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RETURN ORIGINAL TO PDR, HQ.

January 19, 1988

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Mr. Edward F. Hawkins
Chief, Licensing Branch 1
Uranium Recovery Field Office, Region 4
U.S. Nuclear Regulatory Commission
Box 25325
Denver, Colorado 80225

RE: License No. SUA-1470
Docket No. 40-8902

Dear Mr. Hawkins:

As requested in your correspondence dated December 15, 1987, Anaconda Minerals Company submits five (5) copies of the Bluewater Uranium Mill Groundwater Detection Monitoring Plan in the form of an amendment request to Materials License SUA-1470. The plan is intended to comply with the new groundwater protection requirements of 10 CFR Part 40 promulgated as a final rule on November 13, 1987.

We would appreciate the opportunity to meet with you and your staff should you want to discuss the plan in more detail. If you should have any questions, please contact me in Denver at 293-7591.

Sincerely,

Paul D. Bergstrom

Paul D. Bergstrom
Projects Manager

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Enclosures

cc: R. Krablin
L Milner
Greg Lewis,

8803090333 880119
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Certified By Mary C. Hord

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GROUND WATER DETECTION MONITORING PLAN

ANACONDA MINERALS COMPANY

BLUEWATER URANIUM MILL

GRANTS, NEW MEXICO

JANUARY 1988

w/ltr 1/19/88
88-0274

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ANACONDA MINERALS COMPANY
BLUEWATER URANIUM MILL
GRANTS, NEW MEXICO

INTRODUCTION

This document describes the ground water detection monitoring plan for the Anaconda Mineral Company's Bluewater Uranium Mill, located eight miles northwest of Grants, New Mexico. This plan has been prepared in accordance with requirements of the final rule for ground water protection issued on November 13, 1987, by Federal Register Notice (52FR43553). The rules set out a series of criteria for ground water protection and monitoring.

OBJECTIVES OF DETECTION MONITORING

The objectives of the detection monitoring program (Criterion 7A) are:

- o to detect leakage of hazardous constituents from the disposal area, and
- o if leakage of hazardous constituents is determined, to generate data and information needed for the Commission to establish standards under Criterion 5B.

Hazardous constituents are those constituents identified under Criterion 5B(2). Information and data needed to set standards include that necessary to set the compliance period, to adjust the point of compliance, establish background concentrations of hazardous constituents, and establish alternate concentration limits (ACL).

HYDROGEOLOGY

The hydrogeologic and water quality conditions in the vicinity of the Bluewater Mill have been studied in a number of previous investigations (see References).

REGIONAL

The names of geologic formations and detailed descriptions of rock types found in the area are given on Table 1. The oldest rock formations are at the bottom of the table and progressively younger rocks are described in ascending order. The sedimentary rocks ranging in age from Pennsylvanian through Cretaceous were deposited in layers which were subsequently tilted to the northeast and broken in places by faults in the Bluewater area. In the more recent geologic past (Tertiary and Quaternary age), stream channels were eroded into the dipping sedimentary rock strata, and stream-laid alluvium, volcanic rocks and basalt (lava) flows were deposited.

The San Andres-Glorieta aquifer (referred to hereinafter as simply the San Andres aquifer) and the Basalt-Alluvial aquifer (referred to as the Alluvial aquifer) are the principal aquifers in the vicinity of the site. The middle unit of the Chinle Formation is a ground water source in some areas in the region, but the middle unit is not present in the vicinity of the Bluewater Mill. The Yeso Formation which underlies the Glorieta, yields to a few wells in its outcrop area to the west of the mill site but is not utilized in the Anaconda vicinity.

The San Andres aquifer consists of sandstones and limestones and has very high transmissivity in some locations due to solution openings in the limestone. The San Andres generally dips northeasterly and therefore lies at progressively greater depth in the northeast direction, and is exposed to the southwest of the site. The San Andres is also faulted and folded in some locations further complicating the geology of the area. The San Andres is the principal aquifer in the area.

Quaternary basalt and alluvium form the second most utilized aquifer in the area. Older alluvium was deposited during the Pleistocene in bedrock valleys eroded to depths of 150 to 200 feet and attained thicknesses of up to 30 feet. Subsequently, basaltic lava flows filled parts of the valleys.

Younger alluvium has continued to accumulate to the present. The basal part of the older alluvium is most permeable. The basalt appears to be sufficiently fractured to act as an aquifer, but interconnection of pore spaces is poor. Therefore, most wells in the aquifer yield from the underlying older alluvium. Wells tapping alluvium are located adjacent to the course of the Rio San Jose west and south of the mill area and adjacent to San Mateo Creek to the east.

The Chinle Formation is comprised principally of mudstones and claystones although sandstones and conglomerates occur in portions of the formation. Gordon (1961) subdivided the Chinle Formation into three units. The lower unit is 400-500 feet thick and is composed of mudstones, siltstones, and fine-grained sandstones with a few beds of coarser-grained conglomeratic sandstones. Near the Anaconda Mill the lower unit has been shown by drilling activities to contain only a very few relatively thin sandstone lenses, with mudstones forming the majority of this unit. The upper and middle units of the Chinle Formation are not present in the immediate vicinity of the Anaconda Mill and disposal area. The fine-grained characteristics of the Chinle Formation generally restrict the migration of ground water and, hence, the Chinle is better termed an aquitard rather than an aquifer. However, the middle unit and some other isolated coarse-grained lenses do yield limited quantities of poor to fair quality ground water which is used generally for domestic and stock watering supplies. Gordon (1961) shows no wells in the Chinle in the vicinity of Anaconda. The closest well in the Chinle downgradient of the millsite is about a mile east of Toltec (5 miles from the disposal area).

The Yeso Formation has been subdivided into two members: (1) the lower Meseta Blanca Member which consists of fine-grained sandstone, and (2) the upper San Ysidro Member which consists of silty sandstone and mudstone and some layers of gypsum and anhydrite. The several wells tapping the Yeso Formation lie west and upgradient of the mill area on the flank of the Zuni uplift. Except in the outcrop areas, water quality is poor.

Major recharge occurs from the Zuni Mountains (principally the Bluewater Canyon area) and by infiltration of precipitation, stream and irrigation waters. Inter-aquifer flow between the San Andres and Alluvial aquifers is significant in places. Discharge from the San Andres aquifer occurs by spring discharge, leakage to alluvium, and pumpage; while discharge from the Alluvial aquifer occurs by outflow and by pumpage.

The ground water flow direction and rate in the San Andres aquifer are controlled by recharge and discharge conditions, transmissivities, and structural features such as faults. Regionally, flow follows an arcuate pattern subparallel to the edge of the outcrop. The largest volume of flow occurs near the outcrop of the San Andres Formation where transmissivities are highest. General natural water quality becomes poorer with distance from the outcrop due to longer residence time and smaller amounts of fresh water recharge.

Flow direction and rate of ground water flow in the Alluvial aquifer downgradient from the tailings impoundment are controlled by the relatively narrow extent of alluvium and basalt in the ancient channel of the Rio San Jose and by inter-aquifer flow. Ground water in alluvium in the vicinity of the disposal area must either flow downgradient along the relatively narrow alluvial channel to the southeast or leak downward into the San Andres aquifer.

There is significant interconnection between the San Andres and Alluvial aquifers in areas near the San Andres outcrop. West to southwest of disposal area, downward leakage from Alluvium to the San Andres allows some contaminants in the Alluvium to move into the San Andres aquifer. Upward leakage (from the San Andres to the Alluvial aquifer) occurs in the Toltec-Milan area.

LOCAL

GENERAL

Major facilities, property boundaries and the locations of wells used in the past to monitor water levels and water quality on and in the vicinity of the Bluewater Mill are shown on Plate 1. The geology of the site is relatively complex. The disposal area is situated above outcrops or subcrops of the basalt, the San Andres Formation and the lower Chinle Formation. Much of the area beneath the tailings is covered by a veneer of Quaternary alluvium. Basalt flows are also located beneath a part of the pond and cover older alluvium which in turn overlie bedrock. The most southerly portion of the tailings impoundment overlies the trace of a major fault. This fault, shown on Plates 2 and 3, offsets the San Andres Formation with a displacement of approximately 400 feet in the area of the pond. The offset of the San Andres Formation caused by the fault decreases toward the east. The offset of the San Andres-Glorieta aquifer is sufficient to form a flow barrier. A north-south-trending fault or sharp fold has also been suggested to underlie the tailings area and may also form a partial barrier to flow in the San Andres-Glorieta. These variations in the geology found beneath the pond complicates seepage and ground water movement.

The "uppermost aquifer" as defined by the regulations means the aquier closest to the ground surface and hydraulically interconnected lower aquifers within the facility's property boundary. As such, the Alluvial aquifer and the San Andres aquifer form the uppermost aquifer.

SAN ANDRES AQUIFER

A potentiometric map for the San Andres aquifer based upon water levels measured in 1987 is presented on Plate 2. Since 1978 there has been a steady increase in regional water levels in the San Andres-Glorieta amounting to over 20 feet on average. Increases in water levels are attributed to reduced

ground water withdrawals for irrigation since the early 1960's, and reduced withdrawals for industrial use more recently within the Bluewater Basin. The general contour pattern is presently similar to that in 1980 except there appears to be less of a depression due to pumping near the mill. Differences across the fault south of the tailings impoundment are smaller.

The piezometric surface indicates that the fault is restricting the movement of ground water to the south across this fault. A significant modification of the flow would be expected since the fault offsets the permeable karst limestone beds, found in the San Andres Formation, along the fault.

The hydraulic parameters of the San Andres-Glorieta aquifer have been evaluated by four separate pumping tests conducted for Anaconda and from three pumping tests reported by Gordon (1961). The results of the pumping tests are summarized in Table 2. Transmissivity of the entire section of the San Andres-Glorieta aquifer is typically in the range of 400,000 to 500,000 gpd/ft in the mill vicinity. This high transmissivity is attributed primarily to the upper karstic zone of the aquifer. The lower granular portion of the aquifer (the Glorieta Sandstone) supplies water by leakage into the karst zone. Leakage derived from the granular portion of the aquifer strongly affects drawdown curves. Storage coefficients for the aquifer are in the range of 10^{-2} to 10^{-4}. Effects of fault dislocations of the aquifer which produce flow barriers were observable in the test data. Transmissivity immediately east of the disposal area is substantially reduced due to removal of the upper half of the aquifer which contains the karst zone. Further to the east, where the aquifer retains its full character and thickness, transmissivity is similar to that near the mill. Since the aquifer contains karst zones, it is reasonable to assume that much of the aquifer's permeability occurs in relatively small zones within the formation.

ALLUVIAL AQUIFER

The piezometric surface of the Alluvial aquifer in 1987, as interpreted from currently available data and past information, is shown on Plate 3. This piezometric surface is largely controlled by an ancient river channel and by the east-west fault located just south of the tailings pond. Since 1978, general water level increases ranging from 5 to 18 feet have occurred. Increases in water levels are attributed to reduced ground water withdrawals in the area.

The ancient channel of the San Jose River followed a sinuous path in a southeast trend from above the area of the mill to the Grants area. Near the mill and tailings pond, the ancient channel is believed to have extended along the fault line where a steep escarpment was formed adjacent to the harder San Andres Formation, located on the north (up-thrown) side of the fault. At some point in the Late Quaternary period basalt flows filled the river channel. Today the trace of the basalt flows marks this ancient channel. Plate 3 shows the axis of the alluvial channel south of the tailings area. Available data indicate that the subsurface alluvial channel extends in an easterly direction south of the tailings pond and curves southwesterly. Seepage which escapes from the disposal area in alluvium would be expected to be confined to this channel.

