6			
CHLORIDE	MG/L	3400.	570.			
CHROMIUM	MG/L	0.04	0.04			
COBALT	MG/L	-	-			
CONDUCTANCE	UMHO/CM	8500.	9000.			
COPPER	MG/L	-	-			
CYANIDE	MG/L	-	-			
FLUORIDE	MG/L	-	-			
GROSS ALPHA	PCI/L	-	-			
GROSS BETA	PCI/L	-	-			
HYD. SULFIDE	MG/L	-	-			
IRON	MG/L	0.61	1.68			
LEAD	MG/L	-	-			
MAGNESIUM	MG/L	13.3	20.5			
MANGANESE	MG/L	0.18	0.46			
MERCURY	MG/L	-	-			
MOLYBDENUM	MG/L	0.1	0.1			
NICKEL	MG/L	0.06	0.05			
NITRATE	MG/L	< 1.	< 1.			
ORG. CARBON	MG/L	-	-			
PB-210	PCI/L	-	-			
PH	SU	9.06	7.04			
PHOSPHATE	MG/L	-	-			
PO-210	PCI/L	-	-			
POTASSIUM	MG/L	17.	12.9			
RA-226	PCI/L	-	-			
RA-228	PCI/L	-	-			
SELENIUM	MG/L	< 0.005	< 0.005			
SILCON	MG/L	-	-			
SILICA	MG/L	-	-			
SILVER	MG/L	-	-			
SODIUM	MG/L	2400.	654.			
STRONTIUM	MG/L	-	-			
SULFATE	MG/L	34.6	5.7			
SULFIDE	MG/L	-	-			
TEMPERATURE	C - DEGREE	14.	14.			
TH-230	PCI/L	-	-			
TIN	MG/L	-	-			

Table F.3.16 GROUND WATER QUALITY DATA BY LOCATION
SITE: GRAND JUNCTION
03/29/85 TO 07/27/86 (Concluded)

FORMATION OF COMPLETION: SANDSTONE
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE	
		725-01 07/27/86	726-01 07/25/86
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
TOTAL SOLIDS	MG/L	7210.	7050.
TOX	MG/L	-	-
U-234	PCI/L	-	-
U-238	PCI/L	-	-
URANIUM	MG/L	0.0054	0.0031
VANADIUM	MG/L	0.3	0.53
ZINC	MG/L	0.036	0.05

MAPPER INPUT FILE: GRJ01*UDPGW0100376

Table F.3.17 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
02/01/83 TO 09/05/85

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	1073.1329	-	-	-	-
ALUMINUM	MG/L	.0500	745	01	03/30/85	.3000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 4 % ****						
AMMONIUM	MG/L	15.7000	710	01	03/21/85	45.0000
			710	01	06/07/85	24.9000
			710	01	09/04/85	62.1000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 13 % ****						
ANTIMONY	MG/L	.0080	-	-	-	-
ARSENIC	MG/L	.0050	588	01	06/07/85	.0100
			588	01	09/04/85	.0100
**** SAMPLES EXCEEDING MAXIMUM VALUE = 8 % ****						
BALANCE	%	.4700	588	01	02/01/83	5.6500
			588	01	06/07/85	3.8100
			710	01	06/07/85	3.8600
			710	01	09/04/85	.6200
			744	01	06/07/85	1.8600
			744	02	06/07/85	2.2200
			744	03	06/07/85	2.5700
			744	04	06/07/85	1.5300
			744	05	06/07/85	1.2600
			744	04	09/04/85	5.1400
			745	01	03/30/85	2.8800
			745	01	06/07/85	5.0800
			746	01	03/22/85	1.5700
			746	01	06/07/85	5.3700
**** SAMPLES EXCEEDING MAXIMUM VALUE = 60 % ****						
BARIUM	MG/L	.0675	-	-	-	-
BORON	MG/L	1.0965	-	-	-	-
CADMIUM	MG/L	.0012	-	-	-	-
CALCIUM	MG/L	423.2839	710	01	03/21/85	590.0000
			710	01	06/07/85	524.0000
			710	01	09/04/85	503.0000
			745	01	03/30/85	490.0000
			745	01	06/07/85	431.0000
			746	01	03/22/85	490.0000
			746	01	06/07/85	595.0000
			746	01	09/05/85	472.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 34 % ****						
CHLORIDE	MG/L	399.8380	710	01	03/21/85	770.0000
			710	01	06/07/85	607.0000
			710	01	09/04/85	783.0000
			744	01	03/21/85	450.0000

Table F.3.17 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
02/01/83 TO 09/05/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
CHLORIDE	MG/L	399.8380	746	01	03/22/85	460.0000
			746	01	06/07/85	637.0000
			746	01	09/05/85	656.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 30 % ****						
CHROMIUM	MG/L	.0200	744	01	03/21/85	.0700
**** SAMPLES EXCEEDING MAXIMUM VALUE = 4 % ****						
COBALT	MG/L	.0390	-	-	-	-
CONDUCTANCE	UMHO/CM	6714.7250	746	01	09/05/85	7735.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 4 % ****						
COPPER	MG/L	.0508	-	-	-	-
CYANIDE	MG/L	.0050	-	-	-	-
FLUORIDE	MG/L	1.1459	710	01	09/04/85	1.2000
			746	01	06/07/85	1.5000
			746	01	09/05/85	1.6000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 13 % ****						
GROSS ALPHA	PCI/L	126.5685	746	01	03/22/85	230.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 25 % ****						
GROSS BETA	PCI/L	25.0000	710	01	03/21/85	100.0000
			744	01	03/21/85	50.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 50 % ****						
HYD. SULFIDE	MG/L	1.4802	-	-	-	-
IRON	MG/L	1.4835	588	01	02/01/83	2.3000
			710	01	09/04/85	3.0400
			745	01	03/30/85	2.2000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 13 % ****						
LEAD	MG/L	.0050	-	-	-	-
MAGNESIUM	MG/L	547.8729	746	01	06/07/85	570.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 4 % ****						
MANGANESE	MG/L	8.7400	-	-	-	-
MERCURY	MG/L	.0003	-	-	-	-
MOLYBDENUM	MG/L	.0757	710	01	03/21/85	.0800
			710	01	09/04/85	.1000
			746	01	03/22/85	.1200
			746	01	06/07/85	.1100
			746	01	09/05/85	.1500
**** SAMPLES EXCEEDING MAXIMUM VALUE = 21 % ****						
NICKEL	MG/L	.0684	710	01	09/04/85	.0900
			746	01	09/05/85	.0700

Table F.3.17 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
02/01/83 TO 09/05/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
**** SAMPLES EXCEEDING MAXIMUM VALUE = 9 % ****						
NITRATE	MG/L	8.4462	-	-	-	-
ORG. CARBON	MG/L	55.7267	588	01	02/01/83	64.5000
			746	01	03/22/85	575.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 8 % ****						
PB-210	PCI/L	2.6875	-	-	-	-
PH	SU	7.4450	588	01	06/07/85	7.8000
			588	01	09/04/85	7.7000
			746	01	09/05/85	7.5000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 13 % ****						
PHOSPHATE	MG/L	2.5375	-	-	-	-
PO-210	PCI/L	.5000	-	-	-	-
POTASSIUM	MG/L	15.6300	710	01	03/21/85	24.0000
			710	01	06/07/85	23.6000
			710	01	09/04/85	29.7000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 13 % ****						
RA-226	PCI/L	.5000	-	-	-	-
RA-228	PCI/L	.5000	710	01	03/21/85	1.0000
			744	04	09/04/85	1.1000
			746	01	09/05/85	1.1000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 16 % ****						
SELENIUM	MG/L	.0152	-	-	-	-
SILICA	MG/L	21.2545	-	-	-	-
SILVER	MG/L	.0050	-	-	-	-
SODIUM	MG/L	951.9060	-	-	-	-
STRONTIUM	MG/L	4.5156	710	01	03/21/85	6.1000
			710	01	06/07/85	5.8100
			710	01	09/04/85	5.6000
			745	01	03/30/85	4.8000
			745	01	06/07/85	4.8900
			746	01	03/22/85	5.6000
			746	01	06/07/85	5.8700
			746	01	09/05/85	6.8400
**** SAMPLES EXCEEDING MAXIMUM VALUE = 36 % ****						
SULFATE	MG/L	3833.8504	-	-	-	-
SULFIDE	MG/L	.0500	-	-	-	-
TEMPERATURE	C - DEGREE	18.7488	588	01	09/04/85	19.5000
			744	01	09/04/85	19.5000
			744	02	09/04/85	19.5000
			744	03	09/04/85	19.5000
			744	04	09/04/85	19.5000

Table F.3.17 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
02/01/83 TO 09/05/85 (Concluded)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
TEMPERATURE	C - DEGREE	18.7488	744	05	09/04/85	19.5000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 27 % ****						
TH-230	PCI/L	.5000	-	-	-	-
TIN	MG/L	.0025	-	-	-	-
TOTAL SOLIDS	MG/L	7221.0938	-	-	-	-
TOX	MG/L	.2466	744	01	03/21/85	8.2000
			744	01	06/07/85	.3100
			744	02	06/07/85	.2900
			744	03	06/07/85	.2900
			745	01	03/30/85	.3000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 38 % ****						
U-234	PCI/L	35.1621	710	01	06/07/85	36.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 5 % ****						
U-238	PCI/L	23.0995	710	01	06/07/85	30.7000
			746	01	09/05/85	27.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 11 % ****						
VANADIUM	MG/L	.0200	-	-	-	-
ZINC	MG/L	.0626	744	01	03/21/85	.0900
			745	01	03/30/85	1.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 8 % ****						

MAPPER DATA FILE: GRJ01*UDPGWQ100373

Table F.3.18 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	1073.1329	581	01	09/11/85	1375.0000
			581	02	09/11/85	1375.0000
			581	03	09/11/85	1375.0000
			581	04	09/11/85	1375.0000
			581	05	09/11/85	1375.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 15 % ****						
ALUMINUM	MG/L	.0500	583	01	09/21/83	.1700
			584	01	09/21/83	.5100
			747	01	09/05/85	.2000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 12 % ****						
AMMONIUM	MG/L	15.7000	581	01	09/22/83	232.0000
			581	01	03/26/85	166.0000
			581	01	06/07/85	205.0000
			581	02	06/07/85	206.0000
			581	03	06/07/85	199.0000
			581	04	06/07/85	202.0000
			581	05	06/07/85	201.0000
			581	01	09/11/85	204.0000
			581	02	09/11/85	210.0000
			581	03	09/11/85	204.0000
			581	04	09/11/85	206.0000
			581	05	09/11/85	210.0000
			583	01	09/21/83	335.0000
			583	01	03/26/85	357.0000
			583	01	06/07/85	274.0000
			583	01	09/11/85	456.0000
			584	01	09/21/83	374.0000
			584	01	03/26/85	439.0000
			584	01	06/07/85	440.0000
			584	01	09/11/85	521.0000
			587	01	09/21/83	32.3000
			747	01	03/22/85	95.9000
			747	01	06/07/85	128.0000
			747	01	09/05/85	129.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
ANTIMONY	MG/L	.0080	-	-	-	-
ARSENIC	MG/L	.0050	581	01	09/22/83	.0080
			581	01	03/26/85	.0160
			581	01	06/07/85	.0100
			581	02	06/07/85	.0100
			581	03	06/07/85	.0100
			581	04	06/07/85	.0100
			581	05	06/07/85	.0100
			581	01	09/11/85	.0100

Table F.3.18 GROUND WATER QUALITY MEASUREMENTS EXCEEDING
STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE +/-UNCERTAINTY
ARSENIC	MG/L	.0050	581	02	09/11/85	.0100
			581	03	09/11/85	.0100
			581	04	09/11/85	.0100
			581	05	09/11/85	.0100
			583	01	02/07/83	.0060
			583	01	06/07/83	.0110
			583	01	09/21/83	.0770
			583	01	03/26/85	.0190
			583	01	06/07/85	.0200
			583	01	09/11/85	.0300
			584	01	02/08/83	.0070
			584	01	06/08/83	.0450
			584	01	09/21/83	.0700
			584	01	03/26/85	.1800
			584	01	06/07/85	.0900
			584	01	09/11/85	.1400
			587	01	06/08/83	.0070
**** SAMPLES EXCEEDING MAXIMUM VALUE = 78 % ****						
BALANCE	%	.4700	581	01	03/26/85	.5300
			583	01	03/26/85	.5400
			583	01	06/07/85	1.8400
			583	01	09/11/85	1.2200
			584	01	09/11/85	.8000
			587	01	09/21/83	8.8500
			747	01	03/22/85	1.2000
			747	01	06/07/85	3.9500
			747	01	09/05/85	1.8500
**** SAMPLES EXCEEDING MAXIMUM VALUE = 28 % ****						
BARIUM	MG/L	.0675	583	01	09/21/83	.1700
			584	01	09/21/83	.0830
			747	01	03/22/85	.1000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 9 % ****						
BORON	MG/L	1.0965	-	-	-	-
CADMIUM	MG/L	.0012	583	01	09/21/83	.0720
			583	01	03/26/85	.0100
			583	01	06/07/85	.0080
			583	01	09/11/85	.0140
			584	01	09/21/83	.4200
			584	01	03/26/85	.0970
			584	01	06/07/85	.0730
			584	01	09/11/85	.1470
			587	01	09/21/83	.0040
**** SAMPLES EXCEEDING MAXIMUM VALUE = 37 % ****						

Table F.3.18 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
CALCIUM	MG/L	423.2839	581	01	06/09/83	654.0000
			581	01	03/26/85	550.0000
			581	01	06/07/85	483.0000
			581	02	06/07/85	481.0000
			581	03	06/07/85	474.0000
			581	04	06/07/85	477.0000
			581	05	06/07/85	474.0000
			581	01	09/11/85	535.0000
			581	02	09/11/85	541.0000
			581	03	09/11/85	548.0000
			581	04	09/11/85	546.0000
			581	05	09/11/85	540.0000
			583	01	02/07/83	555.0000
			583	01	06/07/83	475.0000
			583	01	09/21/83	520.0000
			583	01	03/26/85	520.0000
			583	01	06/07/85	492.0000
			583	01	09/11/85	545.0000
			584	01	02/08/83	556.0000
			584	01	06/08/83	585.0000
			584	01	09/21/83	470.0000
			584	01	03/26/85	530.0000
			584	01	06/07/85	605.0000
			584	01	09/11/85	523.0000
			587	01	01/31/83	454.0000
			587	01	06/08/83	505.0000
			747	01	03/22/85	580.0000
			747	01	06/07/85	645.0000
			747	01	09/05/85	502.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 90 % ****						
CHLORIDE	MG/L	399.8380	581	01	02/07/83	515.0000
			581	01	06/09/83	640.0000
			581	01	09/22/83	530.0000
			581	01	03/26/85	490.0000
			581	01	06/07/85	563.0000
			581	02	06/07/85	573.0000
			581	03	06/07/85	564.0000
			581	04	06/07/85	576.0000
			581	05	06/07/85	579.0000
			581	01	09/11/85	579.0000
			581	02	09/11/85	598.0000
			581	03	09/11/85	580.0000
			581	04	09/11/85	537.0000
			581	05	09/11/85	567.0000
			583	01	02/07/83	760.0000
			583	01	06/07/83	770.0000

Table F.3.18 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
CHLORIDE	MG/L	399.8380	583	01	09/21/83	790.0000
			583	01	03/26/85	660.0000
			583	01	06/07/85	787.0000
			583	01	09/11/85	862.0000
			584	01	02/08/83	822.0000
			584	01	06/08/83	970.0000
			584	01	09/21/83	790.0000
			584	01	03/26/85	720.0000
			584	01	06/07/85	791.0000
			584	01	09/11/85	869.0000
			587	01	06/08/83	520.0000
			587	01	09/21/83	400.0000
			747	01	03/22/85	740.0000
			747	01	06/07/85	1030.0000
			747	01	09/05/85	1000.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 96 % ****						
CHROMIUM	MG/L	.0200	584	01	03/26/85	.0300
**** SAMPLES EXCEEDING MAXIMUM VALUE = 3 % ****						
COBALT	MG/L	.0390	581	01	06/09/83	.0530
			583	01	06/07/83	.0490
			583	01	09/21/83	.5300
			583	01	06/07/85	.0500
			584	01	02/08/83	.1600
			584	01	06/08/83	.1500
			584	01	09/21/83	.6600
			584	01	03/26/85	.0500
			584	01	06/07/85	.0700
			584	01	09/11/85	.1300
**** SAMPLES EXCEEDING MAXIMUM VALUE = 31 % ****						
CONDUCTANCE	UMHO/CM	6714.7250	581	01	09/11/85	6765.0000
			581	02	09/11/85	6765.0000
			581	03	09/11/85	6765.0000
			581	04	09/11/85	6765.0000
			581	05	09/11/85	6765.0000
			583	01	03/26/85	8600.0000
			583	01	06/07/85	7320.0000
			583	01	09/11/85	9516.0000
			584	01	03/26/85	7600.0000
			584	01	06/07/85	7564.0000
			584	01	09/11/85	10004.0000
			747	01	03/22/85	7000.0000
			747	01	09/05/85	9200.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 64 % ****						

Table F.3.18 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
COPPER	MG/L	.0508	583	01	09/21/83	.0670
			583	01	03/26/85	.1100
			583	01	09/11/85	.0700
			584	01	02/08/83	.1200
			584	01	09/21/83	.2000
			584	01	03/26/85	.1500
			584	01	06/07/85	.0760
			584	01	09/11/85	.1400
**** SAMPLES EXCEEDING MAXIMUM VALUE = 25 % ****						
CYANIDE	MG/L	.0050	-	-	-	-
FLUORIDE	MG/L	1.1459	581	01	09/22/83	4.4000
			581	01	03/26/85	4.7000
			581	01	06/07/85	4.3000
			581	02	06/07/85	4.2000
			581	03	06/07/85	4.3000
			581	04	06/07/85	4.3000
			581	05	06/07/85	4.1000
			581	01	09/11/85	4.8000
			581	02	09/11/85	4.7000
			581	03	09/11/85	4.9000
			581	04	09/11/85	4.9000
			581	05	09/11/85	4.7000
			583	01	09/21/83	4.4000
			583	01	03/26/85	4.2000
			583	01	06/07/85	3.0000
			583	01	09/11/85	4.2000
			584	01	09/21/83	4.3000
			584	01	03/26/85	3.7000
			584	01	06/07/85	3.7000
			584	01	09/11/85	3.9000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 83 % ****						
GROSS ALPHA	PCI/L	176.5685	581	01	03/26/85	160.0000
			583	01	03/26/85	255.0000
			584	01	03/26/85	230.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 75 % ****						
GROSS BETA	PCI/L	25.0000	581	01	03/26/85	70.0000
			583	01	03/26/85	140.0000
			584	01	03/26/85	155.0000
			747	01	03/22/85	90.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
HYD. SULFIDE	MG/L	1.4802	-	-	-	-
IRON	MG/L	1.4835	581	01	02/07/83	3.2400
			581	01	09/22/83	3.7200

Table F.3.18 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
IRON	MG/L	1.4835	581	01	03/26/85	12.0000
			581	01	06/07/85	11.2000
			581	02	06/07/85	11.1000
			581	03	06/07/85	11.5000
			581	04	06/07/85	11.1000
			581	05	06/07/85	11.4000
			581	01	09/11/85	9.8800
			581	02	09/11/85	9.9100
			581	03	09/11/85	9.8500
			581	04	09/11/85	10.0000
			581	05	09/11/85	9.8800
			583	01	03/26/85	1.8000
			583	01	09/11/85	1.9100
			747	01	03/22/85	3.4000
			747	01	06/07/85	2.0100
**** SAMPLES EXCEEDING MAXIMUM VALUE = 53 % ****						
LEAD	MG/L	.0050	581	01	09/22/83	.0100
**** SAMPLES EXCEEDING MAXIMUM VALUE = 6 % ****						
MAGNESIUM	MG/L	547.8729	-	-	-	-
MANGANESE	MG/L	8.7400	583	01	09/21/83	10.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 3 % ****						
MERCURY	MG/L	.0003	583	01	03/26/85	.0004
**** SAMPLES EXCEEDING MAXIMUM VALUE = 4 % ****						
MOLYBDENUM	MG/L	.0757	581	01	02/07/83	.3400
			581	01	06/09/83	.2500
			581	01	09/22/83	.0780
			581	01	03/26/85	.1300
			581	01	06/07/85	.1200
			581	02	06/07/85	.0800
			581	03	06/07/85	.0800
			581	04	06/07/85	.1000
			581	05	06/07/85	.0900
			581	01	09/11/85	.1300
			581	02	09/11/85	.1400
			581	03	09/11/85	.1300
			581	04	09/11/85	.1200
			581	05	09/11/85	.1400
			583	01	02/07/83	.5300
			583	01	06/07/83	.4000
			583	01	09/21/83	.1900
			583	01	03/26/85	.3000
			583	01	06/07/85	.1300
			583	01	09/11/85	.2600

Table F.3.18 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
MOLYBDENUM	MG/L	.0757	584	01	02/08/83	.4200
			584	01	06/08/83	.3800
			584	01	09/21/83	.1700
			584	01	03/26/85	.2800
			584	01	06/07/85	.2200
			584	01	09/11/85	.3500
			587	01	01/31/83	.1400
			587	01	06/08/83	.1280
			587	01	09/21/83	.0760
**** SAMPLES EXCEEDING MAXIMUM VALUE = 90 % ****						
NICKEL	MG/L	.0684	581	01	06/07/85	.0800
			581	02	06/07/85	.0900
			581	03	06/07/85	.0800
			581	05	06/07/85	.0800
			581	01	09/11/85	.0800
			581	02	09/11/85	.1100
			581	03	09/11/85	.0900
			581	04	09/11/85	.0700
			581	05	09/11/85	.1200
			583	01	03/26/85	.1800
			583	01	06/07/85	.1800
			583	01	09/11/85	.2300
			584	01	03/26/85	.2900
			584	01	06/07/85	.2800
			584	01	09/11/85	.3800
			747	01	03/22/85	.0800
			747	01	09/05/85	.0800
**** SAMPLES EXCEEDING MAXIMUM VALUE = 84 % ****						
NITRATE	MG/L	8.4462	583	01	09/21/83	50.0000
			584	01	09/21/83	41.0000
			584	01	09/11/85	23.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 10 % ****						
ORG. CARBON	MG/L	55.7267	581	01	02/07/83	96.3000
			581	01	06/09/83	88.2000
			581	01	09/22/83	113.0000
			583	01	02/07/83	111.0000
			583	01	06/07/83	84.2000
			583	01	09/21/83	129.0000
			584	01	02/08/83	120.0000
			584	01	06/08/83	84.6000
			584	01	09/21/83	139.0000
			587	01	01/31/83	99.9000
			587	01	06/08/83	63.5000
			587	01	09/21/83	87.4000

Table F.3.18 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
**** SAMPLES EXCEEDING MAXIMUM VALUE = 38 % ****						
PB-210	PCI/L	2.6875	584	01	03/26/85	2.8000
			584	01	06/07/85	2.7000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 25 % ****						
PH	SU	7.4450	-	-	-	-
PHOSPHATE	MG/L	2.5375	-	-	-	-
PO-210	PCI/L	.5000	584	01	03/26/85	1.1000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 12 % ****						
POTASSIUM	MG/L	15.6300	581	01	02/07/83	66.4000
			581	01	06/09/83	56.0000
			581	01	09/22/83	52.0000
			581	01	03/26/85	57.0000
			581	01	06/07/85	61.2000
			581	02	06/07/85	61.2000
			581	03	06/07/85	60.8000
			581	04	06/07/85	60.0000
			581	05	06/07/85	60.4000
			581	01	09/11/85	58.9000
			581	02	09/11/85	59.6000
			581	03	09/11/85	59.6000
			581	04	09/11/85	59.8000
			581	05	09/11/85	58.5000
			583	01	02/07/83	104.0000
			583	01	06/07/83	49.0000
			583	01	09/21/83	96.0000
			583	01	03/26/85	96.0000
			583	01	06/07/85	69.2000
			583	01	09/11/85	93.1000
			584	01	02/08/83	113.0000
			584	01	06/08/83	97.0000
			584	01	09/21/83	99.0000
			584	01	03/26/85	106.0000
			584	01	06/07/85	99.6000
			584	01	09/11/85	101.0000
			747	01	03/22/85	36.0000
			747	01	06/07/85	39.7000
			747	01	09/05/85	41.8000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 90 % ****						
RA-226	PCI/L	.5000	581	01	03/26/85	1.4000
			581	01	06/07/85	1.0000
			581	01	09/11/85	1.4000
			581	02	09/11/85	1.2000
			581	03	09/11/85	1.3000

Table F.3.18 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
RA-226	PCI/L	.5000	584	04	09/11/85	1.4000
			584	05	09/11/85	1.3000
			583	01	09/21/83	29.0000
			583	01	03/26/85	4.5000
			583	01	06/07/85	5.0000
			583	01	09/11/85	6.9000
			584	01	09/21/83	15.0000
			584	01	03/26/85	7.5000
			584	01	06/07/85	6.0000
			584	01	09/11/85	7.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 83 % ****						
RA-228	PCI/L	.5000	583	01	03/26/85	1.6000
			583	01	06/07/85	2.2000
			584	01	06/07/85	1.9000
			747	01	09/05/85	1.1000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 44 % ****						
SELENIUM	MG/L	.0152	581	01	02/07/83	.0200
			583	01	02/07/83	.0920
			583	01	09/21/83	.1200
			584	01	02/08/83	.0510
			584	01	06/08/83	.0270
			584	01	09/21/83	.2200
			584	01	03/26/85	.2400
			584	01	06/07/85	.1730
			584	01	09/11/85	.1990
**** SAMPLES EXCEEDING MAXIMUM VALUE = 28 % ****						
SILICA	MG/L	21.2545	581	01	09/22/83	22.0000
			581	01	09/11/85	26.7000
			581	02	09/11/85	24.6000
			581	03	09/11/85	26.1000
			581	04	09/11/85	26.3000
			581	05	09/11/85	25.2000
			583	01	09/21/83	23.0000
			584	01	09/21/83	29.0000
			584	01	09/11/85	24.8000
			587	01	09/21/83	22.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 41 % ****						
SILVER	MG/L	.0050	-	-	-	-
SODIUM	MG/L	951.9060	583	01	06/07/83	1090.0000
			583	01	09/21/83	980.0000
			583	01	06/07/85	1130.0000
			584	01	02/08/83	1210.0000
			584	01	03/26/85	970.0000

Table F.3.18 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
SODIUM	MG/L	951.9060	747	01	06/07/85	1000.0000
			747	01	09/05/85	1050.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 21 % ****						
STRONTIUM	MG/L	4.5156	581	01	03/26/85	6.7000
			581	01	06/07/85	6.4900
			581	02	06/07/85	6.5000
			581	03	06/07/85	6.0300
			581	04	06/07/85	6.5700
			581	05	06/07/85	5.7400
			581	01	09/11/85	6.4800
			581	02	09/11/85	6.4800
			581	03	09/11/85	6.4000
			581	04	09/11/85	6.5000
			581	05	09/11/85	6.3800
			583	01	09/11/85	4.7000
			584	01	03/26/85	4.6000
			584	01	09/11/85	4.7000
			747	01	03/22/85	6.0000
			747	01	06/07/85	5.8100
			747	01	09/05/85	5.8800
**** SAMPLES EXCEEDING MAXIMUM VALUE = 84 % ****						
SULFATE	MG/L	3833.8504	583	01	02/07/83	4200.0000
			583	01	09/21/83	4900.0000
			584	01	02/08/83	4440.0000
			584	01	06/08/83	4200.0000
			584	01	09/21/83	4900.0000
			584	01	03/26/85	4100.0000
			584	01	06/07/85	3960.0000
			584	01	09/11/85	4100.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 25 % ****						
SULFIDE	MG/L	.0500	584	01	06/07/85	.1000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 12 % ****						
TEMPERATURE	C - DEGREE	18.7488	-	-	-	-
TH-230	PCI/L	.5000	583	01	09/21/83 <	.5500
			584	01	09/21/83	.9500
**** SAMPLES EXCEEDING MAXIMUM VALUE = 19 % ****						
TIN	MG/L	.0025	581	01	03/26/85	.0080
			584	01	03/26/85	.0050
**** SAMPLES EXCEEDING MAXIMUM VALUE = 9 % ****						
TOTAL SOLIDS	MG/L	7221.0938	583	01	09/21/83	8000.0000
			584	01	09/21/83	8100.0000

Table F.3.18 GROUND WATER QUALITY MEASUREMENTS EXCEEDING
STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE +/-UNCERTAINTY
TOTAL SOLIDS	MG/L	7221.0938	584	01	09/11/85	7440.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 9 % ****						
TOX	MG/L	.2466	581	01	03/26/85	.3000
			583	01	03/26/85	.3000
			583	01	06/07/85	.3300
			584	01	03/26/85	.6000
			747	01	03/27/85	.7000
			747	01	06/07/85	.6500
**** SAMPLES EXCEEDING MAXIMUM VALUE = 50 % ****						
U-234	PCI/L	35.1621	583	01	06/07/85	41.0000
			583	01	09/11/85	64.0000
			584	01	06/07/85	47.0000
			584	01	09/11/85	47.0000
			747	01	06/07/85	36.0000
			747	01	09/05/85	36.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 46 % ****						
U-238	PCI/L	23.0995	581	01	09/11/85	25.0000
			581	02	09/11/85	24.0000
			583	01	06/07/85	42.0000
			583	01	09/11/85	66.0000
			584	01	06/07/85	49.0000
			584	01	09/11/85	50.0000
			747	01	06/07/85	24.0000
			747	01	09/05/85	25.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 61 % ****						
VANADIUM	MG/L	.0200	581	01	02/07/83	.0740
			581	01	06/09/83	.0780
			581	02	06/07/85	.0300
			581	05	06/07/85	.0300
			583	01	02/07/83	1.6000
			583	01	06/07/83	1.7000
			583	01	09/21/83	7.6000
			583	01	03/26/85	.6000
			583	01	06/07/85	.2800
			583	01	09/11/85	1.1400
			584	01	02/08/83	6.0000
			584	01	06/08/83	5.2000
			584	01	09/21/83	9.0000
			584	01	03/26/85	7.4800
			584	01	06/07/85	6.7500
			584	01	09/11/85	13.8000
			587	01	01/31/83	.0490
			587	01	06/08/83	.0670

Table F.3.18 GROUND WATER QUALITY MEASUREMENTS EXCEEDING
STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Concluded)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
VANADIUM	MG/L	.0200	587	01	09/21/83	.0300
**** SAMPLES EXCEEDING MAXIMUM VALUE = 59 % ****						
ZINC	MG/L	.0626	581	01	03/26/85	.1000
			583	01	02/07/83	.8700
			583	01	06/07/83	.5100
			583	01	09/21/83	23.0000
			583	01	03/26/85	.6000
			583	01	06/07/85	.2670
			583	01	09/11/85	.7200
			584	01	02/08/83	6.7000
			584	01	06/08/83	4.9000
			584	01	09/21/83	37.0000
			584	01	03/26/85	4.1000
			584	01	06/07/85	2.5600
			584	01	09/11/85	4.1400
			587	01	09/21/83	.1100
			747	01	03/22/85	.1000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 46 % ****						

MAPPER DATA FILE: GRJ01*UDPGWQ100371

Table F.3.19 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
03/22/85 TO 09/10/85

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: CROSS GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	1073.1329	-	-	-	-
ALUMINUM	MG/L	.0500	739	01	09/05/85	.2000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 11 % ****						
AMMONIUM	MG/L	15.7000	-	-	-	-
ANTIMONY	MG/L	.0080	-	-	-	-
ARSENIC	MG/L	.0050	-	-	-	-
BALANCE	%	.4700	737	01	03/22/85	4.4700
			737	01	06/07/85	4.8600
			739	01	03/22/85	1.8200
			739	01	06/07/85	5.0900
			742	01	03/22/85	1.0100
			742	01	06/07/85	5.5900
**** SAMPLES EXCEEDING MAXIMUM VALUE = 66 % ****						
BARIUM	MG/L	.0675	-	-	-	-
BORON	MG/L	1.0965	-	-	-	-
CADMIUM	MG/L	.0012	-	-	-	-
CALCIUM	MG/L	423.2839	737	01	03/22/85	550.0000
			737	01	06/07/85	640.0000
			737	01	09/06/85	489.0000
			739	01	03/22/85	540.0000
			739	01	06/07/85	630.0000
			739	01	09/05/85	506.0000
			742	01	03/22/85	570.0000
			742	01	06/07/85	655.0000
			742	01	09/10/85	499.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
CHLORIDE	MG/L	399.8380	737	01	03/22/85	880.0000
			737	01	06/07/85	1080.0000
			737	01	09/06/85	1100.0000
			739	01	03/22/85	970.0000
			739	01	06/07/85	1130.0000
			739	01	09/05/85	1250.0000
			742	01	03/22/85	590.0000
			742	01	06/07/85	673.0000
			742	01	09/10/85	705.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
CHROMIUM	MG/L	.0200	737	01	03/22/85	.0300
			739	01	03/22/85	.0300
			742	01	03/22/85	.0300
**** SAMPLES EXCEEDING MAXIMUM VALUE = 33 % ****						
COBALT	MG/L	.0390	-	-	-	-
CONDUCTANCE	UMHO/CM	6714.7250	737	01	03/22/85	8900.0000

Table F.3.19 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
03/22/85 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: CROSS GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE +/-UNCERTAINTY
CONDUCTANCE	UMHO/CM	6714.7250	737	01	06/07/85	7800.0000
			737	01	09/06/85	9000.0000
			739	01	03/22/85	8300.0000
			739	01	06/07/85	8024.0000
			739	01	09/05/85	9360.0000
			742	01	03/22/85	6900.0000
			742	01	09/10/85	7605.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 88 % ****						
COPPER	MG/L	.0508	-	-	-	-
CYANIDE	MG/L	.0050	-	-	-	-
FLUORIDE	MG/L	1.1459	737	01	09/06/85	1.2000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 11 % ****						
GROSS ALPHA	PCI/L	126.5685	737	01	03/22/85	185.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 33 % ****						
GROSS BETA	PCI/L	25.0000	737	01	03/22/85	60.0000
			742	01	03/22/85	80.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 66 % ****						
HYD. SULFIDE	MG/L	1.4802	-	-	-	-
IRON	MG/L	1.4835	737	01	03/22/85	1.7000
			739	01	03/22/85	3.4000
			742	01	03/22/85	5.7000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 33 % ****						
LEAD	MG/L	.0050	-	-	-	-
MAGNESIUM	MG/L	547.8729	737	01	06/07/85	625.0000
			739	01	06/07/85	600.0000
			742	01	06/07/85	550.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 33 % ****						
MANGANESE	MG/L	8.7400	-	-	-	-
MERCURY	MG/L	.0003	-	-	-	-
MOLYBDENUM	MG/L	.0757	737	01	03/22/85	.1100
			737	01	06/07/85	.0800
			737	01	09/06/85	.1400
			739	01	03/22/85	.1100
			739	01	06/07/85	.1400
			739	01	09/05/85	.1100
**** SAMPLES EXCEEDING MAXIMUM VALUE = 66 % ****						
NICKEL	MG/L	.0684	-	-	-	-
NITRATE	MG/L	8.4462	-	-	-	-
ORG. CARBON	MG/L	55.7267	742	01	03/22/85	562.0000
			742	01	09/10/85	508.0000

Table F.3.19 GROUND WATER QUALITY MEASUREMENTS EXCEEDING
STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
03/22/85 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: CROSS GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
**** SAMPLES EXCEEDING MAXIMUM VALUE = 22 % ****						
PB-210	PCI/L	2.6875	-	-	-	-
PH	SU	7.4450	-	-	-	-
PHOSPHATE	MG/L	2.5375	-	-	-	-
PO-210	PCI/L	.5000	-	-	-	-
POTASSIUM	MG/L	15.6300	-	-	-	-
RA-226	PCI/L	.5000	-	-	-	-
RA-228	PCI/L	.5000	-	-	-	-
SELENIUM	MG/L	.0152	-	-	-	-
SILICA	MG/L	21.2545	-	-	-	-
SILVER	MG/L	.0050	-	-	-	-
SODIUM	MG/L	951.9060	737	01	03/22/85	1190.0000
			737	01	06/07/85	1070.0000
			737	01	09/06/85	1140.0000
			739	01	03/22/85	1260.0000
			739	01	06/07/85	1150.0000
			739	01	09/05/85	1200.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 66 % ****						
STRONTIUM	MG/L	4.5156	737	01	03/22/85	7.3000
			737	01	06/07/85	7.1900
			737	01	09/06/85	7.3200
			739	01	03/22/85	7.4000
			739	01	06/07/85	6.9300
			739	01	09/05/85	7.2400
			742	01	03/22/85	6.5000
			742	01	06/07/85	5.8200
			742	01	09/10/85	6.4400
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
SULFATE	MG/L	3833.8504	739	01	03/22/85	4000.0000
			739	01	09/05/85	3960.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 22 % ****						
SULFIDE	MG/L	.0500	-	-	-	-
TEMPERATURE	C - DEGREE	18.7488	-	-	-	-
TH-230	PCI/L	.5000	-	-	-	-
TIN	MG/L	.0025	737	01	03/22/85	.0050
			742	01	03/22/85	.0050
**** SAMPLES EXCEEDING MAXIMUM VALUE = 22 % ****						
TOTAL SOLIDS	MG/L	7221.0938	737	01	03/22/85	8134.0000
			737	01	06/07/85	8300.0000
			737	01	09/06/85	8340.0000
			739	01	03/22/85	8324.0000
			739	01	06/07/85	8444.0000

Table F.3.19 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
03/22/85 TO 09/10/85 (Concluded)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: CROSS GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
TOTAL SOLIDS	MG/L	7221.0938	739	01	09/05/85	8530.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 66 % ****						
TOX	MG/L	.2466	737	01	03/22/85	.6000
			739	01	03/22/85	.6000
			742	01	03/22/85	.5000
			742	01	06/07/85	.4900
**** SAMPLES EXCEEDING MAXIMUM VALUE = 66 % ****						
U-234	PCI/L	35.1621	737	01	03/22/85	36.0000
			737	01	06/07/85	40.0000
			737	01	09/06/85	39.0000
			739	01	06/07/85	36.0000
			739	01	09/05/85	36.0000
			742	01	03/22/85	41.0000
			742	01	09/10/85	45.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 77 % ****						
U-238	PCI/L	23.0995	737	01	03/22/85	24.0000
			737	01	06/07/85	26.0000
			737	01	09/06/85	26.0000
			739	01	03/22/85	24.0000
			739	01	06/07/85	24.0000
			739	01	09/05/85	27.0000
			742	01	03/22/85	31.0000
			742	01	06/07/85	31.0000
			742	01	09/10/85	33.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
VANADIUM	MG/L	.0200	739	01	06/07/85	.0300
**** SAMPLES EXCEEDING MAXIMUM VALUE = 11 % ****						
ZINC	MG/L	.0626	737	01	03/22/85	.0900
			742	01	03/22/85	.0800
**** SAMPLES EXCEEDING MAXIMUM VALUE = 22 % ****						

MAPPER DATA FILE: GRJ01*UDPGWQ100375

Table F.3.20 GROUND WATER QUALITY MEASUREMENTS EXCEEDING
STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	1073.1329	-	-	-	-
ALUMINUM	MG/L	.0500	589	01	09/22/83	.1900
			733	01	09/06/85	.1000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 6 % ****						
AMMONIUM	MG/L	15.7000	585	01	09/20/83	335.0000
			585	01	03/25/85	383.0000
			585	01	06/07/85	369.0000
			585	01	09/10/85	411.0000
			586	01	09/20/83	310.0000
			586	01	03/25/85	393.0000
			586	01	06/07/85	384.0000
			586	01	09/10/85	438.0000
			589	01	03/25/85	124.0000
			589	01	06/07/85	148.0000
			589	01	09/09/85	149.0000
			590	01	09/22/83	18.1000
			590	01	03/25/85	17.4000
			590	01	09/09/85	18.5000
			740	01	03/22/85	49.0000
			740	01	06/07/85	47.7000
			740	01	09/09/85	50.3000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 54 % ****						
ANTIMONY	MG/L	.0080	586	01	03/25/85	.0120
**** SAMPLES EXCEEDING MAXIMUM VALUE = 3 % ****						
ARSENIC	MG/L	.0050	585	01	02/03/83	.0080
			585	01	09/20/83	.0180
			585	01	03/25/85	.0150
			585	01	09/10/85	.0200
			586	01	06/09/83	.0270
			586	01	09/20/83	.1100
			586	01	03/25/85	.0180
			586	01	06/07/85	.0400
			586	01	09/10/85	.0200
			589	01	09/22/83	.0220
**** SAMPLES EXCEEDING MAXIMUM VALUE = 25 % ****						
BALANCE	%	.4700	585	01	02/03/83	1.3100
			585	01	09/20/83	1.8700
			585	01	03/25/85	3.4900
			585	01	06/07/85	3.6300
			586	01	09/20/83	.7000
			586	01	03/25/85	4.5500
			586	01	06/07/85	4.6600
			586	01	09/10/85	.5000

Table F.3.20 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
BALANCE	%	.4700	589	01	09/22/83	8.3200
			589	01	03/25/85	1.7200
			589	01	06/07/85	2.3200
			590	01	02/02/83	1.5100
			590	01	09/22/83	9.0600
			590	01	06/07/85	1.3700
			590	01	09/09/85	2.5400
			732	01	03/26/85	2.1300
			732	01	06/07/85	2.7300
			733	01	03/25/85	1.3400
			733	01	06/07/85	3.6100
			736	01	03/22/85	2.4900
			736	01	06/07/85	3.9400
			738	01	03/25/85	4.2000
			738	01	06/07/85	2.6000
			740	01	03/22/85	.8500
			740	01	06/07/85	5.3100
**** SAMPLES EXCEEDING MAXIMUM VALUE = 64 % ****						
BARIUM	MG/L	.0675	586	01	02/02/83	.0740
			586	01	06/09/83	.3030
			586	01	09/20/83	.0990
			589	01	02/01/83	.0800
			589	01	09/22/83	.1300
			590	01	09/22/83	.0700
**** SAMPLES EXCEEDING MAXIMUM VALUE = 15 % ****						
BORON	MG/L	1.0965	-	-	-	-
CADMIUM	MG/L	.0012	589	01	09/22/83	.0030
**** SAMPLES EXCEEDING MAXIMUM VALUE = 3 % ****						
CALCIUM	MG/L	423.2839	585	01	02/03/83	556.0000
			585	01	06/09/83	584.0000
			585	01	09/20/83	540.0000
			585	01	03/25/85	540.0000
			585	01	06/07/85	625.0000
			585	01	09/10/85	484.0000
			586	01	02/02/83	487.0000
			586	01	06/09/83	589.0000
			586	01	09/20/83	570.0000
			586	01	03/25/85	550.0000
			586	01	06/07/85	630.0000
			586	01	09/10/85	471.0000
			589	01	02/01/83	574.0000
			589	01	06/08/83	581.0000
			589	01	09/22/83	480.0000
			589	01	03/25/85	590.0000

Table F.3.20 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
CALCIUM	MG/L	423.2839	589	01	06/07/85	665.0000
			589	01	09/09/85	611.0000
			590	01	02/02/83	500.0000
			590	01	06/07/83	493.0000
			590	01	09/22/83	480.0000
			590	01	03/25/85	580.0000
			590	01	09/09/85	495.0000
			732	01	03/26/85	540.0000
			732	01	06/07/85	665.0000
			733	01	03/25/85	510.0000
			733	01	06/07/85	610.0000
			733	01	09/06/85	464.0000
			736	01	03/22/85	570.0000
			736	01	06/07/85	665.0000
			736	01	09/10/85	496.0000
			738	01	03/25/85	470.0000
			738	01	09/09/85	515.0000
			740	01	03/22/85	510.0000
			740	01	06/07/85	600.0000
			740	01	09/09/85	498.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 92 % ****						
CHLORIDE	MG/L	399.8380	585	01	02/03/83	790.0000
			585	01	06/09/83	800.0000
			585	01	09/20/83	810.0000
			585	01	03/25/85	850.0000
			585	01	06/07/85	868.0000
			585	01	09/10/85	854.0000
			586	01	02/02/83	805.0000
			586	01	06/09/83	860.0000
			586	01	09/20/83	820.0000
			586	01	03/25/85	740.0000
			586	01	06/07/85	860.0000
			586	01	09/10/85	898.0000
			589	01	02/01/83	749.0000
			589	01	06/08/83	840.0000
			589	01	09/22/83	860.0000
			589	01	03/25/85	930.0000
			589	01	06/07/85	1100.0000
			589	01	09/09/85	1260.0000
			590	01	02/02/83	736.0000
			590	01	06/07/83	990.0000
			590	01	09/22/83	670.0000
			590	01	03/25/85	830.0000
			590	01	06/07/85	459.0000
			590	01	09/09/85	759.0000
			732	01	03/26/85	930.0000

Table F.3.20 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
CHLORIDE	MG/L	399.8380	732	01	06/07/85	1130.0000
			732	01	09/06/85	872.0000
			733	01	03/25/85	1100.0000
			733	01	06/07/85	1250.0000
			733	01	09/06/85	1270.0000
			736	01	03/22/85	890.0000
			736	01	06/07/85	1060.0000
			736	01	09/10/85	997.0000
			738	01	03/25/85	670.0000
			738	01	06/07/85	944.0000
			738	01	09/09/85	1000.0000
			740	01	03/22/85	650.0000
			740	01	06/07/85	707.0000
			740	01	09/09/85	755.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
CHROMIUM	MG/L	.0200	585	01	03/25/85	.0300
			733	01	03/25/85	.0300
			736	01	03/22/85	.0300
			738	01	03/25/85	.0300
**** SAMPLES EXCEEDING MAXIMUM VALUE = 10 % ****						
COBALT	MG/L	.0390	585	01	06/09/83	.0820
			589	01	06/08/83	.0710
			590	01	06/07/83	.0520
**** SAMPLES EXCEEDING MAXIMUM VALUE = 7 % ****						
CONDUCTANCE	UMHO/CM	6714.7250	585	01	06/07/85	8296.0000
			585	01	09/10/85	10080.0000
			586	01	03/25/85	8900.0000
			586	01	06/07/85	7320.0000
			586	01	09/10/85	10080.0000
			589	01	03/25/85	7200.0000
			589	01	06/07/85	7800.0000
			589	01	09/09/85	9512.0000
			590	01	09/09/85	6960.0000
			732	01	03/26/85	7600.0000
			732	01	09/06/85	7140.0000
			733	01	06/07/85	6800.0000
			733	01	09/06/85	9360.0000
			736	01	03/22/85	9300.0000
			736	01	06/07/85	7930.0000
			736	01	09/10/85	10780.0000
			738	01	03/25/85	7000.0000
			738	01	09/09/85	8424.0000
			740	01	03/22/85	7000.0000
			740	01	09/09/85	7080.0000

Table F.3.20 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE +/-UNCERTAINTY
**** SAMPLES EXCEEDING MAXIMUM VALUE = 76 % ****						
COPPER	MG/L	.0508	586	01	03/25/85	.0700
			589	01	02/01/83	.1160
			589	01	09/09/85	.0600
**** SAMPLES EXCEEDING MAXIMUM VALUE = 7 % ****						
CYANIDE	MG/L	.0050	-	-	-	-
FLUORIDE	MG/L	1.1459	585	01	09/20/83	3.2000
			585	01	03/25/85	3.1000
			585	01	06/07/85	3.2000
			585	01	09/10/85	3.7000
			586	01	09/20/83	3.4000
			586	01	03/25/85	3.1000
			586	01	06/07/85	3.3000
			586	01	09/10/85	3.7000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 25 % ****						
GROSS ALPHA	PCI/L	126.5685	585	01	03/25/85	380.0000
			586	01	03/25/85	490.0000
			589	01	03/25/85	260.0000
			590	01	03/25/85	240.0000
			733	01	03/25/85	185.0000
			736	01	03/22/85	345.0000
			738	01	03/25/85	170.0000
			740	01	03/22/85	245.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 88 % ****						
GROSS BETA	PCI/L	25.0000	585	01	03/25/85	200.0000
			586	01	03/25/85	180.0000
			589	01	03/25/85	130.0000
			590	01	03/25/85	110.0000
			732	01	03/26/85	60.0000
			733	01	03/25/85	60.0000
			736	01	03/22/85	60.0000
			738	01	03/25/85	125.0000
			740	01	03/22/85	100.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
HYD. SULFIDE	MG/L	1.4802	-	-	-	-
IRON	MG/L	1.4835	585	01	02/03/83	4.0300
			585	01	06/09/83	2.6400
			585	01	09/20/83	2.7100
			585	01	03/25/85	13.0000
			585	01	06/07/85	11.2000
			585	01	09/10/85	11.0000
			586	01	02/02/83	13.5000

