EVALUATION OF THE MIGRATION OF NITROGEN COMPOUNDS AT THE CITY OF SANTA FE SLUDGE DISPOSAL SITE NEAR SANTA FE, NEW MEXICO AND AT THE S&R SEPTAGE DISPOSAL SITE NEAR TAOS, NEW MEXICO

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1.0 INTRODUCTION

Land application of septage is an economical method of disposal for communities with sufficient suitable land. Types of septage disposal investigated in this study included hauler truck spreading of untreated septage into earthen disposal cells, and subsurface injection of treated municipal sludge.

Federal regulations on land application of septage is primarily based on limits of agricultural uptake (100 pounds of nitrogen per acre per year by crop uptake; U.S. EPA, 1993). The U.S. Environmental Protection Agency (EPA) regulation refers to a maximum annual application rate of 38,462 gallons per acre per year (gal/acre/yr), whereas some of the midwestern states have regulatory limits for septage based on annual application rates ranging from 39,210 gal/acre/yr (Wisconsin) to 66,700 gal/acre/yr (Minnesota). These regulations are also based on other conditions such as site management, pathogen reduction methods, depth to ground water, and other site characteristics. Currently, New Mexico's regulation on septage disposal is based on site specific conditions and a case-by-case evaluation under the rules and regulations of the New Mexico Water Quality Control Commission.

The goal of this project was to characterize the vertical migration of nitrogen compounds originating from surface disposal of septage.

This project was funded by the EPA and managed by the New Mexico Environment (NMED) Department Ground Water Quality Bureau. The NMED selected John Shomaker & Associates, Inc. (JSAI) to perform the first phase of this study, which consisted of the following tasks:

1. Review existing site specific information and perform literature search of septage disposal practices,
2. Collect climatic data for each site in preparation for predictive computer modeling, and
3. Perform borehole investigation study at two disposal locations.

The purpose of the literature search and collection of climatic data was to obtain existing information needed to assess the migration potential of nitrogen compounds from septage disposal sites in New Mexico.

The borehole investigation was performed at two disposal locations. A sludge disposal site, and a septage disposal site were chosen for this project due to the lack of adequate historical disposal rate information at other New Mexico sludge and septage disposal sites. Although the type of waste discharged at the two locations are different, they are both rich in nitrogen compounds and therefore the migration of these compounds may be similar. JSAI and the NMED selected the City of Santa Fe Sludge Disposal site (Santa Fe Site) near Santa Fe, and the S&R Septage Disposal site (Taos Site) near Taos for performing the subsurface investigations. A location map for the Santa Fe Site is provided as Figure 1, and a location map for the Taos Site is provided as Figure 2.

This project represents the first phase of a series of investigations of nitrogen migration beneath surface disposal sites. The second phase may include additional site specific field investigations and utilization of the data provided in this report and other reports to determine the loading rate of total nitrogen that is protective of ground water.

2.0 BACKGROUND INFORMATION

2.1 Literature Review

The NMED and JSAI performed a literature search to identify research conducted in New Mexico and other states relating to land disposal of septage and potential impacts to ground-water quality. A list of references, categorized according to research topic, is provided in Appendix A. Some of the research has focused on migration of nitrogen compounds from municipal sludge disposal facilities, and practically no research has been performed on land application of untreated domestic septage. In addition, a literature search for information relating to transformation, volatilization, and leaching potential of nitrogen compounds from surface disposal of septage and sludge was performed.

2.1.1 Disposal Practices and Nitrogen Loading Rates

Land disposal practice for municipal sewage sludge (biosolids) commonly includes tilling, injection, and application to disturbed and agricultural land (Sopper and Kerr, 1979; White et al., 1997). Typical loading rates for disposal of municipal sludge range from 177 to 659 pounds of nitrogen per acre per month (White et al., 1997; Medalie et al., 1994; Tindall et al., 1994).

Untreated domestic septage disposal practices vary greatly from facility to facility. Many privately owned disposal facilities unload septage from hauler trucks into earthen bermed cells. The septage eventually dries as a result of both evaporative and infiltrative losses. The typical nitrogen loading rate for land disposal of untreated domestic septage is 16 pounds of nitrogen per acre per month, assuming an average total Kjeldahl nitrogen (TKN) concentration of 600 milligrams per liter (mg/l) in domestic septage and a maximum application rate of 38,462 gal/acre/yr (EPA, 1994).

2.1.2 Nitrogen Transformations

Nitrogen sources derived from municipal sludge and septage waste are primarily in the form of organic nitrogen (as defined by TKN) and inorganic ammonia (Canter, 1997). The total nitrogen in soil or water is generally equal to the sum of TKN (all ammonia nitrogen as organic or inorganic) and nitrate nitrogen (inorganic). Most of the organic nitrogen that occurs in domestic wastes is in the form of proteins or their degradation products (Sawyer et al., 1994). Ultimately, the organic nitrogen and inorganic ammonia undergo transformations to nitrous gas or nitrate. Table 1 lists the transformation processes for nitrogen compounds. Transformation processes relevant to this project include ammonification, volatilization, synthesis of nitrogen by biological processes, nitrification, and denitrification.

Most organic compounds containing nitrogen are derivatives of ammonia, and the degradation of organic nitrogen by oxidation frees the nitrogen as ammonia. This process is called ammonification, and is the first step in the mineralization of organic nitrogen.

Table 1. Descriptions of transformation processes for nitrogen compounds

process	result
fixation	conversion of nitrous oxide to ammonia or nitrate (source)
ammonification	biological conversion of organic nitrogen to ammonia (source)
volatilization	releases ammonia to atmosphere (loss)
synthesis	uptake of nitrogen by biological processes (loss)
nitrification	biological oxidation of ammonia to nitrate (source)
denitrification	converts nitrate to nitrous gas (loss)

loss refers to transformation process that reduces the concentration of ammonia or nitrate nitrogen
source refers to transformation process that increases the concentration of ammonia or nitrate nitrogen

In the unsaturated zone, ammonia may be adsorbed or retained (cation exchange) by the soil, incorporated into microbial mass, transformed to nitrate, or released to the atmosphere by volatilization (Canter, 1997). Losses by volatilization of ammonia can account for approximately 20 to 22 percent of the total nitrogen applied to the land (Harmel et al., 1997; Beauchamp et al., 1978). Sommer and Ersbøll, (1994) found that approximately 50 to 60 percent of the ammonia nitrogen from hog manure is lost to volatilization before the slurry infiltrates into the soil. A model for predicting cumulative ammonia volatilization was developed by Harmel et al. (1997). The model is based on soils and conditions found in the southwestern United States. They found that approximately 8 to 12 percent of the applied ammonia-nitrogen will volatilize in semiarid rangeland. Therefore, approximately 10 to 60 percent of the total nitrogen in land disposed septage and sludge waste can be expected to be lost by volatilization.

Nitrification of ammonia creates nitrate, and if this process occurs below the root zone, then the likelihood for nitrate to leach to the water table is higher (Canter, 1997). First order kinetic rate coefficients for nitrification of ammonia to nitrate in soils ranges from 1.11 day^{-1} for sandy soils to 0.05 day^{-1} for silty clay (Reddy and Patrick, 1981).

Denitrification of nitrate to nitrogen gas generally occurs under oxygen-free conditions (anaerobic). First order kinetic rate coefficients for denitrification of nitrate to nitrogen gas in soils ranges from 0.1 day^{-1} for sandy soils to 1.5 day^{-1} for organic soils (Reddy and Patrick, 1981).

2.1.3 Transport and Fate of Nitrogen Compounds

The transport of ammonia and nitrate nitrogen in the vadose zone is dependent on diffusion, ion exchange, and adsorption. The quantity of ammonia or nitrate transferred by diffusion phenomena per unit area per unit time is proportional to the diffusion coefficient and the concentration gradient. The diffusion coefficient for ammonia ranges from 0.004 to 0.050 cm^2/day and for nitrate ranges from 0.13 to 1.94 cm^2/day (Reddy and Patrick, 1981).

Adsorption or ion exchange processes will most likely retain ammonia in the subsurface, if it is not previously lost to the atmosphere, or incorporated into microbial biomass.

Nitrate is typically more mobile in the subsurface environment than ammonia because it is negatively charged and therefore does not bind to negatively charged soil minerals. This is substantiated by the larger diffusion coefficients for nitrate when compared to ammonia.

2.2 Santa Fe Site

The City of Santa Fe Sludge Disposal Facility (Santa Fe Site) is located west of Santa Fe, due north of the Municipal Airport, along the Santa Fe River (see Fig. 1). This site was chosen for the study because the hydrogeologic setting is typical for sludge disposal sites around New Mexico and the southwest, and the data (climate, hydrogeology, and historic sludge loading rates) for evaluating this site were available.

2.2.1 Site History

This sludge disposal facility has been in operation since 1984. Sludge from the Santa Fe wastewater treatment plant, which provides tertiary treatment of municipal wastewater, is discharged to four land application areas, which are shown on Figure 3. The treated sludge is piped from the treatment plant to trucks that dispose of the sludge by subsurface injection (approximately 1 ft below ground surface). The disposal rates have varied slightly over time for each area. Graphs showing monthly disposal quantity for the last 10 years for each area are provided in Appendix B. These data were obtained from quarterly reports provided to the NMED as required by the discharge plan DP-135. The average discharge rate for each area is listed in Table 2. Discharge rates, and therefore nitrogen loading rates, are approximately twice as much in areas 3 and 4, as compared to areas 1 and 2.

Table 2. Average discharge rates for each disposal area at the Santa Fe Site

area	surface area, acres	disposal rate, gallons per month	disposal rate per unit area, gallons per acre per month	nitrogen loading rate, pounds per acre per month
1	41	308,203	7,488	241
2	13	98,245	7,557	243
3	17	253,782	14,928	480
4	27	395,545	14,650	471

Operational requirements for the disposal facility require chemical analysis of the sludge in order to monitor nitrogen loading. The percentages of nitrogen compounds found in the sludge are listed in Table 3. A review of the analytical records indicate the sludge has an average TKN concentration of 3,853 mg/l, an average ammonia concentration of 1,419 mg/l, and an average nitrate concentration of 1.0 mg/l. Using these values, the average nitrogen loading rate (pounds of nitrogen per acre per month) for each disposal cell was calculated (see Table 2).

Table 3. Average nitrogen composition in sludge at the Santa Fe Site from June 1998 to July 1999

compound	range in concentration, mg/l	average concentration, mg/l	percent of total Kjeldahl nitrogen
TKN	2,659 to 5,058	3,853	100
organic nitrogen	1,978 to 3,336	2,434	63
ammonia	481 to 2,233	1,419	37
nitrate	n/a	1	<0.03

mg/l milligrams per liter TKN total Kjeldahl nitrogen

Table 2 shows that areas 3 and 4 have had the highest rate of disposal for the operational period of the Santa Fe Sludge Disposal Facility. To best represent the effects of sludge disposal practices at the site, areas 1 and 4 were selected as "impacted" locations for the sampling program.

As part of the discharge plan requirements for the Santa Fe Site, five ground-water monitoring wells have been installed around the sludge disposal facility. Plots of nitrate and TKN concentrations in ground water versus time are provided in Appendix B. Monitor wells MW-1 and MW-4, down-gradient of the sludge disposal area, have shown elevated nitrate concentrations (6 to 13 mg/l), whereas the other monitor wells have had nitrate concentrations ranging from 0.3 to 2.0 mg/l. The elevated nitrate in down-gradient monitor wells has been suggested to result from the seepage of historic treated wastewater discharge to the nearby Santa Fe River, and not from the sludge disposal facility (Boyle Engineering Corporation, 1993).

2.2.2 Climatic Data

Climatic data were obtained from the Western Regional Climate Center website and from Summers and Associates (1978). The nearest weather station to the Santa Fe Site is the Santa Fe Airport, less than 0.5 mile to the south. Combining data from both sources, the period of record for this station is 2/1/1924 to 6/23/1998. Copies of the climatic data are provided in Appendix C. A summary of the climatic data is provided in Table 4.

Table 4. Summary of climatic data for the Santa Fe Airport weather station (No. 8078)

station elevation, feet above mean sea level	6,312
average annual precipitation, inches	9.87
annual mean temperature, degrees Fahrenheit	51.0
average annual potential evaporation, inches	36.62

2.2.3 Hydrogeologic Setting

The site is covered with soil consisting of sandy clay loam. The soil cover is described by SCS (1975) as being less than 5 feet thick, and permeability ranging from 0.63 to 2.0 inches per hour (in./hr) or 4.2×10^{-4} to 1.4×10^{-3} centimeters per second (cm/s).

Quaternary-age Terrace deposits and the Ancha Formation underlie the soil (Spiegel and Baldwin, 1963). The Terrace deposits consist of sand and gravel, and the Ancha Formation consists of unconsolidated silt, sand, gravel, and cobbles. The Ancha Formation is approximately 50 to 100 ft in thickness, and unconformably overlies the Tertiary-age Tesuque Formation. The Tesuque Formation consists of unconsolidated and consolidated deposits of stratified clay, silt, sand, and gravel. The beds of the Tesuque Formation dip approximately 10 to 15 degrees to the west (Spiegel and Baldwin, 1963). The depth to water in the area is approximately 130 ft below land surface. Hydrogeologic cross-sections of the Santa Fe Site are provided as Figures 5 and 6.

2.3 Taos Site

The Taos Site is a septage disposal facility owned and operated by S&R Septic. This site was chosen for the study because the hydrogeologic setting, the historic operation, and loading rates are typical of septage disposal facilities in New Mexico. The Taos Site is located north of Highway 64, approximately 7 miles northwest of Taos, New Mexico (see Fig. 2). This facility has been operating under discharge plan DP-465 since 1987. The disposal area consists of approximately 4 acres, which are divided into several shallow earthen disposal cells. Septage is drained from pumper trucks into the shallow surface disposal cells. The operator of the facility rotates the use of the cells to allow for evaporative and infiltration losses. Locations of current septage disposal cells are shown on Figure 4. The disposal cells are unlined and bermed with native soil.

2.3.1 Site History

The operator has reworked the site, covered cells, and constructed new ones between 1987 and 1999. The historic operation of the site is summarized as follows:

- Septage was discharged to unlined disposal cells.
- Dried septage was periodically disked into the soil.
- Disposal of septage has been rotated between cells (ponds) as dictated by season and usage.
- The permitted volume of discharge allowed on any given day has varied from 12,000 to 20,000 gallons.
- Waste manifest include volume of waste and date.

The Taos Site operator has not performed analysis on the septage prior to disposal, but the average composition of septage can be referenced from EPA (1994). A summary of nitrogen concentrations in septage is provided in Table 5. Nitrate concentrations were assumed to be zero.

Table 5. Average nitrogen composition in septage at the Taos Site, based on data provided by EPA (1994)

compound	range in concentration, mg/l	average concentration, mg/l	percent of total Kjeldahl nitrogen
TKN	1,060 - 66	588	100
organic nitrogen	944 – 63	491	84
ammonia nitrogen	116 – 3	97	16
nitrate	0	0	0

mg/l milligrams per liter TKN total Kjeldahl nitrogen

The operator estimated 3,000 gallons per day as the average discharge at the Taos Site. It is assumed the discharge is applied evenly over 4 acres during the course of 1 year. Based on this information and the characteristics of septage composition provided by EPA (1994), the estimated historic nitrogen loading rate at the Taos Site was calculated to be 114 pounds per acre per month (see Table 6).

Table 6. Estimated Average discharge and loading rates for the disposal area at the Taos Site

surface area, acres	disposal rate, gallons per month	disposal rate per unit area, gallons per acre per month	nitrogen loading rate, pounds per acre per month
4	91,312	22,828	114

2.3.2 Climatic Data

Climatic data for the area near the Taos Site were obtained from the Western Regional Climate Center website and from Summers and Associates (1978). The nearest weather station to the Taos Site is the Taos Airport, less than 0.5 mile to the south. The period of record for this station is 1/1/1914 to 12/31/1998. Copies of the climatic data are provided in Appendix C. A summary of the climatic data is provided in Table 7.

Table 7. Summary of climatic data for the Taos Airport weather station (No. 8668)

station elevation, feet above mean sea level	6,970
average annual precipitation, inches	12.46
annual mean temperature, degrees Fahrenheit	47.3
average annual potential evaporation, inches	31.66

2.3.3 Hydrogeologic Setting

The Taos Site is covered with clay loam, approximately 5 feet in depth (Soil Conservation Service, 1982). Permeability of this soil ranges from 0.6 to 2.0 in./hr (4.2×10^{-4} to 1.4×10^{-3} cm/s). Beneath the soil are the Tertiary-age Santa Fe Group sediments and basalt deposits (Coons and Kelly, 1984). In the Taos area, the Santa Fe Group contains three distinct sequences: 1) upper facies of alluvial deposits, 2) middle facies of basalt deposits with interbedded lake and river deposits, and 3) a lower sand facies. Most domestic water-supply wells in the area produce from the lower sand facies. Depth to water at the site is approximately 400 to 500 ft below land surface. Hydrogeologic cross-sections of the Taos Site are provided as Figures 7 and 8.

3.0 INVESTIGATION METHODS

3.1 Site Visit and Preparation

On May 27, 1999, JSAI and NMED made a visit to the Santa Fe Site to discuss project goals with the operator, determine potential health and safety hazards, view potential sampling locations, and develop a proposed schedule. On June 2, 1999, JSAI and NMED made a visit to the Taos Site to discuss project goals with the operator, determine potential health and safety hazards, view potential sampling locations, and develop a proposed schedule.

Prior to drilling, the locations at the Santa Fe and Taos Sites were checked for underground utilities by contacting New Mexico One Call or the local utility company. In addition, the proposed drilling locations were discussed with the operator.

3.2 Selection of Borehole Locations

Nine boreholes were drilled at each site to maximum depths of 30 ft each. At each site, boreholes were drilled at three locations, with each location consisting of three boreholes triangulated 20 ft apart. One location, at each site, was drilled in an area considered representative of background conditions, and the other two were drilled in areas considered impacted by sludge or septage disposal.

3.2.1 Santa Fe Site

The impacted borehole locations were based on selection of two areas representative of disposal practices. Based on historic loading of the site and accessibility, drilling locations in disposal areas 1 and 4 were selected. The background location was located east of the wastewater treatment facility, in an undisturbed open field. The borehole locations for the Santa Fe Site are shown on Figure 3.

3.2.2 Taos Site

Historic loading of the individual disposal cells at the Taos Site are not available. Impacted locations were based on JSAI's and NMED's observations made during the site visit and examination of historic photographs of the site. The background location was due north of the disposal area in an undisturbed area. The borehole locations for the Taos Site are shown on Figure 4.

3.3 Drilling Methods

Drilling and soil sampling was performed at the Santa Fe Site on June 14th and 15th, 1999. The drilling and sampling at the Taos Site were performed on June 16th and 17th, 1999. At each site, the background location was drilled first, followed by the two impacted locations. The auger and sampling equipment were decontaminated between boreholes and locations.

3.3.1 Decontamination Procedures

The following decontamination procedures were performed:

- Drilling of background location prior to the impacted locations
- Steam cleaning augers between boreholes
- Decontaminating and drying of split-spoon sampler prior to sample collection to prevent moisture bias

3.3.2 Borehole Drilling

Drilling was performed by Hydrogeologic Services, Inc., Albuquerque, New Mexico using a CME-75 hollow-stem auger rig. Drilling procedures followed ASTM Method D 1452-80. The auger was advanced at a rate that was practicable for collection of representative samples. The drilling contractor placed plastic or other ground covering to prevent soil contamination from leakage of lubricating oils or fuels from the drill rig.

3.3.3 Split-Spoon Sampling

Split-spoon sampling was performed following ASTM Method D 1586-84 using a 1.5-inch inside diameter decontaminated stainless steel split-spoon sampler. The split-spoon sampler was driven below the auger to collect undisturbed samples. Written descriptions of the split-spoon sampling, such as blows per 6 inches of sediment sampled, moisture content, and percent of sample recovered, are provided on the lithologic logs in Appendix D.

3.3.4 Borehole Abandonment

At the Santa Fe Site, the boreholes were plugged with cement slurry from the bottom of the borehole to 5 feet below ground level. The upper 5 ft of the borehole were backfilled with auger cuttings.

At the Taos Site, the boreholes would not remain open, and alternate methods were employed to abandon them. Approximately 3 feet of hydrated bentonite was placed in the bottom of the background boreholes as the auger was lifted off the bottom. The remainder of the borehole was backfilled with drill cuttings and compacted. At the impacted locations, the boreholes were abandoned with hydrated bentonite and auger cuttings from the bottom of the borehole to surface. Details of the borehole abandonment used at the Taos Site are provided on the lithologic logs (Appendix D.)

3.3.5 Site Restoration

Drill cuttings were spread evenly over the borehole location after drilling and completion of sampling. The drilling locations were restored as close as practicable to their original condition.

3.4 Soil Sampling Methods

ASTM methods were used for soil sampling. Provided in Table 8 is a list of ASTM methods that were referenced for this project.

3.4.1 Sample Description

A continuous lithologic log was recorded for each borehole, and included descriptions of texture, color, composition, relative grain size, moisture, plasticity, and other noteworthy details. Lithologic logs are provided in Appendix D.

Table 8. Summary of ASTM methods for soil sampling

designation	method
D 420-93	Guide to site characterization for engineering, design, and construction purposes
D 1452-80	Practice for soil investigation and sampling by auger borings
D 1586-84	Test method for penetration test and split-barrel sampling of soils
D 2488-93	Practice for description and identification of soils (visual-manual procedure)
D 4220-89	Practices for preserving and transporting soil samples
D 4700-91	Guide for soil sampling from the vadose zone
D 5434-93	Guide for field logging of subsurface explorations of soil and rock

3.4.2 Sample Collection

The sampling program for the Santa Fe Sludge Disposal Site and the Taos Septage Disposal Site is provided in Table 9. Sample bags were labeled with name of site, sample location, sample interval, date and time, and sampler's initials. Split-spoon samples and grab samples were bagged separately. The grab samples were collected at the surface as the auger was advanced, where as the split-spoon samples were collected from an undisturbed portion of the sediment below the auger. Split-spoon samples were sent to Energy Laboratories, Billings, Montana for analysis of chemical constituents, and grab samples were sent to Vinyard & Associates for analysis of physical parameters.

Table 9. Summary of soil sampling and analysis program

parameter	analysis method	sample interval, feet	
		background location[2]	disposal area location[2]
total Kjeldahl nitrogen	ASA Monograph No. 9, Method 31-3	(3, 5, 10, 15, 20, 30)	(3, 5, 10, 15, 20, 30)
nitrate as nitrogen	ASA Monograph No. 9, Method 31-8.1	(3, 5, 10, 15, 20, 30)	(3, 5, 10, 15, 20, 30)
ammonia as nitrogen	ASA Monograph No. 9, Method 31-7.3.3	(3, 5, 10, 15, 20, 30)	(3, 5, 10, 15, 20, 30)
chloride	ASA Monograph No. 9, Method	(3, 5, 10, 15, 20, 30)	(3, 5, 10, 15, 20, 30)
moisture content[1]	U.S.D.A. Handbook No. 60 Method 26	(3, 5, 10, 15, 20, 30)	(3, 5, 10, 15, 20, 30)
total organic carbon[1]	ASA Monograph No. 9, Method 29-3.5.2	(3, 5, 10, 15, 20, 30)	(3, 5, 10, 15, 20, 30)
particle size analysis[1]	ASTM	not analyzed	(3, 5, 10, 15, 20, 30)
hydraulic conductivity[1]	ASTM	not analyzed	(5, 15, 30)
porosity[1]	ASTM	not analyzed	(5, 15, 30)
bulk density[1]	ASTM	not analyzed	(3, 5, 10, 15, 20, 30)

[1] sample profile collected from one borehole in disposal area (impacted)

[2] composite sample of three borings corresponding to each depth

Six composite samples were made from each boring cluster for analysis of nitrogen species and chloride at depths of 3, 5, 10, 15, 20, and 30 ft. Composite samples were representative of each sample depth. Composite samples were prepared as described in Page et al. (1986), which states "composite samples will be made from equal contributions from each of the three samples for each sample interval."

Composite samples were homogenized in a decontaminated stainless steel bowl and placed in containers (Ziplock bags), as recommended by the laboratory. Equal weight was measured for each of the three samples that were mixed to form a composite.

3.4.3 Sample Preservation

Samples were bagged and placed on ice as soon as they were collected. All samples were delivered to the laboratory within recommended holding times. The shortest holding time was approximately 4 weeks for nitrate.

3.4.4 Documentation

Chain-of-custody protocol was used for all samples collected for laboratory analysis. JSAI recorded sampling procedures and observations on borehole logging forms (Appendix D). Chain-of-Custody forms are provided in Appendix E.

3.4.5 Analytical Methods

Analytical methods for chemical and physical analyses are listed in Table 9. The chemical analysis follow methods described in the ASA Monograph No. 9 (Page et al., 1986). The soluble chloride derived from the soil leachate was analyzed using EPA Method 300.0.

Vinyard & Associates used ASTM Methods for analysis of the physical parameters of the soil. The bulk density analysis was based on the jigged method and calculated dry densities using the results from the soil moisture analysis. The porosity results were calculated using the dry unit weight, and specific gravity for each sample. The permeability tests were performed using the 'falling head test' on remolded grab samples.

4.0 RESULTS

The sampling program was deemed successful, as a result of collecting representative samples from all proposed sample intervals. Laboratory reports are provided in Appendix E. Graphs showing TKN concentration, nitrate concentration, percent moisture, percent total organic carbon, and chloride concentration in soils versus depth are provided as Figures 9 through 18. A column showing the general lithology, for comparison to chemical analysis, is shown on Figures 9 through 18.

4.1 Santa Fe Site

The lithology at the Santa Fe Site was fairly consistent between the background and impacted locations, and between the three triangulated boreholes drilled at each location. Hydrogeologic cross-sections of the Santa Fe Site are provided as Figures 5 and 6, and copies of the lithologic logs are in Appendix D. The soil horizon is 2 to 4 ft thick and consist of varying percentages of sand and silt. Below the soil horizon, the sediments are more consolidated and coarser grained (sand, gravel, and cobbles).

Apparent trends were observed in percent soil moisture, percent total organic carbon, TKN, nitrate, and chloride with depth. No trends were apparent in ammonia concentrations with depth. The soil samples below 5 feet in depth had ammonia concentrations near or below the detection limit of 1.0 µg/g. A summary of the soil chemistry results for the Santa Fe Site is listed in Table 10. Graphs showing concentration in soil versus depth for TKN, nitrate, soil moisture, total organic carbon, and soluble chloride for the Santa Fe Site are provided as Figures 9 through 13.

4.1.1 Background Location

The concentrations of total organic nitrogen (analyzed as TKN) in samples from the background boreholes generally decrease with depth, from 690 µg/g at 15 ft below ground level (bgl) to 130 µg/g at 30 ft bgl. Most of the reduction in organic nitrogen occurs in the upper 15 ft (Fig. 9).

Soil nitrate concentrations in background borehole samples were near or below the detection limit of 1.0 µg/g at all sampled depths (see Fig. 10). Ammonia concentrations in soil sampled from the background boreholes were below detection limits, with the exception of the near surface sample collected at 3 ft (see Table 10).

Several shallow soil samples (<10 ft) were previously collected by consultants for the City of Santa Fe to determine background concentrations of TKN and nitrate. The background samples had an average TKN of 306 micrograms per gram (µg/g), and non-detectable nitrate (<0.1 µg/g). These sample concentrations are consistent with the concentrations determined by this study.

Soil moisture in soil samples from the background location averaged about 4 percent to a depth of 20 ft bgl, then increased to approximately 12 percent in the sample collected at 30 ft bgl (Fig. 11). Organic carbon content is highest in the background sample collected at 3 ft bgl, and declines with depth, but slightly increases again at 30 ft bgl (Fig. 12). The average organic carbon content for the background location profile is 0.16 percent and the range is from 0.07 to 0.41 percent. Soluble chloride concentrations in soils collected from the background profile are greatest near the surface, and decrease asymptotically with depth (Fig. 13).

Table 10. Summary of soil chemistry, Santa Fe Site

I. D.	sample depth, feet	percent moisture	percent organic carbon	TKN, µg/g	ammonia, µg/g	nitrate, µg/g	chloride, µg/g
SFBG	3	5.4	0.41	500	2.3	<1.0	363.0
SFBG	5	2.5	0.15	250	<1.0	<1.0	208.0
SFBG	10	3.0	0.13	190	<1.0	<1.0	73.0
SFBG	15	4.3	0.07	690	<1.0	<1.0	41.0
SFBG	20	4.6	0.07	190	<1.0	<1.0	28.0
SFBG	30	12.4	0.17	130	<1.0	1.3	19.0
SF-I1	3	18.9	0.68	1,070	1.6	410.0	60.0
SF-I1	5	18.7	1.34	1,830	2.0	545.0	65.0
SF-I1	10	9.0	0.55	950	1.4	264.0	46.0
SF-I1	15	9.2	0.27	440	1.0	90.8	35.0
SF-I1	20	7.0	0.25	440	1.0	46.3	27.0
SF-I1	30	7.3	0.26	760	1.2	47.2	32.0
SF-I2	3	7.2	1.06	1,580	2.6	259.0	43.0
SF-I2	5	7.0	0.46	760	2.8	248.0	43.0
SF-I2	10	7.5	0.28	440	1.4	123.0	31.0
SF-I2	15	5.5	0.06	130	<1.0	44.8	42.0
SF-I2	20	9.5	0.03	130	1.6	31.2	28.0
SF-I2	30	6.1	0.05	320	<1.0	5.3	24.0

SFBG Background location at Santa Fe Site
SF-I1 Impacted location No. 1 at the Santa Fe Site
SF-I2 Impacted location No. 2 at the Santa Fe Site

µg/g micrograms per gram

4.1.2 Impacted Locations

The trend in TKN concentrations with depth was similar for both of the impacted locations investigated, although impacted location No. 1 exhibited higher concentrations (Fig. 9). This corresponds to the higher historic sludge loading rates in the disposal area No. 1 compared with the rate from area No. 2. The TKN concentrations in soil sampled at the 3 ft depth range from 1,830 to 1,580 µg/g, and 440 to 130 µg/g at the 15 ft depth. At both locations, from 20 ft bgl to 30 ft bgl, the TKN concentrations increased.

Near surface (<5 ft bgl) soil nitrate concentrations varied from 545 to 248 µg/g (Table 10). Soil nitrate concentrations decrease with depths at both impacted locations. Ammonia concentrations in soils sampled from the impacted location boreholes were slightly above detection limits (Table 10). The highest ammonia concentrations (2.6 and 2.8 µg/g) were detected in the 3 and 5 ft bgl samples collected from the impacted location No. 2.

Soil moisture changes with depth were noted at each location, and are illustrated on Figure 11. Slight variations in soil moisture with depth at the impacted locations may indicate the length of time since sludge was last applied to the area. The impacted location No. 1 had approximately 18 percent soil moisture in the upper 5 ft of the profile sampled. The impacted location No. 2 had relatively uniform profile of percent soil moisture that ranged from 6.1 to 9.5. For both locations, the organic carbon content is highest in the sample collected at 3 ft bgl, and declines with depth (Fig. 12). The average organic carbon content for the profiles at impacted locations No. 1 and No. 2 is 0.16 percent and the range is from 0.03 to 1.34 percent. Soluble chloride concentrations in soils collected from the impacted location profiles are fairly uniform, and confined to a range of 65 to 24 µg/g (Fig. 13).

4.1.3 Santa Fe Site Summary

TKN concentrations beneath the impacted locations are elevated to a depth of 10 feet, approach background concentrations by 15 ft bgl, and increase above background concentrations at 30 ft bgl (Fig. 9). The total nitrogen concentration (TKN plus nitrate) decreases by 66 percent from 3 ft to 30 ft bgl. Near surface transformation processes likely account for this loss in total nitrogen content.

The concentration of chloride in the upper soil horizon at the background location is most likely a result of evapotranspiration effects on infiltrating precipitation. This soil chloride concentration phenomena has been noted by Anderholm (1994), and can be used to estimate recharge from precipitation. Chloride is not concentrated in soil as a result of the sludge disposal practices, as compared to concentration of chloride in upper 10 ft of the soil horizon at the background location. This is a result of flushing effect compared to natural effects from evapotranspiration discussed earlier. Using a mass balance approach, the chloride data may be used to estimate hydraulic loading rates resulting from the sludge disposal.

4.2 Taos Site

The lithology at the Taos Site was consistent between the background and impacted locations, although some variation between the three triangulated boreholes drilled at each location was noted. Hydrogeologic cross-sections of the Taos Site are provided as Figures 7 and 8, and copies of the lithologic logs are in Appendix D. The soil horizon is 6 to 7 ft thick and consist of uniform silty sand. Below the soil horizon, the sediments are unconsolidated alluvium consisting of silt, sand, gravel, and cobbles. Thin layers of finer grained material were observed at the impacted locations (see Fig. 7).

Similar to the Santa Fe Site, trends were observed in percent soil moisture, percent total organic carbon, TKN, nitrate, and chloride with depth. Ammonia concentrations were near or below detection limit. A summary of the soil chemistry results for the Taos Site is listed in Table 11. Graphs showing concentration in soil versus depth for TKN, nitrate, soil moisture, total organic carbon, and chloride for the Taos Site are provided as Figures 14 through 18.

4.2.1 Background Location

Background concentrations of total organic nitrogen (TKN) ranges from 500 to 130 µg/g. Soil TKN decreases with depth from land surface to 10 ft bgl, increases slightly at 15 ft bgl, then decreases to 130 µg/g at 20 and 30 ft bgl (Fig. 14). Ammonia-nitrogen was only detected in the 3 ft sample. The soil nitrate concentration was 19.8 µg/g at 3 ft bgl, and decreased to near or below the detection limit of 1.0 µg/g by 10 ft bgl (Fig.15). The presence of TKN accompanied by a lack of ammonia and nitrate nitrogen indicates the mineralization of organic nitrogen (ammonification and nitrification) is not a significant process at the background location.

Table 11. Summary of soil chemistry, Taos Site

I. D.	sample depth, feet	percent moisture	percent organic carbon	TKN, µg/g	ammonia, µg/g	nitrate, µg/g	chloride, µg/g
TBG	3	15.7	0.57	500	1.1	19.8	791.0
TBG	5	12.2	0.38	380	<1.0	10.9	622.0
TBG	10	1.7	0.16	130	<1.0	1.0	114.0
TBG	15	2.1	0.07	320	<1.0	<1.0	31.0
TBG	20	2.0	0.07	130	<1.0	<1.0	22.0
TBG	30	2.8	0.08	130	<1.0	<1.0	25.0
TI1	3	20.4	0.88	1,510	2.7	15.3	20.4
TI1	5	20.5	0.50	440	1.6	16.9	20.5
TI1	10	10.3	0.37	320	1.5	23.0	10.3
TI1	15	4.7	0.14	190	2.5	13.0	4.7
TI1	20	12.7	0.13	130	1.2	2.1	12.7
TI1	30	8.1	0.11	130	<1.0	1.6	8.1
TI2	3	19.2	1.25	1,580	6.2	238.0	433.0
TI2	5	15.7	0.38	380	1.6	58.1	281.0
TI2	10	4.9	0.07	130	<1.0	7.4	47.0
TI2	15	4.6	0.33	440	1.6	58.0	115.0
TI2	20	8.2	0.10	130	1.0	2.6	36.0
TI2	30	14.9	0.14	250	1.3	1.6	30.0

TBG Background location at Taos Site
TI1 Impacted location No. 1 at the Taos Site
TI2 Impacted location No. 2 at the Taos Site

µg/g micrograms per gram

Background soil moisture decreased from approximately 16 to 2 percent from 3 to 10 ft bgl, then remained at about 2 percent to 30 ft bgl (Fig. 16). The organic carbon content for the background location decreased from 0.57 to 0.07 percent from 3 ft to 15 ft bgl, and remained at about 0.07 percent to 30 ft bgl. The average organic carbon content was 0.22 percent. The total organic carbon content decreases with depth, starting at 0.57 at 3 ft bgl to 0.08 at 30 ft bgl (Fig. 17).

Background soil chloride concentrations are greatest near the surface, and decrease asymptotically with depth; identical to that observed at the Santa Fe Site background location.

4.2.2 Impacted Locations

Based on field observations, the Impacted Location No. 1 had been used more recently than Impacted Location No. 2. Different patterns in the distribution of nitrogen compounds were observed between the two impacted locations, although a significant decrease in soil TKN concentration was noted at 5 ft bgl, at both of the impacted locations (Fig. 14). TKN concentrations ranged from 1,510 to 1,580 µg/g in the upper 3 ft of the soil horizon beneath the impacted locations. At both impacted locations, TKN concentrations range from 440 to 130 µg/g from 5 ft to 30 ft. Ammonia concentrations in soil ranged from 6.2 to less than 1.0 µg/g. Soil nitrate concentrations are elevated in the upper 20 ft of the profiles, and range from 238 µg/g to 1.6 µg/g. Impacted location No. 2 had the highest nitrate concentration (238 µg/g), which was from soil sampled at the 3 ft depth.

Both of the Impacted Locations had elevated TKN in the upper 5 ft of the soil horizon, however, the nitrate concentrations in the upper 5 ft of the soil horizon were near background at Impacted Location No. 1 and elevated at Impacted Location No. 2. The difference in nitrate concentrations between these two locations may be a result of the soil cover placed over Impacted Location No. 2. The soil cover could be creating a subsurface environment that favors ammonification and nitrification of organic nitrogen, but limits losses by volatilization and denitrification.

Percent soil moisture changes with depth are shown on Figure 16. Soil moisture was 15 to 20 percent in the upper 5 ft of each sample profile, and ranged from 14.9 to 4.6 percent from 5 to 30 ft. Soil moisture is elevated in the upper soil horizon and the sediments from 20 to 30 ft bgl, because the finer grained material is able to retain more water content.

Total organic carbon decreased with depth at each location (Fig. 17). Values of total organic carbon ranged from 1.25 to 0.07 percent.

The concentration of soluble chloride in soil ranged from 433 to 4.7 µg/g. Chloride is not concentrated in soil at the impacted location No. 1, which was more recently used than impacted location No. 2 (Fig. 18). As discussed earlier, the distribution of chloride is a result of hydraulic loading and from the concentrating effects of evapotranspiration.

4.2.3 Taos Site Summary

As a result of the data collected, comparisons of the distribution of nitrogen compounds in the subsurface at this disposal site can be made to background values, and to nitrogen composition of the septage (Figs. 21 and 22). Approximately all of the ammonia in septage is volatilization or has undergone nitrification before infiltrating into the subsurface. This may account for a loss of approximately 16 percent of the total nitrogen. An additional reduction of 88 percent of the total nitrogen is lost as the soil infiltrates from 3 to 30 ft bgl.

The concentration of organic nitrogen rapidly decreases within the first 5 ft at the Taos Site. Below a depth of 20 ft, the nitrate concentrations in soil at the impacted locations are similar to background concentrations for corresponding depths (Fig. 15).

The trends and percentages of organic carbon are similar for the background and impacted locations (Fig. 17). Variations in percent soil moisture are reflective of the lithology; the finer grained sediments have higher moisture content than the coarser sediments.

The concentration of chloride in the upper soil horizon at the background location is most likely a result of evapotranspiration effects on infiltrating precipitation. This soil chloride concentration phenomena has been noted by Anderholm (1994), and can be used to estimate recharge from precipitation or hydraulic loading rates. An inverse relationship can be inferred between percent soil moisture and soluble chloride in soil.

4.3 Duplicate Analysis

Duplicate analysis was performed on several soil samples for all of the chemical parameters. Results of the duplicate analysis are listed in Table 12. JSAI submitted duplicate samples for analysis, and, in addition, the laboratory performed a duplicate analysis on four submitted samples and four control samples. Results of the duplicate analysis performed by Energy Laboratories, Inc. are provided in Appendix E.

The duplicate samples submitted by JSAI were reflective of a subset of the composite sample. The purpose in submitting these samples was to evaluate the effectiveness of homogenizing composite samples. Overall, the results of the duplicate samples submitted by JSAI reproduced well, with the exception of the TKN analysis performed on sample TI 2-30, and nitrate analysis performed on sample SFI 1-3 (see Table 12). Of the six parameters evaluated, the parameter with the worst reproducibility is total organic carbon.

4.4 Physical Parameters of Soils

A summary of the physical parameters at each site is provided in Table 13. Results of the particle size analysis are provided in Appendix E. At both sites, the porosity decreases with depth, and the bulk density decreases with depth. This is related to the finer grained, well sorted sediment found in the upper five feet at each site. The porosity ranges from 51 to 26 percent for the sediments analyzed from the Taos Site, and from 51 to 25 percent for the sediments analyzed from the Santa Fe Site. These are typical porosity values for alluvial material found in the arid southwest.

The permeability of the sediments sampled at the Santa Fe Site ranges from 1.79E-04 to 5.52E-06 cm/sec, with an average of 7.83E-05 cm/sec. The Taos Site is similar with permeability ranging from 1.30E-04 to 9.72E-06 cm/sec, with an average of 7.81E-05 cm/sec. In comparison the soils at the Taos and Santa Sites are reported by Soil Conservation Service (1975) to have permeability ranging from 1.41E-03 to 4.45E-04 cm/sec (0.63 to 2.0 in./hr).