Transmissivity of the alluvium estimated from pumping test results of Wells B(M) and C(M) is 24,000 gpd/ft. Results of the tests are summarized in Table 2 along with pumping test results for the San Andres aquifer. Permeability of the alluvial aquifer is on the order of 890 gpd/ft^2 south of the tailings pond based upon transmissivities of 24,000 gpd/ft and the observed aquifer thicknesses of 22 to 27 feet. Leakage from basalt was significant during the tests. Vertical permeability of the basalt is estimated at 94 gpd/ft^2 or less based on the test data. Boundary effects from pinch-out of the aquifer were observed in the well B(M) pumping test data. The higher permeabilities of the ancient river channel are reflected by the trough in the

piezometric surface along the axis of the channel. The majority of the flow through this aquifer is believed to be along this channel.

Although the Alluvial aquifer and the San Andres Formation are in direct contact along the fault, hydraulic connection across this fault is poor. This is demonstrated by the distinctly different piezometric surfaces of the aquifers. A higher piezometric level exists in the Alluvial aquifer.

WATER QUALITY

Anaconda has extensively monitored ground water near the mill since early operations. Anaconda began regular ground water monitoring in 1956 and has continued monitoring through the present (Anaconda, 1956-1987; Hydro-Search Inc., 1981). An assessment of impacts of disposal systems with respect to the then proposed New Mexico Environmental Improvement Division (NMEID) ground water standards was performed by Dames & Moore (1975). A series of monitor wells were installed, and regional and site-specific ground water studies were conducted by Hydro-Search Inc. (1977; 1978a; 1978b; 1981).

Anaconda has submitted a ground water discharge plan to the NMEID for the above-grade tailings impoundment (Billings and Associates, Inc., 1984). In response to a request by NMEID following their review of the discharge plan, Anaconda commissioned a detailed study (Dames & Moore, 1984) of the past and future impacts of the Bluewater Mill on ground water quality. In response to another request by NMEID, a numerical flow and contaminant transport model (Dames & Moore, 1986a) was run to simulate past and future ground water conditions with respect to sulfate, chloride, nitrate and total dissolved solids in the region around the mill. A review of water quality data was prepared by Dames & Moore (1986c).

Water quality monitoring has been performed by Anaconda including water levels, major ion concentrations, trace constituents of concern and radionuclides. The studies have indicated that arsenic, barium, cadmium, chromium,

fluoride, lead, mercury, selenium, silver, uranium, copper, iron, manganese, zinc, aluminum, boron, cobalt, molybdenum, nickel, and radium-226 have met and should continue to meet NMEID standards in monitor wells on the site due to rapid neutralization of seepage and geochemical attenuation of these constituents. Nitrates exceeded NMEID standards in the past due to high nitrate concentrations used in the milling process during the mid-1950's; however nitrates have since significantly decreased. Chloride, sulfate and total dissolved solids (TDS) have also exceeded NMEID standards on site but are improving. Anaconda has continually submitted water quality data to the regulatory agencies. Selected recent data are given in the Appendix to this report.

DEFINITION OF DISPOSAL AREA

The "disposal area" means the area containing byproduct materials to which the requirements of Criterion 6 apply. This area is shown on Plates 1, 2 and 3 and includes the evaporation pond area, main tailings, old acid tailings, carbonate tailings, mill and stockpile areas. Discussion of the Criterion 6 area is present in the reclamation plan (Anaconda, 1986).

BACKGROUND WELLS FOR DETECTION MONITORING

Background wells should be hydraulically upgradient of the disposal area, unaffected by its operation and representative of ground waters flowing under the facility. Because the uppermost aquifer is comprised of two aquifers with different flow directions and character, background wells have been designated for both the San Andres aquifer and the Alluvial aquifer.

Table 3 summarizes well construction information for wells monitored in the vicinity of the disposal area. As shown on Plate 2 and by past monitoring, wells L(SG) and M(SG) are upgradient wells completed in the San Andres aquifer which are representative of background water quality. Water quality data (see Appendix and references) also indicate these wells are not affected by the tailings disposal.

Flow in the Alluvial aquifer is fairly complex as shown on Plate 3. Wells E(M) and Aragon are hydraulically upgradient of the disposal area and representative of background water quality.

POINT OF COMPLIANCE WELLS FOR DETECTION MONITORING

Point of compliance wells should be hydraulically downgradient of the disposal facility and in close proximity to provide the earliest practicable warning of the migration of hazardous constituents. Wells OBS#3, S(SG), and OBS#2 are designated as the point of compliance wells in the San Andres aquifer. These are located directly downgradient of the main tailings area, as shown on Plate 2, where the San Andres is the uppermost aquifer.

Wells B(M), T(M) and F(M) are designated as the point of compliance wells in the Alluvial aquifer. Point of compliance well locations are shown on Plate 3. Well construction information is presented on Table 3.

ANALYTICAL PARAMETERS AND METHODS

Analytical parameters for detection monitoring have been selected to indicate if hazardous constituents are leaving the disposal area and to provide additional information to establish standards under Criterion 5B, if necessary. Indicator species are chemical-physical parameters, waste constituents, or reaction products that are reliable indicators of the migration of hazardous constituents. Ideal indicators should have high concentrations in the disposal facility as compared to ground water and should be relatively mobile in ground water to provide early warning.

For the purpose of determining whether hazardous constituents are being released to ground water at the point of compliance, the following indicator species will be monitored and statistically evaluated to determine whether or not concentrations exceed background:

pH
Arsenic (As)
Selenium (Se)

These species have been selected because they occur in high concentrations in the disposal area (see Appendix) relative to ground water and are relatively mobile compared to other potential hazardous constituents. In addition, pH is an important geochemical control on the transport of heavy metals. These indicator parameters will be statistically compared between upgradient and downgradient ground waters at a 95 percent confidence level as outlined in the following section "Data Evaluation and Reporting."

A constituent becomes a hazardous constituent when it is reasonably expected to be in or derived from byproduct material, and it has been detected in ground water, and it is listed in Criterion 13. USNRC has conducted screening analyses of liquid from the evaporation pond 1B in accordance with the EPA hierarchical method. Results of these analyses (USNRC, 1987) showed the presence of a number of metals of concern; in addition, two purgeable organics (acetone and carbon disulfide) were measured in the samples. Acetone is not a Criterion 13 parameter and is a common laboratory contaminant; it was reported at a concentration of 27 ug/l, far below the practical limit of quantitation of 100 ug/l (EPA, 1986, p. 8240-4). Carbon disulfide was reported at 12 ug/l, barely above the limit of quantitation of 5 ug/l. It is not likely either purgeable is significant.

The limit of quantitation (LOQ) is defined as the level above which quantitative results may be obtained with a specified degree of confidence. EPA uses five standard deviations from the average noise level to establish limits of quantitation (EPA, 1986, p. 1-15). EPA cites LOQ values for organic test methodologies rather than using the term limit of detection.

Table 4 lists the parameters detected in the screening of the evaporation pond liquid of the disposal area. Based upon the results of this screening and previous analyses by Anaconda (1956-1987) the parameters listed on Table 4 will be run in the designated background wells and point of compliance wells to determine if these species are hazardous constituents subject to paragraph 5B(5) of Criterion 5. There will be no monitoring of other Criterion 13 parameters not found in the disposal liquid. Table 4 also lists the analytical methods and nominal detection limits.

In order to provide additional quality assurance, the analytical laboratory will be EPA and/or state certified. Trip blanks and laboratory blanks will be taken and analyzed by the laboratory for purgeable (volatile organics) parameters. Analyses will continue to meet QA/QC requirements of USNRC guidelines 4.14 and 4.15, as do all environmental measurements at the site.

FREQUENCY AND SCHEDULE

The frequency and schedule for monitoring are summarized on Table 5. For the purposes of determining background concentrations of indicator species for statistical comparisons, a minimum of 12 representative background measurements incorporating seasonal variations will be made. Therefore, samples and analyses for indicator parameters in ground water from each background well will be taken at each monthly sampling period for one year to establish background. During this background determination period, sampling and analyses for indicator parameters in point of compliance wells will be performed quarterly. Sampling and analyses for indicator species in background and point of compliance wells, and statistical comparisons will then continue semiannually while under detection monitoring. These schedules are summarized on Table 5.

In order to determine what species are hazardous constituents potentially subject to Paragraph 5B(5) of Criterion 5 and to provide additional data should it be necessary to establish standards under Criterion 5B, the para-

meters listed on Table 4 will be run in background and point of compliance wells. Parameters which are detected in the screening analyses of ground water will continue to be monitored quarterly for one year. At the end of one year, the results of these analyses will be evaluated and the need for additional monitoring will be assessed and reported to USNRC.

DATA EVALUATION AND REPORTING

During detection monitoring, data evaluations and reporting will be as follows:

1. During the first year, water levels and samples for indicator species will be taken monthly in background wells and quarterly in point of compliance wells. Samples for the hazardous constituents potentially subject to Paragraph 5B(5) of Criterion 5 will be taken quarterly. Ground water levels and chemical analyses will be reported to USNRC quarterly.

2. When the results of analyses of the fourth quarterly round of analyses are received, a single mean value and associated variance will be calculated for each indicator species for each aquifer (San Andres aquifer and Alluvial aquifer) that comprise the uppermost aquifer at the site. That is, the values from both background wells in a particular aquifer will be pooled to determine background levels in that aquifer.

   With continuing detection monitoring, background means and variations will be updated with the inclusion of subsequent values.

3. For each point of compliance well for each of the indicator species, the mean and variance of the past four analyses will be calculated and compared to background. Statistical comparisons will be made at the 95 percent confidence level using Cochran's Approximation to the Students t-test unless population distribution or character indicates this is not valid. If the latter is the case, an alternate method will be proposed and justified based upon the data.

4. When comparison of a point of compliance well with background shows a statistically significant increase (or pH decrease) in any of the indicator species that is suspected to be false, Anaconda will resample and analyze to determine whether a sampling or analysis error has occurred. Resampling will be performed within 7 days of finding that a statistically significant increase has occurred. If a sta-

tistically significant increase is verified, Anaconda will work with USNRC to establish ground water protection standards.

5. The results of statistical comparisons, notification of exceedances, intent to perform verification sampling, or other important changes in ground water conditions will be reported to USNRC.

6. In addition to presentation of data collected and statistical calculations, ground water flow rate and direction will be evaluated and reported to USNRC at least annually.

GROUND WATER SAMPLING PROCEDURE

Prior to going in the field, the pH and conductivity probe will be cleaned using a mixture of 1 pH HCl and 1% acetone solution. The slope of the pH probe will be calibrated using 7.0 and 4.0 pH buffer solutions (EPA Method 150.1). The calibration of the pH and conductivity probe will be checked and corrected if necessary for each sample in the field.

The following equipment will be used on-site:

- Conductivity Meter (with standard solution)
- pH Meter (with buffers)
- Water Level Meter
- Thermometer
- Sample Containers and Preservatives
- 500ml Plastic Beakers
- Plastic Bucket
- Field Log Book
- Identification Tags or Markers
- Ice Cooler with Ice
- Portable Generator, 2,000 Watts
- 0.45 Micron Filters and Filtering Apparatus
- Distilled Water for Rinsing

Table 6 lists container types, preservative methods and maximum hold times for the various parameters to be analyzed.

All monitor wells have dedicated electric sampling pumps installed which are powered by a portable generator. Some wells in Anaconda's monitoring network are offsite private wells which already have pumps for water supply purposes.

The following outlines sampling procedures:

1. Take the water level depth measurement from the defined measurement point (usually the top of the casing). Calculate the ground water elevation and record.

2. Pump the well until approximately two to three casing volumes are pumped out. Take temperature, pH and conductivity measurements. Pump for at least five minutes more and take another set of temperature, pH and conductivity measurements. Keep pumping and measure the above parameters every five minutes until they stabilize and then collect the ground water sample.