Table F.3.20 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
IRON	MG/L	1.4835	586	01	06/09/83	6.0900
			586	01	09/20/83	4.7700
			586	01	03/25/85	16.0000
			586	01	06/07/85	12.8000
			586	01	09/10/85	15.4000
			589	01	02/01/83	2.7200
			589	01	09/22/83	3.4200
			589	01	06/07/85	3.7900
			589	01	09/09/85	3.0500
			733	01	03/25/85	4.2000
			733	01	06/07/85	2.0400
			738	01	03/25/85	10.0000
			738	01	06/07/85	9.9700
			738	01	09/09/85	10.3000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 53 % ****						
LEAD	MG/L	.0050	589	01	09/22/83	.0100
			590	01	09/22/83	.0200
**** SAMPLES EXCEEDING MAXIMUM VALUE = 9 % ****						
MAGNESIUM	MG/L	547.8729	585	01	02/03/83	620.0000
			732	01	06/07/85	585.0000
			733	01	06/07/85	555.0000
			736	01	06/07/85	575.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 10 % ****						
MANGANESE	MG/L	8.7400	586	01	06/09/83	334.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 2 % ****						
MERCURY	MG/L	.0003	736	01	03/22/85	.0004
			738	01	03/25/85	.0009
**** SAMPLES EXCEEDING MAXIMUM VALUE = 6 % ****						
MOLYBDENUM	MG/L	.0757	585	01	02/03/83	.4400
			585	01	06/09/83	.2900
			585	01	09/20/83	.2100
			585	01	03/25/85	.2700
			585	01	06/07/85	.1800
			585	01	09/10/85	.2900
			586	01	02/02/83	.4700
			586	01	06/09/83	.3600
			586	01	09/20/83	.3600
			586	01	03/25/85	.2300
			586	01	06/07/85	.2000
			586	01	09/10/85	.2200
			589	01	02/01/83	.2000
			589	01	06/08/83	.0930

Table F.3.20 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
MOLYBDENUM	MG/L	.0757	590	01	02/02/83	.1300
			590	01	06/07/83	.1010
			740	01	03/22/85	.1100
			740	01	09/09/85	.1200
**** SAMPLES EXCEEDING MAXIMUM VALUE = 46 % ****						
NICKEL	MG/L	.0684	585	01	03/25/85	.1500
			585	01	09/10/85	.1400
			586	01	03/25/85	.1200
			586	01	06/07/85	.1400
			586	01	09/10/85	.1700
			589	01	06/07/85	.1100
			589	01	09/09/85	.1300
			590	01	09/09/85	.0700
			736	01	03/22/85	.1000
			736	01	09/10/85	.0900
			740	01	09/09/85	.0700
**** SAMPLES EXCEEDING MAXIMUM VALUE = 40 % ****						
NITRATE	MG/L	8.4462	589	01	03/25/85	39.0000
			590	01	03/25/85	12.0000
			736	01	03/22/85	25.0000
			736	01	06/07/85	34.0000
			736	01	09/10/85	19.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 14 % ****						
ORG. CARBON	MG/L	55.7267	585	01	02/03/83	64.7000
			585	01	06/09/83	103.0000
			585	01	09/20/83	99.1000
			586	01	02/02/83	118.0000
			586	01	06/09/83	96.9000
			586	01	09/20/83	78.6000
			589	01	02/01/83	116.0000
			589	01	06/08/83	92.0000
			589	01	09/22/83	118.0000
			590	01	02/02/83	81.9000
			590	01	06/07/83	79.7000
			590	01	09/22/83	98.1000
			733	01	03/25/85	522.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 39 % ****						
PB-210	PCI/L	2.6875	586	01	06/07/85	2.7000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 5 % ****						
PH	SU	7.4450	585	01	02/03/83	7.6000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 2 % ****						

Table F.3.20 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE +/-UNCERTAINTY
PHOSPHATE	MG/L	2.5375	-	-	-	-
PO-210	PCI/L	.5000	-	-	-	-
POTASSIUM	MG/L	15.6300	585	01	02/03/83	99.5000
			585	01	06/09/83	97.0000
			585	01	09/20/83	100.0000
			585	01	03/25/85	95.0000
			585	01	06/07/85	98.4000
			585	01	09/10/85	98.0000
			586	01	02/02/83	110.0000
			586	01	06/09/83	94.0000
			586	01	09/20/83	120.0000
			586	01	03/25/85	94.0000
			586	01	06/07/85	101.0000
			586	01	09/10/85	100.0000
			589	01	02/01/83	52.5000
			589	01	06/08/83	53.0000
			589	01	09/22/83	53.0000
			589	01	03/25/85	52.0000
			589	01	06/07/85	66.4000
			589	01	09/09/85	63.7000
			590	01	02/02/83	22.2000
			590	01	06/07/83	17.2000
			590	01	09/22/83	19.1000
			590	01	03/25/85	20.0000
			590	01	06/07/85	15.7000
			590	01	09/09/85	23.1000
			738	01	03/25/85	18.0000
			738	01	06/07/85	21.6000
			738	01	09/09/85	21.8000
			740	01	03/22/85	27.0000
			740	01	06/07/85	29.4000
			740	01	09/09/85	31.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 76 % ****						
RA-226	PCI/L	.5000	585	01	09/20/83	18.0000
			586	01	09/20/83	18.0000
			586	01	03/25/85	1.1000
			586	01	06/07/85	2.0000
			586	01	09/10/85	2.1000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 16 % ****						
RA-228	PCI/L	.5000	585	01	03/25/85	4.5000
			586	01	03/25/85	2.5000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 9 % ****						
SELENIUM	MG/L	.0152	-	-	-	-
SILICA	MG/L	21.2545	585	01	09/10/85	25.9000

Table F.3.20 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
SILICA	MG/L	21.2545	586	01	09/20/83	23.0000
			586	01	09/10/85	27.8000
			736	01	09/10/85	22.5000
			738	01	09/09/85	25.2000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 17 % ****						
SILVER	MG/L	.0050	-	-	-	-
SODIUM	MG/L	951.9060	585	01	02/03/83	1020.0000
			585	01	06/09/83	960.0000
			585	01	09/20/83	990.0000
			585	01	03/25/85	970.0000
			585	01	09/10/85	980.0000
			586	01	02/02/83	1020.0000
			586	01	09/20/83	1000.0000
			586	01	03/25/85	990.0000
			586	01	09/10/85	990.0000
			589	01	02/01/83	1090.0000
			589	01	06/08/83	1000.0000
			589	01	09/22/83	1300.0000
			589	01	03/25/85	1120.0000
			589	01	06/07/85	1060.0000
			589	01	09/09/85	1180.0000
			590	01	02/02/83	1030.0000
			732	01	03/26/85	980.0000
			732	01	06/07/85	1060.0000
			732	01	09/06/85	990.0000
			733	01	03/25/85	1230.0000
			733	01	06/07/85	1190.0000
			733	01	09/06/85	1220.0000
			736	01	03/22/85	1370.0000
			736	01	06/07/85	1200.0000
			736	01	09/10/85	1350.0000
			738	01	03/25/85	1110.0000
			738	01	06/07/85	1200.0000
			738	01	09/09/85	1142.0000
			740	01	03/22/85	980.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 74 % ****						
STRONTIUM	MG/L	4.5156	585	01	03/25/85	4.7000
			585	01	06/07/85	5.2200
			585	01	09/10/85	4.9600
			586	01	03/25/85	4.7000
			586	01	06/07/85	4.6300
			586	01	09/10/85	4.6400
			589	01	03/25/85	6.1000
			589	01	06/07/85	5.9400
			589	01	09/09/85	6.6800

Table F.3.20 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
STRONTIUM	MG/L	4.5456	590	01	03/25/85	5.9000
			590	01	09/09/85	5.7200
			732	01	03/26/85	6.8000
			732	01	06/07/85	6.8700
			732	01	09/06/85	5.2800
			733	01	03/25/85	7.9000
			733	01	06/07/85	7.1000
			733	01	09/06/85	7.2400
			736	01	03/22/85	6.5000
			736	01	06/07/85	7.4900
			736	01	09/10/85	6.6600
			738	01	03/25/85	5.8000
			738	01	06/07/85	5.5600
			738	01	09/09/85	6.4200
			740	01	03/22/85	5.4000
			740	01	06/07/85	5.3800
			740	01	09/09/85	5.3600
**** SAMPLES EXCEEDING MAXIMUM VALUE = 96 % ****						
SULFATE	MG/L	3833.8504	585	01	02/03/83	4320.0000
			585	01	06/09/83	4500.0000
			586	01	02/02/83	4320.0000
			586	01	06/09/83	4400.0000
			736	01	03/22/85	4100.0000
			736	01	06/07/85	3890.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 15 % ****						
SULFIDE	MG/L	.0500	586	01	06/07/85	.2000
			738	01	06/07/85	.1000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 22 % ****						
TEMPERATURE	C - DEGREE	18.7488	585	01	09/10/85	19.0000
			586	01	09/10/85	19.0000
			736	01	09/10/85	20.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 11 % ****						
TH-230	PCI/L	.5000	585	01	09/20/83	5.4000
			586	01	09/20/83	4.2000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 9 % ****						
TIN	MG/L	.0025	585	01	03/25/85	.0050
			589	01	03/25/85	.0100
**** SAMPLES EXCEEDING MAXIMUM VALUE = 7 % ****						
TOTAL SOLIDS	MG/L	7221.0938	585	01	06/07/85	7310.0000
			586	01	03/25/85	7276.0000
			589	01	03/25/85	7302.0000

Table F.3.20 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
TOTAL SOLIDS	MG/L	7221.0938	589	01	09/09/85	7550.0000
			732	01	03/26/85	7504.0000
			732	01	06/07/85	7864.0000
			733	01	03/25/85	7922.0000
			733	01	06/07/85	8092.0000
			733	01	09/06/85	7850.0000
			736	01	03/22/85	8728.0000
			736	01	06/07/85	8792.0000
			736	01	09/10/85	8220.0000
			738	01	03/25/85	12134.0000
			738	01	09/09/85	7430.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 35 % ****						
TOX	MG/L	.2466	585	01	03/25/85	.9000
			586	01	03/25/85	.5000
			589	01	03/25/85	.6000
			590	01	03/25/85	.5000
			590	01	06/07/85	.2800
			733	01	06/07/85	.3900
			736	01	03/22/85	.5000
			738	01	03/25/85	.4000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 53 % ****						
U-234	PCI/L	35.1621	585	01	06/07/85	84.0000
			585	01	09/10/85	72.0000
			586	01	06/07/85	118.0000
			586	01	09/10/85	67.0000
			589	01	06/07/85	99.0000
			589	01	09/09/85	86.0000
			590	01	09/09/85	56.0000
			732	01	03/26/85	53.0000
			732	01	06/07/85	58.0000
			732	01	09/06/85	39.0000
			733	01	03/25/85	39.0000
			733	01	06/07/85	43.0000
			733	01	09/06/85	44.0000
			736	01	03/22/85	66.0000
			736	01	06/07/85	60.0000
			736	01	09/10/85	71.0000
			738	01	03/25/85	54.0000
			738	01	06/07/85	52.0000
			738	01	09/09/85	69.0000
			740	01	03/22/85	75.0000
			740	01	06/07/85	65.0000
			740	01	09/09/85	72.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 95 % ****						

Table F.3.20 GROUND WATER QUALITY MEASUREMENTS EXCEEDING STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE +/-UNCERTAINTY
U-238	PCI/L	23.0995	585	01	06/07/85	84.0000
			585	01	09/10/85	73.0000
			586	01	06/07/85	116.0000
			586	01	09/10/85	68.0000
			589	01	06/07/85	89.0000
			589	01	09/09/85	79.0000
			590	01	06/07/85	28.0000
			590	01	09/09/85	51.0000
			732	01	03/26/85	36.0000
			732	01	06/07/85	38.0000
			732	01	09/06/85	28.0000
			733	01	03/25/85	25.0000
			733	01	06/07/85	29.0000
			733	01	09/06/85	29.0000
			736	01	03/22/85	49.0000
			736	01	06/07/85	60.0000
			736	01	09/10/85	53.0000
			738	01	03/25/85	41.0000
			738	01	06/07/85	40.0000
			738	01	09/09/85	58.0000
			740	01	03/22/85	70.0000
			740	01	06/07/85	65.0000
			740	01	09/09/85	69.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
VANADIUM	MG/L	.0200	585	01	02/03/83	.0270
			585	01	06/09/83	.1410
			585	01	09/20/83	.0970
			585	01	03/25/85	.1100
			585	01	06/07/85	.0900
			585	01	09/10/85	.1000
			586	01	02/02/83	.1400
			586	01	06/09/83	.4000
			586	01	09/20/83	.2500
			586	01	03/25/85	.1300
			586	01	06/07/85	.2700
			586	01	09/10/85	.1300
			589	01	02/01/83	.0270
			589	01	06/08/83	.0580
			589	01	09/22/83	.1100
			590	01	06/07/83	.0550
			590	01	03/25/85 <	.0500
**** SAMPLES EXCEEDING MAXIMUM VALUE = 43 % ****						
ZINC	MG/L	.0626	586	01	02/02/83	.3000
			589	01	06/08/83	.0800
			589	01	09/22/83	.3900

Table F.3.20 GROUND WATER QUALITY MEASUREMENTS EXCEEDING
STATISTICAL MAXIMUM VALUE BY PARAMETER
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Concluded)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
ZINC	MG/L	.0626	589	01	03/25/85	.1000
			590	01	09/22/83	.0700
			738	01	03/25/85	.2000
			740	01	03/22/85	.0700

**** SAMPLES EXCEEDING MAXIMUM VALUE = 17 % ****

MAPPER DATA FILE: GRJ01*UDPGWQ100372

Table F.3.21 GROUND WATER QUALITY MEASUREMENTS EXCEEDING EPA DRINKING WATER QUALITY STANDARDS
SITE: GRAND JUNCTION
03/26/85 TO 09/10/85

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: BACKGROUND

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
ARSENIC	MG/L	0.05	-	-	-	-
BARIUM	MG/L	1.0	-	-	-	-
CADMIUM	MG/L	0.01	-	-	-	-
CHLORIDE	MG/L	250.0	711	01	03/27/85	300.0000
			711	01	06/07/85	316.0000
			711	01	09/10/85	328.0000
			712	01	03/26/85	350.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 66 % ****						
CHROMIUM	MG/L	0.05	-	-	-	-
COPPER	MG/L	1.0	-	-	-	-
FLUORIDE	MG/L	1.4	-	-	-	-
GROSS ALPHA	PCI/L	15.0	711	01	03/27/85	90.0000
			712	01	03/26/85	50.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
IRON	MG/L	0.3	711	01	06/07/85	.7600
			711	01	09/10/85	.3200
			712	01	03/26/85	1.2000
			712	01	06/07/85	.8900
**** SAMPLES EXCEEDING MAXIMUM VALUE = 66 % ****						
LEAD	MG/L	0.05	-	-	-	-
MANGANESE	MG/L	0.05	711	01	03/27/85	1.4000
			711	01	06/07/85	1.5500
			711	01	09/10/85	1.3300
			712	01	03/26/85	1.1000
			712	01	06/07/85	8.7400
			712	01	09/06/85	.9300
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
MERCURY	MG/L	0.002	-	-	-	-
NITRATE	MG/L	44.0	-	-	-	-
PH	SU	6.5 TO 8.5	-	-	-	-
RA226+RA228	PCI/L	5.0	711	01	06/07/85	< 6.0000
			712	01	06/07/85	< 6.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 19 % ****						
SELENIUM	MG/L	0.01	711	01	06/07/85	.0140
**** SAMPLES EXCEEDING MAXIMUM VALUE = 16 % ****						
SILVER	MG/L	0.05	-	-	-	-
SULFATE	MG/L	250.0	711	01	03/27/85	1500.0000
			711	01	06/07/85	2780.0000
			711	01	09/10/85	2860.0000
			712	01	03/26/85	2700.0000
			712	01	06/07/85	831.0000

Table F.3.21 GROUND WATER QUALITY MEASUREMENTS EXCEEDING EPA DRINKING WATER QUALITY STANDARDS SITE: GRAND JUNCTION 03/26/85 TO 09/10/85 (Concluded)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: BACKGROUND

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
SULFATE	MG/L	250.0	712	01	09/06/85	980.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
TOTAL SOLIDS	MG/L	500.0	711	01	03/27/85	3008.0000
			711	01	06/07/85	5486.0000
			711	01	09/10/85	5370.0000
			712	01	03/26/85	5387.0000
			712	01	06/07/85	2072.0000
			712	01	09/06/85	2340.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
ZINC	MG/L	5.0	-	-	-	-

MAPPER DATA FILE: GRJ01*UDPGWQ100374

Table F.3.22 GROUND WATER QUALITY MEASUREMENTS EXCEEDING
EPA DRINKING WATER QUALITY STANDARDS
SITE: GRAND JUNCTION
02/01/83 TO 09/05/85

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
ARSENIC	MG/L	0.05	-	-	-	-
BARIUM	MG/L	1.0	-	-	-	-
CADMIUM	MG/L	0.01	-	-	-	-
CHLORIDE	MG/L	250.0	710	01	03/21/85	770.0000
			710	01	06/07/85	607.0000
			710	01	09/04/85	783.0000
			744	01	03/21/85	450.0000
			744	01	09/04/85	296.0000
			744	02	09/04/85	302.0000
			744	03	09/04/85	306.0000
			744	04	09/04/85	283.0000
			744	05	09/04/85	323.0000
			745	01	03/30/85	344.0000
			745	01	06/07/85	390.0000
			745	01	09/05/85	352.0000
			746	01	03/22/85	460.0000
			746	01	06/07/85	637.0000
			746	01	09/05/85	656.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 65 % ****						
CHROMIUM	MG/L	0.05	744	01	03/21/85	.0700
**** SAMPLES EXCEEDING MAXIMUM VALUE = 4 % ****						
COPPER	MG/L	1.0	-	-	-	-
FLUORIDE	MG/L	1.4	746	01	06/07/85	1.5000
			746	01	09/05/85	1.6000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 9 % ****						
GROSS ALPHA	PCI/L	15.0	710	01	03/21/85	< 70.0000
			744	01	03/21/85	80.0000
			745	01	03/30/85	80.0000
			746	01	03/22/85	230.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
IRON	MG/L	0.3	588	01	02/01/83	2.3000
			588	01	06/07/85	.3300
			710	01	09/04/85	3.0400
			744	01	03/21/85	1.0000
			745	01	03/30/85	2.2000
			745	01	06/07/85	1.2400
			745	01	09/05/85	.4900
			746	01	03/22/85	.8000
			746	01	06/07/85	1.1500
			746	01	09/05/85	.4100
**** SAMPLES EXCEEDING MAXIMUM VALUE = 43 % ****						
LEAD	MG/L	0.05	-	-	-	-

Table F.3.22 GROUND WATER QUALITY MEASUREMENTS EXCEEDING
EPA DRINKING WATER QUALITY STANDARDS
SITE: GRAND JUNCTION
02/01/83 TO 09/05/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
MANGANESE	MG/L	0.05	588	01	02/01/83	.1600
			588	01	06/07/85	.1500
			588	01	09/04/85	.1500
			710	01	03/21/85	2.7000
			710	01	06/07/85	2.9100
			710	01	09/04/85	2.8600
			744	01	03/21/85	2.0000
			744	01	06/07/85	1.1900
			744	02	06/07/85	1.1600
			744	03	06/07/85	1.1500
			744	04	06/07/85	1.1900
			744	05	06/07/85	1.2000
			744	01	09/04/85	1.3400
			744	02	09/04/85	1.3500
			744	03	09/04/85	1.3800
			744	04	09/04/85	1.3700
			744	05	09/04/85	1.3400
			745	01	03/30/85	1.8000
			745	01	06/07/85	1.4700
			745	01	09/05/85	1.2900
			746	01	03/22/85	2.3000
			746	01	06/07/85	1.7700
			746	01	09/05/85	1.4700
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
MERCURY	MG/L	0.002	-	-	-	-
NITRATE	MG/L	44.0	-	-	-	-
PH	SU	6.5 TO 8.5	-	-	-	-
RA226+RA228	PCI/L	5.0	588	01	09/04/85 <	6.0000
			710	01	06/07/85 <	6.0000
			744	01	03/21/85 <	6.0000
			744	01	09/04/85 <	6.0000
			744	03	09/04/85 <	6.0000
			744	05	09/04/85 <	5.2000
			745	01	06/07/85 <	6.0000
			746	01	03/22/85 <	6.0000
			746	01	09/05/85 <	5.1000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 26 % ****						
SELENIUM	MG/L	0.01	-	-	-	-
SILVER	MG/L	0.05	-	-	-	-
SULFATE	MG/L	250.0	710	01	03/21/85	3000.0000
			710	01	06/07/85	2430.0000
			710	01	09/04/85	2800.0000
			744	01	03/21/85	1700.0000
			744	01	06/07/85	1150.0000
			744	02	06/07/85	1120.0000

Table F.3.22 GROUND WATER QUALITY MEASUREMENTS EXCEEDING
EPA DRINKING WATER QUALITY STANDARDS
SITE: GRAND JUNCTION
02/01/83 TO 09/05/85 (Concluded)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
SULFATE	MG/L	250.0	744	03	06/07/85	1110.0000
			744	04	06/07/85	1150.0000
			744	05	06/07/85	1140.0000
			744	01	09/04/85	1300.0000
			744	02	09/04/85	1380.0000
			744	03	09/04/85	1340.0000
			744	04	09/04/85	1240.0000
			744	05	09/04/85	1410.0000
			745	01	03/30/85	2700.0000
			745	01	06/07/85	2620.0000
			745	01	09/05/85	2450.0000
			746	01	03/22/85	2900.0000
			746	01	06/07/85	3410.0000
			746	01	09/05/85	3370.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 86 % ****						
TOTAL SOLIDS	MG/L	500.0	588	01	02/01/83	878.0000
			588	01	06/07/85	656.0000
			710	01	03/21/85	6204.0000
			710	01	06/07/85	5658.0000
			710	01	09/04/85	6320.0000
			744	01	03/21/85	4462.0000
			744	01	06/07/85	2386.0000
			744	02	06/07/85	2410.0000
			744	03	06/07/85	2456.0000
			744	04	06/07/85	2438.0000
			744	05	06/07/85	2430.0000
			744	01	09/04/85	3080.0000
			744	02	09/04/85	3080.0000
			744	03	09/04/85	4000.0000
			744	04	09/04/85	4000.0000
			744	05	09/04/85	3090.0000
			745	01	03/30/85	5458.0000
			745	01	06/07/85	5376.0000
			745	01	09/05/85	4760.0000
			746	01	03/22/85	6038.0000
			746	01	06/07/85	6878.0000
			746	01	09/05/85	6930.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 95 % ****						
ZINC	MG/L	5.0	-	-	-	-

MAPPER DATA FILE: GRJ01*UDPGWQ100373

Table F.3.23 GROUND WATER QUALITY MEASUREMENTS EXCEEDING EPA DRINKING WATER QUALITY STANDARDS
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
ARSENIC	MG/L	0.05	583	01	09/21/83	.0770
			584	01	09/21/83	.0700
			584	01	03/26/85	.1800
			584	01	06/07/85	.0900
			584	01	09/11/85	.1400
**** SAMPLES EXCEEDING MAXIMUM VALUE = 15 % ****						
BARIUM	MG/L	1.0	-	-	-	-
CADMIUM	MG/L	0.01	583	01	09/21/83	.0720
			583	01	09/11/85	.0140
			584	01	09/21/83	.4200
			584	01	03/26/85	.0970
			584	01	06/07/85	.0730
			584	01	09/11/85	.1420
**** SAMPLES EXCEEDING MAXIMUM VALUE = 25 % ****						
CHLORIDE	MG/L	250.0	581	01	02/07/83	515.0000
			581	01	06/09/83	640.0000
			581	01	09/22/83	530.0000
			581	01	03/26/85	490.0000
			581	01	06/07/85	563.0000
			581	02	06/07/85	573.0000
			581	03	06/07/85	564.0000
			581	04	06/07/85	576.0000
			581	05	06/07/85	579.0000
			581	01	09/11/85	579.0000
			581	02	09/11/85	598.0000
			581	03	09/11/85	580.0000
			581	04	09/11/85	537.0000
			581	05	09/11/85	567.0000
			583	01	02/07/83	760.0000
			583	01	06/07/83	770.0000
			583	01	09/21/83	790.0000
			583	01	03/26/85	660.0000
			583	01	06/07/85	787.0000
			583	01	09/11/85	862.0000
			584	01	02/08/83	822.0000
			584	01	06/08/83	970.0000
			584	01	09/21/83	790.0000
			584	01	03/26/85	720.0000
			584	01	06/07/85	791.0000
			584	01	09/11/85	869.0000
			587	01	01/31/83	375.0000
			587	01	06/08/83	520.0000
			587	01	09/21/83	400.0000
			747	01	03/22/85	740.0000
			747	01	06/07/85	1030.0000

Table F.3.23 GROUND WATER QUALITY MEASUREMENTS EXCEEDING
EPA DRINKING WATER QUALITY STANDARDS
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
CHLORIDE	MG/L	250.0	747	01	09/05/85	1000.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
CHROMIUM	MG/L	0.05	-	-	-	-
COPPER	MG/L	1.0	-	-	-	-
FLUORIDE	MG/L	1.4	581	01	09/22/83	4.4000
			581	01	03/26/85	4.7000
			581	01	06/07/85	4.3000
			581	02	06/07/85	4.2000
			581	03	06/07/85	4.3000
			581	04	06/07/85	4.3000
			581	05	06/07/85	4.1000
			581	01	09/11/85	4.8000
			581	02	09/11/85	4.7000
			581	03	09/11/85	4.9000
			581	04	09/11/85	4.9000
			581	05	09/11/85	4.7000
			583	01	09/21/83	4.4000
			583	01	03/26/85	4.2000
			583	01	06/07/85	3.0000
			583	01	09/11/85	4.2000
			584	01	09/21/83	4.3000
			584	01	03/26/85	3.7000
			584	01	06/07/85	3.7000
			584	01	09/11/85	3.9000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 83 % ****						
GROSS ALPHA	PCI/L	15.0	581	01	03/26/85	160.0000
			583	01	03/26/85	255.0000
			584	01	03/26/85	230.0000
			747	01	03/22/85	< 65.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
IRON	MG/L	0.3	581	01	02/07/83	3.2400
			581	01	06/09/83	1.3100
			581	01	09/22/83	3.7200
			581	01	03/26/85	12.0000
			581	01	06/07/85	11.2000
			581	02	06/07/85	11.1000
			581	03	06/07/85	11.5000
			581	04	06/07/85	11.1000
			581	05	06/07/85	11.4000
			581	01	09/11/85	9.8800
			581	02	09/11/85	9.9100
			581	03	09/11/85	9.8600
			581	04	09/11/85	10.0000
			581	05	09/11/85	9.8800

Table F.3.23 GROUND WATER QUALITY MEASUREMENTS EXCEEDING
EPA DRINKING WATER QUALITY STANDARDS
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
IRON	MG/L	0.3	583	01	02/07/83	.4900
			583	01	03/26/85	1.8000
			583	01	06/07/85	1.0800
			583	01	09/11/85	1.9100
			587	01	01/31/83	.3700
			747	01	03/22/85	3.4000
			747	01	06/07/85	2.0100
			747	01	09/05/85	.4400
**** SAMPLES EXCEEDING MAXIMUM VALUE = 68 % ****						
LEAD	MG/L	0.05	-	-	-	-
MANGANESE	MG/L	0.05	581	01	02/07/83	2.7200
			581	01	06/09/83	2.8500
			581	01	09/22/83	4.5000
			581	01	03/26/85	5.0000
			581	01	06/07/85	4.5900
			581	02	06/07/85	4.5600
			581	03	06/07/85	4.6100
			581	04	06/07/85	4.5800
			581	05	06/07/85	4.5400
			581	01	09/11/85	4.7200
			581	02	09/11/85	4.6400
			581	03	09/11/85	4.6500
			581	04	09/11/85	4.7500
			581	05	09/11/85	4.6100
			583	01	02/07/83	3.1000
			583	01	06/07/83	1.7500
			583	01	09/21/83	10.0000
			583	01	03/26/85	4.3000
			583	01	06/07/85	2.5600
			583	01	09/11/85	4.1500
			584	01	02/08/83	4.2200
			584	01	06/08/83	3.0400
			584	01	09/21/83	8.1000
			584	01	03/26/85	4.0000
			584	01	06/07/85	3.4000
			584	01	09/11/85	3.9200
			587	01	01/31/83	.4600
			587	01	06/08/83	7.1000
			587	01	09/21/83	1.9100
			747	01	03/22/85	4.0000
			747	01	06/07/85	3.1300
			747	01	09/05/85	2.5000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
MERCURY	MG/L	0.002	-	-	-	-
NITRATE	MG/L	44.0	583	01	09/21/83	50.0000

Table F.3.23 GROUND WATER QUALITY MEASUREMENTS EXCEEDING
EPA DRINKING WATER QUALITY STANDARDS
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE		PARAMETER VALUE+/-UNCERTAINTY
**** SAMPLES EXCEEDING MAXIMUM VALUE = 3 % ****							
PH	SU	6.5 TO 8.5	-	-	-		-
RA226+RA228	PCI/L	5.0	581	01	06/07/85		5.4000
			581	04	09/11/85		5.3000
			583	01	09/21/83		30.3000
			583	01	03/26/85		6.1000
			583	01	06/07/85		7.2000
			583	01	09/11/85		6.9000
			584	01	09/21/83		15.0000
			584	01	03/26/85		8.5000
			584	01	06/07/85		7.9000
			584	01	09/11/85		7.0000
			747	01	06/07/85	<	6.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 50 % ****							
SELENIUM	MG/L	0.01	581	01	02/07/83		.0200
			583	01	02/07/83		.0920
			583	01	06/07/83		.0430
			583	01	09/21/83		.1200
			583	01	09/11/85		.0110
			584	01	02/08/83		.0510
			584	01	06/08/83		.0270
			584	01	09/21/83		.2200
			584	01	03/26/85		.2400
			584	01	06/07/85		.1780
			584	01	09/11/85		.1990
**** SAMPLES EXCEEDING MAXIMUM VALUE = 34 % ****							
SILVER	MG/L	0.05	-	-	-		-
SULFATE	MG/L	250.0	581	01	02/07/83		3215.0000
			581	01	06/09/83		3800.0000
			581	01	09/22/83		2800.0000
			581	01	03/26/85		2900.0000
			581	01	06/07/85		2810.0000
			581	02	06/07/85		2810.0000
			581	03	06/07/85		2900.0000
			581	04	06/07/85		2960.0000
			581	05	06/07/85		2920.0000
			581	01	09/11/85		2860.0000
			581	02	09/11/85		2960.0000
			581	03	09/11/85		2870.0000
			581	04	09/11/85		2890.0000
			581	05	09/11/85		2800.0000
			583	01	02/07/83		4200.0000
			583	01	06/07/83		3100.0000
			583	01	09/21/83		4900.0000

Table F.2.23 GROUND WATER QUALITY MEASUREMENTS EXCEEDING EPA DRINKING WATER QUALITY STANDARDS
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
SULFATE	MG/L	250.0	583	01	03/26/85	3700.0000
			583	01	06/07/85	3390.0000
			583	01	09/11/85	3750.0000
			584	01	02/08/83	4440.0000
			584	01	06/08/83	4200.0000
			584	01	09/21/83	4900.0000
			584	01	03/26/85	4100.0000
			584	01	06/07/85	3960.0000
			584	01	09/11/85	4100.0000
			587	01	01/31/83	2370.0000
			587	01	06/08/83	2700.0000
			587	01	09/21/83	2000.0000
			747	01	03/22/85	3400.0000
			747	01	06/07/85	3360.0000
			747	01	09/05/85	3260.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
TOTAL SOLIDS	MG/L	500.0	581	01	02/07/83	5240.0000
			581	01	06/09/83	5610.0000
			581	01	09/22/83	5200.0000
			581	01	03/26/85	5394.0000
			581	01	06/07/85	5464.0000
			581	02	06/07/85	5498.0000
			581	03	06/07/85	5432.0000
			581	04	06/07/85	5460.0000
			581	05	06/07/85	5482.0000
			581	01	09/11/85	5490.0000
			581	02	09/11/85	5540.0000
			581	03	09/11/85	5370.0000
			581	04	09/11/85	5460.0000
			581	05	09/11/85	5400.0000
			583	01	02/07/83	6420.0000
			583	01	06/07/83	5830.0000
			583	01	09/21/83	8000.0000
			583	01	03/26/85	6606.0000
			583	01	06/07/85	6150.0000
			583	01	09/11/85	6890.0000
			584	01	02/08/83	6350.0000
			584	01	06/08/83	6380.0000
			584	01	09/21/83	8100.0000
			584	01	03/26/85	7186.0000
			584	01	06/07/85	6716.0000
			584	01	09/11/85	7440.0000
			587	01	01/31/83	4220.0000
			587	01	06/08/83	4570.0000
			587	01	09/21/83	4790.0000
			747	01	03/22/85	6780.0000

Table F.3.23 GROUND WATER QUALITY MEASUREMENTS EXCEEDING
EPA DRINKING WATER QUALITY STANDARDS
SITE: GRAND JUNCTION
01/31/83 TO 09/11/85 (Concluded)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
TOTAL SOLIDS	MG/L	500.0	747	01	06/07/85	7174.0000
			747	01	09/05/85	7130.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
ZINC	MG/L	5.0	-	-	-	-

MAPPER DATA FILE: GRJ01*UDPGWQ100371

Table F.3.24 GROUND WATER QUALITY MEASUREMENTS EXCEEDING EPA DRINKING WATER QUALITY STANDARDS
SITE: GRAND JUNCTION
03/22/85 TO 09/10/85

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: CROSS GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE		PARAMETER VALUE+/-UNCERTAINTY
ARSENIC	MG/L	0.05	-	-	-		-
BARIUM	MG/L	1.0	-	-	-		-
CADMIUM	MG/L	0.01	-	-	-		-
CHLORIDE	MG/L	250.0	737	01	03/22/85		880.0000
			737	01	06/07/85		1080.0000
			737	01	09/06/85		1100.0000
			739	01	03/22/85		970.0000
			739	01	06/07/85		1130.0000
			739	01	09/05/85		1250.0000
			742	01	03/22/85		590.0000
			742	01	06/07/85		673.0000
			742	01	09/10/85		705.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****							
CHROMIUM	MG/L	0.05	-	-	-		-
COPPER	MG/L	1.0	-	-	-		-
FLUORIDE	MG/L	1.4	-	-	-		-
GROSS ALPHA	PCI/L	15.0	737	01	03/22/85		185.0000
			739	01	03/22/85	<	90.0000
			742	01	03/22/85	<	60.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****							
IRON	MG/L	0.3	737	01	03/22/85		1.7000
			737	01	06/07/85		.6000
			739	01	03/22/85		3.4000
			739	01	06/07/85		1.4700
			739	01	09/05/85		.4700
			742	01	03/22/85		5.7000
			742	01	06/07/85		.5600
			742	01	09/10/85		.6800
**** SAMPLES EXCEEDING MAXIMUM VALUE = 88 % ****							
LEAD	MG/L	0.05	-	-	-		-
MANGANESE	MG/L	0.05	737	01	03/22/85		2.6000
			737	01	06/07/85		2.4700
			737	01	09/06/85		2.1900
			739	01	03/22/85		1.8000
			739	01	06/07/85		1.7600
			739	01	09/05/85		1.5800
			742	01	03/22/85		4.6000
			742	01	06/07/85		2.7700
			742	01	09/10/85		2.4500
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****							
MERCURY	MG/L	0.002	-	-	-		-
NITRATE	MG/L	44.0	-	-	-		-
PH	SU	6.5 TO 8.5	-	-	-		-

Table F.2.24 GROUND WATER QUALITY MEASUREMENTS EXCEEDING
EPA DRINKING WATER QUALITY STANDARDS
SITE: GRAND JUNCTION
03/22/85 TO 09/10/85 (Concluded)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: CROSS GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY	
RA226+RA228	PCI/L	5.0	737	01	06/07/85	< 6.0000	
			739	01	06/07/85	< 6.0000	
			742	01	03/22/85	< 6.0000	
**** SAMPLES EXCEEDING MAXIMUM VALUE = 49 % ****							
SELENIUM	MG/L	0.01	-	-	-	-	
SILVER	MG/L	0.05	-	-	-	-	
SULFATE	MG/L	250.0	737	01	03/22/85	3800.0000	
			737	01	06/07/85	3770.0000	
			737	01	09/06/85	3820.0000	
			739	01	03/22/85	4000.0000	
			739	01	06/07/85	3680.0000	
			739	01	09/05/85	3960.0000	
			742	01	03/22/85	3400.0000	
			742	01	06/07/85	3460.0000	
			742	01	09/10/85	3420.0000	
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****							
TOTAL SOLIDS	MG/L	500.0	737	01	03/22/85	8134.0000	
			737	01	06/07/85	8300.0000	
			737	01	09/06/85	8340.0000	
			739	01	03/22/85	8374.0000	
			739	01	06/07/85	8444.0000	
			739	01	09/05/85	8530.0000	
			742	01	03/22/85	6828.0000	
			742	01	06/07/85	7426.0000	
			742	01	09/10/85	7070.0000	
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****							
ZINC	MG/L	5.0	-	-	-	-	

MAPPER DATA FILE: GRJ01*UDPGWQ1003/5

Table F.3.25 GROUND WATER QUALITY MEASUREMENTS EXCEEDING
EPA DRINKING WATER QUALITY STANDARDS
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
ARSENIC	MG/L	0.05	586	01	09/20/83	.1100

**** SAMPLES EXCEEDING MAXIMUM VALUE = 2 % ****

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
BARIUM	MG/L	1.0	-	-	-	-
CADMIUM	MG/L	0.01	-	-	-	-
CHLORIDE	MG/L	250.0	585	01	02/03/83	790.0000
			585	01	06/09/83	800.0000
			585	01	09/20/83	810.0000
			585	01	03/25/85	850.0000
			585	01	06/07/85	868.0000
			585	01	09/10/85	854.0000
			586	01	02/02/83	805.0000
			586	01	06/09/83	860.0000
			586	01	09/20/83	820.0000
			586	01	03/25/85	740.0000
			586	01	06/07/85	860.0000
			586	01	09/10/85	898.0000
			589	01	02/01/83	749.0000
			589	01	06/08/83	840.0000
			589	01	09/22/83	860.0000
			589	01	03/25/85	930.0000
			589	01	06/07/85	1100.0000
			589	01	09/09/85	1260.0000
			590	01	02/02/83	736.0000
			590	01	06/07/83	990.0000
			590	01	09/22/83	670.0000
			590	01	03/25/85	830.0000
			590	01	06/07/85	459.0000
			590	01	09/09/85	759.0000
			732	01	03/26/85	930.0000
			732	01	06/07/85	1130.0000
			732	01	09/06/85	872.0000
			733	01	03/25/85	1100.0000
			733	01	06/07/85	1250.0000
			733	01	09/06/85	1270.0000
			736	01	03/22/85	890.0000
			736	01	06/07/85	1060.0000
			736	01	09/10/85	997.0000
			738	01	03/25/85	670.0000
			738	01	06/07/85	944.0000
			738	01	09/09/85	1000.0000
			740	01	03/22/85	650.0000
			740	01	06/07/85	707.0000
			740	01	09/09/85	755.0000

**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
CHROMIUM	MG/L	0.05	-	-	-	-

Table F.3.25 GROUND WATER QUALITY MEASUREMENTS EXCEEDING
EPA DRINKING WATER QUALITY STANDARDS
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
COPPER	MG/L	1.0	-	-	-	-
FLUORIDE	MG/L	1.4	585	01	09/20/83	3.2000
			585	01	03/25/85	3.1000
			585	01	06/07/85	3.2000
			585	01	09/10/85	3.7000
			586	01	09/20/83	3.4000
			586	01	03/25/85	3.1000
			586	01	06/07/85	3.3000
			586	01	09/10/85	3.7000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 25 % ****						
GROSS ALPHA	PCI/L	15.0	585	01	03/25/85	380.0000
			586	01	03/25/85	490.0000
			589	01	03/25/85	260.0000
			590	01	03/25/85	240.0000
			732	01	03/26/85	105.0000
			733	01	03/25/85	185.0000
			736	01	03/22/85	345.0000
			738	01	03/25/85	170.0000
			740	01	03/22/85	245.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
IRON	MG/L	0.3	585	01	02/03/83	4.0300
			585	01	06/09/83	2.6400
			585	01	09/20/83	2.7100
			585	01	03/25/85	13.0000
			585	01	06/07/85	11.2000
			585	01	09/10/85	11.0000
			586	01	02/02/83	13.5000
			586	01	06/09/83	6.0900
			586	01	09/20/83	4.7100
			586	01	03/25/85	16.0000
			586	01	06/07/85	12.8000
			586	01	09/10/85	15.4000
			589	01	02/01/83	2.7200
			589	01	09/22/83	3.4200
			589	01	03/25/85	1.1000
			589	01	06/07/85	3.7900
			589	01	09/09/85	3.0500
			590	01	03/25/85	1.1000
			733	01	03/25/85	4.2000
			733	01	06/07/85	2.0400
			733	01	09/06/85	1.3100
			736	01	03/22/85	.5000
			738	01	03/25/85	10.0000
			738	01	06/07/85	9.9700
			738	01	09/09/85	10.3000

Table F.3.25 GROUND WATER QUALITY MEASUREMENTS EXCEEDING
EPA DRINKING WATER QUALITY STANDARDS
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
IRON	MG/L	0.3	740	01	03/22/85	.4000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 66 % ****						
LEAD	MG/L	0.05	-	-	-	-
MANGANESE	MG/L	0.05	585	01	02/03/83	3.4200
			585	01	06/09/83	3.3800
			585	01	09/20/83	4.8000
			585	01	03/25/85	4.8000
			585	01	06/07/85	4.0500
			585	01	09/10/85	4.3100
			586	01	02/02/83	4.0700
			586	01	06/09/83	334.0000
			586	01	09/20/83	4.6000
			586	01	03/25/85	4.8000
			586	01	06/07/85	4.0200
			586	01	09/10/85	4.3300
			589	01	02/01/83	1.2000
			589	01	06/08/83	1.1100
			589	01	09/22/83	1.6100
			589	01	03/25/85	2.0000
			589	01	06/07/85	2.1800
			589	01	09/09/85	2.0800
			590	01	02/02/83	.3600
			590	01	06/07/83	.3800
			590	01	09/22/83	1.2300
			590	01	03/25/85	1.5000
			590	01	06/07/85	.7400
			590	01	09/09/85	1.5700
			732	01	03/26/85	1.0000
			732	01	06/07/85	.8500
			732	01	09/06/85	.6600
			733	01	03/25/85	2.2000
			733	01	06/07/85	2.1700
			733	01	09/06/85	1.8900
			736	01	03/22/85	2.7000
			736	01	06/07/85	3.0000
			736	01	09/10/85	2.1600
			738	01	03/25/85	1.6000
			738	01	06/07/85	1.4000
			738	01	09/09/85	1.4200
			740	01	03/22/85	3.7000
			740	01	06/07/85	2.9600
			740	01	09/09/85	3.2700
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
MERCURY	MG/L	0.002	-	-	-	-
NITRATE	MG/L	44.0	-	-	-	-

Table F.3.25 GROUND WATER QUALITY MEASUREMENTS EXCEEDING
EPA DRINKING WATER QUALITY STANDARDS
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
PH	SU	6.5 TO 8.5	-	-	-	-
RA226+RA228	PCI/L	5.0	585	01	09/20/83	18.0000
			585	01	03/25/85	< 5.5000
			586	01	09/20/83	22.0000
			586	01	03/25/85	6.1000
			586	01	09/10/85	6.1000
			589	01	06/07/85	< 6.0000
			590	01	06/07/85	< 6.6000
			732	01	06/07/85	< 6.0000
			733	01	03/25/85	< 6.0000
			733	01	09/06/85	< 6.0000
			736	01	06/07/85	< 6.0000
			738	01	06/07/85	< 6.0000
			740	01	06/07/85	< 6.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 28 % ****						
SELENIUM	MG/L	0.01	589	01	02/01/83	.0120
**** SAMPLES EXCEEDING MAXIMUM VALUE = 2 % ****						
SILVER	MG/L	0.05	-	-	-	-
SULFATE	MG/L	250.0	585	01	02/03/83	4320.0000
			585	01	06/09/83	4500.0000
			585	01	09/20/83	3800.0000
			585	01	03/25/85	3600.0000
			585	01	06/07/85	3780.0000
			585	01	09/10/85	3820.0000
			586	01	02/02/83	4320.0000
			586	01	06/09/83	4400.0000
			586	01	09/20/83	3800.0000
			586	01	03/25/85	3700.0000
			586	01	06/07/85	3740.0000
			586	01	09/10/85	3730.0000
			589	01	02/01/83	3630.0000
			589	01	06/08/83	3200.0000
			589	01	09/22/83	2900.0000
			589	01	03/25/85	3400.0000
			589	01	06/07/85	3350.0000
			589	01	09/09/85	3560.0000
			590	01	02/02/83	3410.0000
			590	01	06/07/83	2100.0000
			590	01	09/22/83	2500.0000
			590	01	03/25/85	3200.0000
			590	01	06/07/85	1370.0000
			590	01	09/09/85	2570.0000
			732	01	03/26/85	3400.0000
			732	01	06/07/85	3790.0000
			732	01	09/06/85	2860.0000

Table F.3.25 GROUND WATER QUALITY MEASUREMENTS EXCEEDING
EPA DRINKING WATER QUALITY STANDARDS
SITE: GRAND JUNCTION
02/01/83 TO 09/10/85 (Continued)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
SULFATE	MG/L	250.0	733	01	03/25/85	3400.0000
			733	01	06/07/85	3490.0000
			733	01	09/06/85	3430.0000
			736	01	03/22/85	4100.0000
			736	01	06/07/85	3890.0000
			736	01	09/10/85	3760.0000
			738	01	03/25/85	2900.0000
			738	01	06/07/85	3050.0000
			738	01	09/09/85	3310.0000
			740	01	03/22/85	3600.0000
			740	01	06/07/85	3260.0000
			740	01	09/09/85	3300.0000

**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
TOTAL SOLIDS	MG/L	500.0	585	01	02/03/83	6440.0000
			585	01	06/09/83	6520.0000
			585	01	09/20/83	6640.0000
			585	01	03/25/85	7198.0000
			585	01	06/07/85	7310.0000
			585	01	09/10/85	7120.0000
			586	01	02/02/83	6760.0000
			586	01	06/09/83	6620.0000
			586	01	09/20/83	6530.0000
			586	01	03/25/85	7276.0000
			586	01	06/07/85	7186.0000
			586	01	09/10/85	7170.0000
			589	01	02/01/83	6400.0000
			589	01	06/08/83	6030.0000
			589	01	09/22/83	6150.0000
			589	01	03/25/85	7302.0000
			589	01	06/07/85	7184.0000
			589	01	09/09/85	7550.0000
			590	01	02/02/83	6560.0000
			590	01	06/07/83	4670.0000
			590	01	09/22/83	5600.0000
			590	01	03/25/85	6566.0000
			590	01	06/07/85	3292.0000
			590	01	09/09/85	6020.0000
			732	01	03/26/85	7504.0000
			732	01	06/07/85	7864.0000
			732	01	09/06/85	6390.0000
			733	01	03/25/85	7922.0000
			733	01	06/07/85	8092.0000
			733	01	09/06/85	7850.0000
			736	01	03/22/85	8728.0000
			736	01	06/07/85	8792.0000
			736	01	09/10/85	8220.0000