Table 12. Results of duplicate analysis (bold numbers represent differences in values with greater than 25 percent error in reproducibility)

I. D.	sample depth, feet	percent moisture	percent organic carbon	TKN, µg/g	ammonia, µg/g	nitrate, µg/g	chloride, µg/g
SFBG	10	3.0	0.13	190	<1.0	<1.0	73.0
SFBG (JSAI duplicate)	10	2.8	0.12	190	<1.0	<1.0	74.0
difference		0.2	0.01	0	0.0	0.0	1.0
SFI 1-3	3	18.9	0.68	1,070	1.6	410	60.0
SFI 1-3 (JSAI duplicate)	3	18.0	0.88	1,200	1.3	481	66.0
SFI 1-3 (lab duplicate)	3	n/a	0.94	1,170	1.2	465	67.0
difference		0.9	**0.26**	30	**0.4**	71	7.0
TI 2-30 (JSAI duplicate)	30	14.4	<0.05	130	1.2	1.4	27
TI 2-30	30	14.9	0.14	250	1.3	1.6	30
difference		0.5	**0.09**	**120**	0.1	0.2	3
TI 1-20 (JSAI duplicate)	20	7.0	0.05	130	<1.0	1.0	40
TI 1-20 (lab duplicate)	20	n/a	0.05	130	<1.0	1.0	38
TI 1-20	20	12.7	0.13	130	1.2	2.1	104
difference		**5.7**	**0.08**	0	0.2	**1.1**	**66**

TKN total Kjeldahl nitrogen µg/g micrograms per gram

Table 13. Summary of physical parameters for soils sampled at the Santa Fe and Taos Sites

sample	depth	permeability, cm/s	porosity, percent	bulk density, pcf
Taos Site				
T1	3		42	87.4
T1	5	1.30E-04	47	77.3
T1	10		33	106.9
T1	15	free flowing	27	112.6
T1	20		42	92.2
T1	30	9.47E-05	36	103
T2	3		43	78.8
T2	5	9.72E-06	51	74.6
T2	10		31	107.4
T2	15	1.32E-04	26	119.2
T2	20		26	117.9
T2	30	free flowing	32	109.2
Santa Fe Site				
SF1	3		43	88
SF1	5	5.52E-06	51	87.9
SF1	10		31	100.4
SF1	15	1.79E-04	26	105.5
SF1	20		26	113.6
SF1	30	free flowing	32	108.3
SF2	3		41	94.1
SF2	5	5.04E-05	43	93.1
SF2	10		35	111.9
SF2	15	free flowing	25	112.3
SF2	20		28	122.2
SF2	30	free flowing	31	117.9

cm/s centimeters per second pcf pounds per cubic foot

5.0 CONCLUSIONS

Percentages of nitrogen compounds from the sludge and septage waste were compared to percentages observed in the subsurface (Figs. 19 through 22), and trends in nitrogen compounds with depth were assessed (Figs. 9 through 18). These were done to identify transformation processes of nitrogen compounds in the subsurface, so the losses of total nitrogen and the potential for nitrate leaching can be estimated.

The soils beneath the impacted locations at the Santa Fe Site have nitrogen compounds in concentrations greater than what was detected at the background location. Based on the available data, it appears the nitrate concentrations with respect to depth are related to TKN concentration (transformation of source) and soil moisture (hydraulic driving force for infiltration of leachate). Impacted Location No. 1 has had a higher loading history than Impacted Location No. 2, which resulted in higher nitrate concentrations in the subsurface.

At the Santa Fe Site impacted locations, the total nitrogen concentration (TKN plus nitrate) decreases by 66 percent from 3 ft to 30 ft bgl. Near surface transformation processes likely account for this loss in total nitrogen content. At the time of land application, ammonia comprised 37 percent of the total nitrogen in the sludge, but at a depth of 3 ft bgl and deeper, ammonia concentrations in soil are less than 1 percent. The loss of ammonia can be explained by two processes (1) volatilization of ammonia at the surface and shallow subsurface, and (2) nitrification.

At the Taos Site impacted locations, approximately all of the ammonia in septage is volatilized or has undergone nitrification before infiltrating into the subsurface. This may account for a loss of approximately 16 percent of the total nitrogen applied to the land. An additional reduction of 88 percent of the total nitrogen is lost as the leachate infiltrates through the soil horizon from 3 to 30 ft bgl.

The concentration of organic nitrogen rapidly decreases within the first 5 ft at the Taos Site. Soil nitrate concentrations at the Taos Site impacted locations approach background concentrations by 20 ft in depth. Soils have high percent moisture with depth at impacted locations, indicating high hydraulic loading, but accompanied by high nitrate losses.

At both sites, the migration of nitrogen compounds does not appear to be inhibited by the lithology, nor does the lithology strongly influence nitrogen migration. As to no surprise, the grain size of the sediments does not change drastic enough, or the organic content is not significant enough to host nitrogen transformation processes and physical barriers.

The concentration of TKN is about the same for background locations at the two sites. Nitrate concentration profiles at the impacted locations varied slightly between the Santa Fe and Taos Sites, with the Santa Fe Site showing elevated concentrations with depth. Nitrate concentrations are greater at the Santa Fe Site than the Taos Site. This might be a result of the differences in loading rates or land application of septage waste. At the Santa Fe Site, the sludge is injected into the subsurface reducing the potential for volatilization of ammonia, and creating a favorable environment for nitrification, whereas, the septage disposed at the Taos Site is applied to the surface and allowed to evaporate and create favorable conditions for volatilization of ammonia.

Soil chloride concentrations at the Taos Site are greater than the Santa Fe Site, but show a similar trend with depth. The Taos Site has higher annual precipitation, and consequently, greater potential for concentration of chloride by evapotranspiration of precipitation in the soil horizon.

6.0 RECOMMENDATIONS

JSAI recommends performing the following tasks to develop a better understanding of the migration of nitrogen compounds from septage disposal in New Mexico and to develop a method for evaluating disposal sites.

1. Perform additional sampling to contribute to further understanding of nitrogen migration in subsurface. In particular, characterization of nitrogen compounds in septage waste prior to disposal, and at the surface of the disposal area. This information was not available from S&R Septage Disposal Facility (Taos Site) for comparison to the soil investigation.

2. Compile all available existing monitoring and soil sampling data from other land disposal sites in New Mexico. An analysis of these data could contribute to the further understanding of nitrogen migration in the subsurface, and the conditions favorable for protection of ground water.

3. Use the data and conclusions provided in this report to develop a numerical rating scheme for determining acceptable loading rates for septage disposal facilities in New Mexico. The EPA has developed the DRASTIC model, and many state governments have adopted this to develop regulatory criteria for septage disposal sites.

4. The soil chloride data may be used to estimate hydraulic loading rates resulting from the septage disposal. This, in turn, can be used to calibrate a computer model for predicting nitrate leaching potential for disposal facilities in the arid southwest.

7.0 REFERENCES

Anderholm, S. K., 1994, Ground-water recharge near Santa Fe, north-central New Mexico: U.S. Geological Survey, Water-Resources Investigation Report 94-4078, 68 p.

Beauchamp, E. G., Kidd, G. E., and Thurtell, G., 1978, Ammonia volatilization from sewage sludge applied in the field: Journal of Environmental Quality, Vol. 7, pp. 141-146.

Boyle Engineering Corporation, 1993, Sludge injection site phase 1 ground water investigation at the airport wastewater treatment plant: Consultant's report prepared in conjunction with H+GCL for City of Santa Fe, New Mexico, 74 p.

Canter, L. W., 1997, Nitrates in groundwater: CRC Press, Inc., Boca Raton, Florida, 263 p.

Coons, L. M., and Kelly, T. M., 1984, Regional hydrogeology and the effect of structural control on the flow of ground water in the Rio Grande trough, northern New Mexico: Guidebook for the thirty-fifth annual field conference, Rio Grande Rift: Northern New Mexico, New Mexico Geological Society, pp. 241-244.

EPA, 1993, Standards for the use or disposal of sewage sludge: U. S. Environmental Protection Agency, Federal Regulation, 58:9248-9415

EPA, 1994, Guide to septage treatment and disposal: U. S. Environmental Protection Agency, 625/R-94/002, 59 p.

Hantzche, N. N., and Finnemore, E. J., 1992, Predicting ground-water nitrate-nitrogen impacts: Ground Water Journal, Vol. 30, No. 4, pp. 490-499.

Harmel, R. D., Zartman, R. E., Mouron, C., Wester, D. B., and Sosebee, R. E., 1997, Modeling ammonia volatilization from biosolids applied to semiarid rangeland: Soil Science Society of America Journal, Vol. 61, pp. 1794-1798.

Medalie, L., Bowden, W. B., and Smith, C. T., 1994, Nutrient leaching following land application of aerobically digested municipal sewage sludge in a northern hardwood forest: Journal of Environmental Quality, Vol. 23, pp. 130-138.

Reddy, K. R., and Patrick, W. H., 1981, Nitrogen transformations and loss in flooded soils and sediments: CRC Critical Reviews in Environmental Control, Vol. 13, No. 4, pp. 273-303.

Page, A. L., Miller, R. H., and Keeney, D. R. (editors), 1982, Methods of Soil Analysis: Part I Physical and Mineralogical Methods, and Part 2 Chemical and Microbiological Properties, Second Edition, American Society of Agronomy

Sawyer, C. N., McCarty, P. L., and Parkin, G. F., 1994, Chemistry for Environmental Engineering, Fourth Edition: McGraw-Hill, Inc., New York, NY, 658 p.

Soil Conservation Service, 1975, Soil survey of Santa Fe area, New Mexico: U. S. Department of Agriculture, 114 p.

Soil Conservation Service, 1982, Soil survey of Taos County and parts of Rio Arriba and More Counties, New Mexico: U. S. Department of Agriculture, 220 p.

Sommer, S. G., and Ersboll, A. K, 1994, Soil tillage effects on ammonia volatilization from surface-applied or injected animal slurry: Journal of Environmental Quality, Vol. 23, pp. 493-498.

Sopper, W. E., and Kerr, S. N. (editors), 1979, Utilization of municipal sewage effluent and sludge on forest and disturbed land: The Pennsylvania State University Press, University Park, PA, 135 p.

Spiegel, Z., and Baldwin, B., 1963, Geology and water resources of the Santa Fe area, New Mexico: U. S. Geological Survey, Water –supply paper 1525, 258 p.

Summers & Associates, 1978, New Mexico Climatological Data: W. K. Summers & Associates, Socorro, New Mexico, 436 p.

Tindall, J. A., Lull, K. J., and Gaggiani, N. G., 1994, Effects of land disposal of municipal sewage sludge on fate of nitrates in soil, streambed sediment, and water quality: Journal of Hydrology, Vol.163, pp. 147-185.

White, C. S., Loftin, S. R., and Aguilar, R., 1997, Application of biosolids to degraded semiarid rangeland, nine year responses: Journal of Environmental Quality, Vol. 26, pp. 1663-1671.

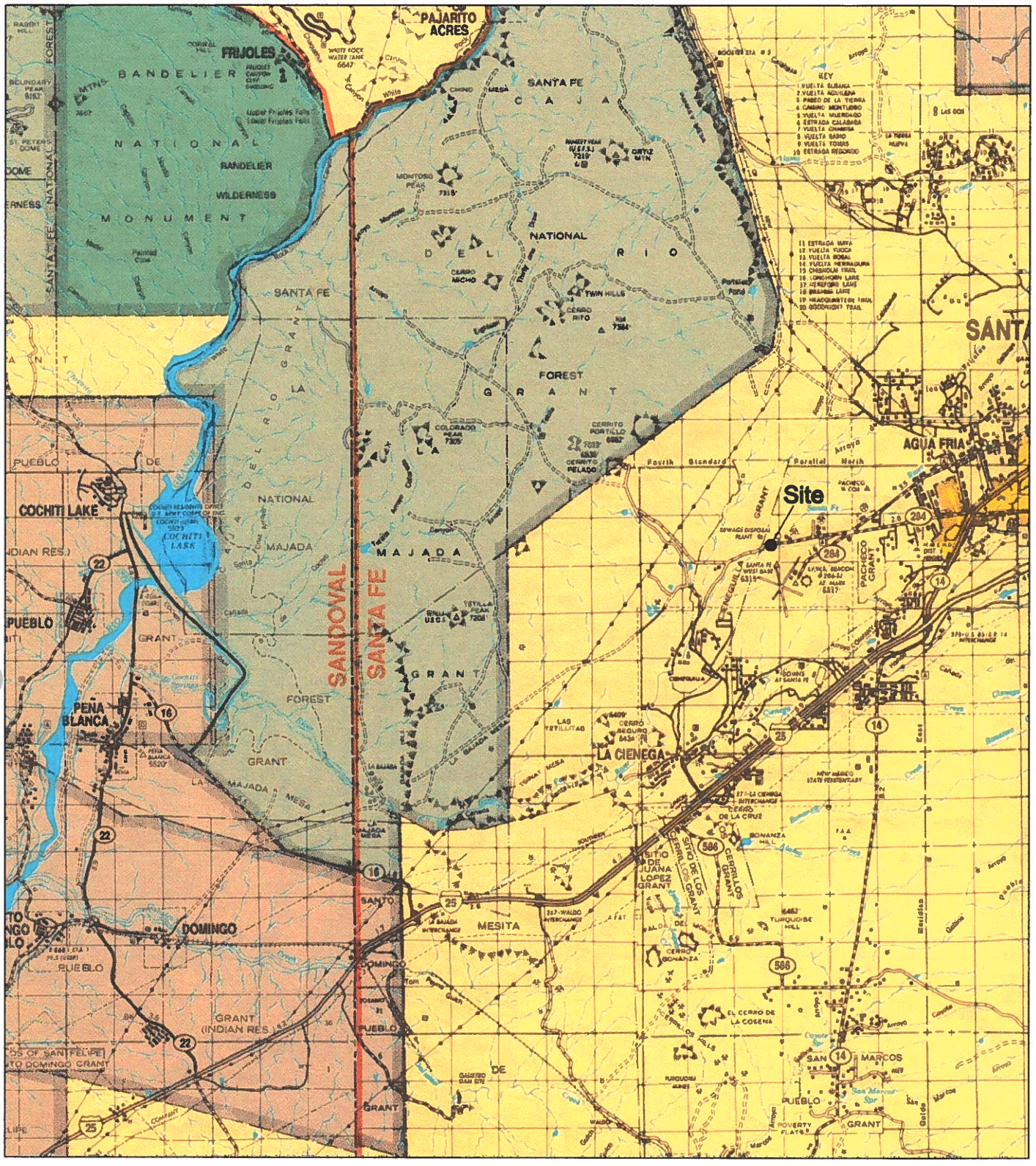

Figure 1. Map showing location of the City of Santa Fe Sludge Disposal site near Santa Fe, New Mexico.

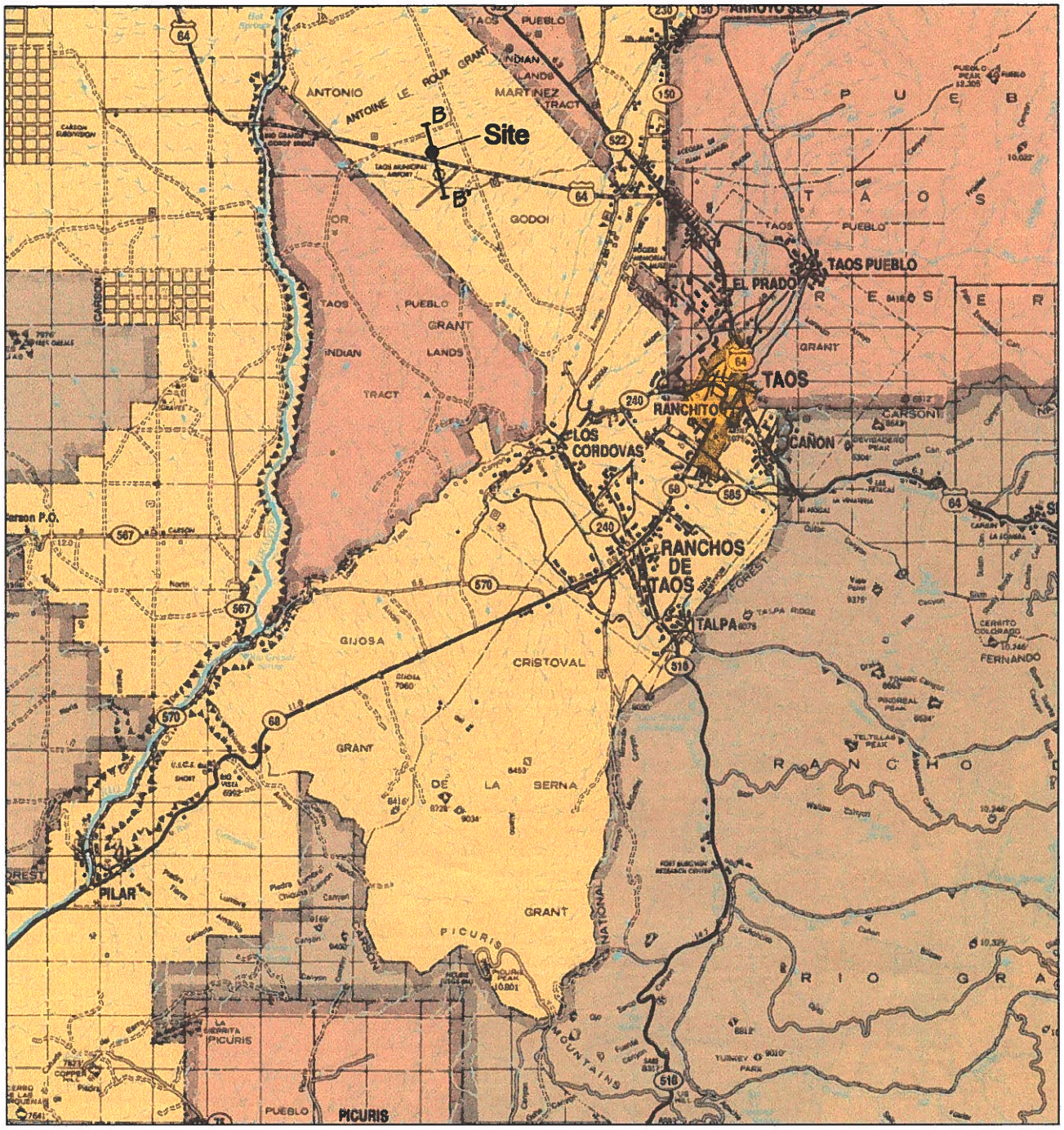

Figure 2. Map showing line of section B–B' and location of the S&R Septage Disposal site near Taos, New Mexico.

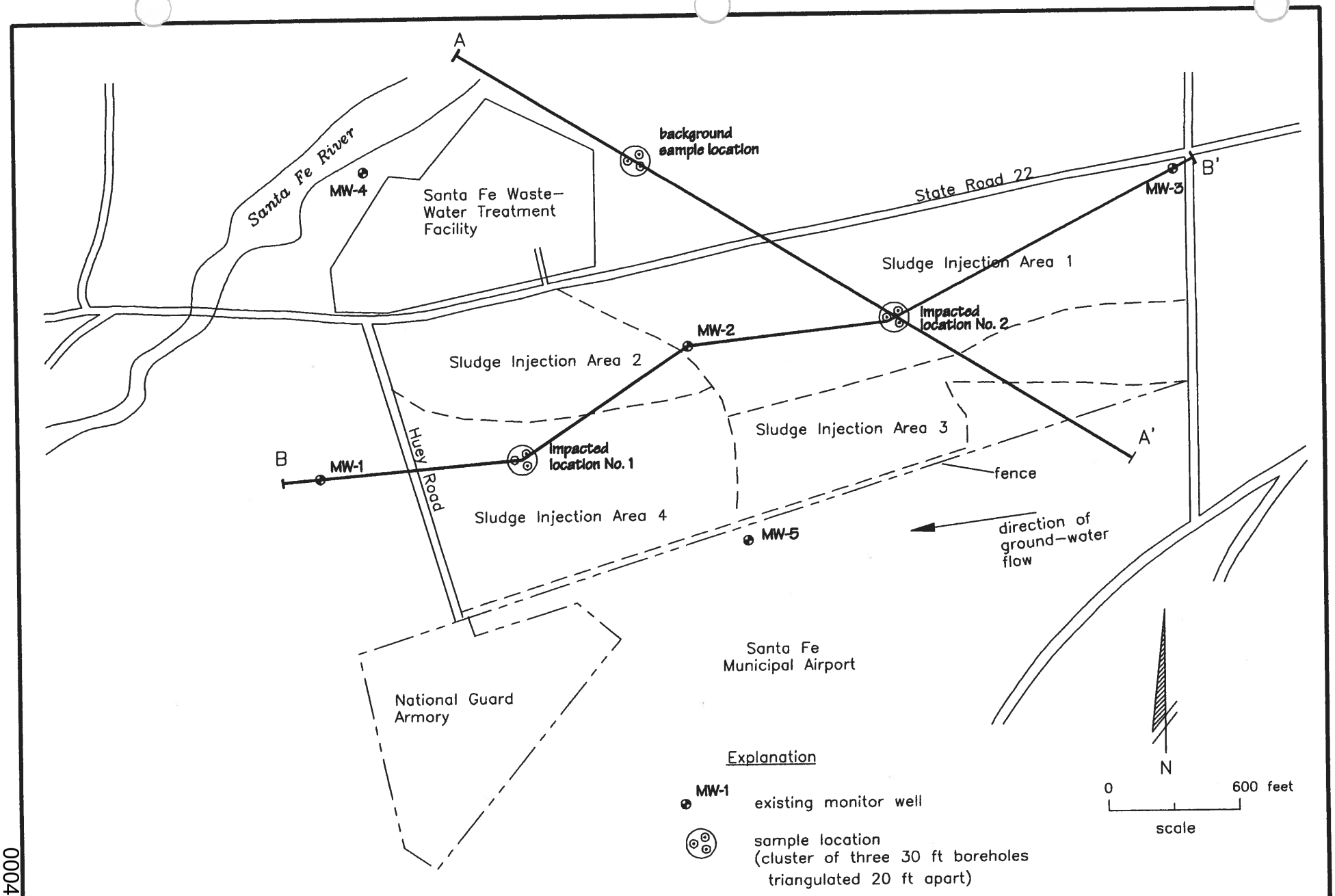

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Figure 3. Site map showing borehole locations and lines-of-section for City of Santa Fe Sludge Disposal site (DP-135) near Santa Fe, New Mexico.

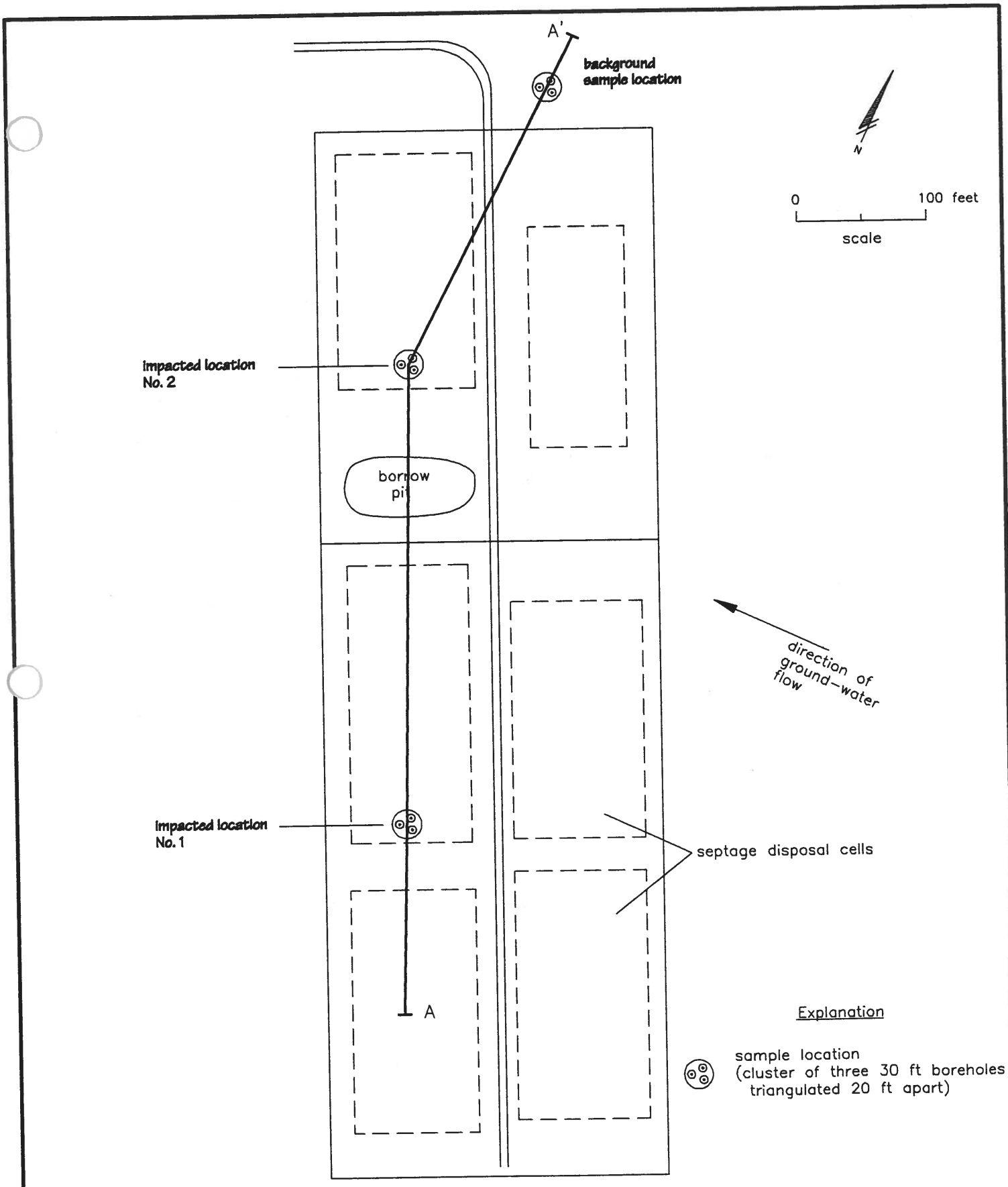

Figure 4. Site map showing borehole locations and line of section for S&R Septage Disposal site (DP-465) near Taos, New Mexico. (Line of section B-B' is shown on Figure 2 due to scale.)

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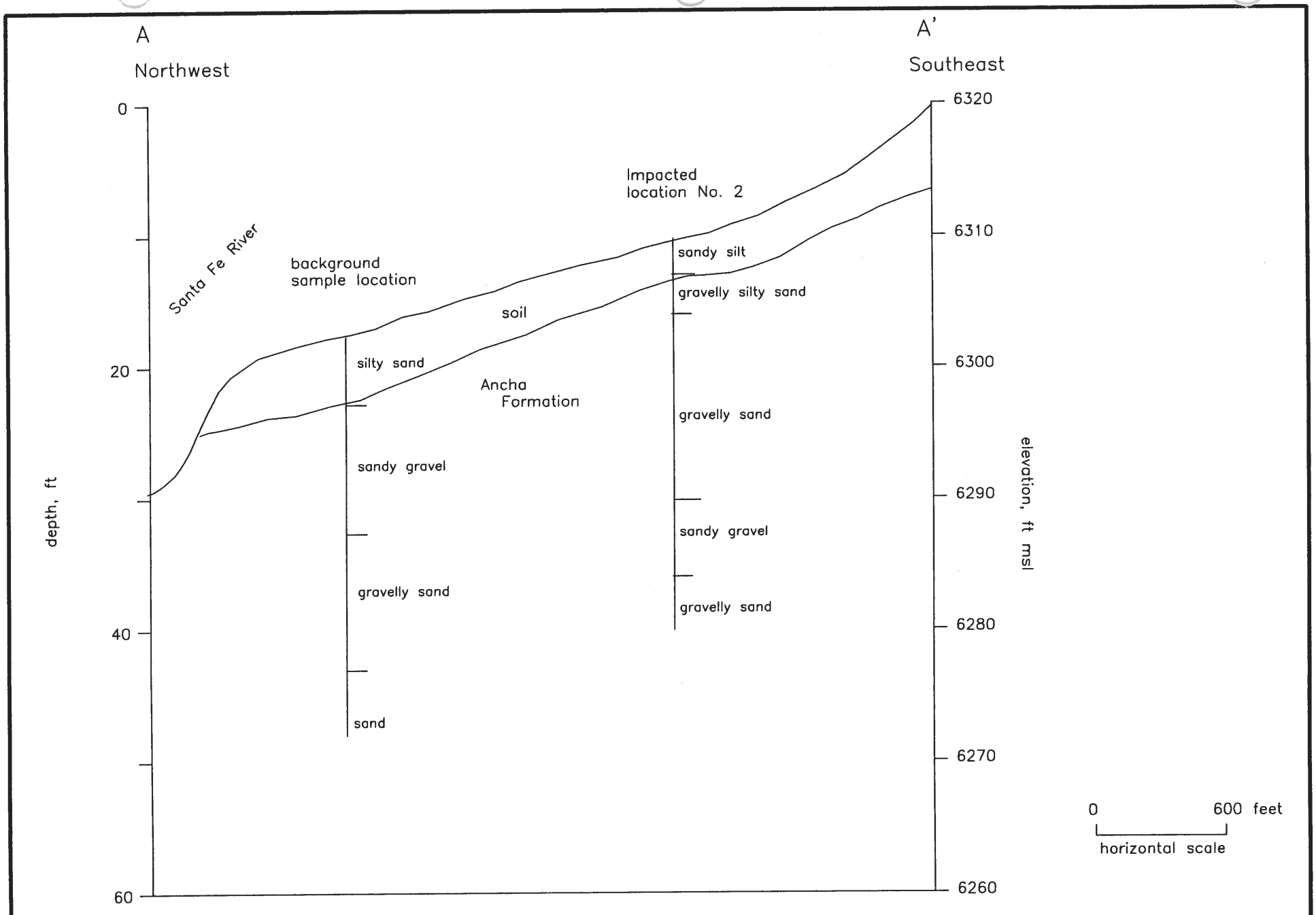

Figure 5. Hydrogeologic cross-section A-A', City of Santa Fe Disposal site near, Santa Fe, New Mexico.

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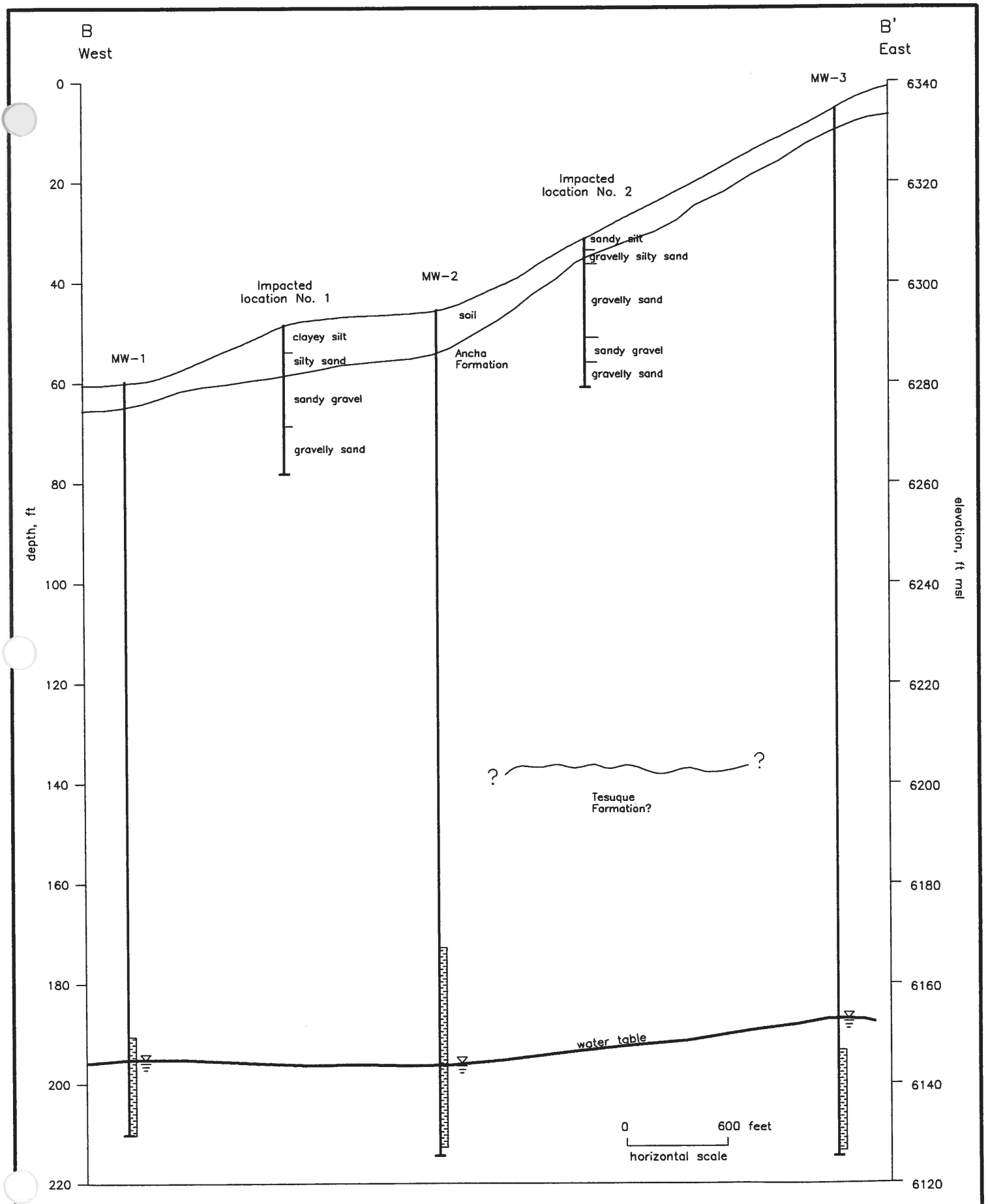

Figure 6. Hydrogeologic cross-section B-B', City of Santa Fe Disposal site near, Santa Fe, New Mexico.

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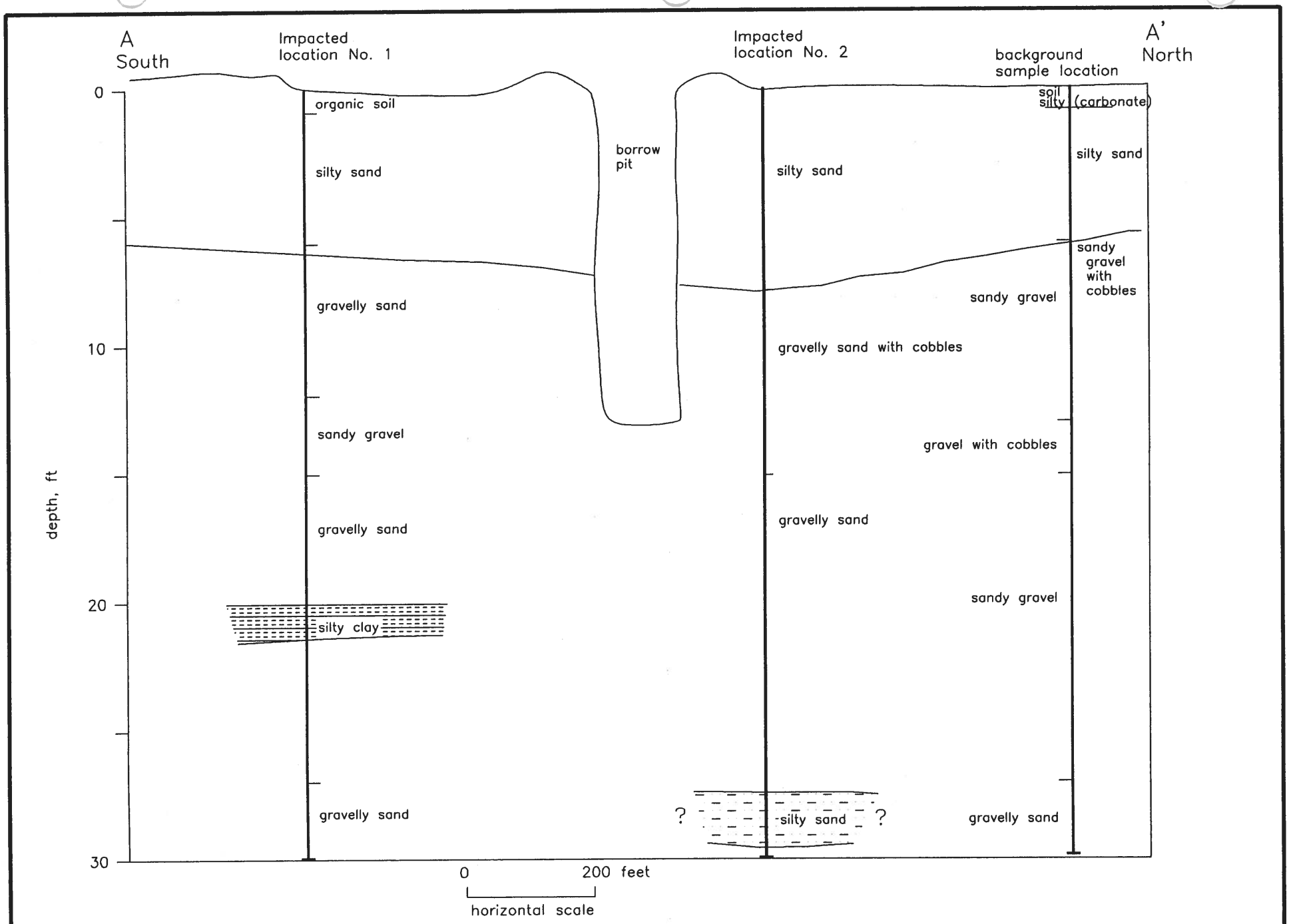

Figure 7. Hydrogeologic cross–section A–A', S&R Disposal site near, Taos, New Mexico.

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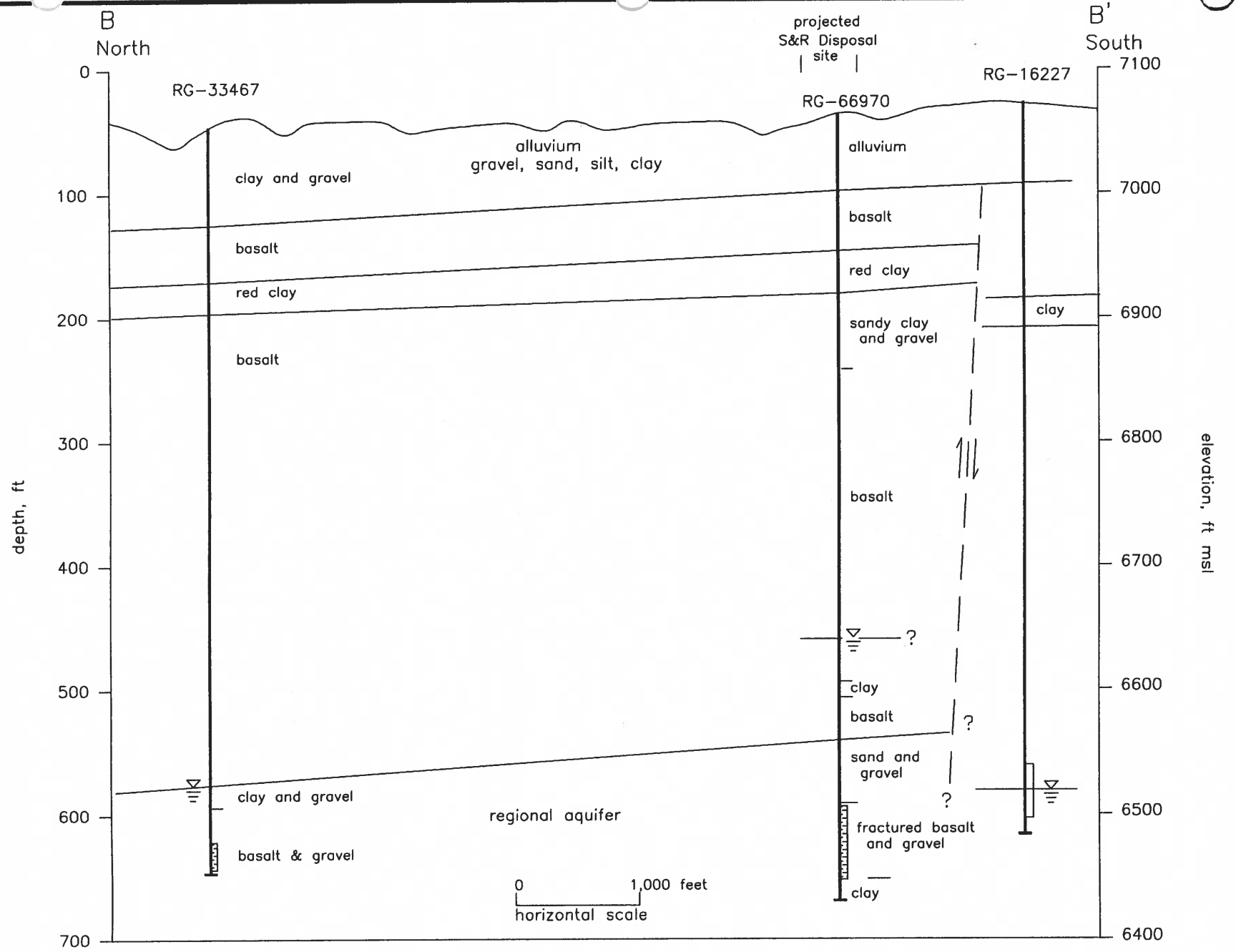

Figure 8. Hydrogeologic cross-section B-B', S&R Disposal site near, Taos, New Mexico.