3. Record the date, time, water level, pH, temperature, conductivity and any other comments on the field data sheet.

4. Samples shall be placed in the containers and preserved as indicated on Table 6. The bottles for purgeable organics analysis must be filled such that no air is left in the vial and must be immediately sealed in the field. The sample should be kept out of direct sunlight and kept on ice. Samples for dissolved metals analyses must be filtered on-site with a 0.45 micron filter and then preserved by acidification with nitric acid to a pH of less than 2 (add about 4 ml acid per liter sample).

5. Ship samples to the appropriate laboratory for analysis so that they may be analyzed within the required hold times (Table 6). The purgeable samples should be kept on ice during shipment.

6. Chain-of-custody documentation will be completed and sent with the sample shipment as appropriate.

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TABLE 1

STRATIGRAPHIC DESCRIPTION AND WATER-BEARING CHARACTERISTICS

Age	Unit	Thickness (Feet)	Lithologic Characteristics	Water-Bearing Characteristics
Quaternary	Recent Alluvium	0- 50	Valley-fill deposits of unconsolidated silt, clay, sand, and gravel.	Alluvium and basalt form a single, important aquifer. Basal alluvium most productive portion. Water quality usually good.
	Basalt	0- 200	Dense to vesicular basalt, extruded as lava flows of varying thickness and extent.	
	Older Alluvium	0- 100	Valley fill deposits of sand, gravel, silt and clay.	
Quaternary(?) and Tertiary	Basaltic Rocks	-	Basaltic cinder cones, plugs and dikes.	Unknown.
Tertiary	Extrusive Rocks	0- 300	Basalt, rhyolite and tuff breccia	Yields water to springs at base of basalt at favorable locations.
Cretaceous	Mesaverde Group, Undivided	1,000-1,500	Silty shale and thin- to thick-bedded fine-grained sandstone, with some local coal beds.	Not utilized in mine or mill vicinity.
	Mancos Shale	700- 800	Platy, calcareous marine shale, with some thick-bedded sandstones in lower part.	Tres Hermanos sandstone member yields small amounts of fair quality water in mine vicinity.
	Dakota Sandstone	50- 100	Massive, medium- to coarse-grained sandstone, locally with interbedded siltstone.	Not utilized for water supply in mine or mill area.
Jurassic	Morrison Formation	300- 500	Brush Basin (upper) member consists of mudstone and arkosic sandstone, contains Jackpile sandstone at top of unit. Westwater Canyon member, sandstone and mudstone. Recapture Creek (lower) member, alternating sandstone and siltstone or mudstone.	Brushy Basin and Westwater Canyon members yield small quantities of fair to poor quality water. Recapture Creek member not known to yield ground water.
	San Rafael Group, Undivided	450- 700	Fine- to medium-grained, in part silty sandstone, siltstone, and claystone, with some limestone in lower part, and massive cross-bedded sandstone in basal part.	Bluff sandstone formation is utilized for stock watering in Jackpile mine area. Yields small quantities of poor quality water.
Triassic	Wingate Sandstone	60- 100	Massive, cross-bedded sandstone.	Not utilized in mine or mill areas.
	Chinle Formation	1,400-1,600	Siltstone and mudstone, with interbedded silty sandstone and some conglomeratic sandstone. Some thin limestones in upper part, a thick sandstone unit near the middle, considerable sandstone in the lower part.	Utilized for domestic, stock watering and occasionally irrigation supply. Water quality fair to poor.
Permian	San Andres Limestone	80- 150	Thick-bedded to massive limestone, sandy limestone, and limy sandstone. The limestone strata are cavernous in many localities.	San Andres and Glorieta formations comprise a single aquifer. Most highly developed aquifer in Bluewater area. Water quality good near outcrop; deteriorates with distance from outcrop.
	Glorieta Sandstone	125- 300	Thick-bedded to massive, well-sorted medium-grained sandstone. Some interbedded siltstone in basal part.	
	Yeso Formation	350- 500	Upper part fine-grained silty sandstone and mudstone with some layers of evaporites and limestone. Lower part fine-grained sandstone.	Yields to several wells on flank of Zuni uplift. Except in outcrop areas, water is of poor quality.
	Abo Formation	500- 800	Arkosic sandstone and siltstone, with numerous layers of conglomerate in lower part.	Not utilized in area. Contains water of poor quality and is deeply buried.
Pennsylvanian(?)		0- 480	Arkose and conglomerate, and a few thin arkosic limestone lenses and beds of shale.	Unknown.
Precambrian			Granite, gneiss, metarhyolite, schist, and greenstone.	Unknown.

TABLE 2

SUMMARY OF AQUIFER TEST RESULTS

Test	Aquifer	Well Name	Pumping Rate (gpm)	Specific Capacity At End Of Test (gpm/ft)	Duration Of Pumping (min)	Pumping Or Observation Well	Radial Distance Of Observation Well (ft)	Method* Of Analysis	Pumping* Or Recovery Data	r/B	Transmissivity (gpd/ft)	Storage Coefficient (dimensionless)	Boundary Condition Noted
A	San Andres-Glorieta	Anaconda #2	1,559	39	1,440	Pumping	-	Sp Cap	P	-	100,000	-	
		Anaconda #1				Obs	426	Lky.Art.	P&R	0.3	196,000	1.3×10^{-4}	Lkg & Bar
B	San Andres-Glorieta	Anaconda #5	2,000	25	4,620	Pumping	-	Sp Cap			65,000	-	Leakage
		Pilot Hole				Obs	33.5	Lky.Art.	P	0.03	149,000	1.2×10^{-4}	Lkg & Bar
								Lky.Art.	R	0.03	151,000	6.0×10^{-5}	Lkg & Bar
		Anaconda #2				Obs	135	Lky.Art.	P	0.2	498,000	1.4×10^{-2}	Lkg & Bar
								Lky.Art.	R	0.2	483,000	1.2×10^{-2}	Lkg & Bar
		Anaconda #1				Obs	514	Lky.Art.	P	0.3	409,000	1.3×10^{-3}	Lkg & Bar
								Lky.Art.	R	0.3	409,000	8.1×10^{-4}	Lkg & Bar
C	San Andres-Glorieta	S-1	2,300	55	2,610	Pumping	-	Jacob	R		380,000	-	
D	Alluvial	B(M)	82	5.2	1,440	Pumping		Sp Cap	P		15,000	-	Lkg & Bar
		B(M) Obs				Obs	72.5	Lky.Art.	R	0.8	24,100	1×10^{-3}	Lkg & Bar
E	Alluvial	C(M)	72	9.7	380	Pumping	-	Sp Cap	P		24,000	-	Lkg & Bar?
F	Glorieta	S(SG)	160	3.9	2,816	Pumping	-						
		G(SG)				Obs	401.5	Lky.Art.	R	1.0	24,400	5.3×10^{-5}	Lkg & Bar
		D(SG)				Obs	597.5	Lky.Art.	P	2.0	29,100	8.9×10^{-5}	Lkg & Bar
								Lky.Art.	R	2.0	33,900	2.8×10^{-4}	Lkg & Bar
		OBS-3					1,003.1	Dist. DD	P&R				Lkg & Bar
		OBS-2					1,504.9	Dist. DD	P&R				Lkg & Bar
**	San Andres-Glorieta 10/18-19/51	Anaconda #1	600	428	1,560	Pumping	-	Jacob	R	-	410,000	-	-
**	San Andres-Glorieta 10/22-24/51	Anaconda #1	775	430	2,970	Pumping	-	Jacob	R	-	430,000	-	-
**	San Andres-Glorieta & Alluvium 10/15/56	Homestake	2,830	158	720	Pumping	-	Jacob	R	-	460,000	-	-

*Key: SP Cap = Specific Capacity; Distance DD = Distance Drawdown; Leaky Artesian = Walton (1960, 1970); P = Pumping; R = Recovery; Jacob = Jacob and Lohman (1952); Lkg & Bar = Leakage and Barrier

** From Gordon (1961)

TABLE 3

WELL CONSTRUCTION SUMMARY

Well	Aquifer[a]	Elevation[b]	Diameter (in)	Total Depth (ft)	Open Interval (ft)	Lithology[d] Qal	Qb	QToa	TRc	Psg	Psy
M(SG)	S	6640.60	5	575	460-610[c]	0-15	-	-	15-432	432-TD	-
L(SG)	S	6602.60	8	610	412-610[c]	-	0-110	110-122	122-412	412-TD	-
OBS#2	S	6629.60	5	319	10-319	-	-	-	-	0-269	269-TD
OBS#3	S	6612.60	5	355	10-355	-	-	-	0-50	50-317	317-TD
S(SG)	S	6621.14	8	337	159-280	-	-	-	-	-	-
Aragon	A	6616.33	6	144	137-144	0-2	2-88	88-144	-	-	-
E(M)	A	6613.08	4	100	67-90	-	0-73	73-82	82-TD	-	-
B(M)	A	6608.64	6	161	117-150	-	0-121	121-147	147-TD	-	-
F(M)	A	6600.31	6	136	94-115	-	0-95	95-112	112-TD	-	-
T(M)	A	6609.40	6	142	128-133	-	0-128	128-133	133-TD	-	-

Notes:

a Aquifer
  A = Alluvial/Basalt aquifer
  S = San Andres/Glorieta aquifer

b Elevation of measuring point (usually top of casing)

c Open hole completions; all other completions are slotted casing

d Lithology
  Qal = recent alluvium
  QToa = old alluvium
  Qb = basalt
  TRc = Chinle Formation
  Psg = San Andres-Glorieta aquifer
  Psy = Yeso Formation

TABLE 4

ANALYTICAL PARAMETERS AND METHODS

Parameter	Method	Description of Method	Detection Limit (mg/l)	Preservative
Arsenic	EPA 206.2 (1)	Graphite Furnace Atomization	0.005	Nitric Acid
Barium	EPA 200.7 (1)	Inductively Coupled Plasma (ICP)	0.01	Nitric Acid
Beryllium	EPA 200.7 (1)	Inductively Coupled Plasma (ICP)	0.005	Nitric Acid
Cadmium	EPA 200.7 (1)	Inductively Coupled Plasma (ICP)	0.005	Nitric Acid
Chromium	EPA 200.7 (1)	Inductively Coupled Plasma (ICP)	0.005	Nitric Acid
Cyanide	EPA 335.2 (1)	Manual Distillation - Colorimetric	0.005	Sodium Hydroxide
Fluorine/Fluoride	EPA 340.2 (1)	Potentiometric	0.5	None
Lead	EPA 239.2 (1)	Graphite Furnace Atomization	0.005	Nitric Acid
Mercury	EPA 245.1 (1)	Manual Cold Vapor	0.0001	Nitric Acid
Molybdenum	EPA 200.7 (1)	Inductively Coupled Plasma (ICP)	0.005	Nitric Acid
Nickel	EPA 200.7 (1)	Inductively Coupled Plasma (ICP)	0.02	Nitric Acid
Selenium	EPA 270.2 (1)	Graphite Furnace Atomization	0.005	Nitric Acid
Radium (Ra-226+ Ra-228)	EPA 903.1 (2)	Coprecipitation - Radon Emanation	0.2 pCi/L	Nitric Acid
Thallium	EPA 200.7 (1)	Inductively Coupled Plasma (ICP)	0.03	Nitric Acid
*Thorium (Th-230)	See below (3)	Ion Exchange - Alpha Spectrometry	0.2 pCi/L	Nitric Acid
Uranium	EPA 908.1 (2)	Fluorimetric	0.2	Nitric Acid
**Acetone	EPA 624 (4)	Purge and Trap - GC/MS	0.010	None - Septum Vial
Carbon Disulfide	EPA 624 (4)	Purge and Trap - GC/MS	0.005	None - Septum Vial
**pH	EPA 150.1 (1)	Electrometric	± 0.1	None

References:

(1) Methods for Chemical Analysis for Water and Wastewater, EPA-600/4-79-020, Revised March 1983.

(2) Prescribed Procedures for Measurement of Radioactivity in Drinking Water, EPA 600/4-80/03, August 1980.

