Investigation of the Fate of Individual Sewage Disposal System Effluent in Turkey Creek Basin, Colorado

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ABSTRACT

With rapid development and population growth in the Turkey Creek Basin (TCB) of Jefferson County, Colorado, the degradation of water quality has become a pressing issue. Residents of TCB are served by a fractured, crystalline-rock-aquifer, typical of those in the western US that provide water to residential users through individual domestic wells and treat wastewater with individual sewage disposal systems (ISDSs). Comparison of basin-scale geochemical data from the 1970s and recent geochemical data from TCB reveals that Specific Conductivity (an indicator of water quality) in the surface water has increased by a factor of 3.3 over the past 30 years. Specific Conductivity in the majority of the ground water has increased by a factor of only 1.2 over the same time period. However, Specific Conductivity of ground water in localized areas has increased by a larger factor. This study investigates the role of ISDS effluent in the degradation of the basin's water quality by investigating the flow path and chemical evolution of ISDS effluent after it leaves the infiltration area of one individual sewage treatment system.

Geophysical methods located the ISDS effluent plume of a single home at the regolith-bedrock interface beneath and adjacent to an ISDS infiltration area. Shallow piezometers were installed to measure hydraulic properties and monitor water level and quality. A water budget was calculated for the ISDS system, to estimate the bedrock infiltration rate. The home had a typical household pumpage of 644 L/day (170 gallons/day) of which ~72%, an average of 466L/day (123 gallons/day), was dosed into the infiltration area from the septic tank. The low return rate is unexpected; an ongoing study is evaluating this finding.

Under typical conditions, the effluent infiltrates the fractured bedrock within 5 meters of the infiltration area, rather than migrating laterally through the regolith to the closest surface water, North Turkey Creek, which is 500 m away. During an unusually high spring runoff the plume migrated 50 to 100 m within the regolith before infiltrating the fractured bedrock.

The chemical fingerprint of the effluent is similar to the anthropogenic component required to account for the ground water quality decline as indicated by other studies. The chemical fingerprint of the effluent has a chemical signature similar to surface water near the mouth of the basin suggesting that it contributes to the decreased surface water quality.

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CHAPTER 1
INTRODUCTION

1.1 Background

Water quantity and quality issues are a major concern for the state of Colorado due to current drought conditions coupled with the state's expanding population. Water issues are most pressing along Colorado's Front Range, where the Denver urban corridor continues to expand at an increasing rate. Between 1990 and 2000, Colorado's population increased by 30%, from 3.3 million to 4.3 million (US Census Bureau, 2003). Approximately 74% of this population increase occurred in the counties of the Front Range urban corridor (Adams, Arapahoe, Boulder, Denver, Douglas, El Paso, Jefferson and Larimer counties). Together, these counties total approximately 9% of Colorado's land area (University of Colorado at Boulder, 2003).

With the increase of the Denver metro area's population, the number of people living in the foothills west of Denver also increased. According to Hofstra and Hall (1975), the population in the mountainous part of Jefferson County in 1970 was approximately 14,000. By 2000, that number had increased to over 48,000 (Jefferson County, 2003).

The majority of people living in the Jefferson County foothills rely on individual domestic wells for drinking water and septic systems, also called individual sewage treatment systems (ISDSs), for wastewater treatment.

1.2 Turkey Creek Basin

The Turkey Creek Basin is representative of mountain watersheds along Colorado's Front Range. The basin is a topographically defined watershed in the foothills of the Front Range, approximately 35 km (22 miles) southwest of Denver (Figure 1.1). The basin lies completely in Jefferson County and covers 122 km^2 (47 mi^2). It includes the mountain towns of Aspen Park, Conifer and Indian Hills.

Like most Rocky Mountain Front-Range watersheds, Turkey Creek Basin is composed of highly fractured crystalline rock (Morgan, 2000). Some of these fractures are water-bearing and provide water to over 11,000 people in approximately 4,900 homes in the basin (Bossong et al., 2003). Several small community water districts exist in the basin. Approximately 350 homes are supplied with community water from the Indian Hills Water District (Evans, 2002), and 275 homes are supplied with water from the Homestead Water District (Harting, 2003); the remaining ~4275 homes are supplied by an individual well. The locations of wells permitted by the Colorado State Engineer's office are shown in Figure 1.2. Houses exist next to the majority of these wells. There are several small wastewater treatment facilities in the basin (Laws, 2003); however, the majority of the 4,900 homes uses an ISDS for treatment.