Table F.3.25 GROUND WATER QUALITY MEASUREMENTS EXCEEDING EPA DRINKING WATER QUALITY STANDARDS SITE: GRAND JUNCTION 02/01/83 TO 09/10/85 (Concluded)

FORMATION OF COMPLETION: ALLUVIUM
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
TOTAL SOLIDS	MG/L	500.0	738	01	03/25/85	12134.0000
			738	01	06/07/85	6870.0000
			738	01	09/09/85	7430.0000
			740	01	03/22/85	6876.0000
			740	01	06/07/85	6872.0000
			740	01	09/09/85	6790.0000

**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****

ZINC	MG/L	5.0	-	-	-	-

MAPPER DATA FILE: GRJ01*UDPGWQ100372

Table F.3.26 GROUND WATER QUALITY MEASUREMENTS EXCEEDING
EPA DRINKING WATER QUALITY STANDARDS
SITE: GRAND JUNCTION
03/21/85 TO 07/25/86

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
ARSENIC	MG/L	0.05	-	-	-	-
BARIUM	MG/L	1.0	-	-	-	-
CADMIUM	MG/L	0.01	-	-	-	-
CHLORIDE	MG/L	250.0	727	01	03/29/85	360.0000
			727	01	06/07/85	312.0000
			727	01	09/16/85	325.0000
			743	01	03/21/85	650.0000
			743	01	06/07/85	838.0000
			743	01	09/10/85	955.0000
			743	01	07/25/86	930.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
CHROMIUM	MG/L	0.05	-	-	-	-
COPPER	MG/L	1.0	-	-	-	-
FLUORIDE	MG/L	1.4	727	01	03/29/85	2.8000
			727	01	06/07/85	2.4000
			727	01	09/16/85	2.9000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 50 % ****						
GROSS ALPHA	PCI/L	15.0	727	01	03/29/85	45.0000
			743	01	03/21/85	< 40.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
IRON	MG/L	0.3	-	-	-	-
LEAD	MG/L	0.05	-	-	-	-
MANGANESE	MG/L	0.05	727	01	09/16/85	.0800
			743	01	09/10/85	.0700
**** SAMPLES EXCEEDING MAXIMUM VALUE = 28 % ****						
MERCURY	MG/L	0.002	-	-	-	-
NITRATE	MG/L	44.0	-	-	-	-
PH	SU	6.5 TO 8.5	727	01	03/29/85	8.6000
			743	01	03/21/85	10.2000
			743	01	06/07/85	11.4000
			743	01	09/10/85	10.2000
			743	01	07/25/86	8.5200
**** SAMPLES EXCEEDING MAXIMUM VALUE = 71 % ****						
RA226+RA228	PCI/L	5.0	727	01	06/07/85	< 6.0000
			743	01	06/07/85	< 6.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 22 % ****						
SELENIUM	MG/L	0.01	-	-	-	-
SILVER	MG/L	0.05	-	-	-	-
SULFATE	MG/L	250.0	743	01	03/21/85	2000.0000
			743	01	06/07/85	1900.0000
			743	01	09/10/85	1760.0000

Table F.3.26 GROUND WATER QUALITY MEASUREMENTS EXCEEDING EPA DRINKING WATER QUALITY STANDARDS SITE: GRAND JUNCTION 03/21/85 TO 07/25/86 (Concluded)

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
SULFATE	MG/L	250.0	743	01	07/25/86	1900.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 57 % ****						
TOTAL SOLIDS	MG/L	500.0	727	01	03/29/85	2098.0000
			727	01	06/07/85	2118.0000
			727	01	09/16/85	2150.0000
			743	01	03/21/85	4034.0000
			743	01	06/07/85	4316.0000
			743	01	09/10/85	4450.0000
			743	01	07/25/86	4110.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
ZINC	MG/L	5.0	-	-	-	-

MAPPER DATA FILE: GRJ01*UDPGWQ100378

Table F.3.27 GROUND WATER QUALITY MEASUREMENTS EXCEEDING
EPA DRINKING WATER QUALITY STANDARDS
SITE: GRAND JUNCTION
02/08/83 TO 09/11/85

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
ARSENIC	MG/L	0.05	-	-	-	-
BARIUM	MG/L	1.0	-	-	-	-
CADMIUM	MG/L	0.01	-	-	-	-
CHLORIDE	MG/L	250.0	582	01	02/08/83	496.0000
			582	01	03/30/85	590.0000
			582	01	06/07/85	698.0000
			582	01	09/11/85	723.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
CHROMIUM	MG/L	0.05	-	-	-	-
COPPER	MG/L	1.0	-	-	-	-
FLUORIDE	MG/L	1.4	582	01	09/11/85	1.7000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 33 % ****						
GROSS ALPHA	PCI/L	15.0	582	01	03/30/85	200.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
IRON	MG/L	0.3	582	01	02/08/83	.5000
			582	01	09/11/85	1.0700
**** SAMPLES EXCEEDING MAXIMUM VALUE = 50 % ****						
LEAD	MG/L	0.05	-	-	-	-
MANGANESE	MG/L	0.05	582	01	02/08/83	.1600
			582	01	03/30/85	.3000
			582	01	06/07/85	.1300
			582	01	09/11/85	.7500
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
MERCURY	MG/L	0.002	-	-	-	-
NITRATE	MG/L	44.0	-	-	-	-
PH	SU	6.5 TO 8.5	-	-	-	-
RA226+RA228	PCI/L	5.0	582	01	06/07/85 <	6.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 19 % ****						
SELENIUM	MG/L	0.01	582	01	02/08/83	.0170
**** SAMPLES EXCEEDING MAXIMUM VALUE = 25 % ****						
SILVER	MG/L	0.05	-	-	-	-
SULFATE	MG/L	250.0	582	01	02/08/83	1665.0000
			582	01	03/30/85	2700.0000
			582	01	06/07/85	2440.0000
			582	01	09/11/85	3190.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
TOTAL SOLIDS	MG/L	500.0	582	01	02/08/83	3320.0000
			582	01	03/30/85	5510.0000
			582	01	06/07/85	5480.0000

Table F.3.27 GROUND WATER QUALITY MEASUREMENTS EXCEEDING EPA DRINKING WATER QUALITY STANDARDS SITE: GRAND JUNCTION 02/08/83 TO 09/11/85 (Concluded)

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY	
TOTAL SOLIDS	MG/L	500.0	582	01	09/11/85	6170.0000	
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****							
ZINC	MG/L	5.0	-	-	-	-	

MAPPER DATA FILE: GRJ01*UDPGWQ100380

Table F.3.28 GROUND WATER QUALITY MEASUREMENTS EXCEEDING EPA DRINKING WATER QUALITY STANDARDS
SITE: GRAND JUNCTION
03/26/85 TO 07/25/86

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: CROSS GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE		PARAMETER VALUE+/-UNCERTAINTY
ARSENIC	MG/L	0.05	-	-	-		-
BARIUM	MG/L	1.0	-	-	-		-
CADMIUM	MG/L	0.01	-	-	-		-
CHLORIDE	MG/L	250.0	741	01	03/26/85		1900.0000
			741	01	06/07/85		2020.0000
			741	01	09/13/85		2060.0000
			741	01	07/25/86		1900.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****							
CHROMIUM	MG/L	0.05	-	-	-		-
COPPER	MG/L	1.0	-	-	-		-
FLUORIDE	MG/L	1.4	-	-	-		-
GROSS ALPHA	PCI/L	15.0	741	01	03/26/85	<	50.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****							
IRON	MG/L	0.3	-	-	-		-
LEAD	MG/L	0.05	-	-	-		-
MANGANESE	MG/L	0.05	741	01	09/13/85		.0600
**** SAMPLES EXCEEDING MAXIMUM VALUE = 25 % ****							
MERCURY	MG/L	0.002	-	-	-		-
NITRATE	MG/L	44.0	-	-	-		-
PH	SU	6.5 TO 8.5	741	01	03/26/85		9.2000
			741	01	06/07/85		8.7000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 50 % ****							
RA226+RA228	PCI/L	5.0	741	01	06/07/85	<	6.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 19 % ****							
SELENIUM	MG/L	0.01	-	-	-		-
SILVER	MG/L	0.05	-	-	-		-
SULFATE	MG/L	250.0	-	-	-		-
TOTAL SOLIDS	MG/L	500.0	741	01	03/26/85		3308.0000
			741	01	06/07/85		3798.0000
			741	01	09/13/85		3680.0000
			741	01	07/25/86		3690.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****							
ZINC	MG/L	5.0	-	-	-		-

MAPPER DATA FILE: GRJ01*UDPGWQ100377

Table F.3.29 GROUND WATER QUALITY MEASUREMENTS EXCEEDING EPA DRINKING WATER QUALITY STANDARDS
SITE: GRAND JUNCTION
03/25/85 TO 09/16/85

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY	
ARSENIC	MG/L	0.05	728	01	06/07/85	< .5400	
			735	01	09/16/85	.0600	
**** SAMPLES EXCEEDING MAXIMUM VALUE = 9 % ****							
BARIUM	MG/L	1.0	-	-	-	-	
CADMIUM	MG/L	0.01	-	-	-	-	
CHLORIDE	MG/L	250.0	728	01	03/25/85	800.0000	
			728	01	06/07/85	436.0000	
			728	02	06/07/85	436.0000	
			728	03	06/07/85	422.0000	
			728	04	06/07/85	432.0000	
			728	05	06/07/85	463.0000	
			728	01	09/09/85	716.0000	
			728	02	09/09/85	730.0000	
			728	03	09/09/85	801.0000	
			728	04	09/09/85	697.0000	
			728	05	09/09/85	765.0000	
			729	01	04/01/85	2300.0000	
			729	01	06/07/85	3480.0000	
			729	01	09/16/85	4010.0000	
			731	01	03/26/85	300.0000	
			731	01	06/07/85	554.0000	
			731	01	09/13/85	718.0000	
			735	01	03/29/85	270.0000	
			735	01	06/07/85	500.0000	
			735	01	09/16/85	690.0000	
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****							
CHROMIUM	MG/L	0.05	-	-	-	-	
COPPER	MG/L	1.0	-	-	-	-	
FLUORIDE	MG/L	1.4	729	01	04/01/85	2.6000	
			735	01	03/29/85	2.1000	
			735	01	06/07/85	3.4000	
			735	01	09/16/85	4.7000	
**** SAMPLES EXCEEDING MAXIMUM VALUE = 19 % ****							
GROSS ALPHA	PCI/L	15.0	728	01	03/25/85	120.0000	
			729	01	04/01/85	70.0000	
			731	01	03/26/85	< 40.0000	
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****							
IRON	MG/L	0.3	728	01	03/25/85	2.5000	
			728	01	06/07/85	1.5800	
			728	02	06/07/85	1.5800	
			728	03	06/07/85	1.4500	
			728	04	06/07/85	1.5300	
			728	05	06/07/85	1.5100	

Table F.3.29 GROUND WATER QUALITY MEASUREMENTS EXCEEDING
EPA DRINKING WATER QUALITY STANDARDS
SITE: GRAND JUNCTION
03/25/85 TO 09/16/85 (Continued)

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
**** SAMPLES EXCEEDING MAXIMUM VALUE = 29 % ****						
LEAD	MG/L	0.05	-	-	-	-
MANGANESE	MG/L	0.05	728	01	03/25/85	1.7000
			728	01	06/07/85	.9500
			728	02	06/07/85	.9000
			728	03	06/07/85	.9500
			728	04	06/07/85	.9400
			728	05	06/07/85	.9000
			728	01	09/09/85	1.6100
			728	02	09/09/85	1.5600
			728	03	09/09/85	1.5900
			728	04	09/09/85	1.6100
			728	05	09/09/85	1.6000
			735	01	09/16/85	.0600
**** SAMPLES EXCEEDING MAXIMUM VALUE = 59 % ****						
MERCURY	MG/L	0.002	-	-	-	-
NITRATE	MG/L	44.0	-	-	-	-
PH	SU	6.5 TO 8.5	729	01	04/01/85	11.5000
			729	01	06/07/85	9.2000
			729	01	09/16/85	9.1000
			731	01	03/26/85	12.6000
			731	01	06/07/85	12.5000
			731	01	09/13/85	12.4000
			735	01	03/29/85	11.8000
			735	01	06/07/85	10.8000
			735	01	09/16/85	9.6000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 44 % ****						
RA226+RA228	PCI/L	5.0	728	01	06/07/85	< 6.0000
			729	01	04/01/85	< 7.0000
			731	01	03/26/85	< 6.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 16 % ****						
SELENIUM	MG/L	0.01	729	01	04/01/85	.0110
			735	01	03/29/85	.0240
			735	01	06/07/85	.0160
**** SAMPLES EXCEEDING MAXIMUM VALUE = 14 % ****						
SILVER	MG/L	0.05	-	-	-	-
SULFATE	MG/L	250.0	728	01	03/25/85	3400.0000
			728	01	06/07/85	1430.0000
			728	02	06/07/85	1450.0000
			728	03	06/07/85	1400.0000
			728	04	06/07/85	1430.0000
			728	05	06/07/85	1570.0000

Table F.3.29 GROUND WATER QUALITY MEASUREMENTS EXCEEDING
EPA DRINKING WATER QUALITY STANDARDS
SITE: GRAND JUNCTION
03/25/85 TO 09/16/85 (Concluded)

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
SULFATE	MG/L	250.0	728	01	09/09/85	2650.0000
			728	02	09/09/85	2820.0000
			728	03	09/09/85	2780.0000
			728	04	09/09/85	2680.0000
			728	05	09/09/85	2700.0000
			729	01	04/01/85	330.0000
			735	01	06/07/85	347.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 64 % ****						
TOTAL SOLIDS	MG/L	500.0	728	01	03/25/85	6600.0000
			728	01	06/07/85	3638.0000
			728	02	06/07/85	3684.0000
			728	03	06/07/85	3668.0000
			728	04	06/07/85	3638.0000
			728	05	06/07/85	3672.0000
			728	01	09/09/85	5930.0000
			728	02	09/09/85	5950.0000
			728	03	09/09/85	5850.0000
			728	04	09/09/85	5870.0000
			728	05	09/09/85	5820.0000
			729	01	04/01/85	4842.0000
			729	01	06/07/85	6280.0000
			729	01	09/16/85	6650.0000
			731	01	03/26/85	2994.0000
			731	01	06/07/85	2740.0000
			731	01	09/13/85	2830.0000
			735	01	09/16/85	1810.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
ZINC	MG/L	5.0	-	-	-	-

MAPPER DATA FILE: GRJ01*UDPGW0100379

Table F.3.30 GROUND WATER QUALITY MEASUREMENTS EXCEEDING
EPA DRINKING WATER QUALITY STANDARDS
SITE: GRAND JUNCTION
03/29/85 TO 07/27/86

FORMATION OF COMPLETION: SANDSTONE
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
ARSENIC	MG/L	0.05	-	-	-	-
BARIUM	MG/L	1.0	724	01	03/30/85	5.1000
			724	01	06/07/85	5.5400
			724	02	06/07/85	5.2900
			724	03	06/07/85	5.3200
			724	04	06/07/85	5.4900
			724	05	06/07/85	5.9300
			725	01	03/29/85	1.8000
			725	02	03/29/85	1.8000
			725	01	06/07/85	1.0500
**** SAMPLES EXCEEDING MAXIMUM VALUE = 59 % ****						
CADMIUM	MG/L	0.01	-	-	-	-
CHLORIDE	MG/L	250.0	724	01	03/30/85	1600.0000
			724	01	06/07/85	1520.0000
			724	02	06/07/85	1510.0000
			724	03	06/07/85	1560.0000
			724	04	06/07/85	1500.0000
			724	05	06/07/85	1600.0000
			724	01	09/13/85	893.0000
			724	02	09/13/85	914.0000
			724	03	09/13/85	903.0000
			724	04	09/13/85	922.0000
			724	05	09/13/85	925.0000
			724	01	07/25/86	1900.0000
			724	02	07/25/86	1800.0000
			724	03	07/25/86	1800.0000
			724	04	07/25/86	1800.0000
			724	05	07/25/86	1800.0000
			725	01	03/29/85	2400.0000
			725	02	03/29/85	2300.0000
			725	01	06/07/85	3720.0000
			725	01	09/12/85	4150.0000
			725	01	07/27/86	3400.0000
			726	01	07/25/86	520.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
CHROMIUM	MG/L	0.05	-	-	-	-
COPPER	MG/L	1.0	-	-	-	-
FLUORIDE	MG/L	1.4	724	01	03/30/85	2.6000
			724	01	06/07/85	2.1000
			724	02	06/07/85	2.1000
			724	03	06/07/85	2.2000
			724	04	06/07/85	2.1000
			724	05	06/07/85	2.0000
			724	01	09/13/85	2.1000
			724	02	09/13/85	2.1000

Table F.3.30 GROUND WATER QUALITY MEASUREMENTS EXCEEDING
EPA DRINKING WATER QUALITY STANDARDS
SITE: GRAND JUNCTION
03/29/85 TO 07/27/86 (Continued)

FORMATION OF COMPLETION: SANDSTONE
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
FLUORIDE	MG/L	1.4	724	03	09/13/85	2.1000
			724	04	09/13/85	2.1000
			724	05	09/13/85	2.2000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 73 % ****						
GROSS ALPHA	PCI/L	15.0	724	01	03/30/85	< 60.0000
			725	01	03/29/85	220.0000
			725	02	03/29/85	100.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
IRON	MG/L	0.3	725	01	06/07/85	111.0000
			725	01	07/27/86	.6100
			726	01	07/25/86	1.6800
**** SAMPLES EXCEEDING MAXIMUM VALUE = 13 % ****						
LEAD	MG/L	0.05	-	-	-	-
MANGANESE	MG/L	0.05	724	01	09/13/85	.0700
			724	02	09/13/85	.0700
			724	03	09/13/85	.0600
			724	04	09/13/85	.0700
			724	05	09/13/85	.0700
			725	01	07/27/86	.1800
			726	01	07/25/86	.4600
**** SAMPLES EXCEEDING MAXIMUM VALUE = 31 % ****						
MERCURY	MG/L	0.002	-	-	-	-
NITRATE	MG/L	44.0	-	-	-	-
PH	SU	6.5 TO 8.5	725	01	03/29/85	12.6000
			725	02	03/29/85	12.6000
			725	01	06/07/85	11.9000
			725	01	09/12/85	11.9000
			725	01	07/27/86	9.0600
**** SAMPLES EXCEEDING MAXIMUM VALUE = 22 % ****						
RA226+RA228	PCI/L	5.0	724	01	06/07/85	8.0000
			725	01	03/29/85	11.0000
			725	02	03/29/85	5.3000
			725	01	09/12/85	5.1000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 30 % ****						
SELENIUM	MG/L	0.01	725	01	06/07/85	.0160
**** SAMPLES EXCEEDING MAXIMUM VALUE = 4 % ****						
SILVER	MG/L	0.05	-	-	-	-
SULFATE	MG/L	250.0	-	-	-	-
TOTAL SOLIDS	MG/L	500.0	724	01	03/30/85	4576.0000
			724	01	06/07/85	4438.0000

Table F.3.30 GROUND WATER QUALITY MEASUREMENTS EXCEEDING EPA DRINKING WATER QUALITY STANDARDS
SITE: GRAND JUNCTION
03/29/85 TO 07/27/86 (Concluded)

FORMATION OF COMPLETION: SANDSTONE
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE +/-UNCERTAINTY
TOTAL SOLIDS	MG/L	500.0	724	02	06/07/85	4450.0000
			724	03	06/07/85	4428.0000
			724	04	06/07/85	4430.0000
			724	05	06/07/85	4468.0000
			724	01	09/13/85	2950.0000
			724	02	09/13/85	2980.0000
			724	03	09/13/85	3110.0000
			724	04	09/13/85	3070.0000
			724	05	09/13/85	3380.0000
			724	01	07/25/86	3930.0000
			724	02	07/25/86	3930.0000
			724	03	07/25/86	3920.0000
			724	04	07/25/86	3920.0000
			724	05	07/25/86	3920.0000
			725	01	03/29/85	6174.0000
			725	02	03/29/85	6178.0000
			725	01	06/07/85	7164.0000
			725	01	09/12/85	6930.0000
			725	01	07/27/86	7210.0000
			726	01	07/25/86	7050.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
ZINC	MG/L	5.0	-	-	-	-

MAPPER DATA FILE: GRJ01*UDPGWQ100376

Maps of iso-concentrations for those constituents for which a "plume" could be defined are presented in Figures F.3.15 through F.3.18.

Background water quality. Background water quality in the alluvium varies both seasonally and with distance from the Colorado River (U.S. Bureau of Reclamation, no date). Several wells were used to characterize background water quality in the alluvium. Two U.S. Bureau of Reclamation wells, 711 and 712 (Figure F.3.10) exhibit the decreasing quality moving away from the river (Table F.3.7).

The use of Bureau of Reclamation wells 711 and 712 as representative of background water quality in the alluvium is based on the following reasons:

- The wells are approximately 2.5 miles from the tailings where ground-water levels are more than 20 feet above the levels near the tailings.

- The wells penetrate a ground-water system that is known to be continuous through the Grand Valley (U.S. Bureau of Reclamation, 1978).

Water quality for samples taken from well 743 is defined as background for the Mancos Shale, based on two reasons:

- The well is hydraulically upgradient or crossgradient from the tailings depending upon temporal effects.

- Water quality for a sample taken from the well is similar to or better in quality than reported water quality for other monitoring wells completed in Mancos Shale in the area (e.g., U.S. Bureau of Reclamation, 1978).

Background water quality for the Dakota Sandstone was more difficult to define than background in the alluvium or Mancos Shale. An extensive study of the artesian water supply of the Grand Junction area did not include samples from wells completed in the Dakota Sandstone (Lohman, 1965). It did, however, produce qualitative reports on the water quality in the Dakota Sandstone (Lohman, 1965): "The water generally is too poor for use..."

It is also reported that locally, water from either the Burro Canyon Formation or Dakota Sandstone or both, is satisfactory for domestic use (Lohman, 1965). Because of this apparent spatial variability in the quality of water in the Dakota Sandstone, problems in defining background quality for the Dakota Sandstone near the site were identified:

- Samples from domestic wells completed in the Dakota Sandstone might not be representative of quality near the site.

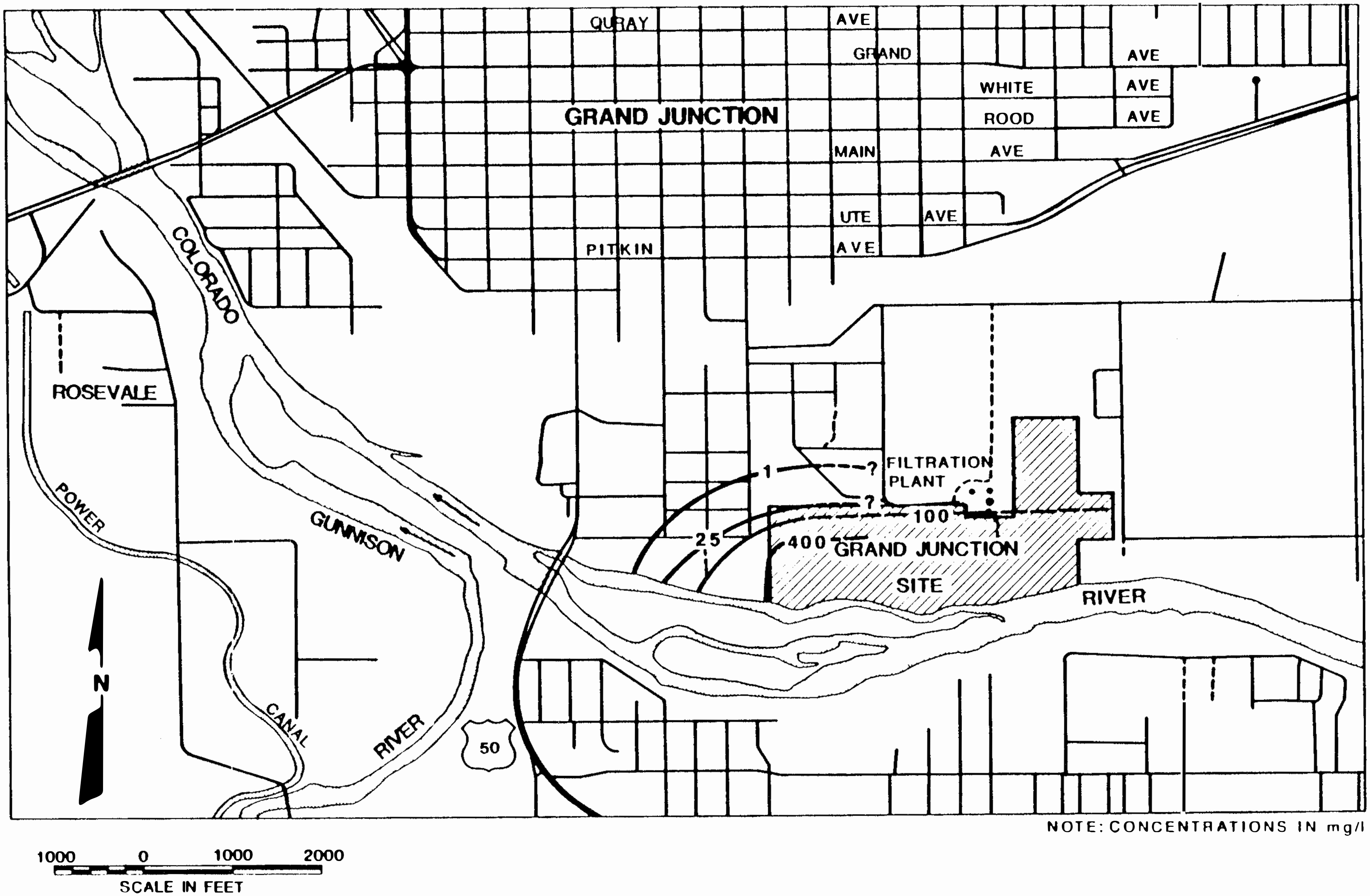


FIGURE F.3.15
ISO-CONCENTRATIONS OF AMMONIUM IN ALLUVIAL GROUND WATER FOR MARCH, 1985

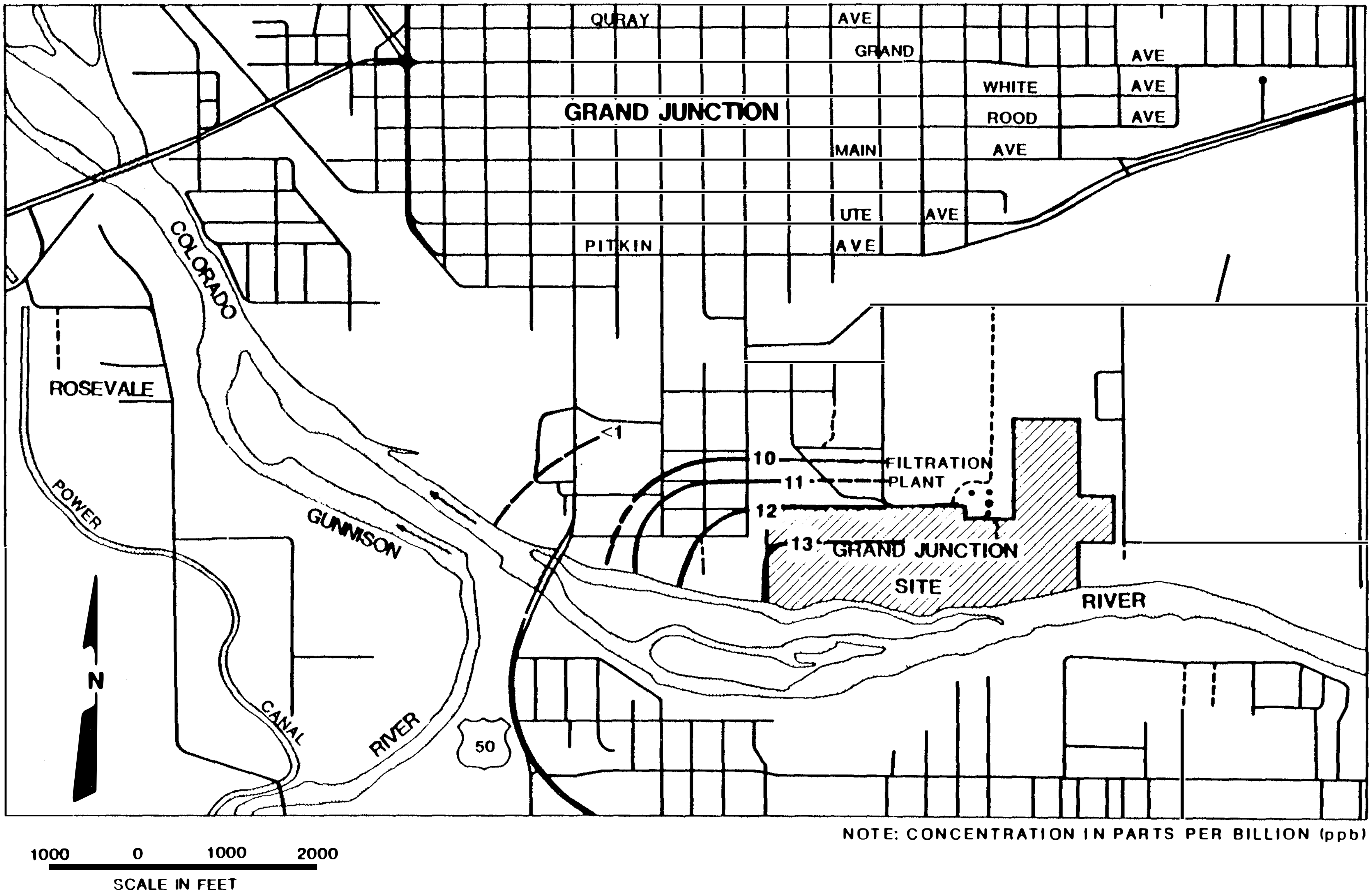


FIGURE F.3.16
ISO-CONCENTRATIONS OF ARSENIC IN MANCOS SHALE FOR MARCH, 1985

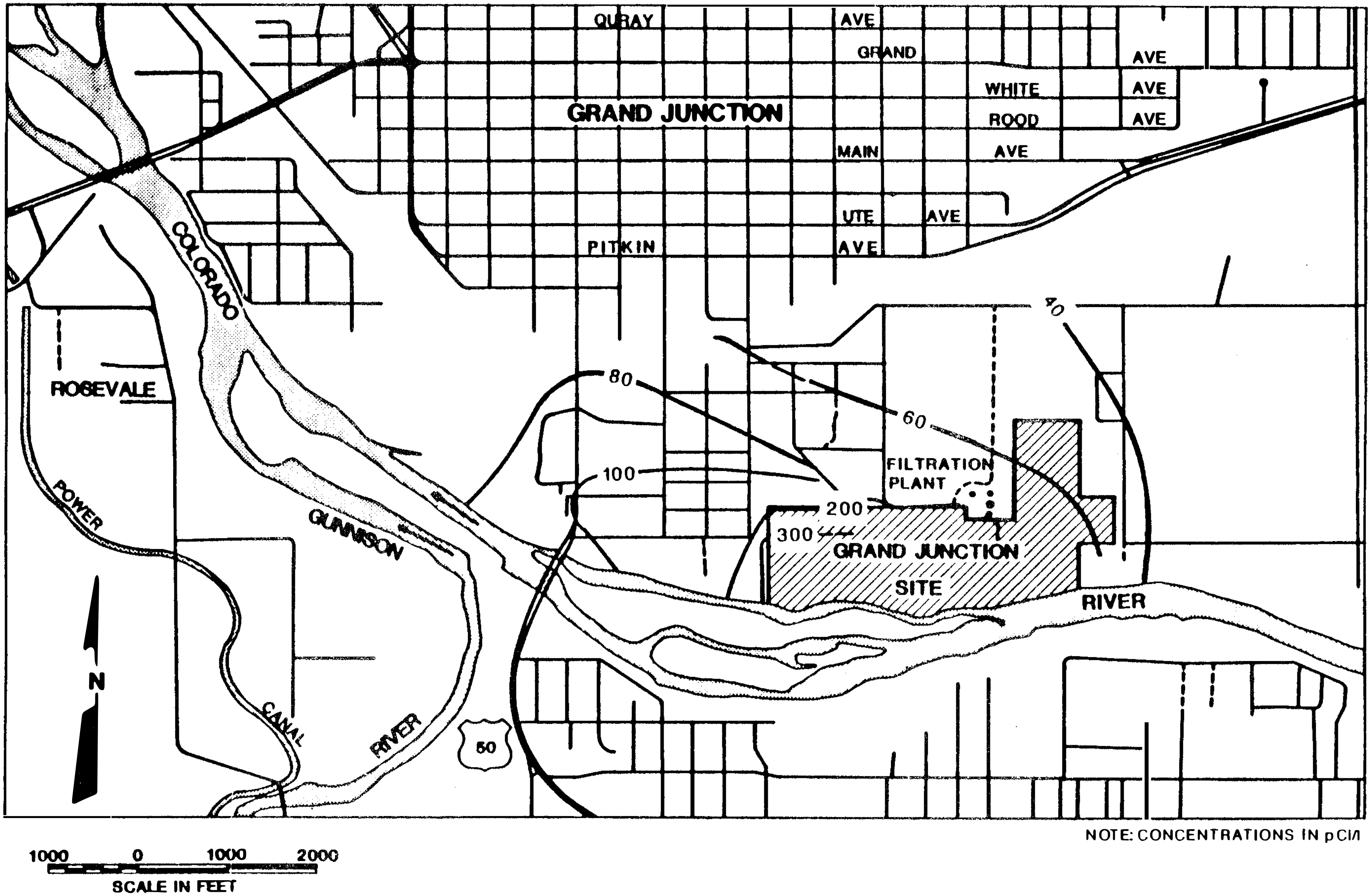
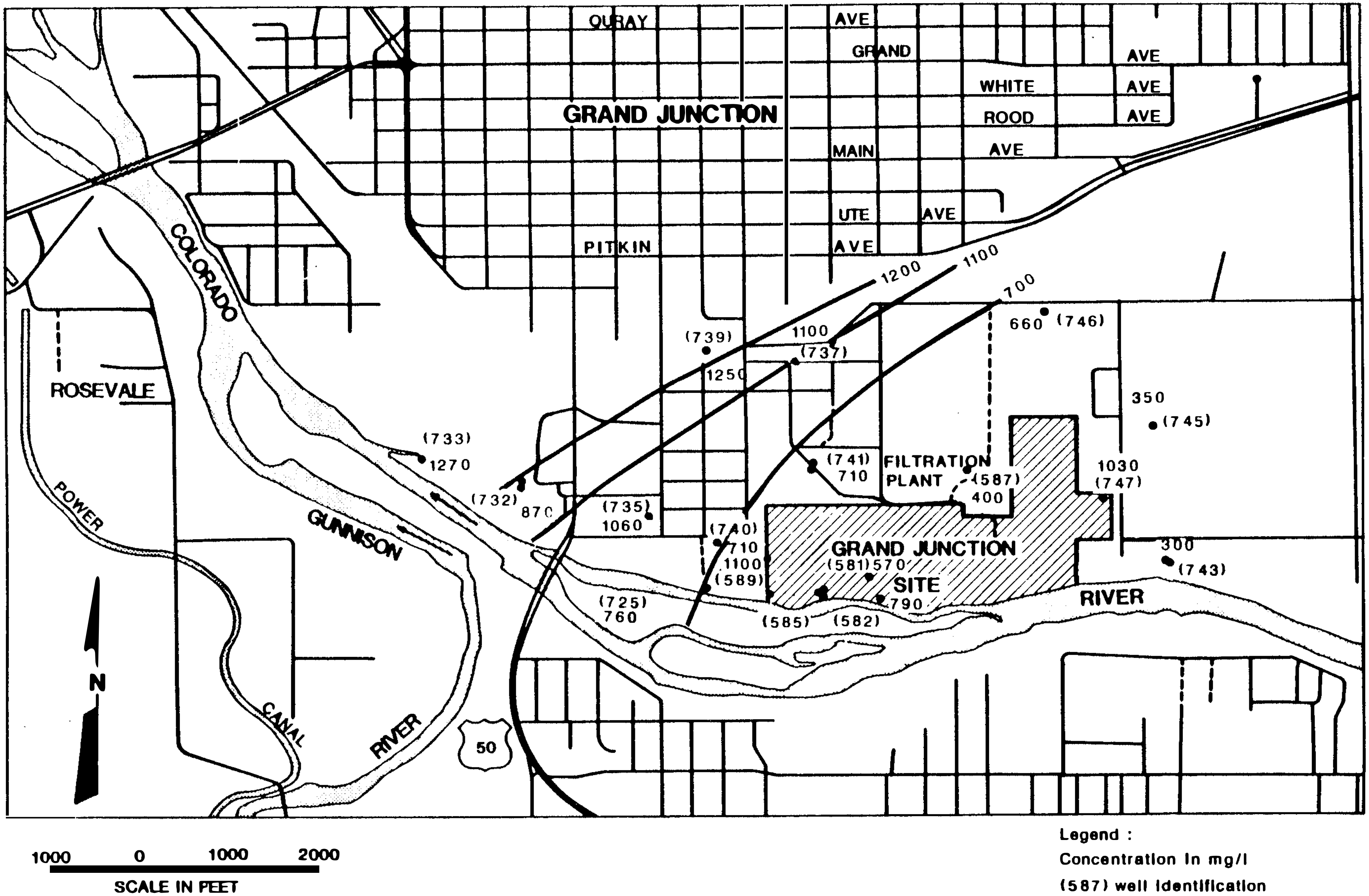


FIGURE F.3.17
ISO-CONCENTRATIONS OF URANIUM IN ALLUVIAL GROUND WATER FOR MARCH, 1985



Legend :
Concentration in mg/l
(587) well identification
400 chloride concentration at well

FIGURE F.3.18
ISO-CONCENTRATIONS OF CHLORIDE IN ALLUVIAL GROUND WATER

- o The Mancos Shale thins from the east end of the site toward the west. A well drilled through the upgradient alluvium might not be representative of background quality for the Dakota Sandstone below the downgradient alluvium, where there is probably more interaction between water in the alluvium and the Dakota Sandstone.

These problems indicated the need to drill a background well in the Dakota Sandstone which was not only below the downgradient alluvium, but reasonably certain of being uncontaminated. A nest of wells were drilled on one of the islands west of the site, including wells in the Mancos Shale and Dakota Sandstone. Water quality from the well in the Dakota Sandstone (725) is defined as background based on the following reasons:

- o Flow in the Dakota Sandstone is probably from south to north; based on the dip of the beds, and identification of the probable recharge area as the outcrop area, which is to the south of the site (Lohman, 1965).

- o The alluvium overlying the Mancos Shale and Dakota Sandstone near the background well is separated from the contaminated portion of the alluvium in the immediate vicinity of the tailings by an arm of the Colorado River.

- o Water quality for samples at an adjacent background well completed in the Mancos Shale (727) did not show indications of contamination.

To determine the nature and extent of contamination in the alluvial ground water resulting from leachate generated at the Grand Junction site, upgradient, on-site, crossgradient, and downgradient concentrations were compared to background alluvial ground-water quality (Tables F.3.17 through F.3.20), and all ground-water analyses were compared to the EPA primary and secondary drinking water standards (Tables F.3.21 through F.3.30). Comparisons to both the standards and the background quality are needed because the background ground water, as represented by samples from wells 711 and 712, consistently exceeded several standards (Table F.3.21). Table F.3.31 summarizes the comparison to background alluvial ground-water quality, and Table F.3.32 summarizes exceedences to the EPA standards. The standards for gross alpha, manganese, sulfate, and TDS are exceeded by all of the background samples. The standards for chloride and iron are exceeded by 66 percent of the background samples and for radium and selenium, 19 and 16 percent of the samples, respectively.

Based on the exceedence of the standards and the exceedence of the maximum background values by alluvial ground-water samples on the site and downgradient of the site, five constituents are most critical:

Table F.3.31 Comparison to background alluvial ground-water quality

		Upgradient		On-site		Downgradient		Crossgradient	
Constituent[a]	Maximum background value[b]	Percent exceedence[c]	Maximum value	Percent exceedence	Maximum value	Percent exceedence	Maximum value	Percent exceedence	Maximum value
Alkalinity	1073	0		15	1375	0		0	
Aluminum	0.05	4	0.30	12	0.51	6	0.19	11	0.20
Ammonium	15.7	13	62.1	100	521.0	54	438	0	
Antimony	0.008	0		0		3	0.012	0	
Arsenic	0.005	8	0.01	78	0.18	25	0.11	0	
Barium	0.068	0		9	0.17	15	0.30	0	
Boron	1.097	0		0		0		0	
Cadmium	0.0012	0		37	0.42	3	0.003	0	
Calcium	423	100	655	90	654	89	665	100	630
Chloride	399.8	30	783.0	96	1030	97	1270	100	1250
Chromium	0.02	4	0.07	3	0.03	10	0.03	33	0.030
Cobalt	0.039	0		31	0.66	7	0.082	0	
Conductance	6715	4	7735	64	10,004	76	10,780	88	9360
Copper	0.0508	0		25	0.20	7	0.116	0	
Cyanide	0.005	0		0		0		0	
Fluoride	1.15	13	1.60	83	4.90	25	3.7	11	1.20
Gross Alpha	126.6	25	230	75	255	88	490	33	185
Gross Beta	25.0	50	100.0	100	155	100	200	66	80
Iron	1.48	13	3.04	53	12.0	53	16.0	33	5.7
Lead	0.005	0		6	0.01	9	0.02	0	
Magnesium	548	4	570	0		10	620	33	625
Manganese	8.74	0		3	10.0	2	334	0	
Mercury	0.0003	0		4	0.0004	6	0.0009	0	
Molybdenum	0.076	21	0.150	90	0.53	46	0.44	66	0.14
Nickel	0.068	9	0.090	84	0.380	40	0.17	0	
Nitrate	8.45	0		10	50.00	14	39	0	
TOC	55.8	8	525	38	139.0	39	522	22	562
Lead-210	2.7	0		25	2.8	5	2.7	0	

Table F.3.31 Comparison to background alluvial ground-water quality (concluded)

Constituent[a]	Maximum background value[b]	Upgradient		On-site		Downgradient		Crossgradient	
		Percent exceedence[c]	Maximum value	Percent exceedence	Maximum value	Percent exceedence	Maximum value	Percent exceedence	Maximum value
pH	7.45	13	7.8	0		2	7.6	0	
Phosphate	2.54	0		0		0		0	
Polonium-210	0.50	0		12	1.10	0		0	
Potassium	15.63	13	29.70	90	113.00	76	120	0	
Radium-226	0.50	0		83	29.00	16	18	0	
Radium-228	0.50	16	1.10	44	2.20	9	4.5	0	
Selenium	0.015	0		28	0.24	0		0	
Silica	21.3	0		41	29.0	17	27.8	0	
Silver	0.005	0		0		0		0	
Sodium	952	0		21	1210	74	1370	66	1260
Strontium	4.52	36	6.84	84	6.7	96	7.9	100	7.40
Sulfate	3834	0		25	4900	15	4500	22	4000
Thorium-230	0.50	0		19	0.95	9	5.4	0	
Tin	0.0025	0		9	0.008	7	0.01	22	0.005
TDS	7221	0		9	8100	35	12,134	66	8530
TOX	0.25	38	8.20	50	0.70	53	0.90	66	0.60
Uranium-234	35.2	5	36.0	46	64.0	95	118	88	118
Uranium-238	23.1	11	30.7	61	66.0	100	116	100	33
Vanadium	0.02	0		59	13.8	43	0.40	11	0.03
Zinc	0.06	8	1.00	46	37.0	17	0.39	22	0.09

[a] All concentrations are in mg/l except specific conductance which is in units of micromhos per centimeter. Gross alpha, gross beta, lead-210, polonium-210, radium-226, radium-228, thorium-230, uranium-234, and uranium-238 are in units of pCi/l, and pH is in standard pH units.

[b] The maximum background value is the greater of the highest recorded value and the mean of all values plus two standard deviations.

[c] Percent exceedance represents the number of samples that exceed the maximum background level.

Table F.3.32 Comparison of ground-water quality to EPA standards

Constituent	Standard[a]	Background alluvium percent exceedence	Upgradient alluvium percent exceedence	On-site alluvium percent exceedence	Downgradient alluvium percent exceedence	Crossgradient alluvium percent exceedence	Upgradient shale percent exceedence	Downgradient shale percent exceedence	Crossgradient shale percent exceedence	Upgradient sandstone percent exceedence
Arsenic	0.05	0	0	15	2	0	0	9	0	0
Barium	1.0	0	0	0	0	0	0	0	0	59
Cadmium	0.01	0	0	25	3	0	0	0	0	0
Chloride	250.0	66	65	100	97	100	100	100	100	100
Chromium	0.05	0	4	0	0	0	0	0	0	0
Copper	1.0	0	0	0	0	0	0	0	0	0
Fluoride	1.4	0	9	83	25	0	50	19	0	73
Gross Alpha	15[b]	100	100	100	100	100	100	100	100	100
Iron	0.3	66	43	68	66	88	0	29	0	13
Lead	0.05	0	0	0	0	0	0	0	0	0
Manganese	0.05	100	100	100	100	100	28	59	25	31
Mercury	0.002	0	0	0	0	0	0	0	0	0
Nitrate	44.0	0	0	3	0	0	0	0	0	0
pH	6.5 to 8.5	0	0	0	0	0	71	44	50	22
Radium	5.0[c]	19	26	50	28	19	22	16	19	30
Selenium	0.01	16	0	34	2	0	0	14	0	4
Silver	0.05	0	0	0	0	0	0	0	0	0
Sulfate	250.0	100	86	100	100	100	57	64	0	0
TDS	500.0	100	95	100	100	100	100	100	100	100
Zinc	5.0	0	0	0	0	0	0	0	0	0

[a]All standards are in units of mg/l except pH, gross alpha, and radium. Gross alpha and radium (radium-226 plus radium-228) are in units of pCi/l, and pH is in standard pH units.

[b]This standard excludes uranium and radon. Analyses included all alpha emitters including uranium and radon; therefore, the percent exceedences for gross alpha are conservatively high. Also, the gross alpha is not a drinking water standard but is applied to contamination from uranium mill tailings.

[c]Many values were less than six pCi/l. These values were considered to be in exceedence of the standard; therefore, the percent exceedences for radium are conservatively high.

- o Chloride exceeded the drinking water standard in 100 percent of the on-site samples and 97 percent of the downgradient samples; it exceeded the maximum background value in 96 percent of the on-site samples and 97 percent of the downgradient samples.

- o Fluoride exceeded the drinking water standard in 83 percent of the on-site samples and 25 percent of the downgradient samples, and exceeded the maximum background value in 83 percent of the on-site samples and 25 percent of the downgradient samples.

- o Iron exceeded the drinking water standard in 68 percent of the on-site samples and 66 percent of the downgradient samples; it exceeded the maximum background value in 53 percent of both the on-site and downgradient samples.

- o Sulfate exceeded the drinking water standard in 100 percent of on-site and downgradient samples and exceeded the maximum background value in 25 percent of the on-site samples and 15 percent of the downgradient samples.

- o Cadmium exceeded the drinking water standard in 25 percent of the on-site samples and three percent of the downgradient samples; it exceeded the maximum background value in 37 percent of the on-site samples and three percent of the downgradient samples.