(3) EMSL-LV-0539-17 Radiochemical Analytical Procedures for Analysis of Environmental Samples, March 1979, p. 33

(4) 40 CFR 136, Appendix A, July 1986.

* Not included in Criterion 13 hazardous constituents list for Bluewater Mill since mill did not produce thorium byproduct material.

** Not in Criterion 13.

All metals and radionuclides are dissolved.

TABLE 5

DETECTION MONITORING SCHEDULE

Parameter	Sampling Event: Spring 88	Summer 88	Fall 88	Winter 88/89	Semiannually Thereafter
Indicator Species[1]					
Background Wells	X X X[3]	X X X[3]	X X X[3]	X X X[3]	X
Point of Compliance Wells	X	X	X	X	X
Other[2]	X	X	X	X	
Water Level[4]	X X X	X X X	X X X	X X X	X

Notes:

1. Indictor species are pH, As, Se (dissolved).

2. Other parameters are Ba, Be, Cd, Cr, CN, F, Pb, Hg, Mo, Ni, Tl, Ra-226 + Ra-228, Th-230, acetone, carbon disulfide (all metals and radionuclides are dissolved). Parameters not detected in the first screening analysis will be dropped from the analytical program.

3. Indicator species are to be measured monthly from each background well during first four quarterly sampling periods.

4. Ground water flow rate and direction to be evaluated and reported annually.

Background wells are E(M) and Aragon in Alluvial aquifer; and M(SG) and L(SG) in San Andres aquifer.

Point of compliance wells are B(M), T(M) and F(M) in Alluvial aquifer; and OBS#2, OBS#3 and S(SG) in San Andres aquifer.

Schedule assumes NRC approval by March 1, 1988.

TABLE 6

CONTAINERS, PRESERVATIVES AND HOLD TIMES

Parameter	Container	Preservation	Maximum Hold Time
Metals (total)	1 liter plastic or glass	HNO_3<pH2	6 months
Radionuclides (total)	1 liter plastic or glass	HNO_3<pH2	6 months
Metals (dissolved)	1 liter plastic or glass	Filter on-site with 0.45 micron filter HNO_3<pH2	6 months
Radionuclides (dissolved)	1 liter plastic or glass	Filter on-site with 0.45 micron filter HNO_3<pH2	6 months
Fluoride	300 ml plastic or glass	None	28 days
Purgeables	3 ea 40 ml glass vials	Cool 4°C, Teflon cap no headspace	14 days
pH	plastic or glass	None	Immediate On-site
Cyanide	500 ml plastic or glass	Cool 4°C NaOH to pH >12	14 days

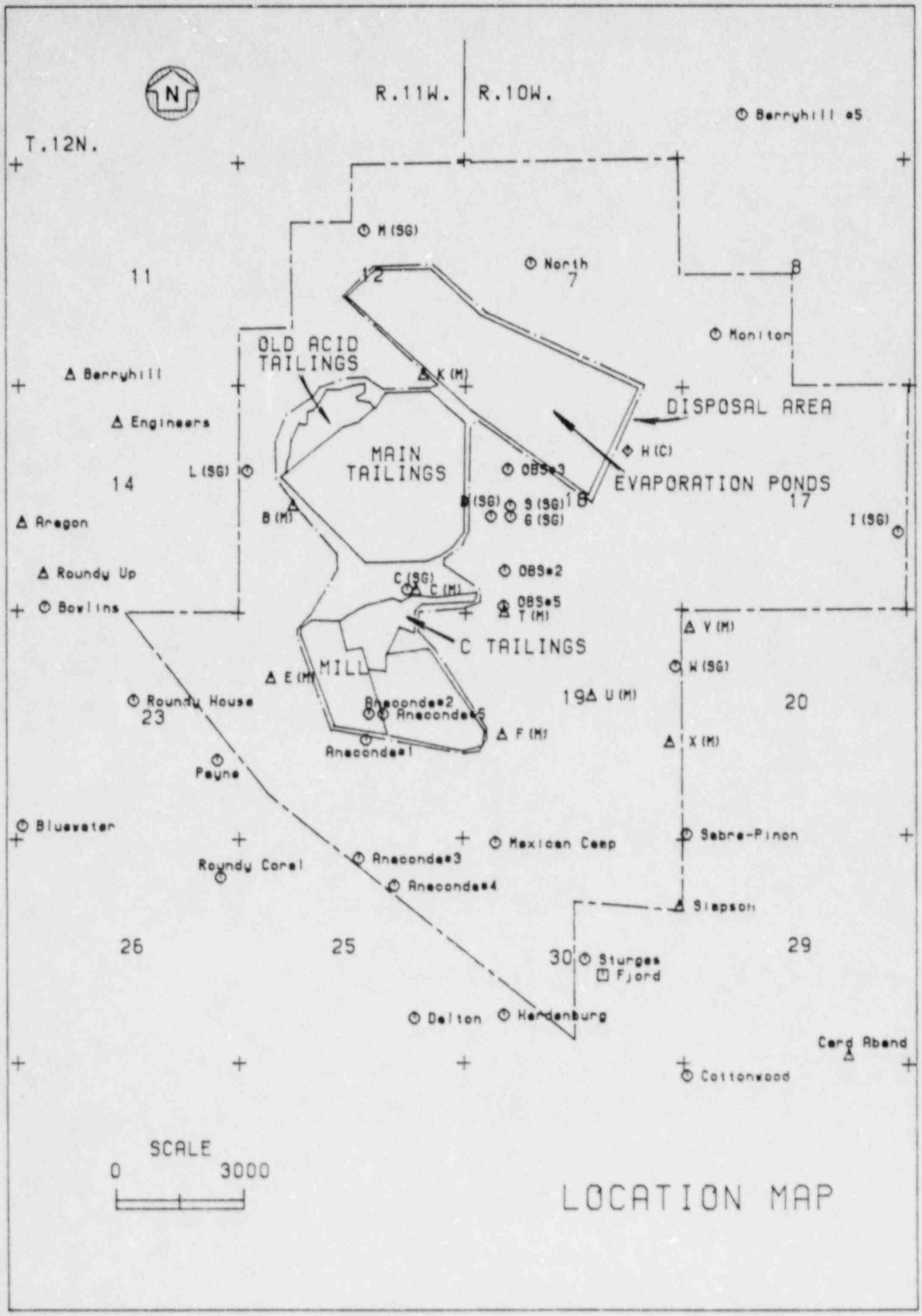

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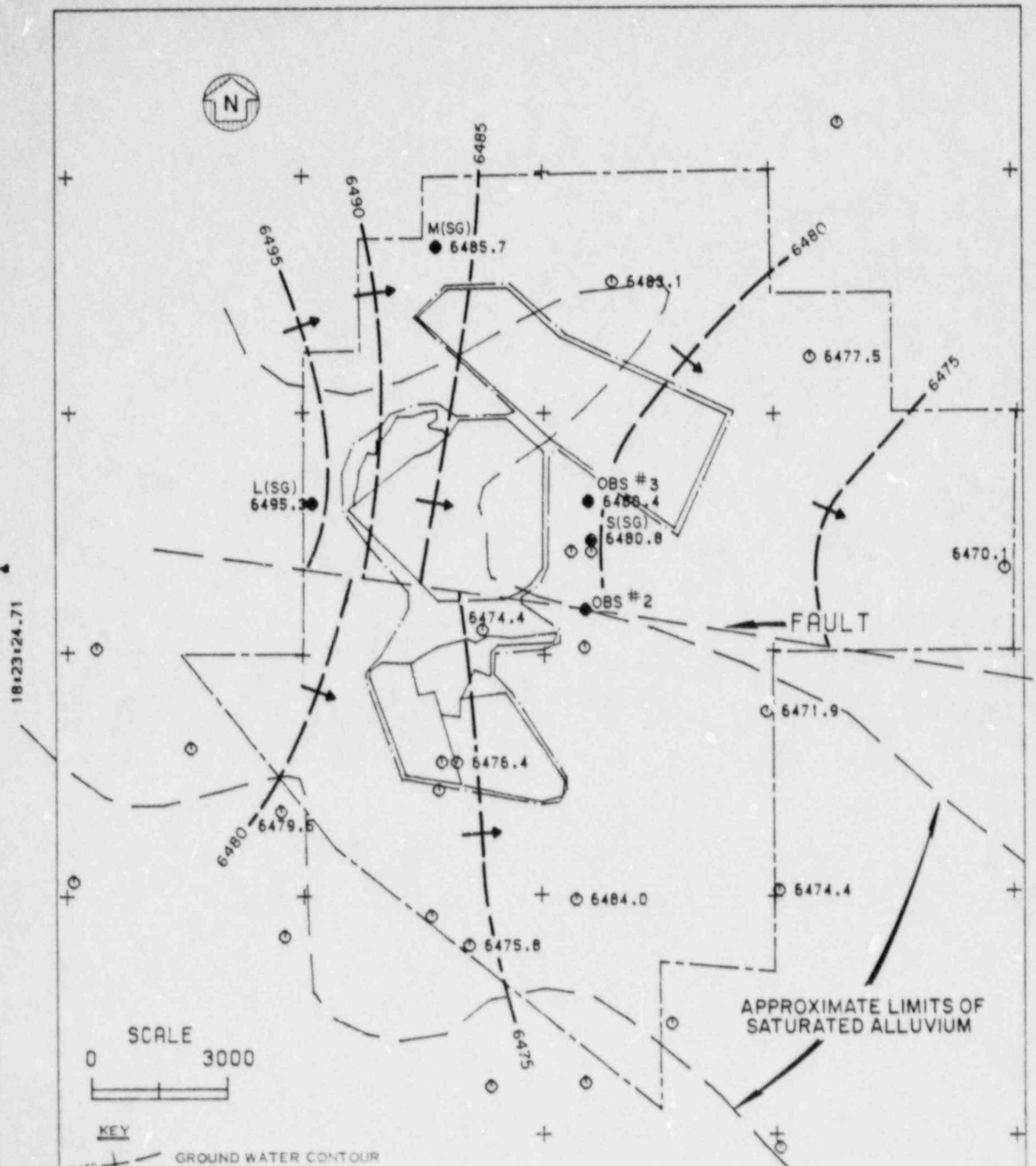
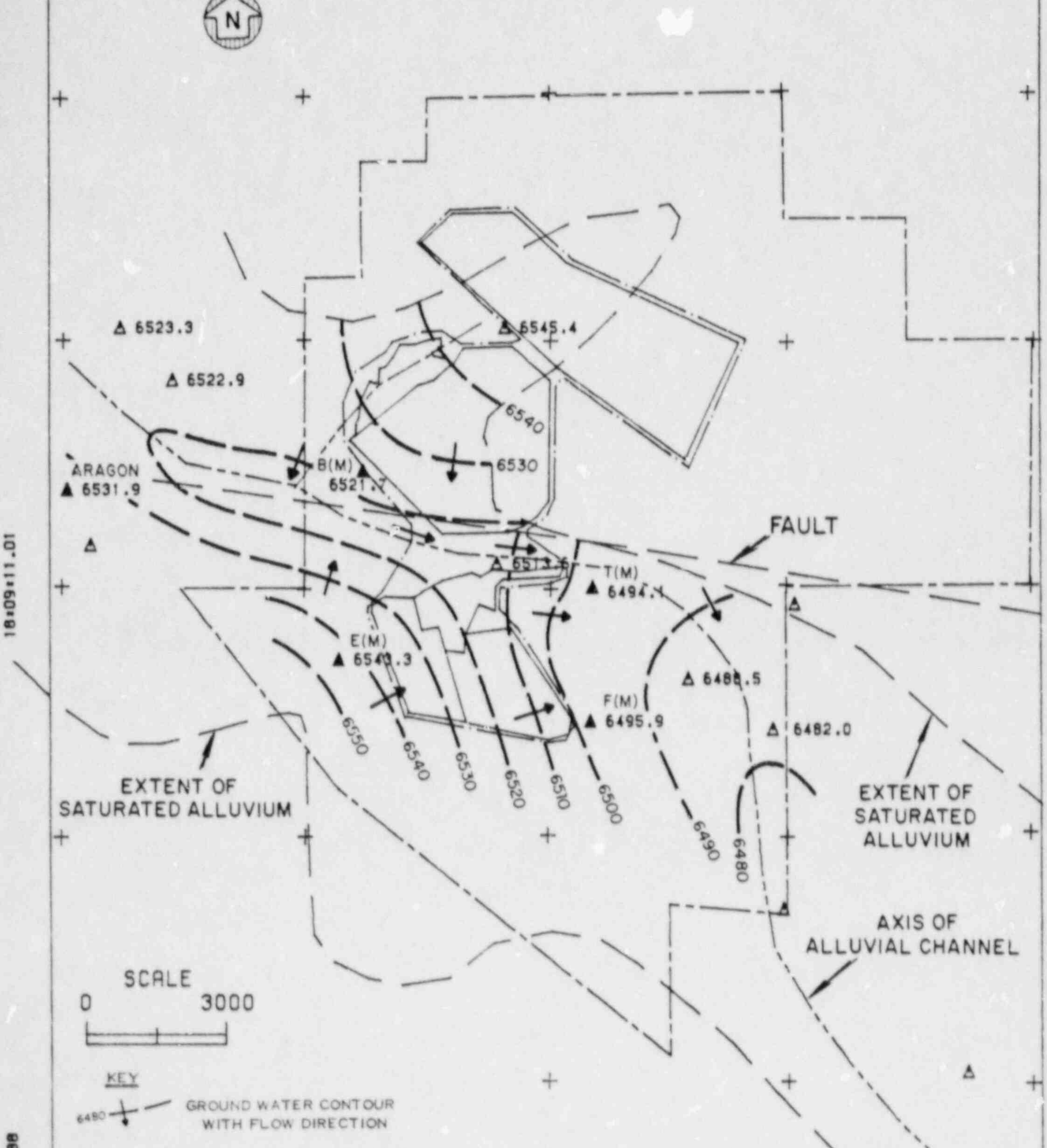
PLATE 1