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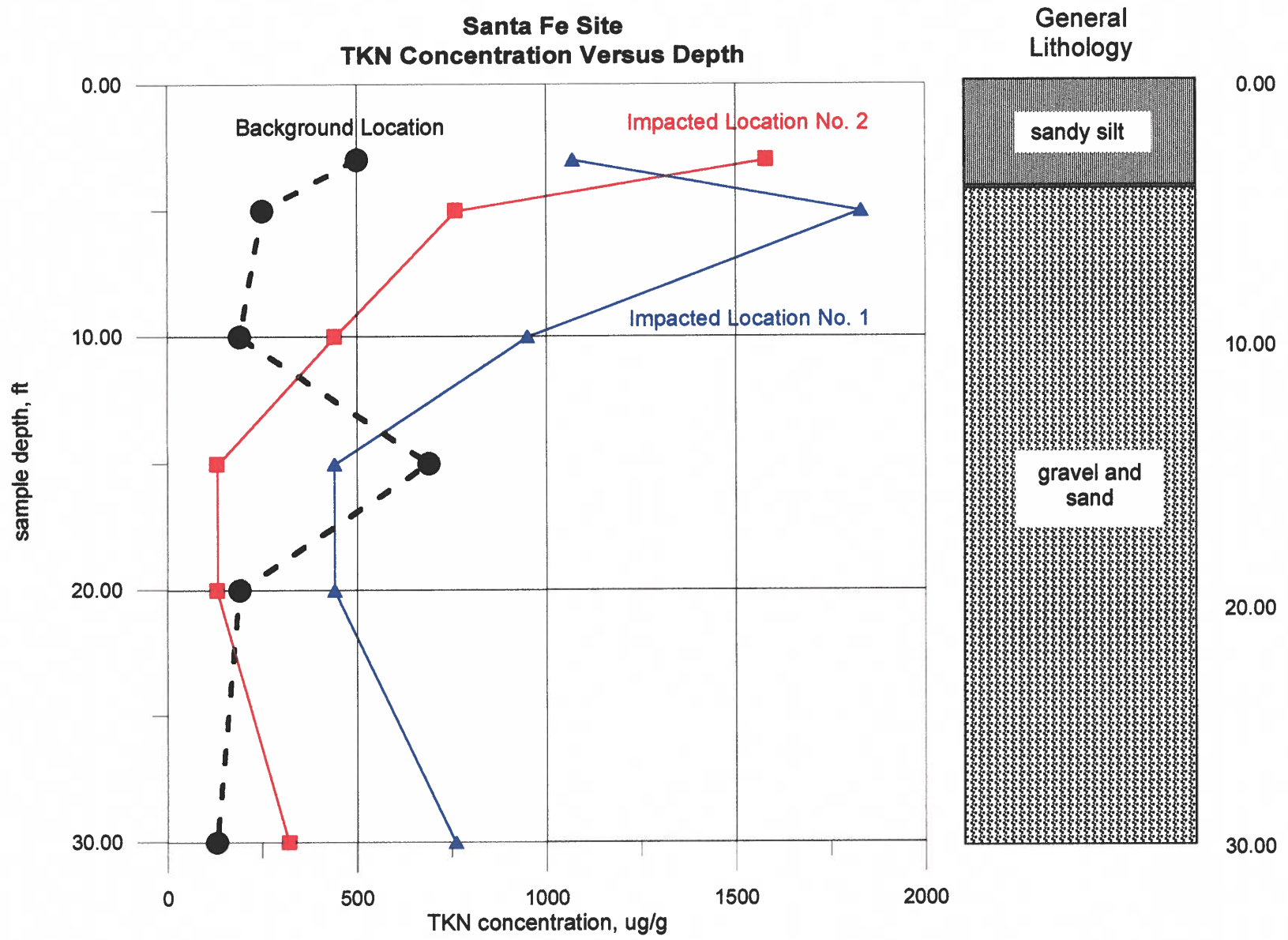


Figure 9. TKN concentration versus depth for the background, impacted No. 1, and impacted No. 2 locations, Santa Fe Site

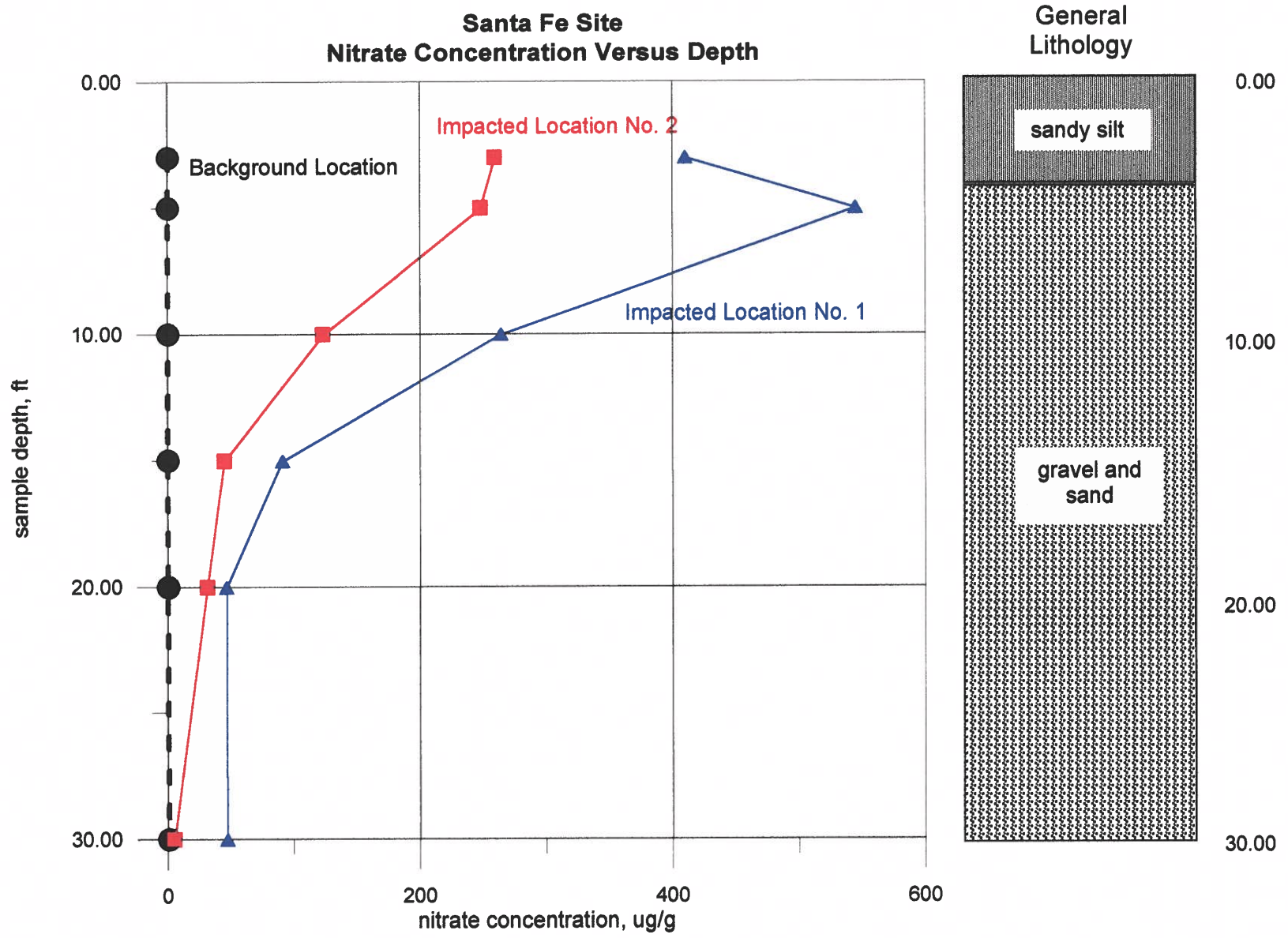


Figure 10. Nitrate concentration versus depth for the background, impacted No. 1, and impacted No. 2 locations, Santa Fe Site

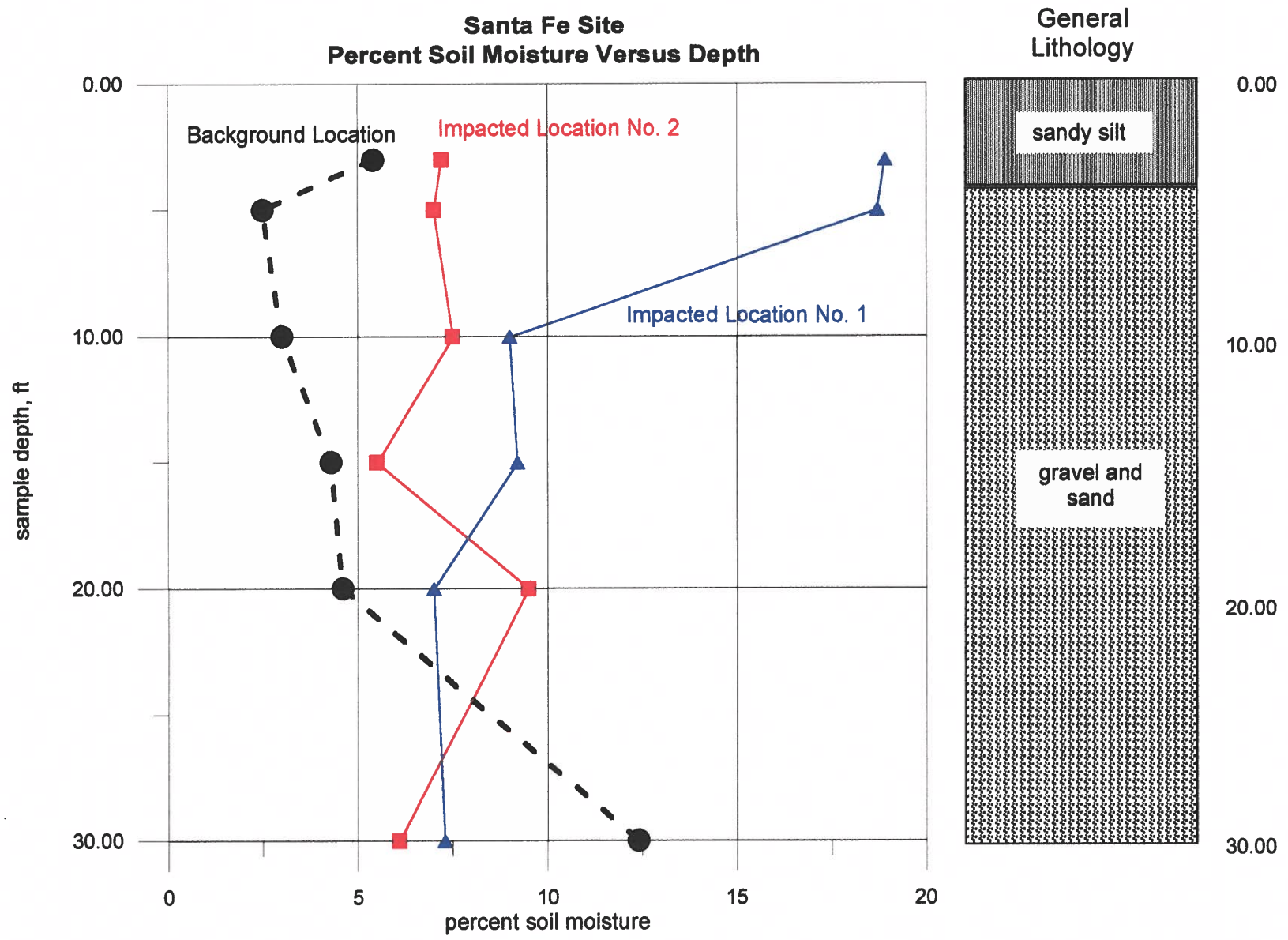


Figure 11. Percent soil moisture versus depth for the background, impacted No. 1, and impacted No. 2 locations, Santa Fe Site

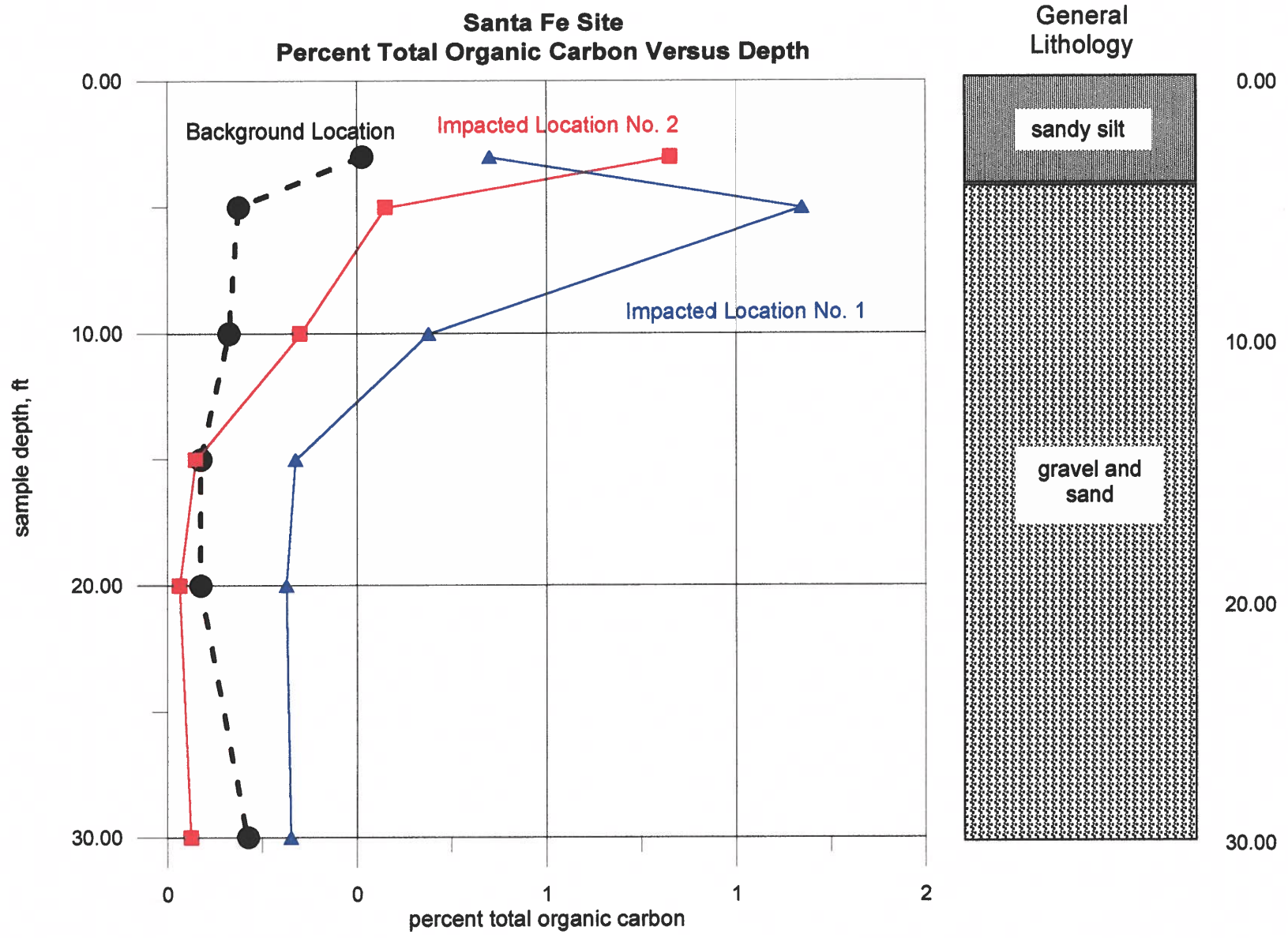


Figure 12. Percent total organic carbon versus depth for the background, impacted No. 1, and impacted No. 2 locations, Santa Fe Site

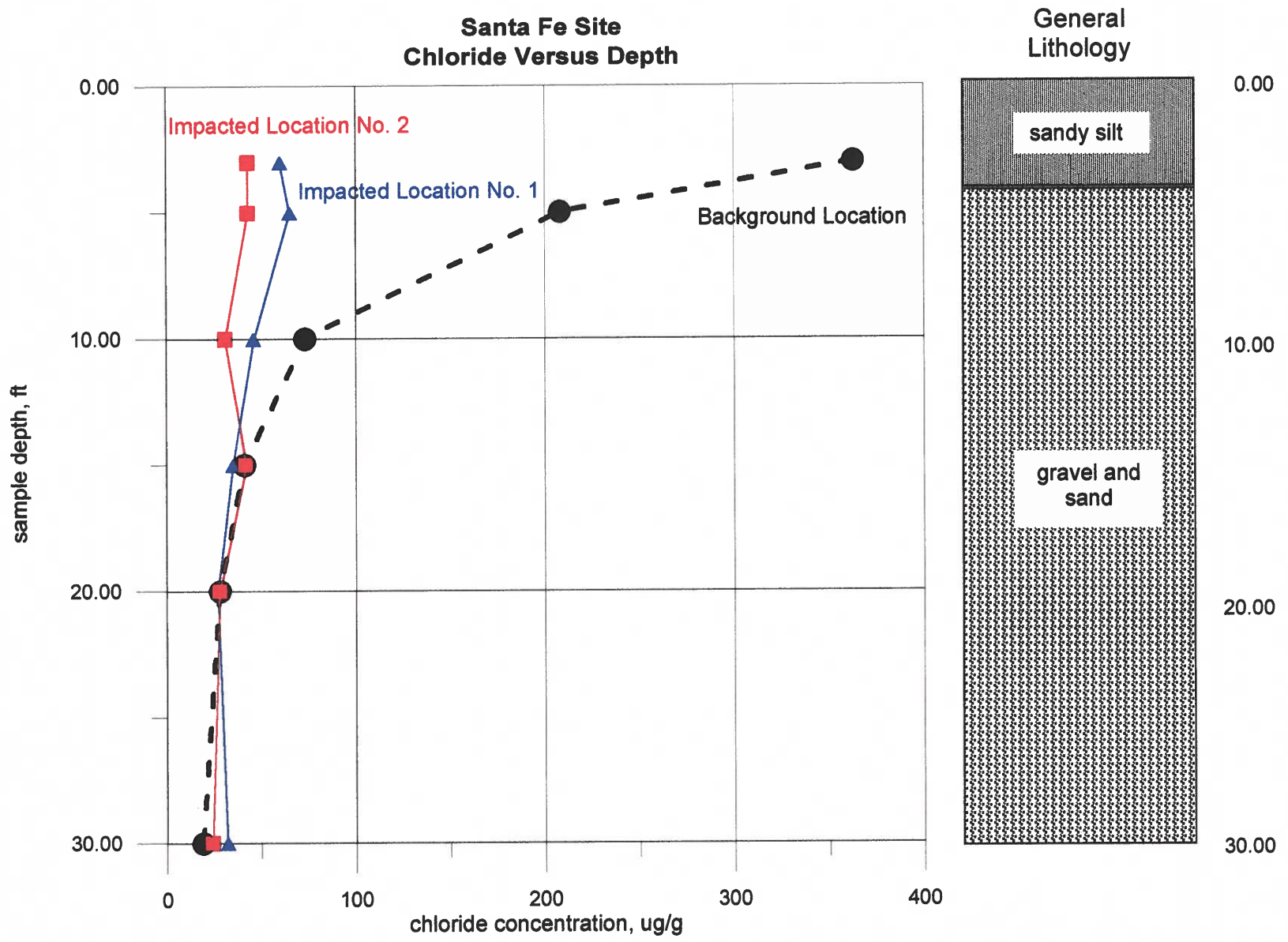


Figure 13. Chloride concentration versus depth for the background, impacted No. 1, and impacted No. 2 locations, Santa Fe Site

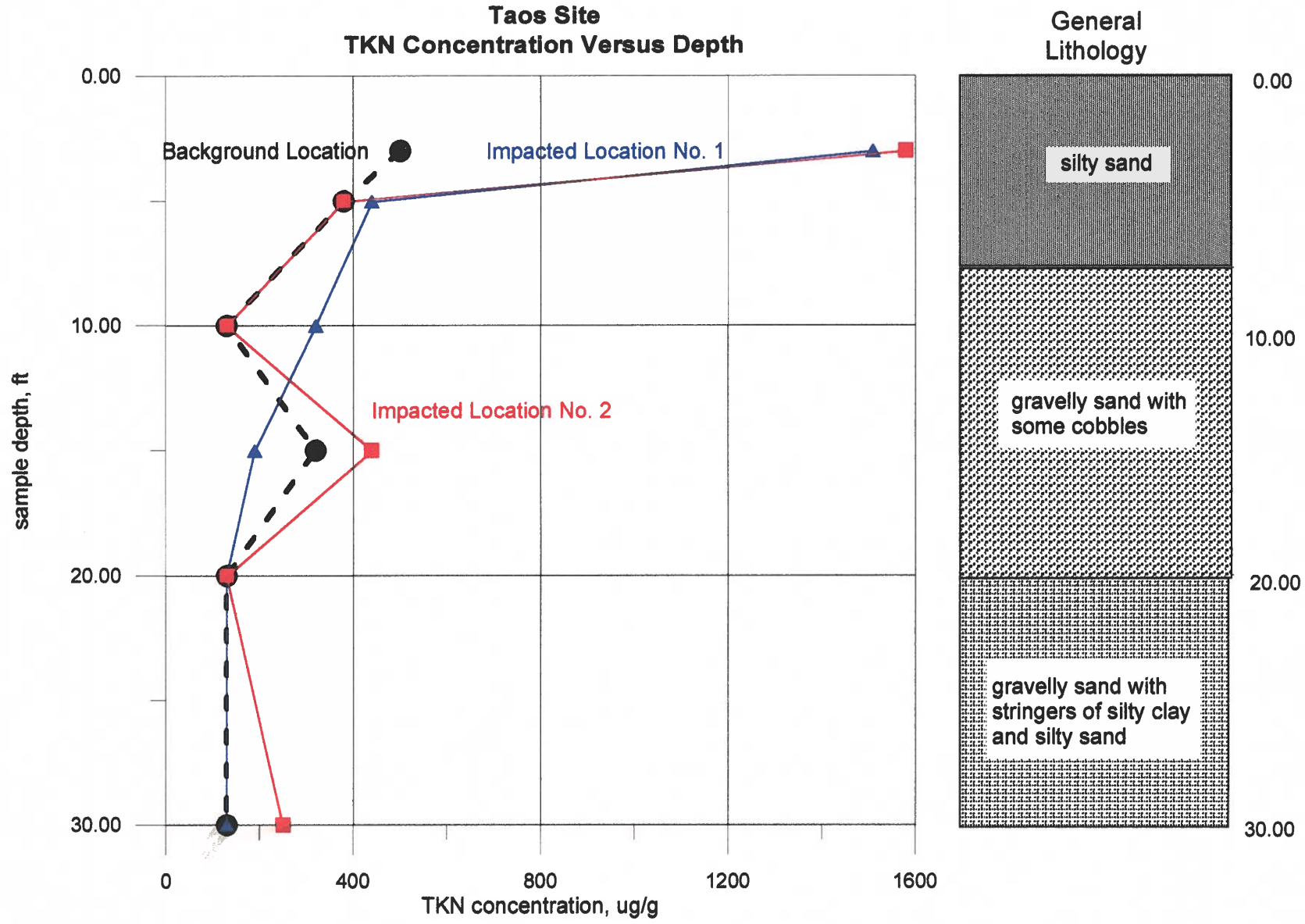


Figure 14. TKN concentration versus depth for the background, impacted No. 1, and impacted No. 2 locations, Taos Site.

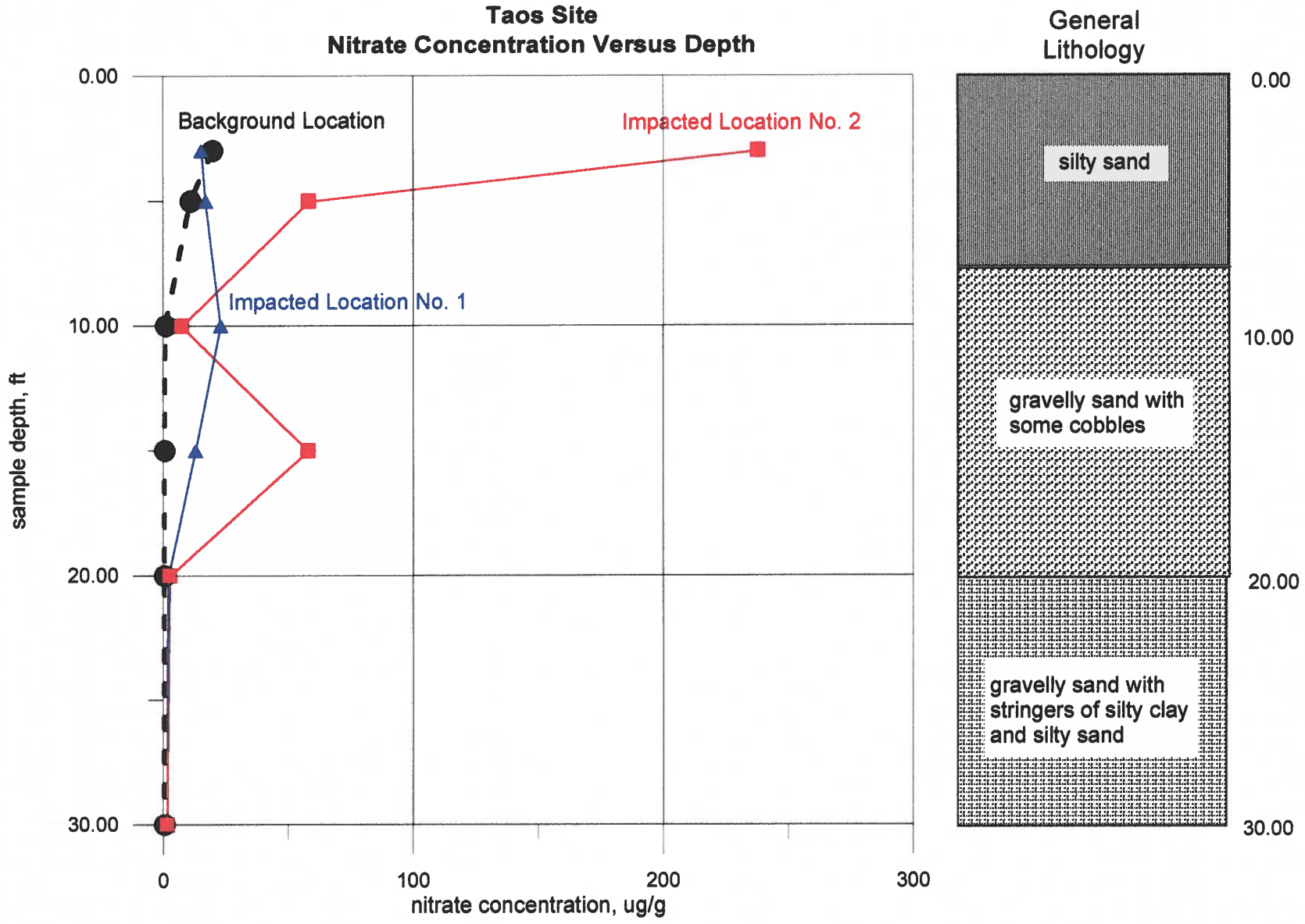


Figure 15. Nitrate concentration versus depth for the background, impacted No. 1, and impacted No. 2 locations, Taos Site.

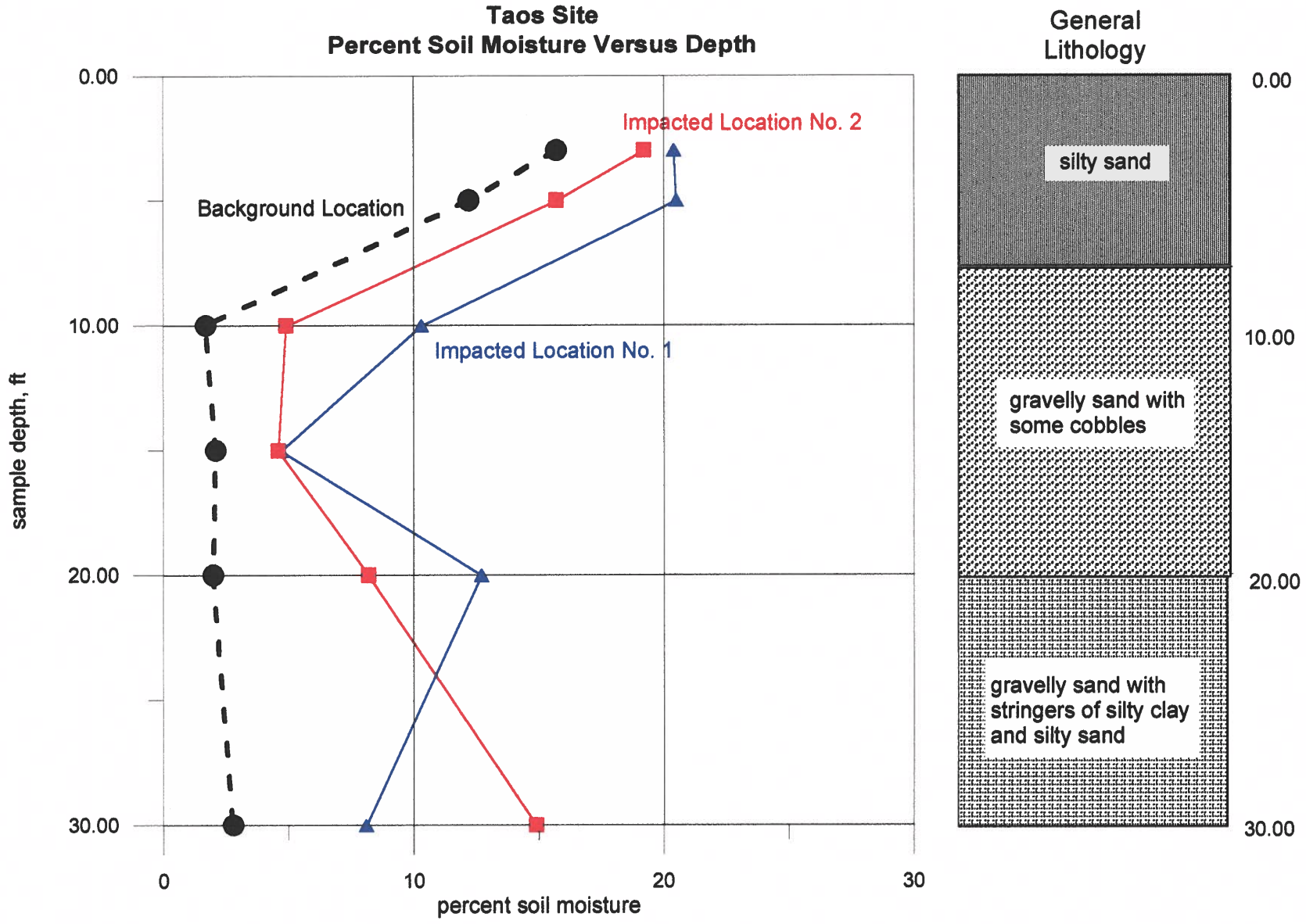


Figure 16. Percent soil moisture versus depth for the background, impacted No. 1, and impacted No. 2 locations, Taos Site.

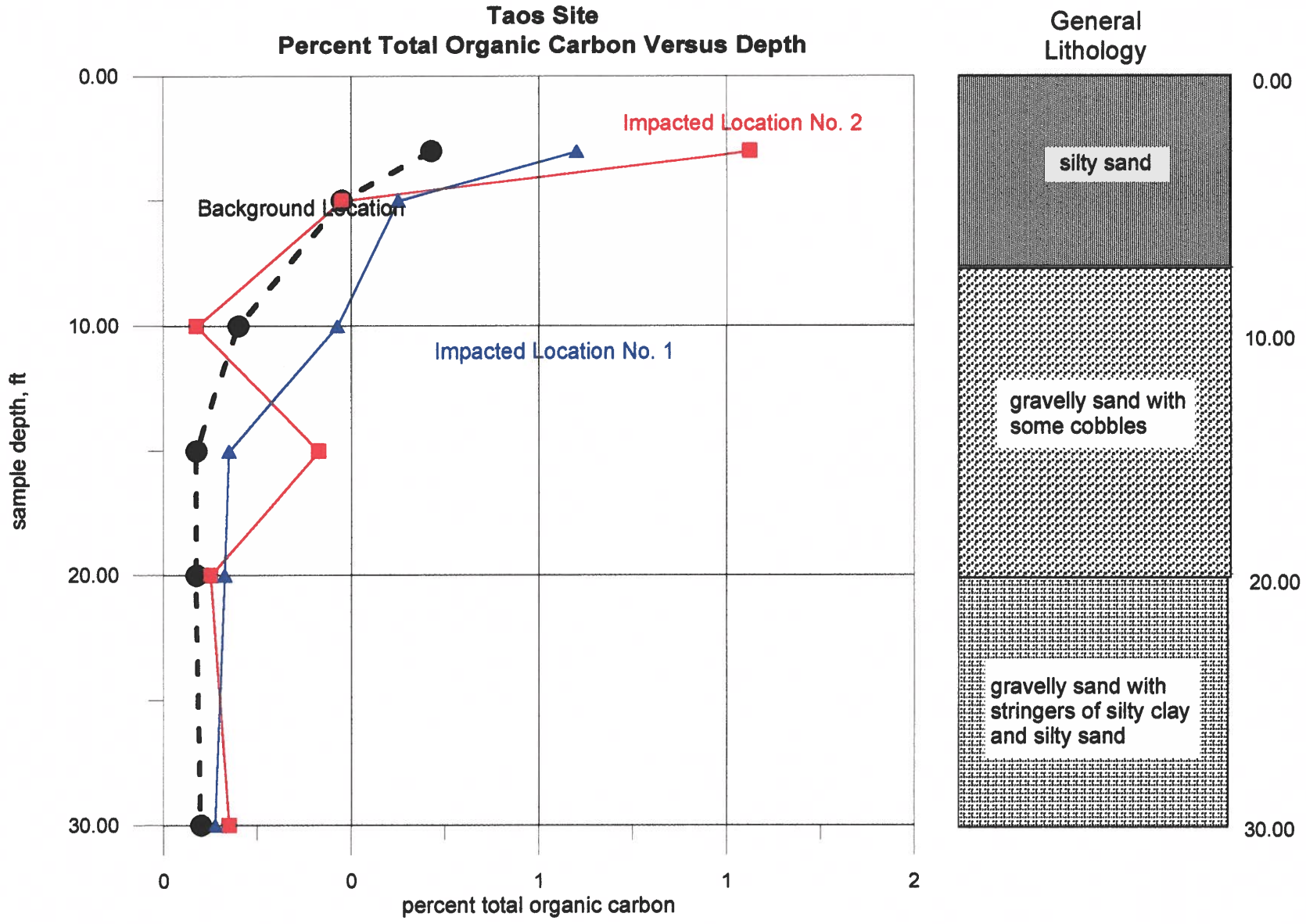


Figure 17. Percent total organic carbon versus depth for the background, impacted No. 1, and impacted No. 2 locations, Taos Site.

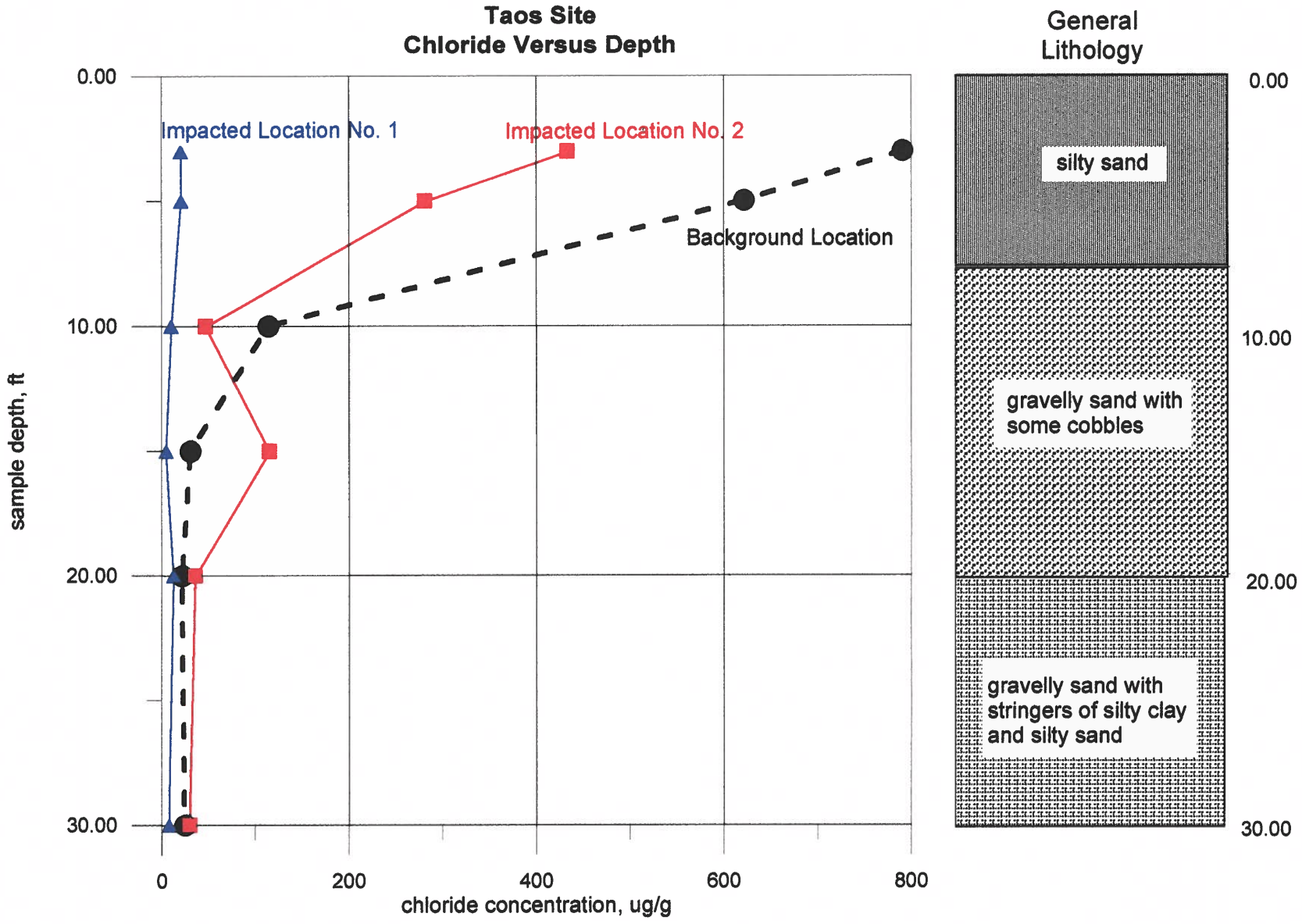


Figure 18. Chloride concentration versus depth for the background, impacted No. 1, and impacted No. 2 locations, Taos Site.

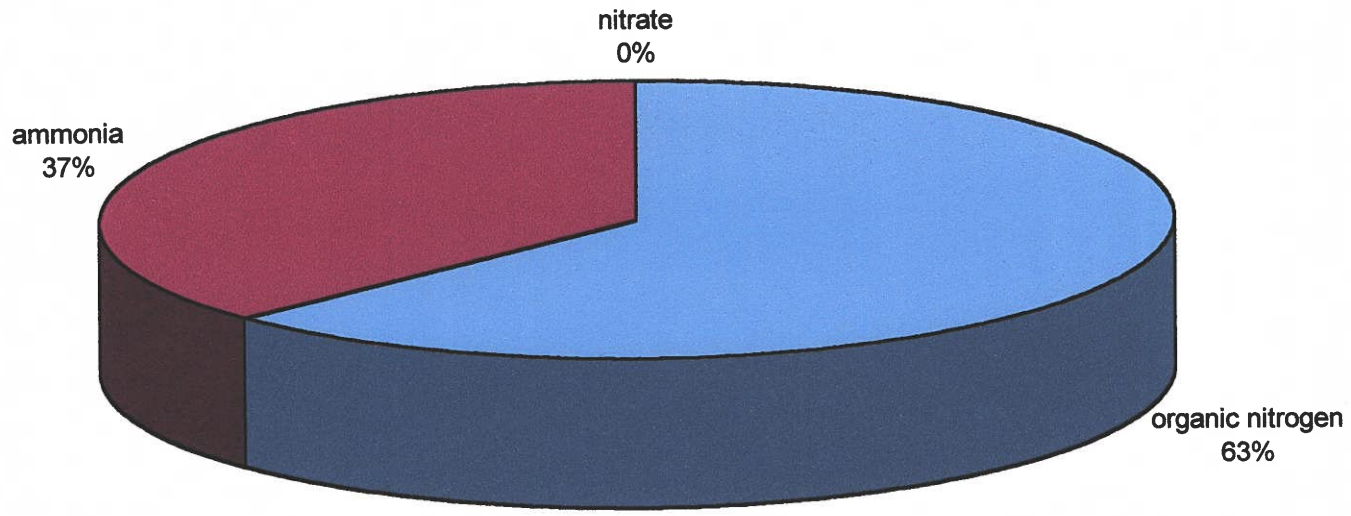


Figure 19. Pie chart showing percentages of organic nitrogen, ammonia, and nitrate of the total nitrogen content in sludge at the Santa Fe Site.

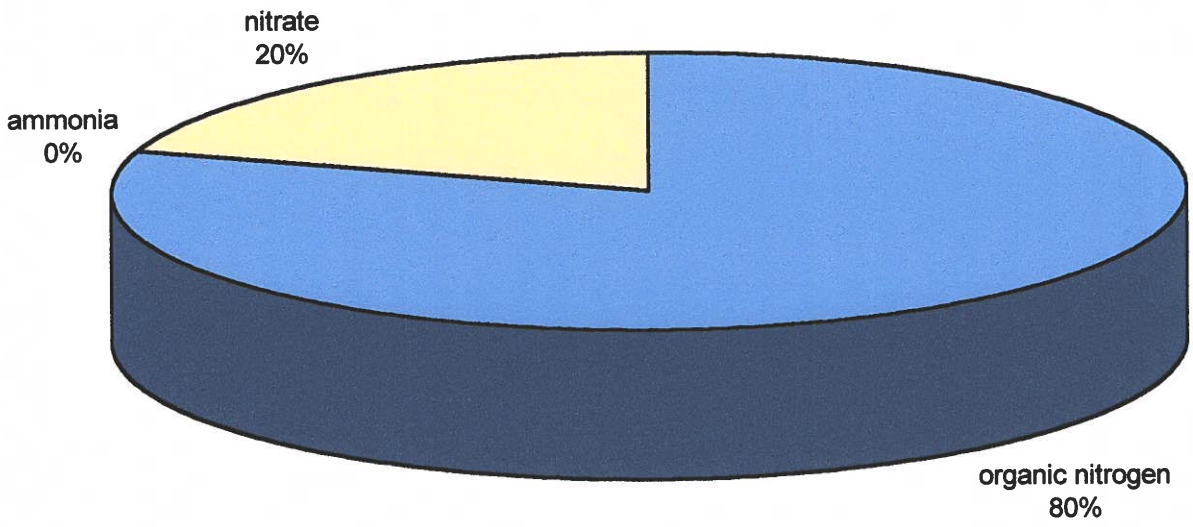


Figure 20. Pie chart showing percentages of organic nitrogen, ammonia, and nitrate of the total nitrogen content in soil sampled 3 feet below land surface at the Santa Fe Site impacted locations.