Other constituents whose concentrations exceeded the maximum background values in on-site and downgradient samples, but have no associated drinking water standards, include calcium, gross beta, potassium, strontium, ammonium, specific conductance, molybdenum, nickel, sodium, uranium, total halogenated hydrocarbons (TOX), and vanadium. During placement of the tailings slurry, leachate may have moved upgradient in the shallow ground water. This past movement of leachate may account for elevated, upgradient concentrations of some constituents such as ammonium.

All of the manganese and TDS concentrations in on-site and downgradient samples exceeded the drinking water standards but only exceeded the maximum background concentration for manganese in three percent of the on-site samples and two percent of the downgradient samples. For TDS, nine percent of the on-site samples and 35 percent of the downgradient samples exceeded the maximum background concentration.

Although radium and gross alpha are shown to exceed the Title II uranium mill tailings standard, these values are not appropriate. Radium is considered to exceed the standard for analyses with detection limits over five pCi/l. Many of the recorded exceedences are less than six pCi/l. These samples may be within compliance of the standard. The gross alpha measurements included uranium and radium whereas the standard excludes these two constituents. Excluding uranium activity from the gross alpha count would reduce the measurements to less than the standard for most of the samples.

The organic components, total organic carbon (TOC), and total halogenated hydrocarbons (TOX) often exceed the background concentrations. To check the toxicity of the organic component, several samples were collected for analysis of priority pollutants and several organics which have drinking water standards. These samples were collected from locations that had high TOC in previous analyses. The analyses for the specific organics indicated concentrations less than detection or very low concentrations.

The distribution of key chemical constituents in ground water is discussed further below, indicating the distinction between contaminants which have a readily definable plume (e.g. patterned distribution) and those which although elevated, have a sporadic distribution.

Aluminum. Background concentrations of aluminum appear to be near the lower detection limit (LDL) of 0.001 to 0.1 mg/l. Samples collected in September, 1983, detected aluminum at levels of 0.17 to 0.51 milligrams per liter (mg/l) near the tailings and 0.018 to 0.19 mg/l downgradient of the tailings. Samples collected in March, 1985, were analyzed using a LDL of 0.1 mg/l. Aluminum was detected in one upgradient alluvial well (745) at a concentration of 0.3 mg/l and in three downgradient wells completed in bedrock (729, 735, 731) at concentrations of 0.2 to 0.7 mg/l.

Ammonium. Ammonium is a key indicator of contamination. At background alluvial wells, concentrations do not exceed 15.7 mg/l. Below or near the tailings, concentrations in the alluvium range between 18 and 393 mg/l for samples collected in March, 1985. Downgradient concentrations in the alluvium ranged from background levels up to 124 mg/l. A plume extends at least 1100 feet but less than 2600 feet downgradient in the alluvium (Figure F.3.15). Wells completed in the shallow bedrock also show elevated levels of ammonium, ranging from background (6.05 mg/l) to 18.1 mg/l. An industrial drainage (flood-control) well (710) had a reported concentration of 45 mg/l in March, 1985. The distribution of ammonium beneath and around the site in the shallow ground water indicated that the water quality in well 710 may be affected by leachate through the tailings. No other indications of contamination were found at this well with the possible exception of elevated uranium (see below).

Arsenic. Background arsenic concentrations appear to be the LDL of 0.01 mg/l. Samples collected from alluvial wells in March, 1985, found arsenic above the LDL only in wells near or below the tailings, at levels between 0.015 and 0.019 mg/l. Downgradient wells completed in the shallow bedrock showed arsenic at concentrations between 0.010 and 0.013 mg/l. Within the shallow bedrock a detectable plume of arsenic probably extends at least 2000 feet but less than 3000 feet downgradient from the tailings (Figure F.3.16).

Arsenic in the bedrock may represent residual contamination. During active milling arsenic concentrations in the alluvium could have been high enough to act as a source of contamination for the underlying Mancos Shale. Flow through the relatively high permeability alluvium could have flushed arsenic out of the alluvium (no arsenic was measured in downgradient samples from alluvial wells), whereas flow in the relatively low permeability shale did not flush out the arsenic.

Boron. Concentrations of boron in samples collected in the 1985 and 1986 field program were very similar to background concentrations.

Chromium. Background concentrations of chromium appear to be between the LDL of 0.01 mg/l and 0.03 mg/l. The primary drinking water standard for chromium is 0.05 mg/l. Only three wells sampled in March, 1985, fall outside the background concentration range (743, 744, 582). Elevated concentrations of chromium do not seem to be associated with the tailings.

Cobalt. Background concentrations of cobalt appear to be at the LDL. Samples collected in March, 1985, showed elevated concentrations of cobalt only in wells completed beneath the tailings (583, 584) or evaporation pond (747).

Manganese. Manganese is absent in shallow bedrock wells except for one well completed beneath the tailings. Background concentrations of manganese in alluvial wells appear to range from 1.1 to 2.6 mg/l. Samples showed elevated concentrations below or near the tailings, ranging up to 4.8 mg/l. There is no apparent downgradient plume. The secondary drinking water standard for manganese is 0.05 mg/l, and the majority of wells sampled exceeded this standard.

Molybdenum. Molybdenum in ground water is commonly associated with uranium mill tailings. Molybdenum is also common in the waters of Colorado. It has been measured at a concentration of 0.033 mg/l in the Colorado River below Glenwood Springs, and at a concentration of 0.087 mg/l in the Colorado River between Kremmling and Dotsero (Voegeli and King, 1969). Background concentrations in the alluvial ground water are probably subject to a relatively high degree of uncertainty, but appear to range up to 0.12 mg/l.

Molybdenum appears to be present in elevated concentrations below the tailings with concentrations up to 0.53 mg/l. Based on an upper background concentration of 0.12 mg/l, and also looking at the spatial variations in concentration, there does not appear to be a downgradient plume.

Nickel. Background concentrations of nickel appear to be at or below the LDL of 0.04 mg/l. Elevated concentrations were found below the tailings and evaporation ponds, ranging up to 0.29 mg/l. One downgradient alluvial well (736) had a concentration of 0.10 mg/l, and one deep bedrock well west of the tailings had a possible anomalous concentration of 0.05 mg/l.

Radium-226. Background concentrations of radium-226 in the alluvium are less than LDL of one pCi/l. Background concentrations in the Dakota Sandstone are more difficult to determine. A national survey of uranium and radium concentrations in ground water found that in the Colorado Plateau, which includes Grand Junction, interpretation of ground water is complicated by the abundance of uranium deposits (Scott and Barker, 1962):

> "The region is the chief uranium province of the United States, both areally and quantitatively. It was not possible before preparation of this report to collect sufficient samples of ground water for statistical treatment from sources known to be unassociated with uranium deposits."

As an alternate means of characterizing background, the recommendation of the same authors was followed (Scott and Barker, 1962): "The statistical results from the western stable region might tentatively be used to evaluate this region, for these two regions were coextensive before the Laramide orogeny." The "anomaly threshold" for the western stable region is 7.3 pCi/l (Scott and Barker, 1962).

A single water sample from a well completed below the tailings had a radium-226 concentration of 29 pCi/l, and several water samples from below the tailings have had concentrations of 15 to 18 pCi/l. Radium-226 has not been detected at any wells away from the tailings, except for concentrations of 1.6 to 5.5 pCi/l at two bedrock wells to the west of the site (724,725), which is below the "anomaly threshold" used to define background.

Selenium. The background concentration of selenium appears to be at or below the LDL of 0.002 mg/l or 0.005 mg/l. Elevated concentrations of selenium are associated with the tailings, particularly at one well (584) where concentrations have reached 0.240 mg/l. Two downgradient wells (729, 735) completed in the shallow bedrock also show concentrations of selenium at concentrations of 0.011 and 0.024 mg/l in March, 1985. There is no apparent downgradient plume in the alluvium; however, five wells (581, 582, 583, 584, and 589) have shown selenium levels greater than the primary drinking water standard of 0.01 mg/l. These levels have not been consistently elevated but have fluctuated above and below the standard upon repeated sampling.

Total dissolved solids. Concentrations of total dissolved solids (TDS) in the alluvium range from seasonal lows of less than 900 mg/l upgradient of the tailings (588) up to a local high of 12,000 mg/l (738). The highest concentrations off the site (738) exceed the highest concentrations measured below the tailings by a factor of three, and are probably a result of other sources of contamination (Section F.3.2.5), rather than contamination from the tailings. There is no readily apparent downgradient plume in the alluvium. The secondary drinking water standard for TDS is 500 mg/l, and all wells sampled exceeded this standard. On the basis of TDS (Hem, 1970) water quality in the alluvium ranges from seasonally fresh to brackish to salty. It is predominantly brackish.

Water quality in the Mancos Shale and Dakota Sandstone near the site can be classified as brackish. There is no readily apparent TDS plume in the shallow bedrock.

Uranium. Background concentrations of uranium in shallow ground water vary, reaching at least 40 pCi/l (Bureau of Reclamation well 712) and have been measured as low as 6.8 pCi/l(well 588). Uranium concentrations fluctuate seasonally by a factor of two to six. Below the tailings, concentrations have been measured as high as 610 pCi/l (584).

A plume of uranium elevated above background concentrations extends downgradient of the tailings (Figure F.3.17). Concentrations are 100 pCi/l at a distance of approximately 2000 feet from the site, and 80 pCi/l at a distance of approximately 3000 feet from the site. Wells 2000 feet north to northwest of the tailings (737,739) are cross-gradient from the tailings. Concentrations at these wells were measured at 58 and 34 pCi/l. Because of the variability and known high concentrations of uranium in the background, it is not certain if these concentrations reflect contamination. There are no correlative indicators of contamination at these wells (e.g. elevated concentrations of ammonium, vanadium, or other constituents associated with mill tailings).

Background concentrations of uranium in deep bedrock wells may be discerned from previous studies of geochemistry in the area. A sample population of 30 (Markos and Bush, 1983a) included several artesian wells and found a mean uranium concentration of 0.012 mg/l (8.2 pCi/l), with a range calculated maximum of 0.034 mg/l (23.1 pCi/l). A compilation of data on uranium concentrations in ground water found too little data to produce statistics for the geotectonic region which includes Grand Junction, but recommended the use of data for another region wherein the "anomaly threshold" for uranium was 0.048 mg/l (32.64 pCi/l) (Scott and Barker, 1962). Concentrations in samples collected in March, 1985, in bedrock wells near the tailings were all within the range calculated maximum and below the anomaly threshold. Uranium has not shown a tendency to migrate into the bedrock. Shallow bedrock wells (729, 735, 741) which exhibit other indications of contamination (see below) all had uranium concentrations below the lower detection limit.

One upgradient industrial drainage well (710) had a reported uranium concentration of 52 pCi/l. This is more than 25 percent above the highest measured background concentration of 40 pCi/l and may represent contamination.

Vanadium. Background concentrations of vanadium appear to be the LDL of 0.01 mg/l. For water samples collected in March, 1985, vanadium was seen at a few wells. Below the tailings (584) concentrations reached 7.48 mg/l. Downgradient of the tailings vanadium is seen in wells completed in the shallow bedrock (729, 741, 735, 731). No vanadium was reported for alluvial wells sampled in March, 1985.

Zinc. Background concentrations of zinc probably range up to 0.1 mg/l. Elevated concentrations are apparent below the tailings to 4.1 mg/l (584), at one well upgradient of the tailings (745) at 1.0 mg/l, and in shallow bedrock wells downgradient of the tailings (729, 735) at concentrations up to 5.3 mg/l. Only three alluvial wells showed zinc at concentrations greater than 0.1 mg/l. These are wells 582, 583, and 738 with concentrations of 0.2, 0.6, and 0.2 mg/l, respectively.

Other radioisotopes. No detectable concentrations of polonium-210 or thorium-230, were found for a LDL of one pCi/l. Lead-210 was reported in one background well (711) at 2.3 pCi/l and at one well below the tailings (584) at 2.8 pCi/l.

Organic compounds. Organic compounds were used in the milling process at Grand Junction, including di(2-ethylhexyl) phosphoric acid (EHPA), and tributyl phosphate (TBP) dissolved in No. 2 fuel oil (Merritt, 1971). Total organic carbon (TOC) and total organic halogen (TOX) were used as a screening guide in an attempt to determine if organic compounds were present in ground water near the site. Concentrations of TOC and TOX are reported in Tables F.3.7 through F.3.16.

Because TOC and TOX were found in the ground water, the following selected wells were sampled for analysis of organic compounds:

581,583 (below tailings)
732,736 (downgradient)
737 (cross-gradient, north of tailings)
744,746 (upgradient)
747 (below evaporation pond).

An analysis of water samples was done for EPA priority pollutants and up to 10 other compounds. No organic compounds were reported with the following exception:

- Methylene chloride, found in four analyses at five to eight parts per billion (ppb), and thought to be from laboratory contamination.
- Tetrahydrofuran, reported at well 583 at 46 ppb. The suggested permissible concentration in water is 8100 ppb (Sittig, 1981).
- Bis(2-ethylhexyl) phthalate, reported at upgradient well 746 at 150 ppb.
- Nine alkanes, reported at upgradient well 746 at concentrations between 26 to 72 ppb.

The Grand Junction tailings are in an area where there is substantial industrial, commercial, and agricultural activity which would involve the use of organic chemicals. The detection of organic chemicals in ground water at upgradient well 746 can probably be attributed to one of these sources, as can the detection of one compound below the tailings (well 583) at a concentration well below the suggested permissible concentration in water. There is no apparent organic contamination of ground water associated with the tailings.

F.3.1.7 Proximity of site to surface water

The tailings are immediately adjacent to and hydraulically connected to the Colorado River. At times of high river stage the Colorado River flows directly against the covered tailings. The other prominent nearby bodies of surface water are a drainage ditch immediately adjacent to the east end of the tailings, a drainage ditch which flows north-south approximately 1500 feet east of the tailings, and a duck pond near the east end of the tailings. (Figure F.3.10). Numerous other major and minor canals, laterals, drainage ditches, and ephemeral drainages are within three miles of the tailings. The discharge of contaminants to surface water is discussed in Section F.3.2.4.

F.3.2 PHYSICAL AND CHEMICAL CHARACTERIZATION OF WASTE AND CONTAMINANT TRANSPORT

The physical and chemical characterization of waste and contaminant transport has several purposes:

- Identification of the potential contaminants.
- Determination of which contaminants have migrated from the tailings.

- o Identification of the extent and relative concentration of contamination, e.g., the contaminant plume.

- o Determination of the rate of contaminant migration.

- o Determination of the extent to which contaminated ground water is discharging to hydraulically connected surface water.

- o Separation of the contamination due to mill tailings from other contaminant sources.

F.3.2.1 Geochemistry of waste

The geochemical setting of the potentially affected hydrogeologic environment has been studied in detail on a site-specific basis. Pertinent findings of these studies are discussed below.

Milling. The Grand Junction mill was operated as an acid-leach process. Relative to other acid leach tailings, the pH is about two pH units higher (less acidic): ranging from 4.0 to 6.5 with a median of 5.5. Both hydrochloric and sulfuric acid were used during the milling process. Iron, ammonia, and salt (NaCl) were other prominent constituents associated with the milling process (Merritt, 1971).

Tailings. The water-soluble concentration of chemical constituents in the tailings is an indicator of which constituents represent potential contamination. Among the constituents which have been found to be present in the tailings in water-soluble form at concentrations above background levels are uranium, vanadium, arsenic, cadmium, and molybdenum. The soils in the evaporation ponds also contain water-soluble concentrations of arsenic, uranium, and vanadium which are above background concentrations (Markos and Bush, 1983a).

Comparison of uranium and radium data for tailings versus adjacent, contaminated soils shows differences (Markos and Bush, 1983a). The migration of radium is much less than that of uranium. Uranium can be expected to be more mobile than radium because it forms sulfate and carbonaceous complexes, whereas radium forms precipitates with sulfate and carbonate.

The tailings also contain high concentrations of the anions sulfate and chloride. The high concentrations of these anions and the acidic conditions of the tailings enhance the mobility of most elements, including such elements as the water soluble constituents listed above as well as selenium, iron, and aluminum.

The mobility of these constituents decreases in the ground water relative to their mobility in the tailings. The migration rates of these constituents is less than the groundwater seepage velocity due to geochemical retardation processes such as precipitation and adsorption.

Some data on the leaching behavior of the tailings in fresh water are available (Veyera, 1980), and are presented in Table F.3.33 and Figure F.3.19. These data indicate that key constituents have leached from the tailings. The mobility of many of these constituents decreases in the ground water. Section F.3.1.6 discusses which constituents are detected above background concentrations in ground water.

F.3.2.2 Water-quality impacts

Water-quality impacts are evaluated for three cases: existing conditions, relocation of the tailings, and impacts for stabilization on the site.

Existing impacts. Water quality for the affected hydrogeologic regime is described in Section F.3.1.6. The concentration of several constituents exceeds EPA standards for drinking water as a result of tailings leachate. The tailings have not caused the quality of the Colorado River to fall outside Colorado water quality standards. The background quality of the ground water is predominantly brackish, and the affected system is not currently used for any purpose.

Relocation of the tailings - residual effects at the processing site. If the tailings are relocated to an alternate disposal site, impacts to water quality near the processing site would be due to residual contamination in the ground water, and possibly sorbed or precipitated contaminants in the alluvium. The impacts to ground water at the Cheney Reservoir and Two Road sites are discussed in Sections F.4 and F.5, respectively.

EPA standards require an evaluation of the persistence and permanence of adverse effects of the ground water. A mixing cell model was used to evaluate the persistence of residual contamination at Grand Junction. A single cell model for water quality is created by assigning a water quality to each component of the water balance for the cell. A mixing cell model was chosen because:

- The varied flow direction within the shallow ground water would tend to make the system analogous to a mixing cell.

- A single cell mixing cell model is simple and is easy to use.

The mixing cell model for the alluvial system has the following features:

- The water balance consists of ground-water inflow, transient storage, and ground-water outflow. Net infiltration and seepage to, or from, deeper aquifers is considered negligible.

Table F.3.33 Chemical analysis of first effluent sample for distilled water leaching test

		Beach sand	Slimes
Soil type		Beach sand	Slimes
Solid weight (g)		1,000	1,170
First sample weight (g)		273.8	275.0
Ca	ppm	687.00	607.00
Mg	ppm	169.00	2,230.00
Na	ppm	314.00	6,880.00
K	ppm	12.00	84.00
P	ppm	0.60	1.00
Al	ppm	0.30	76.00
Fe	ppm	0.03	1.53
Mn	ppm	0.36	7.84
Ti	ppm	0.01	0.08
Cu	ppm	0.07	13.00
Zn	ppm	0.04	225.00
Ni	ppm	0.05	7.51
Mo	ppm	2.68	0.31
Cd	ppm	0.01	6.44
Cr	ppm	0.02	0.08
Sr	ppm	2.80	6.39
B	ppm	0.19	1.60
Ba	ppm	0.08	0.13
Pb	ppm	0.10	5.80
Hg[a]	ppm	0.01	- --
As[a]	ppm	1.60	- --
Se[a]	ppm	10.70	- --
HCO_3	ppm	124.00	0.00
SO_4	ppm	2,330.00	10,800.00
Cl	ppm	504.00	10,640.00
NO_3	ppm	96.00	ND
pH	standard units	6.40	4.30
Cond	ppm	4,700.00	35,800.00
Tds	ppm	4,560.00	35,560.00

Dash - sample not analyzed

ND - Not determined

[a]Hg, As, Se determined by $NaBH_4$ reducing technique (vapor generation) to avoid spectral interference.

Ref. Veyera, 1980.

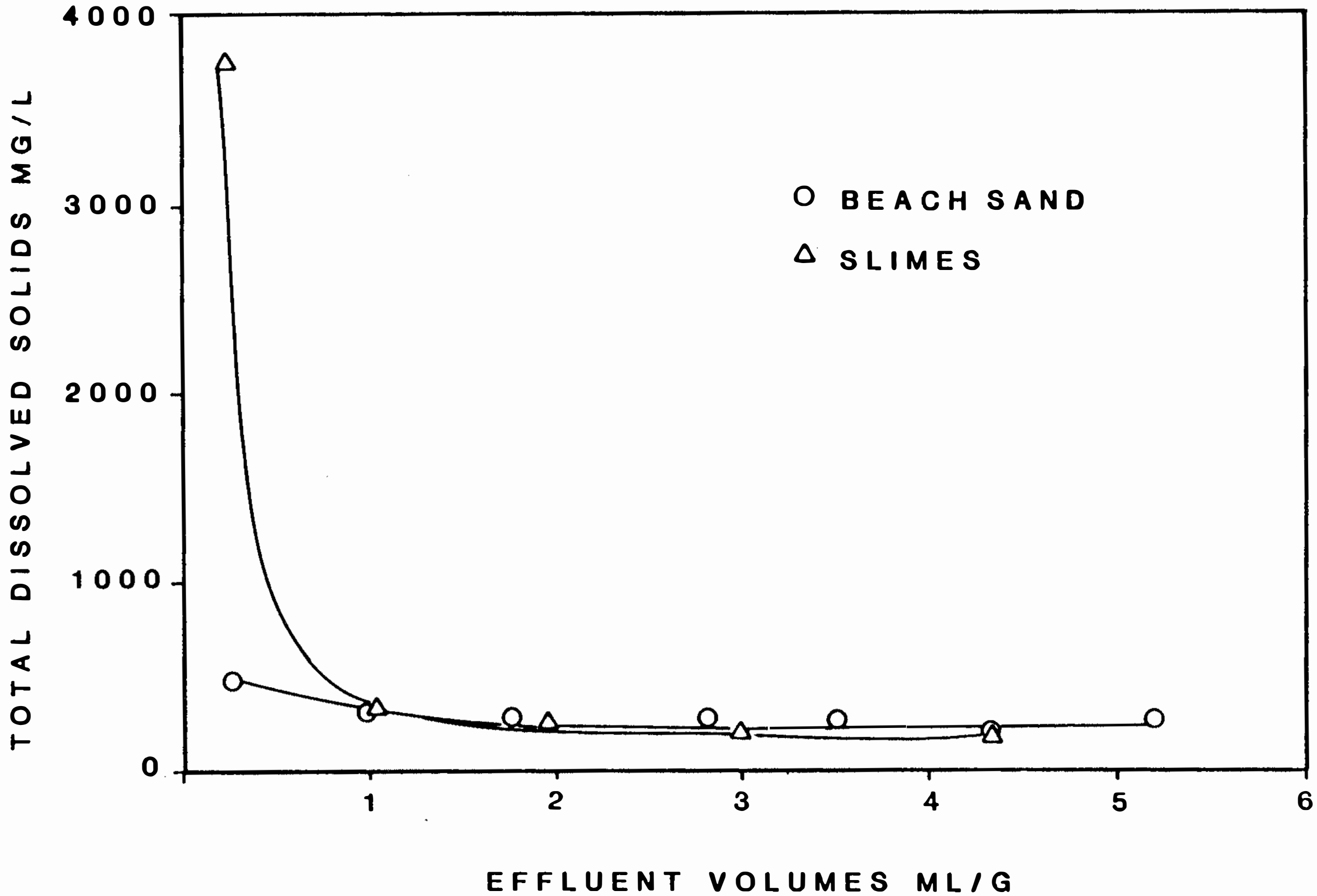


FIGURE F.3.19

RESULTS OF DISTILLED DRIP LEACH TESTS ON BEACH SAND AND SLIMES
Source: Veyera(1980)

- o The mixing cell is treated as a completely mixed system. Dispersivity is not treated explicitly, but is considered only in that it enhances mixing and essentially, creates a dilution problem.

- o Geochemical retardation (i.e. sorption, precipitation), desorption, and radioactive decay are not considered. This assumption overestimates contaminant migration rates and may underestimate flushing times.

- o Time is discretized on an annual basis.

A schematic illustration of the conceptual model and the equations representing the model are shown in Figure F.3.20. The results of the model for the gradual dilution of uranium are presented in Table F.3.34. A range of results is found, depending on the initial concentrations in the ground-water background concentrations, volume of alluvial ground water below the tailings (calculated using drainable porosity), and the rate of ground-water flux. This range in results gives some indication of the sensitivity of the model, and of the physical system, to the uncertainty or variability in various factors.

The results of the model show that residual uranium would be flushed from the aquifer within 100 years, but that concentrations of uranium greater than the EPA's health advisory level of 10 pCi/l may persist for more than 25 years. However, background concentrations of uranium may be more than the advisory level (Section F.3.1.6).

Residual concentrations of contaminants other than uranium were not evaluated with the mixing cell model. Other than uranium, only ammonium had a readily definable plume in the alluvial ground water. The sporadic distribution of other contaminants indicates that one or more of several processes is occurring:

- o The constituents are subject to substantial geochemical retardation and dispersion.

- o The effects of leaching of constituents into ground water are obscured by the concentrations present in the background water.

- o The constituents are rapidly flushed from the ground water.

- o Variability may also result from the density, locations, and completion depths of the monitor wells.

Solute transport calibrations and simulations were conducted for ammonium, arsenic, chloride, and uranium in the alluvial ground-water system. The calibrations are based on interpretation of Figures F.3.15 through F.3.18. Solute transport was simulated with an analytical equation presented in

LEGEND	RULES
C_n DENOTES CONCENTRATION V_n DENOTES VOLUME	C_0 AND V_1 ARE CONSTANTS $\frac{dV_0}{dt} = \frac{dV_2}{dt}$ AND ARE CONSTANT $C_2(t_{n+1}) = \dfrac{C_0 \cdot \left(\frac{dV_0}{dt}\right) \Delta t + C_1(t) \cdot V_1 - C_1(t) \left(\frac{dV_0}{dt}\right) \Delta t}{\left(\frac{dV_0}{dt}\right) \Delta t + V_1}$ $C_1(t_{n+1}) = C_2(t_{n+1})$

FIGURE F.3.20

MIXING CELL MODEL OF GROUND-WATER QUALITY

Table F.3.34 Results of mixing cell model for residual uranium concentration in ground water

Ground-water flux rate[a]	Background concentration[b]	Cell volume[c]	Average initial concentration under tailings[d]	Effluent concentrations[e]			
				10 yrs	25 yrs	50 yrs	100 yrs
5.7×10^6	20	7.0×10^7	600	285	102	32	20
1.6×10^7	20	1.4×10^8	600	217	59	23	20
1.0×10^8	20	2.5×10^8	600	40	20	20	20
1.6×10^7	20	1.4×10^8	125	56	27	20	20
1.6×10^7	20	1.4×10^8	300	115	39	21	20
1.6×10^7	6.8	1.4×10^8	300	106	26	8	6.8
1.6×10^7	40	1.4×10^8	300	128	57	41	40

[a]In liters per year, from Table F.3.5.
[b]In pCi/l, from Table F.3.6.
[c]In liters, from Table F.3.6.
[d]In pCi/l, highest seasonal concentrations below tailings, from Table F.3.6.
[e]In pCi/l, for given number of years after remedial action.

Javandel et al, 1984, page 19. The equation is a solution to a two-dimensional, homogeneous, isotropic porous medium having a unidirectional steady state flow. The dispersion coefficients are in the direction and orthogonal to the direction of flow. The source is a strip orthogonal to the direction of flow. Retardation, exponential decay of the solute, and exponential decay of the source can be simulated. The computer code which numerically solves this equation is documented; this documentation is available in the UMTRA Project Office, Albuquerque, New Mexico.

For each simulation, a source length of 960 feet and a decay constant for the solute of zero were used. The present time was assumed to be 25 years since solute transport began. The calculated average linear velocity for the alluvium at the site ranges from 60 to 1800 feet/year. Calibrations were determined using the low value, 60 feet/year, and adjusting the retardation coefficient to approximate measured values. Because the decay constant for the solute was zero and the decay factor for the source was small (0.02 to 0.044), retardation coefficients and average linear velocities tend to vary linearly and directly. Therefore, if the transport for a given solute was calibrated at the low velocity and some retardation factor, a similar calibration could be obtained at the high velocity by multiplying the first retardation factor by the ratio of the high velocity to the low velocity. Dispersivities were calibrated with the ammonium plume because this plume was defined best. The calibrated values of dispersivity were 225 feet for longitudinal and 22.5 feet for transverse. These values are within the range expected for alluvium (Freeze and Cherry, 1979). Table F.3.35 presents the input and results of the calibrations.

Two simulations were performed for each constituent based on the calibrations. In one simulation, it was assumed that the source would continue to decay at the same rate as in the calibration. This is a no action scenario. In the other simulation, it was assumed that the source would decay from its present concentration to background during a three-year remedial action. This scenario predicts lower concentrations than may be expected because residual contamination is not taken into account. The likely occurrence would be somewhere between these two predictions. Figures F.3.21 through F.3.24 show the results of these simulations for a point along the axis of the plume at the location of the Dakota Sandstone subcrop.

These analyses indicate the following:

- Levels of the four constituents generated during remedial action should be minor.

- Arsenic is presently, and even with no action should remain, well below drinking water standards.

Table F.3.35 Solute transport calibrations

Constituent - Ammonium Decay factor for source = 0.02 Initial source concentration = 500 mg/l Present source concentration = 303 mg/l Velocity/retardation coefficient = 12/feet/year

X-coordinate (feet)	Y-coordinate (feet)	Measured concentration (mg/l)	Calculated concentration (mg/l)
200	0	300	294
650	0	100	111
900	0	25	37
1450	0	1	0.7
200	500	100	90
650	500	15	42
900	500	1	14
1450	500	< 1	0.3

Constituent - Arsenic Decay factor for source = 0.044 Initial source concentration = 0.025 mg/l Present source concentration = 0.008 mg/l Velocity/retardation coefficient = 60/feet/year

X-coordinate (feet)	Y-coordinate (feet)	Measured concentration (mg/l)	Calculated concentration (mg/l)
775	0	12	12.2
1350	0	11	11.4
1645	0	10	9.6
775	500	11	5.2
1350	500	9	5.1
1645	500	4	4.3

Constituent - Uranium Decay factor for source = 0.02 Initial source concentration = 300 pCi/liter Present source concentration = 182 pCi/liter Velocity/retardation coefficient = 54/feet/year

X-coordinate (feet)	Y-coordinate (feet)	Measured concentration (mg/l)	Calculated concentration (mg/l)
190	0	180	192
2130	0	60	57
190	500	100	61
2130	500	20	26

Table F.3.35 Solute Transport Calibrations (concluded)

Constituent - Chloride Decay factor for source = 0.1 Initial source concentration = 2340 mg/l Present source concentration = 513 mg/l Background concentration = 350 mg/l-average linear velocity = 124 ft/yr-No retardation

X-coordinate (feet)	Y-coordinate (feet)	Measured concentration (mg/l)	Calculated concentration (mg/l)
880	0	700	750
1920	0	1100	1090
2640	0	1200	1200

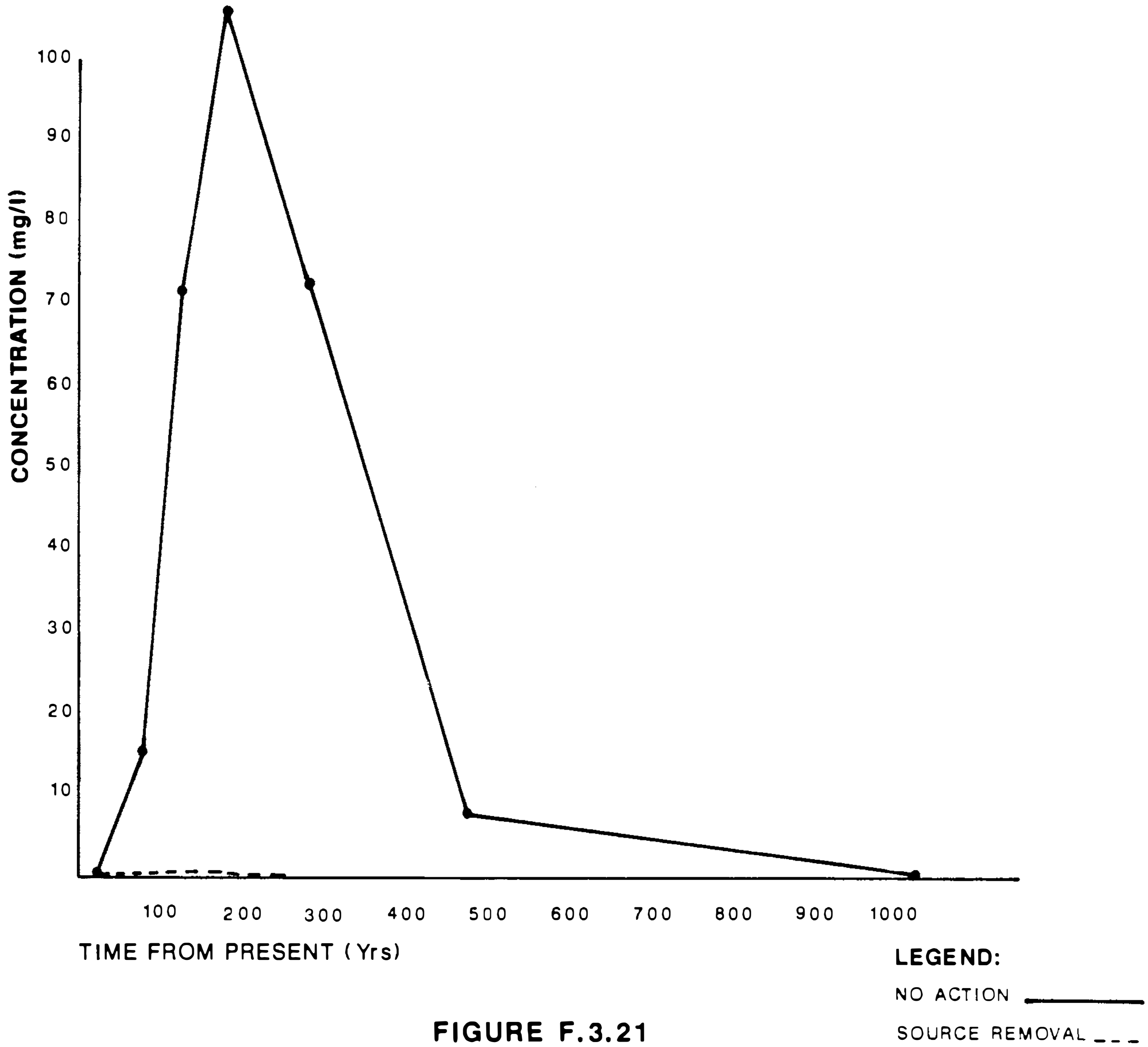


FIGURE F.3.21

SOLUTE TRANSPORT SIMULATION - AMMONIUM
(2640 FEET DOWNGRADIENT AT DAKOTA SANDSTONE SUBCROP)

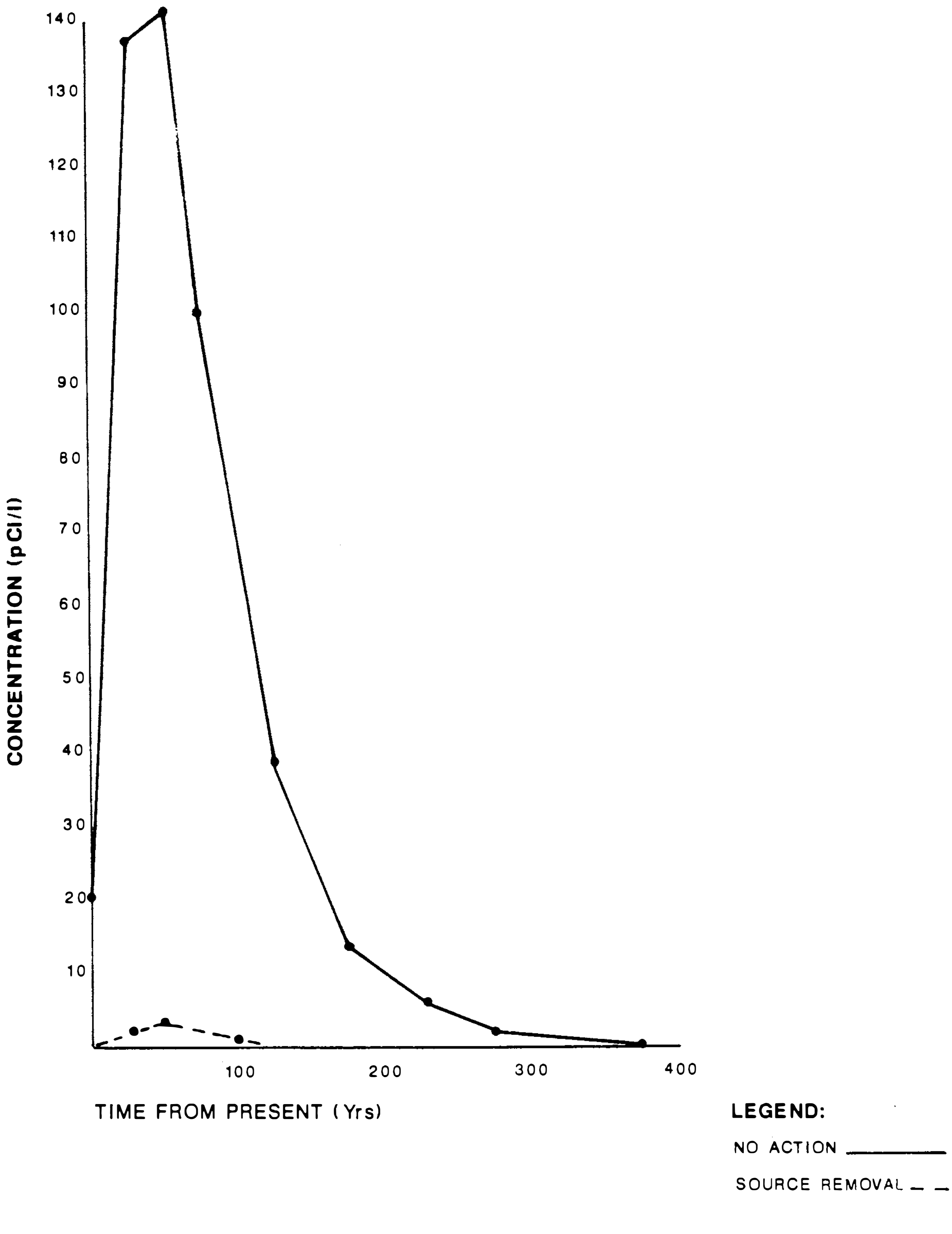


FIGURE F.3.22

SOLUTE TRANSPORT SIMULATION - URANIUM
(2640 FEET DOWNGRADIENT AT DAKOTA SANDSTONE SUBCROP)

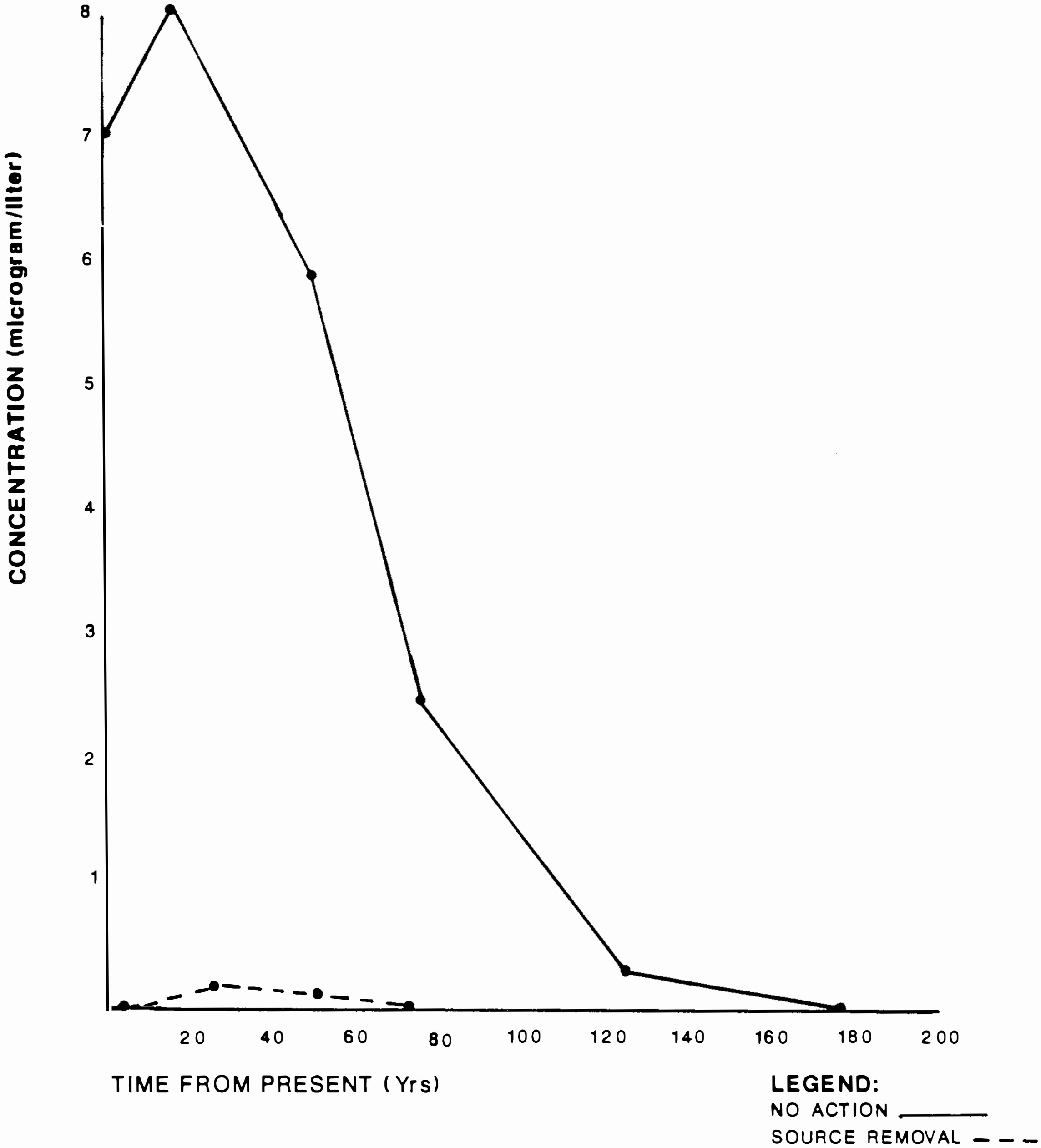


FIGURE F.3.23

SOLUTE TRANSPORT SIMULATION - CHLORIDE

(2640 FEET DOWNGRADIENT AT DAKOTA SANDSTONE SUBCROP)

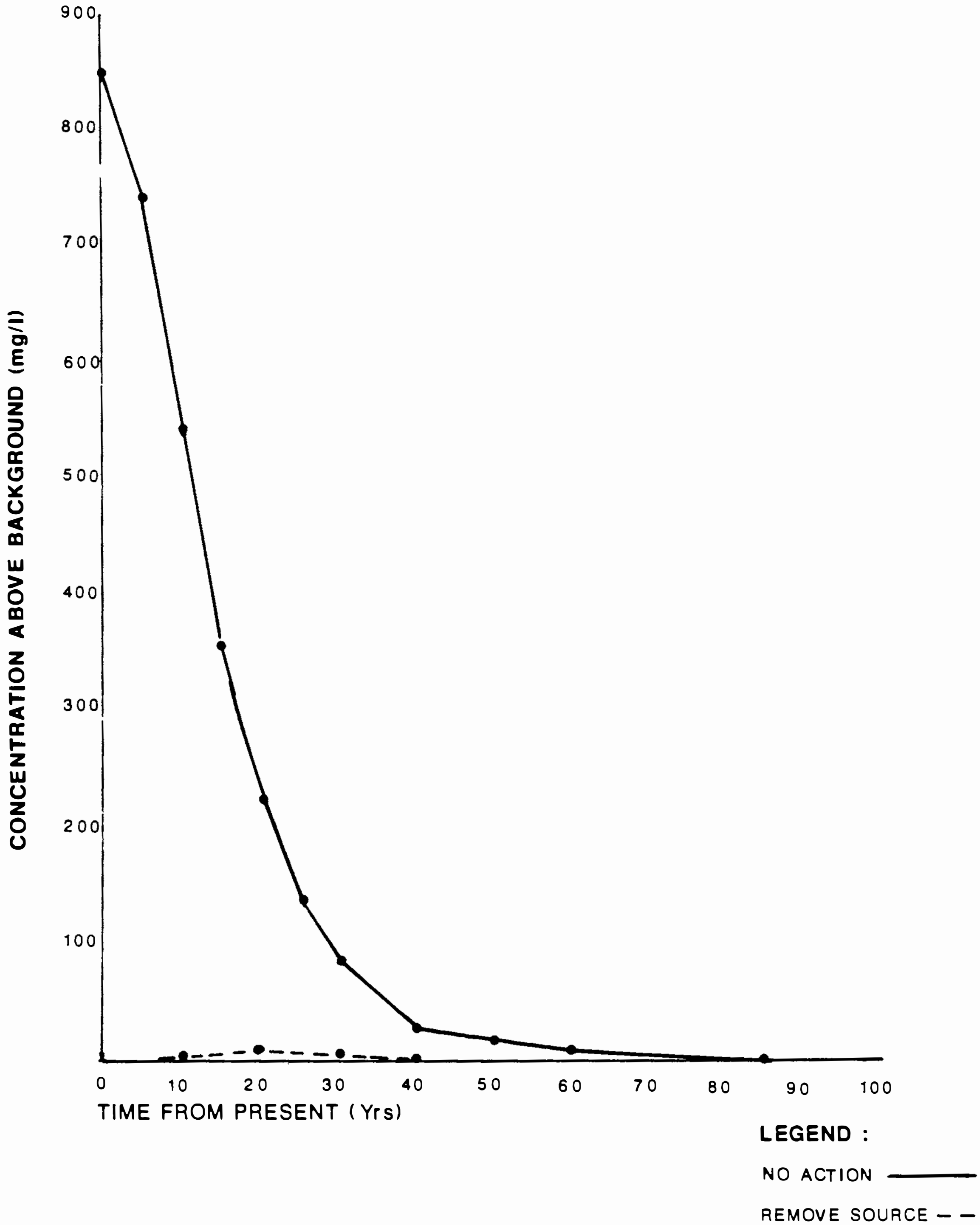


FIGURE F.3.24

SOLUTE TRANSPORT SIMULATION - ARSENIC
(2640 FEET DOWNGRADIENT AT DAKOTA SANDSTONE SUBCROP)

- o Ammonium may persist in the ground water for several hundred years at elevated concentrations. No State of Colorado or Federal water quality standard is applicable.

- o Uranium may persist in the shallow ground water for up to 150 years. No State of Colorado or Federal groundwater standard is associated with uranium.

- o Due to retardation of these constituents, particularly ammonium, natural restoration or artificial restoration would be exceedingly time consuming.

- o The movement of other elevated constituents which are cations such as iron, manganese, and nickel also will be retarded.

In addition to simulating the transport of cations, the transport of chloride was simulated. Chloride is a mobile anion and usually is transported with the ground water without retardation. The plume for chloride is highly irregular which makes the use of the solute transport equation difficult. A primary characteristic of the plume is that the higher chloride concentrations are farther from the pile. Figure 3.18 illustrates the idealized plume used for solute transport calibration. Based on this idealized plume, the calibration results are shown on Table 3.35.

Using the calibrated parameters, two simulations were performed: (1) assuming that the source concentration would continue to decay at an exponential rate of 0.1 (no action); and (2) assuming that the source concentration would be eliminated during the remedial action (continuing contamination during source removal). The results of these two simulations are shown on Figure 3.24. The analyses indicate that the present level of chloride due to the tailings contamination is presently the maximum expected at the Dakota Sandstone subcrop and the concentrations should rapidly decline in the next 20 to 30 years. Also, additional contamination resulting from remedial action should be minimal.

<u>Stabilization on the site</u>. For stabilization on the site, water-quality impacts would be due to two causes:

- o Existing contamination in the ground water.

- o Continuing contamination of the ground water by tailings leachate.