DETECTION MONITORING WELLS AND WATER LEVELS SAN ANDRES AQUIFER 1987

PLATE 2



DETECTION MONITORING WELLS AND WATER LEVELS ALLUVIAL AQUIFER 1987

ANACONDA MINERALS CO 4010-099-18

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PLATE 3

APPENDIX

SELECTED WATER QUALITY DATA

THE ANACONDA MINERALS COMPANY
NEW MEXICO OPERATIONS

Description: Tailings Mixed Liquor
Year: 1985

Date	Temp °C	pH Lab	pH Field	EC Lab	EC Field	HCO_3 ppm	CO_3 ppm	Cl ppm	SO_4 ppm	Na ppm	K ppm	Ca ppm	Mg ppm	Mn ppm	NO_3 ppm	SiO_2 ppm	TDS Dried	Alpha pCi/1	Beta pCi/1	Pb-210 pCi/1	Ra-226 pCi/1
1/2	3.5	1.72	2.11	60000	60000	nil	nil	3000	26000	1700	69	506	1100	1200	26.4	80	47750				57
2/1	2.0	2.00	2.16	60000	52500	nil	nil	2650	22800	1700	78	495	880	1100	27	106	45025				80
3/1	8.0	1.80	2.20	54000	42000	nil	nil	2310	17000	1700	59	480	720	1200	26	106	39925				90
4/2	8	2.17	2.19	80000	56000	nil	nil	3250	37000	2200	96	600	850	1400	26	85	52000	1.12505	68055	Ra-225 <10	93
5/7	14.5	2.48	2.20	65000	42000	nil	nil	3500	25000	1800	64	750	960	1400	26	62	43075				78
6/7	14	2.44	2.25	50500	55000	nil	nil	2600	20000	1500	90	516	560	1400	22	108	40125				111
7/1	32	2.23	2.32	46000	54000	nil	nil	2250	23000	1600	44	400	790	1100	22	140	31900				91+74
8/1	16	2.51	2.29	60000	52000	nil	nil	2500	24000	1800	30	658	530	1200	26	139	41375				103+16

Date	Ra-228 pCi/1	Th-230 pCi/1	U-Nat mg/1	As ppm	Ba ppm	Cd ppm	Cr ppm	F ppm	Pb ppm	Hg ppm	Se ppm	Ag ppm	Cu ppm	Fe ppm	Zn ppm	Al ppm	B ppm	Co ppm	Mo ppm	Ni ppm	V ppm	PO_4 ppm
1/2			115.1					25						2100								
2/1			115.2	0.4	<1.0	0.7	0.7	20	0.20	<.002	0.18	0.05	1.87	2190	41	1700	0.30	2.3	0.6	3.1	155	24
3/1			112.5					30						2610								
4/2	<10	5.5957	122.45	0.50	<1.0	0.19	0.90	30	0.20	<.002	.09	<.05	1.90	2320	30	1700	0.20	1.8	1.20	1.6	165	25
5/7			111.27					15						2010								
6/7			109.46											1440								
7/1			103.18	0.4	<1.0	.34	.80	50	.60	<.002	.07	<.05	1.65	1220	29	2100	0.70	2.8	.40	5.3	174	45
8/1			115.89					32						1740								

The Anaconda Minerals Company
New Mexico Operations
Chemical Analyses of Ground Water Samples

Type of Analysis	B(M)	C(M)	T(M)	K(M)	U(M)
Sample Date	04-06-87	04-06-87	04-06-87	04-09-87	04-08-87
W.L., feet	6521.71	6513.64	6494.15	6545.4	6488.5
Temp., C.	14	14	14	15	14
pH	6.51	6.82	7.01	6.74	7.3
E.C.,uOhms/cm	15000	1150	1425	7250	2400
HCO3, mg/l	479	239	298	22	345
CO3, mg/l	0	0	0	0	0
Cl, mg/l	3050	65	70	1500	194
SO4, mg/l	3200	301	310	2000	570
Na, mg/l	2000	95	150	1100	370
K, mg/l	29	1	1	3	7
Ca, mg/l	610	130	120	600	150
Mg, mg/l	580	38	42	140	39
Mn, mg/l	16	0.005	0.024	3.2	<.005
NO3, mg/l	49	15	26	40	43
F, mg/l	0.14	0.28	0.32	0.13	0.25
NH3, mg/l	10.4	0.24	12.22	2.9	1.33
TDS, mg/l	11000	838	936	6440	1650
Cd, mg/l	<.005	<.005	<.005	<.005	<.005
Pb, mg/l	<.005	<.005	<.005	<.005	<.005
Se, mg/l	0.057	<.005	0.01	0.022	0.006
Cu, mg/l	<.005	0.008	<.005	<.005	<.005
Fe, mg/l	10	<.01	0.14	120	0.05
Co, mg/l	<.005	<.005	<.005	<.005	<.005
Ni, mg/l	<.02	<.02	<.02	<.2	<.2

The Anaconda Minerals Company
New Mexico Operations
Chemical Analyses of Ground Water Samples

Type of Analysis	X(M)	L(SG)	S(SG)	Obs-3	W(SG)
Sample Date	04-08-87	04-06-87	04-06-87	04-06-87	04-08-87
W.L., feet	6481.96	6495.27	6480.85	6480.45	6471.91
Temp., C.	14	17	14	14	16
pH	7.29	6.78	6.72	6.92	6.92
E.C.,uOhms/cm	3300	2650	5000	5300	3400
HCO3, mg/l	306	531	319	189	295
CO3, mg/l	0	0	0	0	0
Cl, mg/l	350	192	670	921	449
SO4, mg/l	850	560	1520	1570	910
Na, mg/l	430	400	560	640	360
K, mg/l	7	4	9	14	11
Ca, mg/l	350	120	340	310	310
Mg, mg/l	64	82	230	210	99
Mn, mg/l	0.015	0.056	2.3	0.7	0.03
NO3, mg/l	84	<1	19	12	84
F, mg/l	0.24	0.59	0.3	0.24	0.5
NH3, mg/l	<.1	0.12	10.4	4.36	4.6
TDS, mg/l	2460	1680	4060	3990	2640
Cd, mg/l	<.005	<.005	<.005	<.005	<.005
Pb, mg/l	<.005	<.005	<.005	<.005	<.005
Se, mg/l	<.005	<.005	0.011	0.005	0.01
Cu, mg/l	<.005	<.005	<.005	<.005	<.005
Fe, mg/l	0.02	0.82	62	53	<.01
Co, mg/l	<.005	<.005	0.006	<.005	<.005
Ni, mg/l	<.2	<.02	<.02	<.02	<.2

The Anaconda Minerals Company
New Mexico Operations
Chemical Analyses of Ground Water Samples

Type of Analysis	C(SG)	M(SG)	North Well	Monitor Well	I(SG)
Sample Date	04-09-87	04-08-87	04-08-87	04-13-87	04-08-87
W.L., feet	6474.43	6485.68	6483.14	6477.51	6470.12
Temp., C.	14	16	17	16	16
pH	6.82	7.1	7.03	6.69	6.81
E.C.,uOhms/cm	3025	1700	2050	3000	3700
HCO3, mg/l	378	348	255	427	387
CO3, mg/l	0	0	0	0	0
Cl, mg/l	380	90	164	340	516
SO4, mg/l	1020	380	550	790	1070
Na, mg/l	300	130	230	310	380
K, mg/l	9	9	11	13	13
Ca, mg/l	300	180	120	260	330
Mg, mg/l	140	50	72	98	130
Mn, mg/l	0.37	0.016	0.056	0.04	<.005
NO3, mg/l	27	4	1	3	26
F, mg/l	0.24	0.7	0.47	0.58	0.53
NH3, mg/l	3.02	<.1	0.36	<.1	1.09
TDS, mg/l	2750	1220	1480	2370	2980
Cd, mg/l	<.005	<.005	<.005	<.005	<.005
Pb, mg/l	<.005	<.005	<.005	<.005	<.005
Se, mg/l	0.009	<.005	<.005	<.005	0.012
Cu, mg/l	<.005	<.005	<.005	<.005	<.005
Fe, mg/l	0.42	0.06	0.49	0.61	0.03
Co, mg/l	<.005	<.005	<.005	<.02	<.005
Ni, mg/l	<.20	<.20	<.20	<.01	<.20

The Anaconda Minerals Company
New Mexico Operations
Chemical Analyses of Ground Water Samples

Type of Analysis	Berryhill House	Floyd Aragon	Roundy Harmon	E(M)	F(M)
Sample Date	04-13-87	04-13-87	04-13-87	04-08-87	04-06-87
W.L., feet	6523.29	6531.93	66.27	6543.32	6495.88
Temp., C.	13	13	13	13	13
pH	7.39	7.12	7.04	7.42	7.27
E.C.,uOhms/cm	1100	1150	1200	1100	830
HCO3, mg/l	229	231	352	202	193
CO3, mg/l	0	0	0	0	0
Cl, mg/l	39	54	30	61	33
SO4, mg/l	301	310	301	313	196
Na, mg/l	53	25	38	59	30
K, mg/l	4	3	2	5	<1
Ca, mg/l	140	180	190	150	110
Mg, mg/l	38	47	43	34	33
Mn, mg/l	0.008	0.006	<.005	0.016	0.006
NO3, mg/l	19	27	17	12	12
F, mg/l	0.3	0.3	0.25	0.24	0.32
NH3, mg/l	<.1	<.1	<.1	<.1	<.1
TDS, mg/l	866	864	994	862	602
Cd, mg/l	<.005	<.005	<.005	<.005	<.005
Pb, mg/l	<.005	<.005	<.005	<.005	<.005
Se, mg/l	<.005	<.005	<.005	<.005	<.005
Cu, mg/l	<.005	<.005	<.005	<.005	<.005
Fe, mg/l	0.02	0.01	0.03	<.01	0.01
Co, mg/l	<.02	<.02	<.02	<.005	<.005
Ni, mg/l	<.01	<.01	<.01	<.2	<.02