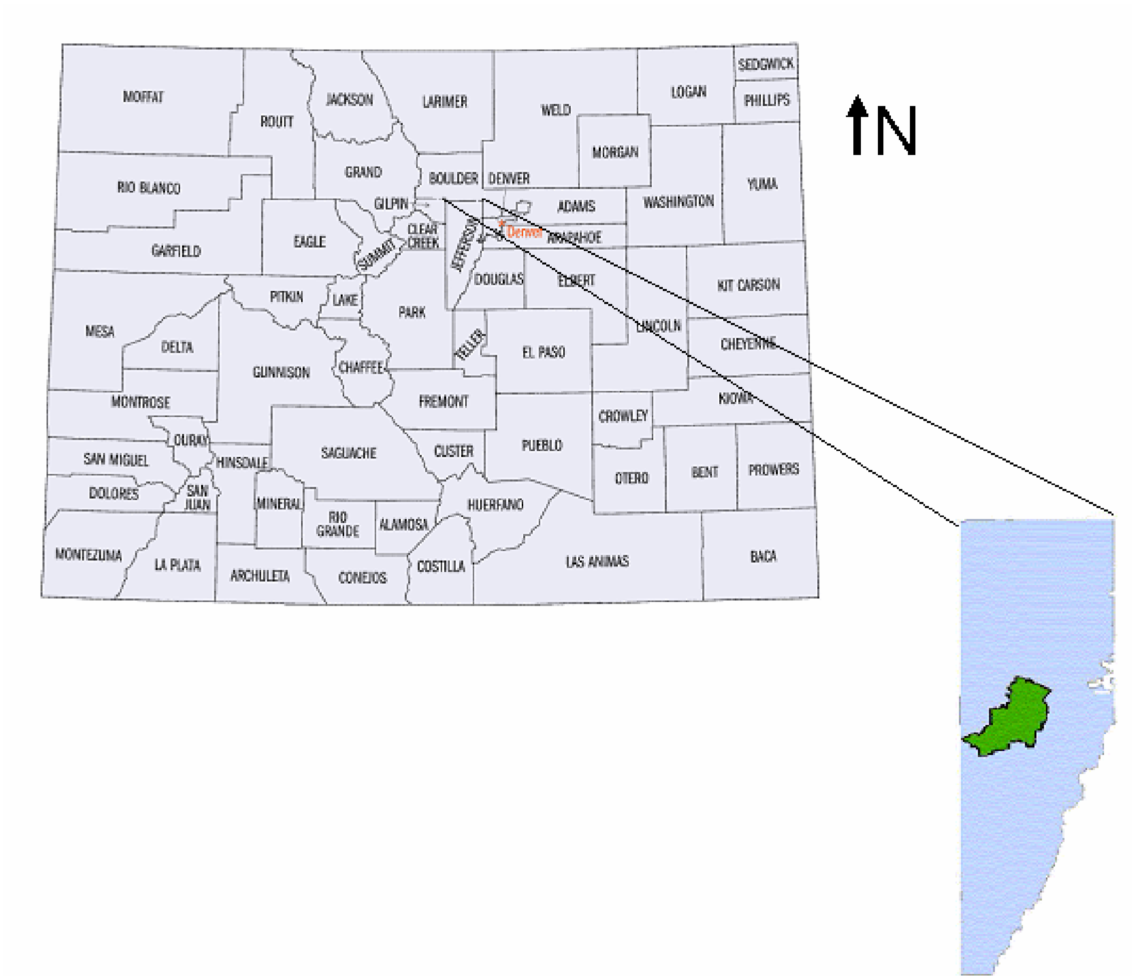


Figure 1.1 Turkey Creek Basin lies within Jefferson County, Colorado.

1.3 The Problem

Recent development in the basin has produced noticeable effects on the quality of the surface and ground water. Bossong et al. (2003), Morgan (2000), Hofstra and Hall (1975), and Yacob (2004), report that most chemical constituents in both the ground and surface water increased from 1975 to 1999. For example, the median value of chloride increased by a factor of 1.7 in the ground water and a factor of 10.4 in the surface water. The median value of Specific Conductivity increased by a factor of 1.2 in ground water and 3.3 in surface water (Table 1.1 and Figure 1.3). Specific Conductivity is often used to estimate the amount of total dissolved

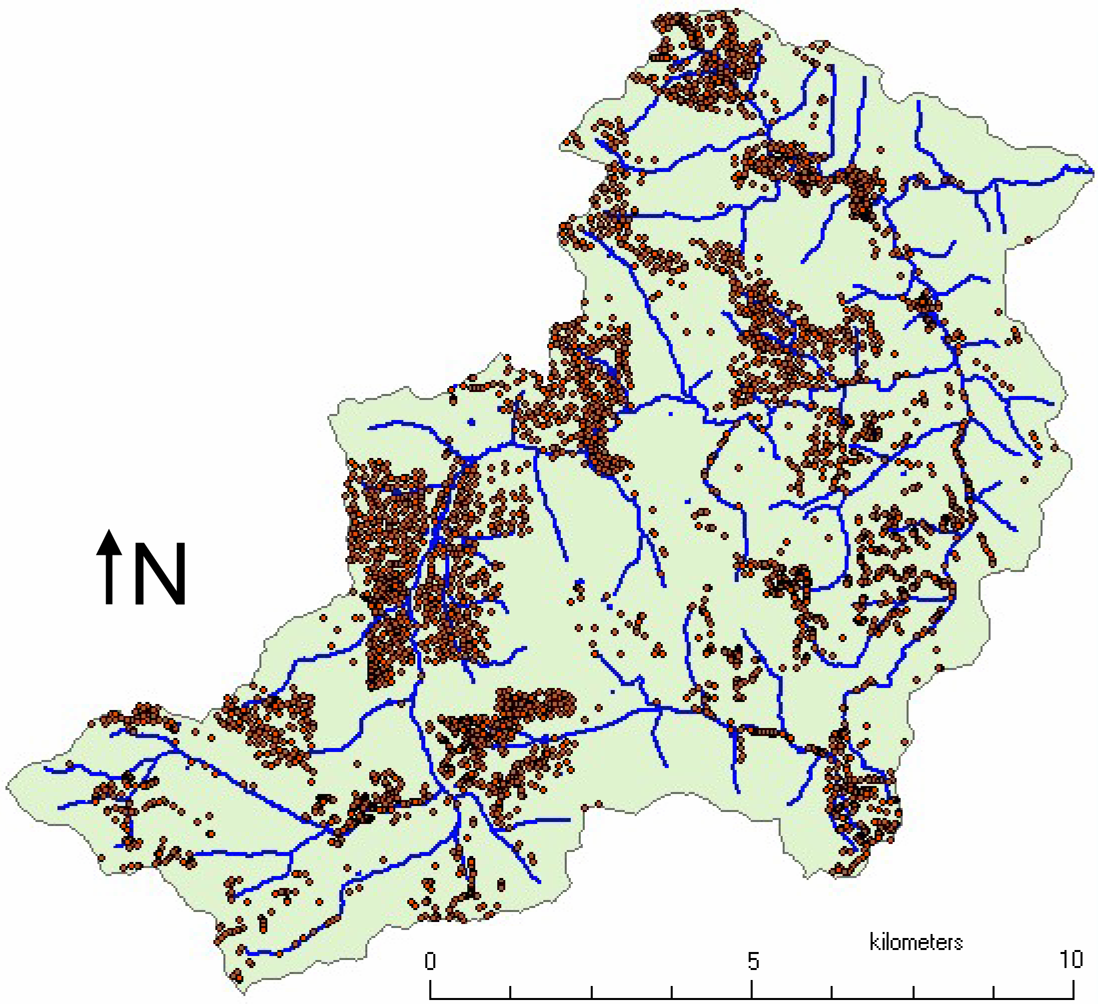


Figure 1.2 Permitted wells within Turkey Creek Basin. Each dot represents a well. Most wells are associated with a house.

solids (TDS) in a water sample. For basin surface water samples, the value of Specific Conductivity (in µS/cm) is related to the value of TDS (in mg/L) by a ratio of 25:24, the ratio is 25:23 for ground water samples.

It has been determined that the basin's surface water chemistry is influenced by an anthropogenic source (Thyne et al., 2004; Poeter et al., 2003; Bossong et al., 2003). All of these reports identified ISDS effluent as a possible influence on the chemistry of the basin's surface waters. Bossong et al. (2003) suggested road salt (usually magnesium chloride) might

Ground Water

Parameter	unit	1975 mean	1975 median	1975 # of samples	1999 mean	1999 median	1999 # of samples
specific conductivity	μS/cm	288	256	291	330	313	363
calcium	mg/L	40	34	40	39	36	269
magnesium	mg/L	10	8	40	9	8	270
sodium	mg/L	26	16	40	16	11	270
potassium	mg/L	2	2	259	2	2	142
alkalinity	mg/L	181	173	6	118	120	273
sulfate	mg/L	16	11	40	22	12	273
chloride	mg/L	9	4	291	25	7	269
fluoride	mg/L	1	0	40	1	1	242
nitrogen (NO3+NO2)	mg/L	2	1	288	2	1	309