These impacts can be evaluated by expansion of the mixing cell model used to evaluate the water-quality impacts of tailings relocation. A new term is added to the water balance to account for infiltration through the tailings, and a water-quality description is attached to that term.

There are no available data on the concentration of uranium within the tailings pore water, and for the mixing cell model a concentration of 600 pCi/l will be assumed (610 pCi/l was the highest measured concentration of uranium in a well completed below the tailings). Because ground water moves through the tailings, this appears to be a representative concentration of the contaminant source strength.

Results of mixing cell calculations are presented in Table F.3.36 for two different rates of infiltration corresponding to two different values of hydraulic conductivity for the cover (Section F.3.3.2) and for various values of hydraulic and water-quality parameters. It can be concluded that the concentration of contaminants in the ground water is relatively sensitive to the rate of infiltration through the cover. For the case of uranium, a higher infiltration rate indicates long-term concentrations in the range of 39 to 235 pCi/l, several times EPA's health advisory level. For the lower infiltration rate, the mixing cell model indicates long-term concentrations of uranium of 8.8 to 52 pCi/l. This is slightly below to several times above the EPA's health advisory level. The range in concentrations reflects variability in background concentrations and hydraulic parameters.

For the toxic non-radioactive contaminants in the ground water, a quantitative assessment was not performed. Uranium and ammonium are the only constituents for which a definite plume could be defined, while other constituents are sporadically distributed in alluvial ground water or are not present at concentrations above background levels (Section F.3.1.6). Stabilization on the site would include removal of the tailings from the ground water, and thus would remove the main source of the sporadically distributed constituents. Because these constituents are not mobile enough to develop a definable plume, removal of their main source means that they would probably be rapidly flushed from the alluvial ground water, relative to the rate of flushing of uranium.

F.3.2.3 Extent of contaminant plume

Iso-concentration maps for those constituents for which a plume could be defined are presented in Section F.3.1.6.

F.3.2.4 Discharge of plume to surface water

Review of existing data. A site-specific geochemical investigation of the Grand Junction tailings (Markos and Bush, 1983a) included experiments to investigate the possible movement of contaminants into the Colorado River (Bush et al., 1980). These studies concluded that "The Colorado River, however, contains no measurable contamination from the tailings." (Markos and Bush, 1983a).

Table F.3.36 Results of mixing cell model of uranium concentration in ground water for stabilization on site

Ground-water flux rate[a]	Background concentration[b]	Infiltration rate[c]	Leachate concentration[d]	Cell volume[e]	Average initial concentration under tailings[f]	Effluent concentrations[g]			
						10 yrs	25 yrs	50 yrs	100 yrs
5.7×10^{6}	20	8.9×10^{-1}	600	7.0×10^{7}	600	343	253	236	235
5.7×10^{6}	20	8.9×10^{-2}	600	7.0×10^{7}	600	292	122	61	52
1×10^{8}	20	8.9×10^{-1}	600	2.5×10^{8}	600	57	39	39	39
1×10^{8}	20	8.9×10^{-2}	600	2.5×10^{8}	600	42	22	22	22
1×10^{8}	20	8.9×10^{-2}	600	2.5×10^{8}	125	25	22	22	22
1×10^{8}	6.8	8.9×10^{-2}	600	2.5×10^{8}	125	13	8.8	8.8	8.8
1×10^{8}	40	8.9×10^{-2}	600	2.5×10^{8}	125	45	42	42	42

[a] In liters per year, from Table F.3.4.
[b] In pCi/l, from Table F.3.6.
[c] In cm/year, from Table F.3.11.
[d] In pCi/l, highest measured concentration below the tailings, from Table F.3.6.
[e] In liters, from Table F.3.5.
[f] In pCi/l, highest seasonal concentrations below tailings, from Table F.3.6.
[g] In pCi/l, for given number of years after remedial action.

Continuously-monitored water-quality data from the Colorado River system near Grand Junction are available from two sources: the U.S. Geological Survey (USGS, 1931-1986) and the Radium Monitoring Network (EPA, 1973). As of 1983, the USGS reported water-quality information for stations at Cameo (upstream of Grand Junction), the Gunnison River near Grand Junction, and the Colorado River near the Colorado-Utah state line. As of 1972 the Radium Monitoring Network (RMN) reported water-quality for stations at DeBeque (upstream of Grand Junction), the Gunnison River at Grand Junction, and the Colorado River near Fruita, Colorado (downstream of Grand Junction). The RMN was reduced after 1972, and its usefulness was impaired (EPA, 1973).

The USGS data include measurements of specific conductance, common ions such as calcium, magnesium, sodium, potassium, alkalinity, sulfate, and chloride; and other dissolved constituents such as arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, selenium, silver, and zinc. The RMN data include measurements of radium-226, uranium, and occasional measurements of total alpha, gross beta, thorium-alpha, lead-210, strontium-90, and polonium-210.

Evaluation of USGS data for the 1982 water year failed to show any measurable changes in Colorado River water quality attributable to the tailings. This is to be expected due to several factors:

- o The relatively large flow of the Colorado River would dilute and disperse contaminants originating from the tailings.
- o The effect of the tailings would be overshadowed by effects of influx of the Gunnison River into the Colorado River one mile downstream of the tailings.
- o The influx to the Colorado River of irrigation return flow, urban runoff, and ephemeral drainages should overshadow the effects of the tailings.

Evaluation of the RMN data for the years 1962 to 1972 showed no evidence of contamination in the Colorado River which could be attributable to the Grand Junction tailings, even though milling operations were active during the time. The mill site lies between upstream stations on the Colorado River at DeBeque and the Gunnison River upstream of Grand Junction, and the downstream station on the Colorado River near Fruita. The EPA stated that radium concentrations did not appreciably increase through the reach but uranium did increase by about 20 percent. Part or all of that increase is due to the high concentrations of uranium in the Gunnison River upstream of Grand Junction, which exceed concentrations in the Colorado River at DeBeque. It is evident that there would be no clear indication of (e.g., measurable contamination) radiometric contamination of the Colorado River water by the Grand Junction tailings because:

- o The relatively large flow of the Colorado River dilutes known ground-water inflow from beneath the tailings.

- o The effects of the tailings are overshadowed by the effects of influx of the Gunnison River into the Colorado River one mile downstream of the tailings.

- o The ambient concentrations of radionuclides in Colorado River water overshadow the effects of the Grand Junction tailings.

- o The cumulative effects of uranium milling on the Colorado River system above Grand Junction would tend to obscure the effects of the Grand Junction tailings.

Impact assessment. Although the effects of the Grand Junction tailings on Colorado River water quality have not been measured to date, there is an unmeasurable but estimatable minimal impact on the water resource. The degree of this impact may be estimated for a given water-quality constituent by calculating the dilution of that constituent in the Colorado River. For example, calculations could be based on an average flow in the Colorado River above Imperial Dam of 10,900 cubic feet per second (USGS, 1979), an average ground-water flux under the tailings of 7.1×10^7 liter per year (7.95×10^{-2} cubic feet per second), and an excess concentration of total dissolved solids (TDS) of 5000 mg/l in the ground water. The highest downgradient concentration of TDS is less than 5000 mg/l more than the maximum of the background range. The flux of 7.1×10^7 liters per year is in the range of fluxes calculated using Darcy's law (Section F.3.1.5), and is the same as calculated in a previous study (NUS, 1983). Based on these numbers a dilution factor of 137,000 is calculated, and influx of contaminated ground water into the Colorado River would contribute 3.7×10^{-2} mg/l TDS to the Colorado River. A U.S. Bureau of Reclamation study (URS, 1983) estimated an annual loss of $540,000 for each increase of one mg/l TDS in the Colorado River at Imperial Dam (along the Arizona-California border). Based on these assumptions and approximate calculations, the TDS load due to the tailings may represent an annual loss of no greater than $20,060 in the value of the resource to downstream water users.

Using similar assumptions health effects can be addressed. Using ground-water flow volumes of 1.6×10^7 to 1×10^8 liters per year (Table F.3.5), an average concentration of uranium in the ground water of 600 pCi/l, and a flow in the Colorado River of 3780 cfs (the 49-year average at Cameo; USGS, 1979), the influx of contaminated ground water into the Colorado River would contribute 2.9×10^{-3} to 1.8×10^{-2} pCi/l opposite the tailings. This is an over-estimate because 600 pCi/l represents the highest measured concentration of uranium in the ground water, not an average. Health effects of ingesting water are discussed in detail in Appendix I, Radiation Health Effects.

F.3.2.5 Contaminant sources other than mill tailings

There are several potential contaminant sources other than mill tailings within the potentially affected hydrologic setting. These include:

- o Irrigation return flow.
- o Urban runoff.
- o Landfills or buried trash.
- o Industrial activities.

The most easily identifiable source of ground-water contamination in the area is irrigation return flow, including seepage from canals, deep percolation of irrigation water, and urban seepage from water mains, sewers, and gardening. This water percolates through the alluvium and into the Mancos Shale, where it leaches salts. Concentrations of salts exceed 3000 to 4000 mg/l in the Mancos Shale. This leachate moves toward the active alluvium along the Colorado River and then into the river. The entire Grand Valley contributes enough salt to the Colorado River to increase the salinity of the river at Imperial Dam by more than 43 mg/l (U.S. Bureau of Reclamation, 1978). The annual costs of this leachate can be estimated at more than $23 million using a similar estimation approach as the one presented above (Section F.3.2.4).

The impacts of urban runoff on ground-water quality in the Grand Junction area have not been quantified. It is known that contaminants present on street surfaces contribute to water pollution (EPA, 1972). Among the contaminants known to be present on city streets are phosphates, nitrates, heavy metals, and pesticides.

At one boring location down-gradient of the tailings (733) trash was encountered. The extent of this "landfill" is unknown. This material could contribute to ground-water contamination.

There are numerous industries in the vicinity of the tailings. Several of these use chemicals in their operations. The effects of these industries on ground-water quality, if any, are unknown.

F.3.3 CLIMATIC EFFECTS ON CONTAMINANT MIGRATION

F.3.3.1 Climate

The climate in the vicinity of Grand Junction is relatively dry. Annual precipitation averages about 8.9 inches (22.6 cm). Simmons and Gee (1981) report values of potential evapotranspiration (PET) for Grand Junction in the range of 180 cm per year. Thus the ratio of PET to precipitation is in the range of seven to eight. Selected data for pan evaporation are shown in Table F.3.37.

Table F.3.37 Selected pan evaporation data for the Grand Junction area

Year	Months of record	Total evaporation (inches)
	GRAND JUNCTION 6 ESE	
1977	May-September	55.87
1978	May-September	54.93
1979	May-September	57.29
1980	May-July, September	41.78
Average (period of record)	May-September	74.81
	MONTROSE 1	
1977	April, June-October	38.23
1978	April-November	52.93
1979	April-October	50.13
1980	May-October	45.90
Average (period of record)	April-November	52.89

Ref. NOAA, 1977-1980.

F.3.3.2 Contaminant migration in the unsaturated zone

Existing conditions. During the period of active milling and up to the present time, the impact of contaminant transport in the unsaturated zone has been relatively minor. The major impacts to ground water have been the drainage of the initially saturated tailings after deposition and the flow of ground water through those portions of the tailings which are below the water table.

Future conditions. Infiltration of incident precipitation through the tailings can generate leachate which can move out of the stabilized site embankment. It is difficult to predict the precipitation which would infiltrate; however, calculations have been made to provide an upper bound on infiltration.

A variety of methods are used to compensate for the difficulty in predicting infiltration rates. The various methods are briefly described below, while predicted infiltration rates are presented in Table F.3.38. These calculations should be considered as preliminary.

One conservative method of calculating an upper bounding value of infiltration through the tailings embankment is to assume a constant saturated flux through the cover (method 1, Table F.3.38). This calculation uses Darcy's Law to calculate flux:

$$q = K \frac{dh}{dl}$$

where

q = flux (l/t)

K = saturated hydraulic conductivity (l/t)

dh/dl = hydraulic gradient

Net infiltration would probably be significantly less than calculated with method 1, because the flux of moisture into the cover is not constant and because moisture also moves out of the cover by evapotranspiration. A lower, more representative value of net infiltration was calculated using the following assumptions (method 2):

- o The sloping embankment cover promotes lateral runoff of excess moisture.
- o Infiltration occurs only under a snowpack or during significant (i.e. more than 0.1 inch) precipitation events.

Table F.3.38 Predicted infiltration rate through the cover at the Grand Junction site

Method[a]	Cover hydraulic conductivity[b]	Duration of flow[c]	Infiltration rate (cm/yr)
1	1×10^{-6}	constant	3.15×10^{1}
1	1×10^{-7}	constant	3.15×10^{0}
2	1×10^{-6}	246	8.90×10^{-1}
2	1×10^{-7}	246	8.90×10^{-2}
3			Data not available
4			Not applicable

[a] Method 1 is constant Darcy flow under unit hydraulic gradient;
Method 2 is constant Darcy flow during rainfall events > 0.1 inch;
Method 3 is wetting front advance during rainfall events > 0.1 inch;
Method 4 is water balance.

[b] In cm/sec. Hydraulic conductivity of cover would be specified in engineering design.

[c] In hours per year.

- A downward, unit hydraulic gradient exists only under a snowpack or during significant precipitation events.

- Contribution of snowpack to infiltration is minimal, because snows are light and they seldom remain on the ground for long periods of time (U.S. Bureau of Reclamation, 1978).

- Significant net infiltration occurs only during days with precipitation greater than 0.1 inch of precipitation. For precipitation events less than 0.1 inch, it is assumed that the overlying rock cover would cause large interception losses. For the period 1965-1981, the area averaged 41 days with precipitation greater than 0.1 inch (Colorado Climatological Office, 1982).

- For days with precipitation greater than or equal to 0.1 inch, the precipitation occurs over a six-hour period. For the period January, 1981, through March, 1985, climatic data for Grand Junction show that days with precipitation greater than or equal to 0.1 inch averaged 5.5 hours of measurable precipitation (NOAA, 1981-1985).

Based on these assumptions, a unit hydraulic gradient occurs for a limited period:

$$41 \text{ days} \times 6 \frac{\text{hours}}{\text{days}} = 246 \text{ hours}$$

This calculated duration of a downward, unit hydraulic gradient is used to calculate annual net infiltration (Table F.3.38).

An alternate means (method 3) of calculating annual infiltration is made using a formula for advancement of a wetting front during constant infiltration (Stallman, 1967):

$$dw/hc + \log 1/(1 + dw/hc) = kt/hcSc$$

where

dw = depth of wetting front at time t

hc = pressure head across wetting front

k = saturated hydraulic conductivity

t = time after the ground surface is wetted

Sc = change in volumetric water content across the wetting front

The use of this equation for calculating infiltration is as follows:

- o Infiltration occurs only when there is a surface source of water, although the wetting front would continue to advance after the source is removed.
- o Sc equals the difference between the -15 bar and saturation moisture percentage.
- o Net infiltration occurs only during precipitation events of 0.1 inch or greater (see method 2 for reasoning), which are assumed to last six hours.
- o Net infiltration equals dw x Sc.

This method was not used for the Ground Junction site, but was used for the Cheney Reservoir site (Section F.4). An alternative means of estimating the net infiltration is to assume that it would be less than or equal to the existing net infiltration through the undisturbed soils at the site, and estimate the existing infiltration rate using a water balance calculation (method 4). The reasoning behind this estimate would be that the engineered cover will have a lower permeability than the undisturbed soils, which would tend to restrict infiltration to less than existing rates. It must be noted that factors other than the permeability of the soil control infiltration, e.g. evapotranspiration by the existing vegetation. The existing rate of net infiltration still provides a qualitative measure of what infiltration through the covered tailings could be.

Previous studies. The Grand Junction site was used to investigate the use of vegetation and rock covers to stabilize uranium mill tailings (Mayer et al., 1981). The investigation consisted of simulating moisture movement through the tailings and cover layers. The simulation used a version of the computer code, UNSAT (Gupta et al., 1978). The version is called UNSATV and accounts for the important factors influencing the unsaturated zone:

- o Water infiltration from precipitation or irrigation.
- o Evaporation.
- o Transpiration.
- o Runoff.
- o Drainage.
- o Water vapor diffusion (a feature of UNSATV).

The simulations were run for a one-year period to initialize the model, and then for a two-year period using either the repeated climatic data for 1979 (wettest year in 1976 to 1979 period) or the repeated climatic data for 1976 (driest year 1976 to 1979).

The results of the simulation study have several limitations which restrict their applicability to the current designs for stabilizing the tailings. It should be noted that although the simulations are limited in their applicability, these limitations tend to overestimate moisture movement and thus, discussion of these limitations follows:

- The cover system design used in the simulations was quite different from the current design. Most significant is that the simulated profile had a low-permeability layer at depth (1.3 meters) within the multi-layer cover, whereas the current conceptual design has a low-permeability layer near the top of the cover system. The simulated cover had a 1.3-meter thick layer of overburden which could retain moisture, tending to drive water down through the low-permeability cover.

- The low-permeability layer used in the simulation was only 15 cm thick, approximately one-tenth (1/10) the thickness of the current design. Using Darcy's Law modified for unsaturated flow (Hillel, 1971):

$$q = -K\,(\text{theta})\,\frac{dh}{dl}$$

where

q = flux

K = unsaturated hydraulic conductivity

theta = water content

dh/dl = hydraulic gradient

dh = change in total head

dl = length of flow path

It can be seen that for a given value of K and a given change in head across a tailings system; the greater the length of the flow path across the low-permeability layer the smaller the flux. The ratio K/dl is sometimes called the "Effectiveness Factor" (Buelt and Barnes, 1981). The current design has an effectiveness factor approximately four times that of the simulation study.

- The simulation was performed using a one-dimensional model, therefore lateral drainage was not considered. And more importantly, the model does not calculate runoff directly, and does not take into account the effects of a sloped surface on runoff. The current conceptual design includes a cover top slope of two to four percent to promote runoff, with sideslopes of 20 percent.

It can be concluded that the previous simulation study (Mayer et al., 1981) included several aspects which would tend to overestimate net infiltration and which limit the applicability of the simulation study to the current design. The current conceptual design would be more effective in minimizing infiltration and leachate production than the design used in the previous simulation study.

The Grand Junction tailings were also the location of a field study of the use of vegetation and rock covers (Beedlow, 1984). Field measurements of matrix potential and volumetric moisture for two sets of two dates in 1982 corroborate the simulation studies. The vegetated cover showed very little change in moisture content relative to rock cover (the changes in moisture content under the vegetative cover are near the resolution of the neutron probe that was used to make the measurements).

The applicability of the field study to the current design is also limited by differences between the two cover designs. The test plots were relatively flat (see Figure 1 in Kirkham et al., 1982), which would minimize runoff. The current conceptual design includes a cover sloped three to four percent, with side slopes of 20 percent, to promote runoff. The test plots had a low-permeability layer at depth with overburden which could retain moisture, which would tend to drive water through the low-permeability layer. Also, the thickness of the low-permeability layer is less than in the current site design although the hydraulic conductivity is lower. The net result was that the current design has a greater effectiveness factor than the test plot. These differences all indicate that net infiltration would tend to be less with the current design than for the test plots.

F.3.4. EXISTING USAGE AND VALUE OF WATER RESOURCES

F.3.4.1 Ground water

Usage. Utilization of ground water in the Grand Junction area is predominantly from deeper confined aquifers rather than from the shallow aquifers. The lack of usage of shallow ground water can be attributed to three factors: the poor quality and low yield of shallow aquifers, and the ready availability of alternate water supplies. Reports on the hydrogeology of the Grand Junction area corroborate this (Lohman, 1965):

> "In the Grand Junction area, unconfined aquifers yield but little water or water of poor quality, or both ... Where thick, the alluvium along the principal streams probably would yield considerable water to properly constructed wells, but the water probably would be too hard for domestic or public supplies. It would be suitable chemically for irrigation, but irrigation water from the rivers is abundantly available at lower cost."

In the immediate vicinity of the tailings only one unregistered well, an industrial drainage well upgradient of the tailings, is known to be completed in the alluvium. This upgradient well is used only in summer months when high ground-water levels in the alluvium flood land adjacent to the Colorado River. Location of the well (710) is shown in Figure F.3.1.

There are four artesian aquifers in the Grand Junction area, which are, in order of importance and productivity, (Lohman, 1965):

- o The Entrada Sandstone.
- o The Wingate Sandstone.
- o The lenticular sandstone beds in the Salt Wash Member of the Morrison Formation and in some places in the Brushy Basin Member.
- o The Dakota Sandstone and sandstone in the Burro Canyon Formation.

The Dakota Sandstone is the uppermost artesian aquifer in the vicinity of tailings. No registered wells are known to be completed in the Dakota Sandstone within the potentially affected hydrogeologic environment of the tailings.

Value. The value of shallow ground water in the vicinity of the tailings can be judged by the value of alternative water supplies in the area. The actual value is probably less than alternative water supplies because of the poorer quality of the ground water versus the quality of alternative water supplies. A rate schedule for delivery of city water is shown in Table F.3.39.

Table F.3.39 Rate schedule for water users within Grand Junction city limits

Quantity per month (gallons)	Charge
First 3,000	$5.35
Next 7,000	$0.90/1000 gal.
Next 10,000	$1.05/1000 gal.
More than 20,000	$1.25/1000 gal.

Ref. City of Grand Junction, 1985.

Because ground water in the Dakota Sandstone varies significantly in yield and quality depending on location, its value must be judged according to yield and quality. The Dakota Sandstone is not utilized in the near vicinity of the tailings, and therefore has only a future value (Section F.3.6).

F.3.4.2 Surface water

Usage. The Colorado River mainstream below the tailings is used by several states and by Mexico for various purposes including domestic use, industrial use, irrigation, livestock watering, and for fish and wildlife.

There are no major domestic users of Colorado River water for 200 miles downstream from Grand Junction (FBDU, 1977). The normal water supplies for Grand Junction are obtained from Grand Mesa surface water, the Juniata and Purdy Mesa reservoirs being the major sources. During dry spells, Grand Junction can use Gunnison River water, the intake being approximately one mile upstream from the confluence with the Colorado River. The Ute Water District uses Colorado River water during dry spells, but its intake is just upstream from Palisade and therefore upstream from the pile.

Value. In the highest category of use, municipal rate schedules are indicative of the highest potential value of Colorado River water (Table F.3.39). Another way to look at value is to look at the incremental losses due to pollution of the river. A 1983 study by the Bureau of Reclamation has estimated an annual loss of $540,000 for each increase of one mg/l in the total dissolved solids (TDS) content of the Colorado River at Imperial Dam (URS, 1983).

F.3.5 ALTERNATE WATER SUPPLIES

The tailings have not affected any ground water that is currently used. Should the affected ground water be considered for use, there would be potential alternate water supplies. Alternate water supplies in the potentially affected hydrogeologic setting would include several sources:

- Grand Junction municipal water system.
- Commercial water supply (delivery by tanker).
- Drilling of wells into multiple artesian aquifers.
- Appropriation of Colorado River water (subject to availability).

F.3.6 FUTURE USAGE AND VALUE OF WATER RESOURCES

F.3.6.1 Ground water

Usage. Future usage of shallow ground water in the affected hydrogeologic environment will be minimal because of the availability of the city water, the seasonally low quality of the alluvial aquifer, and the impact of other contaminant sources on the water (Section F.3.2.5). The only known existing use of the alluvial aquifer, at a well upgradient of the tailings, occurs only seasonally when the river is at high stage, and is only for drainage of flooded land.

Future use of the uppermost artesian aquifer is also expected to be minimal:

> "The sandstones in the Dakota Sandstone and Burro Canyon Formation are tapped by very few wells but, because of the generally poor quality of the water. . . very little additional development of water from these formations is likely or anticipated." (Lohman, 1965).

Value. Estimates of the future value of water resources are difficult to establish, and are severely limited as to the duration over which they can be deemed reliable. One reason for the uncertainty of estimates of water value is that water value is strongly related to population and water demand, and estimates of population changes tend to be very short term. In the Grand Junction area future water demand would also be tied to such uncertain factors as the economics of oil-shale development (oil-shale processing may consume large amounts of water).

Estimates of the value of shallow ground water near the Grand Junction tailings must be based on the fact that it is not a discrete water resource. The shallow ground water is hydraulically connected to the Colorado River and any capture of ground water would draw water from the river. It cannot be "mined" as can some ground-water systems, e.g. there is no non-renewable portion of the alluvial system.

Several factors can be used to qualitatively judge the future value of shallow ground water near the tailings. These factors are:

- o Expected future usage (low).
- o Extent (limited to area adjacent to Colorado River).
- o Amount of system which is non-renewable (none).
- o Quality versus alternative sources (poor-exceeds EPA drinking water standards).
- o Availability of alternative supplies (readily available).

Based on these qualitative factors, it can be concluded that the expected future value of the shallow ground water is relatively low.

F.3.6.2 Surface water

Usage. In the immediate vicinity of the tailings, future usage will be minimal. This is because of the same reasons as the expected low use of ground water in the area (the ready availability of good quality municipal water).

Value. The value of Colorado River water in the area can be expected to increase. Increasing population, agricultural development, and mineral or energy development in the Grand Junction area and the Colorado River Basin would be expected to increase demand for Colorado River water. The increasing demand would increase the value placed on the water.

F.3.7 IMPACTS IN AFFECTED HYDROGEOLOGIC ENVIRONMENT

Impacts on the affected hydrogeologic environment are discussed both for existing conditions and for future conditions. Future conditions can be affected by any of the alternative actions:

- No action.
- Stabilization on the site.
- Relocation to an alternate disposal site.

F.3.7.1 Human health risks

Health effects of ingesting ground water and surface water are discussed in detail in Appendix I, Radiation Health Effects.

Existing conditions. To date, there are no known users of ground water in the affected hydrogeologic environment and therefore there are no known human health risks from the ingestion of this ground water.

Future conditions. For the no action alternative, impacts on ground-water and surface-water quality would probably be about the same as existing conditions (Section F.3.1.6). The probability of human ingestion of ground water would be low (Section F.3.6.1).

For stabilization on the site, contaminated ground water would be flushed from the affected environment until it approached background conditions. Until the flushing is complete, concentrations of some constituents (e.g. arsenic, cadmium, iron, manganese, selenium, and zinc) would exceed Federal drinking water standards in the ground water below the tailings. During the time of flushing (less than 100 years), the probability of human ingestion would be low due to the low probability of future use of this water (Section F.3.6.1). Potential human health effects due to ingestion of surface water would decline over this same short period. Uranium concentrations would persist at concentrations above background (Section F.3.2.2). Human health risks due to ingestion of ground water containing elevated concentrations of uranium would be minimal, because the expected use of the ground water is low (Section F.3.6.1). Health effects are discussed in more detail in Appendix I, Radiation Health Effects.

F.3.7.2 Damage to crops and vegetation

There is no known agricultural activity overlying the affected hydrogeologic system. There has been no known impact to crops or vegetation. The future likelihood of damage to crops and vegetation is minimal because of the urban setting of the affected hydrogeologic system.

F.3.7.3 Damage to wildlife

There have been no known impacts to wildlife due to ingestion of contaminated ground water. Considering the magnitude of contamination relative to that caused by other sources (e.g. irrigation return flow), the likelihood of damage attributable to the tailings is relatively small.

F.3.7.4 Persistence and permanence of adverse effects

Quantitative and qualitative conclusions on the persistence of ground-water contamination are discussed in Section F.3.2.2. Based on the lack of known adverse impacts at present and the projection of decreasing amounts of contamination, persistent or permanent adverse effects are expected to be minimal.

F.3.8 AQUIFER RESTORATION

For affected ground water at UMTRA Project sites the decision on whether to institute remedial action, what specific action to take, and to what levels an aquifer should be protected or restored should be made on a case-by-case basis. On September 3, 1985, the United States Tenth Circuit Court of Appeals set aside EPA's water protection standards, 40 CFR Part 192.20(a)(2)-(3), and EPA has not yet reissued these standards. When EPA issues revisions to the water protection standards, DOE will re-evaluate the ground-water issues at the site to assure that the revised standards are met. Performing remedial actions to stabilize the tailings prior to EPA issuing new standards will not affect the measures that are ultimately required to meet the revised water protection EPA standards. On this basis, the evaluation of the need for aquifer restoration must take into account several factors:

- Technical feasibility of improving the aquifer in its hydrogeologic setting.
- Cost of applicable restorative or protective programs.
- Present and future value of the aquifer as a water resource.
- Availability of alternative water supplies.
- The degree to which human exposure is likely to occur.

As indicated by the regulations, remedial actions for affected aquifers can be divided into two basic approaches: ground-water protection and aquifer restoration. A remedial action strategy can also be a combination of these two approaches. At the Grand Junction site, ground-water contamination has probably already reached a maximum physical extent because the contamination has been ongoing for a relatively long time in an alluvial aquifer with relatively large annual flux (inflow and outflow). Therefore, protective measures would have only future benefit to the affected aquifer. Protective measures are incorporated into the remedial action: removal of the tailings to an alternate site or, for stabilization in place, removal of the tailings from the ground water and use of a low-permeability cover to minimize infiltration. The discussion that follows covers only aquifer restoration.

F.3.8.1 Technical feasibility

Two basic approaches to aquifer restoration are plume capture and plume management. An aquifer restoration program could also be a combination of the two approaches. Cost differences between the various technical alternatives will be discussed separately from feasibility.

Plume capture consists of some method or methods of obtaining contaminated ground water, which is then pumped or fed by gravity flow to a treatment facility. Among the methods for obtaining contaminated ground water are drains, wells, sumps, and trenches.

Plume management consists of injecting uncontaminated water into the aquifer. The uncontaminated water displaces the plume, forcing it in a direction determined by the injection set-up. Injection can be performed using wells or spreading basins. The injection can be performed to obtain several effects:

- To keep the plume away from existing or potential ground-water users.
- To force the plume toward a collection system.
- To force the plume toward a discharge area.

In the case of the contaminated ground water at Grand Junction, there are no known existing ground-water users (Section F.3.4) downgradient of the tailings, and only one upgradient industrial well which may have been affected by the tailings (Section F.3.1.6). The upgradient well is on the edge of the contaminated shallow ground water, and is used to control high water levels which flood a truck scale at an industrial facility adjacent to the Colorado River. The water is pumped back into the Colorado River, and is rarely used (Seevers, 1985). Plume management could be performed to force contaminated ground water toward a collection system or toward a discharge area. The discharge area in this case would be the Colorado River. Discharge to the Colorado River would only transfer contamination from one water resource (ground water) to another (surface water). Plume management would be of most benefit if it is used to force the plume toward a collection system.

Plume capture near the Grand Junction tailings is complicated by both physical and cultural features. The presence of the Colorado River adjacent to the plume means that there is a ready source of recharge to the alluvial aquifer. Pumping in the shallow aquifer would induce flow from the river to the drain, well, sump, or trench (Figure F.3.25). The flow from the nearby river dilutes the contaminated ground water. Therefore, an increased volume of water would be captured and treated, and thus costs for each activity would be increased. The amount of induced flow can be reduced by various pumping schemes (e.g. more wells pumping less water) or by installing a low-permeability slurry wall as a barrier (Figure F.3.26). Each of these measures would also increase costs for plume capture.

Cultural complications to aquifer restoration at Grand Junction are due to the contaminated ground water underlying a populated area with a concentration of cultural features (buildings, roads, pipes, and the like). A capture scheme may be difficult to implement. There may not be enough available land to effectively implement trenches. Drains or wells (with the accompanying pipelines to the treatment plant) would involve trenching and corresponding disruption to the community.

Plume treatment can be accomplished in a couple of ways. There are various methods of removing contaminants from water; these do not merit further discussion except to conclude that it is technically feasible to clean up the captured water, if given sufficient monetary resources. The treatment system can either be an existing one or one specifically constructed for aquifer restoration.

An existing treatment system could be utilized by routing contaminated water into the existing waste water (sewage) treatment system of the city of Grand Junction. This has the advantage of the using existing waste transmission systems (sewers). It has the disadvantage of mixing the plume waste water with the normal municipal waste water. Municipal wastewater treatment plants usually do not use treatment technologies designed to remove constituents such as those in the tailings plume. Different capabilities could be added to the existing treatment plant; however, these must treat not only the captured plume but also the municipal waste water which is diluting it. It may be ineffective to dilute a waste before treating it.

A scheme for treating the captured plume can also be a treatment system near the mill tailings site. This scheme can be any physical, biological, or chemical means of removing

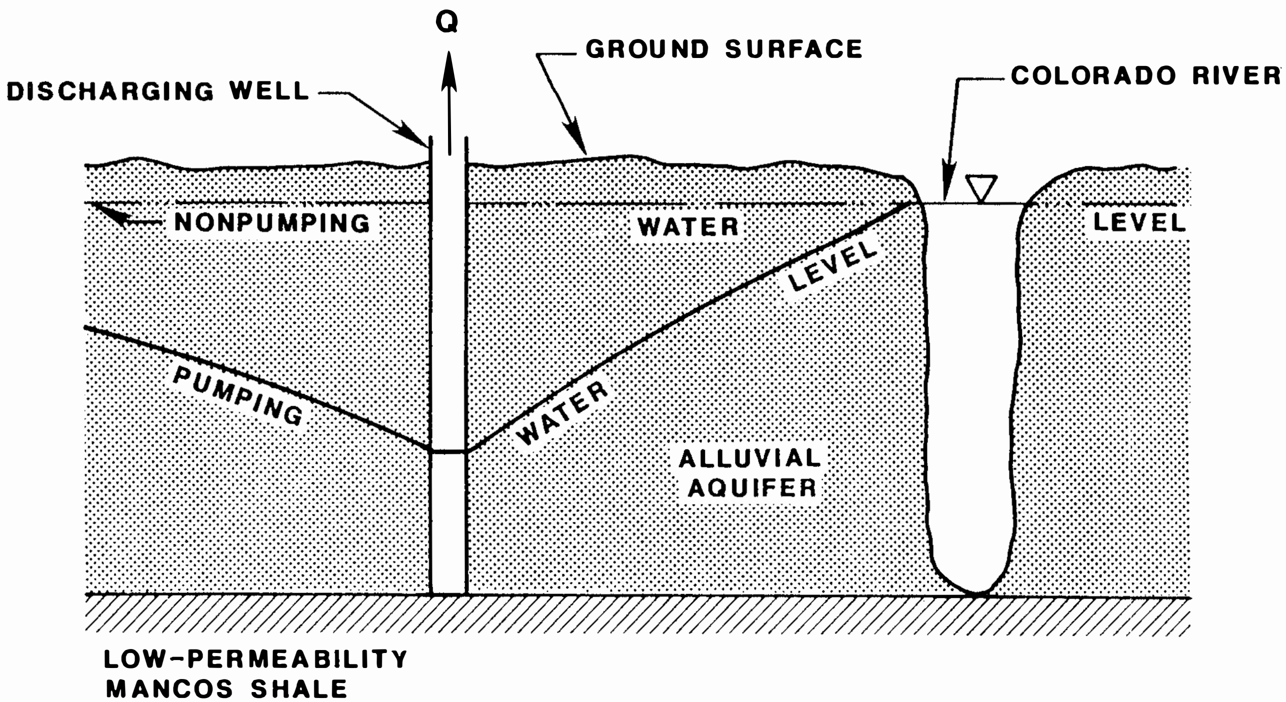


FIGURE F.3.25

PUMPING GROUND WATER NEAR A RIVER INDUCES FLOW

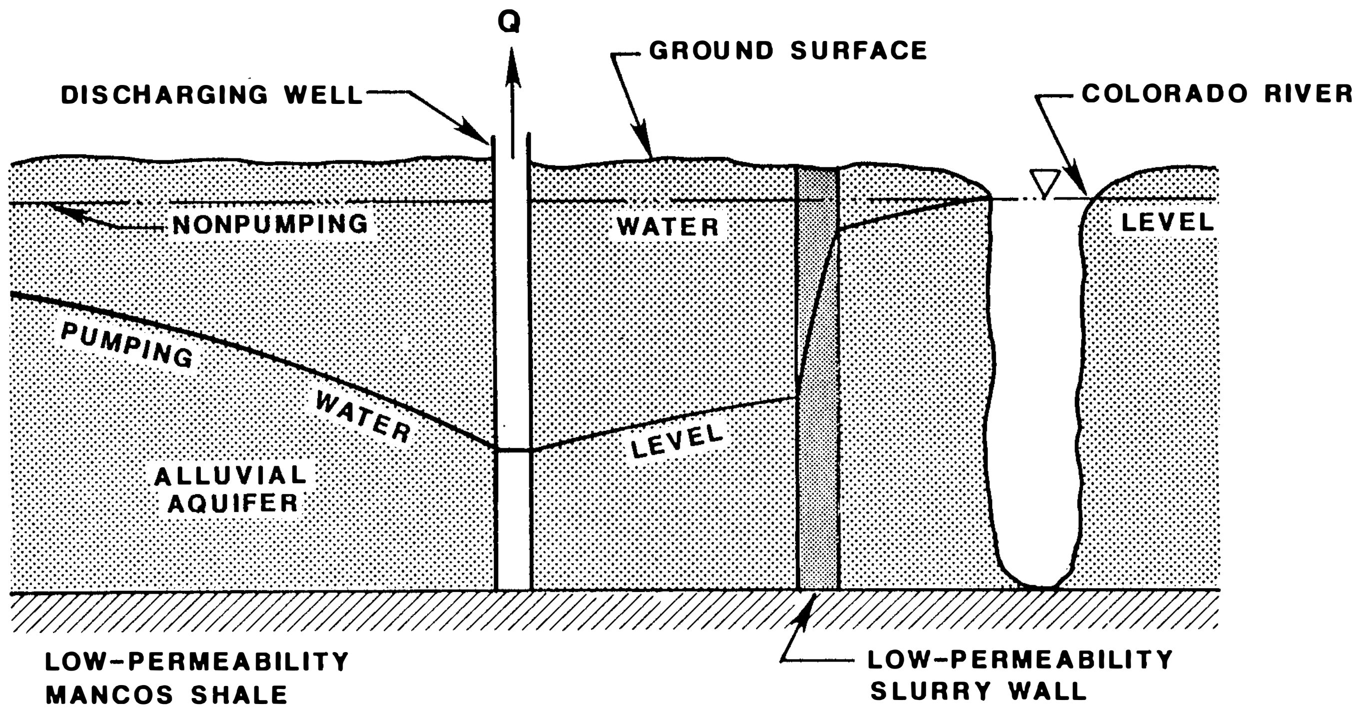


FIGURE F.3.26

LOW-PERMEABILITY BARRIER REDUCES INDUCED FLOW FROM RIVER

contaminants from the water. It can also be as simple as evaporating the contaminated water, and disposing of the residual salts. The main disadvantage of treatment at the site in Grand Junction is the necessity for a waste-water transmission system which would have to transect the many cultural structures in the area.

F.3.8.2 Cost

Based on the EPA standards for inactive uranium mills (40 CFR Part 192) it has been determined that aquifer restoration is not needed at the Grand Junction site. This determination took into account, as required by the EPA standards, the cost of a restoration program. The following discussion is included to demonstrate how cost was considered in determining the need for aquifer restoration. The estimation of costs which follows is not meant to be a rigorous analysis, but only an initial investigation of approximate costs. For the Grand Junction site this initial investigation of costs appeared to be adequate for evaluating the need for aquifer restoration.

Remedial action for the Grand Junction tailings would include dewatering and waste-water treatment. This would in effect clean up alluvial ground water below and adjacent to the site. Aquifer restoration could be done for off-site areas within the extent of contaminant plumes.

It is possible to determine some approximate costs of an aquifer restoration program without doing a precise cost estimate. Necessary expenditures for an aquifer restoration program can be identified and approximate costs assigned to them. At a minimum, necessary aspects of an aquifer restoration program for the off-site alluvial ground water at Grand Junction would include:

- Well installation to capture contaminated ground water.
- Pumps to lift the water out of the wells.
- Pipe to carry the captured water to a treatment plant.
- Trenching to place the pipe below grade.
- Road repair (asphalt paving) where the pipe crosses city streets.
- A water treatment plant or added capacity for the waste-water treatment plant on the site.
- Well abandonment for the capture wells.
- Operation and maintenance of the restoration system.
- Decommissioning of the wells and pipeline.

Some approximate costs are presented in Table F.3.40. The system described in this table is for 20-foot-deep wells 250 feet apart. These costs could be scaled down depending on how much of the plume is to be captured. However, many needed items are not included, and the cost estimate in Table 3.40 is therefore conservatively low.

Costs could also be changed by changing well spacing. Note that the table does not include costs for operation and maintenance, nor for water treatment capacity; these costs would normally constitute a major portion of the total costs of an aquifer restoration program. Thus the total cost listed in the table could possibly be increased by a factor of two or more to account for water treatment capacity, operation, and maintenance. Considering the option of scaling down the program described in Table F.3.40 and the unaccounted costs, an aquifer restoration program at Grand Junction could cost between a few hundred thousand dollars to more than a million dollars.

Some other costs of an aquifer restoration program are not addressed in the discussion above. Because the program would be done in a metropolitan area, there would be other direct and indirect costs such as traffic barriers, relocation of utilities or tunneling where pipelines cross utility easements, temporary disruption to businesses, among others. It would be difficult to quantify indirect costs such as disruption to businesses.

F.3.8.3 Future value of the resource

The future value of the affected ground water is discussed fully in Section F.3.6.

F.3.8.4 Availability of alternative water supplies

Water use in the Grand Junction area is discussed in Section F.3.4. In the area overlying the plume of contaminated ground water, good quality potable water is readily available from water mains. There is little reason at present for people in the area immediately adjacent to the tailings to drill wells into the alluvial aquifer.

F.3.8.5 Degree of human exposure likely to occur

Several circumstances indicate that the likelihood of human exposure to contaminated shallow ground water is low. These are:

- A water distribution system is already in place and fully used in the area overlying contaminated ground water.

Table F.3.40 Approximate costs for selected expenditures required for aquifer restoration

Item	Unit price($)	Unit description	Units	Costs ($)
Well installation				
easement purchase			- not included-	
legal survey			- not included-	
well drilling	30	feet	1760	52,800
4-inch casing, installed	12	feet	1760	21,120
100-gpm pump	1975	unit	88	173,800
well development	100	hour	176	17,600
setting pump	105	unit	88	9,240
field engineer	25	hour	200	5,000
Pipeline installation				
easement purchase			- not included-	
legal survey			- not included-	
engineering (design)			- not included-	
2-inch PVC pipe	2	feet	24,000	48,000
trenching (backhoe)	5	feet	24,000	120,000
asphalt paving	2	square feet	2,000	4,000
field engineer			-not included-	
Miscellaneous				
fencing, installed	250	unit	88	22,000
electrical hook-up	600	unit	88	52,800
water treatment plant			-not included-	
Operation and maintenance				
water treatment			-not included-	
electricity (pumping)	2500	month	24	65,320
water sampling and analysis	260	sample	264	68,640
Decommissioning				
pulling pump	105	unit	88	9,240
pump resale	64%	unit	88	-111,232
dismantling fence	30	unit	88	2,640
trenching (backhoe)	5	feet	24,000	120,000
asphalt paving	2	square feet	2,000	4,000
well abandonment	263	unit	88	23,144
TOTAL COST				708,112

- The existing water distribution system can be easily hooked into by future development in the area.
- The shallow ground water and Colorado River in the general area are known to be of poorer quality than available water supplies.
- The taste and short-term effects of ingesting contaminated ground water (e.g., laxative effects due to sulfate) would discourage long-term usage, and long-term usage is necessary to cause a high probability of harm.
- Only one existing user is possibly within the extent of contaminated ground water, and the well is used for flood control.

F.3.8.6 Summary

The need for aquifer restoration in the affected shallow ground water has been considered using the recommended factors of 40 CFR Part 192.20. The following conclusions have been reached:

- It is technically difficult to improve the aquifer in its hydrogeologic setting. The effort would be complicated by recharge from the nearby river.
- Conducting an aquifer restoration program could cause a disruption to the community.
- In monetary terms only, cost of the restorative program would be relatively high compared to the benefit.
- There are no known users of the affected ground water.
- The present and future value of the aquifer as a water resource is much lower than the cost of restoration.
- Alternative water supplies are readily available and are currently being used.
- The degree of human exposure which is likely to occur is low.
- One industrial user upgradient of the tailings may be within the affected (e.g. contaminated) hydrogeologic setting. The well is used primarily to control high water levels which occur during high stage in the Colorado River. Measures other than aquifer restoration would seem appropriate to ensure that there are no health effects from ingestion of this water.

Based on these criteria, aquifer restoration of the shallow ground water is neither a cost effective nor a necessary means of mitigating ground-water contamination caused by the uranium mill tailings at Grand Junction.

F.3.9 NO ACTION ALTERNATIVE

One of the alternatives addressed in this EIS is the "no action" alternative. It is difficult to quantify the impacts due to no action. On a qualitative basis it can be concluded that the impacts would be very similar to conditions in the existing environment. The following general conclusions can be reached regarding the no action alternative:

- In the short-term the tailings would remain in contact with the ground water and would continue to act as a source of contamination. Water-quality impacts in the short term would be very similar to those seen in the existing environment.

- In the long-term there is a high probability that erosion could remove the existing temporary cover. The tailings could be dispersed over a wider area and the potential for leaching of contaminants could be increased.

The water-quality impacts due to the no action alternative will not be further assessed within this appendix. More detailed discussion of the impacts of no action may be derived by reviewing the description of the existing hydrogeologic environment (Section F.3.1).

F.4 POTENTIALLY AFFECTED HYDROGEOLOGIC ENVIRONMENT-CHENEY RESERVOIR SITE

F.4.1 CHARACTERIZATION OF HYDROGEOLOGIC ENVIRONMENT

F.4.1.1 Previous investigations

The Cheney Reservoir area has been included within regional hydrogeologic studies; however it has been the subject of only one site-specific study. The Colorado Geological Survey (CGS, 1982) performed a reconnaissance level study of the location's potential use as a mill tailings disposal site.

F.4.1.2 Recent investigations

The field programs have involved exploratory drilling, hydraulic testing, monitoring well installation, and water sampling in two phases. The first phase was begun with drilling in November to December, 1982. The second phase was begun with drilling in March, 1985.

In the first phase, six exploratory borings were drilled and sampled for stratigraphic logging and to obtain soil samples for laboratory testing. These borings were also used for field permeability tests. An additional three borings were drilled and used for monitor well installation.

In the second phase, two borings were drilled for monitoring well installation. These borings were sampled during drilling for stratigraphic logging. Well construction details for both the first and second phases are presented in Table F.4.1, and well locations are presented in Figure F.4.1.

The first phase was conducted in accordance with a work plan for geotechnical and ground-water hydrology work (Golder Associates, 1982). All field and laboratory work in the second phase was completed in accordance with standard operating procedures. These standard operating procedures are on file with the U.S. DOE UMTRA Project Office in Albuquerque, New Mexico.

F.4.1.3 Stratigraphy

The stratigraphy of the disposal site has been defined through a series of borings (Figures F.4.2 through F.4.4).

On a hydrogeologic basis the stratigraphy can be divided into four zones:

- o A surficial layer of unconsolidated deposits.
- o The upper weathered zone of the Mancos Shale.

TABLE F.4.1 CHENEY RESERVOIR SITE BOREHOLE AND WELL INFORMATION

LOCATION[a] ID	NORTH[b] COORDINATE	EAST[b] COORDINATE	WELL DIAMETER [IN.]	TOTAL DEPTH [FT.]	SURFACE ELEVATION [FTMSL]	TOP OF CASING [FTMSL]	SCREENED INTERVAL BEG DP [FTFD]	SCREENED INTERVAL LENGTH [FT.]	BOREHOLE DEPTH [FTFD]
501	15241.1	95359.8			5301.80				49.83
502	14281.7	94162.6			5271.70				51.00
503	13348.9	92836.0			5238.40				50.00
504	14140.3	96238.6			5325.80				55.70
505	13132.9	94694.8			5279.30				50.50
506	11834.9	93198.0			5233.10				50.50
507	11902.9	93261.4	2.000	53.40	5235.14	5236.54	32.40	21.0	52.00
508	14169.1	96180.2	2.000	52.60	5324.06	5325.96	32.60	20.0	50.70
509	14336.4	94130.7	4.000	102.50	5271.57	5273.07	82.50	20.0	105.00
701	14463.1	95021.4	2.000	40.00	5293.10	5295.02	28.00	10.0	38.00
702	13412.9	93568.3	2.000	39.50	5252.96	5254.73	27.50	5.0	37.50

[a] 501-506 correspond to GCH-1 through GCH-6 in DOE, 1983; 507-509 correspond to GWCH-1 through GWCH-3 in DOE, 1983.