The Anaconda Minerals Company
New Mexico Operations
Chemical Analyses of Ground Water Samples

Type of Analysis	Berryhill Sec.5	Bowlin's	Allen Payne	ANA#4	ANA#5
Sample Date	04-10-87	04-13-87	04-09-87	04-13-87	04-06-87
W.L., feet	N/A	N/A	6479.56	6475.84	6476.37
Temp., C.	17	13	13	13	14
pH	6.8	6.89	7.43	6.99	6.86
E.C.,uOhms/cm	2900	2000	820	1100	1550
HCO3, mg/l	548	385	196	290	281
CO3, mg/l	0	0	0	0	0
Cl, mg/l	198	146	25	44	100
SO4, mg/l	690	570	212	290	400
Na, mg/l	350	190	31	61	110
K, mg/l	14	5	3	4	1
Ca, mg/l	230	210	120	140	160
Mg, mg/l	76	72	28	41	50
Mn, mg/l	0.024	0.011	<.005	<.005	0.032
NO3, mg/l	1	7	12	22	21
F, mg/l	0.43	0.32	0.37	0.49	0.56
NH3, mg/l	<.1	<.1	<.1	<.1	0.36
TDS, mg/l	2070	1470	676	860	1080
Cd, mg/l	<.005	<.005	<.005	<.005	<.005
Pb, mg/l	<.005	<.005	<.005	<.005	<.005
Se, mg/l	<.005	<.005	<.005	<.005	<.005
Cu, mg/l	<.005	<.005	<.005	<.005	<.005
Fe, mg/l	3.6	0.04	<.02	0.02	0.28
Co, mg/l	<.005	<.02	<.005	<.02	<.005
Ni, mg/l	<.2	<.01	<.2	<.01	<.02

The Anaconda Minerals Company
New Mexico Operations
Chemical Analyses of Ground Water Samples

Type of Analysis	Mexican Camp	Sabre Pinon	Engineer's Well		
Sample Date	04-09-87	04-09-87	04-13-87		
W.L., feet	6484	6474.44	6522.89		
Temp., C.	13	14	10		
pH	7.26	7.73	7.4		
E.C.,uOhms/cm	725	1100	1100		
HCO3, mg/l	213	255	235		
CO3, mg/l	0	0	0		
Cl, mg/l	12	62	38		
SO4, mg/l	149	287	287		
Na, mg/l	46	81	59		
K, mg/l	3	7	4		
Ca, mg/l	84	110	130		
Mg, mg/l	29	47	37		
Mn, mg/l	0.027	0.47	0.016		
NO3, mg/l	<1.0	1	27		
F, mg/l	0.38	0.42	0.28		
NH3, mg/l	<.1	10.2	<.1		
TDS, mg/l	494	828	862		
Cd, mg/l	<.005	<.005	<.005		
Pb, mg/l	<.005	<.005	<.005		
Se, mg/l	<.005	<.005	<.005		
Cu, mg/l	<.005	<.005	0.14		
Fe, mg/l	0.32	0.41	0.01		
Co, mg/l	<.005	<.005	<.02		
Ni, mg/l	<.2	<.2	<.01		

The Anaconda Minerals Company
New Mexico Operations
Radiological Analyses of Liquids

Sample location : SDS#5
Sample type : Ground water Date collected :04-02&10-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	1.48E-08	9.81E-10	1.10E-10
Ra-226	4.00E-10	2.00E-10	1.00E-10
Th-230	2.00E-10	2.00E-10	1.00E-10
Gross alpha	3.60E-08	3.30E-08	2.80E-08
Gross beta	4.00E-09	9.00E-09	1.50E-08

Sample location : SDS#7
Sample type : Ground water Date collected :04-02&10-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	1.06E-07	7.03E-09	1.10E-09
Ra-226	1.70E-09	3.00E-10	1.00E-10
Th-230	8.00E-10	4.00E-10	2.00E-10
Gross alpha	3.00E-08	1.20E-07	2.00E-07
Gross beta	6.90E-08	7.00E-08	1.10E-07

Sample location : SDS#15
Sample type : Ground water Date collected :04-02&10-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	1.14E-08	7.56E-10	1.10E-10
Ra-226	5.00E-10	2.00E-10	1.00E-10
Th-230	0.00E+00	1.00E-10	1.00E-10
Gross alpha	2.00E-08	1.00E-08	1.22E-09
Gross beta	-1.00E-09	5.00E-09	9.00E-09

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New Mexico Operations
Radiological Analyses of Liquids

Sample location : SDS#19
Sample type : Ground water   Date collected :04-02&10-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	1.43E-08	9.48E-10	1.10E-10
Ra-226	1.00E-10	2.00E-10	1.00E-10
Th-230	1.00E-10	1.00E-10	1.00E-10
Gross alpha	2.70E-08	1.80E-08	2.10E-08
Gross beta	6.00E-09	8.00E-09	1.20E-08

Sample location : H(C)
Sample type : Ground water   Date collected :04-02&10-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	2.52E-09	1.67E-10	1.10E-10
Ra-226	1.00E-10	2.00E-10	1.00E-10
Th-230	1.00E-10	2.00E-10	1.00E-10
Gross alpha	1.00E-09	6.00E-09	1.00E-08
Gross beta	1.00E-09	5.00E-09	9.00E-09

Sample location : B(M)
Sample type : Ground water   Date collected :04-06-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	2.42E-06	1.60E-07	1.10E-08
Ra-226	3.00E-10	2.00E-10	2.00E-10
Th-230	2.00E-10	2.00E-10	2.00E-10
Gross alpha	2.10E-06	3.00E-07	1.20E-07
Gross beta	9.30E-07	1.30E-07	1.60E-07

The Anaconda Minerals Company
New Mexico Operations
Radiological Analyses of Liquids

Sample location : C(M)
Sample type : Ground water   Date collected :04-06-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	5.07E-08	3.36E-09	1.10E-10
Ra-226	4.00E-10	2.00E-10	2.00E-10
Tn-230	0.00E+00	1.00E-10	1.00E-10
Gross alpha	4.60E-08	1.40E-08	1.30E-08
Gross beta	1.40E-08	6.00E-09	9.00E-09

Sample location : T(M)
Sample type : Ground water   Date collected :04-06-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	1.36E-07	9.02E-09	1.10E-09
Ra-226	1.00E-10	2.00E-10	2.00E-10
Th-230	0.00E+00	1.00E-10	1.00E-10
Gross alpha	1.30E-07	2.00E-08	1.40E-08
Gross beta	4.00E-08	7.00E-09	9.00E-09

Sample location : K(M)
Sample type : Ground water   Date collected :04-09-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	3.01E-08	2.00E-09	1.10E-09
Ra-226	3.00E-10	2.00E-10	1.00E-10
Th-230	-2.00E-10	2.00E-10	2.00E-10
Gross alpha	7.50E-08	5.30E-08	5.20E-08
Gross beta	3.30E-08	3.90E-08	6.30E-08

The Anaconda Minerals Company
New Mexico Operations
Radiological Analyses of Liquids

Sample location : U(M)
Sample type : Ground water   Date collected :04-08-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	2.81E-07	1.86E-08	1.10E-09
Ra-226	2.00E-10	2.00E-10	1.00E-10
Th-230	1.10E-09	4.00E-10	1.00E-10
Gross alpha	4.00E-07	6.00E-08	1.70E-08
Gross beta	1.30E-07	1.00E-08	1.60E-08

Sample location : X(M)
Sample type : Ground water   Date collected :04-08-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	2.05E-07	1.36E-08	1.10E-09
Ra-226	0.00E+00	2.00E-10	2.00E-10
Th-230	0.00E+00	1.00E-10	1.00E-10
Gross alpha	3.20E-07	6.00E-08	2.30E-08
Gross beta	1.00E-07	2.00E-08	2.40E-08

Sample location : L(SG)
Sample type : Ground water   Date collected :04-06-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	5.30E-09	3.51E-10	1.10E-10
Ra-226	4.20E-09	4.00E-10	2.00E-10
Th-230	2.00E-10	1.00E-10	1.00E-10
Gross alpha	2.30E-08	1.90E-08	2.60E-08
Gross beta	1.20E-08	1.10E-08	1.80E-08

The Anaconda Minerals Company
New Mexico Operations
Radiological Analyses of Liquids

Sample location : S(SG)
Sample type : Ground water Date collected :04-06-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	8.60E-07	5.70E-08	5.50E-09
Ra-226	4.00E-10	2.00E-10	2.00E-10
Th-230	0.00E+00	1.00E-10	1.00E-10
Gross alpha	1.10E-06	1.00E-07	4.90E-08
Gross beta	2.40E-07	3.00E-08	3.60E-08

Sample location : Obs-3
Sample type : Ground water Date collected :04-06-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	2.60E-07	1.72E-08	2.70E-09
Ra-226	6.00E-10	2.00E-10	2.00E-10
Th-230	3.00E-10	2.00E-10	2.00E-10
Gross alpha	4.00E-07	7.00E-08	5.10E-08
Gross beta	7.00E-08	2.50E-08	3.60E-08

Sample location : W(SG)
Sample type : Ground water Date collected :04-08-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	7.16E-08	4.75E-09	2.80E-10
Ra-226	5.00E-10	2.00E-10	1.00E-10
Th-230	1.00E-10	1.00E-10	1.00E-10
Gross alpha	1.30E-07	4.00E-08	2.30E-08
Gross beta	3.70E-08	4.60E-08	2.40E-08

The Anaconda Minerals Company
New Mexico Operations
Radiological Analyses of Liquids

Sample location : C(SG)
Sample type : Ground water   Date collected :04-09-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	9.44E-07	6.26E-08	5.50E-09
Ra-226	7.00E-10	2.00E-10	1.00E-10
Th-230	1.00E-10	1.00E-10	1.00E-10
Gross alpha	8.20E-07	1.00E-07	2.40E-08
Gross beta	4.50E-07	3.00E-08	2.20E-08

Sample location : M(SG)
Sample type : Ground water   Date collected :04-08-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	9.49E-09	6.29E-10	1.10E-10
Ra-226	6.00E-10	2.00E-10	1.00E-10
Th-230	-1.00E-10	3.00E-10	1.00E-10
Gross alpha	1.30E-08	1.10E-08	1.20E-08
Gross beta	1.50E-08	9.00E-09	1.30E-08

Sample location : North well
Sample type : Ground water   Date collected :04-08-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	1.23E-08	8.15E-10	1.10E-10
Ra-226	3.00E-10	2.00E-10	1.00E-10
Th-230	0.00E+00	1.00E-10	1.00E-10
Gross alpha	2.10E-08	1.50E-08	1.50E-08
Gross beta	1.30E-08	9.00E-09	1.40E-08

The Anaconda Minerals Company
New Mexico Operations
Radiological Analyses of Liquids

Sample location : Monitor well
Sample type : Ground water   Date collected :04-13-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	1.59E-07	1.05E-08	1.10E-09
Ra-226	2.40E-09	3.00E-10	1.00E-10
Th-230	-2.00E-10	2.00E-10	1.00E-10
Gross alpha	2.40E-07	5.00E-08	2.20E-08
Gross beta	8.90E-08	1.70E-08	2.20E-08

Sample location : I(SG)
Sample type : Ground water   Date collected :04-08-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	3.04E-07	2.02E-08	1.10E-09
Ra-226	1.10E-09	3.00E-10	2.00E-10
Th-230	0.00E+00	1.00E-10	1.00E-10
Gross alpha	2.90E-07	6.00E-08	2.60E-08
Gross beta	1.70E-07	2.00E-08	2.80E-08