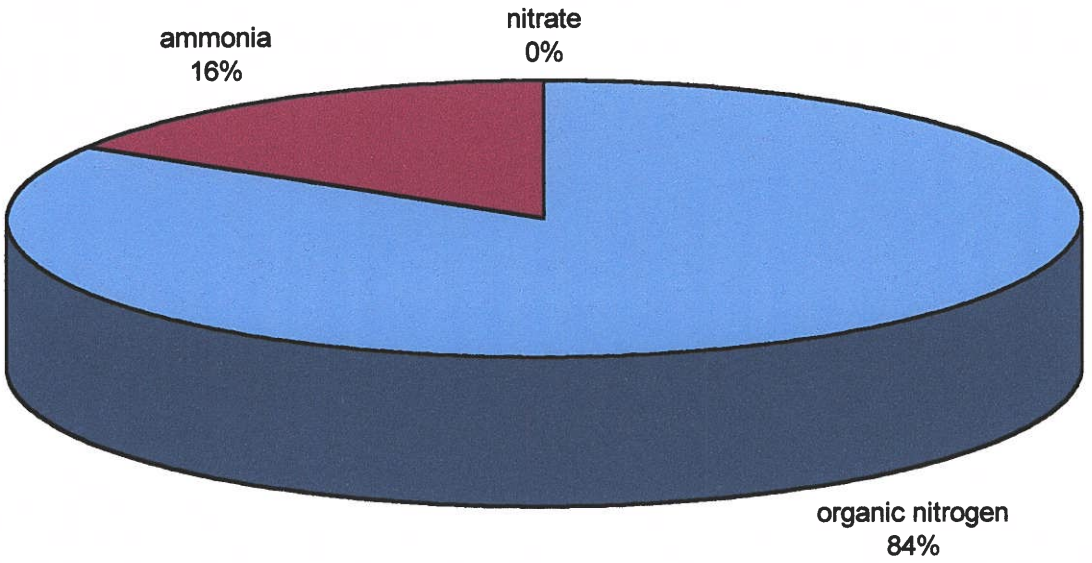


Figure 21. Pie chart showing percentages of organic nitrogen, ammonia, and nitrate of the total nitrogen content in septage at the Taos Site (estimated).

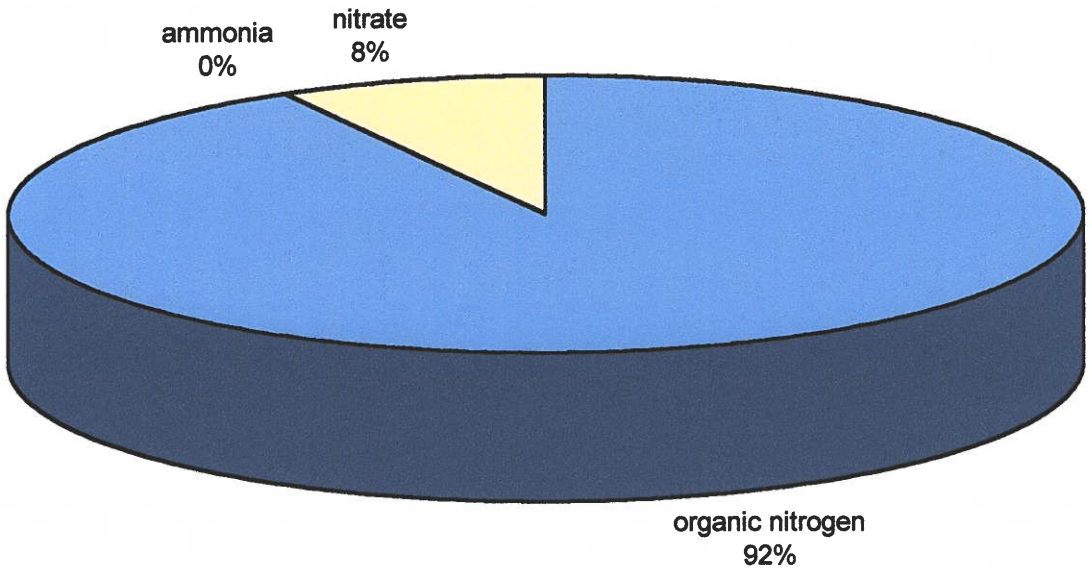


Figure 22. Pie chart showing percentage of organic nitrogen, ammonia, and nitrate of the total nitrogen content in soil sampled 3 feet below land surface at the Taos Site impacted locations.

Appendix A.

List of references from literature search

Sewage Sludge

Aguilar, R., S. R. Loftin, and P. R. Fresques, 1994. Rangeland Restoration with Treated Municipal Sewage Sludge. p. 211-220. In C. E. Clapp et al. (ed.) Sewage Sludge: Land Utilization and the Environment. SSSA Misc. Publ., SSSA, Madison, WI.

Aguilar, R., S. R., Loftin, 1991. Sewage Sludge Application in Semiarid Grasslands: Effects on Runoff and Surface Water Quality. In Proceedings of the 36th annual New Mexico Water Conference, New Mexico Water Resource Research Institute Report No. 265, p. 101-111.

Loftin, S. R., R. Aguilar, 1994. Semiarid Rangeland Response to Municipal Sewage Sludge: Plant Growth and Litter Decomposition. p. 221-229. In C. E. Clapp et al. (ed.) Sewage Sludge: Land Utilization and the Environment. SSSA Misc. Publ., SSSA, Madison, WI.

Loftin, S. R., Management-Scale Applications of Biosolids: Effects on Soil, Soil Water, and Vegetation. U.S. Forest Service Publication. Rocky Mountain Forest and Range Experiment Station, 2205 Columbia SE Albuquerque, NM 87106

Shepherd, M. A., 1996. Factors Affecting Nitrate Leaching from Sewage Sludges Applied to a Sandy Soil in Arable Agriculture. Agriculture, Ecosystems and Environment 58:171-185.

White, C. S., S. R. Loftin, and R. Aguilar, 1997. Application of biosolids to Degraded Semiarid Rangeland: Nine-Year Responses. J. Environ. Qual. 26:1663-1671.

Sommers, L. E., A. L. Page, T. E. Logan, and J. A. Ryan, 1991. Optimum Use of Sewage Sludge on Agricultural Land. In Western Regional Res. Publ. W-124. Colorado Ag. Experiment Station, Ft. Collins.

Barbarick, K. A., R. N. Lerch, J. M. Utschig, D. G. Westfall, R. H. Follett, J. Ippolito, R. Jepson, and T. McBride, 1992. Eight Years of Sewage Sludge addition to dryland Winter Wheat. Colorado Ag. Exp. Station Bull. TB92-1.

Septage Monitoring

Morton, B. L., J. J. Kolega, and H. L. Luce, 1984. Ground Water Monitoring at a Septage lagoon Facility in Connecticut, Ground Water Monitoring Review v.4 n.2 p. 45-50.

Ammonia Volatilization

Adamsen, F. J., and B. R. Sabey, 1987. Ammonia Volatilization from Liquid Digested Sewage Sludge as Affected by Placement in Soil. Soil Sci. Soc. Am. J. 51:1080-1082.

Al-Kanani, T., E. Akochi, A. F. MacKenzie, I. Alli, and S. Barrington, 1992. Organic and Inorganic Amendments to Reduce Ammonia Losses from Liquid Hog Manure. J. Environ. Qual. 21:709-715

Chang, C., and H. H. Janzen, 1996. Long-Term Fate of Nitrogen from Annual Feedlot Manure Applications. J. Environ. Qual. 25:785-790.

Donovan, W. C., and T. J. Logan, 1983. Factors Affecting Ammonia Volatilization from Sewage Sludge Applied to Soil in a Laboratory Study. J. Environ. Qual. 12:584-590.

Ryan, J. A., and D. R. Keeney, 1975. Ammonia Volatilization from Surface Applied Wastewater Sludge, JWPCF, 47, no. 2:386-393.

Sommer, S. G., E. Sibbesen, T. Nielsen, J. K. Schjorring, and J. E. Oelsen, 1996. A Passive Flux Sampler for Measuring Ammonia Volatilization from Manure Storage Facilities. J. Environ. Qual. 25:241-247.

Sommer, S. G. and A. K. Ersboll, 1994. Soil Tilage Effects on Ammonia Volatilization from Surface Applied or Injected Animal Slurry. J. Environ. Qual. 23:493-498.

Zirschky, J. and D. Crawford, 1989. Effect of Wastewater Application Device on Ammonia Volatilization. J. Environ. Eng. 115, no. 6:1258-1263.

Harmel, R. D. and Zartman, R. E., 1997. Modeling Ammonia Volatization from Biosolids Applied to Semiarid Rangeland. Soil Science Journal, 61:1794-1798.

Nitrogen Loading

Haith, D. A., J. E. Reynolds, P. T. Landre, and T. L. Richard, 1991. Sludge Loading Rates for Forest Land. J. Environ. Eng. 118, no. 2:196-208.

Uebler, R. L., 1984. Effect of Loading Rate and Soil Amendments on Inorganic Nitrogen and Phosphorus Leached from Wastewater Soil Absorption System. J. Environ. Qual. 3, no. 3:475-479.

Nitrogen Fate and Transport

Barbarick, K. A., J. A. Ippolito, and D. G. Westfall, 1996. Distribution and mineralization of biosolids nitrogen applied to dryland wheat. JEQ. 25:796-801.

Sumner, D. M., D. E. Rolston, L. A. Bradner, 1998. Nutrient Transport and Transformation beneath an Infiltration Basin. Water Environment Research 70, no. 5:997-1004.

Tindall, J. A., K. J. Lull, and N. G. Gaggiani, 1994. Effects of Land Disposal of Municipal Sewage Sludge on Fate of Nitrates in Soil, Streambed Sediment, and Water Quality. Journal of Hydrology 163:147-185.

Schuh, W. M., D. L. Klinkbiel, J. C. Gardner, and R. F. Meyer, 1997. Tracer and Nitrate Movement to Groundwater in Northern Great Plains. Journal of Environmental Quality, 26:1335-1348.

Lance, J. C., 1972. Nitrogen removal by Soil Mechanisms. Journal Water Pollution Control Federation. v.44, no.4, pp. 1352-1361.

Walker, W. G., J. Bouma, D. R. Keeney, and F. R. Magdoff, 1973a. Nitrogen Transformations during subsurface disposal of septic tank effluent in sands: I. Soil Transformations. JEQ. v.2, no.4, pp. 475-480.

Walker, W. G., J. Bouma, D. R. Keeney, and P. G. Olcott, 1973b. Nitrogen Transformations during subsurface disposals of septic tank effluent in sands. II. Ground Water Quality. JEQ. v.2, no.4, pp. 475-480.

Tinker, J. R., Jr., 1991. Analysis of nitrate-nitrogen in ground water beneath unsewared subdivisions. Ground Water Monitoring Review. v.11, no.1, pp.141-150.

Harkin, J. M., C. J. Fitzgerald, C. P. Duffy, and D. G. Kroll, 1979. Evaluation of mound systems for purification of septic tank effluent. Water Resources Center, Univ. of Wisc. Madison. Technical Report WIS WRC 79-05.

Gilliam, J. W., et al., 1996. Contamination of Surficial Aquifers with Nitrogen Applied to Agricultural Land. Report No. 306, Water Resources Research Institute of the Univ. of North Carolina.

Westerman, 1995. Estimated Seepage Losses from Established Swine Waste Lagoons in the Lower Coastal Plain of North Carolina. Transactions of the ASAE 38(2):449-453.

Kelly, Brian P., Michael Pomes, 1998. Preferential Flow and Transport of Nitrate and Bromide in Claypan Soil. Ground Water. v.36, no.3, p. 484.

Nielson, D. R., M. Th. Van Genuchten, and J. W. Biggar, 1986. Water flow and solute transport processes in the unsaturated zone. Water Resources Research 22, no. 9:895-1085.

Richard, T. L., and T. S. Steenhuis, 1988. Tile drain sampling of preferential flow on a field scale. Journal of Contaminant Hydrology 3, no. 2-4:307-325.

Silva, S. R., C. Kendall, D. H. Wilkison, A. C. Ziegler, C. C. Y. Chang, and R. J. Avanzino. In press. Collection and analysis of nitrate from fresh water for nitrogen and oxygen isotopes. Journal of Hydrology.

Singh, P., and R. S. Kanwar, 1991. Preferential solute transport through macropores in large undisturbed saturated soil columns. Journal of Environmental Quality 20, no.1: 295-300.

Tindall, J. A. R. L. Petrusak, and P. B. McMahon, 1994. Nitrate transport and transformation processes in unsaturated porous media. Journal of Hydrology 169, 51-94.

van Ommen, H. C. R. Dijksma, and J. M. H. Hendrickx, 1989. Experimental assessment of preferential flow paths in a field soil. Journal of Hydrology 105, no. 3: 253-262.

Land Disposal of Septage

Logan, T. J. and R. L. Chaney, 1983. Utilization of waste water and sludges on land. In A. L. Page (ed.) Proc. of the 1983 Workshop on Utilization of Municipal Waste Water and Sludge on Land. Univ. of Cal-Riverside.

Biosolids

Barbarick, K. A., J. A. Ippolito, and D. G. Westfall, 1997. Sewage biosolids cumulative effects on extractable-soil and grain elemental concentrations. JEQ. 26:1696-1702.

Barbarick, K. A., J. A. Ippolito, and D. G. Westfall, 1998., Extractable elements in the soil profile after years of biosolids application. JEQ.27:801-805.

Dennis, G. L., and P. R. Fresquez, 1989. The soil microbial community in a sewage-amended semi-arid grassland. Biol. And Fert. Soils. 7:310-317. (*Soil test methods*).

Aguilar, R. and S. Loftin, 1991. Sewage Sludge Application in Semi-arid Grasslands: Effects on Runoff and Surface Water Quality. New Mexico Water Resources Research Institute Report, 265.

King, J. P., H. S. Fahmy, A. W. Blair, and R. Jacquez, 1992. Developing criteria for small on-site sewage treatment systems: two case studies.

Brandvold, D. K. and J. A. Brierley, 1977. Feedlot runoff and sewage effluent as potential water pollutants with emphasis on nitrogen and phosphate levels and oxygen depletion.

Trotter, E. H., B. Thomson, and R. Coleman, 1994. Evaluation of a subsurface flow wetland processing sewage from the Sevilleta LTER Field Station.

Aguilar, R., S. R. Loftin, T. J. Ward, K. A. Stevens, and J. R. Gosz, 1994. Sewage sludge application in semiarid grasslands: effects on vegetation and water quality.

Nitrate Leaching

Hantzsche, N. N., and E. J. Finnemore, 1992. Predicting Ground-Water Nitrate-Nitrogen Impacts. Ground Water. v. 30, no. 4, p. 490-499.

Jabro, J. D., W. L. Stout, S. L. Fales, and R. H. Fox, 1997. Nitrate Leaching from Soil Core Lysimeters Treated with Urine or Feces under Orchardgrass: Measurement and Simulation. J. Environ. Qual. 26:89-94.

Saporito, L. S., and L. E. Lanyon, 1998. Evaluating Management and Soil and Weather Contributions to Potential Nitrate Leaching from a Pennsylvania Dairy Farm using NLEAP. J. Environ. Qual. 27:1367-1375.
Swensen, B., and B. R. Singh, 1997. Soil Processes and Chemical Transport. J. Environ. Qual. 26:1516-1523.

Medalie, L., W. B. Bowden, and C. T. Smith, 1994. Nutrient Leaching following Land Application of Aerobically Digested Municipal Sewage Sludge in a Northern Hardwood Forest. J. Environ. Qual. 23:130-138.

Korom, S. F., and R. W., Jeppson, 1994. Nitrate Contamination from Dairy Lagoons Constructed in Coarse Alluvial Deposits. J. Environ. Qual. 23:973-976.

Stout, W. L., W. J. Gburek, R. R. Schnabel, G. J. Folmar, and S. R. Weaver, 1998. Soil-Climate Effects on Nitrate Leaching from Cattle Excreta. J. Environ. Qual. 27:992-998.

Stout, W. L., S. A. Fales, L. D. Muller, R. R. Schnabel, W. E. Priddy, and G. F. Elwinger, 1997. Nitrate Leaching from Cattle Urine and Feces in Northeast USA. Soil Sci. Soc. Am. J. 61:1787-1794.

Adams, P. L., T. C. Daniel, D. R. Edwards, D. J. Nichols, D. H. Pote, and H. D. Scott, 1994. Poultry Litter and Manure Contributions to Nitrate Leaching through the Vadose Zone. Soil Sci. Soc. Am. J. 58:1206-1211.

Larocque, M., and O. Banton, 1994. Determining Parameter Precision for Modeling Nitrate Leaching: Inorganic Fertilization in Nordic Climates. Soil Sci. Soc. Am. J. 58:896-400.

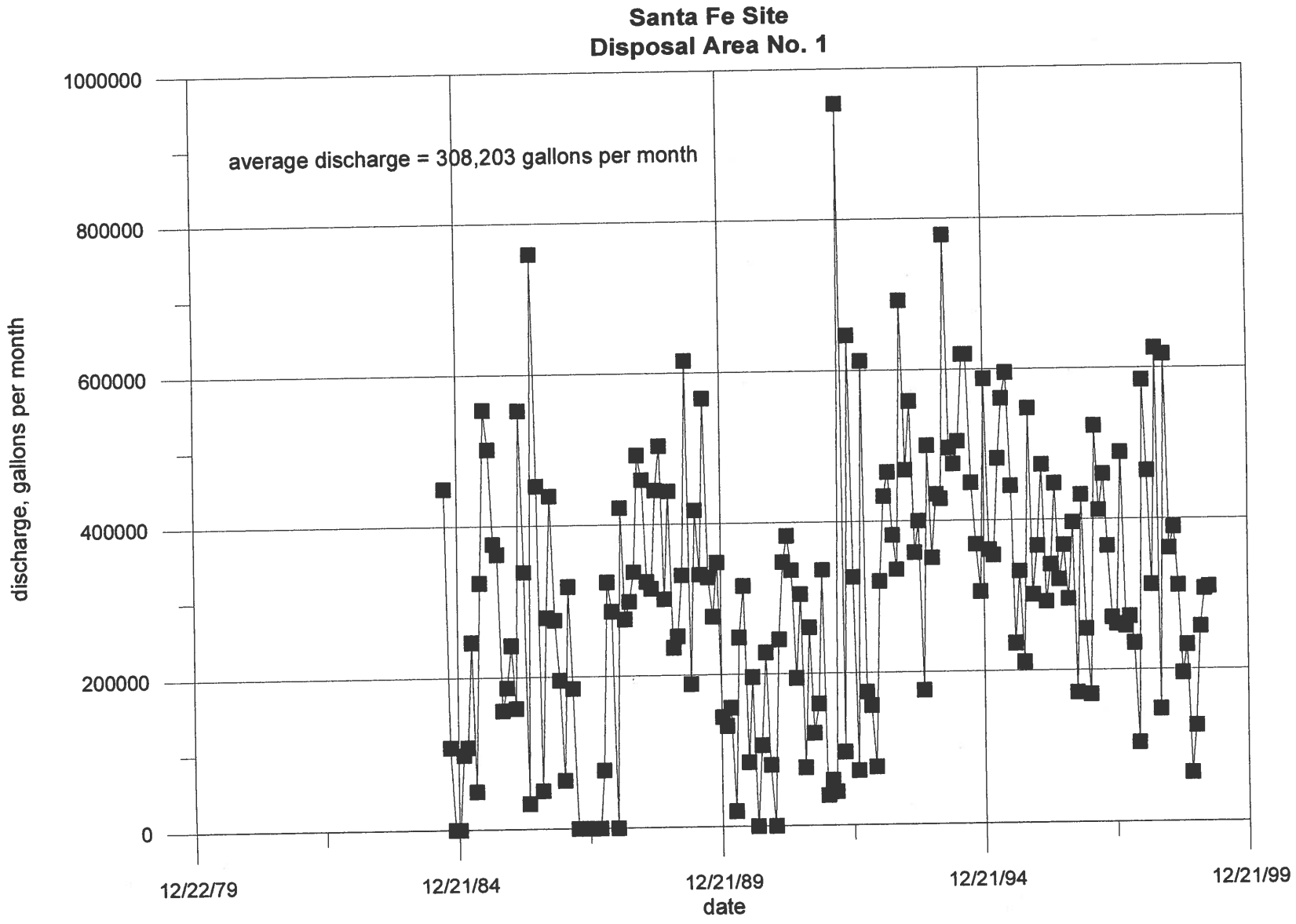
Evans, S. D., G. A. Peterson, D. G. Westfall, and E. McGee, 1994. Nitrate Leaching in Dryland Agroecosystems as Influenced by Soil and Climate Gradients. J. Environ. Qual. 23:999-1005.

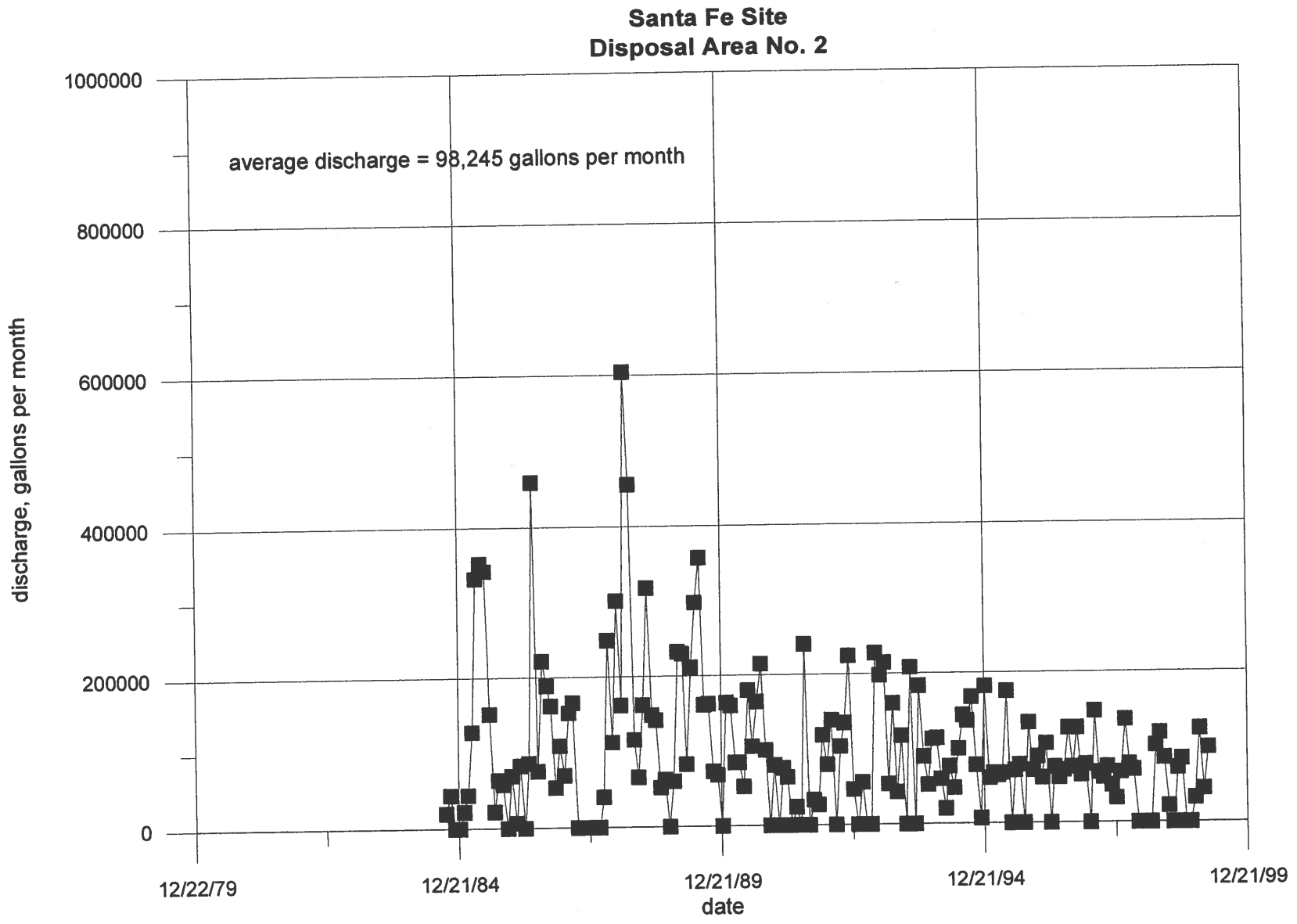
Khakural, B. R., and P. C. Robert, 1993. Soil Nitrate Leaching Potential Indices: Using a Simulation Model as a Screeing System. J. Environ. Qual. 22:839-845.

Appendix B.

Time series graphs of sludge discharge for each discharge area, and nitrogen concentrations in ground water, Santa Fe Site, City of Santa Fe Sludge Disposal Facility

JOHN SHOMAKER & ASSOCIATES, INC.
WATER-RESOURCE AND ENVIRONMENTAL CONSULTANTS


Santa Fe Site
Disposal Area No. 1
average discharge = 308,203 gallons per month
discharge, gallons per month
1000000
800000
600000
400000
200000
0
12/22/79
12/21/84
12/21/89
12/21/94
12/21/99
date


Santa Fe Site
Disposal Area No. 2
average discharge = 98,245 gallons per month
discharge, gallons per month
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800000
600000
400000
200000
0
12/22/79
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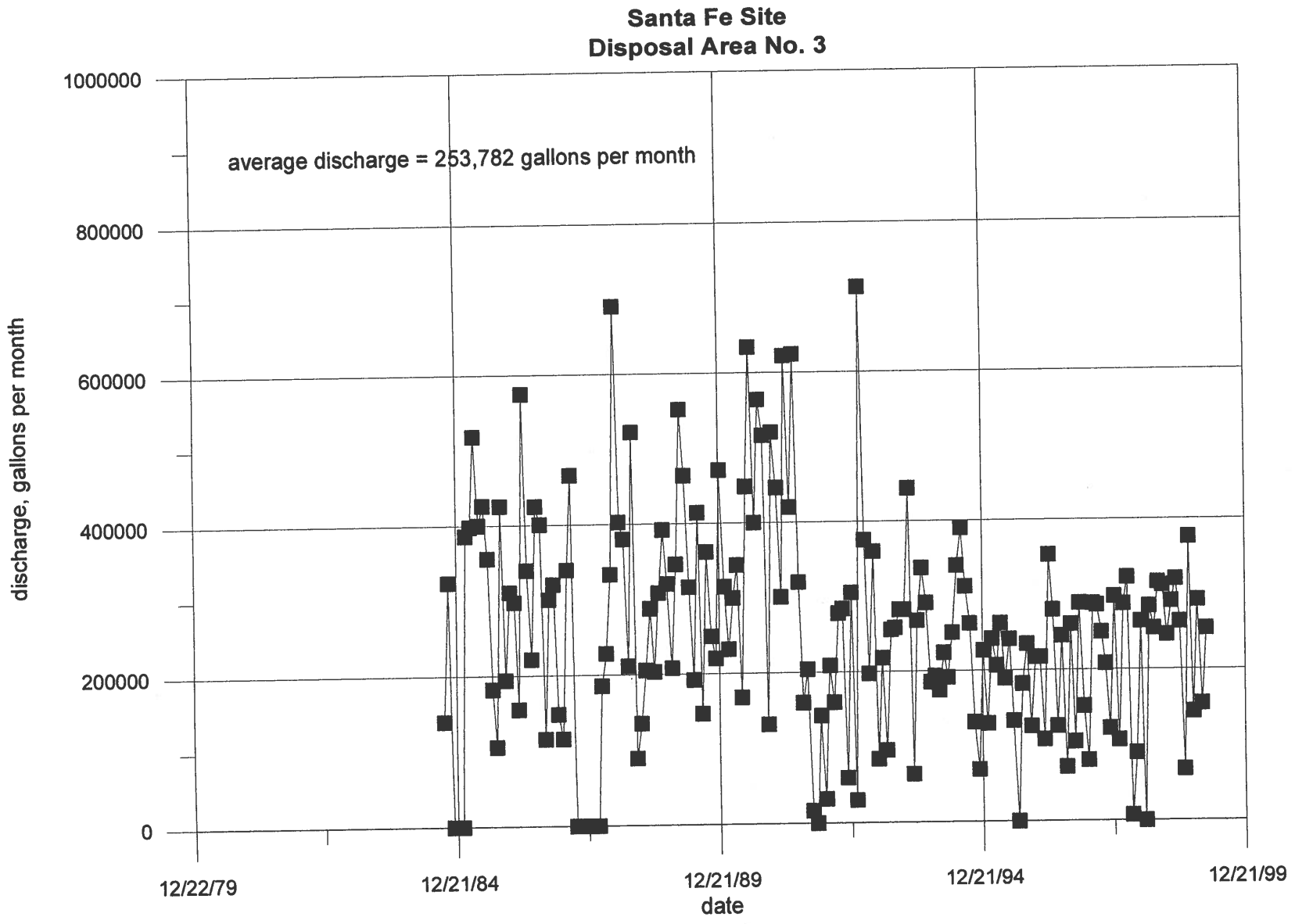
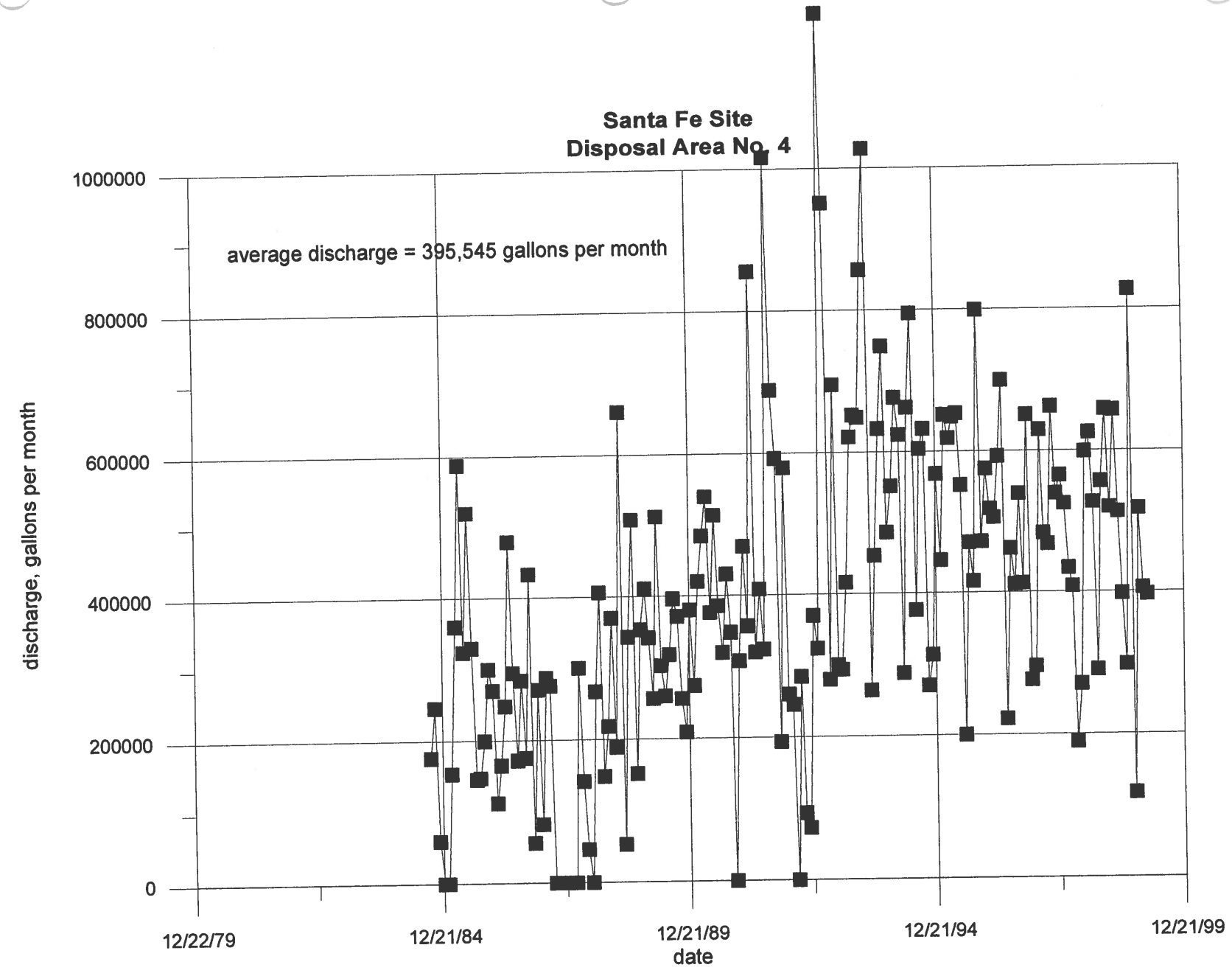
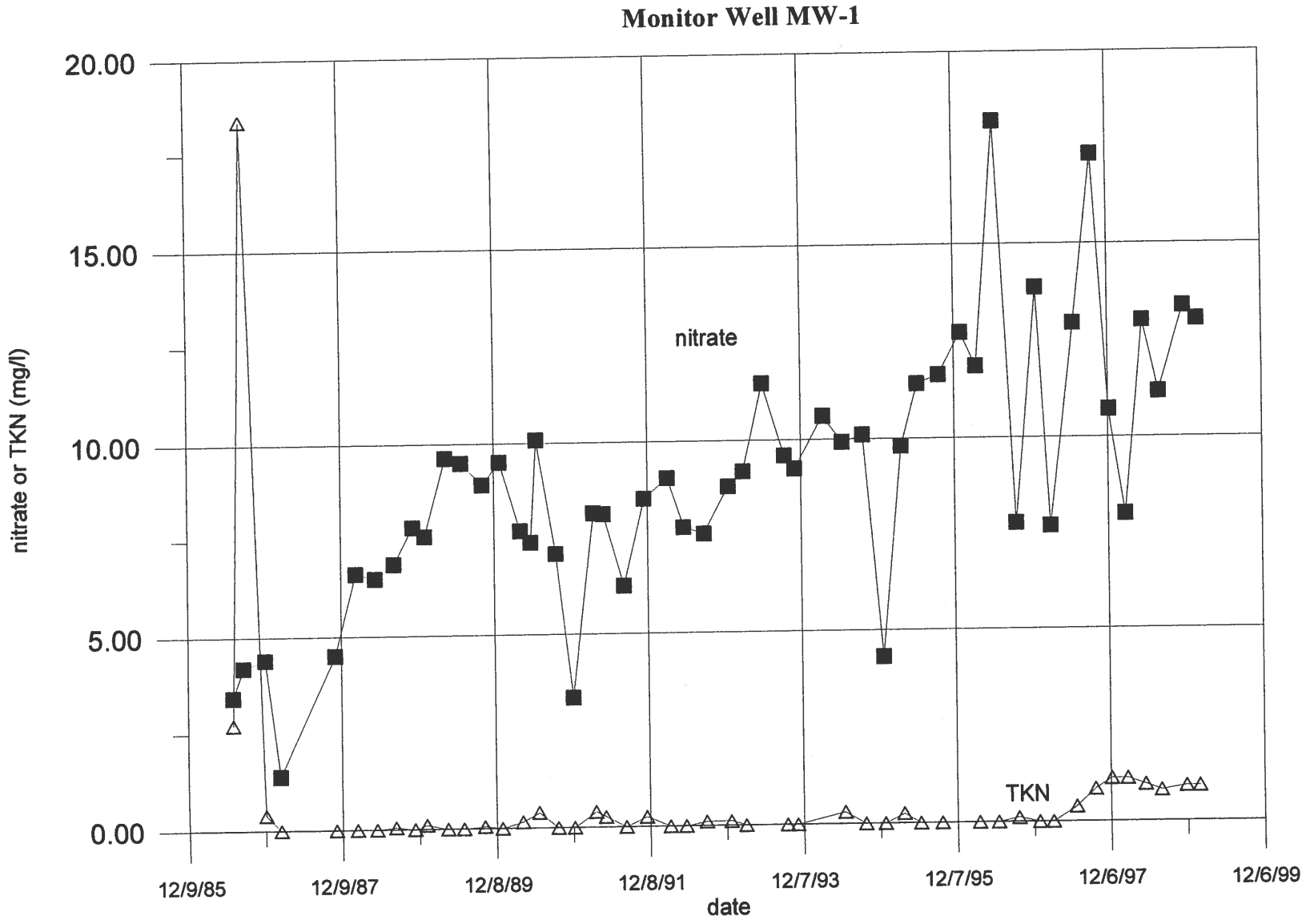
12/21/89
12/21/94
12/21/99
date

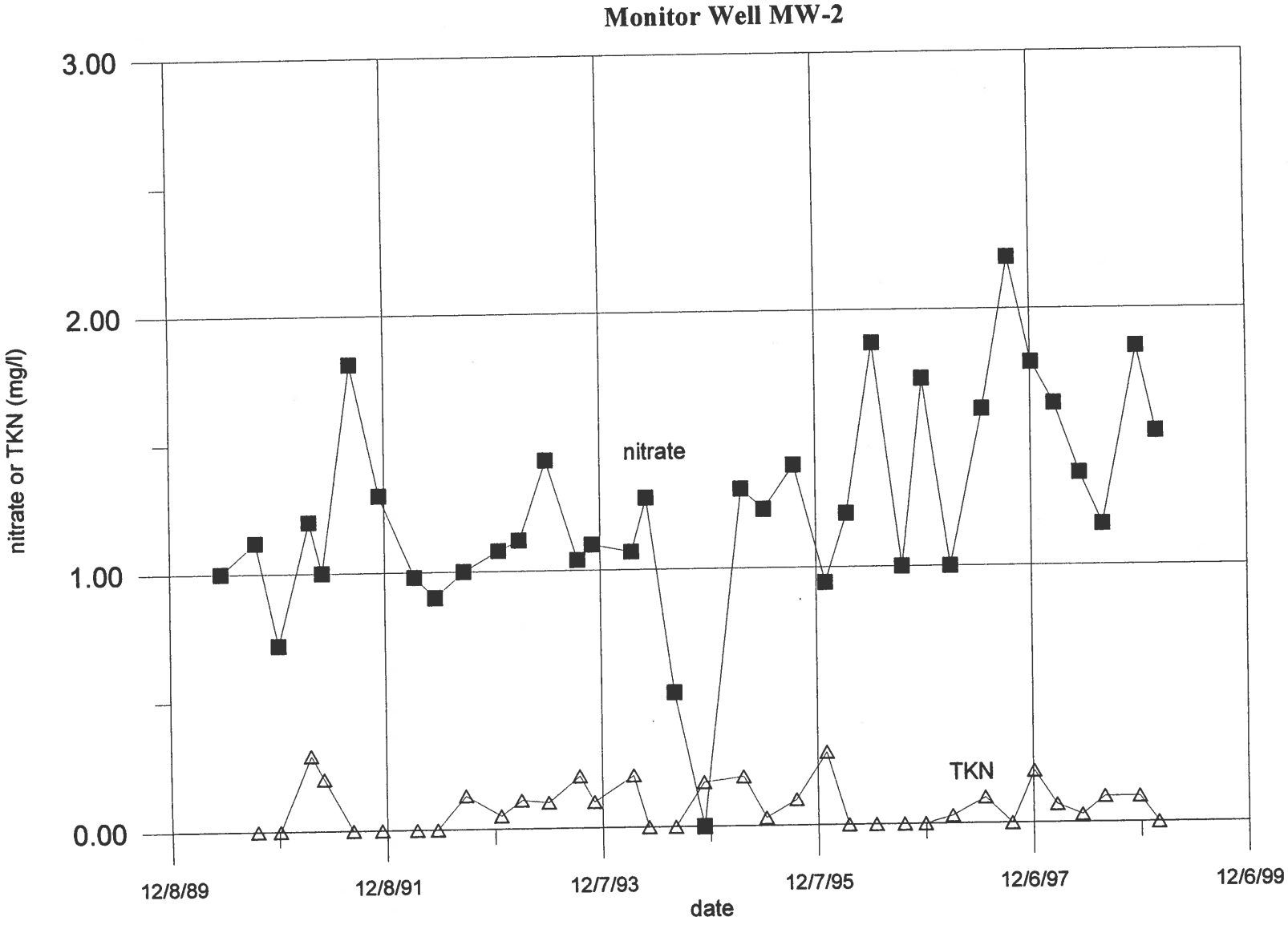

Santa Fe Site
Disposal Area No. 3
average discharge = 253,782 gallons per month
discharge, gallons per month
1000000
800000
600000
400000
200000
0
12/22/79
12/21/84
12/21/89
12/21/94
12/21/99
date

69000


Santa Fe Site
Disposal Area No. 4
average discharge = 395,545 gallons per month
discharge, gallons per month
1000000
800000
600000
400000
200000
0
12/22/79
12/21/84
12/21/89
12/21/94
12/21/99
date