[b] Site coordinate system is based on a truncation of modified Colorado coordinate system.

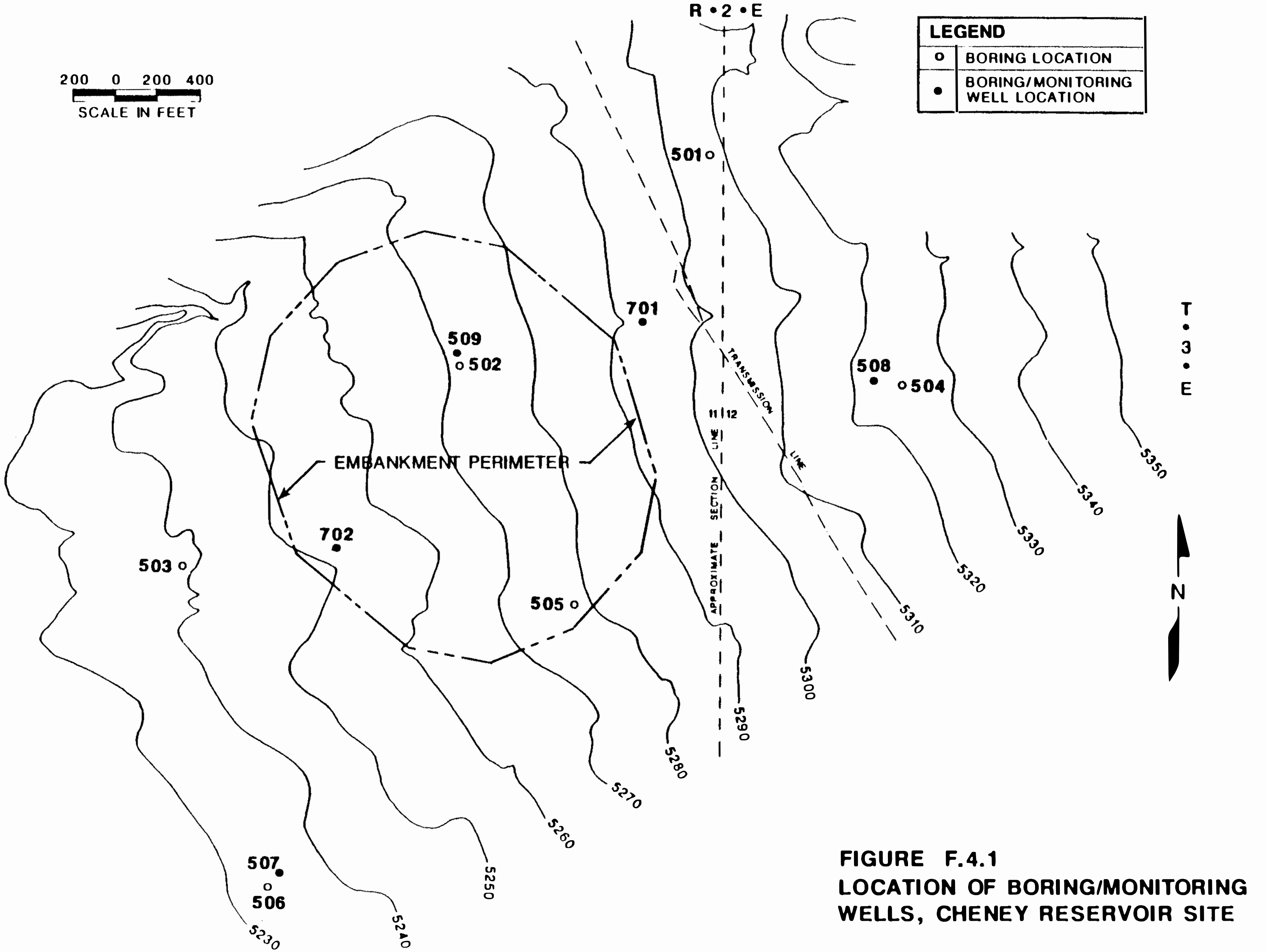


FIGURE F.4.1
LOCATION OF BORING/MONITORING WELLS, CHENEY RESERVOIR SITE

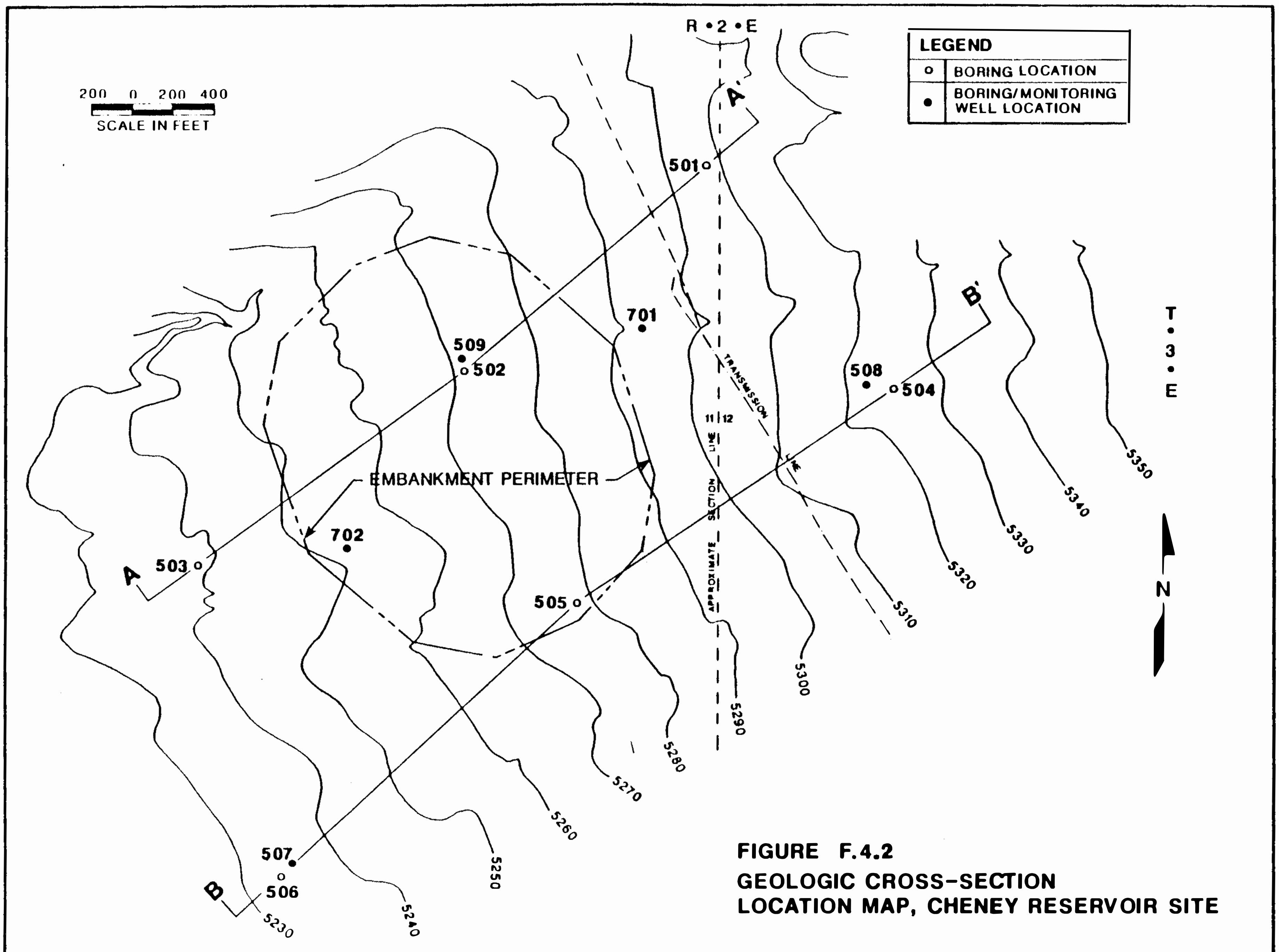


FIGURE F.4.2
GEOLOGIC CROSS-SECTION LOCATION MAP, CHENEY RESERVOIR SITE

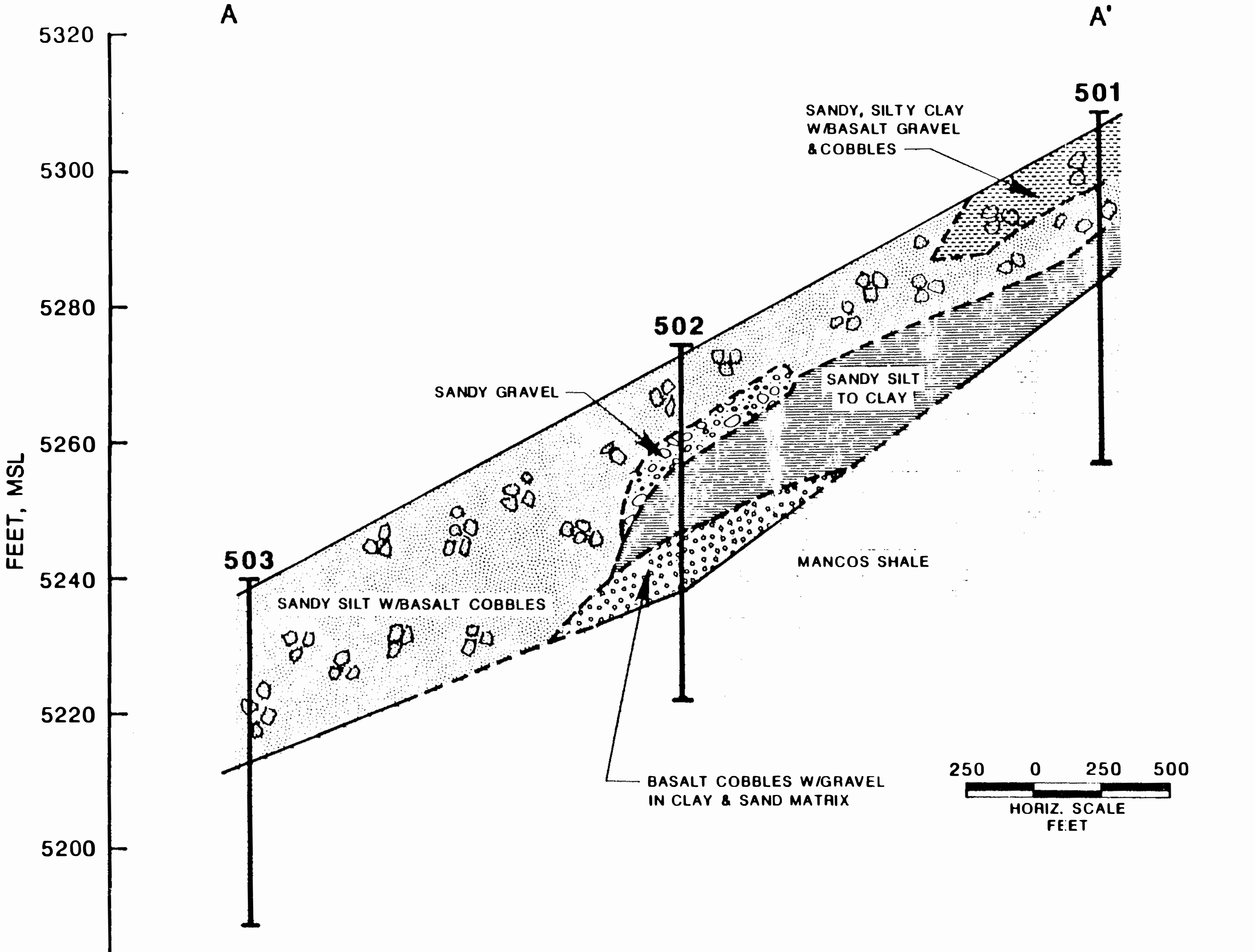


FIGURE F.4.3 CHENEY RESERVOIR SITE GEOLOGIC CROSS-SECTION A – A'

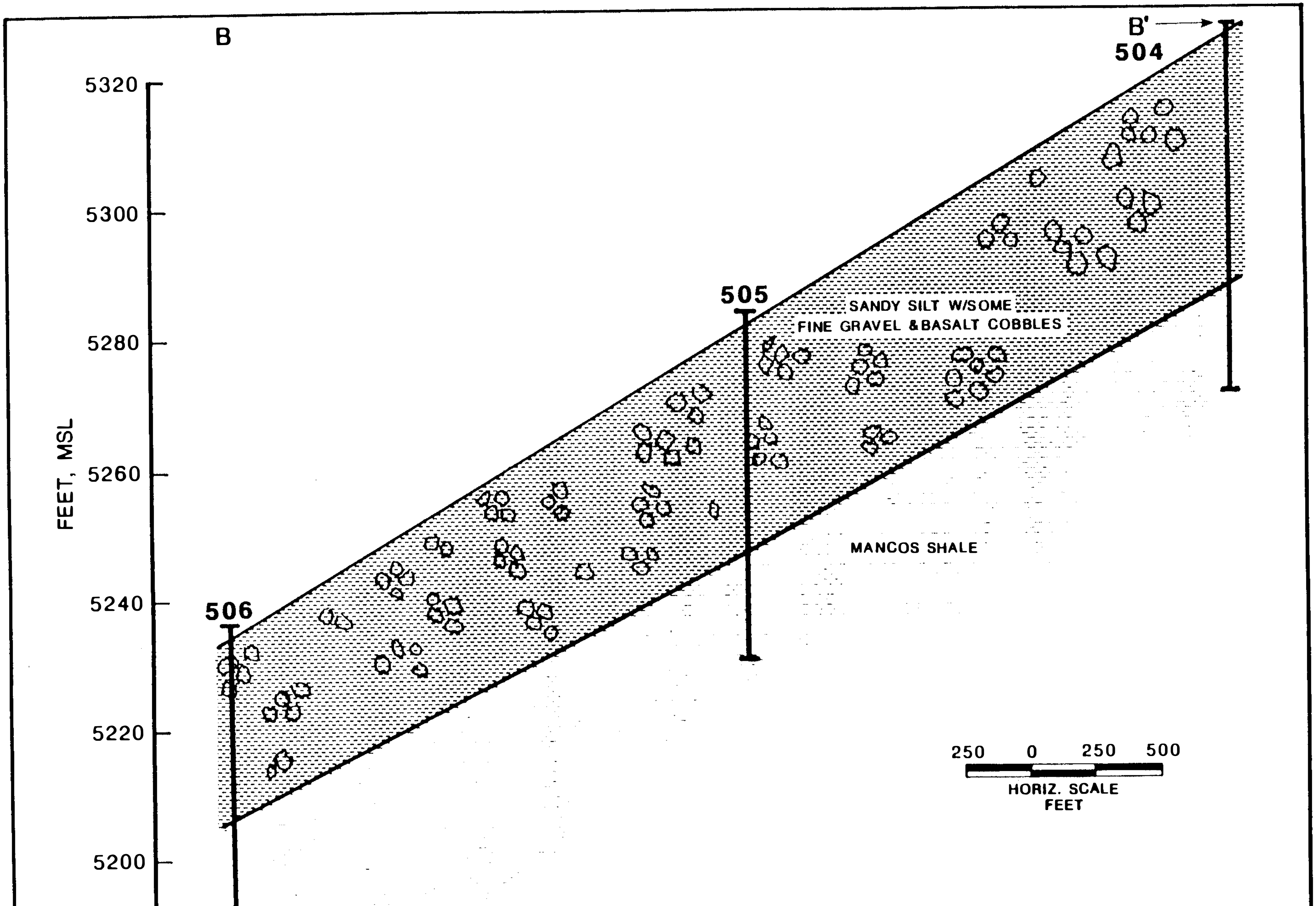


FIGURE F.4.4
CHENEY RESERVOIR SITE GEOLOGIC CROSS-SECTION B – B'

- o The lower, less-weathered portion of the Mancos Shale.

- o The Dakota Sandstone and other formations underlying the Mancos Shale.

Surficial layer. The Cheney Reservoir site is on a pediment surface as can be seen by the uniformly-sloping surface of the Mancos Shale in Figures F.4.3, F.4.4, and F.4.5. The unconsolidated deposits, based on the logs of nine borings, range in thickness from 23.5 to 42.0 feet. A brown to reddish brown eolian silt with some clay and sand and occasional gravel to boulder sized fragments of basalt, varies from zero to two to three feet at the surface. This material is underlain by interlayered clay, silt, sand, and gravel, with occasional layers of cobbles and boulders of basalt. This layer apparently represents mixed alluvial and colluvial deposits, and has been mapped as a pediment gravel (Cole and Sexton, 1981).

The primary geochemical mechanism for attenuating acid leachate is neutralization. Eight soil samples were collected at the Cheney Reservoir site. The analyses for calcium carbonate ranged from 4.83 to 34.90 percent by weight with an average of 16.17 percent. This equates to an acid neutralizing potential in tons of calcium carbonate equivalent per 1000 tons ranging from 60.6 to 350.4 with an average of 162.3. Limited data regarding the geochemical characteristics of the surficial layer are available, and are presented in Tables F.4.2 and F.4.3. The occurrence of water in the surficial zone is discussed in Section F.4.1.5.

Weathered Mancos Shale. At other locations, including Shiprock, New Mexico (DOE, 1984), it has been determined that the upper portions of the Mancos Shale will transmit measurable quantities of water. The hydraulic properties of the Mancos Shale would be expected to vary depending on location and stratigraphic position within the shale. At the Cheney Reservoir site, data are available regarding the capacity of the local shale to transmit water:

- o None of the 11 borings at the site encountered noticeable amounts of water in the shale at the time of drilling.

- o The two wells completed below the top of the shale (507, 509) have remained dry for over two years.

- o The three wells which have encountered ground water are completed partly in the upper shale and partly in the overburden.

- o In-situ permeability tests (Table F.4.4) indicate that near one of the dry wells (501) there is little difference between the permeability of the shale and the permeability of the overlying unconsolidated deposits. This is also true for one of the wells (508) with measurable ground water.

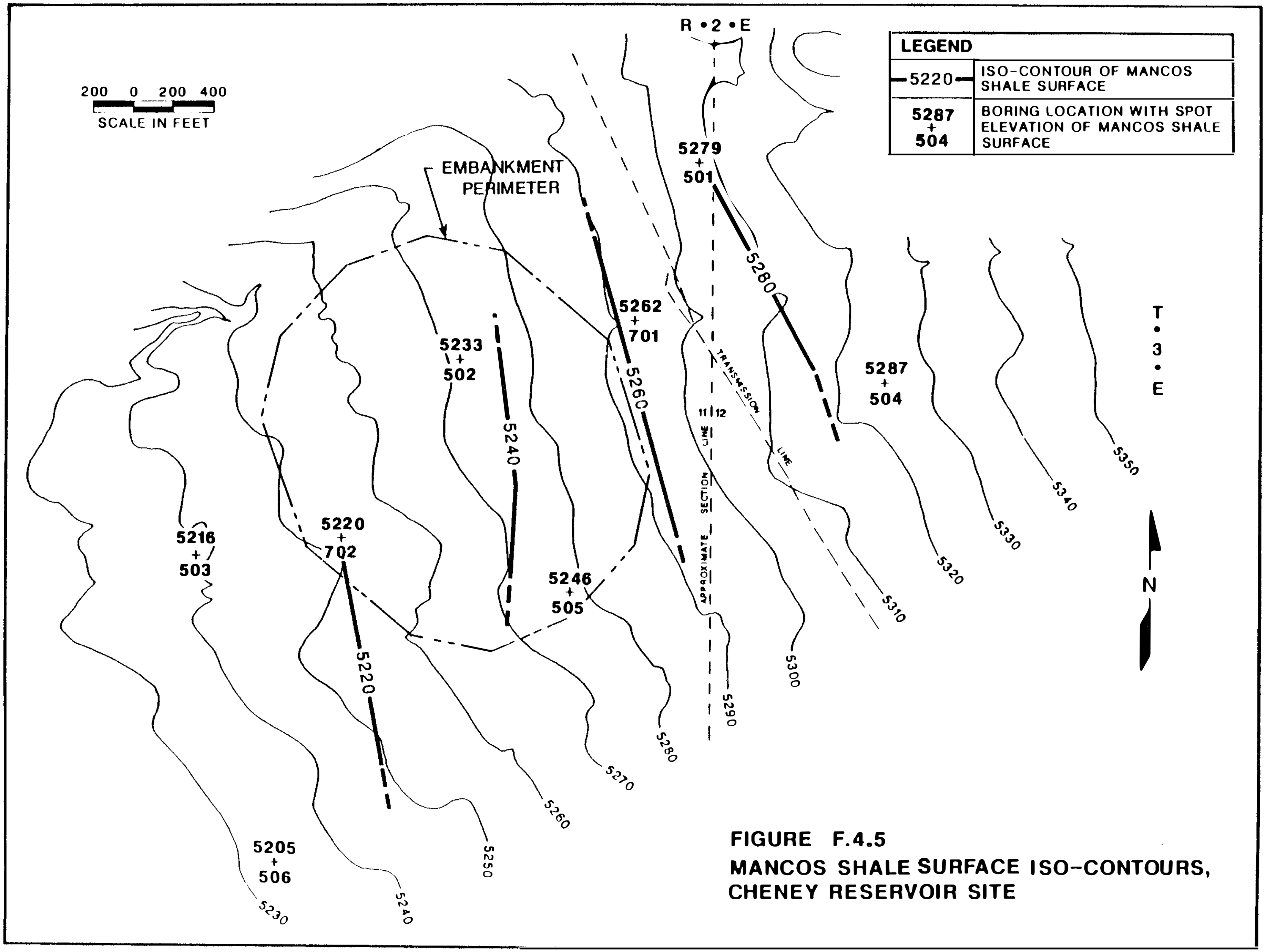


FIGURE F.4.5
MANCOS SHALE SURFACE ISO-CONTOURS, CHENEY RESERVOIR SITE

Table F.4.2 Cation-exchange capacity results

Parameter	Units[a]
Exchangeable sodium	22.1
Soluble sodium	19.2
Exchangeable potassium	0.28
Soluble potassium	0.04
Exchangeable calcium	91.3
Soluble calcium	5.69
Exchangeable magnesium	4.38
Soluble magnesium	1.22
CEC	20.0
Sulfate	2.21
Carbonate	9.50

[a]All except sulfate and carbonate data expressed in milliequivalents per 100 grams. Values for sulfate and carbonate expressed in weight-percent.

Ref. NUS, 1983.

Table F.4.3 Mineralogy analysis of bulk and clay-size fractions of soils at the Cheney Reservoir site

Phase	Bulk sample
Analcime	1
Ankerite (Fe-dolomite)	1
Apatite	--
Calcite	7
Clays(s) $\pm$ chlorite	4
Cristobalite	--
Gypsum	11
Hematite	2
K-feldspar	10
Mica-illite	8
Plagioclase-feldspar	8
Pyroxene	4
Quartz	28
Siderite	1
Amorphous	15

Phase	Clay-size-fraction sample[a]
Calcite	1
Chlorite ($\pm$kaolinite?)	8
Gypsum	--
K-feldspar	<1
Mica-illite	13
Mixed-layer clays	--
Montmorillonite	75
Plagioclase feldspar	<1
Quartz	2

[a]17.8 weight percent less than 2 microns.

Ref. NUS, 1983.

Table F.4.4 In-situ permeability tests at Cheney Reservoir

Location[a]	Depth interval (ft)	Permeability (cm/sec)
501	12-22	4×10^{-6}
	21-31	1×10^{-6}
	31-40	$<1 \times 10^{-7}$
	40-50	$<1 \times 10^{-7}$
502	10-14	2×10^{-4}
	20-31	3×10^{-6}
	36-46	$<1 \times 10^{-7}$
	41-51	$<1 \times 10^{-7}$
503	8-14	5×10^{-5}
	14-28	1×10^{-7}
	30-40	$<1 \times 10^{-7}$
	40-50	1×10^{-6}
504	10-18	3×10^{-5}
	22-34	5×10^{-6}
	35-44	6×10^{-5}
	44-56	$<5 \times 10^{-8}$
505	8-18	1×10^{-5}
	18-28	9×10^{-6}
	23-35	1×10^{-5}
	38-51	1×10^{-7}
506	10-19	6×10^{-5}
	21-29	1×10^{-4}
	29-40	6×10^{-5} to 1×10^{-4}
	40-51	1×10^{-5} to 5×10^{-5}

[a]Boring locations are shown in Figure F.4.1

Ref. NUS, 1983.

These data show that the upper weathered Mancos Shale is not transmitting significant amounts of water; however, there may be zones in the upper weathered Mancos Shale which are transmitting small amounts of water, but these zones are locally perched and laterally discontinuous.

Communication with deep aquifers. The Colorado Geological Survey reports that the site appears to be underlain by about 300 to 700 feet of Mancos Shale (CGS, 1982). The Mancos Shale is more than 400 feet thick beneath the site, as determined from the structural contours of Williams (1964). The Dakota Sandstone would be the uppermost potential aquifer underlying the Mancos Shale.

The Mancos Shale is generally regarded as a low-permeability formation which retards the movement of water (Lohman, 1965; Cooley et al., 1969). Because of the low permeability and thickness of the Mancos Shale, hydraulic communication between geologic units above and below the shale is expected to be minimal.

F.4.1.4 Unsaturated zone hydraulics

The description of unsaturated zone hydraulics at an alternate disposal site can include both vertical and horizontal movement of moisture. The characterization of hydraulic properties of the Grand Junction tailings has been documented elsewhere (see Section F.3.1.4), and includes properties for the in-situ tailings as well as properties for different mixtures and different degrees of compaction (Veyera, 1980).

The flux of moisture away from the site boundaries would be controlled by the properties of the surrounding soil or rock matrix, and by the properties of the engineered cover. Field permeability tests of the matrix determined saturated permeability values ranging from 2×10^{-4} cm/sec to less than 5×10^{-8} cm/sec. These tests are summarized in Table F.4.4. The unsaturated hydraulic conductivity will be less than the saturated permeability.

F.4.1.5 Saturated zone hydraulics

Five monitoring wells were installed at the Cheney Reservoir site. Three of the wells encountered saturated conditions, and all three were completed across the interface between the Mancos Shale and the overlying unconsolidated formation. This indicates the existence of water table conditions in the lower part of the unconsolidated zone or in the upper weathered zone of the Mancos Shale. Figure F.4.6 is a water-level map for May, 1985. Water levels for March, 1985, were all within 0.5 foot of the May water levels. Slug test results for two wells are summarized in Table F.4.5.

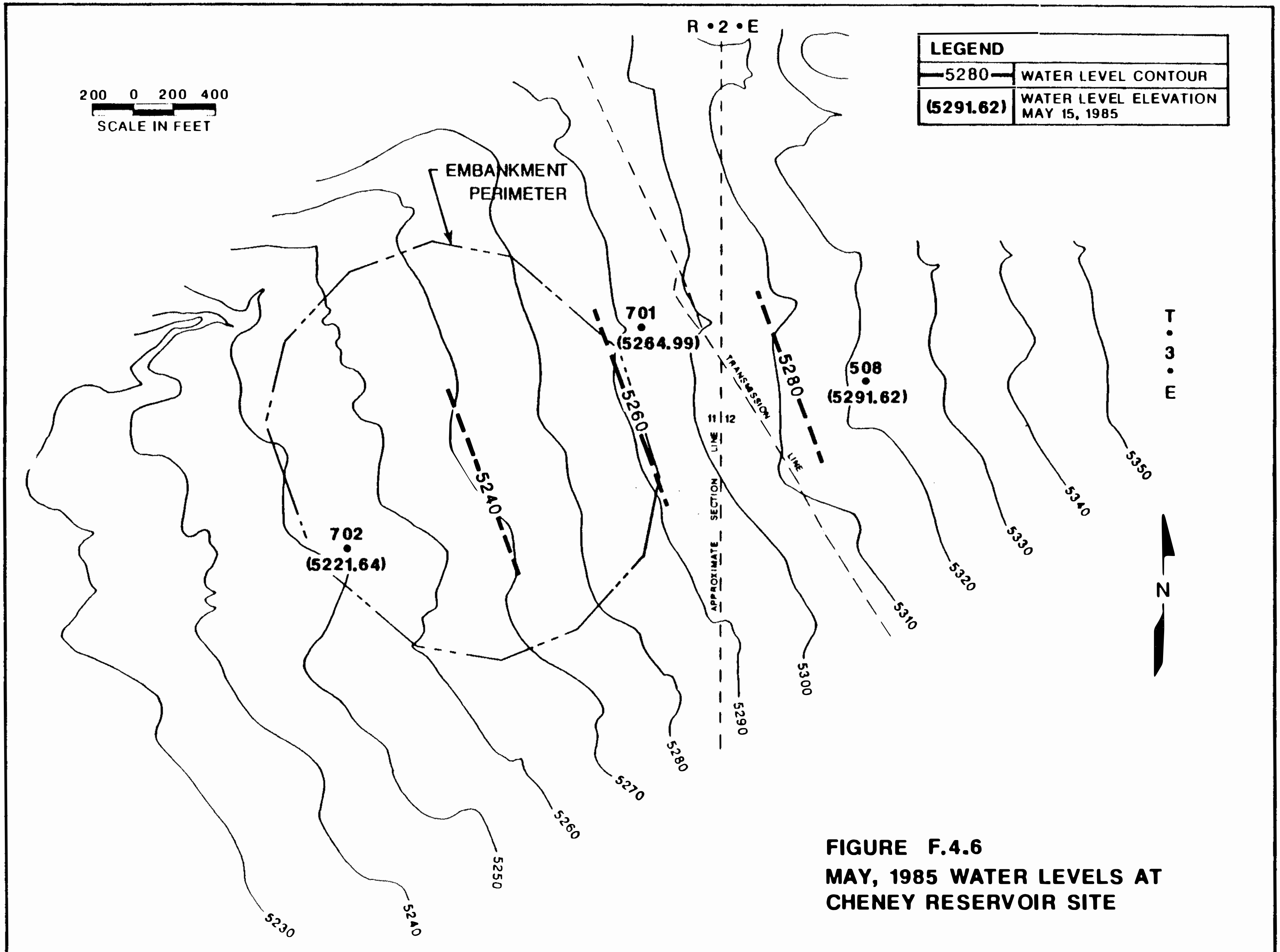


FIGURE F.4.6
MAY, 1985 WATER LEVELS AT CHENEY RESERVOIR SITE

Table F.4.5 Slug test results for the Cheney Reservoir site

Location	Hydraulic conductivity (cm/sec)
508	4.8×10^{-6}
701	2.1×10^{-5}

Test analyzed with Bouwer-Rice Method (Bouwer, 1978).

Based on Figure F.4.6, the average hydraulic gradient in this shallow system is approximately 0.025. The hydraulic conductivity in the saturated zone is known from in-situ permeability tests (Table F.4.4) and slug tests (Table F.4.5). These data were used to calculate an average linear or Darcian ground-water flux in the shallow system using Darcy's Law:

$$q = K \frac{dh}{dl}$$

where

q = flux (l/t)

K = hydraulic conductivity

dh/dl = hydraulic gradient (dimensionless).

The lowest measured hydraulic conductivity in one of the two slug tests was 5×10^{-6} cm/sec.

For this permeability the flux is:

$$\begin{aligned} q &= (5 \times 10^{-6})(0.025)(3.1536 \times 10^{7} \text{ sec/yr}) \\ &= 3.9 \text{ cm/yr} \\ &= 0.13 \text{ ft/yr} \end{aligned}$$

For the higher permeability of 1×10^{-5} cm/sec, which seems to be representative of the saturated zone (Table F.4.4) and is approximately the measured value of the other slug test:

$$\begin{aligned} q &= (1 \times 10^{-5})(0.025)(3.1536 \times 10^{7} \text{ sec/yr}) \\ &= 8 \text{ cm/yr} \\ &= 0.26 \text{ ft/yr.} \end{aligned}$$

Using these flux rates, the ground-water discharge can be calculated for a cross-section of the ground-water system, using Darcy's Law. This calculation is based on the assumption of a continuous ground-water system. If the system is laterally discontinuous the flux would be less than the rate calculated below. Based on the presence or absence of saturated conditions in monitoring wells completed at different depths, the thickness of the system appears to be less than 10 feet. The discharge for a 0.5-mile-wide section of the system is:

$$Q = q \times A$$

where

$$Q = \text{discharge } (l^3/t)$$

$$A = \text{cross-sectional area } (l^2)$$

$$Q = (0.13 \text{ to } 0.26 \text{ ft/yr})(10 \text{ feet} \times 2640 \text{ feet})$$

$$= 3432 \text{ to } 6864 \text{ ft}^3/\text{yr}.$$

The average velocity of the ground water can be calculated if the effective porosity with respect to the medium is known (Bear, 1979). The specific yield is sometimes called effective porosity (Bear, 1979). Specific yield was not measured at the Cheney Reservoir site, but can be assumed based on published values for similar soil types found at the site. Using these assumed values of effective porosity (Todd, 1980), average velocity can be calculated as follows (Bear, 1979):

$$V = Q/n_{ef}\, A$$

where

$$V = \text{average velocity } (l/t)$$

$$Q = \text{flow rate } (l^3/t)$$

$$n_{ef} = \text{effective porosity}$$

$$A = \text{cross-sectional area } (l^2)$$

$$V = (3432 \text{ to } 6864 \text{ ft}^3/\text{yr})/(0.03 \text{ to } 0.23) \times (26400 \text{ ft}^2)$$

$$= 0.57 \text{ to } 8.67 \text{ ft/yr}$$

The uncertainty in the assumed range of effective porosity is reflected in the calculated average velocity of the ground water.

Recharge. Recharge of shallow ground water in the vicinity of the Cheney Reservoir site probably comes from several sources including seepage losses from Whiting's Ditch (Figure F.4.7), infiltration of precipitation, and seepage from ephemeral and intermittent streams. Of these sources, seepage from Whiting's Ditch probably predominates for two

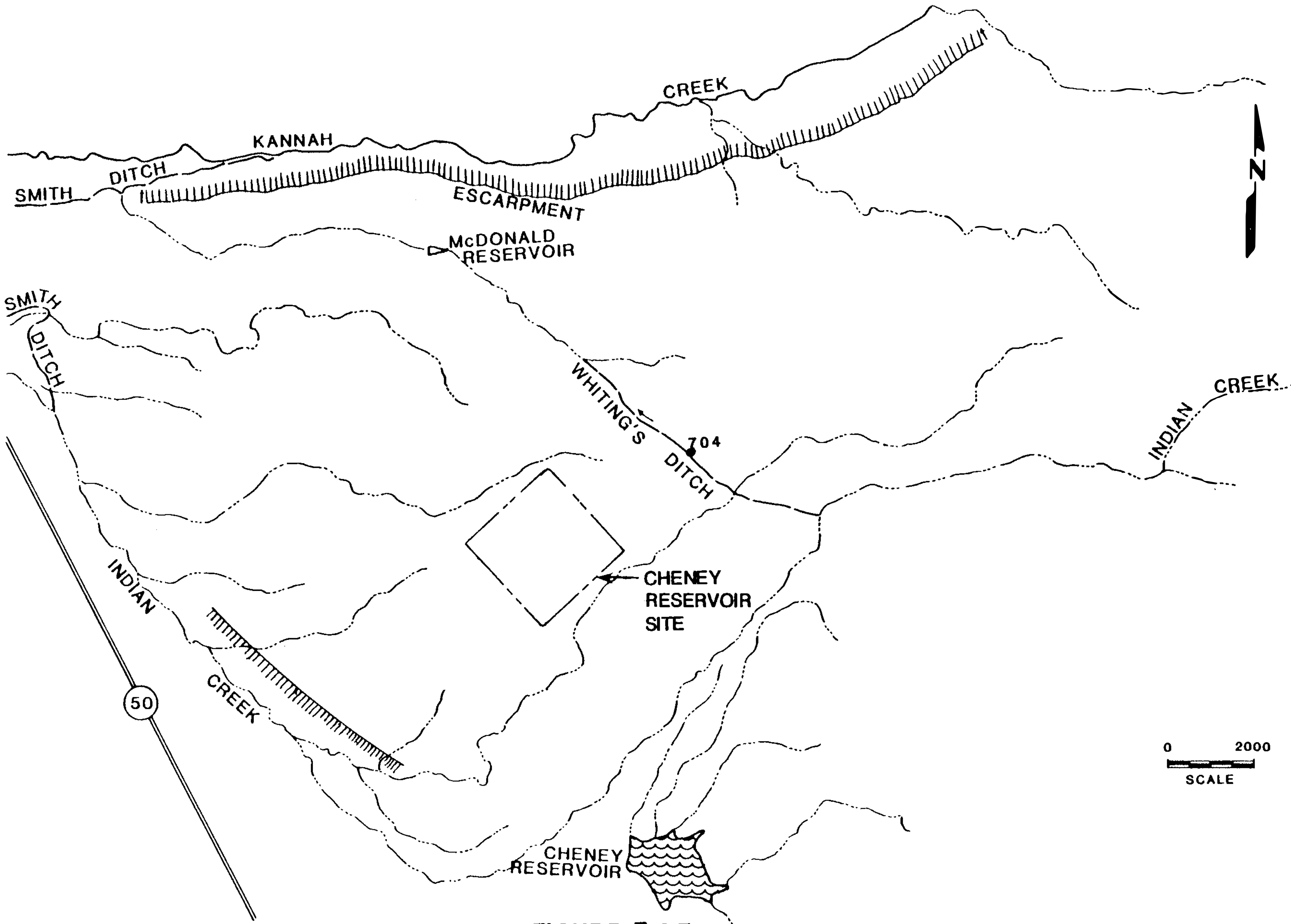


FIGURE F.4.7
HYDROLOGIC SETTING CHENEY RESERVOIR SITE

reasons: it is a constant head source for part of the year, and it is directly uphill from the site area.

Infiltration of precipitation is probably a minor source of recharge. Using the flux values calculated above, an estimate of the bounding maximum value of net infiltration can be made using the hydrologic equation (Chow, 1964):

$$I - O = dS$$

where

dS = change in storage
I = inflow
O = outflow

In a long-term, steady state condition, inflow must equal outflow to satisfy the continuity equation. A maximum value of infiltration results if it is assumed that all inflow is due to infiltration.

To estimate a maximum rate of infiltration, the area over which infiltration occurs must be known or assumed:

- o For discharge through the 0.5-mile-wide cross section (see above), it is assumed that infiltration occurs over an area 0.5 mile wide extending one mile uphill of the cross-section.

- o Infiltration over the area is uniform.

These assumptions are reasonable because reconnaissance of the area shows it to be relatively uniform with respect to factors which would influence infiltration including slope, vegetation type and coverage, and surficial geology. The maximum infiltration rate is then:

$$I_{max} = Q/A_i$$

where

I_{max} = maximum infiltration rate (l/t)

Q = discharge through cross-section (l^3/t)

A_i = area of infiltration

$$I_{max} = (3.4 \times 10^3 \text{ to } 6.8 \times 10^3 \text{ ft}^3/\text{yr}) / (2640 \text{ ft} \times 5280 \text{ ft})$$

$$= 2.4 \times 10^{-4} \text{ to } 4.9 \times 10^{-4} \text{ ft/yr}$$
$$= 2.9 \times 10^{-3} \text{ to } 5.9 \times 10^{-3} \text{ in/yr.}$$

Although this value of recharge is very low, it is consistent with the findings of studies elsewhere in the area. For example, at the Two Road site (Section F.5) ground water is not present in the shallow unconsolidated deposits or Mancos Shale, indicating a very low rate of recharge.

If a substantial fraction of the ground-water recharge is derived from seepage from Whiting's Ditch or Indian Creek, the net infiltration of precipitation would be much less than the calculated value.

A quantification of the rate of recharge from Whiting's Ditch into the shallow, perched ground water was attempted. Using a pygmy meter, streamflow was measured directly upstream of the Cheney Reservoir site and downstream of approximately one-third of the site. Measurements further downstream could not be obtained due to a structural diversion. The results of the measurements are shown on Table F.4.6. The flows were low and the stream bottom was soft which resulted in considerable variation in calculated streamflow, particularly at the downstream location. Although the results are not precise and may be inaccurate, the average of the downstream measurements is 0.019 cfs (8.5 gallons per minute) less than the average of the upstream measurements. Assuming that no evaporation occurred from the upstream to the downstream location, and that the recharge from the reach upgradient of the Cheney Reservoir site is three times the calculated recharge rate, then the recharge rate from the ditch to the shallow, perched ground water is 25.6 gallons per minute.

Discharge. Natural discharge of ground water occurs through three main components (Ward, 1975):

- o Evapotranspiration.
- o Discharge by means of spring flow and seepage into surface water bodies.
- o Leakage into adjacent aquifers.

Leakage from the shallow system into adjacent aquifers is probably negligible (Section F.4.1.3). Discharge by evapotranspiration, spring flow, or seepage into surface water bodies can be expected to occur where the ground surface intersects the water table and where an underlying relatively impermeable layer crops out. West of the site there is a topographic break where the slope increases, and the Mancos Shale crops out in some places in ephemeral drainages. Because this area seems like a favorable place for ground-water discharge to occur a reconnaissance was conducted in May, 1985.

During the reconnaissance a walking tour was made of three areas which could be potential discharge areas: incised drainages above the topographic break, the hillslope along the topographic break, and drainages below the topographic break. No signs of seepage were observed. Some small areas of salt accumulation were seen along Mancos Shale outcrops in the incised drainages; however, there are many such areas of salt accumulation within the Grand Valley (Lohman, 1965). Because there were no observed signs of seepage, no definite conclusion about the area of ground-water discharge can be made.

Table F.4.6 Stream flow measurements on Whiting's Ditch[a]

Location	Stream width (feet)	Stream depth (feet)	Rotations per minute	Velocity (feet/ second)	Discharge (cfs)
Upstream-station 1	2.3	0.42	9.6	0.18	0.089
Upstream-station 2	2.1	0.19	42.5	0.72	0.144
Upstream-station 3	2.2	0.28	16	0.29	0.089
Average upstream	--	--	--	--	0.107
Downstream-station 1	1.9	0.16	30.5	0.53	0.080
Downstream-station 2	1.85	0.22	11.85	0.22	0.045
Downstream-station 3	1.8	0.44	19.75	0.35	0.139
Average downstream	--	--	--	--	0.088

[a]Date: July 25, 1986. Measurement device: pygmy meter.

Instead, several potential means of ground-water discharge can be postulated:

- o The ground-water discharge is small and discharge is in the form of diffuse seepage over a relatively large area. This type of discharge occurs in homogeneous geologic materials (Davis and DeWiest, 1966). The discharge is consumed by direct evaporation and transpiration, and there is no evidence of seepage.

- o The ground-water flux moves down the topographic break through the unconsolidated deposits on the hillslope. The unconsolidated deposits are essentially continuous with the Mancos Shale cropping out only in the incised drainages that transect the topographic break. There is no seepage at the topographic break, and the ground water moves through unconsolidated deposits to discharge at the Gunnison River several miles to the west.

- o Near the topographic break the Mancos Shale is closer to the ground surface and the weathered, more permeable, zone of the shale thickens. Ground water moves across the topographic break deep in the shale and eventually discharges at some unknown point.

- o A combination of the three postulated means of discharge occurs.

Whichever of these postulated means of discharge occurs, it can be concluded that discharge either occurs at a point relatively far from the site or discharge is mostly consumed by evapotranspiration.

Yield. The shallow ground-water system appears to have a small potential yield, where potential "safe yield" is defined as the amount of water that can be withdrawn without running out of water (Lohman, 1972). On a quantitative basis, the Thiem equation with Dupuit assumptions can be used to estimate the safe yield of the system (Todd, 1980):

$$Q = (Pi)K \frac{h_o^2 - h_w^2}{\ln(r_o/r_w)}$$

where

Q = discharge (l^3/t)

K = hydraulic conductivity(l/t)

h_o = original head (pre-pumping or no drawdown)

h_w = head at well

r_o = radius to point of negligible drawdown

r_w = radius of well

For a two-inch well at the uphill side of the site, assuming negligible drawdown at the recharge source (Whiting's Ditch), an initial saturated thickness of 10 feet, and drawdown of eight feet:

$K = 1.4$ to 2.8×10^{-2} ft/day

h_o = 10 feet

h_w = 2 feet

r_o = 2600 feet

r_w = 0.0833 feet

Q = 3 to 6 gallons per day.

However, because the ground-water system is sloping and there is no recharge source on the downhill side of the well, sustained yield of ground water can come only from the uphill semicircle surrounding the well and the potential yield is halved:

Q = 1.5 to 3 gallons per day.

The estimated flow through a one-mile wide cross-section in the shallow system is 3432 to 6864 ft^3/year (Section F.4.1.5). A well or wells capturing all of this water (an impossibility) would yield only 70 to 141 gallons per day.

F.4.1.6 Water quality

Water-quality analyses for three monitoring wells are presented in Tables F.4.7 and F.4.8. Lists of all exceedances of EPA primary and secondary drinking water standards are presented in Tables F.4.9 and F.4.10. The water quality at the farthest upgradient well can be described as fresh, and as brackish at the other two wells. The ground water exhibits a definite increase in total dissolved solids in the downgradient direction. This increase can be attributed to contact with the marine origin Mancos Shale. Concentrations of several constituents exceeding National Primary or Secondary Drinking Water Standards include iron, manganese, pH, sulfate, total dissolved solids, and uranium (health advisory level).

Total organic carbon (TOC) exceeded 700 mg/l at the two wells installed in 1985. This probably resulted from the slow breakdown of biodegradable organic drilling fluid additives, as has been noted by other investigators (Barcelona, 1984; Ericson et al., 1985). The wells were purged after installation and were bailed dry several times prior to sampling. The persistence of high concentrations of TOC may indicate that

Table F.4.7 GROUND WATER QUALITY DATA BY LOCATION
SITE: CHENEY RESERVOIR
02/21/83 TO 07/22/86

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		508-01 02/21/83	508-01 03/27/85	508-01 06/07/85	508-01 09/03/85	508-01 07/22/86
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	280.	413.	365.	340.	284.
ALUMINUM	MG/L	-	< 0.1	< 0.1	< 0.1	0.3
AMMONIUM	MG/L	-	0.68	< 0.1	< 0.1	< 0.1
ANTIMONY	MG/L	-	< 0.003	< 0.003	< 0.003	-
ARSENIC	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
BALANCE	%	2.82	1.	2.54	-5.3	-1.5
BARIUM	MG/L	< 0.07	< 0.1	< 0.1	< 0.05	-
BORON	MG/L	-	0.11	0.11	0.04	-
CADMIUM	MG/L	0.0002	< 0.002	< 0.001	< 0.001	-
CALCIUM	MG/L	164.	86.	116.	91.8	105.
CHLORIDE	MG/L	33.	22.	21.2	20.6	36.
CHROMIUM	MG/L	< 0.001	< 0.01	< 0.01	< 0.01	0.02
COBALT	MG/L	< 0.001	< 0.05	< 0.05	< 0.05	-
CONDUCTANCE	UMHO/CM	1200.	890.	1006.	1064.	800.
COPPER	MG/L	0.0015	0.03	< 0.02	< 0.02	-
CYANIDE	MG/L	-	< 0.01	< 0.01	-	-
FLUORIDE	MG/L	-	0.5	0.5	0.47	-
GROSS ALPHA	PCI/L	-	25.	-	-	-
GROSS BETA	PCI/L	-	< 50.	-	-	-
HYD. SULFIDE	MG/L	-	< 0.2	-	0.27	-
IRON	MG/L	0.0062	0.2	0.34	0.33	0.14
LEAD	MG/L	0.047	< 0.01	< 0.01	-	-
MAGNESIUM	MG/L	57.8	44.	55.2	49.6	51.
MANGANESE	MG/L	0.34	0.5	0.44	0.42	0.37
MERCURY	MG/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	-
MOLYBDENUM	MG/L	0.04	< 0.01	< 0.01	< 0.01	0.16
NICKEL	MG/L	-	< 0.04	< 0.04	< 0.04	< 0.04
NITRATE	MG/L	< 0.1	< 1.	< 1.	< 1.	< 1.
ORG. CARBON	MG/L	80.9	17.2	23.	42.1	-
PB-210	PCI/L	-	< 1.5	< 1.5	-	-
PH	SU	7.	7.2	7.4	6.9	7.37
PHOSPHATE	MG/L	-	< 0.1	< 0.1	-	-
PO-210	PCI/L	-	< 1.	< 1.	-	-
POTASSIUM	MG/L	5.07	3.7	3.83	2.81	3.65
RA-226	PCI/L	< 0.5	< 1.	< 1.	< 1.	-
RA-228	PCI/L	-	< 1.	< 1.	< 1.	-
SELENIUM	MG/L	0.002	< 0.005	< 0.005	< 0.005	< 0.005
SILICA	MG/L	-	18.9	17.2	38.1	-
SILVER	MG/L	< 0.01	< 0.01	< 0.01	-	-
SODIUM	MG/L	71.1	94.	79.8	71.2	90.4
STRONTIUM	MG/L	-	1.	1.12	1.16	-
SULFATE	MG/L	420.	155.	256.	285.	344.
SULFIDE	MG/L	-	-	0.2	-	-
TEMPERATURE	C - DEGREE	16.	14.	16.	19.	15.
TH-230	PCI/L	-	< 1.	< 1.		-
TIN	MG/L	-	< 0.005	< 0.005	< 0.005	
TOTAL SOLIDS	MG/L	1000.	656.	782.	790.	828.