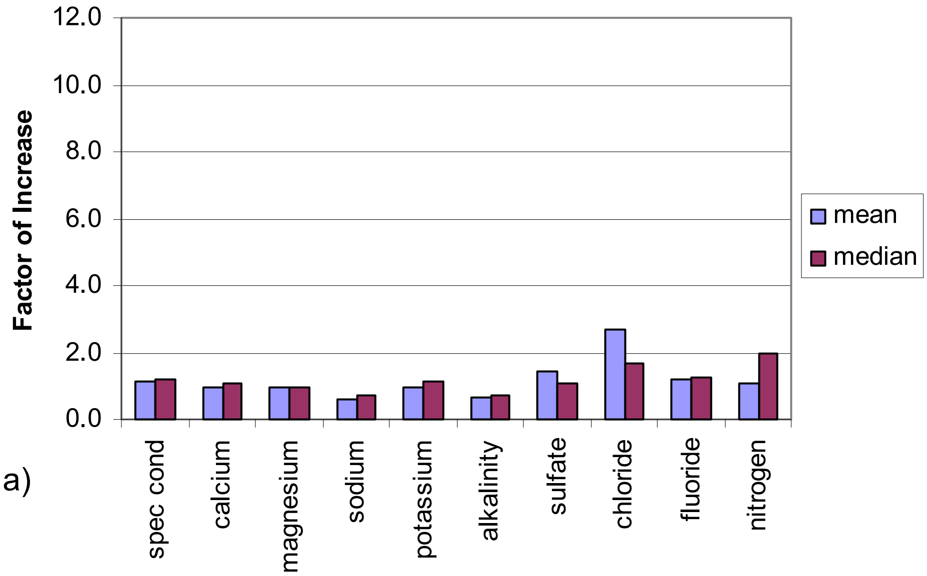
Surface Water

Parameter	unit	1975 mean	1975 median	1975 # of samples	1999 mean	1999 median	1999 # of samples
specific conductivity	μS/cm	179	139	25	596	457	78
calcium	mg/L	16	14	24	72	42	56
magnesium	mg/L	4	3	24	16	10	56
sodium	mg/L	8	7	24	36	28	56
potassium	mg/L	2	1	24	3	3	34
alkalinity	mg/L	75	61	28	115	99	58
sulfate	mg/L	8	8	24	71	13	58
chloride	mg/L	9	6	24	79	65	58
fluoride	mg/L	1	0	24	1	0	55
nitrogen (NO3+NO2)	mg/L	0	0	23	1	0	47

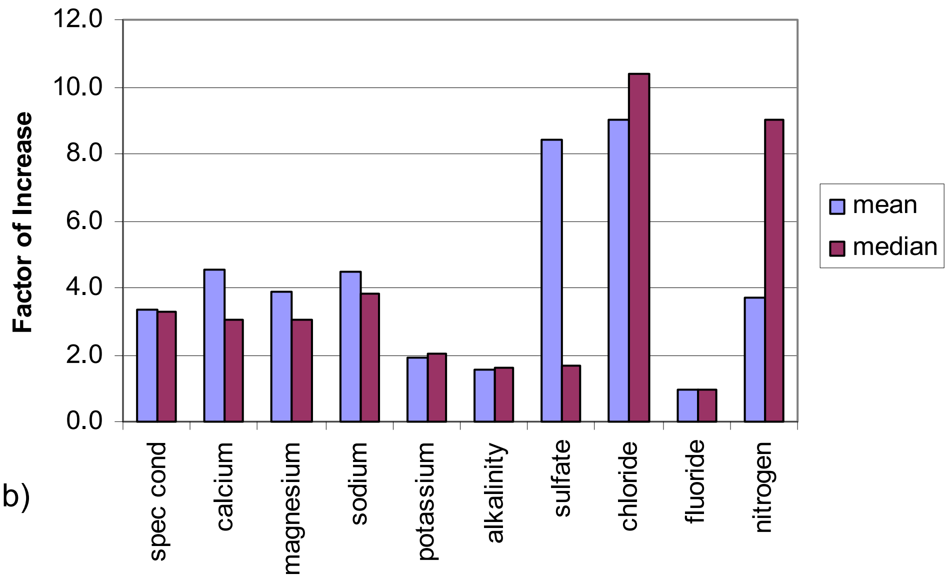
Table 1.1 Comparison of water chemistry data from the 1970s (Hofstra and Hall, 1975) and the late 1990s (Bossong et al., 2003).

contribute to the increase in surface water TDS. Stream water chemistry does not show a seasonal variation in chloride, and road salt is only used in winter. However, there may be a delay in transport to water bodies. Thyne et al. (2004) identified an anthropogenic influence on the basin's ground water, and suggested ISDS effluent as a source.

The Colorado Division of Water Resources estimates that 90% of the water pumped to the surface is returned to the aquifer (Graham, 2003) via the ISDS infiltration area. The remaining 10% is thought to be lost to evaporation in and around the home before it enters the ISDS tank. In some cases, as shown later using data collected in this study, the return may be considerably less than 90%. It has also been proposed that ISDS effluent may bypass the regional aquifer by rapid lateral flow through the regolith or shallow fractured bedrock, slowly infiltrating the regional aquifer along the flow path. If a stream is close to the ISDS infiltration area, it is possible that some of this effluent water discharges directly to the steam, bypassing



a)



b)

Figure 1.3 Factors of increase for chemical parameters in ground (a) and surface (b) waters between 1975 and 1999.

the regional aquifer. Findings of this study indicate that effluent leaves the regolith and enters the fractured bedrock near the infiltration area. However, monitor wells did not penetrate the shallow crystalline rock, so it is not possible to assess the full extent of effluent infiltration to the deep aquifer. The regolith may reduce the solute load of the effluent more efficiently than fractured crystalline rock, because it may have more sorption, exchange sites, and organic matter. However, residence time in regolith may be shorter, thus preventing sufficient treatment before the effluent discharges to the stream.

1.4 Purpose

The purpose of this study is to increase understanding of the fate of individual sewage disposal system (ISDS) effluent as it leaves the infiltration area. The balance between residence time and treatment efficiency along flow paths in the bedrock and regolith, and the associated impact on stream water quality are the objects of this study (Figure 1.4).