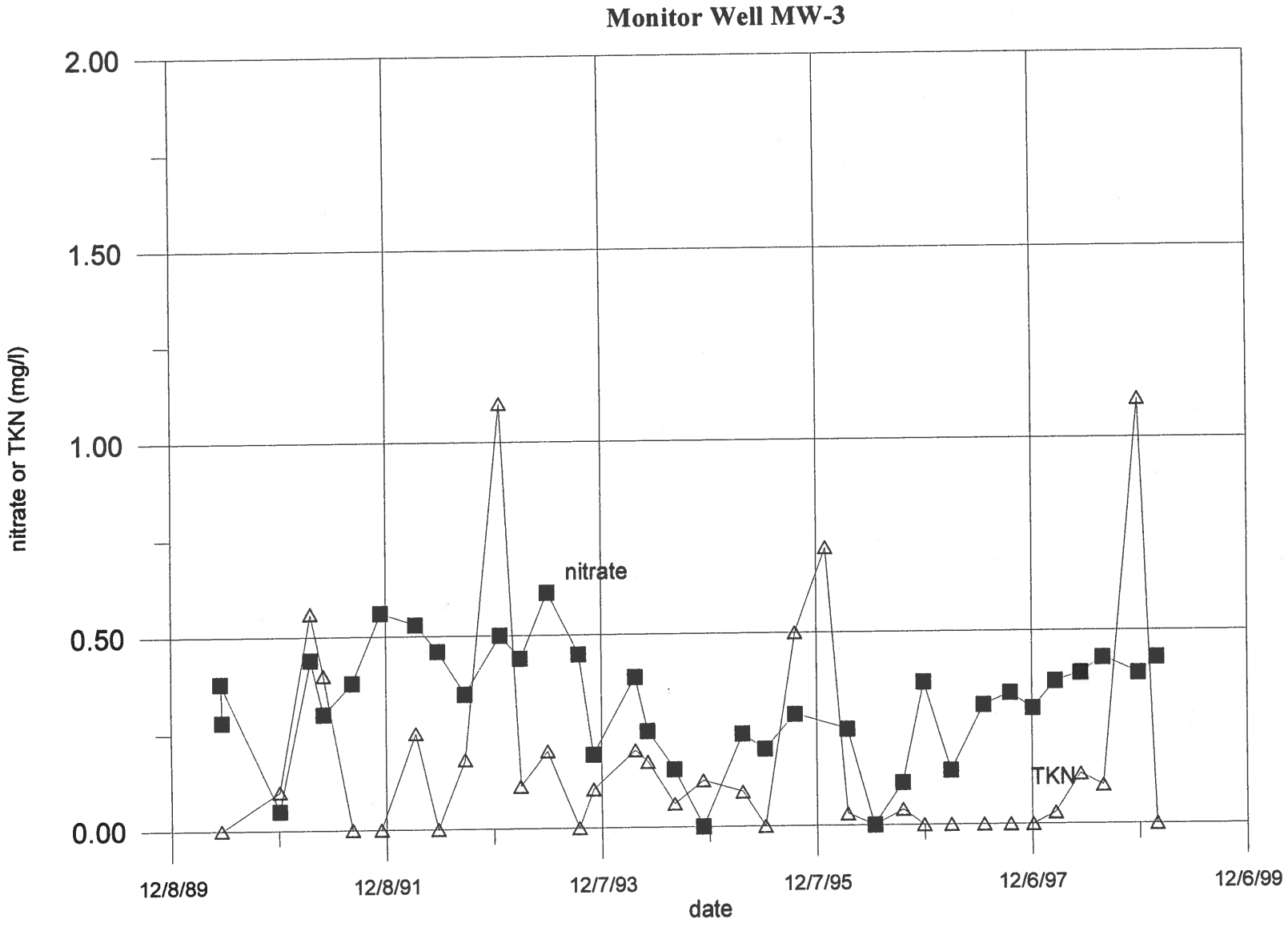


Graph showing nitrate and TKN versus time for monitor well MW-1,
Santa Fe Sludge Disposal Site

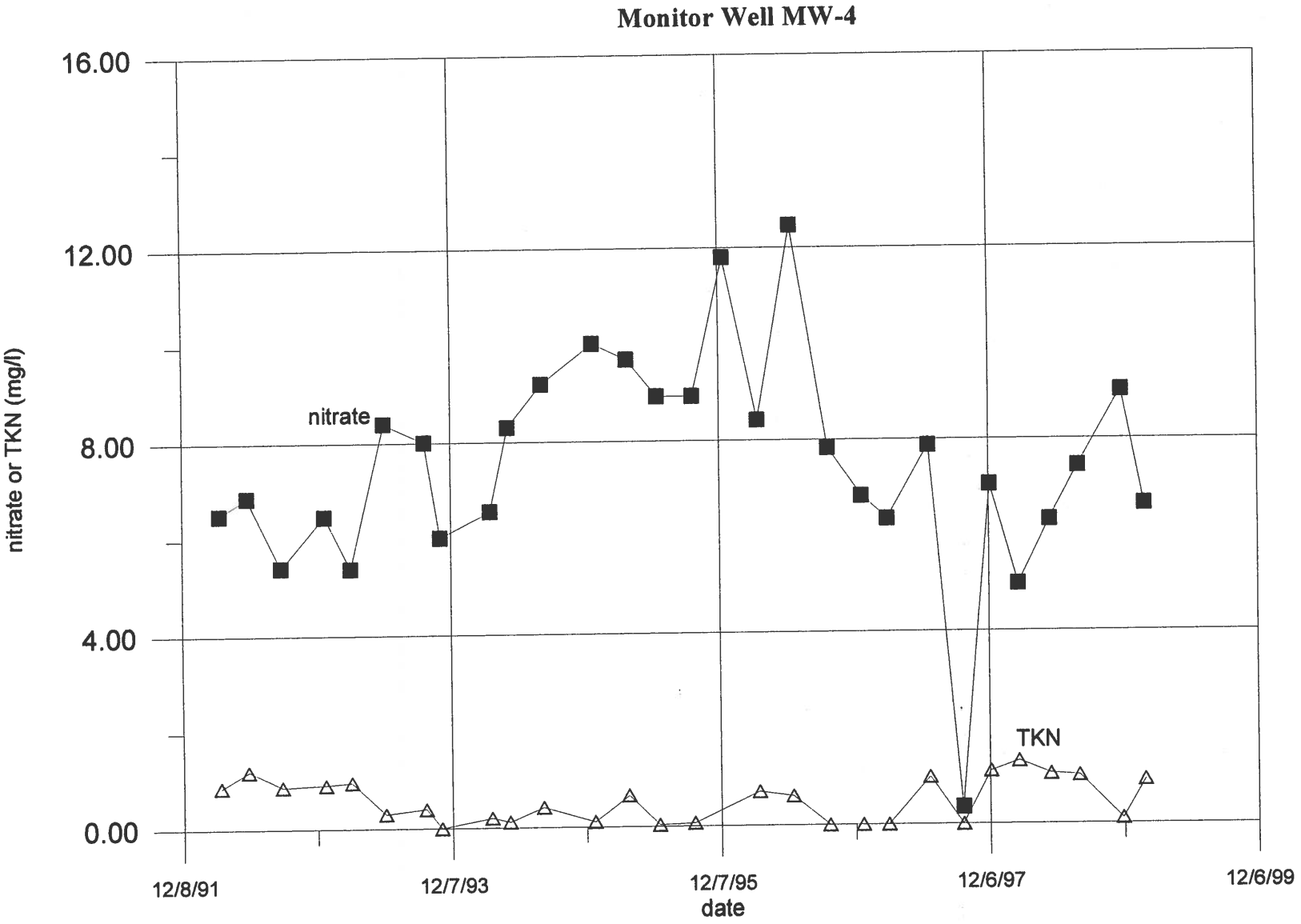


Graph showing nitrate and TKN versus time for monitor well MW-2,
Santa Fe Sludge Disposal Site

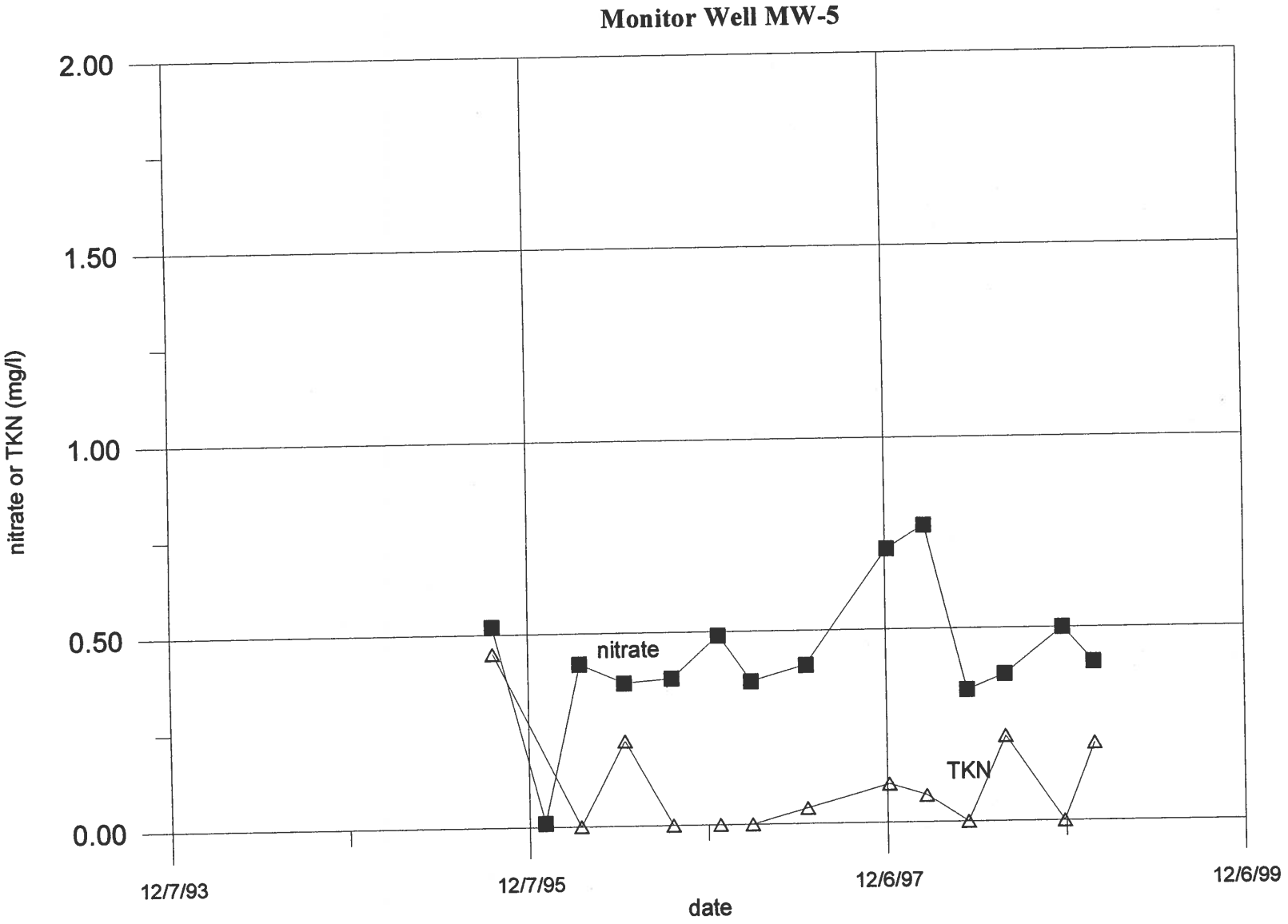
0007Z



Graph showing nitrate and TKN versus time for monitor well MW-3,
Santa Fe Sludge Disposal Site



Graph showing nitrate and TKN versus time for monitor well MW-4,
Santa Fe Sludge Disposal Site



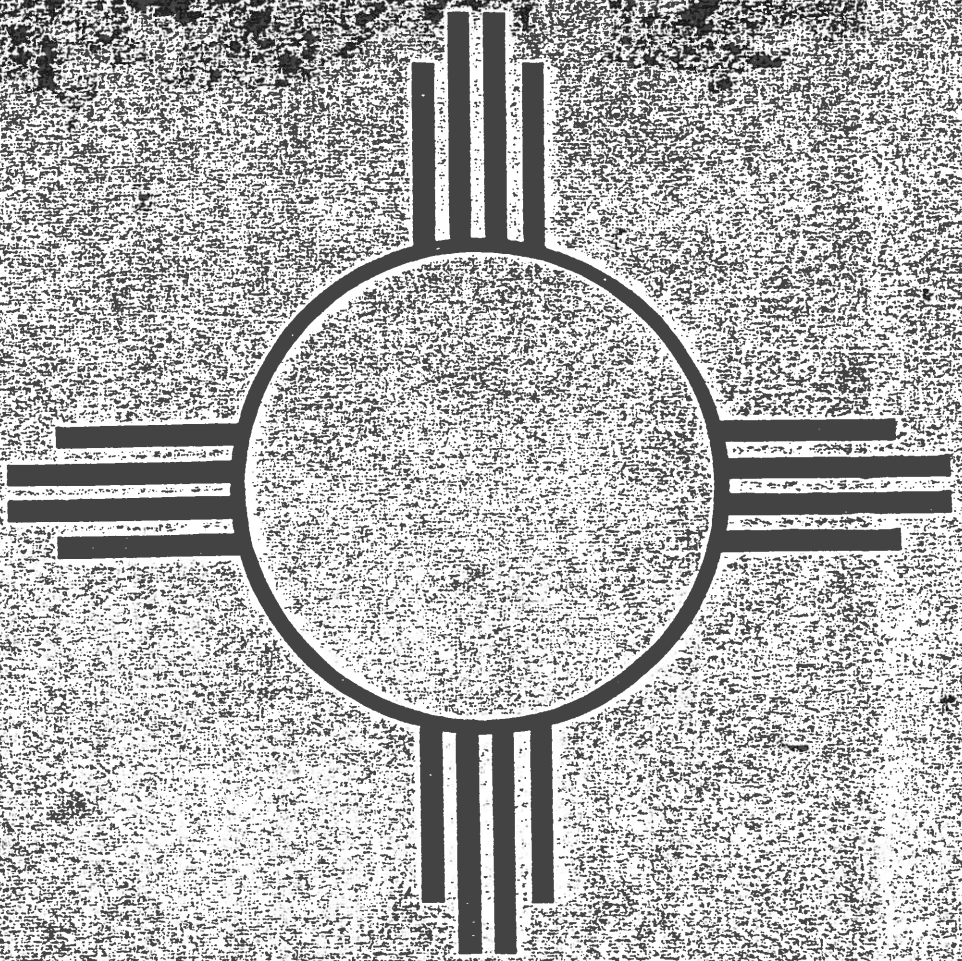
Graph showing nitrate and TKN versus time for monitor well MW-5,
Santa Fe Sludge Disposal Site

Appendix C.

Climatic data for the Santa Fe and Taos Sites

Thorndale

NEW MEXICO CLIMATOLOGICAL DATA



PRECIPITATION, TEMPERATURE, EVAPORATION, AND WIND

MONTHLY AND ANNUAL MEANS

1850 — 1975

Station Otto FAA Airport County Santa Fe Index No. 6492

Latitude 35°05' Longitude 106°01' Elevation 6226 ft

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Precip													
Years of record	42	40	39	41	40	41	43	43	40	40	39	39	34
Mean	.45	.42	.45	.61	.97	.96	2.27	1.97	1.30	.96	.38	.51	11.63/ 11.25
Temp													
Years of record	40	40	40	40	38	37	42	43	41	38	39	39	31
Mean	28.6	33.1	39.8	48.1	56.4	65.7	70.4	68.6	61.8	50.4	38.3	30.4	49.6/ 49.3
PE	.38	.50	1.06	2.18	3.93	5.95	6.99	5.93	3.89	2.02	.73	.40	33.96
Surplus	.07											.11	.18
Deficit		.08	.61	1.57	2.96	4.99	4.72	3.96	2.59	1.06	.35		22.89

Station Santa Fe County Santa Fe Index No. 8072

Latitude 35°41' Longitude 105°54' Elevation 7200 ft

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Precip													
Years of record	115	116	115	114	113	112	112	112	116	115	116	108	106
Mean	.62	.77	.75	.88	1.18	1.11	2.55	2.39	1.54	1.09	.71	.80	14.22/ 14.39
Temp													
Years of record	96	96	94	95	95	93	93	95	94	95	95	94	85
Mean	29.8	33.2	38.5	47.3	57.3	65.9	69.4	67.7	61.6	50.9	39.1	30.9	48.6/ 49.3
PE	.39	.50	.97	2.07	4.12	6.06	6.84	5.80	3.82	2.08	.76	.41	33.82
Surplus	.23	.27										.39	.89
Deficit			.22	1.19	2.94	4.95	4.29	3.41	2.28	.99	.05		20.32
Evap													
Years of record	0	0	1	4	13	20	20	18	20	19	4	0	0
Mean			3.21	7.91	9.43	11.22	10.21	8.48	7.32	5.39	2.85		
Wind													
Years of record	5	5	6	9	20	20	20	20	20	19	14	7	5
Mean	1253	1275	1532	1767	1902	1752	1432	1226	1248	1384	1430	1281	15713/ 17482

Station Santa Fe 2SE County Santa Fe Index No. 8090

Latitude 35°41' Longitude 105°56' Elevation 7240 ft

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Precip													
Years of record	3	3	3	3	3	4	4	3	3	2	3	3	1
Mean	1.15	.51	.32	.56	1.01	1.91	2.12	2.48	1.13	1.38	.22	.18	18.96/ 12.97
Temp													
Years of record	3	3	2	3	3	4	3	3	3	1	2	3	0
Mean	29.6	33.6	40.4	48.4	57.8	66.1	71.3	69.1	62.9	50.5	39.3	33.8	50.2 /
PE	.39	.50	1.10	2.20	4.22	6.08	7.26	6.06	4.01	2.02	.79	.44	35.07
Surplus	.76	.01											.77
Deficit			.78	1.64	3.21	4.17	5.14	3.58	2.88	.64	.57	.26	22.87
Evap													
Years of record	0	0	0	0	3	4	2	3	3	2	1	0	0
Mean					6.71	10.19	10.41	8.93	8.49	5.64	4.56		
Wind													
Years of record	0	0	0	1	2	2	1	1	2	0	0	1	0
Mean				2905	2502	2877	2003	1887	2249			1543	

Station Santa Fe CAA Airport County Santa Fe Index No. 8078

Latitude 35°37' Longitude 106°05' Elevation 6312 ft

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Precip													
Years of record	17	17	17	17	17	17	17	17	17	17	17	17	16
Mean	.42	.39	.57	.54	.73	.64	1.80	2.08	1.05	.88	.35	.42	9.63/ 9.87
Temp													
Years of record	16	16	16	16	16	17	16	16	16	16	16	16	15
Mean	30.7	35.4	39.5	49.4	58.4	67.8	72.2	70.3	64.3	53.1	38.8	31.2	51.0/ 50.9
PE	.41	.53	1.05	2.33	4.32	6.46	7.51	6.30	4.26	2.28	.76	.41	36.62
Surplus	.01											.01	.02
Deficit		.14	.48	1.79	3.59	5.82	5.71	4.22	3.21	1.40	.41		26.77

Station South Fork A County Taos Index No. _____

Latitude 36°35' Longitude 105°30' Elevation 8405 ft

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Precip													
Years of record	0	0	0	1	2	2	2	2	2	2	0	0	0
Mean													
Temp													
Years of record													
Mean													
PE													
Surplus													
Deficit													

Station Taos County Taos Index No. 8668

Latitude 36°23' Longitude 105°36' Elevation 6970 ft

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Precip													
Years of record	79	80	82	81	78	79	80	80	81	81	80	80	73
Mean	.74	.71	.84	.93	1.17	.89	1.70	1.82	1.24	1.01	.67	.65	12.46/ 12.37
Temp													
Years of record	73	75	76	78	73	75	76	72	72	71	69	74	59
Mean	25.0	30.9	38.2	46.5	55.0	65.6	68.1	66.8	58.9	48.5	30.6	26.7	47.3/ 46.7
PE	.33	.46	.96	2.00	3.73	5.98	6.51	5.60	3.41	1.84	.49	.35	31.66
Surplus	.41	.25									.18	.30	1.14
Deficit			.12	1.07	2.56	5.09	4.81	3.78	2.17	.83			20.43

TAOS, NEW MEXICO (298668)

Period of Record Monthly Climate Summary

Period of Record : 1/ 1/1914 to 12/31/1998

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	39.7	45.5	52.8	62.6	71.9	82.0	85.5	83.3	76.8	66.0	52.1	41.9	63.4
Average Min. Temperature (F)	9.5	16.4	22.6	29.4	37.5	45.2	50.8	49.7	42.6	31.8	20.3	11.9	30.7
Average Total Precipitation (in.)	0.69	0.65	0.84	0.91	1.25	0.88	1.67	1.85	1.26	1.08	0.75	0.65	12.47
Average Total SnowFall (in.)	7.5	5.5	5.0	1.8	0.5	0.0	0.0	0.0	0.0	0.6	2.9	6.4	30.1
Average Snow Depth (in.)	2	1	0	0	0	0	0	0	0	0	0	1	0

Western Regional Climate Center, wrcc@dri.edu

TAOS, NEW MEXICO

Monthly Average Temperature (Degrees Fahrenheit)

File last updated on Apr 13, 1999
*** Note *** Provisional Data *** After Year/Month 199812
a = 1 day missing, b = 2 days missing, c = 3 days, ..etc..,
z = 26 or more days missing, A = Accumulations present
Long-term means based on columns; thus, the monthly row may not
sum (or average) to the long-term annual value.
MAXIMUM ALLOWABLE NUMBER OF MISSING DAYS : 5
Individual Months not used for annual or monthly statistics if more than 5 days are missing.
Individual Years not used for annual statistics if any month in that year has more than 5 days missing.

YEAR(S)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
1914	27.68	32.00	37.66	46.53	56.08	65.73	65.58	65.39	61.22	48.13a	40.45	24.03	47.54
1915	21.48	27.62	32.58	47.85	51.65	61.62	66.63	64.15	57.37	49.37	37.68	28.44	45.54
1916	27.97	33.05	41.68	46.27	54.98	63.63	66.92	66.32	57.80	47.15	35.36a	25.13	47.19
1917	23.23	30.23	33.34	44.63	48.06	63.33	69.06	65.82	60.12	47.92	39.45	32.10	46.44
1918	22.15	31.98	40.60	44.42	54.32	66.30	67.60b	64.92f	58.23	49.87	34.03	21.95	44.68
1919	14.63	22.82	36.72d	49.35	56.08	62.97	67.81	67.10j	60.45	----- z	37.20	29.58	43.76
1920	29.05	36.21	37.55	40.78j	56.66	62.53	67.08	64.08	57.22	47.48	36.07	24.02	47.09
1921	29.37	----- z	43.64j	42.72	55.29	62.27	66.11	----- z	59.53	49.13a	38.22	33.68	48.48
1922	23.90	30.91a	36.40	----- z	56.08	65.40	68.73	67.55	60.48	47.08	35.15	30.65	47.48
1923	30.23	31.16	36.11	46.32	----- z	64.24g	68.06	64.18	55.43	45.10	37.93	29.84	44.44
1924	21.65	36.14	35.35	45.30	55.79	65.92	67.61	66.73	58.77	50.95	40.12	22.69	47.25
1925	18.45	32.23	42.55	50.52	58.52	63.78	68.88a	64.79	59.32	49.66	36.94d	26.79	47.70
1926	21.79	33.93	38.82	46.32	53.16	63.10	65.66	66.31	61.43	51.19	37.63	26.42	47.15
1927	31.87	36.18	38.56	47.55	56.24	62.58	67.69	64.63	59.33	48.87	40.82	24.08	48.20
1928	29.63	32.05	40.98	44.42	56.03	62.20	67.05	64.77	60.00	51.48	36.42	25.27	47.53
1929	22.32	25.11	36.84c	45.95	53.65	63.53	67.56	64.95	58.62	50.71	33.93	30.90	46.17
1930	24.35	41.18	36.98	51.83	52.56	65.92	67.89	65.98	59.30	----- z	34.02	19.74	47.25
1931	24.90	36.48	35.85	48.12	54.53	66.90	70.56	67.90	62.58	53.85	37.12	19.42	48.19
1932	18.60	37.24	37.16	47.03	55.15	62.13	68.38a	67.92	57.38	44.45	35.50	21.63	46.05
1933	20.61	19.70	38.16	41.70	52.77	65.07	69.68	67.31	62.03	49.58	35.87	29.24	45.98
1934	24.18	35.25	41.82	50.07	60.13	64.13	70.31	68.89	57.37	48.48	34.97	25.90	48.46
1935	28.85	30.34	36.08	45.75	50.84	64.47	68.77	67.45	57.88	47.37	31.70	22.18	45.97
1936	24.34	31.48	38.52	47.03	57.45	65.93	----- z	66.24	57.67	47.53	35.60	----- z	47.18
1937	18.98g	31.73	39.95	48.22	58.21	63.88	67.26	70.32	63.48	52.00	41.35	33.18	51.78
1938	28.69	34.41	39.55	46.68	53.87	64.88	67.75a	69.05	60.83	51.15	32.93	30.95	48.40
1939	26.31	22.20	38.55	47.48	56.45	63.82	68.53	66.48	61.25	47.63	38.33	25.53o	48.82
1940	24.10	27.41	37.66	44.48	56.15	64.62	68.28a	65.16	59.87	50.65	34.90	30.15	46.95
1941	22.27	30.95	37.18	42.33	54.66	59.20	64.71	64.05a	56.60	47.13	34.88	29.44	45.28
1942	24.68	24.58j	33.52	46.05	51.73	61.47	66.06	66.40	60.97	48.81	39.02	32.13	48.26
1943	28.85	32.71	37.19	49.70	53.82	61.70	67.20a	68.18	59.75	48.08	36.83	23.87	47.32
1944	22.19	29.43	36.26	43.15	53.24	62.02	66.56	67.19	59.45	51.13	35.72	29.32	46.31

1945	25.00	33.91	35.82	41.83	54.69	60.03	69.42	68.24	59.13	49.81	35.15t	20.31o	49.79
1946	24.15n	28.66	37.48	50.98	53.15	65.82	72.33h	69.00n	63.26k	48.07h	34.55h	30.67j	47.22
1947	21.96f	35.55g	37.95i	46.05i	56.71j	58.69l	68.19j	65.24j	62.40o	50.00l	30.61l	24.89i	9999.00
1948	23.19j	26.80g	31.46h	47.77h	51.10z	62.33f	67.87h	64.89h	59.19c	46.65h	29.67j	27.26d	43.22
1949	19.90a	22.75d	36.48g	44.29f	53.38e	59.85d	65.80i	65.24j	59.85q	46.95l	40.29k	24.17k	38.97
1950	25.69g	32.24e	34.58l	46.68e	----- z	61.92q	65.08g	65.38j	57.18p	55.34l	38.88j	31.30h	39.46
1951	27.36i	28.55h	36.72h	43.63g	53.17h	60.70h	70.27i	67.81g	60.08k	49.22h	32.29k	26.06e	26.06
1952	30.77	30.73g	32.90e	46.81f	54.79g	66.92e	66.69j	69.05l	61.24m	50.74j	28.82k	22.42k	43.53
1953	29.75k	28.75l	40.22k	45.07c	49.62f	65.19i	68.83e	66.52j	60.97m	48.78k	37.23f	22.90k	56.95
1954	28.71n	38.09l	36.72k	49.78j	55.80k	64.22g	69.13h	65.90j	61.40i	51.34l	39.77o	27.00l	9999.00
1955	22.78m	26.28j	37.96g	43.83j	50.56m	61.18h	67.12j	66.77i	60.35j	49.05l	34.72l	31.30i	9999.00
1956	31.85h	24.63j	36.79j	44.78g	56.72f	67.20g	67.24h	64.44g	63.26k	52.31o	30.67j	29.07p	9999.00
1957	28.50j	37.67j	37.95l	43.45h	52.38j	64.29i	68.91b	66.57a	59.66a	49.40f	31.53k	28.55l	65.05
1958	26.37l	35.32i	35.50j	46.50g	59.09h	67.26e	68.97	68.27	60.42	48.47	33.75	31.48	54.09
1959	28.02	31.12	38.03	47.88	56.21	67.37	69.98	68.56	60.03	48.61	35.79a	33.23p	50.15
1960	18.76b	24.66d	38.92e	49.76a	56.55	65.27	68.47	70.35	63.05	46.90	35.25	26.39	47.03
1961	23.44	32.15a	39.52	47.27b	58.03	67.08	69.05	67.61	57.73	48.85	34.53	22.69	47.33
1962	22.36b	35.43	34.27	50.25	57.05	65.75	69.56	69.42	61.38	51.24	39.10	29.98	48.82
1963	19.97	32.46	37.76	49.50b	60.10	65.42	71.48b	68.15	63.72	54.73	38.82	26.95	49.09
1964	22.95	24.60	34.63	44.65	57.40	65.20	70.35	67.63	60.95	51.60	36.82	25.98	46.90
1965	29.35	30.61	34.39	46.68	54.00	62.12	69.35	65.87	58.05	49.55	39.43	29.05	47.37
1966	21.34	25.32	37.81	45.88	56.63	62.48	69.68	65.16	59.80b	48.52	39.63	27.18	46.62
1967	24.50	31.79	42.32	46.80	53.92	61.48	68.31	62.97	58.00	48.48	38.73	21.56	46.57
1968	22.39	32.29	37.84	42.43	52.98	63.77	67.11	63.44	57.52	49.24	34.70	24.26	45.66
1969	31.16	30.54	32.95	48.02	55.71	60.73	69.18	68.42	59.03	46.10	35.55	30.23	47.30
1970	24.47	34.39	34.08	41.10	55.10	60.73	68.58	67.56	57.00	44.11	36.95	29.27	46.11
1971	26.02	30.18	37.68	44.48	51.87	64.30	68.44	65.37	57.88	47.24	34.88	24.82	46.10
1972	25.24	34.28	43.77	47.88	54.39	63.25	68.21	65.58	59.55	50.77	29.57a	22.94	47.12
1973	19.40	26.59	35.85	40.65	52.48	60.82	67.19b	66.58	57.38	49.16	37.72	27.15	45.08
1974	21.24	24.75	42.26	43.52	57.63	64.25	66.84	62.21	57.77	51.03	34.58	22.89	45.75
1975	20.11	29.52	37.60	42.73	51.37	62.92	67.44	66.98	58.35	49.18	34.45	26.40	45.59
1976	23.40b	36.53	37.60	46.82	54.29	63.28	67.35	64.16	59.15	45.21	34.25	20.39	46.04
1977	18.92	27.89	34.37	47.98	54.58	65.68	67.92	67.61	59.85	50.24	37.70	30.81	46.96
1978	27.95	31.29	39.53	47.32	50.16	64.38	69.13	64.94	58.98	51.24	39.20	22.32	47.20
1979	17.76	23.30	36.05	44.68	51.98	60.12	67.71	65.05	60.92	51.39	31.40	29.63	45.00
1980	31.81	34.57	35.40	42.68	51.89	65.09a	71.26	66.77	60.95	46.68	36.63	35.11	48.24
1981	30.50	32.05	37.15	49.68	54.24	66.80	69.44	66.94	59.57	48.26	39.18	28.90	48.56
1982	24.84	26.61	37.37	44.60	51.97	61.30	67.31	65.69	58.63	43.73	35.53	25.08	45.22
1983	26.16	30.50	36.48	39.80	50.27	59.38	66.73	65.90	61.55	47.74	36.35	27.13	45.67
1984	19.60	28.10	36.11	42.43	58.11	62.65	68.79	67.23	61.10	44.00	35.75	30.31	46.18
1985	23.61	26.80	38.21	46.97	54.79	64.13	67.63	66.90	57.12	48.56	36.83	28.18	46.65
1986	33.03	33.73	42.11	47.02	53.73	62.40	66.00	66.89	56.90	45.98	36.35	29.05	47.77
1987	23.71	31.25	36.16	46.18	52.74	64.28	67.92	66.02	57.92	51.40	35.95	24.73	46.52
1988	17.27	32.24	36.37	46.03	54.15	64.17	67.92	65.45	56.77	49.68	34.55	24.23	45.74
1989	21.95	27.45	41.21	49.07	55.47	62.37	67.73	63.63	60.10	47.95	36.97	25.94	46.65
1990	24.32	29.62	39.56	47.48	53.06	67.70	67.21	64.71	62.95	48.47	37.68	21.24	47.00
1991	20.27	31.23	37.11	44.78	53.87	62.60	66.97	65.60	58.77	50.79	33.48	23.08	45.71

1992	18.11	30.07	39.24	49.47	55.65	61.53	65.77	65.26	60.48	51.97	30.67	20.71	45.74
1993	27.03	30.68	38.95	46.20	53.65	63.35	69.58	66.29	57.85	46.95	----- z	27.32	47.99
1994	28.18	29.27	40.27	46.52	54.76	66.78	70.03	69.81	60.10	47.50	35.47	31.56	48.35
1995	31.50	38.55	39.92	42.92	50.97	62.17	67.11	69.45	60.93	48.42	39.30	30.97	48.52
1996	27.13	36.55	37.97	46.78	60.53	66.62	69.15	67.77	58.17	47.02	38.40	27.82	48.66
1997	25.53	32.09	41.34	43.00	55.52	62.92	68.48	67.35	63.57	49.31	35.12	25.42	47.47
1998	29.63	29.73	38.06	40.83	55.98	----- z	----- z	----- z	61.40	46.98	38.07	29.92	41.18
Period of Record Statistics													
MEAN	24.48	30.83	37.71	46.04	54.65	63.70	68.12	66.47	59.48	48.80	36.36	26.83	46.88
S.D.	4.16	4.12	2.50	2.70	2.41	2.10	1.36	1.76	1.82	2.22	2.37	3.67	1.06
SKEW	0.06	-0.32	0.17	-0.21	0.07	-0.03	0.03	0.05	0.33	-0.04	-0.31	-0.06	0.15
MAX	33.03	41.18	43.77	51.83	60.53	67.70	71.48	70.35	63.72	54.73	41.35	35.11	49.09
MIN	14.63	19.70	32.58	39.80	48.06	59.20	64.71	62.21	55.43	43.73	29.57	19.42	45.00
NO YRS	73	73	73	73	73	74	73	70	75	71	71	71	57

TAOS, NEW MEXICO

Monthly Total Snowfall (Inches)

File last updated on Mar 10, 1999
*** Note *** Provisional Data *** After Year/Month 199812
a = 1 day missing, b = 2 days missing, c = 3 days, ..etc..,
z = 26 or more days missing, A = Accumulations present
Long-term means based on columns; thus, the monthly row may not
sum (or average) to the long-term annual value.
MAXIMUM ALLOWABLE NUMBER OF MISSING DAYS : 5
Individual Months not used for annual or monthly statistics if more than 5 days are missing.
Individual Years not used for annual statistics if any month in that year has more than 5 days missing.

YEAR(S)	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN
1913-14	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1914-15	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1915-16	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1916-17	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1917-18	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1918-19	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1919-20	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1920-21	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1921-22	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1922-23	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1923-24	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1924-25	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1925-26	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1926-27	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1927-28	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1928-29	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1929-30	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1930-31	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1931-32	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1932-33	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1933-34	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1934-35	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1935-36	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1936-37	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1937-38	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1938-39	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1939-40	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1940-41	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1941-42	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1942-43	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1943-44	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00

1944-45	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1945-46	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1946-47	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1947-48	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	5.40	21.10	13.20	0.00	0.00 g	0.00	39.70
1948-49	0.00 a	0.00	0.00	0.00	0.00 c	1.50	15.50	10.70	3.00	0.00 a	0.00	0.00	30.70
1949-50	0.00	0.00	0.00	0.50	0.00 a	0.00	1.00 d	0.00 c	0.00 a	0.00	0.00 z	0.00 f	1.50
1950-51	0.00	0.00	0.00	0.00	0.00	0.00	13.40	0.80	0.00 z	0.00 z	0.00	0.00	14.20
1951-52	0.00	0.00	0.00	0.00	4.00	13.00	0.00 z	3.00	13.50	0.00	0.00	0.00	33.50
1952-53	0.00	0.00	0.00	0.00	0.00 e	5.50	0.00 a	0.00 e	0.00 c	0.00	0.00 b	0.00	5.50
1953-54	0.00	0.00	0.00	0.00	0.00 b	6.50	13.00	0.00 b	0.00 a	0.00	0.00	0.00	19.50
1954-55	0.00	0.00	0.00	0.00	0.00	0.00	11.50	12.00	4.80	2.50	8.00	0.00	38.80
1955-56	0.00	0.00	0.00	0.00	0.00	4.00	0.00	1.50 a	1.50 b	1.50	0.00	0.00	8.50
1956-57	0.00	0.00	0.00	0.00	6.00	0.00 d	20.00	1.00	1.50	3.00	0.00	0.00	31.50
1957-58	0.00	0.00	0.00	0.00	0.00 d	0.00 c	0.00 f	0.60 d	0.00 z	0.00 z	0.00	0.00	0.60
1958-59	0.00	0.00	0.00	0.00	0.00 a	0.00	0.50 c	0.00 d	0.00 c	3.00	0.00	0.00	3.50
1959-60	0.00	0.00	0.00	0.00 a	0.00 a	0.00 g	0.00 e	0.00 i	0.00 d	2.00	0.00	0.00	2.00
1960-61	0.00	0.00	0.00	0.00	0.00	6.50	5.50	5.50	10.00	0.00 c	0.00	0.00	27.50
1961-62	0.00	0.00	0.00	0.00	0.00 c	14.60	7.00	0.00 b	0.00 z	0.00	0.00	0.00	21.60
1962-63	0.00	0.00	0.00	0.00	5.00	0.00 z	0.00 z	6.00	5.00	0.00	0.00	0.00	16.00
1963-64	0.00	0.00	0.00	0.00	0.00	1.50	4.00	12.80	6.00	0.00 f	0.00	0.00	24.30
1964-65	0.00	0.00	0.00	0.00	1.50	0.00 g	1.00	0.00 b	0.00	0.00	0.00	0.00	2.50
1965-66	0.00	0.00	0.00	0.00	0.00	0.00 f	0.00 e	0.00 c	0.00 a	0.00	0.00	0.00	0.00
1966-67	0.00	0.00	0.00	1.00	0.00	0.00 b	0.00 c	0.00 a	0.00 b	0.00	0.00	0.00	1.00
1967-68	0.00	0.00	0.00	0.00	0.00 d	18.50 c	0.50	6.00	3.00	4.50	0.00	0.00	32.50
1968-69	0.00	0.00	0.00	0.00	1.80	13.50	15.50	5.40	7.50	2.00	0.00	0.00	45.70
1969-70	0.00	0.00	0.00	2.50	1.50	9.50	1.50	6.50	6.50	3.50	1.00	0.00	32.50
1970-71	0.00	0.00	0.00	0.50	4.00	2.80	2.30	9.00	0.60	1.00	0.00	0.00	20.20
1971-72	0.00	0.00	0.00 a	0.00	10.20	20.00	5.00	2.00	1.00	0.30	0.00	0.00	38.50
1972-73	0.00	0.00	0.00	0.00	18.50	16.50	14.50	6.50	17.50	3.50	0.00	0.00	77.00
1973-74	0.00	0.00	0.00	0.00 a	0.00 z	0.00 b	23.40	1.00	2.00	0.00	0.00	0.00	26.40
1974-75	0.00	0.00	0.00	0.00	3.00	13.10	6.50 a	7.00	5.70 b	2.40	0.00	0.00	37.70
1975-76	0.00	0.00	0.00	0.00	17.10	6.50	4.50	0.80	12.00	1.80	1.00	0.00	43.70
1976-77	0.00	0.00	0.00	0.50	13.50	1.80	16.40	3.80	2.30	4.00	0.00	0.00	42.30
1977-78	0.00	0.00	0.00	0.00	4.00	0.40	10.90	13.50 a	4.00	0.00	10.00	0.00	42.80
1978-79	0.00	0.00	0.00	0.00	0.00	7.60	27.00	7.90	4.50	2.00	0.00	0.00	49.00
1979-80	0.00	0.00	0.00	0.00	1.00	3.50	3.50	1.00	14.10	8.00	0.00	0.00	31.10
1980-81	0.00	0.00	0.00	0.00	6.00	1.00	3.00	0.00	4.50	0.00	0.00	0.00	14.50
1981-82	0.00	0.00	0.00	0.00	0.00	6.00	5.90	18.80	1.20	0.50	0.00	0.00	32.40
1982-83	0.00	0.00	0.00	1.00	0.40	12.70	2.80	7.80	10.70	3.50	2.00	0.00	40.90
1983-84	0.00	0.00	0.00	0.00	10.10	10.10	8.30	4.40	8.40	13.80	0.00	0.00	55.10
1984-85	0.00	0.00	0.00	5.10	0.30	4.40	13.30	5.60	21.30	1.00	0.00	0.00	51.00
1985-86	0.00	0.00	0.00	0.00	8.10	2.10	2.00	8.50	1.90	7.50	0.50	0.00	30.60
1986-87	0.00	0.00	0.00	1.30	4.00	5.10	9.10	15.60	7.80	4.00	0.00	0.00	46.90
1987-88	0.00	0.00	0.00	0.00	1.70	9.60	14.30	0.40	1.80	3.90	0.00	0.00	31.70
1988-89	0.00	0.00	0.00	0.00	0.30	3.00	14.50	15.50 a	1.00	0.00	0.00	0.00	34.30
1989-90	0.00	0.00	0.00	0.00	0.00	9.20	7.80	12.00	11.00	0.00	0.00	0.00	40.00
1990-91	0.00	0.00	0.00	0.00	0.00	44.00	2.00	0.00	9.50	0.00	0.00	0.00	55.50

1991-92	0.00	0.00	0.00	3.00	0.00	15.00	10.00	2.00	0.60	0.00	0.00	0.00	30.60
1992-93	0.00	0.00	0.00	0.00	6.00 a	13.00 a	5.00 a	16.00	0.00	2.00	0.00	0.00	42.00
1993-94	0.00	0.00	0.00	4.00	0.00 z	2.40	8.00	5.40	0.00	3.00	0.00	0.00	22.80
1994-95	0.00	0.00	0.00	0.00 c	0.00	0.00 a	0.00 z	0.00	0.00 b	2.00	0.00	0.00	2.00
1995-96	0.00	0.00	0.00 z	0.00	0.00	1.60	1.00 z	3.00	11.00	0.00	0.00	0.00	15.60
1996-97	0.00	0.00	0.00	9.20	7.80	1.70	11.00	8.00	2.00	3.00	0.00	0.00	42.70
1997-98	0.00	0.00	0.00	0.00	3.00	3.00	0.00 a	4.00	4.00	0.00	0.00	0.00 z	14.00
Period of Record Statistics													
MEAN	0.00	0.00	0.00	0.57	2.89	6.75	7.53	5.45	4.91	1.86	0.46	0.00	34.51
S.D.	0.00	0.00	0.00	1.63	4.55	8.01	6.73	5.63	5.28	2.63	1.83	0.00	15.77
SKEW	0.00	0.00	0.00	3.77	1.91	2.39	0.87	0.99	1.14	2.41	4.49	0.00	-0.12
MAX	0.00	0.00	0.00	9.20	18.50	44.00	27.00	21.10	21.30	13.80	10.00	0.00	77.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
NO YRS	50	50	49	50	48	46	46	50	48	48	49	49	35

SANTA FE CAA AIRPORT, NEW MEXICO (298078)

Period of Record Monthly Climate Summary

Period of Record : 2/ 1/1924 to 6/23/1958

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	42.8	48.2	53.0	64.2	72.2	83.0	86.1	83.7	78.6	67.5	52.4	43.6	64.7
Average Min. Temperature (F)	18.4	22.9	26.4	34.4	43.4	51.9	57.8	56.1	49.1	39.0	24.9	18.6	36.9
Average Total Precipitation (in.)	0.42	0.39	0.57	0.55	0.73	0.70	1.80	2.09	0.99	0.88	0.29	0.42	9.81
Average Total SnowFall (in.)	5.2	3.7	2.3	1.6	0.1	0.0	0.0	0.0	0.0	0.0	1.8	3.1	17.7
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Western Regional Climate Center, wrcc@dri.edu

SANTA FE CAA AIRPORT, NEW MEXICO

Monthly Average Temperature (Degrees Fahrenheit)

File last updated on Apr 13, 1999
*** Note *** Provisional Data *** After Year/Month 195806
a = 1 day missing, b = 2 days missing, c = 3 days, ..etc..,
z = 26 or more days missing, A = Accumulations present
Long-term means based on columns; thus, the monthly row may not
sum (or average) to the long-term annual value.
MAXIMUM ALLOWABLE NUMBER OF MISSING DAYS : 5
Individual Months not used for annual or monthly statistics if more than 5 days are missing.
Individual Years not used for annual statistics if any month in that year has more than 5 days missing.