Table F.4.7 GROUND WATER QUALITY DATA BY LOCATION
SITE: CHENEY RESERVOIR
02/21/83 TO 07/22/86 (Continued)

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		508-01 02/21/83	508-01 03/27/85	508-01 06/07/85	508-01 09/03/85	508-01 07/22/86
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
TOX	MG/L	-	0.1	0.17	-	-
U-234	PCI/L	-	-	1.8	2.	-
U-238	PCI/L	-	-	1.	1.	-
URANIUM	MG/L	0.024	0.008	-	-	0.0241
VANADIUM	MG/L	0.015	< 0.01	< 0.01	< 0.01	0.3
ZINC	MG/L	0.02	0.1	< 0.005	0.012	0.024

Table F.4.7 GROUND WATER QUALITY DATA BY LOCATION
SITE: CHENEY RESERVOIR
02/24/83 TO 07/27/86 (Continued)

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE				
		704-01 03/27/85	704-01 06/07/85	704-01 09/03/85	704-01 07/27/86	
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	581.	403.	294.	412.	
ALUMINUM	MG/L	< 0.1	< 0.1	< 0.1	0.2	
AMMONIUM	MG/L	0.62	0.1	< 0.1	< 0.1	
ANTIMONY	MG/L	0.005	< 0.003	< 0.003	-	
ARSENIC	MG/L	< 0.01	< 0.01	< 0.01	< 0.01	
BALANCE	%	17.89	0.04	-1.72	-2.79	
BARIUM	MG/L	< 0.1	< 0.1	< 0.05	-	
BORON	MG/L	0.29	0.09	0.03	-	
CADMIUM	MG/L	< 0.002	< 0.001	< 0.001	-	
CALCIUM	MG/L	530.	154.	113.	118.	
CHLORIDE	MG/L	120.	22.1	22.2	59.	
CHROMIUM	MG/L	< 0.01	< 0.01	< 0.01	0.03	
COBALT	MG/L	< 0.04	< 0.05	< 0.05	-	
CONDUCTANCE	UMHO/CM	3100.	1098.	1112.	850.	
COPPER	MG/L	< 0.01	< 0.02	0.03	-	
CYANIDE	MG/L	< 0.01	< 0.01	-	-	
FLUORIDE	MG/L	0.3	0.5	0.46	-	
GROSS ALPHA	PCI/L	< 40.	-	-	-	
GROSS BETA	PCI/L	60.	-	-	-	
HYD. SULFIDE	MG/L	< 0.2	-	< 0.1	-	
IRON	MG/L	7.7	0.53	0.43	0.89	
LEAD	MG/L	< 0.01	< 0.01	-	-	
MAGNESIUM	MG/L	131.	56.2	51.6	54.8	
MANGANESE	MG/L	6.6	1.43	0.54	0.8	
MERCURY	MG/L	< 0.0002	< 0.0002	0.0002	-	
MOLYBDENUM	MG/L	< 0.01	< 0.01	0.02	0.17	
NICKEL	MG/L	< 0.04	< 0.04	0.06	0.06	
NITRATE	MG/L	< 1.	< 1.	< 1.	< 1.	
ORG. CARBON	MG/L	775.	15.	18.2	-	
PB-210	PCI/L	< 1.5	< 1.5	-	-	
PH	SU	6.2	7.15	7.	7.07	
PHOSPHATE	MG/L	< 0.1	< 0.1	-	-	
PO-210	PCI/L	< 1.	< 1.	-	-	
POTASSIUM	MG/L	13.1	4.48	2.65	4.01	
RA-226	PCI/L	< 1.	< 1.	< 1.	-	
RA-228	PCI/L	< 1.	< 1.	< 1.	-	
SELENIUM	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	
SILICA	MG/L	22.8	18.4	39.4	-	
SILVER	MG/L	< 0.01	< 0.01	-	-	
SODIUM	MG/L	243.	77.	69.9	118.	
STRONTIUM	MG/L	4.2	1.16	1.14	-	
SULFATE	MG/L	910.	343.	334.	320.	
SULFIDE	MG/L	-	0.2	-	-	
TEMPERATURE	C - DEGREE	14.	16.	17.	14.	
TH-230	PCI/L	< 1.	< 1.	-	-	
TIN	MG/L	< 0.005	< 0.005	< 0.005	-	
TOTAL SOLIDS	MG/L	3746.	898.	876.	875.	

Table F.4.7 GROUND WATER QUALITY DATA BY LOCATION
SITE: CHENEY RESERVOIR
02/24/83 TO 07/27/86 (Concluded)

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

		LOCATION ID - SAMPLE ID AND LOG DATE							
		701-01 03/27/85		701-01 06/07/85		701-01 09/03/85		701-01 07/27/86	
PARAMETER	UNIT OF MEASURE		PARAMETER VALUE+/-UNCERTAINTY		PARAMETER VALUE+/-UNCERTAINTY		PARAMETER VALUE+/-UNCERTAINTY		PARAMETER VALUE+/-UNCERTAINTY
TOX	MG/L	<	0.1		0.46		-		-
U-234	PCI/L		-		5.3		7.		-
U-238	PCI/L		-		3.5		4.		-
URANIUM	MG/L		0.046		-		-		0.0438
VANADIUM	MG/L	<	0.01	<	0.01	<	0.01		0.3
ZINC	MG/L		0.07	<	0.005		0.018		0.027

MAPPER INPUT FILE: GRJ03*UDPGWQ100384

Table F.4.8 GROUND WATER QUALITY DATA BY LOCATION
SITE: CHENEY RESERVOIR
03/27/85 TO 07/27/86

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

		LOCATION ID - SAMPLE ID AND LOG DATE				
		702-01 03/27/85	702-01 06/07/85	702-01 09/03/85	702-01 07/27/86	
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY	PARAMETER VALUE+/-UNCERTAINTY
ALKALINITY	MG/L CACO3	270.	670.	399.	405.	
ALUMINUM	MG/L	< 0.1	< 0.1	< 0.1	0.3	
AMMONIUM	MG/L	0.5	0.1	< 0.1	< 0.1	
ANTIMONY	MG/L	< 0.003	< 0.003	< 0.003	-	
ARSENIC	MG/L	< 0.01	0.01	< 0.01	< 0.01	
BALANCE	%	-4.56	13.28	-2.6	0.	
BARIUM	MG/L	< 0.1	< 0.1	< 0.05	-	
BORON	MG/L	0.09	0.23	0.05	-	
CADMIUM	MG/L	< 0.002	< 0.001	< 0.001	-	
CALCIUM	MG/L	360.	215.	109.	100.	
CHLORIDE	MG/L	250.	95.9	30.3	54.	
CHROMIUM	MG/L	< 0.01	< 0.01	< 0.01	0.01	
COBALT	MG/L	< 0.01	< 0.05	< 0.05	-	
CONDUCTANCE	UMHO/CM	2800.	1357.	1265.	800.	
COPPER	MG/L	0.04	< 0.02	0.03	-	
CYANIDE	MG/L	< 0.01	< 0.01	-	-	
FLUORIDE	MG/L	0.4	0.6	0.59	-	
HYD. SULFIDE	MG/L	< 0.2	-	< 0.1	-	
IRON	MG/L	5.5	0.72	0.29	0.19	
LEAD	MG/L	< 0.01	< 0.01	-	-	
MAGNESIUM	MG/L	50.	99.	50.2	49.8	
MANGANESE	MG/L	1.7	1.53	1.11	0.92	
MERCURY	MG/L	< 0.0002	< 0.0002	0.0002	-	
MOLYBDENUM	MG/L	0.01	< 0.01	< 0.01	0.12	
NICKEL	MG/L	< 0.04	< 0.04	0.04	-	
NITRATE	MG/L	< 1.	< 1.	< 1.	< 1.	
ORG. CARBON	MG/L	742.	29.4	10.5	-	
PB-210	PCI/L	-	< 1.5	-	-	
PH	SU	6.4	6.8	6.7	7.45	
PHOSPHATE	MG/L	< 0.1	< 0.1	-	-	
PO-210	PCI/L	-	< 1.	-	-	
POTASSIUM	MG/L	11.	7.56	4.03	4.04	
RA-226	PCI/L	-	< 1.	< 1.	-	
RA-228	PCI/L	-	< 1.	< 1.	-	
SELENIUM	MG/L	< 0.005	< 0.005	< 0.005	< 0.005	
SILICA	MG/L	13.3	27.2	43.4	-	
SILVER	MG/L	< 0.01	< 0.01	-	-	
SODIUM	MG/L	260.	234.	96.4	156.	
STRONTIUM	MG/L	2.7	2.51	1.24	-	
SULFATE	MG/L	1200.	304.	282.	306.	
SULFIDE	MG/L	-	0.7	-	-	
TEMPERATURE	C - DEGREE	12.	17.	18.	15.	
TH-230	PCI/L	-	< 1.	-	-	
TIN	MG/L	< 0.005	< 0.005	< 0.005	-	
TOTAL SOLIDS	MG/L	-	1584.	880.	794.	
TOX	MG/L	-	0.27	-	-	
U-234	PCI/L	-	2.4	4.	-	

Table F.4.8 GROUND WATER QUALITY DATA BY LOCATION
SITE: CHENEY RESERVOIR
03/27/85 TO 07/27/86 (Concluded)

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

		LOCATION ID - SAMPLE ID AND LOG DATE							
		702-01 03/27/85		702-01 06/07/85		702-01 09/03/85		702-01 07/27/86	
PARAMETER	UNIT OF MEASURE	PARAMETER VALUE+/-UNCERTAINTY		PARAMETER VALUE+/-UNCERTAINTY		PARAMETER VALUE+/-UNCERTAINTY		PARAMETER VALUE+/-UNCERTAINTY	
U-238	PCI/L		-		1.5		3.		-
URANIUM	MG/L		-		-		-		0.0136
VANADIUM	MG/L	<	0.01	<	0.01	<	0.01		0.31
ZINC	MG/L		0.3	<	0.005		0.015		0.017

MAPPER INPUT FILE: GRJ03*UDPGWQ100382

Table F.4.9 GROUND WATER QUALITY MEASUREMENTS EXCEEDING EPA DRINKING WATER QUALITY STANDARDS
SITE: CHENEY RESERVOIR
02/21/83 TO 07/27/86

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
ARSENIC	MG/L	0.05	-	-	-	-
BARIUM	MG/L	1.0	-	-	-	-
CADMIUM	MG/L	0.01	-	-	-	-
CHLORIDE	MG/L	250.0	-	-	-	-
CHROMIUM	MG/L	0.05	-	-	-	-
COPPER	MG/L	1.0	-	-	-	-
FLUORIDE	MG/L	1.4	-	-	-	-
GROSS ALPHA	PCI/L	15.0	508	01	03/27/85	25.0000
			701	01	03/27/85	< 40.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
IRON	MG/L	0.3	508	01	06/07/85	.3400
			508	01	09/03/85	.3300
			701	01	03/27/85	7.7000
			701	01	06/07/85	.5300
			701	01	09/03/85	.4300
			701	01	07/27/86	.8900
**** SAMPLES EXCEEDING MAXIMUM VALUE = 66 % ****						
LEAD	MG/L	0.05	-	-	-	-
MANGANESE	MG/L	0.05	508	01	02/21/83	.3400
			508	01	03/27/85	.5000
			508	01	06/07/85	.4400
			508	01	09/03/85	.4700
			508	01	07/27/86	.3700
			701	01	03/27/85	6.6000
			701	01	06/07/85	1.4300
			701	01	09/03/85	.5100
			701	01	07/27/86	.8000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
MERCURY	MG/L	0.002	-	-	-	-
NITRATE	MG/L	44.0	-	-	-	-
PH	SU	6.5 TO 8.5	701	01	03/27/85	6.2000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 11 % ****						
RA226+RA228	PCI/L	5.0	508	01	06/07/85	< 5.5000
			701	01	03/27/85	< 6.0000
			701	01	09/03/85	< 6.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 25 % ****						
SELENIUM	MG/L	0.01	-	-	-	-
SILVER	MG/L	0.05	-	-	-	-
SULFATE	MG/L	250.0	508	01	02/21/83	420.0000
			508	01	06/07/85	256.0000
			508	01	09/03/85	285.0000
			508	01	07/27/86	344.0000

Table F.4.9 GROUND WATER QUALITY MEASUREMENTS EXCEEDING EPA DRINKING WATER QUALITY STANDARDS
SITE: CHENEY RESERVOIR
02/24/83 TO 07/27/86 (Concluded)

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: UP GRADIENT

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
SULFATE	MG/L	250.0	701	01	03/27/85	910.0000
			701	01	06/07/85	343.0000
			701	01	09/03/85	334.0000
			701	01	07/27/86	320.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 88 % ****						
TOTAL SOLIDS	MG/L	500.0	508	01	02/24/83	1000.0000
			508	01	03/27/85	656.0000
			508	01	06/07/85	782.0000
			508	01	09/03/85	790.0000
			508	01	07/27/86	828.0000
			701	01	03/27/85	3746.0000
			701	01	06/07/85	898.0000
			701	01	09/03/85	876.0000
			701	01	07/27/86	875.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
ZINC	MG/L	5.0	-	-	-	-

MAPPER DATA FILE: GRJ03*UDPGWQ100381

Table F.4.10 GROUND WATER QUALITY MEASUREMENTS EXCEEDING
EPA DRINKING WATER QUALITY STANDARDS
SITE: CHENEY RESERVOIR
03/27/85 TO 07/27/86

FORMATION OF COMPLETION: SHALE
HYDRAULIC FLOW RELATIONSHIP: ON-SITE

PARAMETER	UNITS OF MEASURE	MAXIMUM VALUE	LOCATION ID	SAMPLE ID	LOG DATE	PARAMETER VALUE+/-UNCERTAINTY
ARSENIC	MG/L	0.05	-	-	-	-
BARIUM	MG/L	1.0	-	-	-	-
CADMIUM	MG/L	0.01	-	-	-	-
CHLORIDE	MG/L	250.0	-	-	-	-
CHROMIUM	MG/L	0.05	-	-	-	-
COPPER	MG/L	1.0	-	-	-	-
FLUORIDE	MG/L	1.4	-	-	-	-
GROSS ALPHA	PCI/L	15.0	-	-	-	-
IRON	MG/L	0.3	702	01	03/27/85	5.5000
			702	01	06/07/85	.7200
**** SAMPLES EXCEEDING MAXIMUM VALUE = 50 % ****						
LEAD	MG/L	0.05	-	-	-	-
MANGANESE	MG/L	0.05	702	01	03/27/85	1.7000
			702	01	06/07/85	1.5300
			702	01	09/03/85	1.1100
			702	01	07/27/86	.9200
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
MERCURY	MG/L	0.002	-	-	-	-
-NITRATE	MG/L	44.0	-	-	-	-
PH	SU	6.5 TO 8.5	702	01	03/27/85	6.4000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 25 % ****						
RA226+RA228	PCI/L	5.0	702	01	09/03/85	< 6.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 25 % ****						
SELENIUM	MG/L	0.01	-	-	-	-
SILVER	MG/L	0.05	-	-	-	-
SULFATE	MG/L	250.0	702	01	03/27/85	1200.0000
			702	01	06/07/85	304.0000
			702	01	09/03/85	282.0000
			702	01	07/27/86	306.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
TOTAL SOLIDS	MG/L	500.0	702	01	06/07/85	1584.0000
			702	01	09/03/85	880.0000
			702	01	07/27/86	794.0000
**** SAMPLES EXCEEDING MAXIMUM VALUE = 100 % ****						
ZINC	MG/L	5.0	-	-	-	-

MAPPER DATA FILE: GRJ03*UDPGWQ100382

the system is relatively stagnant with low flow rates; the complete removal of drilling fluid from and around the well bore may require removing several additional bore volumes of water (and drilling fluid).

F.4.1.7 Proximity of site to surface water

The Cheney Reservoir site is approximately 0.8 mile north-northwest of Cheney Reservoir. To the north of the site Kannah Creek and Smith Ditch (an irrigation canal) are approximately one mile from the site.

Several ephemeral drainages of varying size run generally northwest to southeast within one mile of the site. These drainages flow into Indian Creek, an ephemeral drainage approximately 0.1 to 0.5 mile west-southwest of the site. The Colorado Geological Survey (CGS, 1982) noted that an irrigation ditch of unknown nature crosses the upper part of the site which was investigated. The ditch (Whiting's Ditch) is approximately 0.25 mile northeast of the site boundary as it is now designated. The ditch flows into McDonald Reservoir, a stock-watering and irrigation reservoir approximately one mile northwest of the designated site boundary.

F.4.2 CLIMATE EFFECTS ON CONTAMINANT MIGRATION

F.4.2.1 Climate

The site is less than 15 miles from the processing site and about 600 feet higher in elevation. Except for local topographic effects, the long-term climate is probably very similar to that at the processing site (Section F.3.3.1).

F.4.2.2 Contaminant migration in the unsaturated zone

The predicted rate of net infiltration through the stabilized tailings is a key indicator of the rate of contaminant migration, because infiltration would generate leachate. Four methods of calculating infiltration rates are described in Section F.3.2.2. These same methods are used to predict infiltration rates through the stabilized tailings at the Cheney Reservoir site. The results are summarized in Tables F.4.11 through F.4.13.

F.4.3 EXISTING USAGE AND VALUE OF WATER RESOURCES

F.4.3.1 Ground water

Usage. There are no registered wells within about two miles of the site, and no shallow wells within about 3.5 miles of the site. Existing usage of ground water in the vicinity of the Cheney Reservoir site is minimal due to three factors.

Table F.4.11 Predicted infiltration rate through the cover at the Cheney Reservoir site

Method[a]	Cover hydraulic conductivity[b]	Duration of flow[c]	Infiltration rate (cm/yr)
1	1×10^{-6}	Constant	3.15×10^{1}
1	1×10^{-7}	Constant	3.15×10^{0}
2	1×10^{-6}	246	8.90×10^{-1}
2	1×10^{-7}	246	8.90×10^{-2}
3			Table F.4.8
4			7.4×10^{-3} to 1.5×10^{-2}

[a]Method 1 is constant Darcy flow under unit hydraulic gradient;
Method 2 is constant Darcy flow during rainfall events > 0.1 inch;
Method 3 is wetting front advance during rainfall events > 0.1 inch;
Method 4 is water balance (Section F.4.1.5).
[b]In cm/sec. Hydraulic conductivity of cover would be specified in engineering design.
[c]In hours per year.

Table F.4.12 Calculated infiltration rates using equation for wetting front advance

t, sec	k (cm/sec)	hc (cm)	Sc (%)[a]	dw	Infiltration: Event (cm)	Infiltration: Annual events	Infiltration: Annual I (cm)
21,600	1×10^{-6}	15700	7	0.55	3.8×10^{-2}	41	1.6×10^{0}
21,600	1×10^{-6}	5235	4.3	0.89	3.8×10^{-2}	41	1.6×10^{0}
21,600	1×10^{-6}	1047	2.1	1.80	3.8×10^{-2}	41	1.6×10^{0}
21,600	1×10^{-7}	15700	7	0.055	3.8×10^{-3}	41	1.6×10^{-1}
21,600	1×10^{-7}	5235	4.3	0.089	3.8×10^{-3}	41	1.6×10^{-1}
21,600	1×10^{-7}	1047	2.1	0.18	3.8×10^{-3}	41	1.6×10^{-1}

[a]From Table F.4.9

Table F.4.13 Capillary moisture retention for Cheney Reservoir cover source

Capillary pressure (Bar)	Water retention, %
0.1	--
0.3	24.47
0.5	23.74
0.7	--
1.0	22.38
3.0	21.02
5.0	20.19
7.0	19.55
10.0	18.24
15.0	17.59

Note: Above tests performed using both ASTM D3152 and D2325 test methods.

First, the current low population density in the area results in a low demand for water in the area. Second, the limited availability of shallow ground water is shown by the fact that monitoring wells drilled on the site failed to encounter significant quantities of shallow ground water and is supported by estimates of yield (Section F.4.1.5). The Mancos Shale is not considered to be water-bearing in the Grand Junction area (Lohman, 1965). Significant quantities of deeper ground water may be available, but at greater drilling costs. Third, shallow ground water is probably too poor in quality for domestic use, except in localized areas.

A homeowner on Highway 50 approximately 1.5 miles southwest of the site reported that she and her immediate neighbors hauled their water from Grand Junction. A 150-foot test well on her property yielded water that was too saline for use. Where shallow ground water is present in this vicinity, it can be expected to be saline due to contact with the marine-origin Mancos shale; as is the case for shallow ground water in the Grand Valley (Lohman, 1965).

Another homeowner at a location approximately 0.5 mile northwest of the site reported that she and her immediate neighbors also hauled water from a location in the Kannah Creek community.

Value. Because there is no existing usage of shallow or deep ground water within the potentially affected hydrogeologic environment, ground water has no existing present value and only a very low future value (Section F.4.5).

F.4.3.2 Surface water

Usage. Perennial streams with headwaters in Grand Mesa, east of the site, include Kannah Creek and Indian Creek. Kannah Creek is utilized for irrigation along some of its length; however, residents along Kannah Creek obtain potable water for domestic use from a city of Grand Junction water supply line which runs along the Creek.

Indian Creek is tapped by an unlined ditch which diverts flow to McDonald Reservoir (Figure F.4.7). According to the operator of the ditch, the diversion is used for stockwatering and for irrigating pasture near McDonald Reservoir.

Value. The value of surface water in the vicinity of the site can be evaluated by two means. One is to determine the cost of alternative water supplies in the area. A rate schedule for water supplied by the city of Grand Junction to bulk water users in the Whitewater area is shown in Table F.4.14. Another alternative source of water is delivery from commercial suppliers based in Grand Junction, who report charges of $16 to $25 per 1100 gallons for delivered water in the Whitewater and Kannah Creek area. These charges can vary significantly depending on the exact location of the delivery and the total quantity of water to be delivered. These charges reflect a much higher value than would be attached with the probably poor quality water underlying the site.

Table F.4.14 Rate schedule for bulk water users near Whitewater

Quantity per month (gallons)	Charge
First 3,000	$9.40 (minimum)
Next 7,000	$1.40/1000 gal
Next 10,000	$1.70/1000 gal
More than 20,000	$2.10/1000 gal

Ref. City of Grand Junction, 1985.

F.4.4 ALTERNATE WATER SUPPLIES

Stabilization of the tailings at the Cheney Reservoir site would not affect any currently used water resources, and use of the potentially affected ground water would be unlikely (Section F.4.5). Should the potentially affected ground water be considered for use, several alternate sources of water are available.

Water supplies in the immediate vicinity of the Cheney Reservoir site could be obtained from several sources. Homeowners in the area already haul water or obtain it from a city of Grand Junction water line running along Kannah Creek. Surface water could be obtained from perennial streams such as Kannah Creek and Indian Creek if appropriate water rights were obtained. Deep ground water may be available but its potential is unknown.

F.4.5 FUTURE USAGE AND VALUE OF WATER RESOURCES

F.4.5.1 Ground water

Usage. In February, 1985, a homeowner at a location approximately 0.5 mile northwest of the site reported that she had plans to drill a well to a depth of less than 1000 feet. Attempts to utilize deep ground-water resources in the area within several miles of the site may be anticipated. The controlling factors would be the extent to which the population increases, the extent to which other water resources and their distribution systems are developed, and the success of attempts to find usable deep ground water.

Some zones of fresh or potable shallow ground water can be found near creeks and ditches in the area, where the surface water represents a source of recharge. The extent of these zones is probably limited to an area very near the recharge source. The areal extent of these potable zones is limited by the small amount of recharge and the tendency of the underlying Mancos Shale to degrade water quality. The potential sustained yield of the zones is also small (Section F.4.1.5). The potential for development of shallow ground water is minimal.

Value. The difficulty of establishing the future value of water resources is discussed in Section F.3.6.1. The value of shallow ground water in the vicinity of the site would be limited by the low potential yield (Section F.4.1.5) of the system. On a qualitative basis, it can be concluded that the resource value of shallow ground water is low.

F.4.5.2 Surface water

Usage. The nearest potentially developable sources of surface water are Indian Creek and a diversion ditch which carries water from Indian Creek. In years of higher flow in Indian Creek these both could be used to develop greater use of surface water in the vicinity of the site. The degree of development would probably be governed by land use restrictions on the Federal land, by economic factors on nearby private land, and by the availability of additional water rights.

Value. The difficulty of establishing the future value of water resources is discussed in Section F.3.6.1. In the vicinity of the Cheney Reservoir site water is used for various agricultural purposes. The value of water in the area would probably parallel the value of agricultural products. Alternatively, population growth in the area could increase demand for a domestic water supply. On a qualitative or relative basis, it can be concluded that the value of surface water resources in the area is moderate to high.

F.4.6 IMPACTS IN AFFECTED HYDROGEOLOGIC ENVIRONMENT

The impacts in the potentially affected hydrogeologic setting at the Cheney Reservoir site are discussed below.

F.4.6.1 Human health risks

There is no known existing use of shallow ground water in the potentially affected hydrogeologic environment, and future use of shallow ground water is expected to be minimal. Because the probability of human ingestion of potentially affected ground water would be minimal, the probability of human health risks would be minimal.

F.4.6.2 Damage to crops and vegetation

There is no known existing use of shallow ground water by crops and vegetation in the potentially affected hydrogeologic environment, and future use of shallow ground water is expected to be minimal. Because the probability of water use by crops and vegetation would be minimal, the probability of damage to crops and vegetation would be minimal.

F.4.6.3 Damage to wildlife

There is no known existing use of shallow ground water by wildlife, and no known location where wildlife could potentially ingest it. It can be concluded that damage to wildlife due to ingestion of ground water would be minimal.

F.4.6.4 Persistence and permanence of adverse affects

Adverse effects due to ingestion of ground water by humans, crops and vegetation, and wildlife are discussed above. It is concluded that the probability of ingestion of potentially affected ground water would be minimal. Therefore it can be concluded that adverse effects due to ingestion of ground water would be neither persistent nor permanent.

F.5 POTENTIALLY AFFECTED HYDROGEOLOGIC ENVIRONMENT-TWO ROAD SITE

F.5.1 CHARACTERIZATION OF HYDROGEOLOGIC ENVIRONMENT

F.5.1.1 Previous investigations

The Two Road area has previously been the subject of two investigations which included characterization of the hydrogeologic regime. The Colorado Geological Survey (CGS, 1982) did a reconnaissance level study of the location's potential use as a mill tailings disposal site. The Bureau of Reclamation has studied a larger area which includes the proposed tailings disposal area (URS, 1983). The latter investigation was part of the Colorado River Water Quality Improvement Program: the Two Road area is a proposed location for evaporation ponds. The latter investigation included 23 borings and the installation of 22 wells.

F.5.1.2 Recent investigations

The field program has involved exploratory drilling, soil testing, monitoring well installation, and water sampling. The program was begun with drilling in March, 1985. Previous investigations by the U.S. Bureau of Reclamation for a separate project (Section F.5.1.1) included two exploratory borings, field and laboratory testing, and the installation of two monitoring wells within the designated site boundary.

In the March, 1985, field program, 16 exploratory borings were drilled on a four-by-four grid pattern. Monitoring wells were installed in five of the borings. Soil samples were collected from the borings for stratigraphic logging and for laboratory testing. Well construction details are presented in Table F.5.1.

All field and laboratory work was performed in accordance with standard operating procedures. These standard operating procedures are on file with the U.S. DOE UMTRA Project Office in Albuquerque, New Mexico.

F.5.1.3 Stratigraphy

The stratigraphy at the site has been defined by 18 borings. Geologic cross-sections are presented in Figures F.5.1 through F.5.4. On a hydrogeologic basis the stratigraphy can be divided into three zones:

- A surficial layer of unconsolidated deposits.
- Mancos Shale.

TABLE F.5.1 TWO ROAD SITE BOREHOLE AND WELL INFORMATION.

LOCATION[a] ID	NORTH[b] COORDINATE	EAST[b] COORDINATE	WELL DIAMETER (IN.)	TOTAL DEPTH (FT.)	SURFACE ELEVATION (FTMSL)	TOP OF CASING (FTMSL)	SCREENED INTERVAL BEG DP (FTFD)	SCREENED INTERVAL LENGTH (FT.)	BOREHOLE DEPTH (FTFD)
501	48501.0	19098.6	2.000	56.00	4943.00		51.00	5.0	56.00
502	48476.0	21762.7	2.000	41.00	4918.00		36.00	5.0	41.00
701	49506.5	19243.6	2.000	36.90	4959.42	4961.66	29.90	5.0	35.00
702	49609.9	19826.2			4959.14				20.00
703	49614.0	20354.3			4959.29				30.50
704	49619.1	20832.1	2.000	25.20	4954.52	4956.84	18.20	5.0	23.00
705	48786.9	20834.3			4948.67				28.00
706	48777.1	20338.9	2.000	34.80	4951.42	4935.13	27.80	5.0	33.00
707	48772.4	19800.2			4949.97				25.60
708	48764.2	19247.5			4954.53				30.50
709	48053.9	19253.5			4944.75				27.00
710	48041.7	19782.0	2.000	37.80	4943.13	4945.45	30.80	5.0	36.00
711	48030.5	20326.8			4943.11				27.00
712	48016.8	20791.5			4943.42				26.00
713	47298.7	20763.0	2.000	33.00	4933.59	4936.02	26.00	5.0	31.00
714	47303.8	20318.3			4936.71				39.00
715	47308.8	19753.7	2.000	29.40	4933.35	4935.67	22.40	5.0	27.40
716	47314.7	19255.8			4937.30				18.00

[a] 501 and 502 are U.S. Bureau of Reclamation borings and monitor wells C-1 and C-2 in URS(1983).

[b] Site coordinate system is based on a truncation of modified Colorado coordinate system.

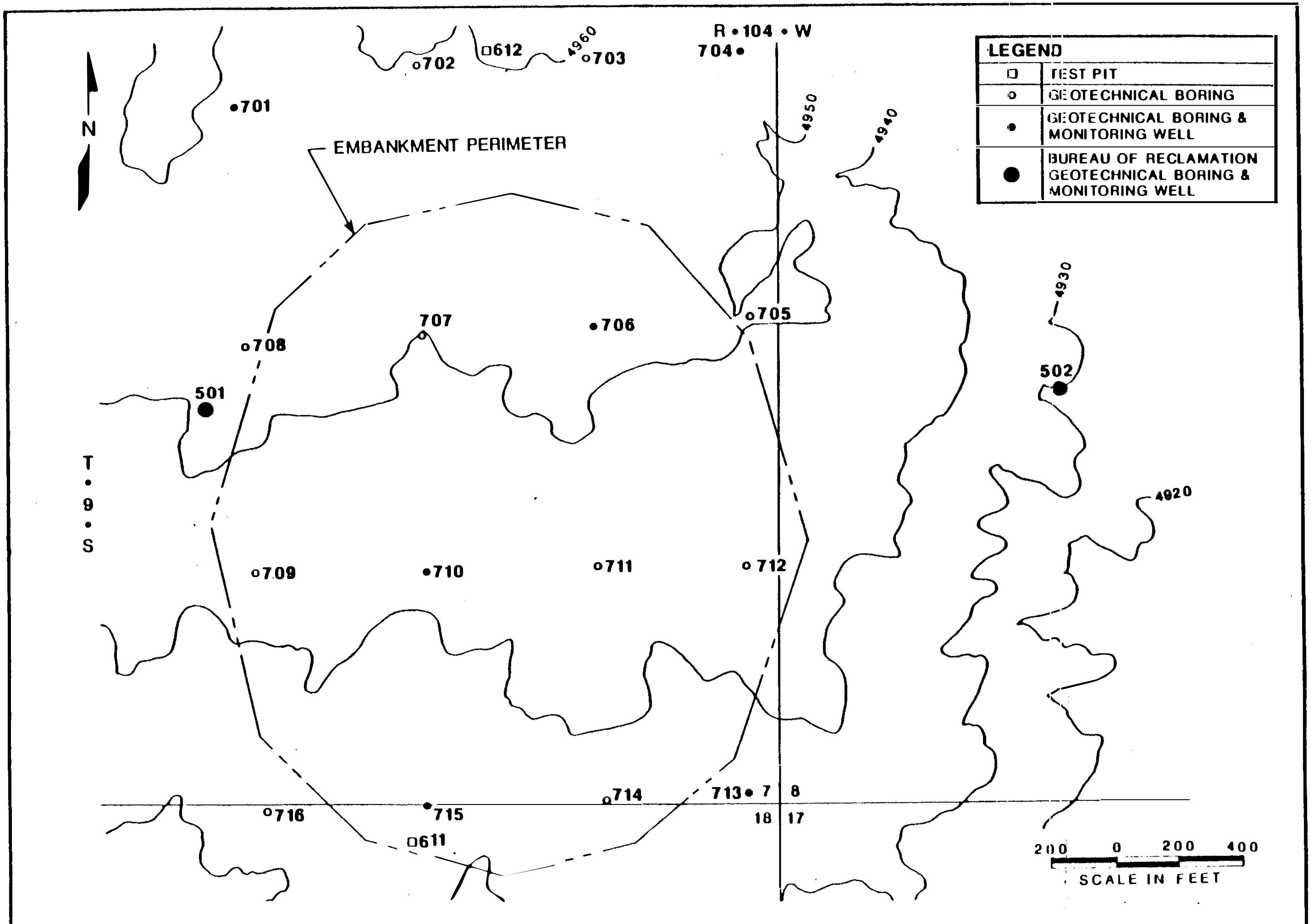


FIGURE F.5.1 LOCATION OF BORING/MONITORING WELLS, TWO ROAD SITE

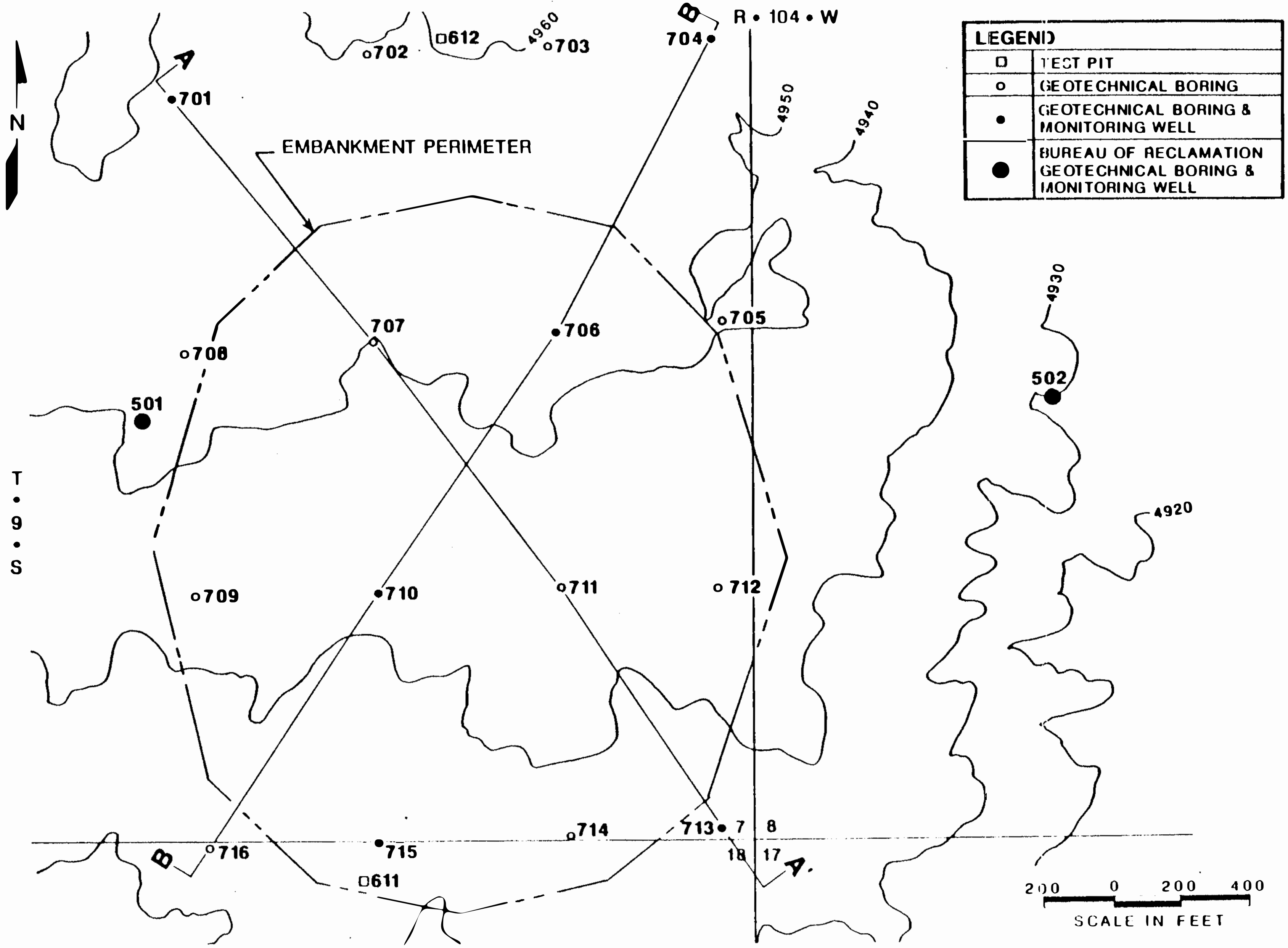


FIGURE F.5.2 GEOLOGIC CROSS-SECTION LOCATION MAP, TWO ROAD SITE

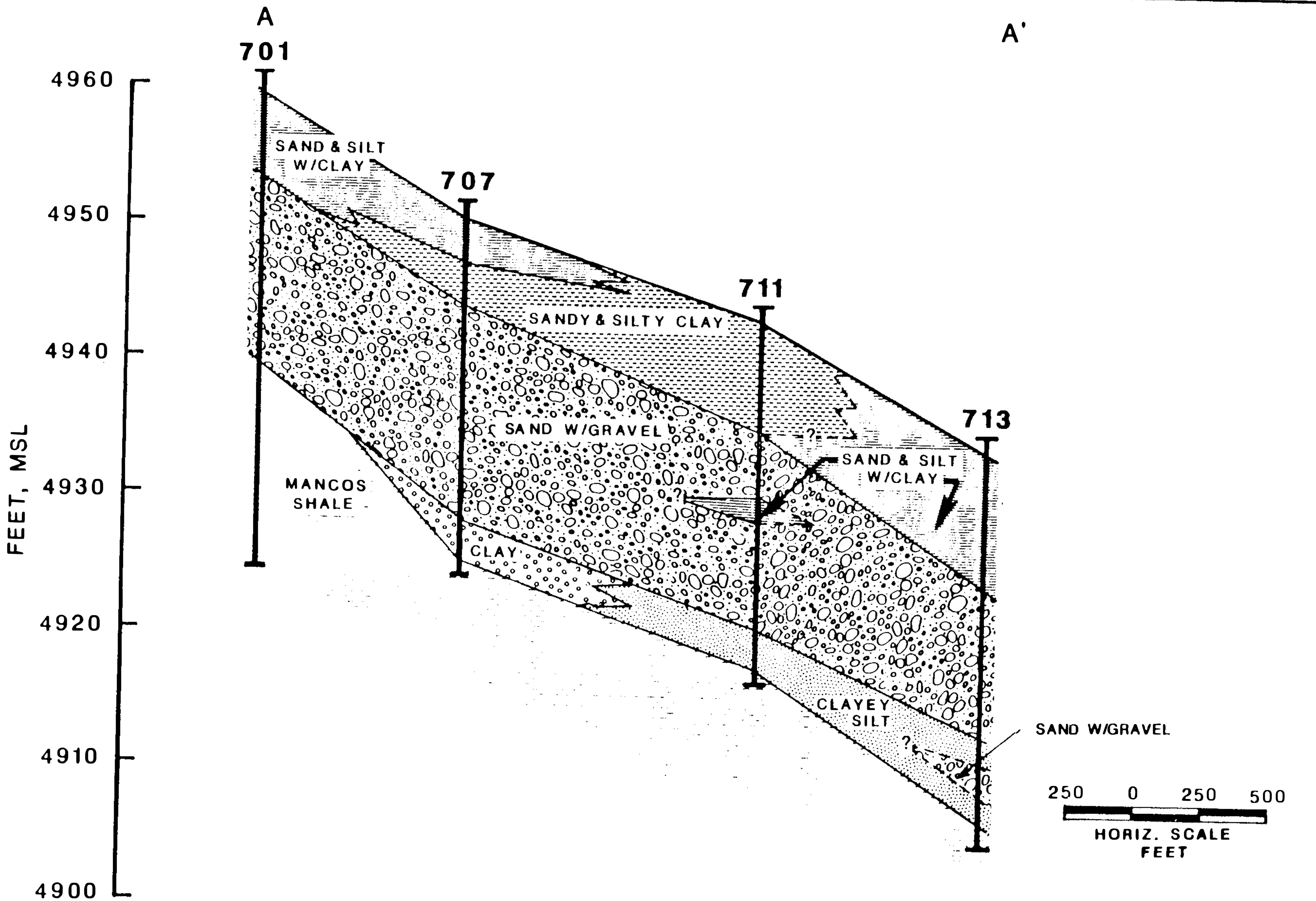


FIGURE F.5.3 **TWO ROAD SITE GEOLOGIC CROSS-SECTION A - A'**

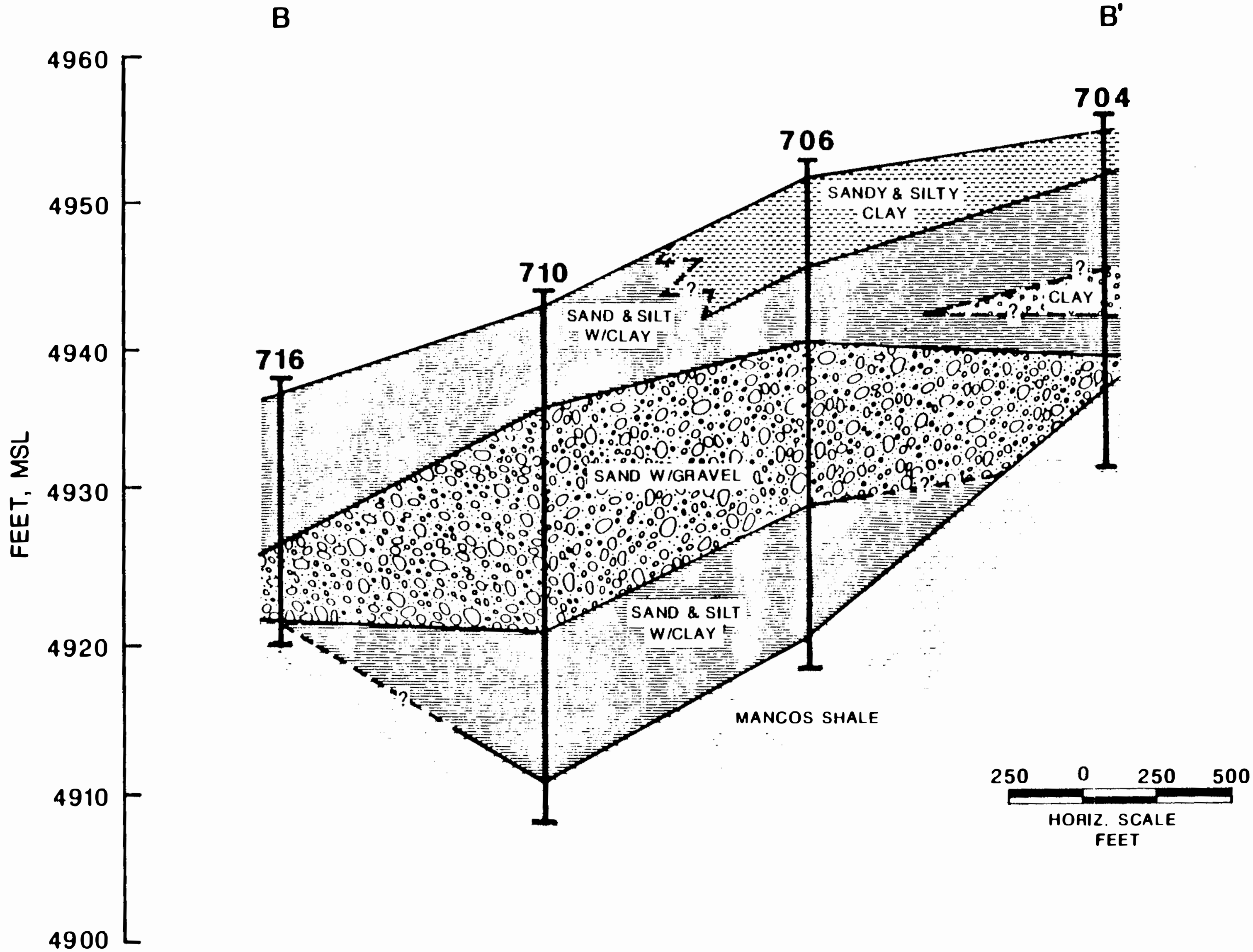


FIGURE F.5.4 TWO ROAD SITE GEOLOGIC CROSS-SECTION B - B'

- o The Dakota Sandstone and other formations underlying the Mancos Shale.

Surficial layer. The site is on a pediment surface formed by erosion of the Mancos Shale. The dominant surficial materials present in the site area are residual soils formed by weathering of the Mancos, pediment gravels, and eolian deposits. Ground water was not encountered in the surficial deposits. Intermittent ground water has been reported in one well adjacent to a stock pond (U.S. Bureau of Reclamation, 1978).

Communication with deep aquifers. The Colorado Geological Survey reports that the site is underlain by approximately 500 to 1100 feet of Mancos Shale (CGS, 1982). The log of an oil well drilled less than 0.5 mile from the designated site boundary reported the top of the Dakota Sandstone at 748 feet below land surface. The Dakota Sandstone would be the uppermost potential aquifer underlying the Mancos Shale. Mancos Shale is generally acknowledged to be a low-permeability formation on a regional basis, as reported by various authors (Lohman, 1965; Cooley et al., 1969). Because of the low permeability and thickness of the Mancos Shale, hydraulic communication between geologic units above and below the shale is expected to be minimal.