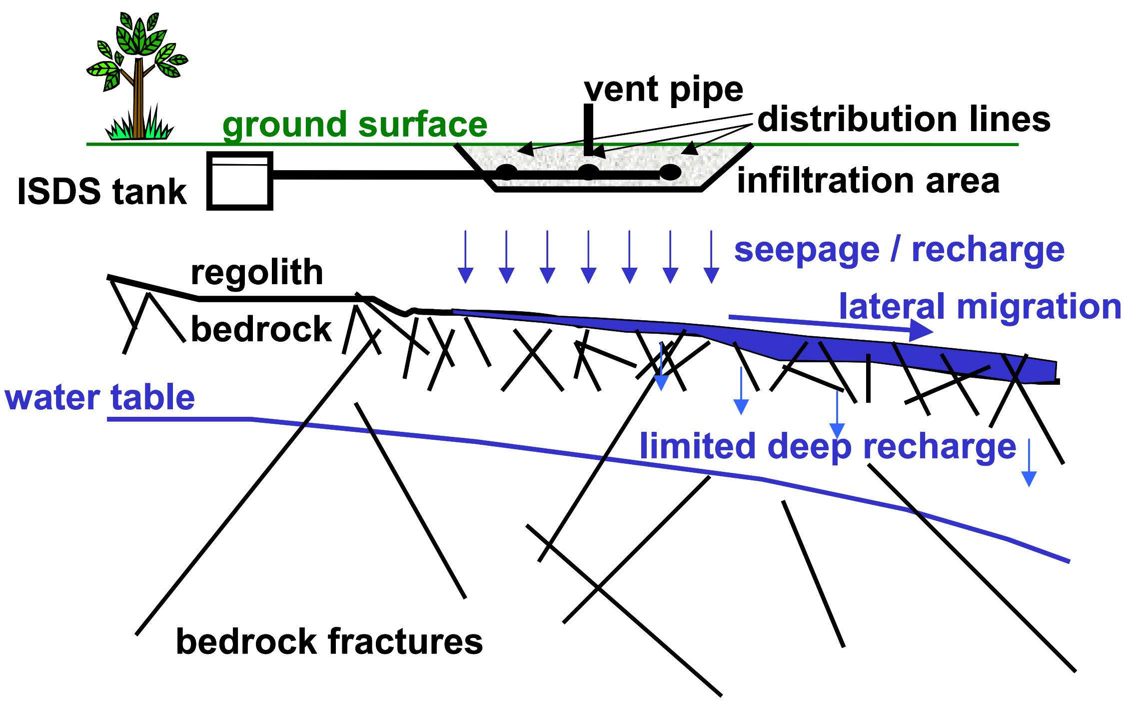


Figure 1.4 Graphical representation of the possible fate of ISDS effluent. When leaving the infiltration area, some of the ISDS effluent may flow laterally along the regolith/bedrock interface or through the shallow fractured zone. Drawing is not to scale.

CHAPTER 2
PREVIOUS WORK

2.1 Overview

The hydrochemical background of Turkey Creek Basin (TCB) facilitates understanding of the effect individual sewage disposal system (ISDS) effluent has on water quality. Studies have shown a decrease in water quality in the basin over the past 30 years.

2.2 Historical Geochemical Studies

A reconnaissance study completed in 1975 by the Colorado Geological Survey (Hofstra and Hall, 1975) examined geochemical water quality and quantity in the mountainous watersheds of Jefferson County, Colorado. The study area, which included Turkey Creek Basin, was 770 km^2 (300 mi^2) of mountain land including undeveloped land and urban mountain areas. This study provides a baseline for current hydrochemical studies in the area.

Hofstra and Hall concluded the mountain water quality was being degraded, especially in developing areas, and indicated the water-quality problems were related to anthropogenic activity. Numerous ground and surface water samples were chemically analyzed. The major ions present in the surface water at both high and low flow conditions were calcium, magnesium, sodium, bicarbonate, sulfate and chloride. During high stream flow conditions, concentrations of sulfate were higher and concentrations of bicarbonate were lower than base flow conditions. Major ions in the unaffected (low TDS) ground water were calcium, magnesium, sodium, bicarbonate and sulfate. Ions in the affected (higher TDS) ground water were calcium, magnesium, sodium, bicarbonate, sulfate, chloride and nitrate-plus-nitrite.

2.3 Recent Hydrochemical Studies

Morgan (2000) reported an increase in TDS in surface water, but not ground water, over the past 30 years, indicating anthropogenic activity has affected the surface water without affecting the ground water. Morgan concluded the discrepancy between the increase in TDS in surface and ground water suggests poor connection between the surface and ground water systems. Calcium, magnesium and bicarbonate correlated well with TDS, indicating that natural weathering reactions are an important control on the hydrochemistry of the ground water. Results from PHREEQC chemical modeling confirmed this observation. Chloride in the surface water was shown not to correlate with TDS or any other parameter. Chloride did not display systematic spatial variations suggesting a non-point source. Morgan speculated bleach or other household cleaning products might be a source of the excess chloride.

In 2003, Bossong et al. of the US Geological Survey, working with Jefferson County, completed a study investigating the quantity and quality of both the surface and ground water in Turkey Creek Basin. The study concluded that although surface and ground water samples rarely exceeded Environmental Protection Agency drinking water standards, concentrations of some constituents in the calcium-bicarbonate to calcium-chloride waters, such as Specific Conductance, chloride, nitrate, calcium, magnesium and sodium, have increased significantly since Hofstra and Hall's study in the 1970s. Chloride levels in surface and ground water were higher than would be expected for natural weathering. The authors suggested that the excess chloride is the result of residential development, specifically from road salt and ISDS effluent.

2.4 Statistical Analysis

Thyne et al. (2004) used statistical analysis to group a set of 180 water samples from the Bossong et al. (2003) study. The analysis produced four chemically distinct groups of samples. Groups 1 and 2 were water samples with chemistry derived from natural weathering processes. Group 3 (ground water) and Group 4 (surface water) consisted of samples that were higher in sodium, nitrate-plus-nitrite and chloride, with a significantly higher sodium-to-chloride ratio than Groups 1 and 2.

Using PHREEQC software to chemically model the four groups, the authors found that the chemistry of groups 1 and 2 were a result of natural water-rock interaction. Groups 3 and 4, however, did not reflect normal water-rock interaction. The mineral sources present in the basin could not provide the levels of chloride and nitrate found in these samples. Thyne et al. (2004) concluded that the present chemistry in groups 3 and 4 could not be derived from natural weathering, and the most likely explanation was a mixing of natural water with an "anthropogenic component" (Figure 2.1). This hypothetical anthropogenic input has a lower pH than the unaffected ground water, and is higher in chloride, nitrate-plus-nitrite and sulfate. The authors suggested the source of the anthropogenic input was, at least in part, ISDS effluent because there was little seasonal fluctuation in chloride for the impacted groups (3 and 4).