Sample location : Berryhill House
Sample type : Ground water   Date collected :04-13-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	4.60E-09	3.05E-10	1.10E-10
Ra-226	1.00E-10	2.00E-10	2.00E-10
Th-230	1.00E-10	1.00E-10	1.00E-10
Gross alpha	6.00E-09	8.00E-09	1.00E-08
Gross beta	1.00F-09	5.00E-09	9.00E-09

The Anaconda Minerals Company
New Mexico Operations
Radiological Analyses of Liquids

Sample location : Floyd Aragon
Sample type : Ground water Date collected :04-13-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	4.73E-09	3.14E-10	1.10E-10
Ra-226	1.00E-10	2.00E-10	2.00E-10
Th-230	1.00E-10	1.00E-10	1.00E-10
Gross alpha	1.00E-08	8.00E-09	9.00E-09
Gross beta	-2.00E-09	5.00E-09	8.00E-09

Sample location : Roundy Harmon
Sample type : Ground water Date collected :04-13-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	7.19E-09	4.77E-10	1.10E-10
Ra-226	2.00E-10	2.00E-10	2.00E-10
Th-230	2.00E-10	1.00E-10	1.00E-10
Gross alpha	1.50E-08	1.00E-08	1.00E-08
Gross beta	4.00E-09	5.00E-09	9.00E-09

Sample location : E(M)
Sample type : Ground water Date collected :04-08-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	1.27E-08	8.42E-10	1.10E-10
Ra-226	2.00E-10	2.00E-10	1.00E-10
Th-230	1.00E-10	1.00E-10	1.00E-10
Gross alpha	2.20E-08	1.20E-08	9.00E-09
Gross beta	1.30E-08	6.00E-09	9.00E-09

The Anaconda Minerals Company
New Mexico Operations
Radiological Analyses of Liquids

Sample location : F(M)
Sample type : Ground water Date collected :04-06-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	4.64E-09	3.08E-10	1.10E [illegible]0
Ra-226	1.00E-10	2.00E-10	2.00E-10
Th-230	1.00E-10	1.00E-10	1.00E-10
Gross alpha	1.00E-09	6.00E-09	1.00E-08
Gross beta	3.00E-09	4.00E-09	7.00E-09

Sample location : Berryhill Sec.5
Sample type : Ground water Date collected :04-10-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	7.93E-09	5.26E-10	1.10E-10
Ra-226	7.60E-09	5.00E-10	1.00E-10
Th-230	2.00E-10	2.00E-10	1.00E-10
Gross alpha	2.30E-08	3.00E-08	4.30E-08
Gross beta	2.30E-08	1.50E-08	2.30E-08

Sample location : Bowlin's
Sample type : Ground water Date collected :04-13-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	1.23E-08	8.15E-10	1.10E-10
Ra-226	3.00E-10	2.00E-10	2.00E-10
Th-230	2.00E-10	1.00E-10	1.00E-10
Gross alpha	3.90E-08	2.00E-08	1.60E-08
Gross beta	1.40E-08	1.00E-08	1.60E-08

The Anaconda Minerals Company
New Mexico Operations
Radiological Analyses of Liquids

Sample location : Allen Payne
Sample type : Ground water Date collected :04-09-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	3.44E-09	2.28E-10	1.10E-10
Ra-226	2.00E-10	2.00E-10	1.00E-10
Th-230	8.00E-10	4.00E-10	2.00E-10
Gross alpha	8.00E-09	9.00E-09	9.00E-09
Gross beta	6.00E-09	5.00E-09	9.00E-09

Sample location : ANA#4
Sample type : Ground water Date collected :04-13-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	7.13E-09	4.73E-10	1.10E-10
Ra-226	4.00E-10	2.00E-10	1.00E-10
Th-230	0.00E+00	1.00E-10	1.00E-10
Gross alpha	1.70E-08	1.00E-08	9.00E-09
Gross beta	3.00E-09	5.00E-09	9.00E-09

Sample location : ANA#5
Sample type : Ground water Date collected :04-06-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	3.89E-08	2.58E-09	2.70E-10
Ra-226	6.00E-10	2.00E-10	2.00E-10
Th-230	1.50E-09	4.00E-10	1.00E-10
Gross alpha	4.50E-08	1.60E-08	1.60E-08
Gross beta	1.20E-08	8.00E-09	1.20E-08

The Anaconda Minerals Company
New Mexico Operations
Radiological Analyses of Liquids

Sample location : Mexican camp
Sample type : Ground water Date collected :04-09-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	3.87E-09	2.57E-10	1.10E-10
Ra-226	5.00E-10	2.00E-10	1.00E-10
Th-230	2.00E-10	2.00E-10	1.00E-10
Gross alpha	1.20E-08	7.00E-09	6.00E-09
Gross beta	8.00E-09	5.00E-09	8.00E-09

Sample location : Sabre Pinon
Sample type : Ground water Date collected :04-09-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	2.58E-09	1.71E-10	1.10E-10
Ra-226	3.00E-10	2.00E-10	1.00E-10
Th-230	0.00E+00	1.00E-10	1.00E-10
Gross alpha	7.00E-09	8.00E-09	9.00E-09
Gross beta	8.00E-09	6.00E-09	9.00E-09

Sample location : Engineer's Well
Sample type : Ground water Date collected :04-13-87

Radionuclide	Concentration uCi/ml	Error estimate uCi/ml	LLD uCi/ml
U-nat	7.45E-09	4.94E-10	1.10E-10
Ra-226	1.00E-10	2.00E-10	1.00E-10
Th-230	0.00E+00	1.00E-10	1.00E-10
Gross alpha	1.40E-08	9.00E-09	8.00E-09
Gross beta	1.00E-08	6.00E-09	8.00E-09

TABLE 3

APRIL 1986 GROUND WATER DATA

SAMPLE IDENTIFICATION	WELL C(SG)	WELL I(SG)	WELL L(SG)	WELL M(SG)	WELL S(SG)	WELL W(SG)	ANACONDA #4
DATE SAMPLED	5- 5-86	4-17-86	4-15-86	4-15-86	4-17-86	4-17-86	4-22-86
AQUIFER #	1.	1.	1.	1.	1.	1.	1.
MAJOR IONS (mg/l except as noted)							
CALCIUM (Ca)	262.	340.	156.	192.	405.	356.	158.
MAGNESIUM (Mg)	140.	148.	90.	55.	290.	120.	45.
SODIUM (Na)	268.	430.	366.	143.	560.	386.	60.
POTASSIUM (K)	12.0	23.0	14.0	14.0	20.0	18.0	6.0
BICARBONATE (HCO3)	412.	448.	676.	366.	455.	367.	322.
CHLORIDE (Cl)	352.	456.	218.	98.	763.	418.	46.
SULFATE (SO4)	1054.	1123.	603.	464.	1737.	992.	302.
NITRATE (as NO3)	20.0	22.0	< 1.0	4.0	24.0	81.0	19.0
FLUORIDE (F)	.2	.5	.5	.8	.3	.4	.5
WATER LEVEL (feet)	6476.14	6470.61	6496.17	6484.90	6480.41	6472.54	6473.77
pH (units)	6.7	6.7	6.9	7.0	6.8	6.8	7.1
TEMPERATURE (C)	15.0	15.5	17.5	16.5	13.5	15.0	14.5
CONDUCTIVITY (umhos/cm)	3100.	3650.	2590.	1700.	5100.	3450.	1200.
TOTAL DISSOLVED SOLIDS (lab)	2567.	2851.	1771.	1273.	4209.	2659.	803.
DISSOLVED SOLIDS (calculated)	2314.	2764.	1778.	1150.	4028.	2556.	795.
TOTAL CATIONS (meq/L)	36.6	48.4	31.5	20.7	68.9	44.9	14.4
TOTAL ANIONS (meq/l)	38.9	43.9	29.8	18.5	65.5	39.8	13.2
CHARGE BALANCE (% error)	-3.2	4.9	2.8	5.5	2.6	6.1	4.2
TRACE IONS (mg/l dissolved)							
AMMONIA (as NH3)	2.9	1.4	< .5	< .5	4.6	3.9	< .2
CADMIUM (Cd)	< .001	< .001	< .001	< .001	< .001	< .001	< .001
COBALT (Co)	< .01	< .01	< .01	< .01	< .01	< .01	< .01
COPPER (Cu)	< .01	< .01	.01	< .01	< .01	< .01	< .01
IRON (Fe)	.08	105.00	.70	.45	89.00	.03	.01
LEAD (Pb)	< .01	< .01	< .01	< .01	< .01	< .01	< .01
MANGANESE (Mn)	.48	< .01	.10	.02	3.60	< .01	< .01
NICKEL (Ni)	< .10	< .10	< .10	.10	< .10	< .10	< .10
SELENIUM (Se)	< .01	< .01	< .01	< .01	< .01	< .01	< .01
URANIUM (U, TOTAL)	.8496	.4291	.0053	.0114	1.1700	.0885	.0168
RADIOLOGICAL (pCi/l)							
RADIUM-226	.5	.3	3.2	.2	.2	.3	< .2
THORIUM-230	31.7	5.6	2.6	2.7	34.1	3.4	.7
GROSS ALPHA	536.	308.	6.	9.	582.	55.	13.
GROSS BETA	383.	221.	18.	< 10.	451.	23.	< 10.

* NO ANALYSIS MADE

\# 1=SAN ANDRES AQUIFER
2=ALLUVIAL AQUIFER
3=CHINLE FORMATION

TABLE 3 (Continued-2)
APRIL 1986 GROUND WATER DATA

SAMPLE IDENTIFICATION DATE SAMPLED	ANACONDA #5 4-22-86	BERRYHILL #5 4-22-86	BOWLINS 4-24-86	MEXICAN CAMP 4-22-86	MONITOR WELL 4-17-86	NORTH WELL 4-17-86	WELL OBS-3 4-17-86
AQUIFER #	1.	1.	1.	1.	1.	1.	1.
MAJOR IONS (mg/l except as noted)							
CALCIUM (Ca)	168.	250.	172.	78.	296.	125.	380.
MAGNESIUM (Mg)	55.	94.	55.	34.	122.	75.	230.
SODIUM (Na)	93.	386.	147.	44.	342.	228.	620.
POTASSIUM (K)	10.0	23.0	10.0	4.0	22.0	16.0	22.0
BICARBONATE (HCO3)	343.	694.	390.	271.	489.	306.	303.
CHLORIDE (Cl)	90.	255.	89.	12.	325.	182.	829.
SULFATE (SO4)	358.	670.	445.	181.	950.	554.	1676.
NITRATE (as NO3)	19.0	< 1.0	7.0	< 1.0	1.0	< 1.0	20.0
FLUORIDE (F)	.5	.4	.6	.4	.6	.5	.2
WATER LEVEL (feet)	6475.52	*	*	6472.72	6476.36	6482.68	6479.95
pH (units)	7.2	6.8	6.9	7.3	6.7	7.0	6.9
TEMPERATURE (C)	14.5	20.0	14.0	14.0	16.5	16.5	14.5
CONDUCTIVITY (umhos/cm)	1400.	2800.	1600.	750.	3100.	2000.	5100.
TOTAL DISSOLVED SOLIDS (lab)	964.	1980.	1180.	480.	2342.	1377.	4183.
DISSOLVED SOLIDS (calculated)	962.	2019.	1117.	485.	2299.	1329.	3930.
TOTAL CATIONS (meq/L)	17.2	37.6	19.8	8.7	40.3	22.7	65.4
TOTAL ANIONS (meq/l)	15.9	32.5	18.3	8.6	37.0	21.7	63.5
CHARGE BALANCE (% error)	3.8	7.2	3.8	.9	4.2	2.4	1.5
TRACE IONS (mg/l dissolved)							
AMMONIA (as NH3)	.2	.6	< .1	< .2	< .5	< .5	4.0
CADMIUM (Cd)	< .001	< .001	< .001	< .001	< .001	< .001	< .001
COBALT (Co)	< .01	< .01	< .01	< .01	< .01	< .01	< .01
COPPER (Cu)	< .01	< .01	< .01	< .01	< .01	< .01	< .01
IRON (Fe)	.15	7.60	.03	.15	.11	.04	54.00
LEAD (Pb)	< .01	< .01	< .01	< .01	< .01	< .01	< .01
MANGANESE (Mn)	.05	.05	< .01	.06	.10	.06	1.20
NICKEL (Ni)	< .10	< .10	< .10	< .10	< .10	< .10	< .10
SELENIUM (Se)	< .01	< .01	< .01	< .01	< .01	< .01	< .01
URANIUM (U, TOTAL)	.0528	.0108	.0113	.0067	.2643	.0155	.5362
RADIOLOGICAL (pCi/l)							
RADIUM-226	.4	6.3	.5	.3	2.5	< .2	.3
THORIUM-230	2.4	.8	1.9	1.0	4.9	3.0	6.8
GROSS ALPHA	58.	9.	< 5.	6.	215.	9.	280.
GROSS BETA	24.	< 10.	< 10.	< 10.	170.	< 10.	325.