YEAR(S)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
1924	----- z	35.47	----- z	----- z	----- z	----- z	----- z	----- z	60.45	----- z	----- z	----- z	47.96
1925	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	9999.00
1926	----- z	----- z	38.22a	----- z	53.98	----- z	----- z	----- z	----- z	----- z	----- z	----- z	46.10
1927	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	9999.00
1928	34.07a	32.62	41.76	44.98	56.10	64.60	69.76	65.34	61.50	52.61	37.37	30.74	49.29
1929	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	9999.00
1930	25.55	38.64	37.32	52.35	52.34	67.10	68.35	67.79b	60.38	50.52	36.81a	27.77	48.74
1931	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	9999.00
1932	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	9999.00
1933	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	9999.00
1934	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	9999.00
1935	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	9999.00
1936	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	9999.00
1937	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	9999.00
1938	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	9999.00
1939	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	9999.00
1940	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	9999.00
1941	----- z	----- z	----- z	----- z	----- z	61.68	68.87	68.21	62.20	----- z	----- z	----- z	65.24
1942	----- z	----- z	----- z	----- z	----- z	65.62	71.00	68.48	61.03	50.55	41.35	34.92	56.14
1943	31.89	36.88	39.97	52.30	58.06	66.82	71.15	72.56	64.02	50.69	40.17	24.16	50.72
1944	22.42	34.02	38.44	45.92	56.66	66.68	----- z	----- z	63.27	----- z	----- z	----- z	46.77
1945	30.65	38.05	39.33a	46.20	59.42	64.98	72.16	72.29	63.78	53.40	40.13	28.21	50.72
1946	34.45	34.62	41.87	54.70	56.56	----- z	----- z	----- z	----- z	----- z	----- z	35.27	42.91
1947	27.39	36.79	38.90	47.23	60.11	65.83	74.21	70.10	65.60	55.23	33.25	29.21	50.32
1948	27.58	31.90	35.02a	52.23	59.61	67.03	72.82	70.69	65.05	51.37	35.28	33.47	50.17
1949	23.56	31.27	41.34	49.22	58.26	66.30	71.35	69.45	65.42	50.61	45.48	28.68	50.08
1950	32.48	38.52	41.02	51.28	57.68	68.30	69.18	68.63	61.10	59.15	41.97	36.89	52.18
1951	30.76	34.62	39.34	47.53	59.24	66.55	75.50	70.23	64.65	52.34	36.48	30.56	50.65
1952	33.94	33.33	36.10	48.83	58.35a	70.82	71.68	72.55	64.60	55.06	34.67	27.37	50.61
1953	35.98	32.50	43.06	48.87	54.85	71.10	73.92	71.02	66.17	53.44	41.97	27.40	51.69
1954	33.37	41.59	39.81	54.87	60.08	69.27	74.16	70.50	66.62	55.45	43.88	32.03	53.47
1955	27.31	29.39	40.56	48.03	57.08	66.07	71.61	71.11	66.28	55.06	39.38	35.50	50.62
1956	36.37	30.25a	42.97	48.55	62.75a	72.45	72.23	70.42	68.05	54.87	36.67	31.66	52.27
1957	33.92	42.95	41.40	46.97	54.89	68.53	73.84	69.56	63.88	51.45	33.50	34.47	51.28
1958	30.31	39.07	36.73	46.47	62.05	70.70g	----- z	----- z	----- z	----- z	----- z	----- z	42.92
Period of Record Statistics													
MEAN	30.67	35.39	39.64	49.25	57.79	67.21	71.87	69.94	63.90	53.24	38.65	31.08	50.85
S.D.	4.18	3.77	2.27	3.01	2.68	2.57	2.06	1.87	2.27	2.44	3.70	3.61	1.19
SKEW	-0.52	0.30	-0.36	0.53	-0.12	0.18	-0.08	-0.63	-0.11	0.73	0.19	-0.06	0.43
MAX	36.37	42.95	43.06	54.87	62.75	72.45	75.50	72.56	68.05	59.15	45.48	36.89	53.47
MIN	22.42	29.39	35.02	44.98	52.34	61.68	68.35	65.34	60.38	50.52	33.25	24.16	48.74
NO YRS	18	19	19	18	19	18	17	17	19	16	16	17	15

SANTA FE CAA AIRPORT, NEW MEXICO

Monthly Total Precipitation (inches)

File last updated on Apr 13, 1999
*** Note *** Provisional Data *** After Year/Month 195806
a = 1 day missing, b = 2 days missing, c = 3 days, ..etc..,
z = 26 or more days missing, A = Accumulations present
Long-term means based on columns; thus, the monthly row may not
sum (or average) to the long-term annual value.
MAXIMUM ALLOWABLE NUMBER OF MISSING DAYS : 5
Individual Months not used for annual or monthly statistics if more than 5 days are missing.
Individual Years not used for annual statistics if any month in that year has more than 5 days missing.

YEAR(S)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
1924	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1925	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1926	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1927	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1928	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1929	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1930	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1931	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1932	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1933	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1934	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1935	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1936	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1937	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1938	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1939	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1940	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1941	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	1.50	1.21	1.04	2.76	2.72	0.36	0.21	9.80
1942	0.00	0.43	0.21	2.54	0.11	0.76	0.49	3.25	3.28	0.79	0.00	1.15	13.01
1943	0.40	0.25	0.79	0.13	1.27	1.64	1.49	1.71	0.30	0.54	0.29	0.87	9.68
1944	0.10	0.11	0.31	0.58	0.38	0.28	2.56	2.16	1.40	2.20	0.41	0.62	11.11
1945	0.33	0.07	0.52	0.64	0.21	0.17	1.14	1.74	1.88	1.19	0.03	0.39	8.31
1946	0.18	0.21	1.81	0.36	0.33	0.09	1.63	4.28	0.17	0.91	0.86	0.11	10.94
1947	0.34	0.45	0.24	0.57	1.73	0.00	0.45	2.97	0.44	0.55	0.35	0.66	8.75
1948	0.07	1.38 a	0.67	0.54	0.79	1.55	1.45	3.20	0.56	1.50	0.00	0.24	11.95
1949	0.87	0.39	0.47	0.45	0.98	3.03	4.61	1.17	1.95	0.10	0.01	0.76	14.79
1950	0.72	0.59	0.00	0.32	0.05	1.00	3.92	0.76	1.23	0.03	0.05	0.00	8.67
1951	0.18	0.34	0.37	0.54	1.29	0.23	0.83	4.39	0.21	0.41	0.22	0.32	9.33
1952	0.46	0.08	0.74	0.85	1.26	0.22	1.39	2.20	0.95	0.00	0.33	0.43	8.91
1953	0.23	0.35	0.52	0.14	0.53	0.31	2.22	0.28	0.52	0.64	0.88	0.36	6.98
1954	0.27	0.09	0.94	0.02	1.47	0.30	3.42	1.47	0.58	0.43	0.05	0.21	9.25
1955	1.22	0.34	0.11	0.58	0.60	0.03 a	0.98	2.09	0.47	0.02	0.02	0.61	7.07
1956	0.42	0.27 a	0.00	0.00	0.46	0.24	0.91	0.47	0.00	0.21	0.09	0.05	3.12
1957	0.88	0.86	1.02	0.38	0.85	0.00	1.88	2.31	0.13	2.73	1.00	0.11	12.15
1958	0.42	0.38	0.93	0.57	0.05	1.02 g	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	2.35
Period of Record Statistics													
MEAN	0.42	0.39	0.57	0.54	0.73	0.67	1.80	2.09	0.99	0.88	0.29	0.42	9.63
S.D.	0.33	0.32	0.46	0.57	0.53	0.83	1.20	1.22	0.97	0.90	0.33	0.32	2.75
SKEW	1.00	1.83	1.06	2.69	0.34	1.57	1.09	0.41	1.12	1.06	1.07	0.70	-0.34
MAX	1.22	1.38	1.81	2.54	1.73	3.03	4.61	4.39	3.28	2.73	1.00	1.15	14.79
MIN	0.00	0.07	0.00	0.00	0.05	0.00	0.45	0.28	0.00	0.00	0.00	0.00	3.12
NO YRS	17	17	17	17	17	17	17	17	17	17	17	17	16

SANTA FE CAA AIRPORT, NEW MEXICO

Monthly Total Snowfall (Inches)

File last updated on Mar 10, 1999
*** Note *** Provisional Data *** After Year/Month 195806
a = 1 day missing, b = 2 days missing, c = 3 days, ..etc..,
z = 26 or more days missing, A = Accumulations present
Long-term means based on columns; thus, the monthly row may not
sum (or average) to the long-term annual value.
MAXIMUM ALLOWABLE NUMBER OF MISSING DAYS : 5
Individual Months not used for annual or monthly statistics if more than 5 days are missing.
Individual Years not used for annual statistics if any month in that year has more than 5 days missing.

YEAR(S)	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN
1923-24	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1924-25	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1925-26	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1926-27	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1927-28	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1928-29	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1929-30	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1930-31	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1931-32	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1932-33	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1933-34	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1934-35	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1935-36	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1936-37	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1937-38	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1938-39	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1939-40	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1940-41	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1941-42	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1942-43	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1943-44	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1944-45	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1945-46	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1946-47	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1947-48	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	2.30	16.90	4.80	0.00	0.00	0.00	24.00
1948-49	0.00	0.00	0.00	0.00	0.00	0.50	13.50	2.20	3.00	5.70	0.00	0.00	24.90
1949-50	0.00	0.00	0.00	0.00	0.00	9.00	5.60	4.00	0.00	0.00	0.00	0.00	18.60
1950-51	0.00	0.00	0.00	0.00	0.00	0.40	3.50	0.00	2.00	0.00	0.00	0.00	5.90
1951-52	0.00	0.00	0.00	0.00	0.00	0.20	1.00	3.00	2.00	1.00	0.00	0.00	7.20
1952-53	0.00	0.00	0.00	0.00	2.00	4.00	3.00	5.20	1.20	0.00	0.70	0.00	16.10
1953-54	0.00	0.00	0.00	0.00	4.20	4.60	2.20	0.60	0.40	0.00	0.00	0.00	12.00
1954-55	0.00	0.00	0.00	0.00	0.00	5.50	12.50	1.40	1.10	0.00	0.00	0.00	20.50
1955-56	0.00	0.00	0.00	0.00	0.00	4.40	3.10	4.80 a	0.00	2.00	0.00	0.00	14.30
1956-57	0.00	0.00	0.00	0.00	1.10	0.60	5.20	0.40	2.30	3.70	0.00	0.00	13.30
1957-58	0.00	0.00	0.00	0.00	11.00	1.50	5.50	2.00	8.20	5.10	0.00	0.00 g	33.30
Period of Record Statistics													
MEAN	0.00	0.00	0.00	0.00	1.83	3.07	5.22	3.68	2.27	1.59	0.06	0.00	14.76
S.D.	0.00	0.00	0.00	0.00	3.50	2.92	4.12	4.72	2.42	2.22	0.21	0.00	6.10
SKEW	0.00	0.00	0.00	0.00	2.04	0.71	1.20	2.17	1.42	0.93	2.85	0.00	0.08
MAX	0.00	0.00	0.00	0.00	11.00	9.00	13.50	16.90	8.20	5.70	0.70	0.00	24.90
MIN	0.00	0.00	0.00	0.00	0.00	0.20	1.00	0.00	0.00	0.00	0.00	0.00	5.90
NO YRS	10	10	10	10	10	10	11	11	11	11	11	10	9

SANTA FE, NEW MEXICO (298072)

Period of Record Monthly Climate Summary

Period of Record : 1/ 1/1890 to 3/21/1972

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	40.2	44.5	51.2	60.4	69.3	79.3	82.1	80.2	74.0	63.4	50.8	41.4	61.4
Average Min. Temperature (F)	19.1	22.7	27.5	34.5	42.8	51.9	56.7	55.3	49.3	38.6	27.5	20.5	37.2
Average Total Precipitation (in.)	0.65	0.74	0.80	1.00	1.33	1.06	2.36	2.19	1.55	1.14	0.63	0.73	14.17
Average Total SnowFall (in.)	4.8	5.3	9.6	1.6	0.1	0.0	0.0	3.3	0.0	0.3	1.9	6.9	33.9
Average Snow Depth (in.)	1	1	0	0	0	0	0	0	0	0	0	1	0

Western Regional Climate Center, wrcc@dri.edu

SANTA FE, NEW MEXICO

Monthly Average Temperature (Degrees Fahrenheit)

File last updated on Apr 13, 1999
*** Note *** Provisional Data *** After Year/Month 197203
a = 1 day missing, b = 2 days missing, c = 3 days, ..etc..,
z = 26 or more days missing, A = Accumulations present
Long-term means based on columns; thus, the monthly row may not
sum (or average) to the long-term annual value.
MAXIMUM ALLOWABLE NUMBER OF MISSING DAYS : 5
Individual Months not used for annual or monthly statistics if more than 5 days are missing.
Individual Years not used for annual statistics if any month in that year has more than 5 days missing.

YEAR(S)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
1867	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	9999.00
1868	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	9999.00
1869	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	9999.00
1870	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	9999.00
1871	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	9999.00
1872	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	9999.00
1873	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	9999.00
1874	32.18	28.57	36.97	42.63	58.06	67.23	69.94	68.82	60.05	52.42	40.80	31.05	49.06
1875	29.68	32.64	34.68	46.90	59.29	67.27	65.74	67.10	59.52	54.02	39.90	33.87	49.22
1876	29.69	34.02	37.31	49.20	55.21	63.88	68.60	66.81	60.83	50.15	37.75	30.15	48.63
1877	32.55	35.11	46.08	42.83	53.82	64.75	68.15	67.97	61.20	47.31	35.18	28.63	48.63
1878	21.77	30.05	40.82	47.80	56.03	63.43	71.82	70.68	61.28	55.13	43.87	29.68	49.36
1879	33.95	41.07	53.27	49.73	61.56	66.07	73.10	71.63	65.07	51.05	37.13	26.90	52.54
1880	28.95	24.02	32.13	43.70	55.50	65.60	66.65	64.92	55.82	46.18	29.25	28.61	45.11
1881	22.29	32.00	35.61	51.68	57.60	69.57	70.21	67.44	60.35	51.29	35.35t	----- z	51.80
1882	30.10	33.92b	42.48	47.58	55.76	65.95	70.13	66.89	59.67	50.66	39.50	32.03	49.56
1883	26.31	38.09a	45.05	43.71a	56.21	64.37o	----- z	----- z	----- z	----- z	----- z	----- z	41.87
1884	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	31.50	31.50
1885	24.97	32.62	41.00	46.63	53.34	63.47	69.39	67.58	60.47	50.45	40.52	32.82	48.60
1886	25.06	35.11	35.81	44.72	60.60	64.73	71.87	66.98	58.90	50.60	34.30	34.66	48.61
1887	29.97	33.87a	44.05	46.73	55.02	66.88	68.85	67.16	61.93	51.55	41.98	26.95	49.58
1888	30.08	35.81	38.21	50.55	53.73	66.75	70.11	65.89	62.95	51.02	37.55	33.50a	49.68
1889	24.65	30.77	41.66	51.57	56.40	64.25	67.56	70.90	61.02	52.10	35.15	39.84	49.66
1890	32.15	36.59	41.92	47.75	59.18	64.68	69.82a	67.19	60.97	49.98	39.69a	34.60	50.38
1891	22.69	29.16	36.32	46.45	52.87	62.63	69.18	68.32	61.82	51.18	40.48a	25.56	47.22
1892	29.00	34.33	39.33a	46.72	54.92	66.02	69.74	68.12a	64.97	48.85	38.50	28.66	49.10
1893	33.56	33.29	38.32	47.80	55.34	68.43	68.55	65.82	59.78	49.68	38.40	33.69	49.39
1894	27.85	26.02	39.31	48.98	58.85	64.00	68.87	64.52	59.05	51.90	43.33	33.71	48.87
1895	28.19	28.46	39.71	48.95	54.60	62.72	66.27	66.27	63.62	49.58	35.05	25.87	47.44
1896	33.90	33.00	40.50	47.87	57.98	69.03	66.82	68.05	61.15	48.52	38.82	35.94	50.13
1897	27.40	30.36	36.68	47.66a	56.90	64.25	66.95	66.52	61.90	49.03	41.35	29.15	48.18

1898	24.66	36.14	37.61	49.47	54.52	64.13	68.23	67.73	61.08	49.32	36.98	24.03	47.83
1899	26.72a	28.62	40.44	49.12	55.66	64.07	67.52	68.71	63.22	50.40	41.58	32.71	49.06
1900	35.48	34.05	43.79	44.00	57.98	67.77	69.55	68.66	60.48	50.92	41.32	32.47	50.54
1901	31.02	33.59	37.90	46.74a	55.73	65.68	69.90	68.82	61.20	52.26	42.80	32.87	49.88
1902	33.71	35.14	36.15	52.02a	57.05	68.63	67.35	68.35	59.95	51.73	39.57	31.26	50.08
1903	30.34	27.34	39.10	47.07	54.23	61.18	70.66	69.45	59.48	51.11	43.48	31.84	48.77
1904	27.34	38.53	42.61	49.25	56.30a	62.80	68.95	66.81	60.85	48.81	39.98	29.40	49.30
1905	28.11	31.38	40.87	44.55	53.98	65.75	65.95	65.97a	61.02	48.19	39.20	25.37	47.53
1906	28.77	34.61	40.18	47.12	54.61	64.85	64.87	65.56	60.13	47.45	38.29b	35.05	48.46
1907	32.78a	39.59	44.10	47.64a	49.35	60.62	67.95a	66.50	60.16a	50.87	36.97	30.95	48.96
1908	30.47	32.50	42.42	46.57	51.06	63.07	65.92	65.97	61.20	46.42	36.57	30.66	47.73
1909	34.98	31.11	36.52	44.13	51.89	65.73	69.77	66.85	59.12	49.98	41.07	21.89	47.75
1910	30.15	31.20	45.81	47.57	56.16	65.65	70.15	67.82	63.15	49.48	41.57	32.02	50.06
1911	34.47	30.59	41.69	47.13	56.52	64.93	64.56	67.13	62.80	46.76	32.28	24.03	47.74
1912	28.89	30.55	37.68	42.30	55.37	62.38	68.15	67.21	58.07	48.94	39.25	25.94	47.06
1913	24.77	29.27	36.08	47.20	58.61	62.78	69.69	68.55	57.25	47.79	42.45	26.42	47.57
1914	33.52	32.57	39.45	48.02	56.26	66.95	66.97	66.84	63.00	49.39	43.07	26.03	49.34
1915	24.39	32.02	35.81	47.68	52.27	64.05	67.58	65.40	59.58	51.95	39.78	32.03	47.71
1916	30.56	36.40	43.65	46.62	55.56	66.18	68.79	66.74	60.83	50.61	38.92	27.90	49.40
1917	28.05	32.61	35.77	46.10	48.92	66.08	71.52	67.71	62.53	51.90	45.27	38.11	49.55
1918	26.19	35.84	42.97	44.93	55.69	68.31a	69.29	67.84	60.38	51.95	35.03	27.03	48.79
1919	24.34	27.29	37.55a	48.02	55.98	63.81a	67.85	69.06	61.43	47.10	38.58	34.21	47.94
1920	33.87	37.52a	37.37	40.82	56.26	63.62	68.71	65.05	60.43a	48.74	37.67	27.40	48.12
1921	32.47	35.34	42.85a	43.35	56.12a	62.88	67.10	66.02	63.50	53.02	42.98	36.53	50.18
1922	28.08	32.18	36.48	44.28	55.92	66.33	70.10	70.71	63.83	51.45	35.83	34.00	49.10
1923	34.92	32.09	34.71	45.63	55.85	65.23	69.68	65.79	58.55	45.84	38.87	29.13	48.02
1924	27.05	35.43	33.69	45.55	56.06	68.63	67.79	68.02	60.50	51.24	41.27	25.48	48.39
1925	25.44	35.98	43.42a	50.60	59.21	65.85	69.76	65.73a	61.35	49.55	37.35	29.06	49.44
1926	25.32	36.38	38.82a	46.53	53.98	65.45	67.18a	68.87	63.22	52.84	40.02	29.24	48.99
1927	36.27	37.09	39.63	48.88	58.56	64.20	70.34	66.71	60.65	51.32	43.13	26.98	50.31
1928	33.77	33.41a	41.76	44.98	56.10	64.91a	69.76	65.34	61.50	52.61	37.38	30.74	49.36
1929	28.85	27.52	37.89	46.92	54.23	66.15	68.84	66.78a	60.58	49.55	32.42	33.27	47.75
1930	25.55	38.46	37.16	52.37	52.34	67.10	68.35	67.56	60.37	50.50	36.37	27.77	48.66
1931	29.89	35.30	36.26	47.83	55.00	67.42	70.18	67.03	63.28	52.82	37.08	27.73	49.15
1932	22.97a	37.72	36.71	48.07	55.68	63.40	69.58	68.18	60.68	47.40	39.98	25.21	47.97
1933	27.11	26.88	41.74	42.85	53.48	66.13	70.55	67.82	65.50	53.69	41.68	37.35	49.57
1934	32.69	39.59	44.34	50.77	61.02	66.78	72.03	70.21	60.32	54.32	39.77	32.52	52.03
1935	34.71	35.14	40.82	46.73	50.90	66.13	70.60	67.84	61.47	51.48	38.70	31.24	49.65
1936	28.24	33.41	41.24	49.22	59.03	68.58	70.10	69.79	59.63	49.94	39.57	32.50	50.10
1937	23.82	32.26a	37.69	47.88	58.73	64.71a	69.82	71.26	63.87	52.68	42.18	34.10	49.92
1938	31.71	35.55	40.84	48.43	55.61	66.43	68.92	70.27	61.72	53.26	34.13	34.37	50.10
1939	28.77	24.45	40.74	49.16a	58.10	67.50	69.40	67.76	63.53	50.23	40.60	36.79	49.75
1940	29.71	32.12	42.16	47.75	58.02	65.68	70.58	67.13	63.58	53.63	37.75	35.13	50.27
1941	31.39	37.79	39.03	43.83	57.00	61.68	68.87	68.21	62.20	50.47	40.67	33.24	49.53
1942	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	9999.00
1943	34.02e	37.52d	40.78d	53.94d	57.77g	64.90d	71.33e	71.08e	62.16e	50.56e	39.82e	----- z	52.61
1944	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	9999.00

1945	29.85	36.38	37.89	44.32	57.45	63.10	69.45	69.87	62.13	51.26	39.97	27.31	49.08
1946	28.92	34.00	41.53	54.88	55.81	70.05	71.19	68.08	63.97	49.55	35.97	35.26	50.77
1947	26.71	36.05	38.90	45.98	58.44	63.50c	72.39	69.52	65.22	54.68	34.02a	28.79b	49.52
1948	29.28b	32.32a	35.38f	51.23	58.07a	64.73b	70.97n	----- z	64.14b	50.09h	34.45	33.00	45.90
1949	25.15	30.37a	41.47p	48.34a	57.74	66.93j	69.60	68.17a	63.78l	49.06	43.33	27.98a	46.64
1950	30.68	35.38	38.95	49.98	55.25g	71.26i	67.42	66.62c	59.03a	58.45	42.78	36.98	48.63
1951	31.24	34.52	39.18	47.32	58.92	65.28	74.86b	68.27	64.17	52.08	36.33	29.29	50.12
1952	33.52	31.69	34.21	47.33	56.32	69.62	69.73	70.61	63.78	54.90	34.52	28.26	49.54
1953	35.55b	30.91	37.28m	47.24a	52.62a	68.40	71.73	68.83a	64.93b	52.03	41.12	27.34	50.97
1954	32.93a	39.95	37.12b	51.57w	59.09i	68.30	73.07c	69.18	66.22	55.48	44.50	34.50	52.12
1955	28.48	30.20	40.95	47.62	55.52	63.50	69.29	67.44	64.08	53.53	39.18	33.45	49.44
1956	34.74	28.33	41.35	45.97	60.45	70.82	69.90	66.66	66.35	54.15	35.98	31.08	50.48
1957	33.21	40.36	38.65	45.08	51.97	65.25	71.34	66.79	61.67	49.97	34.10	34.40	49.40
1958	29.56	37.14	34.89	45.35	59.97	69.48	71.52	69.90	62.33	50.98	40.55	37.66	50.78
1959	31.48	33.34	37.69	48.03	56.21	67.93	70.53	68.15	62.60	50.40	38.05	34.34	49.90
1960	26.06	27.21	41.31	49.27	55.35	67.37	69.48c	69.13	63.63	49.40	40.80	28.32	48.94
1961	28.71	33.38	39.63	46.15	57.74	67.70	68.97	65.90	57.02a	49.50	35.70	27.27	48.14
1962	27.13	36.05	34.68	50.42	58.13	65.40	68.24	69.79	61.37	51.95	41.18	33.26	49.80
1963	23.85	33.61	38.85	48.68	58.92	65.25	71.66	66.39	63.22	55.68	40.30	30.94	49.78
1964	25.63	23.97	34.29	44.20	56.29	64.55	70.35	67.37	61.47	53.56	38.62	29.77	47.51
1965	31.68	30.75	34.85	47.97	54.35	62.30	69.35	66.26	59.68	52.15	42.60	32.84	48.73
1966	25.70a	27.20	41.02b	47.48a	58.19	63.82	71.76	65.92	61.32p	51.69	42.40	30.42a	47.78
1967	29.65	35.05	44.31	50.05b	55.63	63.70	69.70a	64.10	59.31a	52.16	41.78	26.00	49.29
1968	30.05a	35.90	39.90	44.27	54.39	66.82	67.50	63.90	59.30	52.48	38.57	27.56	48.39
1969	34.24	33.23	34.16	49.75	57.61	63.92	71.56	70.08	61.53	48.71	37.64a	33.27	49.64
1970	28.95	36.88	36.42	44.53	58.15	63.25	69.87	68.53	60.08	45.55a	39.40	33.16	48.73
1971	29.76	32.38	40.50	46.10	55.35a	66.10	69.23	65.07c	59.97	----- z	38.65c	27.21b	48.21
1972	30.32a	35.91	48.25k	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	33.12

Period of Record Statistics

MEAN	29.44	33.24	39.38	47.29	56.08	65.51	69.34	67.67	61.51	50.90	39.03	30.85	49.11
S.D.	3.51	3.73	3.39	2.57	2.44	2.13	1.83	1.69	2.04	2.34	3.03	3.69	1.11
SKEW	-0.10	-0.37	0.70	0.21	-0.40	0.21	-0.10	0.26	0.09	0.17	-0.50	0.01	-0.28
MAX	36.27	41.07	53.27	54.88	61.56	70.82	74.86	71.63	66.35	58.45	45.27	39.84	52.54
MIN	21.77	23.97	32.13	40.82	48.92	60.62	64.56	63.90	55.82	45.55	29.25	21.89	45.11
NO YRS	96	96	92	94	92	92	93	93	92	92	93	93	85

SANTA FE, NEW MEXICO

Monthly Total Precipitation (inches)

File last updated on Apr 13, 1999
*** Note *** Provisional Data *** After Year/Month 197203
a = 1 day missing, b = 2 days missing, c = 3 days, ..etc..,
z = 26 or more days missing, A = Accumulations present
Long-term means based on columns; thus, the monthly row may not
sum (or average) to the long-term annual value.
MAXIMUM ALLOWABLE NUMBER OF MISSING DAYS : 5
Individual Months not used for annual or monthly statistics if more than 5 days are missing.
Individual Years not used for annual statistics if any month in that year has more than 5 days missing.

YEAR(S)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
1867	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00	0.02	0.40	0.42
1868	0.14	0.07	0.60	0.94	1.10	0.06	3.20	1.56	0.18	0.03	0.62	0.48	8.98
1869	0.71	1.01	0.88	0.70	1.46	1.55	0.55	1.47	0.20	0.00	1.10	1.51	11.14
1870	0.05	0.35	0.65	0.42	0.89	0.51	4.00	3.32	2.67	1.14	0.17	0.61	14.78
1871	1.49	0.20	0.53	0.38	0.33	1.26	0.91	2.88	2.89	0.77	1.46	1.01	14.11
1872	0.34	0.20	0.13	0.14	0.45	2.44	2.62	2.98	0.27	0.25	0.01	0.04	9.87
1873	0.55	0.40	0.15	0.26	0.33	1.72	1.02	2.79	1.23	0.07	0.38	0.83	9.73
1874	1.39	1.60	1.51	1.71	0.70	0.54	3.92	1.73	1.52	2.47	0.58	2.26	19.93
1875	0.67	0.72	1.37	0.33	0.88	0.33	6.91	1.59	4.14	0.06	1.50	0.47	18.97
1876	0.61	0.40	0.64	0.46	0.83	1.62	5.43	2.13	0.85	0.75	0.97	0.38	15.07
1877	0.18	1.08	0.14	1.83	0.92	0.13	3.54	1.72	0.96	1.32	0.70	0.63	13.15
1878	0.21	0.89	0.73	0.22	1.01	3.18	3.20	5.15	1.03	0.00	3.15	0.78	19.55
1879	0.77	0.23	0.15	0.48	0.37	0.51	2.34	2.30	1.07	1.38	1.34	0.50	11.44
1880	0.28	0.94	0.15	0.05	0.52	0.65	2.69	1.79	1.13	0.75	0.28	0.66	9.89
1881	0.38	0.22	0.57	0.98	2.31	0.08	4.72	6.28	0.91	4.19	1.11	0.00	21.75
1882	0.47	0.06	0.23	0.26	1.06	1.36	1.17	4.12 a	0.62	0.00	0.90	0.55	10.80
1883	0.42	0.96	0.40	0.11	0.87	0.00 o	0.00	0.00	0.00	0.00	0.00	0.00	2.76
1884	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	1.77	1.77
1885	0.26	0.53	1.51	1.38	1.31	1.57	1.13	0.98	1.87	1.07	1.01	2.27	14.89
1886	0.70	0.85	0.47	1.33	0.21	0.95	1.54	4.15	4.02	1.06	0.30	0.32	15.90
1887	0.10	0.85	0.66	0.74	1.73	0.60	2.24	1.57	2.41	1.50	0.66	0.32	13.38
1888	0.44	0.90	0.61	1.42	0.70	0.16	1.98	2.08	0.38	1.40	1.30	0.66	12.03
1889	0.84	0.53	0.80	0.44	0.15	0.63	1.30 a	1.43	0.67	0.37	0.45	0.26	7.87
1890	0.42	0.88	0.69	2.08	0.00	0.13	2.18 a	1.49	0.89	0.93	1.31 a	1.60	12.60
1891	1.32	1.91	0.59	0.17	3.21	1.26	0.84	1.02	4.69	0.12	0.13 a	1.53	16.79
1892	1.34	1.22	1.49 a	0.69	0.50	1.05	2.12	0.77 a	0.00	1.32	0.36	0.70	11.56
1893	0.26	0.76	0.78	0.01	0.98	0.02	3.01	5.12	3.00	0.22	0.29	0.49	14.94
1894	0.23	1.11	0.41	1.48	1.99	0.77	2.17	1.93 a	0.87	1.05	0.00	1.28	13.29
1895	1.51	1.20	0.54	0.01	3.46	0.99	4.78	3.64	0.09	1.75	1.18	1.09	20.24
1896	0.36	0.57	0.53	1.11	0.27	0.69	3.78	1.47	1.39	3.19	0.25	0.67	14.28
1897	1.11	1.10	2.06	0.87	4.35	0.57	2.85	2.33	2.49	1.95	0.08	0.64	20.40

1898	0.97	0.30	0.88	1.37	0.22	1.53	2.31	4.00	0.18	0.54	0.27	0.40	12.97
1899	0.19 a	0.73	0.35	0.25	0.01	1.22	4.71	0.36	1.39	0.27	0.44	0.13	10.05
1900	0.38	1.00	0.63	2.10	1.65	1.44	2.85	0.83	3.00	1.19	0.74	0.08	15.89
1901	1.30	1.30	0.89	1.02	2.12	0.29	3.37	3.04	2.00	1.15	0.73	0.20	17.41
1902	0.28	0.43	1.13	0.02	2.84	0.34	1.50	2.47	2.05	0.59	0.93	0.78	13.36
1903	0.11	1.31	1.32	0.67	0.17	3.87	0.56	1.18	0.55	0.02	0.00	0.03	9.79
1904	0.20	0.26	0.32	0.05	0.79	1.53	0.66	2.31	5.37	1.70	0.23	0.77	14.19
1905	1.28	1.60	1.56	2.09	0.22	1.55	1.98	0.75	1.49	1.02	3.39	0.29	17.22
1906	0.35	0.55	1.05	2.23	0.45	0.51	3.82	1.84	1.71	1.63	0.68	1.78	16.60
1907	2.18	0.39	0.29	2.04	1.92	0.84 a	1.38 a	3.16	0.69	1.12	0.36	0.40	14.77
1908	0.36	0.85	0.28	1.85	2.10	0.60	2.14	2.74	0.07	0.56	1.14	0.10	12.79
1909	0.79	0.56	0.73	0.30	0.38	0.20	2.39	2.02	2.70	0.62	1.02	0.55	12.26
1910	0.76	0.08	0.55	0.99	0.30	0.56	0.82	1.91	1.12	0.40	0.86	0.30	8.65
1911	0.45	1.99	0.67	0.48	1.00	0.66	5.50	0.51	1.17	3.13	1.34	0.22	17.12
1912	0.03	0.40	1.85	0.43	0.99	2.21	1.49	1.15	0.08	0.84	0.03	0.79	10.29
1913	0.57	1.15	0.87	1.32	0.17	4.26	1.12	1.07	1.54	0.42	1.75	0.77	15.01
1914	0.19	0.63	0.82	0.44	2.28	1.72	3.98	2.51	0.59	2.40	0.00	1.70	17.26
1915	1.95	0.77	0.70	4.82	0.83	0.16	4.37	1.02	1.62	0.04	0.61	0.97	17.86
1916	3.02	0.20	1.36	2.50	0.07	0.38	2.77	1.67	1.45	2.76	0.06	0.17	16.41
1917	0.55	0.23	0.27	0.15	0.84	0.06	0.45	1.37	0.64	0.19	0.26	0.02	5.03
1918	1.63	1.14	1.46	0.72	1.02	0.68 a	2.42	0.82	0.76	2.73	0.63	1.24	15.25
1919	0.12	0.69	1.70	1.94	3.37	1.50 a	4.02	2.06	2.53	1.82	0.75	0.33	20.83
1920	0.31	1.12	0.57	0.73	2.28	2.04	1.04	1.98	0.77 a	1.42	0.14	0.84	13.24
1921	1.35	0.33	0.73 a	0.55	2.35	2.85	3.87	3.71	0.18	0.98	0.00	0.88	17.78
1922	0.64	0.51	0.44	1.43	0.29	0.74	1.75	1.85	1.07	0.24	1.13	0.20	10.29
1923	0.12	0.25	1.28	1.60	1.02	0.24	2.06	2.33	1.10	2.43	0.82	0.98	14.23
1924	0.13	0.24	1.12	1.26	0.85	0.31	1.53	0.71	0.62	0.30	0.33	1.52	8.92
1925	0.24 a	0.30	0.59	0.24	1.31	0.30	2.48	1.41 a	2.27	2.09	0.58	0.68	12.49
1926	0.45	0.28	1.31	0.82	3.14	0.32	1.11 a	1.50	1.49	0.94	0.13	1.46	12.95
1927	0.18	1.62	0.73	0.58	0.16	3.28	1.06	3.41	2.23	0.29	0.19	0.44	14.17
1928	0.01	1.22	1.31	1.63	2.84	0.11	0.65	2.60	0.13	1.81	0.58	0.23	13.12
1929	0.27	0.97	0.59	0.15	5.58	0.04	2.50	3.84	5.15	1.43	0.89	0.11	21.52
1930	0.46	0.49	0.68	0.81	0.41	0.37	4.32	1.99	1.89	0.64	1.12	0.06	13.24
1931	0.25	0.73	1.18	1.98	0.46	0.85	1.10	2.10	4.59	1.10	1.16	0.50	16.00
1932	0.00 z	0.00 z	0.41	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.41
1933	0.73	0.21	0.29	0.80	0.99	2.30	2.00	1.90	1.24	1.16	1.02	0.47	13.11
1934	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1935	1.11	0.56	0.06	1.02	2.72	0.07	1.89	2.03	0.98	0.58	1.50	0.36	12.88
1936	0.00 z	0.00 z	0.00 z	0.20	0.00 z	0.00 z	3.29	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	3.49
1937	0.53	0.84	0.69	0.49	3.97	3.51	0.71	1.11	2.71	0.65	0.12	0.33	15.66
1938	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1939	1.93	1.08	0.54	1.13 a	0.43	0.01	2.19	0.94	2.53	1.20	0.74	0.57	13.29
1940	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1941	1.23	0.84	1.72	1.52	2.20	0.00	0.00	0.00	2.88	2.75	0.53	0.29	13.96
1942	0.02	0.14	0.39	4.29	0.00 z	0.42	0.97	2.23	2.85	1.30	0.00	1.29	13.90
1943	0.66	0.38	0.82	0.20	1.53	0.95	0.65	2.18	0.60	0.27	0.46	0.00 z	8.70
1944	0.00 z	0.00	0.00 z	0.00 z	0.29 p	1.78	3.52	2.35	1.29	2.39	1.14	0.66	13.13

1945	0.34	0.52	1.10	1.18	0.15	0.39	2.43	2.76	0.96	0.85	0.00	0.81	11.49
1946	0.44	0.68	1.71	0.28	0.32	0.06	3.48	3.72	0.64	0.92	1.17	0.12	13.54
1947	0.39	0.34	0.44	0.10	2.47	0.38	0.53	3.03	0.42	0.70	0.76	1.42	10.98
1948	0.09	1.86	0.87	0.50	3.48	2.40	0.00 n	0.00 z	1.12	2.42 g	0.18	0.27	10.77
1949	1.71	0.32	0.45	0.81	1.37	0.98 g	5.21	1.79	1.21	0.34	0.00	1.01 a	14.22
1950	1.04	0.82	0.05	0.29	0.03	0.04 i	4.22	1.47	1.22	0.27	0.00	0.00	9.41
1951	0.23	0.30	0.31	0.43	1.59	0.80	0.40	3.94	0.05	0.37	0.30	0.54	9.26
1952	0.55	0.49	0.82	1.07	1.12	0.36	2.57	2.26	0.79	0.07	0.80	0.53	11.43
1953	0.32	0.44	0.80	0.24	0.84	0.39	5.12	0.94	1.08	0.51	1.34	0.78	12.80
1954	0.35	0.13	1.49	0.00	1.88	1.14	3.38	3.42	1.09	0.68	0.13	0.37	14.06
1955	0.81	0.27	0.20	0.89	1.29	0.23	1.87	2.57	1.35	0.24	0.02	1.11	10.85
1956	0.83	0.26	0.00	0.01	1.22	0.58	1.77	1.39	0.00	0.24	0.09	0.29	6.68
1957	1.00	0.91	1.61	1.22	1.59	0.30	2.33	3.61	0.20	3.20	1.33	0.26	17.56
1958	0.73	1.02	1.74	1.43	0.18	0.67	0.57	3.73	2.38	1.26	0.60	0.32	14.63
1959	0.32	0.32	0.91	1.00	1.40	1.20	1.03	2.79	0.08	2.27	0.18	1.41	12.91
1960	1.30	1.39	1.28	0.22	0.33	2.52	3.45	1.36	0.66	2.89	0.38	1.84	17.62
1961	0.53	0.55	0.79	0.93	0.69	0.46	1.88	3.96	1.77	1.14	0.74	1.33	14.77
1962	0.68	0.27	0.37	0.08	0.07	1.77	1.74	0.84	2.59	0.82	1.41	0.65	11.29
1963	0.68	1.15	0.59	0.15	1.01	1.05	2.84	2.80	2.45	0.97	0.36	0.13	14.18
1964	0.30	1.48	0.80	1.27	0.91	0.22	3.13	2.09	1.67	0.02	0.46	1.00	13.35
1965	1.54	0.98	0.74	0.33	2.31	3.12	1.64	2.85	2.73	2.21	0.56	1.70	20.71
1966	0.46	0.47	0.45	0.00 z	0.50	2.56	2.49	2.76	1.20	0.32	0.48	0.45	12.14
1967	0.24	0.67	1.05	0.00	0.19	1.64	2.51	4.67	1.69	0.26	0.27	1.86	15.05
1968	0.24	0.71	0.53	0.84	0.51	0.26	6.11	3.90	0.18	0.24	1.01	0.66	15.19
1969	0.41	0.64	0.80	2.80	1.99	1.65	1.71	3.85	1.30	2.09	0.30	2.02	19.56
1970	0.00	0.43	0.56	0.58	0.33	2.15	2.72	1.90	1.18	1.28 a	0.32	0.03	11.48
1971	0.40	0.48	0.13	1.26	0.20	0.40	3.15	0.91	2.31	0.00 z	2.06	1.14	12.44
1972	0.16	0.03	0.00 j	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.19
Period of Record Statistics													
MEAN	0.63	0.69	0.77	0.91	1.22	1.04	2.43	2.25	1.47	1.06	0.66	0.71	13.98
S.D.	0.55	0.45	0.47	0.85	1.10	0.96	1.44	1.19	1.17	0.91	0.61	0.56	3.44
SKEW	1.60	0.77	0.68	1.90	1.40	1.28	0.66	0.69	1.21	1.04	1.74	0.92	0.17
MAX	3.02	1.99	2.06	4.82	5.58	4.26	6.91	6.28	5.37	4.19	3.39	2.27	21.75
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.03
NO YRS	98	99	98	97	96	95	98	97	98	97	99	99	89

SANTA FE, NEW MEXICO

Monthly Total Snowfall (Inches)

File last updated on Mar 10, 1999
*** Note *** Provisional Data *** After Year/Month 197203
a = 1 day missing, b = 2 days missing, c = 3 days, ..etc..,
z = 26 or more days missing, A = Accumulations present
Long-term means based on columns; thus, the monthly row may not
sum (or average) to the long-term annual value.
MAXIMUM ALLOWABLE NUMBER OF MISSING DAYS : 5
Individual Months not used for annual or monthly statistics if more than 5 days are missing.
Individual Years not used for annual statistics if any month in that year has more than 5 days missing.