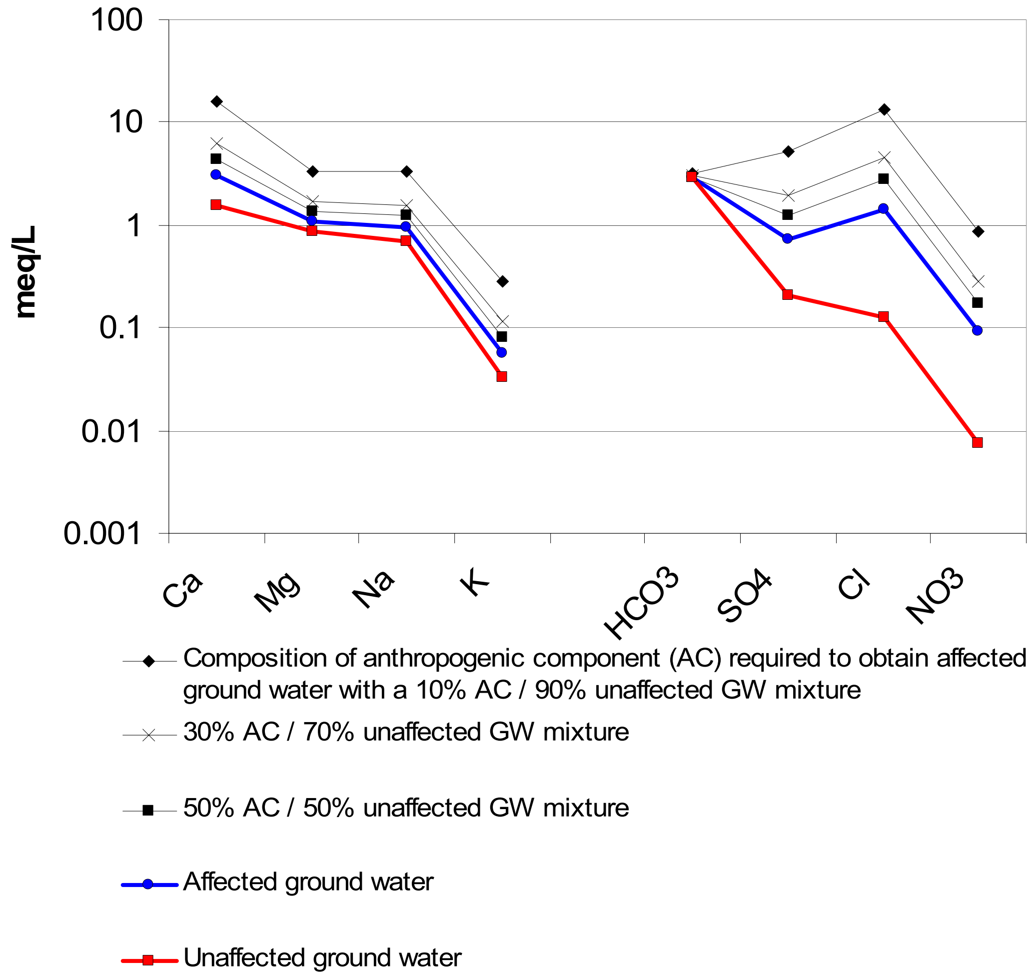


Figure 2.1 Chemical fingerprint of the "anthropogenic component" as defined by Thyne, et al. (2004). If 10% of the anthropogenic component were mixed with the "unaffected ground water" series, the anthropogenic component would have the chemical composition presented by the "10% AC / 90% unaffected GW mixture" series. By mixing 1 part of this component with 9 parts of the unaffected ground water (Group 2), the "affected ground water" (Group 3) series would result. Also shown are the compositions of the anthropogenic component if it were mixed with the Group 2 water at ratios of 3:7 and 5:5.

CHAPTER 3
STUDY AREA

3.1 Basin Location

The Turkey Creek Basin is a topographically defined mountain watershed in the eastern foothills of the Front Range of the Rocky Mountains, approximately 35 km southwest of Denver, Colorado. With elevation ranging from 1830 meters (6,000 feet) to 3050 meters (10,000 feet) above sea level, the basin lies completely in Jefferson County and covers 122 km^2 (47mi^2). It includes the mountain towns of Aspen Park, Conifer and Indian Hills. US highway 285 enters the basin at its mouth and runs southwest along South Turkey Creek towards the top of the basin. North Turkey Creek follows North Turkey Creek Road and State Highway 73 lies along the western side of the basin (Figure 3.1.)

3.2 Geology

Like most Rocky Mountain Front-Range watersheds, Turkey Creek Basin is composed of fractured crystalline rock. The basin geology consists primarily of intrusive igneous rocks, mostly Precambrian in age, but local Paleozoic sedimentary rocks are present as well. Trimble and Machette (1979) compiled a geologic map of the greater Denver area and the Front Range urban corridor. According to this map, Turkey Creek Basin consists of the following five major units: Silver Plume quartz monzonite, migmatite, biotite gneiss, Pikes Peak granite, and Boulder Creek granite. All units present in the basin consist of the same basic minerals: potassium feldspar, plagioclase, quartz, biotite, muscovite, and hornblende (Morgan, 2000).

There is a discontinuous thin layer of Quaternary alluvium that overlies the bedrock in the stream valleys, varying in thickness from several centimeters to several meters. While these deposits cover only 6% of the basin's area they are important, as they are able to hold more water per unit volume than the bedrock. The porosity of these deposits is approximately 20% (Morgan, 2000). Assuming an average depth of 1.5 meters for the Quaternary deposits, and an area equal to 6% of 122 km^2, the area and volume of the Quaternary deposits is 7.3 $x10^6$ m^2 ($7.9x10^7$ ft^2) and $1.1x10^7$ m^3 ($3.9x10^8$ ft^3), respectively. Using the porosity value of 20%, the maximum volume of water stored in these deposits is $2.2x10^6$ m^3 ($7.8x10^7$ ft^3, ~1800AF). The porosity of the underlying bedrock is estimated to be as high as 2% near the surface, probably decreasing with depth (Snow, 1968; Poeter et al., 2003), and as low as 0.002% in the intrusive rocks (Bossong et al., 2003). Assuming a possible aquifer thickness of 200 meters and an area of 122 km^2, the volume of bedrock is$2.4x10^{10}$ m^3 ($8.5x10^{11}$ ft^3). Using maximum and minimum porosity values of 2% and 0.002%, the maximum and minimum volumes of water capable of being stored in the bedrock are 4.9x10^{8} m^{3} (1.7x10^{10} ft^{3}, ~400,000AF) and 4.9x10^{5} m^{3} (1.7x10^{7} ft^{3}, ~400AF), respectively.

Figure 3.1 Turkey Creek Basin including the major roads: US Hwy 285, CO Hwy 73 and North Turkey Creek Rd. North and South Turkey Creeks and Parmalee Gulch are the major streams in the basin.

3.3 ISDS Site Location

The individual sewage disposal system (ISDS) site was chosen primarily because the homeowners volunteered their house, ISDS and domestic well for study by the Colorado School of Mines. Family size and proximity to a stream were other important factors in site selection. This site is referred to as “House1” in this report. The original plan included investigating four ISDSs: two existing systems and two new systems, but the need for a more detailed assessment became apparent during the study and so it was limited to a more thorough analysis of one existing system. The site is near the northwestern boundary of the basin, at an elevation of 2414 meters (7920 feet) and approximately 500 m (1640 ft.) north of North Turkey Creek (Figure 3.2). House1 is located on the border of two intersecting lithologies: Silver Plume quartz monzonite and migmatite. Two adults and two young children live in House1. One adult works outside of the home.