* NO ANALYSIS MADE

# 1=SAN ANDRES AQUIFER
2=ALLUVIAL AQUIFER
3=CHINLE FORMATION

TABLE 3 (Continued-3)
APRIL 1986 GROUND WATER DATA

SAMPLE IDENTIFICATION DATE SAMPLED	ALLEN PAYNE 4-24-86	ROUNDY HOUSE 4-24-86	SABRE PINON 6-10-86	WELL B(M) 4-15-86	WELL C(M) 4-15-86	WELL E(M) 4-22-86	WELL F(M) 4-17-86
AQUIFER #	1.	1.	1.	2.	2.	2.	2.
MAJOR IONS (mg/l except as noted)							
CALCIUM (Ca)	115.	198.	161.	780.	141.	120.	107.
MAGNESIUM (Mg)	34.	47.	47.	620.	41.	34.	34.
SODIUM (Na)	31.	41.	79.	1810.	70.	92.	16.
POTASSIUM (K)	2.0	[illegible]	7.0	50.0	5.0	5.0	3.0
BICARBONATE (HCO3)	232.	4[illegible]	264.	655.	300.	277.	235.
CHLORIDE (Cl)	43.	[illegible]	66.	3030.	61.	48.	36.
SULFATE (SO4)	230.	3[illegible]	357.	3449.	314.	296.	181.
NITRATE (as NO3)	10.0	16[illegible]	17.0	60.0	16.0	9.0	10.0
FLUORIDE (F)	.4	.2	.4	.1	.2	.3	.2
WATER LEVEL (feet)	6478.52	*	6473.22	6522.12	6514.11	6548.41	6496.19
pH (units)	7.1	6.9	7.2	6.4	[illegible].7	7.5	7.3
TEMPERATURE (C)	13.5	13.5	14.0	14.5	[illegible]	13.5	13.5
CONDUCTIVITY (umhos/cm)	870.	1300.	1250.	14000.	[illegible]	1100.	770.
TOTAL DISSOLVED SOLIDS (lab)	1131.	980.	955.	10828.	[illegible]	845.	568.
DISSOLVED SOLIDS (calculated)	579.	886.	864.	10126.	795.	739.	502.
TOTAL CATIONS (meq/L)	9.9	15.6	15.5	170.0	13.6	12.9	8.9
TOTAL ANIONS (meq/l)	10.0	15.4	13.9	168.9	13.4	12.2	8.8
CHARGE BALANCE (% error)	-.2	.7	5.5	.3	.5	2.9	.6
TRACE IONS (mg/l dissolved)							
AMMONIA (as NH3)	< .1	< .1	< .1	5.2	< .5	< .2	< .5
CADMIUM (Cd)	.001	< .001	< .001	< .001	< .001	< .001	< .001
COBALT (Co)	< .01	< .01	< .01	< .01	< .01	< .01	< .01
COPPER (Cu)	< .01	< .01	< .01	< .01	< .01	< .01	< .01
IRON (Fe)	.05	.01	.03	5.90	.05	.07	.05
LEAD (Pb)	.01	< .01	< .01	< .01	< .01	< .01	< .01
MANGANESE (Mn)	< .01	< .01	< .05	21.00	< .01	.02	< .01
NICKEL (Ni)	< .10	< .10	< .10	< .10	< .10	< .10	< .10
SELENIUM (Se)	< .01	< .01	< .01	.05	.01	< .01	< .01
URANIUM (U, TOTAL)	.0044	.0097	.0097	3.2920	.0730	.0355	.0053
RADIOLOGICAL (pCi/l)							
RADIUM-226	< .2	< .2	.2	.5	.2	< .2	< .2
THORIUM-230	.7	< .5	2.2	59.4	3.9	1.0	2.4
GROSS ALPHA	6.	6.	10.	2108.	47.	21.	6.
GROSS BETA	< 10.	< 10.	< 10.	1775.	38.	< 10.	< 10.

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* NO ANALYSIS MADE

# 1=SAN ANDRES AQUIFER
2=ALLUVIAL AQUIFER
3=CHINLE FORMATION

TABLE 3 (Continued-4)
APRIL 1986 GROUND WATER DATA

SAMPLE IDENTIFICATION	WELL K(M)		WELL T(M)		WELL U(M)		WELL X(M)		FLOYD ARAGON		BERRYHILL HO		ENGINEER'S	
DATE SAMPLED		4-22-86		4-17-86		4-17-86		4-17-86		4-24-86		4-22-86		4-22-86
AQUIFER #		2.		2.		2.		2.		2.		2.		2.
MAJOR IONS (mg/l except as noted)														
CALCIUM (Ca)		669.		130.		189.		393.		168.		142.		142.
MAGNESIUM (Mg)		256.		52.		60.		117.		50.		43.		43.
SODIUM (Na)		1175.		130.		455.		577.		24.		52.		56.
POTASSIUM (K)		15.0		7.0		16.0		18.0		2.0		4.0		4.0
BICARBONATE (HCO3)		148.		390.		430.		330.		277.		275.		288.
CHLORIDE (Cl)		1710.		80.		298.		762.		48.		48.		48.
SULFATE (SO4)		2262.		324.		689.		1073.		325.		312.		302.
NITRATE (as NO3)		84.0		21.0		45.0		87.0		21.0		16.0		21.0
FLUORIDE (F)		.2		.3		.2		.2		.3		.3		.3
WATER LEVEL (feet)		6546.58		6494.88		6488.64		6481.86		6534.59		6523.68		6523.68
pH (units)		6.7		7.2		7.2		7.2		7.0		7.4		7.6
TEMPERATURE (C)		14.5		13.5		13.5		14.0		13.5		14.5		14.5
CONDUCTIVITY (umhos/cm)		7900.		1450.		2800.		3950.		1200.		1150.		1150.
TOTAL DISSOLVED SOLIDS (lab)		6402.		976.		1933.		2902.		881.		785.		775.
DISSOLVED SOLIDS (calculated)		6245.		950.		1965.		3189.		774.		752.		758.
TOTAL CATIONS (meq/L)		105.[illegible]		16.6		34.6		54.8		13.6		13.0		13.2
TOTAL ANIONS (meq/l)		99.[illegible]		15.7		30.5		50.6		13.0		12.6		12.7
CHARGE BALANCE (% error)		3.4		2.7		6.2		4.0		2.2		1.4		1.8
TRACE IONS (mg/l dissolved)														
AMMONIA (as NH3)		1.2		13.8		1.1	<	.5	<	.1	<	.2	<	.2
CADMIUM (Cd)	<	.001	<	.001	<	.001	<	.001	<	.001	<	.001	<	.001
COBALT (Co)	<	.01	<	.01	<	.01	<	.01	<	.01	<	.01	<	.01
COPPER (Cu)	<	.01	<	.01	<	.01	<	.01	<	.01	<	.01		.14
IRON (Fe)		40.00		.03		.02		.03		.02		.03		.02
LEAD (Pb)	<	.01	<	.01	<	[illegible]	<	.01	<	.01	<	.01	<	.01
MANGANESE (Mn)		2.40		.03		.02		.02	<	.01	<	.01		.05
NICKEL (Ni)	<	.10	<	.10	<	.10	<	.10	<	.10	<	.10	<	.10
SELENIUM (Se)		.02	<	.01	<	.01	<	.01		.01	<	.01	<	.01
URANIUM (U, TOTAL)		.0696		.2146		.4645		.2957		.0072		.0094		.0161
RADIOLOGICAL (pCi/l)														
RADIUM-226		.[illegible]	<	.2	<	.2	<	.2	<	.2		.4		.2
THORIUM-230		8.9		7.0		9.3		5.5		.9		1.5		1.4
GROSS ALPHA		87.		135.		318.		191.	<	5.		7.		10.
GROSS BETA		48.		99.		310.		182.	<	10.	<	10.	<	10.

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* NO ANALYSIS MADE

# 1=SAN ANDRES AQUIFER
2=ALLUVIAL AQUIFER
3=CHINLE FORMATION

TABLE 3 (Continued-5)
APRIL 1986 GROUND WATER DATA

SAMPLE IDENTIFICATION		WELL H(C)	EVAP PONDS	TAILINGS
DATE SAMPLED		4-15-86	4- 2-86	5- 0-82
AQUIFER #		3.	4.	5.
MAJOR IONS (mg/l except as noted)				
CALCIUM (Ca)		15.	590.	430.
MAGNESIUM (Mg)		8.	6300.	650.
SODIUM (Na)		342.	9800.	1145.
POTASSIUM (K)		13.0	515.0	59.0
BICARBONATE (HCO3)		132.	*	*
CHLORIDE (Cl)		100.	15200.	1990.
SULFATE (SO4)		520.	169000.	21800.
NITRATE (as NO3)	<	1.0	261.0	32.0
FLUORIDE (F)		1.1	91.0	*
WATER LEVEL (feet)		6520.97	*	*
pH (units)		9.6	.6	2.4
TEMPERATURE (C)		14.5	*	*
CONDUCTIVITY (umhos/cm)		1750.	*	29900.
TOTAL DISSOLVED SOLIDS (lab)		1066.	216200.	32800.
DISSOLVED SOLIDS (calculated)		1063.	201757.	26106.
TOTAL CATIONS (meq/L)		16.6	987.4	126.3
TOTAL ANIONS (meq/l)		15.8	3952.8	510.1
CHARGE BALANCE (% error)		2.4	-60.0	-60.3
TRACE IONS (mg/l dissolved)				
AMMONIA (as NH3)	<	.5	*	*
CADMIUM (Cd)	<	.001	.530	*
COBALT (Co)	<	.01	8.40	*
COPPER (Cu)	<	.01	6.50	*
IRON (Fe)		.02	16631.00	350.00
LEAD (Pb)	<	.01	2.60	*
MANGANESE (Mn)	<	.01	6200.00	1200.00
NICKEL (Ni)	<	.10	7.60	*
SELENIUM (Se)	<	.01	.88	*
URANIUM (U, TOTAL)		.0076	83.6000	153.0000
RADIOLOGICAL (pCi/l)				
RADIUM-226	<	.2	208.0	*
THORIUM-230		1.5	650000.0	*
GROSS ALPHA		5.	770000.	*
GROSS BETA	<	10.	260000.	*

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* NO ANALYSIS MADE

\# 1=SAN ANDRES AQUIFER
2=ALLUVIAL AQUIFER
3=CHINLE FORMATION
4=AVERAGE OF SAMPLES FROM EVAPORATION PONDS IA,IB,IIIA AND IIIB FOR APRIL 2, 1986.
5=AVERAGE OF SAMPLES FROM SIX WELLS IN TAILINGS DEPOSIT (Data on Table 3.3-9).