YEAR(S)	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN
1866-67	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1867-68	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1868-69	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1869-70	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1870-71	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1871-72	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1872-73	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1873-74	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1874-75	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1875-76	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1876-77	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1877-78	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1878-79	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1879-80	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1880-81	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1881-82	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1882-83	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1883-84	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1884-85	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1885-86	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1886-87	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1887-88	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1888-89	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1889-90	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1890-91	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1891-92	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1892-93	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1893-94	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1894-95	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1895-96	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1896-97	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00

1897-98	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1898-99	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1899-00	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1900-01	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1901-02	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1902-03	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1903-04	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1904-05	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1905-06	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1906-07	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1907-08	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1908-09	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1909-10	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1910-11	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1911-12	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1912-13	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1913-14	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1914-15	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1915-16	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1916-17	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1917-18	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1918-19	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1919-20	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1920-21	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1921-22	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1922-23	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1923-24	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1924-25	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	60.60 z	0.00 z	0.00 z	0.00 z	0.00
1925-26	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1926-27	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1927-28	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1928-29	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1929-30	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1930-31	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1931-32	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1932-33	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1933-34	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1934-35	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1935-36	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1936-37	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1937-38	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1938-39	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1939-40	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1940-41	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	4.30
1941-42	0.00 z	0.00 z	0.00	0.00	0.00	4.30	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00	11.00
1942-43	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	5.00	6.00	0.00	0.00	0.00	0.00	11.00
1943-44	0.00	0.00	0.00	0.00	0.00	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00

1944-45	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	6.50	8.50	4.70	8.00	0.00	0.00	27.70
1945-46	0.00	0.00	0.50	0.00	0.00	12.00	11.00	10.80	18.20	0.00	0.00	0.00	52.50
1946-47	0.00	0.00	0.00	0.00	10.20	1.00	10.00	3.00	6.50	0.50	0.00	0.00	31.20
1947-48	0.00	0.00	0.00	0.00	6.70	14.00	1.10	15.50	6.00	0.00	0.00	0.00	43.30
1948-49	0.00 n	0.00 z	0.00	0.00 g	2.10	2.70	17.00	0.10 c	1.00	4.10	0.00	0.00 g	27.00
1949-50	0.00	0.00	0.00	0.00	0.00	11.00 a	8.50	6.00	0.00	0.00	0.00	0.00 i	25.50
1950-51	0.00	0.00	0.00	0.00	0.00	0.00	3.50	1.00	1.00 a	0.00	0.00 b	0.00	5.50
1951-52	0.00	0.00	0.00	0.00	0.30	5.80	1.50	6.00	7.70	0.00	1.00	0.00	22.30
1952-53	0.00	0.00	0.00	0.00	4.40	5.80	8.00	7.20	4.20	0.00	0.00	0.00	29.60
1953-54	0.00	0.00	0.00	0.00	6.00	7.50	1.50 a	1.80	0.50	0.00	0.00	0.00	17.30
1954-55	0.00	0.00	0.00	0.00	0.00	0.00 a	0.00	0.00 a	2.00	0.00	0.00	0.00	2.00
1955-56	0.00	0.00	0.00	0.00	0.00	0.00 b	0.00 c	0.00 g	0.00	0.00	0.00	0.00	0.00
1956-57	0.00	0.00	0.00	0.00	1.50	3.00	6.10	0.60	2.80	6.00	0.00	0.00	20.00
1957-58	0.00	0.00	0.00	0.00	0.00 h	0.00 d	0.00 f	0.00 e	0.00 z	0.00 b	0.00	0.00	0.00
1958-59	0.00	0.00	0.00	0.00	0.00 d	0.00 a	0.00 e	0.00 e	0.00 c	0.00 a	0.00	0.00	0.00
1959-60	0.00	0.00	0.00	0.00	0.00 a	0.00 f	0.00 e	0.00 n	0.00 e	0.00 a	0.00	0.00	0.00
1960-61	0.00	0.00	0.00	0.00	0.00	12.10	5.00	9.50	6.70	4.00	0.00	0.00	37.30
1961-62	0.00	0.00	0.50	0.00	9.30	14.50	7.10	2.00	7.00	0.00	0.00	0.00	40.40
1962-63	0.00	0.00	0.00	0.00	7.00	6.00	11.00	10.50	10.00	1.00	0.00	0.00	45.50
1963-64	0.00	0.00	0.00	0.00	1.50	3.50	6.00	24.50	13.50	17.00	0.00	0.00	66.00
1964-65	0.00	0.00	0.00	0.00	3.00	12.00	14.00	14.00	10.00	0.50	0.00	0.00	53.50
1965-66	0.00	0.00	0.00	7.00	0.00	13.00	6.50	0.00	0.00 a	0.00 z	0.00	0.00	26.50
1966-67	0.00	0.00	0.00	0.00	0.20	4.00	3.00	3.20	2.00 a	0.00	0.00	0.00	12.40
1967-68	0.00	0.00	0.00	3.00	0.00 c	31.50	2.30	6.50	0.00	0.00	0.00	0.00	43.30
1968-69	0.00	0.00	0.00	0.00	0.00 e	3.50 c	0.00 b	2.00	5.00	0.00	1.50	0.00	12.00
1969-70	0.00	0.00	0.00	0.00	0.00	14.00	0.00	2.70	4.00	3.00	0.00	0.00	23.70
1970-71	0.00	0.00	0.00	0.00	1.60	0.00	6.00	5.00	3.00	0.00	0.00	0.00	15.60
1971-72	0.00	0.00	0.00	0.00 z	0.00 p	6.00 a	0.00 a	0.00	0.00 j	0.00 z	0.00 z	0.00 z	6.00
Period of Record Statistics													
MEAN	0.00	0.00	0.03	0.37	1.99	6.93	5.02	5.42	4.29	1.63	0.09	0.00	28.67
S.D.	0.00	0.00	0.13	1.45	3.12	7.05	4.65	5.88	4.62	3.72	0.33	0.00	18.58
SKEW	0.00	0.00	3.40	4.00	1.46	1.59	0.76	1.48	1.28	2.98	3.56	0.00	0.21
MAX	0.00	0.00	0.50	7.00	10.20	31.50	17.00	24.50	18.20	17.00	1.50	0.00	66.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NO YRS	27	27	29	27	27	27	28	27	27	27	28	26	20

SANTA FE 2, NEW MEXICO (298085)

Period of Record Monthly Climate Summary

Period of Record : 4/ 1/1972 to 12/31/1998

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	41.7	48.0	55.0	63.4	72.4	82.8	85.7	83.2	76.9	66.6	52.4	43.9	64.4
Average Min. Temperature (F)	18.3	23.1	27.6	33.3	42.0	51.2	55.7	54.4	47.6	36.9	26.3	19.0	36.3
Average Total Precipitation (in.)	0.68	0.56	0.89	0.72	1.28	1.28	2.22	2.19	1.76	1.24	1.07	0.66	14.53
Average Total SnowFall (in.)	3.6	3.1	2.3	0.9	0.0	0.0	0.0	0.0	0.0	0.8	2.7	3.7	17.1
Average Snow Depth (in.)	1	0	0	0	0	0	0	0	0	0	0	0	0

Western Regional Climate Center, wrcc@dri.edu

00105

SANTA FE 2, NEW MEXICO

Monthly Average Temperature (Degrees Fahrenheit)

File last updated on Apr 13, 1999
*** Note *** Provisional Data *** After Year/Month 199812
a = 1 day missing, b = 2 days missing, c = 3 days, ..etc..,
z = 26 or more days missing, A = Accumulations present
Long-term means based on columns; thus, the monthly row may not
sum (or average) to the long-term annual value.
MAXIMUM ALLOWABLE NUMBER OF MISSING DAYS : 5
Individual Months not used for annual or monthly statistics if more than 5 days are missing.
Individual Years not used for annual statistics if any month in that year has more than 5 days missing.

YEAR(S)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
1972	----- z	----- z	----- z	49.70	57.63	66.08	70.81	67.22a	60.82	52.55a	33.28	28.89	54.11
1973	27.18	32.14	36.98	41.22l	54.87	64.05	69.05	68.73	59.88	52.15d	41.85	31.60	48.95
1974	27.05	30.36	44.82	45.42e	62.62f	68.98	69.81	65.66	58.95	52.02	38.73	26.90	48.06
1975	25.53	30.91	39.00	42.53	53.98	65.03	68.31	67.63	58.28	51.21	42.45h	32.39	48.62
1976	29.53	38.78	39.42	48.67	56.11	66.30	69.19	67.23	61.33	47.08	37.52	28.65	49.15
1977	25.63	34.29	37.08	48.68	57.29	69.30	70.95	71.08	63.58	54.63	42.20	31.77	50.54
1978	32.42	33.98	43.19	51.57	54.89	68.28	73.53	68.11	61.80	53.97	41.47	28.65	50.99
1979	23.55	31.34	40.44	48.50	54.56	64.27	70.47	67.11	64.23	54.81	34.38	34.02	48.97
1980	33.23	36.74	38.92	45.70	55.02	69.63	75.16	69.37	63.98	50.30a	40.88	38.97	51.49
1981	35.47	37.71	39.55	52.78	57.10	70.32	71.76	68.37	63.00	51.71	43.30	35.82	52.24
1982	29.26	32.57	41.37	48.63	55.69	66.25	71.82l	69.60	62.37	48.97	38.48	29.73	47.54
1983	31.13	34.18	40.06	43.05	55.10	64.73	72.57d	71.85	67.64a	54.26	41.81a	32.66	50.75
1984	30.85	37.10	42.23	47.33	64.27	67.73	74.35	70.95a	64.25d	48.13a	42.53	34.37	52.01
1985	30.57a	34.55	43.66	52.55	58.71	68.57	71.84	71.90	61.28	53.11	42.03	35.24	52.00
1986	39.55	39.05	46.21	52.18	57.94	67.60	70.44	71.32	60.50	50.48	38.53	32.47	52.19
1987	30.48	35.82	40.35	51.12	56.81	68.48	72.10	69.05	62.67	55.82	40.60	31.40	51.23
1988	28.02	39.03	41.21	50.05	58.52	67.92	71.41o	67.97l	59.33	53.92	38.53	29.15	46.57
1989	28.61	34.57	44.71	52.85	59.32	66.97	70.55	66.48	67.73	54.00	41.35	31.29	51.54
1990	30.52	35.91	45.15	50.72a	55.26	70.60	68.37	66.79	62.27s	51.24h	40.63	26.68	49.06
1991	28.65	37.96	39.03	46.88	56.97	65.75	67.90	67.37	60.23	51.60	36.82	30.97	49.18
1992	26.40	35.86	41.79	51.18	56.74	63.80	68.40	67.02	61.63	53.11	33.18	25.29	48.70
1993	32.29	35.45	41.32	48.35	56.71	65.97	70.53	66.98	60.18	49.47	35.48	30.39	49.43
1994	30.71	32.25	42.02	48.50	57.74	70.10	70.92	71.10	62.50	49.73	38.28	34.71	50.71
1995	31.98	40.98	42.29	45.80	54.92	64.27	69.97	71.42	62.10	51.55	43.48	33.58	51.03
1996	30.58	38.90	39.05a	50.18	63.39	69.15	71.84	68.29	58.70	49.11	40.42	32.77	51.03
1997	27.84	34.30	44.18	45.58	57.69	64.13	67.76	68.58	64.60	51.35	36.48	26.35	49.07
1998	32.98	33.77	39.61	44.65	57.50	64.85	69.73	69.42	67.13	51.48	41.80	33.60a	50.54
Period of Record Statistics													
MEAN	30.00	35.33	41.29	48.58	57.10	67.00	70.65	68.79	62.26	51.79	39.39	31.42	50.64
S.D.	3.36	2.82	2.48	2.96	2.44	2.17	1.95	1.86	2.62	2.22	3.02	3.22	1.17
SKEW	0.61	0.08	0.22	-0.35	1.50	0.06	0.53	0.34	0.60	-0.20	-0.65	0.05	-0.34
MAX	39.55	40.98	46.21	52.85	64.27	70.60	75.16	71.90	67.73	55.82	43.48	38.97	52.24
MIN	23.55	30.36	36.98	42.53	53.98	63.80	67.76	65.66	58.28	47.08	33.18	25.29	48.70
NO YRS	26	26	26	26	26	27	25	26	26	26	26	27	20

SANTA FE 2, NEW MEXICO

Monthly Total Precipitation (inches)

File last updated on Apr 13, 1999
*** Note *** Provisional Data *** After Year/Month 199812
a = 1 day missing, b = 2 days missing, c = 3 days, ..etc..,
z = 26 or more days missing, A = Accumulations present
Long-term means based on columns; thus, the monthly row may not
sum (or average) to the long-term annual value.
MAXIMUM ALLOWABLE NUMBER OF MISSING DAYS : 5
Individual Months not used for annual or monthly statistics if more than 5 days are missing.
Individual Years not used for annual statistics if any month in that year has more than 5 days missing.

YEAR(S)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
1972	0.00 z	0.00 z	0.00 z	0.03	1.47	0.72	1.84	2.25	2.32	1.78	1.26	0.56	12.23
1973	0.54	0.49	1.28	0.11	1.07	1.81	3.56	1.27	1.78	0.55	0.32	0.14	12.92
1974	1.56	0.92	0.50	0.28	0.35	0.04	2.81	1.24	1.93	3.27	0.14	0.68	13.72
1975	0.57	0.55	0.87	0.47	0.65	0.32	2.02	1.15	4.65	0.00	1.22	0.17	12.64
1976	0.03	0.47	0.55	0.55	0.18	0.09	2.16	2.01	1.19	0.27	0.12	0.27	7.89
1977	0.55	0.44	0.44	1.46	0.91	0.13	3.28	3.00	0.74	0.46	1.66	0.17	13.24
1978	0.85	0.48	0.86	0.17	2.67	2.29	0.66	0.99	0.85	1.06	2.64	0.57	14.09
1979	0.55	0.74	0.13	0.83	2.98	3.75	2.16	2.11	0.55	1.06	0.95	0.34	16.15
1980	1.29	1.31	1.00	1.18	1.95	0.02	0.23	2.08	1.98	0.05	0.33	0.07	11.49
1981	0.11	0.00	0.96	0.88	1.53	0.46	3.00	3.80	1.17	1.10	0.53	0.00	13.54
1982	1.54	1.02	0.75	0.00	0.72	0.15	2.75	0.86	2.81	0.70	1.25 b	1.22	13.77
1983	0.46	0.86	1.21	0.39	0.28	0.36	2.79 d	1.46	1.11 a	0.85	0.98	0.86 c	11.61
1984	0.08 a	0.06	2.01	0.60	0.57	4.00	0.97	2.90	0.62	2.59	0.68	2.62 a	17.70
1985	0.37 a	0.72	2.16	3.53	1.58	1.99	0.97	0.85	2.35	3.16	0.27	0.05	18.00
1986	0.03	1.03	0.68	1.27	1.14	2.26	2.14	1.40	2.81	1.38	3.52	1.62	19.28
1987	0.85	0.34	0.20	0.17	2.26	0.68	0.65	3.52	0.46	0.75	0.94	0.37	11.19
1988	0.92	0.13	0.17 h	1.25	1.04	3.83	0.88 p	2.26 h	3.56	0.79	0.92 a	0.00	12.44
1989	1.01	0.74	0.85	0.09	0.49	0.32	2.32	1.61 e	0.52	1.62	0.40	0.37	10.34
1990	0.41 b	0.82	0.41	1.77	1.23	0.00	2.56	2.60	2.30 l	0.56 b	1.19	1.60	13.15
1991	0.04	0.00	1.45	0.00	2.08	2.64	4.43 a	3.59	1.95	0.38	1.53	1.36	19.45
1992	0.82	0.28	0.72 a	0.27	2.37	1.15	0.94	2.65	1.68	0.53	1.61	2.18	15.20
1993	2.08 a	0.98 a	1.25	0.00	0.77	0.53	1.77	3.46	0.54	0.68	1.00	0.25	13.31
1994	0.31 a	0.60	1.91	1.53	3.96	0.58	0.64	2.94	2.35	2.61	2.00 c	0.66	20.09
1995	0.70 a	0.48	0.38	0.70	1.25 a	1.25	0.91	2.52	1.86	0.00	0.26	0.13 a	10.44
1996	0.44	0.15	0.12	0.00	0.01	3.13	2.60	2.24	1.88	2.97 a	0.94	0.00	14.48
1997	1.24	0.60 a	0.31	1.44	1.03	1.50	4.81	1.50	2.21	0.69	1.26	1.22	17.81
1998	0.02	0.44	1.70	0.39 a	0.00	0.58	4.26	1.84	0.30	3.54	0.56	0.03 a	13.66
Period of Record Statistics													
MEAN	0.67	0.56	0.91	0.72	1.28	1.28	2.20	2.15	1.70	1.24	1.05	0.65	14.25
S.D.	0.54	0.34	0.59	0.79	0.96	1.28	1.24	0.90	1.05	1.08	0.78	0.71	3.17
SKEW	0.82	0.11	0.64	1.78	0.93	0.90	0.33	0.27	0.82	0.91	1.37	1.26	0.23
MAX	2.08	1.31	2.16	3.53	3.96	4.00	4.81	3.80	4.65	3.54	3.52	2.62	20.09
MIN	0.02	0.00	0.12	0.00	0.00	0.00	0.23	0.85	0.30	0.00	0.12	0.00	7.89
NO YRS	26	26	25	27	27	27	26	26	26	27	27	27	24

SANTA FE 2, NEW MEXICO

Monthly Total Snowfall (Inches)

File last updated on Mar 10, 1999
*** Note *** Provisional Data *** After Year/Month 199812
a = 1 day missing, b = 2 days missing, c = 3 days, ..etc..,
z = 26 or more days missing, A = Accumulations present
Long-term means based on columns; thus, the monthly row may not
sum (or average) to the long-term annual value.
MAXIMUM ALLOWABLE NUMBER OF MISSING DAYS : 5
Individual Months not used for annual or monthly statistics if more than 5 days are missing.
Individual Years not used for annual statistics if any month in that year has more than 5 days missing.

YEAR(S)	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN
1971-72	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00	0.00	0.00	0.00
1972-73	0.00	0.00	0.00	0.00	12.50	6.50	8.50	6.00	9.40	6.00	0.00	0.00	48.90
1973-74	0.00	0.00	0.00	0.00	0.00	4.30	17.00	10.50	5.20	0.00	0.00	0.00	37.00
1974-75	0.00	0.00	0.00	0.00	0.50	6.50	1.30	1.80 a	1.50	3.30 a	0.00	0.00	14.90
1975-76	0.00	0.00	0.00	0.00	5.50	1.90	0.00 z	0.00 z	4.90	0.00	0.00	0.00	12.30
1976-77	0.00	0.00	0.00	0.00	2.00	4.20	0.00 z	0.00 z	0.50	4.00	0.00	0.00	10.70
1977-78	0.00	0.00	0.00	0.00	2.00	1.00	0.00 z	0.00 z	0.00 a	0.00	0.00 b	0.00	3.00
1978-79	0.00	0.00	0.00	0.00	1.00	5.50 a	0.00 z	0.00 z	0.00	0.00	0.00	0.00	6.50
1979-80	0.00	0.00	0.00	0.00 a	0.00 a	0.00 j	0.00 z	0.00 z	0.00 z	0.00 z	0.00	0.00	0.00
1980-81	0.00	0.00	0.00	0.00	3.50	0.00	0.50 a	0.00	0.00 a	0.00	0.00	0.00	4.00
1981-82	0.00	0.00	0.00	0.00 a	0.00	0.00	0.00 z	0.00 z	0.00	0.00	0.00	0.00	0.00
1982-83	0.00	0.00	0.00	0.00	0.50	5.50 b	0.00 z	0.00 z	0.00 z	3.40	0.00	0.00	9.40
1983-84	0.00	0.00	0.00	0.00	6.40 a	7.10	2.80	0.00	0.00 c	3.00	0.00	0.00	19.30
1984-85	0.00	0.00	0.00	2.00	1.50	35.50	3.50 a	2.30	3.30	0.00	0.00	0.00	48.10
1985-86	0.00	0.00	0.00	0.00	0.00	1.20	0.00	10.40	4.00	0.00 c	0.00	0.00	15.60
1986-87	0.00	0.00	0.00	4.00	16.00	0.00 z	7.00	0.00	0.00	0.00	0.00	0.00	27.00
1987-88	0.00	0.00	0.00	0.00	3.00	5.00	10.50	1.00	1.50 h	0.00	0.00	0.00	19.50
1988-89	0.00 a	0.00	0.00	0.00	6.80 a	0.00	6.30	8.50	9.30	0.00	0.00	0.00	30.90
1989-90	0.00	0.00	0.00	0.00	3.00	1.00	0.00	8.30	0.00	0.00	0.00	0.00	12.30
1990-91	0.00	0.00	0.00	0.00	5.00	0.00 i	1.00	0.00	11.00	0.00	0.00	0.00	17.00
1991-92	0.00	0.00	0.00	5.00	0.00	0.00 a	0.00 b	0.00	0.00	0.00	0.00	0.00	5.00
1992-93	0.00	0.00	0.00	0.00	0.00 b	0.00 d	0.00 a	0.00	0.00 a	0.00	0.00	0.00	0.00
1993-94	0.00	0.00	0.00	0.00 a	0.00	0.00 a	0.00 e	0.00 a	0.00 a	0.00	0.00	0.00	0.00
1994-95	0.00	0.00	0.00	0.00	0.00	0.00	0.00 b	0.00	0.00	0.00	0.00	0.00	0.00
1995-96	0.00	0.00	0.00	0.00	0.00	0.00	0.00 a	0.00 a	0.00	0.00	0.00	0.00	0.00
1996-97	0.00	0.00	0.00	10.00	0.00	0.00	9.10	4.00 a	0.00	2.00 b	0.00	0.00	25.10
1997-98	0.00	0.00	0.00	0.50	3.30 a	7.00	0.20	4.20	4.00 a	1.20 a	0.00	0.00	20.40
Period of Record Statistics													
MEAN	0.00	0.00	0.00	0.83	2.79	4.01	3.56	3.00	2.31	0.88	0.00	0.00	17.59
S.D.	0.00	0.00	0.00	2.26	4.03	7.40	4.86	3.86	3.50	1.66	0.00	0.00	16.64
SKEW	0.00	0.00	0.00	3.07	1.95	3.52	1.34	0.91	1.34	1.72	0.00	0.00	0.64
MAX	0.00	0.00	0.00	10.00	16.00	35.50	17.00	10.50	11.00	6.00	0.00	0.00	48.90
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NO YRS	26	26	26	26	26	23	19	19	23	26	27	27	16

Appendix D.

Lithologic logs from borehole drilling programs at the Santa Fe and Taos sites

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(505) 345-3407, FAX (505) 345-9920

Environmental borehole logging form

Client: NMED	Project: Nitrogen Study	Hole: BG-A	Date: 6-21-99
Site: Santa Fe Waste water Treatment Plant	Start time: 12:40	Geologist: STF	
	Contractor:	Map: o A	
Drill method: hollow stem Auger	Rig: CME-75	o B o C	
Bit size: 7 1/4"	Comments: Background location split spoon samples 2' tool		

depth, ft	sample depth	PID PPM	blows /6"	description
0-3	3		6/6"	Sandy silt, moist, sand fine grn, Brn (SP -3' 100% rec)
3-5	5		18/6"	Sandy silt, dry, Buff, fine grn, few gravels <1" dia dry (SP-5', 75% rec)
5-8				Silty Sandy Gravel, buff, sand poorly sorted, gravel <2" dia dry
8-12	10		60/6"	Sandy gravel, minor silt + few cobbles > 3" dia, dry sand poorly sorted fine-coarse grn (Sp 10' 90% rec)
12-15	15		>60/6"	Sandy gravel, Tan, slightly moist, sand coarse-med grn, gravel <1" dia subrounded (Sp 15' 60% rec)
25	20		18/6"	Gravelly Sand, brn, sand coarse-med grn, gravel <1/2" dia, slightly moist (Sp 20' 95% rec)
25-30	30		10/6"	Sand, brn, slightly moist, few gravels, minor clay + silt (Sp 30 - 95% rec)

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Environmental borehole logging form

Client: NMED	Project: Nitrogen Study	Hole: BG-B	Date: 6/21/99
Site: Santa Fe Wastewater Treatment Plant	Start time: 14:00	Geologist: STF	
	Contractor: Hydrogeologic Services	Map: ○A ○B ○C	
Drill method: Hollow Stem Auger	Rig: CME-75		
Bit size: 7 1/4"	Comments: Background location 2' split spoon sampler		

depth, ft	sample depth	PID PPM	blows /6"	description
0 - 2				Silty Sand, Brn, moist, sand fine grn - med grn.
2 - 4	3		6/6"	Sandy silt, Buff, clay, V. fine grn (sp-3' 70% rec dry)
4 - 10	5		12/6"	Silty Sandy Gravel, Buff, clay, poorly sorted, sand fine- coarse grn, Gravel ≤ 1" dia (sp-5' 65% rec dry, gravels)
10 - 13	10		35/6"	Sandy Gravel w/ cobbles, buff, sand + gravel poorly sorted, cobbles > 3" dia (sp 10 95% rec dry gravels)
13 - 25	15		50/6"	gravelly Sand, brn, slightly moist, sand med - coarse grn, gravels ≤ 1 1/2" dia (sp 15 90% rec, dry)
	20		27/6"	same as abv, (sp 20
25 - 30	30		16/6"	gravelly sand, brn, minor clay content, moist, sand poorly sorted, very few gravels, ≤ 1/2 dia. (sp 20

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Environmental borehole logging form

Client: NMED	Project: NMED - Nitrogen	Hole: BG-C	Date: 6-21-95
Site: Santa Fe Wastewater Treatment Facility	Start time: 11:10	Geologist: STF	
Drill method: Hollow Stem Auger	Contractor: Hydrogeologic Services	Map: A, B, C	
Bit size: 7¼"	Rig: CME-75		
	Comments:		

depth, ft	sample depth	PID PPM	blows /6"	description
0-4	3		5/6"	Sandy silt, buff, low moisture, high carbonate material Sand V. fine grn. (collect sp-3-4.5 70% rec)
4-7	5		45/24"	Silty Sandy Gravel, buff, mod. moisture, carbonate. Sand poorly sorted Gravel < ½" dia well rounded. (collect sp-5-6.6 80% rec)
7-10	10		30/6"	Sandy Gravel w/ cobbles, sand f grn-coarse grn buff, gravel 1-2" dia subrounded, low moisture (collect sp-10-11.6 75% rec)
11-15	15		20/6"	Gravelly Sand, sand poorly sorted, brn, slightly moist, Gravel < ½" dia subrounded (collect sp-15 slight moisture, 90%)
15-20	20		50/6"	Silty Sand, brn, sand poorly sorted coarse-fine grn, few gravels < ½" minor clay content, moist, (SP-20 (refusal @ 21ft) ~ 60% rec) caliche @ 21 ft Pi split spoon sample
20-27				Silty Sand, brn, sand med-fine grn, moist
27-30				Silty Sand, dark brn, minor clay, mod. moisture, few gravels < ½" dia. sand v. coarse-fine grn.
	30		25/6"	SP-30-2ft, clay content, sand, few gravel, silt, 90% rec

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Environmental borehole logging form

Client: NMED	Project: NMED - Nitrogen Study	Hole: I1-A	Date: 6-22-99
Site: Santa Fe	Start time: 10:05	Geologist: STF	
	Contractor: Hydrogeologic Services	Map: N ↑ DA	
Drill method: Hollow Stem Auger	Rig: CME-75		
Bit size: 7 4/4"	Comments:	B° °C	

depth, ft	sp sample depth	PID PPM	blows /6"	description
0-9	3		6/6"	Sandy Silt, Brn, some clay + organic content; sand fine grn; very moist, (Sp3 90% rec V. moist)
	5		10/6"	(Sp5 85% rec V. moist)
9-30	10		20/6"	gravelly Sand; Brn; moist; Sand, med-coarse grn, mod. sorting; few gravels, < 1/2" dia; moist (Sp10, 75% rec, moist)
	15		25/6"	(Sp15, 90% rec; moist; gravels)
	20		25/6"	(Sp20 90% rec slightly moist some gravel)
	30		25/6"	(Sp30 75% rec, slightly moist, gravels)

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Environmental borehole logging form

Client: NMED	Project: NMED Nitrogen Study	Hole: I1-B	Date: 6-22-99
Site: Santa Fe Wastewater Treatment Plant Sludge Disposal Area 4	Start time: 12:15	Geologist: STF	
Drill method: Hollow Stem Auger	Contractor: Hydrogeologic Services	Map: °A site I1 °B °C	
Bit size: 7 1/4"	Rig: CME-75		
	Comments: Impacted location 2		

depth, ft	sample depth	PID PPM	blows /6"	description
0-5	3		4/6"	Clayey Silt, brn, v. moist; minor fine-grn Sand, (Sp3 100% rec, v. moist, clayey)
5-11	5		3/6"	Silty Sand, brn, moist; sand med-fine grn mod. sorted; (Sp5, 100% rec; moist; sandy)
	10		15/6"	(Sp10 90% rec; moist, bottom 1/2 gravelly)
11-15	15		50/6"	Sandy Gravel w/ Cobbles; poorly sorted; brn; moist; cobbles w 6" dia. (Sp15
15-20	20		50/6"	Gravelly Sand; brn; moist; poorly sorted; sand fine-coarse grn; gravel 1/2-1" dia; minor silt

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Environmental borehole logging form

Client: NMED	Project: Nitrogen Study	Hole: I1-C	Date: 6/21/99
Site: Santa Fe Wastewater Treatment Plant Study Disposal area 4	Start time: 8:45	Geologist: STF	
Drill method: Hollow Stem Auger	Contractor: Hydrogeologic Services Inc.	Map: OA 8 C see attached site map	
Bit size: 7¼"	Rig: CME-75		
	Comments: 2' split spoon tool Imported location in Area 4		

depth, ft	sample depth	PID PPM	blows /6"	description
0-3	3		3/6"	Sandy silt, brn, very moist, minor clay + organic matter sand med-fine grn. (Sp 3 - 100% rec V. moist)
5-10.5	5	L	4/6"	Silty Sand, brn, very moist, minor clay, sand coarse-fine grn, poorly sorted (Sp 5 100% rec V. moist)
10.5-12	10		30/6"	Sandy Gravel, Lt Brn, gravel coarse ½-2" dia, few cobbles; sand poorly sorted c-f grn, moist (Sp 10 75% rec moist, ab cobbles)
12-17	15		35/6"	Sandy gravel, Brn, gravel < 1" dia; sand poorly sorted, moist, minor silt, few granite cobbles (Sp 15 80% rec slightly moist cobbles)
17-20	20		25/6"	gravelly Sand; Brn, moist; sand poorly sorted c-f grn, gravel < 1" dia minor silt (Sp 20 75% rec slightly moist, coarse
20-25				Sandy gravel; Brn, mod moisture, gravel, granitic ~ ½-1½" dia; sand, poorly sorted
25-30			25/6"	gravelly sand; brn, mod. moisture; sand poorly sorted f-C grn; gravel < 1" dia (Sp 30 85% rec, slightly moist, gravelly)

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Environmental borehole logging form

Client: NMED	Project: Nitrogen Study	Hole: IZ-A	Date: 6-22-99
Site: Santa Fe Waste Water Plant Sludge Disposal Area I	Start time: 16:30	Geologist: STF	
	Contractor: Hydrogeologic Services	Map: Impacted location No. 2	
Drill method: Hollow Stem Auger	Rig: CME-75	1 O_A	
Bit size: 7 1/4"	Comments: 2 ft split spoon sampler	N O_B O_C	

depth, ft	sample depth	PID PPM	blows /6"	description
0-3	3		3/6"	Sandy Silt, Lt Brn, Slightly moist; sand fine grn; few gravels (Sp3, 70% rec; slightly moist)
3-6	5		30/6"	Gravelly Silty Sand; Brn; slightly moist; sand fine-med grn; gravel 1/2-1 1/2" dia
6-20	10		25/6"	Gravelly Sand; Lt Brn, slightly moist; (Sp5, 90% rec; slightly moist, buff carbonate material; mostly med-coarse grn sand (Sp10 90% rec, Slightly moist
	15		30/6"	(Sp15 90% rec; Slightly moist
20-26	20		>50/6"	Sandy Gravel; Lt Brn - Buff; Slightly moist; gravel 1/2-1" dia; sand med-coarse grn (Sp20 —)
26-30	30		>50/6"	Gravelly sand; Lt Brn; slightly moist; mostly med-coarse grn sand; gravel <1/2" dia; minor silt (Sp30; refusal @ 1'; 50% rec)

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Environmental borehole logging form

Client: NMED	Project: NMED Nitrogen Study	Hole: I2-B	Date:
Site: Santa Fe Wastewater Plant Sludge disposal Area 1	Start time: 15:20	Geologist: STF	
	Contractor: Hydrogeologic Services	Map: 1 (See site map)	
Drill method: Hollow Stem Auger	Rig: CME-75		
Bit size: 7 1/4"	Comments: Impacted location No. 2 sediments tight w/ clay ≤ 24 ft Samples heated from drilling		

depth, ft	sample depth	PID PPM	blows /6"	description
0-5	3		2/6"	Sandy Silt, brn, slightly moist; sand fine-med grn. (Sp 3; 60% rec; moist)
5-8	5		2/6"	Silty Sand w/ few gravels; brn; slightly moist; sand fine-coarse grn; gravel < 1" dia (Sp 5; 80% rec; moist)
8-12	10		15/6"	Silty Gravelly Sand; Brn; moist; sand fine-coarse grn; gravel ≤ 1/2" dia; minor clay content (Sp 10; 80% rec; moist)
12-17	15		15/6"	Gravelly Sand; Brn, moist; sand poorly sorted; gravel 1/2-2" dia; few cobbles (Sp 15; 50% rec; refusal @ 1'; slightly moist)
17-20	20		20/6"	Silty Sand w/ few gravels; Brn; moist; poorly sorted (Sp 20; 90% rec; slightly moist)
20-24				Gravelly Sand, BRN, moist; sand coarse-fine grn; gravel ≤ 1" dia,
24-28				Silty Sand w/ clay; brn, moist; sand fine-coarse grn
28-30	30		30/6"	Sandy gravel, brn; moist; ~50% gravel, 1" dia; sand poorly sorted minor silt + clay (Sp 30; 50% rec, refusal @ 1')

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Environmental borehole logging form

Client: NMED	Project: NMED - Nitrogen	Hole: I2-C	Date: 6/22/99
Site: Santa Fe Wastewater Plant Sludge Disposal Area	Start time:	Geologist: STF	
	Contractor: Hydrogeologic Services	Map:	
Drill method:	Rig: CME-75		
Bit size:	Comments: Impacted Location No. 2 sediment bound stiff w/ clay @ 22' to where drilling heated samples	See Attached map	

depth, ft	SP sample depth	PID PPM	blows /6"	description
0-3	3		2/6"	Gravelly Silty Sand; Lt Brn, Slightly moist, Sand poorly sorted fine-coarse grn, gravel < 1/2" dia (Sp 3', 50% rec; dry)
3-6	5		6/6"	Silty Sand, w/ few gravels; Lt Brn.; Slightly moist, (Sp 5; 100% rec; moist)
6-10	10		20/6"	Gravelly Sand; moist; Brn; poorly sorted sand; gravel 1/2-1" dia minor Silt content (Sp 10; 90% rec; Slightly moist)
10-12				Sandy gravel w/ few cobbles; Brn, Slightly moist; Sand poorly sorted. fine-coarse grn; gravel 1/2-1 1/2" dia
12-22	15		25/6"	Gravelly Sand; brn, Slightly moist; sand poorly sorted; gravel 1/2-1" dia (Sp 15, 60% rec; slightly moist
	20		40/6"	(Sp 20; 80% rec; slightly moist, gravels) clay
22-30				Gravelly Sand; dark brn; Slightly moist; sand poorly sorted; gravel ~1" dia; minor Silt & dark brn
				(note; ~ 50% gravel 50% Sand from 24-28 ft)
	30		50/6"	(Sp 30; 75% rec; Slightly moist)

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Environmental borehole logging form

Client: NMED	Project: Nitrogen Study	Hole: TBG-A	Date: 6/23/99
Site: Taos Site S+R Septage Disposal	Start time: 13:45	Geologist: STF	
	Contractor: Hydrogeologic Services	Map:	
Drill method: Hollow Stem Auger	Rig: CME-75		
Bit size: 7¼"	Comments: use 2" split spoon tool Background dia Location		

depth, ft	sample depth	PID PPM	blows /6"	description
0 - 1				Top soil; lt Brn, dry - slightly moist, silty carbonate
1 - 6	3		4/6"	Sandy Silt; Lt Brn; slightly moist, sand poorly sorted; minor clay (sp 3; 100% rec, slightly moist)
6 - 30	5		15/6"	Sandy Gravel w/ cobbles; Tan; dry; sand poorly sorted; Gravel poorly sorted (sp5; 80% rec.; dry)
	10			(sp10; 60% rec, dry)
	15			(sp15; 80% rec, dry)
	20			(sp20; 60% rec same gravel)
	30			(sp30; 50% rec, silt sand gravel)

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Environmental borehole logging form

Client: NMED	Project: Nitrogen Study	Hole: TBG-B	Date: 6/23/99
Site: Taos Site	Start time: 15:50	Geologist: STF	
	Contractor: Hydrogeologic Services	Map: A B C 1 N; site	
Drill method: Hollow Stem Auger	Rig: CME-75		
Bit size: 7¼"	Comments: 2" dia Split Spoon Background Location		

depth, ft	sample depth	PID PPM	blows /6"	description
0 - 4				Sandy Silt, Brn (light); slightly moist; sand fine grn; minor clay content
4 - 6	3		5/6"	Silty Sand, Buff; slightly moist; 60% sand poorly sorted; minor clay; high carbonate (SP3 75% rec,
6 - 13	5		5/6"	Sandy Gravel; Lt Brn; dry; 60% gravel ½-2" dia; sand poorly sorted, minor silt content (SP5, 80% rec silty sand)
	10		10/6"	(SP10; 45% rec, lose)
13-15	15		20/6"	Gravel w/ cobbles; dry; coarse (SP15, 50% rec, loose)
- 27	20		25/6"	Sandy gravel; Lt Brn; dry; 80% gravel poorly sorted; sand (SP20 60% rec, lose)
27-30	30		35/6"	Gravelly Sand; Lt Brn; dry; sand poorly sorted; gravel < ½" dia. (SP30; 30% rec, dry)
				note: driller raise Auger to add bentonite to bottom of hole, add ½ bag bentonite (50lb) chips + hydrate, Hole caved in on top of seal as Auger was removed.

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Environmental borehole logging form

Client: NMED	Project: Nitrogen Studies	Hole: TBG-C	Date: 6/23/99
Site: Taos Site S+E septage disposal	Start time: 12:20	Geologist: STF	
Drill method: Hollow Stem Auger	Contractor: Hydrogeologic Services	Map: N	
Bit size: 7 1/4"	Rig: CME-75		
	Comments: Background Location		

depth, ft	sample depth	PID PPM	blows /6"	description
0-3	3		12/6"	Sandy Silt; Tan Light; dry; mostly silt (caliche); sand fine grn ~1 ft (Sp3, 80% rec, dry)
3-6	5		8/6"	Sandy silt; Tan; dry; 50% silt; sand fine-coarse grn (Sp5; 60% rec, dry)
6-15	10		40/6"	Sandy Gravel; dry; Tan; gravel 1-2" dia.; sand poorly sorted coarse-fine grn; minor silt (carbonate) (Sp10; 45% rec, cobbles)
15-20	15		20/6"	Gravel; minor sand, Tan; 1/2-3" dia coarse (Sp15, 50% rec, cobbles)
20-30	20		20/6"	Gravelly Sand; Tan; slightly moist; sand poorly sorted fine-coarse grn gravel 1/2"-1" dia (Sp20; 60% rec, sand + gravel)
	30		25/6"	(Sp30; 50% rec, sandy gravel)

Note: added 1/2 50lb bag bentonite chips to bottom of hole and hydrated before tripping Auger. borehole caved in only 9 ft left open at top.