A small surface drainage leads away from the yard of House1, flowing southwest for approximately 300 meters before turning southeast and flowing to North Turkey Creek (Figure 3.3). Geophysical surveys appeared to show the ISDS effluent from House1 followed this surface drainage, thus the drainage was the starting location for the piezometer placement.

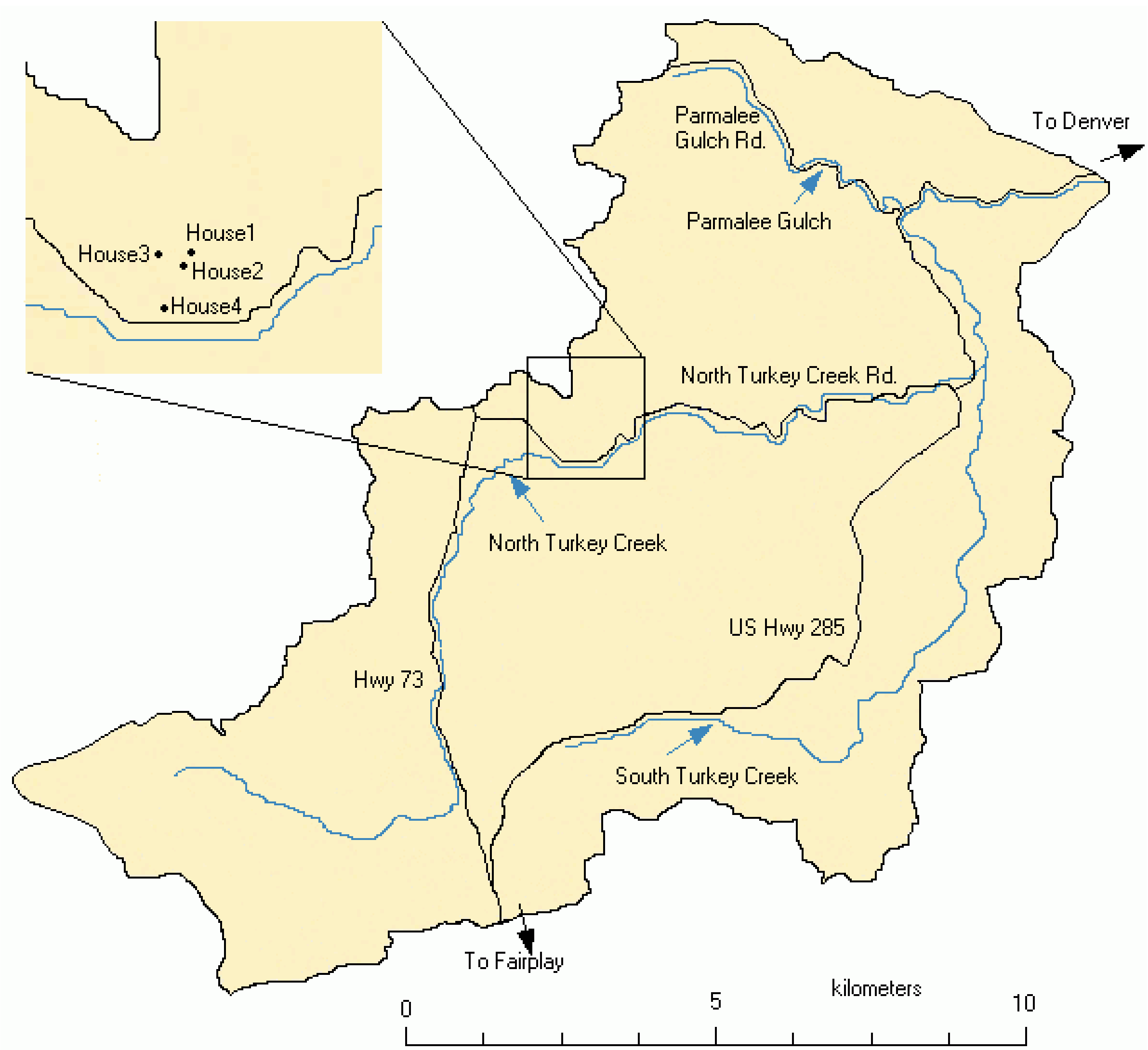


Figure 3.2 Site locations of House1, House2, House3 and House4 within Turkey Creek Basin.

3.4 Secondary Site Locations

While House1 is the main focus for this study, three additional neighboring houses (House2, House3, House4) are also considered because of the location of their ISDS infiltration areas. The houses have infiltration areas in locations that might result in their effluents also flowing along the surface drainage. A geophysical survey was conducted over part of the ISDS infiltration area of House2, the well water for each house was chemically analyzed, and the water-softening system for each house was investigated. A single adult lives in House2. Two adults live in House3. A single adult lives in House4. A satellite image of the four houses is shown in Figure 3.3.

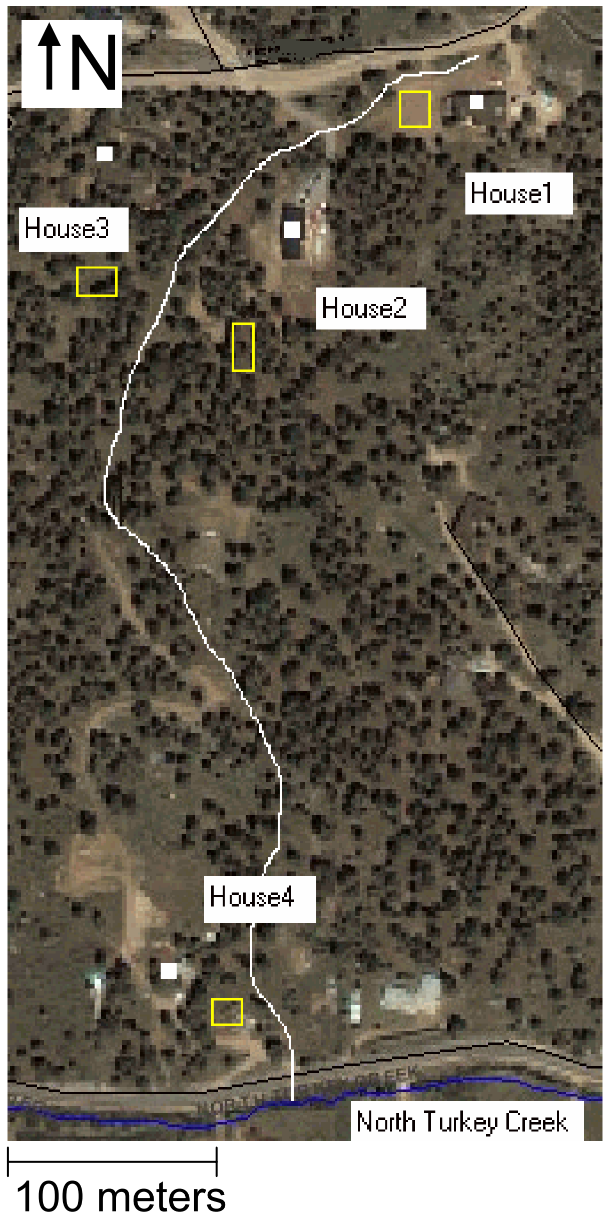


Figure 3.3 Satellite image showing the relative locations of the four houses (white squares) involved in the study. House1 is the main focus of the study. Approximate locations of ISDS infiltration areas are shown with the rectangle outlines. The approximate location of the surface drainage is shown with the white line. North Turkey Creek flows west to east along the bottom of this image. Satellite photo from Jefferson County Online Interactive Mapping Resource (2003).