F.5.1.4 Unsaturated zone hydraulics

The description of unsaturated zone hydraulics at an alternate disposal site can include both vertical and horizontal movement of moisture. The vertical movement of moisture is controlled to a large extent by the properties of the mill tailings and the engineered cover. The characterization of hydraulic properties of the Grand Junction tailings has been documented elsewhere, and includes properties for the in-situ tailings as well as properties of different mixtures and different degrees of compaction (Veyera, 1980).

The horizontal flux of moisture away from the site boundaries is partially controlled by the properties of the surrounding soil or rock matrix. Field permeability tests of the matrix have been reported for two boreholes within the site boundaries (URS, 1983), ranging from 1.29×10^{-4} cm/sec to 1.4×10^{-3} cm/sec. These tests are summarized in Table F.5.2. The unsaturated hydraulic conductivity will be less than the saturated permeability.

F.5.1.5 Saturated zone hydraulics

All of the monitoring wells installed during March, 1985, were dry in April or May, 1985. Two Bureau of Reclamation wells which are within the proposed site were dry in May, 1985. These wells had been installed more than two years

Table F.5.2 In-situ permeability tests at Two Road

Location[a]	Depth interval (ft)	Type of test	Permeability (cm/sec)
501[b]	0-1	bucket	1.4×10^{-3}
	4-7.5	shallow well	4.2×10^{-4}
	8.5-12.7	shallow well	1.4×10^{-3}
	16-20	shallow well	7.8×10^{-4}
	31.4-40.9	packer	1.6×10^{-4}
	40.5-50.1	packer	1.3×10^{-4}
	51-56	packer	2.1×10^{-4}
502[c]	11-21	packer	2.1×10^{-4}
	21-31	packer	1.8×10^{-4}
	31-41	packer	1.5×10^{-4}

[a] Boring locations are shown in Figure F.5.1.
[b] URS boring C-1.
[c] URS boring C-2.

Ref. URS, 1983.

before. It may be concluded that there is no existing shallow zone of saturation. In-situ permeability tests are described in Section F.5.1.4. If significant quantities of water were to move as saturated flow at the Two Road site, the results of the permeability tests are probably indicative of the hydraulic properties of potential zones of saturation.

F.5.1.6 Water quality

Because of the absence of a saturated shallow ground-water system in the vicinity of the site (Section F.5.1.5), there are no data regarding shallow ground-water quality. There may be ground water in the ephemeral washes on either side of the site. The quality of alluvial ground water is described by comments made about an old well located on a wash, about four miles southwest of the site (State of Utah, 1938).

> "This water is used as a supplemental supply of water for stock... during the winter season only; it is not fit for domestic use at any season of the year, and in the summer the mineral content is too high."

F.5.1.7 Proximity of site to surface water

The Two Road site is located in an area of ephemeral drainages. Two ephemeral drainages bound either side of the pediment surface on which the site lies, and are within 0.1 mile of the proposed site boundary. Both of these unnamed washes are tributary to Bitter Creek, an ephemeral wash to the southwest of the site. The hydrologic setting of the site is presented in Figure F.5.5.

F.5.2 CLIMATIC EFFECTS ON CONTAMINANT MIGRATION

F.5.2.1 Climate

Some short-term site-specific climatic data are available from the U.S. Bureau of Reclamation's study of the Two Road site. The site is less than 20 miles from the processing site and is about 100 feet higher in elevation. Except for local topographic effects, the long-term climate is probably very similar to that at the processing site (Section F.3.3.1).

F.5.2.2 Contaminant migration in the unsaturated zone

Ground water was not encountered in wells at the Two Road site. This indicates that infiltration rates are too low to maintain a shallow zone of saturation, and are consistent with the results of water balance calculations of recharge for the Cheney Reservoir site (Section F.4.2.2). Other qualitative indications of low recharge rates in the area are available.

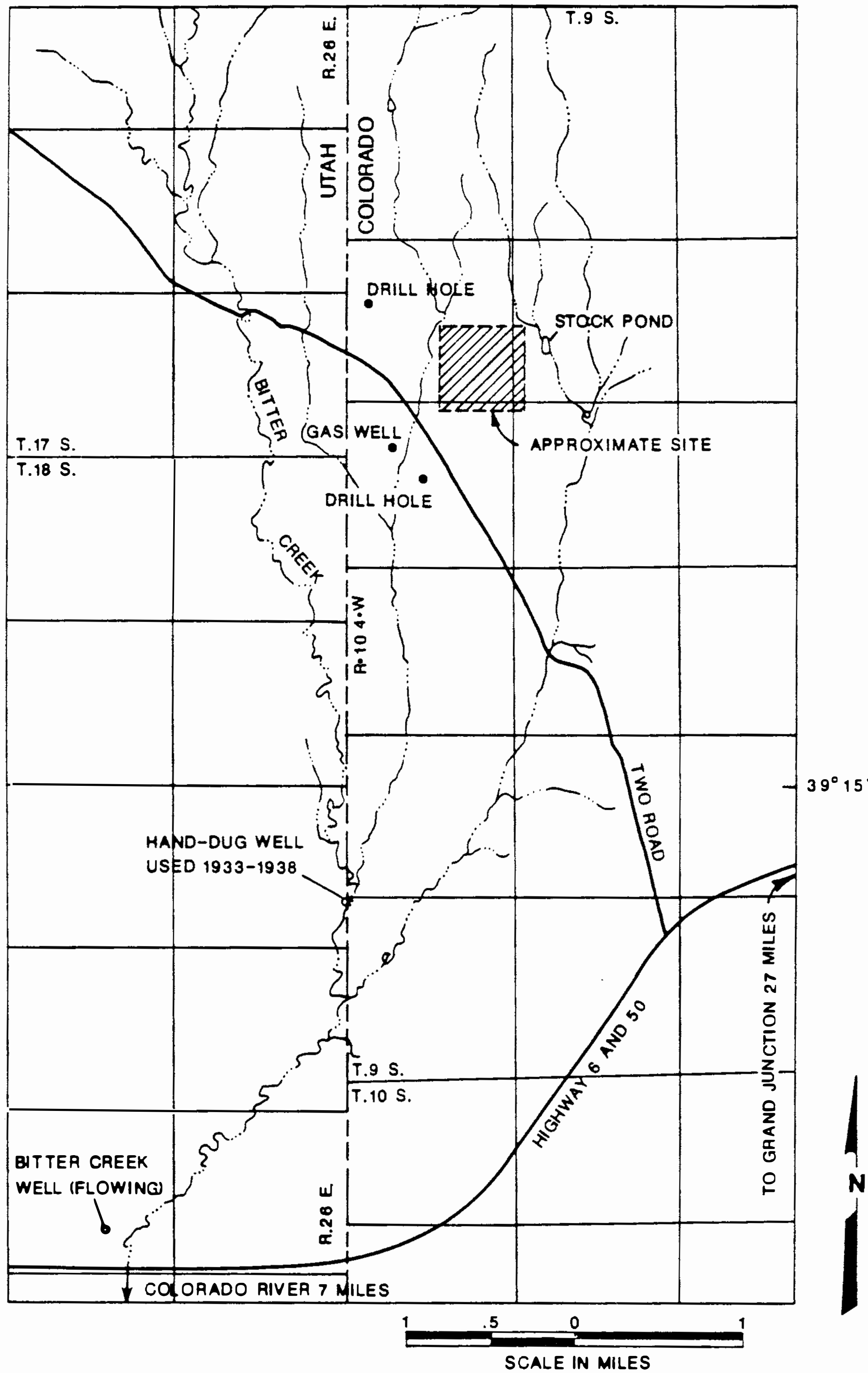


FIGURE F.5.5
HYDROLOGIC SETTING TWO ROAD SITE

An investigation of ambient soil moisture content in the Grand Junction area found relatively low values (Rogers et al., 1981). The study was done specifically to investigate expected long-term moisture contents in materials likely to be used for covers on stabilized mill tailings. Soil samples from the site were collected during a U.S. Bureau of Reclamation study (URS, 1983). These samples showed very low moisture contents, in the range of two to six percent.

The transition from saturation to partial saturation (i.e. decreasing soil moisture content) entails a steep drop in hydraulic conductivity (Hillel, 1971). Using Darcy's law modified for unsaturated flow (Hillel, 1971), it can be shown that under a unit hydraulic gradient the flux rate is exactly equal to the unsaturated hydraulic conductivity. Thus a low ambient soil moisture content is indicative of a low flux rate and a low rate of recharge.

The site conceptual design for stabilization of the tailings involves placement of the tailings at low moisture contents. Further drainage beyond that which has already occurred at the processing site would be relatively small.

The construction of a compacted low-permeability cover would minimize infiltration. If infiltration rates were approximately equal to those in the existing uncompacted soils, it would be expected that relatively little migration of contamination would occur.

Impact assessment. The distance from the proposed location of the stabilized tailings to surrounding drainages is relatively short, less than 0.1 mile. These drainages are topographic lows and represent potential outlets for contaminants. Although the development of the conceptual model for potential contaminant migration did not include site-specific analytical or numerical calculations, a qualitative assessment of potential impacts can be made:

- Existing and expected usages and values of water resources in the area are low (Sections F.5.3 and F.5.5).

- Because there is no existing ground-water system at the site, potential seepage could build up in the upper Mancos Shale and overburden before flowing away from the site. Contaminant migration away from the site would be delayed while moisture deficits are replenished.

- Existing water quality in the adjacent drainages is brackish. If seepage were to reach the alluvium the affected water would already be of poor quality.

- Vegetated slopes are found on each side of the site. If low rates of seepage reached these areas, the water would potentially be consumed by evaporation or transpiration.

F.5.3 EXISTING USAGE AND VALUE OF WATER RESOURCES

F.5.3.1 Ground water

Usage. Review of records of the Colorado Division of Water Resources shows that there is no existing usage of shallow or deeper ground water in the vicinity of the site. There are no registered wells in the township surrounding the site. There are monitoring wells adjacent to the site which were installed by the U.S. Bureau of Reclamation's Colorado River Water Quality Control Program.

Review of records of the State of Colorado has shown that there are no existing water rights in the township immediately to the west of the site (T17S, R26E). There are two wells in T18S, R26E which is to the southwest of the site (Figure F.5.5). One is a hand-dug well 11 feet deep in Section 16, approximately four miles from the site. The other is the U.S. Bureau of Reclamation's Bitter Creek Well in Section 30, approximately six miles from the site.

Value. Because there is no existing usage of ground water in the vicinity of the site, it has no existing present value and only potential future value (Section F.5.5.1).

F.5.3.2 Surface water

Usage. Surface water in the vicinity of the site is used for stock watering and for casual use by wildlife.

Value. The estimated value of stock-watering supplies can vary extensively. In years in which livestock production produces minimal profits or even losses for the producer, the value of such supplies is relatively very small. An upper bound on the value of such supplies is probably the cost of providing alternative water supplies. In the area of the proposed site this is less than $20 per thousand gallons for hauled water. Water of lesser quality than fresh hauled water would have a lesser value.

F.5.4 ALTERNATIVE WATER SUPPLIES

There is no existing shallow ground water below the Two Road site, and it is not expected that water resources near the site would be affected by stabilization of the tailings at the site. In the event that water resources were affected, it would be possible for future water users to obtain water supplies from other sources; including deep wells into artesian aquifers or by hauling water.

F.5.5 FUTURE USAGE AND VALUE OF WATER RESOURCES

F.5.5.1 Ground water

Usage. In the immediate vicinity of the site, test borings have shown that there is no continuous shallow ground-water system. Because of the limited amount and poor quality of shallow ground water, the potential use is minimal.

Value. Shallow ground water is not present in sufficient quantity to have any but a minimal future value.

F.5.5.2 Surface water

Usage. Because of the low precipitation and high evapotranspiration in the area, the potential surface-water development in the area is probably small. Usage in the area would probably continue to be limited to stock watering and casual use by wildlife.

Value. The difficulty of establishing the future value of water resources is discussed in Section F.3.6.1. In the vicinity of the Two Road site the value of water would probably parallel the value of livestock products. On a qualitative or relative basis, it can be concluded that the value of water resources in the vicinity of the site would remain low.

F.5.6 IMPACTS IN AFFECTED HYDROGEOLOGIC ENVIRONMENT

There is no existing shallow ground water at the Two Road site. Potential impacts on humans, crops and vegetation, and wildlife are discussed only in order to meet EPA standards.

F.5.6.1 Human health risks

There is no existing use of shallow ground water at the site and future use is expected to be minimal. It can be concluded that human health risks due to ingestion of shallow ground water would be minimal.

F.5.6.2 Damage to crops and vegetation

There is no existing shallow ground water at the site. It can be concluded that damage to crops and vegetation due to uptake of shallow ground water would be minimal.

F.5.6.3 Damage to wildlife

There is no existing shallow ground water at the site, and therefore no potential way for wildlife to uptake ground water. It can be concluded that damage to wildlife due to uptake of potentially affected ground water would be minimal.

F.5.6.4 Persistence and permanence of adverse effects

Adverse effects due to ingestion of ground water by humans, crops and vegetation, and wildlife are discussed above. Because of the absence of shallow ground water, it is concluded that persistent or permanent adverse effects associated with the ingestion of ground water would be minimal.

F.6 CONCLUSIONS - GROUND WATER

The ground-water systems of the Grand Junction tailings and potential alternate disposal sites have been studied taking into account factors indicated by EPA standards. On September 3, 1985, the United States Tenth Circuit Court of Appeals set aside EPA's water protection standards, 40 CFR Part 192.20(a)(2)-(3), and EPA has not yet reissued these standards. When EPA issues revisions to the water protection standards, DOE will re-evaluate the ground-water issues at the site to assure that the revised standards are met. Performing remedial actions to stabilize the tailings prior to EPA issuing new standards will not affect the measures that are ultimately required to meet the revised water protection EPA standards. Based on these studies and factors, significant conclusions have been reached with respect to the effects or potential effects of the tailings on the hydrogeologic regime:

Grand Junction existing environment

- Ground water near the processing site is strongly influenced by the adjacent Colorado River.
- Vertical hydraulic gradients are very close to zero. Measured gradients have indicated both upward and downward flow. There is some uncertainty about the vertical gradient due to the hydraulic characteristics of the Mancos Shale (low permeability, slow recovery after development, and sampling).
- Background water quality in the alluvium very near the Colorado River can vary seasonally from fresh to brackish. Away from the river it varies from brackish to salty.
- Water quality in the Mancos Shale and Dakota Sandstone also ranges from brackish to salty. The Dakota Sandstone, the uppermost potential bedrock aquifer, has low potential use near the site.
- The Grand Junction tailings are set within a complicated hydrogeologic area. Factors such as the presence of contaminant sources other than mill tailings complicate the characterization of the site.
- The tailings contribute contamination in the form of ammonium and uranium to the alluvial ground water.
- There is evidence of contamination in the Mancos Shale including a plume of arsenic and sporadically distributed, elevated concentrations of aluminum, ammonium, selenium, vanadium, and zinc. There is no evidence of radionuclide migration into the bedrock.
- Radionuclides other than uranium and radium are not contaminating the ground water. Radium-226 does not appear to be migrating away from the ground water directly below the tailings. Polonium-210 and thorium-230 were not detected in any wells. Lead-210 was detected at approximately equal levels in one background well and one well completed below the tailings.

- There is no evidence of contamination in the Dakota Sandstone, the uppermost potential bedrock aquifer.

- Although the tailings have caused changes in the quality of alluvial ground water, there are no known existing effects on humans due to the absence of existing use.

- The tailings have not caused a measurable degradation in the quality of the Colorado River water; however, some degradation can be calculated. For increases in salinity only, the estimated annual loss of $23,760 due to the tailings is relatively small when compared to the estimated annual loss of $23 million caused by irrigation within the Grand Valley.

Aquifer restoration

- Aquifer restoration has been evaluated for the affected ground water and rejected based on relevant considerations in EPA requirements (40 CFR Part 192). Limited measures may be needed to ensure that there is no use of water from a possibly contaminated industrial drainage well.

Stabilization on the site

- A mixing cell model predicts the persistence of elevated concentrations of uranium in ground water. The magnitude of concentrations depends on input values for ground-water flux and ambient (background) uranium concentration; but may be 13 to 243 pCi/l ten years after remedial action, 8.8 to 253 pCi/l at 25 years after remedial action, and stabilized at 8.8 to 235 pCi/l at 50 years after remedial action. Predicted long-term concentrations are lower for a low-permeability cover than for a higher-permeability cover over the tailings.

- Based on conditions in the existing environment, non-radioactive contaminants are expected to be flushed from the ground water relatively rapidly.

Relocation of the tailings

- Relocation of the tailings to an alternate site would leave residual contamination in the ground water. Based on a mixing cell model, uranium may persist at levels exceeding background concentrations for up to 100 years. Contaminants other than uranium would be flushed relatively rapidly.

- Sporadic contamination would persist in the Mancos Shale at the Grand Junction site. The same hydrogeologic conditions which cause this persistence make the use of this ground water unlikely.

- Use of the affected ground water in the near future is unlikely.

Cheney Reservoir site

- There is a shallow ground-water system perched on the Mancos Shale. This system is probably less than 10 feet in thickness.

- The shallow ground water moves through low-permeability deposits, at an average velocity of approximately 0.57 to 8.67 feet per year.

- The quality of the water ranges from fresh to brackish. The representativeness of some water-quality analyses is questioned because the residual presence of biodegradable drilling fluid is suspected. The residual presence of drilling fluid after repeated purges of the wells would indicate a very low permeability system.

- Infiltration rates calculated using a water balance are very low, less than 1.5×10^{-2} centimeters per year. Other calculated infiltration rates indicate that a low permeability cover over the tailings would permit little net infiltration of moisture.

- The potential yield of the ground-water system is low, 1.5 to 3.0 gallons per day. Expected use of this ground water would be minimal.

Two Road site

- Ground water was not encountered at the site. Current and potential use of ground water would be minimal because there is none.

- Seepage from stabilized tailings would be low due to low infiltration and drainage. There is no on-site ground water which would be impacted.

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APPENDIX G

FLOODPLAIN AND WETLANDS ASSESSMENT

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LIST OF FIGURES

G.1 PROJECT DESCRIPTION

Materials contaminated by uranium mill tailings from the inactive processing site at Grand Junction, Colorado, are present in the floodplain of the Colorado River and in the wetlands within the floodplain. There are no floodplains or wetlands associated with the Cheney Reservoir or the Two Road sites.

The primary feature of the remedial action is the consolidation and stabilization of tailings and other contaminated soils either at the processing site or at an alternate disposal site.

Remedial action would require the following major construction activities regardless of which alternative is selected:

- Removal of approximately 0.2 acre of vegetation on the 100-year floodplain prior to excavation of contaminated soils.
- Grading and revegetating the floodplain where excavated, including adding any necessary soil conditioners.
- Upon completion of the remedial action, radioactive contamination in the floodplain would be reduced to levels that comply with the EPA standards for inactive uranium processing sites (40 CFR Part 192). These areas would then be released for any use consistent with local land use controls.

G.2 FLOODPLAIN EFFECTS

Alteration of the floodplain during and after remedial action is of concern due to the potential for changes in river elevations during flood events and the resulting impacts to nearby properties and structures. These impacts are discussed in this assessment.

Other temporary impacts, such as increased sedimentation and erosion, alteration of habitat, and water-quality changes, are of additional concern. After remedial action, long-term impacts on ground-water quality and flow and surface-water quality would result from the removal of contaminated materials present in the floodplain. Temporary and long-term impacts are discussed in Sections 5.5 and 5.6 of this EIS. Mitigation measures for these short- and long-term impacts are discussed in Sections 5.20 and G.2.2.

Effects of flooding resulting from changes in flood elevations during construction and after completion of the remedial action were calculated. Results of these analyses are summarized in Sections G.2.1 through G.2.3. Additional discussion can be found in Appendix F, Hydrology Report.

G.2.1 FLOOD ANALYSIS

During a 100-year flood event, the flow of the Colorado River at the Grand Junction site would be 61,600 cfs. The maximum water surface elevation at the site would be 4575.1 feet at the tailings pile with a mean velocity of 8.4 fps. Figure G.2.1 is a map of the 100-year floodplain at the Grand Junction site. The base of the tailings would be under approximately six feet of water. Existing erosion at the southeast corner of the pile would be accelerated during a major flood.

The 500-year flood flow would be 84,200 cfs with the water surface elevation ranging from 4574 to 4578 along the tailings pile. The base of the tailings pile would be approximately nine feet under water. Mean velocities would range between six and 12 fps. Figure G.2.2 is a map of the 500-year floodplain boundary.

The PMF, as described in Section 4.6.1, for the Colorado River at the tailings pile would be approximately 889,000 cfs and would range in elevation from 4589 to 4600 along the tailings pile.

G.2.2 FLOOD CONDITIONS DURING REMEDIAL ACTION

During remedial action, aside from the tailings, approximately 0.2 acre would be removed from the Colorado River floodplain. The changes in the flood level and velocities would be undetectable from current flood levels and velocities.

Potential impacts would be mitigated by use of the following measures during remedial action:

- o Excavation of contaminated materials in the floodplain during the seasonal dry period, when runoff is lowest.

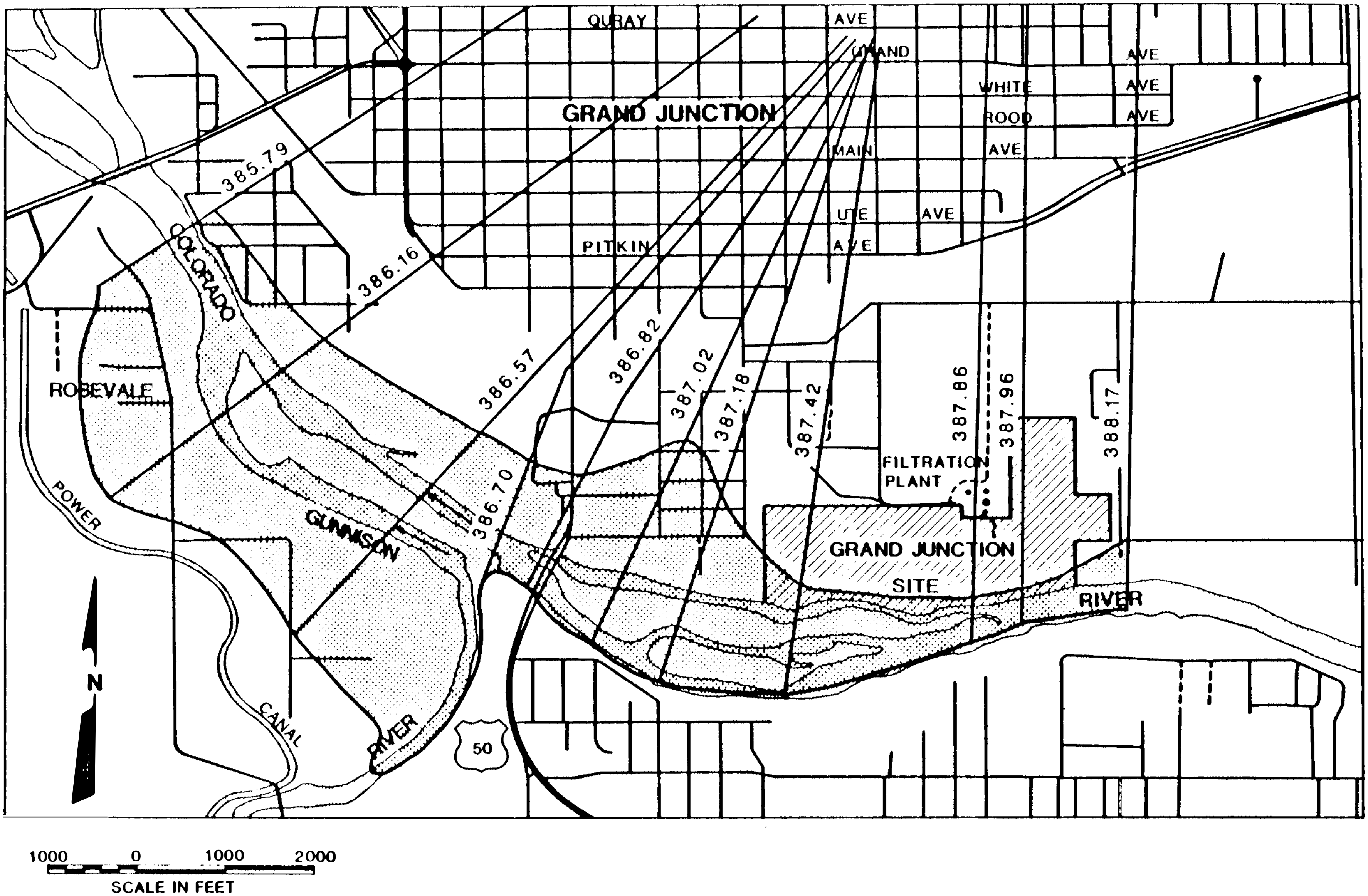

FIGURE G.2.1
LOCATION OF CROSS SECTIONS & FLOODPLAIN BOUNDARIES OF THE 100-YEAR FLOOD EVENT

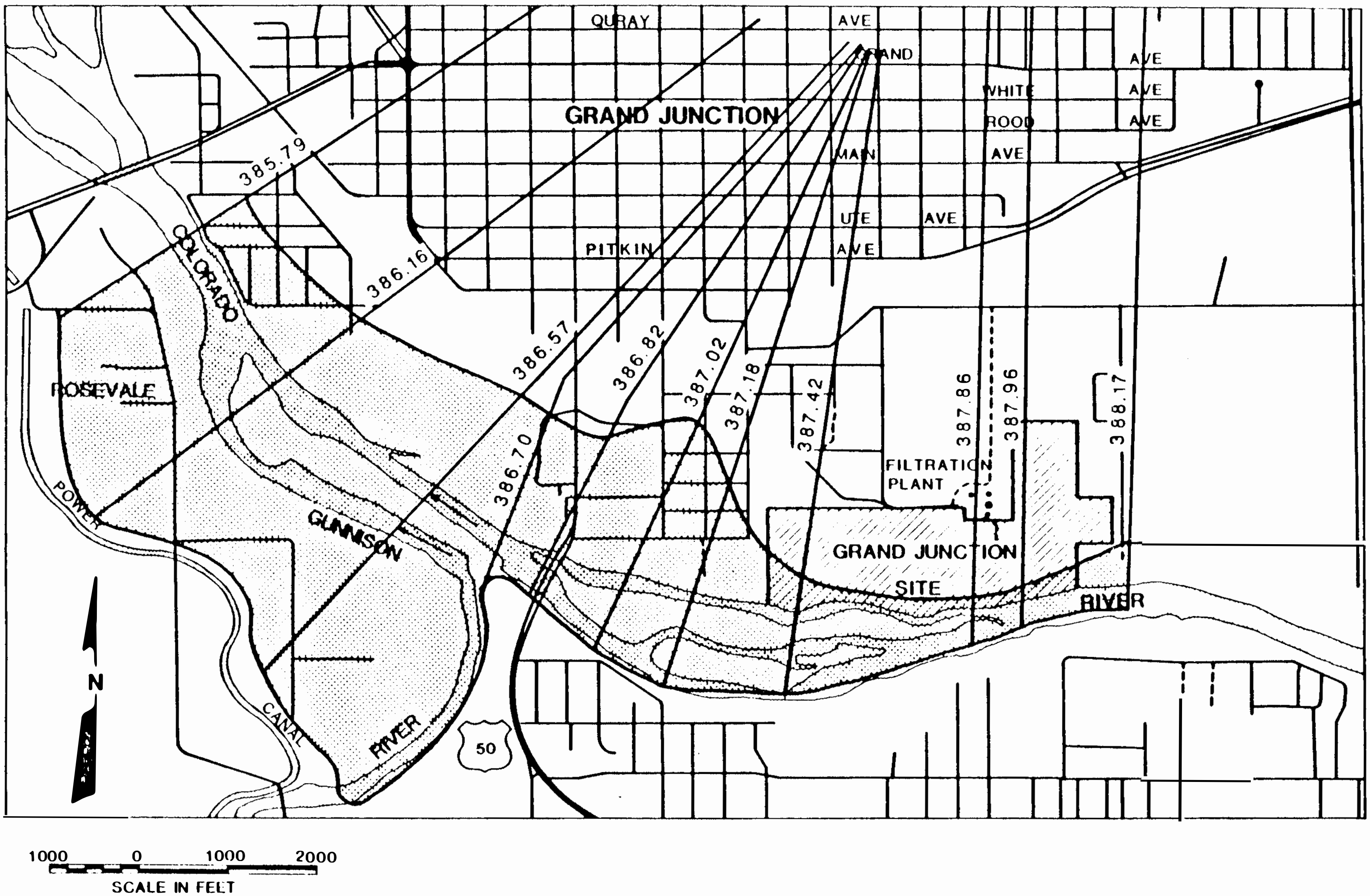

FIGURE G.2.2
LOCATION OF CROSS SECTIONS & FLOODPLAIN BOUNDARIES
OF THE 500-YEAR FLOOD EVENT

- o Restrictions on removal of riparian vegetation adjacent to areas subject to excavation to reduce river velocities and associated erosion during flood events.
- o Initiation of revegetation efforts as soon as practicable after removal of contaminated materials.
- o Selective use of water bars, mulch, riprap, or other soil erosion controls to minimize erosion.

G.2.3 FLOOD CONDITIONS FOLLOWING REMEDIAL ACTION

Following remedial action, if the tailings are stabilized on the site, the pile would be stabilized above the 100-year floodplain. The configuration of the excavated areas within and adjacent to the river would be the same as during the remedial action until the vegetation of the floodplain is reestablished. During a 100-year or 500-year flood event, impacts to nearby property and structures would be similar to flood impacts before remedial action. The reestablishment of a vegetative cover would tend to stabilize the floodplain and minimize the impacts during floodflows. Excavated areas of the floodplain would be reclaimed by contouring the area, adding any necessary soil conditioners, and revegetating the area with native riparian plants.

If the tailings are removed from the Grand Junction site, the 100-year flood flow boundaries would change slightly from existing conditions. Figure G.2.3 shows the 100-year flood boundary without the tailings present. The elevation of the flood would be slightly higher (0.1 foot), and the mean channel velocity would be slightly higher (0.1 fps) than the conditions predicted for the 100-year flood with the tailings in place. Figure G.2.4 shows the 500-year flood boundary without the tailings present. The maximum water surface elevation during a 500-year flood event would be 4577.1 feet at the tailings pile, while the mean channel velocity would be 9.6 fps. These elevations and velocities for the 500-year event are slightly less than would occur if the tailings pile were left in place.

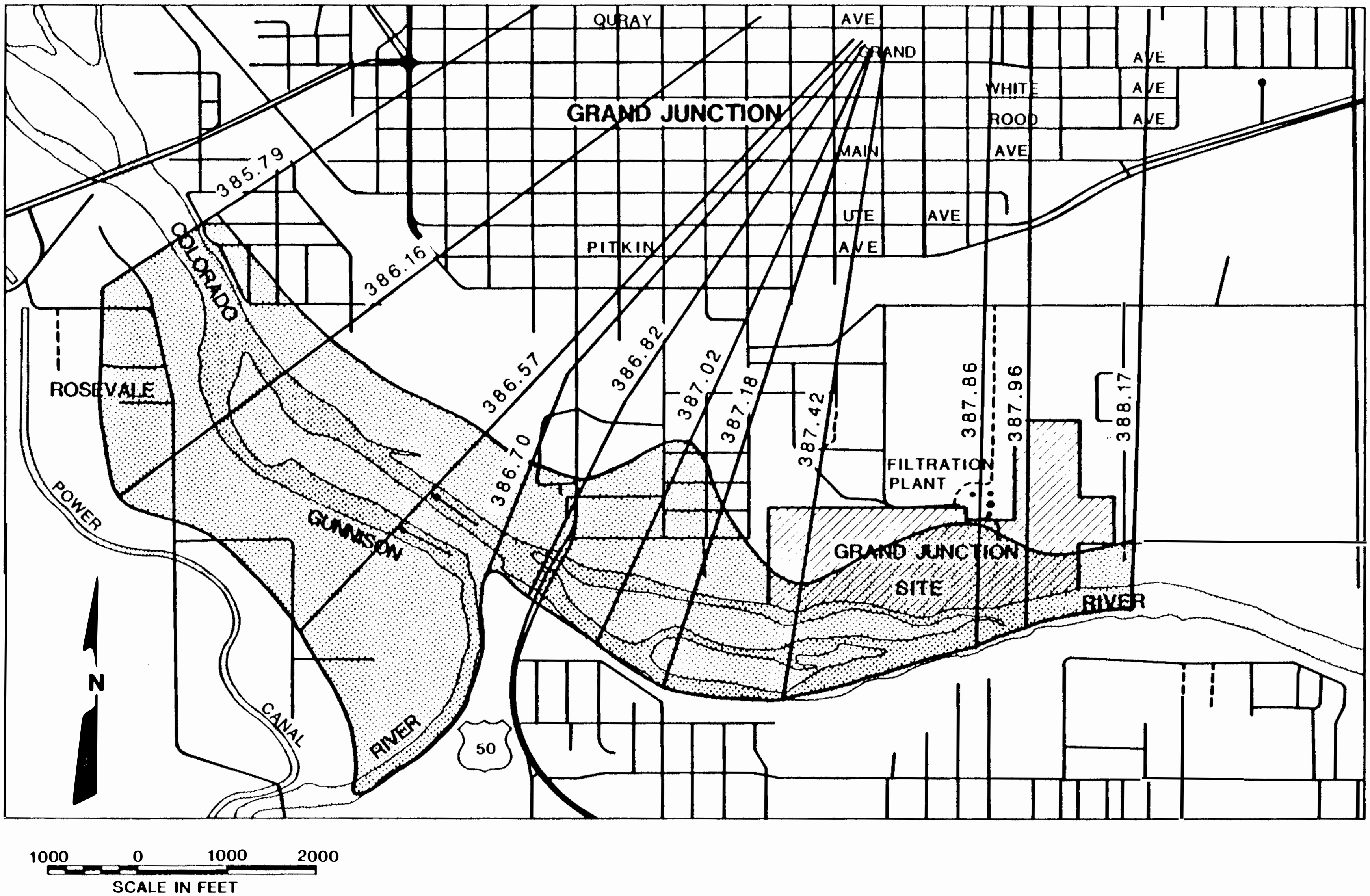

FIGURE G.2.3
LOCATION OF CROSS SECTIONS & FLOODPLAIN BOUNDARIES OF THE 100-YEAR FLOOD AFTER RELOCATION OF TAILINGS PILE

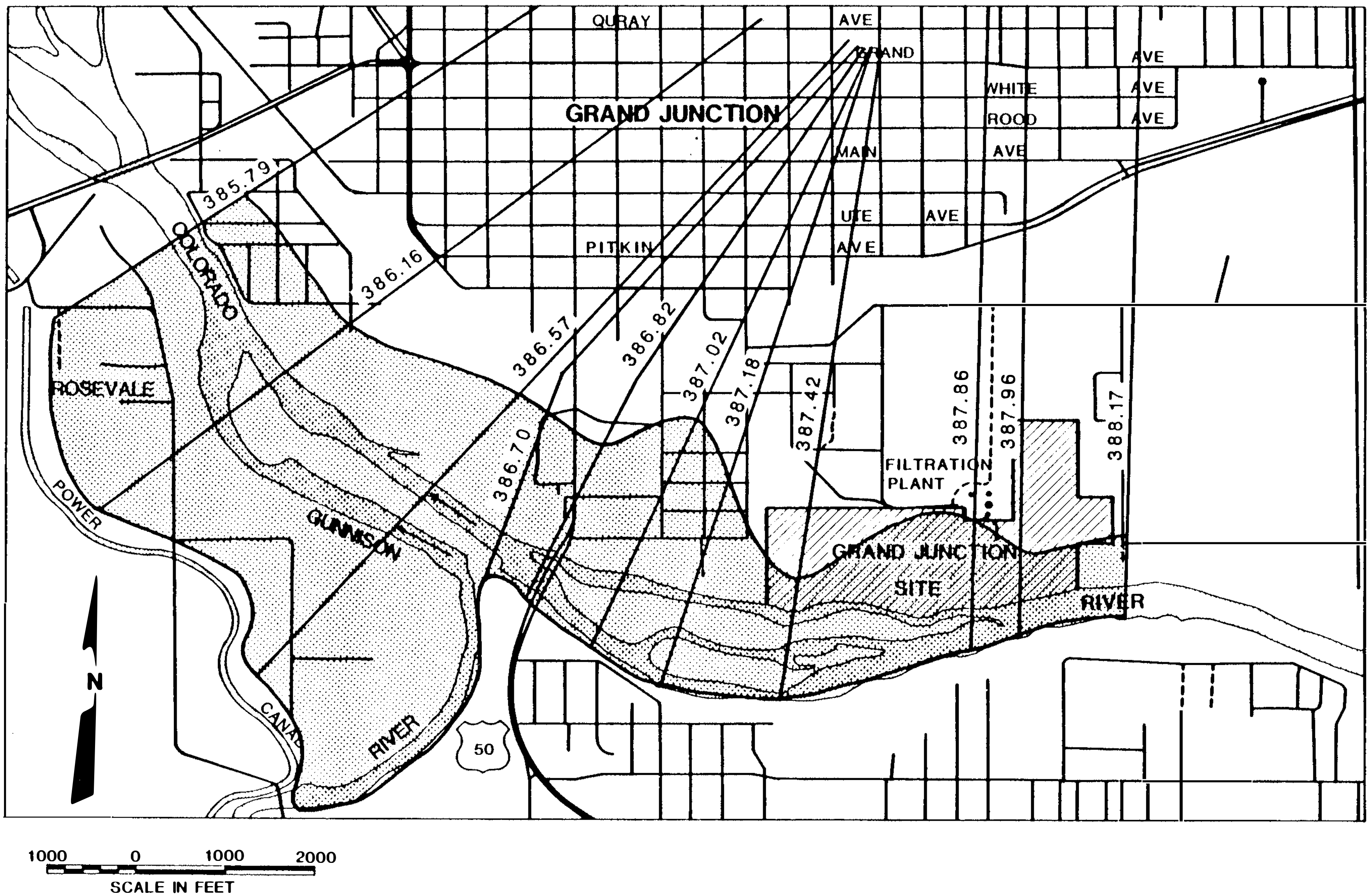

FIGURE G.2.4
LOCATION OF CROSS SECTIONS & FLOODPLAIN BOUNDARIES OF THE 500-YEAR FLOOD AFTER RELOCATION OF TAILINGS PILE

G.3 WETLANDS EFFECTS

G.3.1 WETLANDS DESCRIPTION

The U.S. Army Corps of Engineers (COE) has determined that approximately 47 acres of the Colorado River floodplain near the existing tailings site are wetlands (COE, 1985). Figure G.3.1 shows wetlands adjacent to the site. Discharge of dredged or fill material including backfilling or recontouring in COE-designated wetlands would require a permit under Section 404 of the Clean Water Act.

The wetlands area consists primarily of palustrine scrub-shrub habitat, with some riverine unconsolidated habitat and some palustrine forested habitat. The scrub-shrub wetland is dominated by tamarisk and the forested wetland is primarily cottonwood (USFWS, 1985).

Wildlife associated with the wetlands consists of birds, small mammals, and some small furbearers (beaver and muskrat).

G.3.2 WETLANDS IMPACTS

Remedial action activities in this riparian zone will be limited to the decontamination of the 400- to 600- square-foot area on Watson Island (Figure G.3.1). This activity would have very little impact on the riparian vegetation since the equipment necessary to perform the job will traverse an existing bridge to Watson Island and existing roads on the island. In addition, the contaminated area is located in a highly disturbed section of Watson Island having been cleared of trees, and piled with rubble and slash. The activity will have very little or no impact on the small side channel of the Colorado River situated near the area of contamination.

G.3.3 WETLANDS IMPACTS MITIGATION

The Department of Interior commented (Section 6.16) on impacts to the riparian area and suggested several mitigations. On the basis of these comments, the potential impacts to the wetlands area would be mitigated by measures listed in Section G.2.2 and by the following actions:

- Recontouring of excavated areas to create conditions favorable to reestablishment of scrub-shrub wetlands.
- Revegetation of the area using plant materials that would lead to the reestablishment of palustrine scrub-shrub wetlands.
- Selective use of water bars, mulch, riprap, or other soil-erosion controls to minimize erosion.

After vegetation has been reestablished, habitat similar to pre-remedial action conditions would develop.

The DOE will continue to consult with the Department of Interior to develop appropriate mitigations.

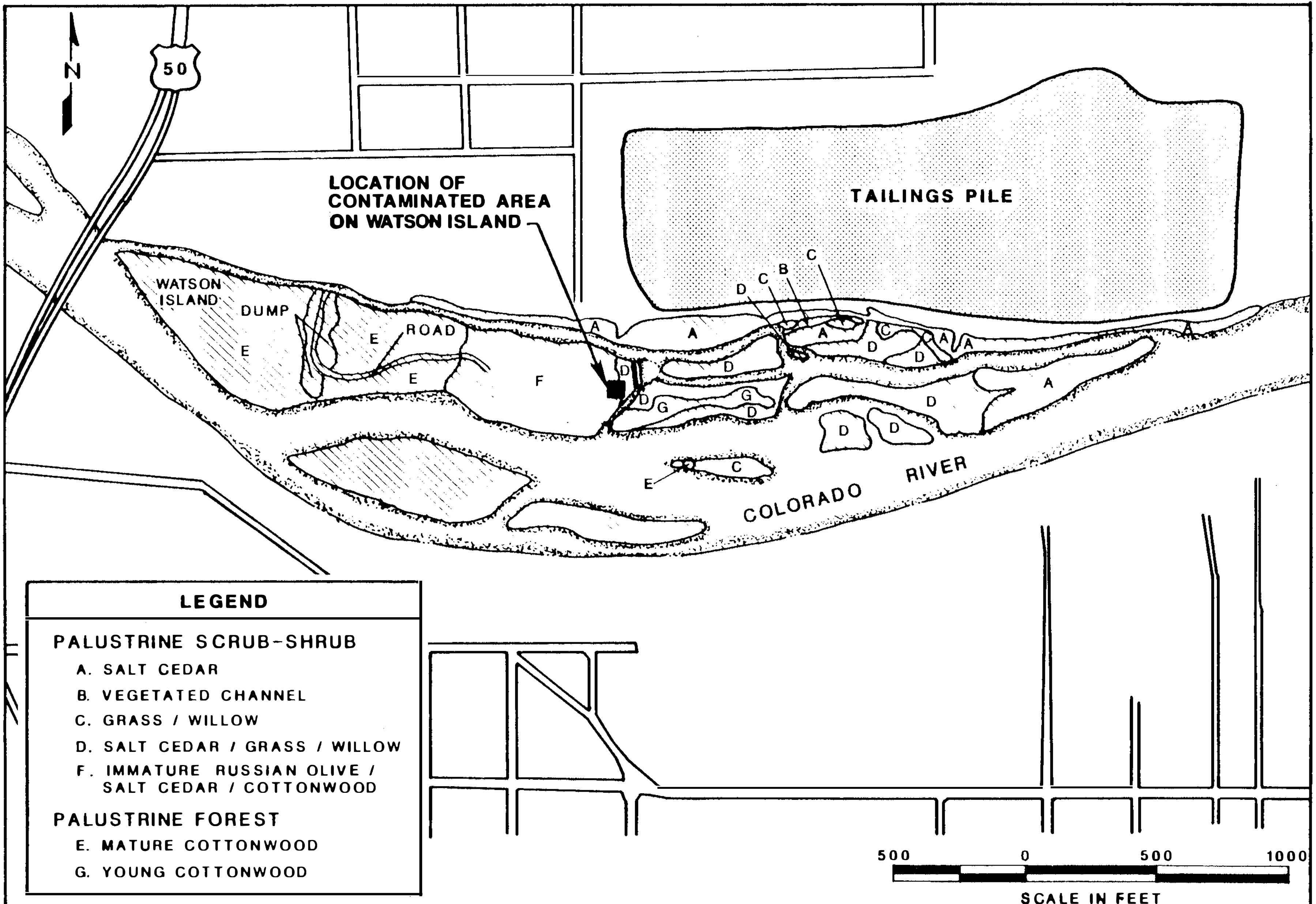

FIGURE G.3.1

WETLANDS PLANT COMMUNITY TYPES ADJACENT TO THE GRAND JUNCTION PROCESSING SITE

G.4 ALTERNATIVES

The alternative remedial actions are discussed in Sections 1.2 and 3.2 of this EIS. The impacts of these alternatives are discussed in Sections 5.1 through 5.17. Mitigation measures that are likely to be used are described in Sections 5.20, G.2.2, and G.3.3.

The no action alternative, which entails leaving the site in its present condition, would not be consistent with the intent of Congress in PL95-604 and would not result in DOE's compliance with the EPA standards. For the other alternatives, the construction activities and impacts that would occur are discussed in Sections G.2 and G.3.2.

G.5 STATEMENT OF FINDINGS

This is a Statement of Findings prepared pursuant to Executive Orders 11988 and 11990, and 10 CFR Part 1022, Compliance with Floodplain/Wetlands Environmental Review Requirements. Under authority granted by the Uranium Mill Tailings Radiation Control Act of 1978, the DOE proposes to clean up the residual radioactive wastes and other contaminated materials at the inactive uranium mill tailings site in Grand Junction, Colorado, and relocate these materials to the Cheney Reservoir site.

Most of the radioactively contaminated materials are located on the edge of the 100-year floodplain of the Colorado River. As indicated in Section G.3.1, the U.S. Army Corps of Engineers indicated that wetlands were present within the area of planned construction activities.

The principal feature of the proposed action is the transportation of tailings and other contaminated soils (from the floodplain, mill site, and wetlands) to the Cheney Reservoir site approximately 18 miles southeast of the former mill site. The Cheney Reservoir site is well out of the reach of the nearest perennial stream and is not subject to flood events. After removal of the wastes, the former mill site would be restored with uncontaminated fill and recontoured to conform to the surrounding terrain.

Specific construction activities related to the floodplain and wetlands area include: (1) removal of approximately 0.2 acre of vegetation on the 100-year floodplain prior to excavation of contaminated soils; (2) grading and revegetating the floodplain where excavated, including adding any necessary soil conditioners; and (3) use of water bars, mulch, riprap, or other soil erosion controls to minimize erosion.

The DOE examined three alternatives (with multiple transportation modes) for the remedial actions in this EIS. The DOE's proposed action (alternative 3) is to decontaminate the Grand Junction mill site and to relocate the wastes to the Cheney Reservoir site. The other alternatives analyzed in the EIS included taking no action, stabilizing the wastes on the Grand Junction mill site, and relocating the wastes to the Two Road site.

The remedial action has been designed to conform to applicable Federal and state regulations. Before construction begins, all applicable permits and approvals, such as those required under section 404 of the Clean Water Act, will be obtained from the U.S. Army Corps of Engineers, Colorado state agencies, and other agencies having jurisdiction. Initial consultation with the agencies has taken place, and as a result the conceptual design has been modified to minimize environmental impacts (see Sections G.2.2 and G.3.3).

The no action alternative would leave contaminated material in the floodplain and wetlands. Cleanup of this material (all action alternatives) inherently involves action within the floodplain and wetlands areas. On the basis of the floodplain and wetlands assessment (Appendix G), the DOE has determined that there is no practicable alternative to the proposed activities and that the proposed action has been designed to minimize potential harm to or within the floodplain and wetlands.

REFERENCES FOR APPENDIX G

COE (U.S. Army Corps of Engineers), 1985. Written communication from G. McNure, Chief Regulatory Unit 4, Grand Junction, Colorado, to R. Peel, Jacobs Engineering Group, Inc., UMTRA Project Office, Albuquerque, New Mexico, dated May 7, 1985.

USFWS (U.S. Fish and Wildlife Service), 1985. Written communication from R. Garrison, Acting Field Supervisor, Salt Lake City, Utah, to R. Peel, Jacobs Engineering Group, UMTRA Project Office, Albuquerque, New Mexico, dated March 28, 1985.