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Environmental borehole logging form

Client: NMED	Project: Nitrogen Study	Hole: TI1-A	Date: 6/24/99
Site: Taos Site S+R Septage Disposal	Start time: 10:00	Geologist: STF	
	Contractor: Hydrogeologic Services	Map:	
Drill method: Hollowstem Auger	Rig: CME-75		
Bit size: 7¼"	Comments: Impacted area MO1		

depth, ft	sample depth	PID PPM	blows /6"	description
0-1				Soil, organic silt, brn, moist
1-6	3		6/6"	Silty Sand; buff, slightly moist; sand poorly sorted; (Sp 3 60% rec moist)
6-12	5		4/6"	Gravelly Sand, Lt Brn; moist; sand poorly sorted; gravel <1" dia (Sp 5 80% rec moist)
12-15	10		12/6"	Sandy Gravel w/cobbles; Lt Brn, moist; poorly sorted + coarse (Sp 10 : 80% rec moist
15-20	15		20/6"	Gravelly Sand; Lt Brn, moist, some staining; sand v coarse - med grn, Gravel <1" dia, (Sp15; 50% rec moist)
20-28				Gravelly Sand w/ silty Clay Stringers; Lt Brn, moist; sand poorly sorted; Gravel <½" dia.
	20		8/6"	(Sp20 ; 60% rec moist)
28-30	30		7/6"	Gravelly Sand; minor silt; Lt. Brn; slightly moist; sand poorly sorted fine-coarse grn; gravel <1" dia (Sp30
				NOTE:
				Borehole P+A: add bentonite plug in bottom of hole 30-28 ft + hydrate; backfill to 22'; add
				1 50lb bag bentonite + hydrate seal
				22-20 ft; backfill to 8' add 2 ft
				bentonite seal hydrate; + backfill
				to surface

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Environmental borehole logging form

Client: NMED	Project: Nitrogen Study	Hole: TI-B	Date: 6/23/99
Site: Taos site S+R Septage disposal	Start time: 17:30	Geologist: STF	
	Contractor: Hydrogeologic Services	Map:	
Drill method: Hollow Stem Auger	Rig: CME-75		
Bit size: 7 1/4"	Comments: Impacted Location No 1		

depth, ft	sample depth	PID PPM	blows /6"	description
0-0.5				Soil + Sludge (septage solids) organics
0.5-8	3		10/6"	Silty Sand; Lt Brn; MOIST; Sand fine - coarse grn (Sp3 100% Rec moist)
8-12	5		10/6"	Sandy Gravel; Lt Brn; MOIST; Sand poorly sorted; gravel 1/2-1 1/2" dia, (Sp5 80% Rec moist)
12-18	10		?	Sandy Gravel w/cobbles; LTBrn, moist; poorly sorted; cobbles 2-3" dia. (Sp10; 80% rec; slightly moist
18-23	15		?	Gravelly Sand w/ clay stringers; LTBrn, MOIST; sand poorly sorted; gravel ~1" dia. silty (Sp15; 80% rec moist gravelly
	20		18/6"	Silty Clay layer 20-22 ft (Sp20 no recovery)
23-27	23		20/6"	Gravelly Sand w/silt; LT Brn; moist; poorly sorted. (Sp23 100% moist
27-30	30			Sand; Lt Brn, ~~moist~~ slightly moist; med-fine grn; minor Gravel + silt (hard drilling, consolidated?) (Sp30
				note: borehole abandonment 1/2 50lb bag @ 30ft Hydrate w 3 gal H_2O; 1 soil bag bentonite
				from 20-22 ft Hydrated; 1/2 50lb bag
				bentonite added from 8-9 ft Hydrated
				backfill between bentonite seal

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JOHN SHOMAKER & ASSOCIATES, INC.
WATER-RESOURCE AND ENVIRONMENTAL CONSULTANTS
2703 BROADBENT PARKWAY NE, SUITE D
ALBUQUERQUE, NEW MEXICO 87107
(505) 345-3407, FAX (505) 345-9920

Environmental borehole logging form

Client: NMED	Project: Nitrogen study	Hole: TIL-C	Date: 6/24/99
Site: Taos Site S+R Septage	Start time: 11:45	Geologist: STF	
	Contractor: Hydrogeologic Services	Map:	
Drill method: Hollow Stem Auger	Rig: CME-75		
Bit size: 7 7/8"	Comments: Impacted location No. 1		

depth, ft	sample depth	PID PPM	blows /6"	description
0-0.5				Organic matter + silty soil; Dark Brn; slightly moist
0.5-6	3		6/6"	Sandy Silt; Lt Brn; moist; sand med-fine grn. (Sp3, 60% rec, organics)
6-12	5		1/6"	Gravelly sand w/ minor silt; vi moist; Lt Brn; poorly sorted; gravel 1/2-2" dia. (minor clay?) (Sp5; 60% rec, moist)
	10		10/6"	(Sp10; 60% rec moist)
12-17	15		10/6"	Sandy gravel; Lt Brn, moist; 80% gravel 1/2-2" dia few cobbles; sand med-vi coarse grn (Sp15; 70% rec, moist)
17-19				gravelly sand w/ stringers of silty clay; sand poorly sorted; gravel <1" dia; Lt-Brn, moist
19-23	20		6/6"	Same as abv. w/ more clay stringers (Sp20; 50% rec; clayey moist)
23-26				Silty Sand; Lt Brn, moist, sand med-fine grn.
26	30			gravelly sand; Lt Brn, moist; sand poorly sorted; gravel <1" dia (Sp30
				Note: borehole abandonment bentonite
				seal (hydrated) 28-30 ft

a:\forms\eborlog

JOHN SHOMAKER & ASSOCIATES, INC.
WATER-RESOURCE AND ENVIRONMENTAL CONSULTANTS
2703 BROADBENT PARKWAY NE, SUITE D
ALBUQUERQUE, NEW MEXICO 87107
(505) 345-3407, FAX (505) 345-9920

Environmental borehole logging form

Client: NMED	Project: Nitrogen Study	Hole: TI2-A	Date: 6-24-99
Site: Taos Site S+R Septage disposal	Start time: 1615	Geologist: STF	
Drill method: Hollow Stem Auger	Contractor: Hydrogeologic Services	Map:	
Bit size:	Rig: CME-75		
	Comments: Impacted Location NO 2,		

depth, ft	sample depth	PID PPM	blows /6"	description
0–8	3		2/6"	Silty Sand; Lt Brn; dry; sand poorly sorted (moist @ 5ft) (Sp3; 70% rec, dry)
	5		2/6"	(Sp5; 70% rec; dry-moist)
8–15				Gravelly sand w/cobbles; slightly moist; Lt Brn; sand poorly sorted Gravel ½–2" dia
	10		15/6"	(Sp10; 70% rec; moist grey-yellow staining)
	15		6/6"	(Sp15; 80% rec; grey staining, slightly moist)
15–30	20		6/6"	Gravelly Sand; Lt Brn, slightly moist, poorly sorted. Gravel < 1" dia (Sp20; 80% rec; slightly moist)
	30		6/6"	(Sp30; 80% rec; bottom 1' moist clay)
				NOTE:
				Borehole P+A 1 bag (50 lb) Bentonite chips in bottom (27–30') hydrated.

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JOHN SHOMAKER & ASSOCIATES, INC.
WATER-RESOURCE AND ENVIRONMENTAL CONSULTANTS
2703 BROADBENT PARKWAY NE, SUITE D
ALBUQUERQUE, NEW MEXICO 87107
(505) 345-3407, FAX (505) 345-9920

Environmental borehole logging form

Client: NMED	Project: Nitrogen Study	Hole: TI2-B	Date: 6-24-99
Site: Taos Site S+R Septage disposal	Start time: 15:45	Geologist: STF	
Drill method: hollow stem Auger	Contractor: Hydrogeologic Services	Map:	
Bit size: 7 1/4"	Rig: CME-75		
	Comments: Impacted Location No. 2		

depth, ft	sample depth	PID PPM	blows /6"	description
0-7		3	6/6"	Silty Sand, minor gravel; dry, Lt Brn, sand poorly sorted moist @ 5 ft (Sp3; 70% rec silty, moist)
		5	6/6"	(Sp5. moist, yellow staining)
7-15		10	12/6"	Cobbley Gravelly Sand; Lt Brn - yellow, slightly moist, (stringers of silty clay begen at 10) (Sp10, 60% rec silt clay gravel
15-27		15	20/6"	Gravelly Sand: Lt Brn (yellow stain); slightly moist, sand poorly sorted; Granular Clia. (Sp15; 70% rec; slightly moist
		20	10/6"	(Sp20. staining; sandy 70% rec, slightly moist
27-30		30		Silty Sand w/clay stringers; Lt Brn, moist; sand fine - coarse grain few gravels (<½ dia)
				NOTE - P+A add 1 50lb bag 0-chips on bottom (27-30') and hydrate back fill to ~11 ft; add 1 50lb bag chips (8-11 ft) hydrate + backfill to surface.

a:\forms\eborlog

JOHN SHOMAKER & ASSOCIATES, INC.
WATER-RESOURCE AND ENVIRONMENTAL CONSULTANTS
2703 BROADBENT PARKWAY NE, SUITE D
ALBUQUERQUE, NEW MEXICO 87107
(505) 345-3407, FAX (505) 345-9920

Environmental borehole logging form

Client: NMED	Project: Nitrogen Study	Hole: TI2-C	Date: 6-24-99
Site: Taos Site S+R Septage	Start time: 14:40	Geologist: STF	
	Contractor: Hydrogeologic Services	Map:	
Drill method: Hollow Stem Auger	Rig: CME-75		
Bit size: 7 1/4"	Comments: Impacted location No 2		

depth, ft	sample depth	PID PPM	blows /6"	description
0 - 4	3		3/6"	Silty Sand, Lt Brn, Slightly moist; sand fine - coarse grn few gravels (Sp3; 70% rec; Slightly moist)
4 - 8	5		4/6"	Sandy Silt; Buff; fine grn; dry (Sp5; 70% rec; slightly moist
8 - 30	10		10/6"	Gravelly Sand; Lt Brn; Sand med-coarse grn; gravel < 1" dia Slightly moist - dry few cobbles @ 25ft (Sp10; 60% rec; Slightly moist
	15		20/6"	(Sp15; 70% rec; Slightly moist-d
	20		13/6"	(Sp20; 75% rec; dry)
	30			(Sp30; 70% rec. Slightly moist minor clay content)
				Note Borehole abandonment
				add 2' bentonite seal from 28-30'
				Hydrate, hole caved in to 21', backfill
				to 11, add 3' seal + hydrate (8-11)
				Backfill to surface

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Appendix E.

Laboratory reports

ENERGY LABORATORIES, INC.
P.O. BOX 30916 • 1120 SOUTH 27TH STREET • BILLINGS, MT 59107-0916
PHONE (406) 252-6325 • FAX (406) 252-6069 • 1-800-735-4489 • E-MAIL eli@energylab.com

LABORATORY REPORT

LAB NO.: 001-014-99-54298
DATE: 07/14/99 dc

TO: Steve Finch
ADDRESS: John Shomaker & Associates
2703-D Broadbent Parkway
Albuquerque, NM 87107

SOIL ANALYSIS

NMED/Taos-Santa Fe
Submitted 07/01/99

Sample Number	Identification	Organic Carbon %	Total Kjeldahl Nitrogen ug/g	Ammonia as N KCL Extract ug/g	Nitrate as N KCL Extract ug/g	Chloride 1:5 H2O Extract ug/g	Moisture %
99-54298-001	TBG-3	0.57	500	1.1	19.8	791	15.7
99-54298-002	TBG-5	0.38	380	<1	10.9	622	12.2
99-54298-003	TBG-10	0.16	130	<1	1.0	114	1.7
99-54298-004	TBG-15	0.07	320	<1	<1	31	2.1
99-54298-005	TBG-20	0.07	130	<1	<1	22	2.0
99-54298-006	TBG-30	0.08	130	<1	<1	25	2.8
99-54298-007	SFBG-3	0.41	500	2.3	<1	363	5.4
99-54298-008	SFBG-5	0.15	250	<1	<1	208	2.5
99-54298-009	SFBG-10	0.13	190	<1	<1	73	3.0
99-54298-010	SFBG-15	0.07	690	<1	<1	41	4.3
99-54298-011	SFBG-20	0.07	190	<1	<1	28	4.6
99-54298-012	SFBG-30	0.17	130	<1	1.3	19	12.4
99-54298-013	SFDBG-10	0.12	190	<1	<1	74	2.8
99-54298-014	SFDI 1-3	0.88	1200	481	1.3	66	18.0
DUPLICATE ANALYSIS							
99-54298-014	SFDI 1-3	0.94	1170	465	1.2	67	N/A
CONTROL SOIL	**	1.23	760	6.4	5.2	58	N/A
TARGET RANGE	**	(1.01-2.25	(490-870)	(4.3-11.9)	(2.0-5.5)	(43-75)	N/A
				07/08/99	07/08/99	07/07/99	07/06/99

00132

Lab Nos.: 001-99-54298 - 014-99-54298

Date: 01-JUL-99

Received by: Randa Hoelscher

Logged In by: Randa Hoelscher

SAMPLE CONDITION QA/QC REPORT

This report provides information about the condition of the sample(s) and associated sample custody information on receipt at the laboratory.

Chain of Custody Form Completed & Signed	Yes	Comments:
Chain of Custody Seal	No	Comments:
Intact	N/A	Comments:
Signature Match Chain of Custody vs. Seal	N/A	Comments:
Samples Received Cold	No	Comments:
Samples Received Within Holding Time	Yes	Comments:
Samples Received in Proper Containers	Yes	Comments:
Samples Received Properly Preserved	N/A	Comments:

Samples requiring analysis for volatile organics are tested for proper preservation at the time of analysis. Any preservation problems encountered for these samples are noted on the analytical parameter report pages.

Client notified about sample discrepancies:

Who:_____ By:_____ Date/Time:_____

Method of Shipping: Fed Ex 810800016092

Additional comments:_____

CHAIN OF CUSTODY RECORD

PLEASE PRINT OR TYPE ALL INFORMATION EXCEPT SIGNATURES

Received Date: _____ Cust. No.: _____
Login Date: _____ Login No.: _____
Shipped by: _____ Custody Seal: Yes/No
Shipping Bill #: _____ Intact: Yes/No
Signature Match?: Yes/No
If no - Reason:

Pg 2 of 2

For Lab Use Only

ENERGY LABORATORIES, INC.
P.O. Box 30916 watts 800-735-4489
1120 South 27th Street voice 406-252-6325
Billings, Montana 59107 Fax 406-252-6069

ENERGY LABORATORIES, INC.
P.O. Box 3258 watts 888-235-0515
2393 Salt Creek Highway voice 307-235-0515
Casper, Wyoming 82602 Fax 307-234-1639

ENERGY LABORATORIES, INC.
1105 West First Street voice 307-686-7175
Gillette, Wyoming 82716 Fax 307-682-4625

ENERGY LABORATORIES, INC.
P.O. Box 2470 watts 888-672-1225
610 Farnwood voice 605-342-1225
Rapid City, South Dakota 57709 Fax 605-342-1397

P.O. # ✓

Project Name / Address: NMED/Taos – Santa Fe

Contact Name & Phone: Steve Finch 505-345-3407

Sampler's Signature:

Invoice to: John Shomaker & Assoc, Inc
2703-D Broadbent Parkway
Albuquerque, NM 87107

Report to: Steve Finch

Lab No. (For Lab Use Only)	DATE	TIME	SAMPLE I.D.	number of containers	Sample Type: A Air W Water S Soils/Solids V Vegetation U Urine O Other	TKN	Nitrate	Ammonia	Soluble Chloride	Moisture Content	Total Organic Carbon			Comments, Special Instructions, etc.
						Analysis Requested								
011-99-54298	6/21/99		SFBG-20	1		X	X	X	X	X	X			use ASA Methods
012	"		SFBG-30	1		X	X	X	X	X	X			"
013	"		SFDBG-10	1		X	X	X	X	X	X			"
014	6/24/99		SFDI1-3	1		X	X	X	X	X	X			"

1. Relinquished (signature)	Date	Time	Received by: (signature)	2. Relinquished (signature)	Date	Time	Received for Laboratory by: (signature)
	6/25/99	12:20			07/01/99	1105	Sandra Hoelscher

00134

CHAIN OF CUSTODY RECORD

PLEASE PRINT OR TYPE ALL INFORMATION EXCEPT SIGNATURES

Received Date: 07/01/99 Cust. No.: 99CASH204
Login Date: 1 Login No.:
Shipped by: Fed Ex Custody Seal: Yes/(No)
Shipping Bill #: 810800016092 Intact: Yes/No
PC $980.00 Signature Match?: Yes/No
Pg 1 of 2 If no - Reason:
For Lab Use Only

ENERGY LABORATORIES, INC.
P.O. Box 30916 watts 800-735-4489
1120 South 27th Street voice 406-252-6325
Billings, Montana 59107 Fax 406-252-6069

ENERGY LABORATORIES, INC.
P.O. Box 3258 watts 888-235-0515
2393 Salt Creek Highway voice 307-235-0515
Casper, Wyoming 82602 Fax 307-234-1639

ENERGY LABORATORIES, INC.
1105 West First Street voice 307-686-7175
Gillette, Wyoming 82716 Fax 307-682-4625

ENERGY LABORATORIES, INC.
P.O. Box 2470 watts 888-672-1225
610 Farnwood voice 605-342-1225
Rapid City, South Dakota 57709 Fax 605-342-1397

P.O. # | Project Name / Address: NMED / Taos – Santa Fe

Contact Name & Phone: Steve Finch 505-345-3407

Sampler's Signature:

Invoice to: John Shoemaker + Associates, 2703-D Broadbent Parkway, Albuquerque, NM 87107

Report to: Steve Finch

Lab No. (For Lab Use Only)	DATE	TIME	SAMPLE I.D.	number of containers	Sample Type: A Air W Water S Soils/Solids V Vegetation U Urine O Other	TKN	Nitrate	Ammonia	Soluble Chloride	moisture content	Total Organic Carbon			Comments, Special Instructions, etc.
001-99-54298	6/28/99		TBG-3	1		X	X	X	X	X	X			use ASA methods
002	"		TBG-5	1		X	X	X	X	X	X			"
003	"		TBG-10	1		X	X	X	X	X	X			"
004	"		TBG-15	1		X	X	X	X	X	X			"
005	"		TBG-20	1		X	X	X	X	X	X			"
006	"		TBG-30	1		X	X	X	X	X	X			"
007	6/21/99		SFBG-3	1		X	X	X	X	X	X			"
008	"		SFBG-5	1		X	X	X	X	X	X			"
009	"		SFBG-10	1		X	X	X	X	X	X			"
010	"		SFBG-15	1		X	X	X	X	X	X			"

1. Relinquished (signature)	Date	Time	Received by: (signature)	2. Relinquished (signature)	Date	Time	Received for Laboratory by: (signature)
	6-30-99	17:30			07/01/99	1105	Ynnita Thelischer

00135

ENERGY LABORATORIES, INC.
P.O. BOX 30916 • 1120 SOUTH 27TH STREET • BILLINGS, MT 59107-0916
PHONE (406) 252-6325 • FAX (406) 252-6069 • 1-800-735-4489 • E-MAIL eli@energylab.com

LABORATORY REPORT

TO: Steve Finch
ADDRESS: John Shomaker & Associates
2703 Broadbent Parkway NE
Suite D
Albuquerque, NM 87107

LAB NO.: 99-54299-001-014
DATE: 07/16/99 fs

SOIL ANALYSIS

NMED/Taos-Santa Fe
Submitted 07/01/99

Sample Number	Identification	Organic Carbon %	Total Kjeldahl Nitrogen ug/g	Ammonia as N KCL Extract ug/g	Nitrate as N KCL Extract ug/g	Chloride 1:5 H2O Extract ug/g	Moisture %
99-54299-001	SFI 2-3	1.06	1580	2.6	259	43	7.2
99-54299-002	SFI 2-5	0.46	760	2.8	248	43	7.0
99-54299-003	SFI 2-10	0.28	440	1.4	123	31	7.5
99-54299-004	SFI 2-15	0.06	130	<1	44.8	42	5.5
99-54299-005	SFI 2-20	<0.05	130	1.6	31.2	28	9.5
99-54299-006	SFI 2-30	0.05	320	<1	5.3	24	6.1
99-54299-007	SFI 1-3	0.68	1070	1.6	410	60	18.9
99-54299-008	SFI 1-5	1.34	1830	2.0	545	65	18.7
99-54299-009	SFI 1-10	0.55	950	1.4	264	46	9.0
99-54299-010	SFI 1-15	0.27	440	1.0	90.8	35	9.2
99-54299-011	SFI 1-20	0.25	440	1.0	46.3	27	7.0
99-54299-012	SFI 1-30	0.26	760	1.2	47.2	32	7.3
99-54299-013	TDI 2-30	<0.05	130	1.2	1.4	27	14.4
99-54299-014	TDI 1-20	0.05	130	<1	1.0	40	7.0
DUPLICATE ANALYSIS							
99-54299-014	TDI 1-20	0.05	130	<1	1.0	38	N/A
CONTROL SOIL	**	1.23	760	6.4	5.2	58	N/A
TARGET RANGE	**	(1.01-2.25)	(490-870)	(4.3-11.9)	(2.0-5.5)	(43-75)	N/A

00136

Lab Nos.: 001-99-54299 - 014-99-54299

Date: 01-JUL-99

Received by: Krystal McDonald

Logged In by: Krystal McDonald

SAMPLE CONDITION QA/QC REPORT

This report provides information about the condition of the sample(s) and associated sample custody information on receipt at the laboratory.

Chain of Custody Form Completed & Signed	Yes	Comments:
Chain of Custody Seal	No	Comments:
Intact	N/A	Comments:
Signature Match Chain of Custody vs. Seal	N/A	Comments:
Samples Received Cold	No	Comments:
Samples Received Within Holding Time	Yes	Comments:
Samples Received in Proper Containers	Yes	Comments:
Samples Received Properly Preserved	N/A	Comments:

Samples requiring analysis for volatile organics are tested for proper preservation at the time of analysis. Any preservation problems encountered for these samples are noted on the analytical parameter report pages.

Client notified about sample discrepancies:

Who: _____ By: _____ Date/Time: _____

Method of Shipping: Fed Ex

Additional comments: _____

CHAIN OF CUSTODY RECORD

PLEASE PRINT OR TYPE ALL INFORMATION EXCEPT SIGNATURES

Received Date: 07/01/99 Cust. No.: SFLW4704
Login Date: 1 Login No.:
Shipped by: Fed Ex Custody Seal: Yes/No
Shipping Bill #: Intact: Yes/No
Signature Match?: Yes/No
If no - Reason:
For Lab Use Only NC 980.00

ENERGY LABORATORIES, INC.
P.O. Box 30916 watts 800-735-4489
1120 South 27th Street voice 406-252-6325
Billings, Montana 59107 Fax 406-252-6069

ENERGY LABORATORIES, INC.
P.O. Box 3258 watts 888-235-0515
2393 Salt Creek Highway voice 307-235-0515
Casper, Wyoming 82602 Fax 307-234-1639

ENERGY LABORATORIES, INC.
1105 West First Street voice 307-686-7175
Gillette, Wyoming 82716 Fax 307-682-4625

ENERGY LABORATORIES, INC.
P.O. Box 2470 watts 888-672-1225
610 Farnwood voice 605-342-1225
Rapid City, South Dakota 57709 Fax 605-342-1397

P.O. # | Project Name / Address: NMED / TAOS - SANTA FE

Contact Name & Phone: STEVE FINCH 505-345-3407 | Sampler's Signature:

Invoice to: JOHN SHOMAKER & ASSOC., INC. 2703-D BROADBENT PKWY NE ALBUQUERQUE, NM 87107

Report to:

number of containers | Sample Type: A Air W Water S Soils/Solids V Vegetation U Urine O Other

Lab No. (For Lab Use Only)	DATE	TIME	SAMPLE I.D.	#	TKN	NITRATE	AMMONIA	SOLUBLE CHLORIDE	MOISTURE CONTENT	TOTAL ORGANIC CARBON			Comments, Special Instructions, etc.
001-99-54299	6-29-99		SFI2-3	1	X	X	X	X	X	X			USE ASA METHODS
002	"		SFI2-5	1	X	X	X	X	X	X			"
003	"		SFI2-10	1	X	X	X	X	X	X			"
004	"		SFI2-15	1	X	X	X	X	X	X			"
005	"		SFI2-20	1	X	X	X	X	X	X			"
006	"		SFI2-30	1	X	X	X	X	X	X			"
007	"		SFI1-3	1	X	X	X	X	X	X			"
008	"		SFI1-5	1	X	X	X	X	X	X			"
009	"		SFI1-10	1	X	X	X	X	X	X			"
010	"		SFI1-15	1	X	X	X	X	X	X			"

1. Relinquished (signature)	Date	Time	Received by: (signature)	2. Relinquished (signature)	Date	Time	Received for Laboratory by: (signature)
	6/30/99	12:30			7/1/99	1125	

00138

CHAIN OF CUSTODY RECORD

PLEASE PRINT OR TYPE ALL INFORMATION EXCEPT SIGNATURES

Received Date: 07/01/99 Cust. No.: 9911SH704
Login Date: 1 Login No.:
Shipped by: Fed Ex Custody Seal: Yes/No
Shipping Bill #: Intact: Yes/No
Signature Match?: Yes/No
If no - Reason:
For Lab Use Only R 980-W

ENERGY LABORATORIES, INC.
P.O. Box 30916 watts 800-735-4489
1120 South 27th Street voice 406-252-6325
Billings, Montana 59107 Fax 406-252-6069

ENERGY LABORATORIES, INC.
P.O. Box 3258 watts 888-235-0515
2393 Salt Creek Highway voice 307-235-0515
Casper, Wyoming 82602 Fax 307-234-1639

ENERGY LABORATORIES, INC.
1105 West First Street voice 307-686-7175
Gillette, Wyoming 82716 Fax 307-682-4625

ENERGY LABORATORIES, INC.
P.O. Box 2470 watts 888-672-1225
610 Farnwood voice 605-342-1225
Rapid City, South Dakota 57709 Fax 605-342-1397

P.O. # | Project Name / Address: NMED / TAOS - SANTA FE

Contact Name & Phone: STEVE FINCH 505-345-3407 | Sampler's Signature:

Invoice to: JOHN SHOMAKER & ASSOC., INC. 2703-D BROADBENT PKWY NE ALBUQUERQUE, NM 87107

Report to:

number of containers | Sample Type: A Air W Water S Soils/Solids V Vegetation U Urine O Other | Analysis Requested: TKN, NITRATE, AMMONIA, SOLUBLE CHLORIDE, MOISTURE CONTENT, TOTAL ORGANIC CARBON

Lab No. (For Lab Use Only)	DATE	TIME	SAMPLE I.D.	# containers	Sample Type	TKN	NITRATE	AMMONIA	SOLUBLE CHLORIDE	MOISTURE CONTENT	TOTAL ORGANIC CARBON			Comments, Special Instructions, etc.
011-99-54299	6-22-99		SFI1-20	1		X	X	X	X	X	X			USE ASA METHODS
012	6-22-99		SFI1-30	1		X	X	X	X	X	X			"
013	6-24-99		TDI2-30	1		X	X	X	X	X	X			"
014	6-24-99		TDI1-20	1		X	X	X	X	X	X			"

1. Relinquished (signature)	Date	Time	Received by: (signature)	2. Relinquished (signature)	Date	Time	Received for Laboratory by: (signature)
	6-30-99	12:30			07/1/99	1125	

00139

ENERGY LABORATORIES, INC.
P.O. BOX 30916 • 1120 SOUTH 27TH STREET • BILLINGS, MT 59107-0916
PHONE (406) 252-6325 • FAX (406) 252-6069 • 1-800-735-4489 • E-MAIL eli@energylab.com

LABORATORY REPORT

LAB NO.: 001-012-99-54251
DATE: 07/14/99 dc

TO: Steve Finch
ADDRESS: John Shomaker & Associates
2703-D Broadbent Parkway
Albuquerque, NM 87107

SOIL ANALYSIS

NMED/Taos-Santa Fe
Submitted 06/30/99

Sample Number	Identification	Organic Carbon %	Total Kjeldahl Nitrogen ug/g	Ammonia as N KCL Extract ug/g	Nitrate as N KCL Extract ug/g	Chloride 1:5 H2O Extract ug/g	Moisture %
99-54251-001	TI 2-3	1.25	1580	6.2	238	433	19.2
99-54251-002	TI 2-5	0.38	380	1.6	58.1	281	15.7
99-54251-003	TI 2-10	0.07	130	<1	7.4	47	4.9
99-54251-004	TI 2-15	0.33	440	1.6	58.0	115	4.6
99-54251-005	TI 2-20	0.10	130	1.0	2.6	36	8.2
99-54251-006	TI 2-30	0.14	250	1.3	1.6	30	14.9
99-54251-007	TI 1-3	0.88	1510	2.7	15.3	57	20.4
99-54251-008	TI 1-5	0.50	440	1.6	16.9	86	20.5
99-54251-009	TI 1-10	0.37	320	1.5	23.0	65	10.3
99-54251-010	TI 1-15	0.14	190	2.5	13.0	67	4.7
99-54251-011	TI 1-20	0.13	130	1.2	2.1	104	12.7
99-54251-012	TI 1-30	0.11	130	<1	1.6	66	8.1
DUPLICATE ANALYSIS							
99-54251-010	TI 1-15	0.16	190	2.4	14.3	66	N/A
CONTROL SOIL	**	1.23	690	6.4	5.2	58	N/A
TARGET RANGE	**	(1.01-2.25	(490-870)	(4.3-11.9)	(2.0-5.5)	(43-75)	N/A
DATE ANALYZED	**	07/07/99	07/08/99	07/08/99	07/08/99	07/07/99	07/06/99

00140

Lab Nos.: 001-99-54251 - 012-99-54251

Date: 30-JUN-99

Received by: Pam Harder

Logged In by: Pam Harder

SAMPLE CONDITION QA/QC REPORT

This report provides information about the condition of the sample(s) and associated sample custody information on receipt at the laboratory.

Chain of Custody Form Completed & Signed	Yes	Comments:
Chain of Custody Seal	No	Comments:
Intact	N/A	Comments:
Signature Match Chain of Custody vs. Seal	N/A	Comments:
Samples Received Cold	Yes	Comments:
Samples Received Within Holding Time	Yes	Comments:
Samples Received in Proper Containers	Yes	Comments:
Samples Received Properly Preserved	N/A	Comments:

Samples requiring analysis for volatile organics are tested for proper preservation at the time of analysis. Any preservation problems encountered for these samples are noted on the analytical parameter report pages.

Client notified about sample discrepancies:

Who: _____ By: _____ Date/Time: _____

Method of Shipping: Fed Ex 810800016070

Additional comments: _____

CHAIN OF CUSTODY RECORD

PLEASE PRINT OR TYPE ALL INFORMATION EXCEPT SIGNATURES

Received Date: 12/30/99 Cust. No.: 9900251704
Login Date: Login No.:
Shipped by: FedEx Custody Seal: Yes/No
Shipping Bill #: 810800016070 Intact: Yes/No
PC 840.00 Signature Match?: Yes/No
If no - Reason:
For Lab Use Only

ENERGY LABORATORIES, INC.
P.O. Box 30916 watts 800-735-4489
1120 South 27th Street voice 406-252-6325
Billings, Montana 59107 Fax 406-252-6069

ENERGY LABORATORIES, INC.
P.O. Box 3258 watts 888-235-0515
2393 Salt Creek Highway voice 307-235-0515
Casper, Wyoming 82602 Fax 307-234-1639

ENERGY LABORATORIES, INC.
1105 West First Street voice 307-686-7175
Gillette, Wyoming 82716 Fax 307-682-4625

ENERGY LABORATORIES, INC.
P.O. Box 2470 watts 888-672-1225
610 Farnwood voice 605-342-1225
Rapid City, South Dakota 57709 Fax 605-342-1397

P.O. #

Project Name / Address: NMED / Tios

Contact Name & Phone: Steve Finch 505-345-3407

Sampler's Signature:

Invoice to: John Shomaker & Assoc, 2703-D Broadbent Parkway Albuquerque, NM 87107

Report to: Steve Finch

Lab No. (For Lab Use Only)	Sample DATE	Sample TIME	SAMPLE I.D.	number of containers	Sample Type: A Water S Soils/Solids V Vegetation U Urine O Other	TKN	Nitrate	Ammonia	Soluble Chloride	Moisture Content	Total Organic Carbon			Comments, Special Instructions, etc.
001-99-54251	6-29-99		TI2-3	1		X	X	X	X	X	X			
002-	"		TI2-5	1		X	X	X	X	X	X			
003-	"		TI2-10	1		X	X	X	X	X	X			
004-	"		TI2-15	1		X	X	X	X	X	X			
005-	"		TI2-20	1		X	X	X	X	X	X			
006-	"		TI2-30	1		X	X	X	X	X	X			
007-	"		TI1-3	1		X	X	X	X	X	X			
008-	"		TI1-5	1		X	X	X	X	X	X			
009-	"		TI1-10	1		X	X	X	X	X	X			
010-	"		TI1-15	1		X	X	X	X	X	X			

1. Relinquished (signature)	Date	Time	Received by: (signature)	2. Relinquished (signature)	Date	Time	Received for Laboratory by: (signature)
	12/30/99	16:00			12/30/99	1137	

00142

CHAIN OF CUSTODY RECORD

PLEASE PRINT OR TYPE ALL INFORMATION EXCEPT SIGNATURES

Received Date: 06/30/99
Login Date:
Shipped by: Fed Ex
Shipping Bill #:

Cust. No.:
Login No.:
Custody Seal: Yes/No
Intact: Yes/No
Signature Match?: Yes/No
If no - Reason:

For Lab Use Only

ENERGY LABORATORIES, INC.
P.O. Box 30916 — watts 800-735-4489
1120 South 27th Street — voice 406-252-6325
Billings, Montana 59107 — Fax 406-252-6069

ENERGY LABORATORIES, INC.
P.O. Box 3258 — watts 888-235-0515
2393 Salt Creek Highway — voice 307-235-0515
Casper, Wyoming 82602 — Fax 307-234-1639

ENERGY LABORATORIES, INC.
1105 West First Street — voice 307-686-7175
Gillette, Wyoming 82716 — Fax 307-682-4625

ENERGY LABORATORIES, INC.
P.O. Box 2470 — watts 888-672-1225
610 Farnwood — voice 605-342-1225
Rapid City, South Dakota 57709 — Fax 605-342-1397

P.O. #: /

Project Name / Address: NMED / Taos

Contact Name & Phone: Steve Finch 505-345-3407

Sampler's Signature:

Invoice to:

Report to:

Lab No. (For Lab Use Only)	DATE	TIME	SAMPLE I.D.	number of containers	Sample Type: A W S V U O / Air Water Soils/Solids Vegetation Urine Other	TKN	Nitrate	Ammonia	Soluble chloride	Moisture content	Total organic carbon			Comments, Special Instructions, etc.
011-99-54251	6-24-99		TI1-20	1		X	X	X	X	X	X			
012-)	"		TI1-30	1		X	X	X	X	X	X			
	"													
	"													
	"													

1. Relinquished (signature)	Date	Time	Received by: (signature)	2. Relinquished (signature)	Date	Time	Received for Laboratory by: (signature)
	6/30/99	16:00			7/1/99	11:37	Sam Hardee

00143

Vinyard & Associates, Inc.

8916-A Adams Street. NE
Albuquerque. New Mexico 87113
(505) 797-9743 • Fax: (505) 797-9749

Geotechnical Engineering • Materials Testing • Environmental Engineering

July 13, 1999

John Shoemaker & Associates, Inc.
2703-D Broadbent Parkway NE
Albuquerque, NM 87107

Attn: Mr. Steven Finch

Project: Taos & Santa Fe Samples
V & A Project No. 99-2-346

Gentlemen:

Attached are copies of the Laboratory Test Results for the subject project. Your personnel delivered the samples to our office as bag samples.

Sieve Analysis and bulk density were performed on each sample. Permeability and porosity on every other sample. The Porosity results were calculated using the dry unit weight, and specific gravity for each sample tested. The Bulk Density was based on the jigged method and calculated dry densities using the moisture results on the samples. The permeability test was performed on the samples by remolding them to 95% of the jigged unit weight. The samples that are marked as "free flowing" were samples that a reading could not be obtained during the Falling Head Permeability test due to speed the column of water fell.

Should you have any questions regarding this data, please do not hesitate to call our office.

Sincerely,

Vinyard & Associates, Inc.

Robert K. Abeyta, S.E.T.

Martin D. Vinyard, P.E.

Attachment: Data Sheets (3)

cc: Addressee: (1)

SUMMARY OF LABORATORY TEST DATA

Test Hole	Depth (feet)	Unified Classification	Natural Dry Density (pcf)	Natural Moisture Content (%)	Permeability	SIEVE ANALYSIS-% PASSING BY WEIGHT									Description
					K cm/sec	1 1/2"	3/4"	3/8"	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200	
TI1	3		87.4	14.5		100	100	100	99	98	96	94	91	86	77.0	
TI1	5		77.3	21.8	1.13 E-04	100	100	100	95	92	88	84	80	71	57.7	
TI1	10		106.9	7.2		100	75	63	53	48	43	38	32	27	22.3	
TI1	15		112.6	5.7	FREE FLOWING	100	94	75	59	49	41	35	29	24	19.1	
TI1	20		92.2	24.8		100	92	86	71	60	54	50	45	40	34.5	
TI1	30		103.0	5.3	9.47 E-05	100	96	81	71	64	55	47	39	30	24.3	
TI2	3		78.8	14.2		100	100	100	98	95	91	87	81	73	54.8	
TI2	5		74.6	19.2	9.72 E-06	100	100	100	100	95	90	85	79	71	51.7	
TI2	10		107.4	4.5		100	69	49	41	37	34	31	28	23	16.5	
TI2	15		119.2	3.8	1.32 E-04	100	93	64	50	41	35	29	22	16	12.5	
TI2	20		117.9	2.9		100	85	74	52	41	34	28	21	16	12.5	
TI2	30		109.2	4.8	FREE FLOWING	100	92	73	60	53	47	41	34	28	21.3	
			* Unit Weights were Jigged not compacted weights													
			** FREE FLOWING- GRANULAR MATERIAL LOW AMOUNT OF FINES.													

00145

Project Number : 99-2-346

Project : Taos & Santa Fe Samples

Table No. : 1

SUMMARY OF LABORATORY TEST DATA

Test Hole	Depth (feet)	Unified Classification	Natural Dry Density (pcf)	Natural Moisture Content (%)	Permeability	SIEVE ANALYSIS-% PASSING BY WEIGHT									Description
					K cm/sec	1 1/2"	3/4"	3/8"	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200	
SFI1	3		88.0	22.4		100	100	100	99	97	94	90	82	69	51.3	
SFI1	5		87.9	18.3	5.52 E-06	100	100	100	100	100	98	96	92	85	72.1	
SFI1	10		100.4	12.5		100	100	96	90	86	80	73	64	53	42.0	
SFI1	15		105.5	6.3	1.78 E-04	100	100	80	70	62	54	48	40	33	25.6	
SFI1	20		113.6	7.6		100	93	88	76	67	59	53	46	39	31.4	
SFI1	30		108.2	4.2	FREE FLOWING	100	93	88	76	65	55	45	36	28	21.7	
SFI2	3		94.1	8.1		100	82	80	78	76	72	67	62	56	47.0	
SFI2	5		93.1	6.6	5.04 E-05	100	95	71	68	66	62	58	53	48	41.8	
SFI2	10		111.9	6.2		100	100	83	73	64	56	48	40	33	26.4	
SFI2	15		112.3	4.7	FREE FLOWING	100	100	94	82	71	60	50	40	30	22.8	
SFI2	20		122.2	4.4		100	100	84	66	53	43	34	26	19	15.1	
SFI2	30		117.9	4.9	FREE FLOWING	100	95	82	70	59	47	38	31	24	18.3	
			* Unit Weights were Jigged not compacted weights													
			** FREE FLOWING- GRANULAR MATERIAL LOW AMOUNT OF FINES.													

00146

Project Number : 99-2-346

Table No. : 2

Taos & Santa Fe Samples

99-2-346

Sample	Specific Gravity	Dry Unit Weight	Void Ratio (e)	Porosity (n) %
TI1 @ 3	2.403	87.4	0.72	42%
TI1 @ 5	2.354	77.3	0.90	47%
TI1 @ 10	2.541	106.9	0.48	33%
TI1 @ 15	2.470	112.6	0.37	27%
TI1 @ 20	2.539	92.2	0.72	42%
TI1 @ 30	2.563	103	0.55	36%
TI2 @ 3	2.232	78.8	0.77	43%
TI2 @ 5	2.419	74.6	1.02	51%
TI2 @ 10	2.511	107.4	0.46	31%
TI2 @ 15	2.596	119.2	0.36	26%
TI2 @ 20	2.552	117.9	0.35	26%
TI2 @ 30	2.569	109.2	0.47	32%
SFI1 @ 3	2.372	88	0.68	41%
SFI1 @ 5	2.464	87.9	0.75	43%
SFI1 @ 10	2.491	100.4	0.55	35%
SFI1 @ 15	2.248	105.5	0.33	25%
SFI1 @ 20	2.519	113.6	0.38	28%
SFI1 @ 30	2.526	108.2	0.46	31%
SFI2 @ 3	2.379	94.1	0.58	37%
SFI2 @ 5	2.359	93.1	0.58	37%
SFI2 @ 10	2.543	111.9	0.42	29%
SFI2 @ 15	2.557 .	112.3	0.42	30%
SFI2 @ 20	2.645	122.2	0.35	26%
SFI2 @ 30	2.576	117.9	0.36	27%