CHAPTER 4
WATER TREATMENT

4.1 Wastewater Treatment

The majority of the homes in the Turkey Creek Basin treat wastewater with a septic system, or individual sewage disposal system (ISDS). This section explains the function of the ISDS and specifications of the ISDS for House1.

4.1.1 ISDS Background and Function

As a primary treatment of wastewater, ISDSs appeared in the late 1800s. Discharge of effluent into subsurface drains or absorption fields began during the mid-1900s. According to the US Census Bureau, 23% of the nation's 115 million homes are currently serviced by ISDSs (USEPA, 2002). A number of these systems rely on outdated technology and are designed to function in "perfect" conditions: appropriate soil types and hydraulic capacities. However, it is estimated that only one-third of the land area in the US has suitable soils for conventional ISDSs, and the national ISDS annual failure rate is estimated to be 10 to 20% (USEPA, 2002).

The basic ISDS consists of a tank, a soil infiltration area, and pipes used to transport the effluent from one end of the system to the other. Wastewater enters the tank from the house. In the tank, solids settle to the bottom while greases and fats float to the top. The remaining effluent travels to the infiltration area, where it is dispersed into the soil. While moving through the soil, the effluent is significantly reduced in solute load, due to biological and physical chemical processes (USEPA, 2002). The distance that effluent must travel through soil to be considered "clean" depends on several key factors: government standards, and soil type, thickness, porosity and hydraulic conductivity are the primary factors. Jefferson County regulations state a minimum of 15.2 horizontal meters (50 feet) must exist between any part of an ISDS and surface water (JCBH, 1999). This regulation for ISDS location is a general rule for the entire county. The regulation does not vary with soil type or geology (e.g. the high plains in the east or the foothills of the Rocky Mountains.)

4.1.2 Site-Specific ISDS

The ISDS for House1 was installed in May 2001. The current system replaced the failing ISDS that the home previously used. The two-acre lot slopes to the southwest. The 4730-liter (1250-gallon), two-compartment tank has a screened vault-dosing siphon. The theoretical (and manufacturer-reported) volume of each dose is 473 liters (125 gallons).

However, further investigation involving a dosing test in which water was added to the tank in five-gallon increments until it dosed, revealed each dose to be 870 liters (230 gallons). The larger dose occurred because the bevel between the main chamber and dosing chamber was lower than the high-water level in the dosing chamber, so each dose drew effluent from the main chamber of the tank in addition to the effluent in the dosing chamber. The infiltration area is 3.7 meters by 24 meters (12 ft by 80 ft), resulting in an area of 89 m^2 (960 ft^2). The infiltration area is connected to the tank by a 16-meter distribution pipe (Figure 4.1). A PVC liner was installed on the uphill side of the constructed infiltration area to reduce the migration of effluent and to maintain a minimum separation of 31 meters (100 feet) between the absorption field and the well (Church and Associates, 2000).

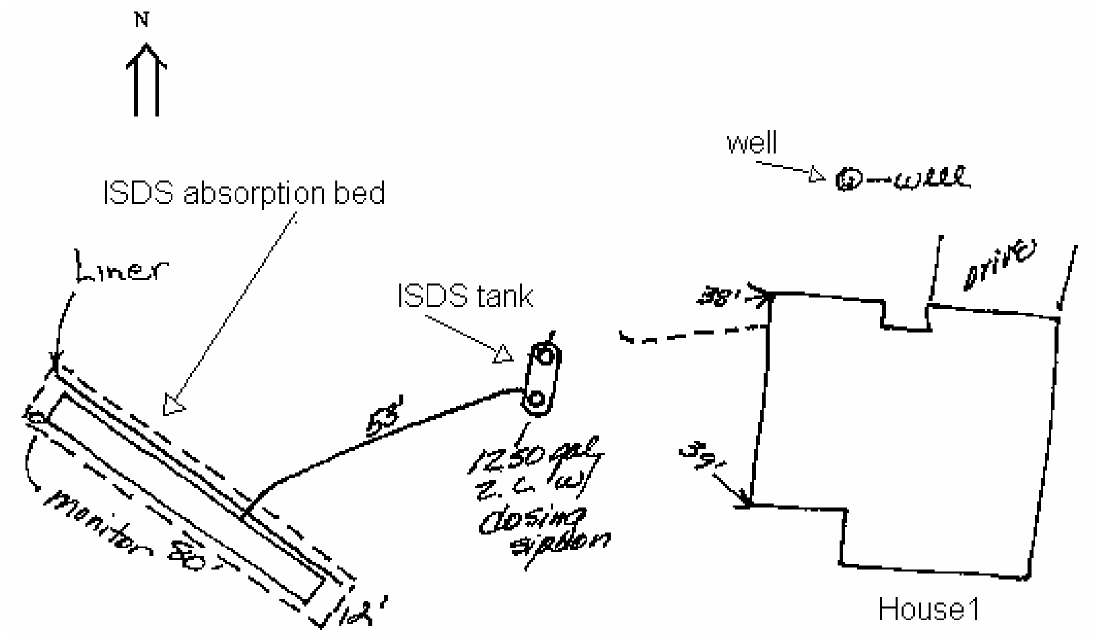


Figure 4.1 The "as-built" drawing for House1, made by Jefferson County Department of Health and Environment upon final county approval of the ISDS. Handwritten lengths are in feet. Drawing is not to scale.

4.2 Well Water Treatment

Much of the ground water in the basin is considered hard, that is, the calcium and magnesium levels in the water are high enough to leave mineral deposits on sinks, bathtubs and toilets. To reduce the hardness, some homeowners in the basin use a water-softening system. This section explains the water-softening system function and provides specifications for the houses involved in this study.

4.2.1 Water-Softening Systems

A water-softening system is a unit designed to remove excess calcium and magnesium from the water. Water can be softened through filtration, activated carbon, reverse-osmosis, or an ion exchange column. Two of the four houses involved in the study use ion-exchange columns. When water passes through the column, the calcium and magnesium ions in the water attach to the ion exchange sites. When the exchange sites are full, the column is recharged with a potassium or sodium chloride solution. The potassium or sodium ions push the calcium and magnesium ions out of the exchange sites and into the solution stream. The column can then be reused. Once the potassium or sodium ion is stripped from the exchange sites by a calcium or magnesium ion, the recharge solution enters the household water and ends up in the ISDS. The large amounts of potassium or sodium measured in ISDS effluent are a result of this process where potassium or sodium chloride solution is used in the water-softening system.

Potassium chloride is an alternative to the more widely used sodium chloride. If sodium intake is a health concern, potassium chloride can be used when homeowners wish to reduce the amount of sodium in their drinking water compared to that which a sodium-based water softener would produce. The potassium is an essential plant nutrient and some homeowners prefer releasing potassium to the environment. The chloride released into the environment by homes' water-softening systems is one source of the increased chloride in the basin's waters. The number of homes using water-softening systems in the basin is not known.

4.2.2 Site-Specific Water-Softening Systems

House1 uses a potassium chloride recharge solution in their ion exchange water-softening system. House3 uses a sodium chloride recharge solution in their ion exchange column. House2 and House4 do not use water-softening systems.

CHAPTER 5
METHODS

5.1 Introduction

The effluent in the tank and the resulting plume from the ISDS of House1 was located and sampled to determine the chemical composition of each. The house well water and the basin stream water were collected and chemically analyzed. Hydrological components of the system were identified and characterized to determine the rate at which the ISDS effluent infiltrates the underlying bedrock.

5.2 Data Collection

Geophysical, geochemical and hydrological data were collected over the course of this study. Geophysical data were collected to locate and identify the subsurface ISDS plume. Geochemical data were collected to characterize the chemical evolution of the plume as it moved through the subsurface. Hydrological data were collected to estimate the rate of infiltration of the plume to the bedrock.

5.2.1 Geophysical Data

Electromagnetic (EM) induction and direct current (DC) resistivity were the two geophysical techniques employed to locate the subsurface ISDS plume. These techniques measure differences in electrical conductivity in the subsurface. Soil and bedrock containing fresh water is more electrically conductive than drier soil and bedrock, and water with more total dissolved solids (TDS) is more conductive than fresh water. ISDS effluent increases the regolith moisture with very high TDS water, and is therefore more conductive than the surrounding soil and regolith.

The EM31 survey produces a map showing apparent conductivity averaged over depth for an area on the ground surface, and was used to locate areas at the surface under which spots of high electrical conductivity exist. The DC resistivity survey produces a cross-section of the subsurface, showing the depth of the true conductivity distribution.

A *Geonics* EM-31 instrument was used to conduct the electromagnetic (EM) induction surveys. EM-31 measures variations in subsurface electrical conductivity, in units of milliSiemens/meter (mS/M). The EM-31 system utilizes two coils separated by a specified distance. The transmitting coil generates a primary EM field that induces current flow in the earth (Reynolds, 1997). When the radiation encounters a conductive medium, eddy currents are produced. These eddy currents generate a secondary EM field that is detected by the receiving coil (Reynolds, 1997). Both the inphase and quadrature phase parts of the response signal are recorded by the EM-31. The quadrature component is calibrated to yield an apparent conductivity in mS/m, and the inphase component gives the ratio of secondary field over the primary field in parts per thousand (ppt). For this study, the apparent conductivity was used for mapping the lateral variation of ground conductivity.

The instrument is calibrated for coils one meter above the ground surface: approximately waist-height of the operator. The EM-31 can explore to depths of about six meters, but is most sensitive to materials about one meter below ground surface (Geovision, 2003). Grids were laid out over the areas of interest. Data were collected as the operator walked along each grid line. To insure there was no directional component to the conductive material in the subsurface, four different combinations of instrument orientation (front-back or right-left) and survey direction (east-west or north-south) were used to collect data over the grid. It was found that instrument orientation and survey direction made a slight difference in the resulting maps, but the general trends were the same.

The second geophysical technique employed was DC resistivity. DC resistivity surveys measure the resistivity of the surveyed ground. The inverse of conductivity, resistivity is a physical property describing how well a material inhibits current flow, in units of Ohm meters (Ωm). The surveys at House1 used a dipole-dipole array. Two electrodes (one negative, one positive) are used to apply electric current directly to the ground. Two additional electrodes measure the resulting potential differences on the surface (Figure 5.2). These potential electrodes are moved further away from the current source electrodes with each measurement. The dipole spacing and increments for this survey were 2 m. The ground was very dry, so the electrodes were hammered into the ground to a depth of at least a foot to improve coupling of the current to the subsurface.

The apparent resistivity data collected by the DC resistivity survey were then inverted using *DCIP2D* inversion software as described by Oldenburg and Li (1994). The inversion produces a true resistivity distribution section.

Although DC resistivity data are measured in terms of resistivity, they will be discussed in terms of conductivity in this paper, to facilitate comparison between the EM-31 data, the DC resistivity data, and the aqueous Specific Conductivity data.

5.2.2 Geochemical Data

The second step in characterizing the ISDS effluent plume and its effect on the watershed was a chemical analysis of the plume and the basin's surface waters. Well water from the four homes was also analyzed to establish a chemical background for the water entering the ISDS and surrounding regolith.

To sample the septic plume as it leaves the leach field, a total of 31 piezometers were installed along the flow path determined from geophysical measurements. Three-inch diameter holes were augered with a *Little Beaver*® Hydraulic Earth drill. The holes were drilled to the soil-regolith/bedrock interface (the point where drilling rates significantly slowed). Depth of the piezometers ranges from 0.8 to 3 meters (2.6 to 9.8 feet). The piezometers are constructed of 1.9 or 2.54 cm-diameter (¾ inch or 1 inch-diameter) PVC pipe. Twenty-seven of the piezometers are slotted from the bottom of the pipe to approximately 15 centimeters below the surface. The annular space is packed with mesh-size10-20 sand and capped with a bentonite clay layer and a concrete seal. The relative locations and elevations of the piezometers were determined by a Total Station survey. The probe of a hand-held field Specific Conductivity meter was lowered into each piezometer to record Specific Conductivity and temperature before a sample was collected. A 1.25 cm-diameter (½ inch-diameter) plastic bailer was used to collect water from the vent pipe and piezometers.

The ISDS effluent (from House1) was sampled directly from standing water in the infiltration area vent pipe, instead of from the ISDS tank. It was decided effluent taken from the vent pipe was more representative of effluent draining from the leach pipes because of the residence time of effluent and the associated microbial processes that occur in the tank.

Surface water in the basin was sampled by placing a bottle directly into the stream. Well water from the houses involved in the study was collected from the kitchen, or outside tap of each house.

Upon collection, all aqueous samples were put into acid-washed 500-mL plastic bottles. If possible, the bottle was pre-rinsed with sample; little or no headspace was left in the bottle. The samples were not kept in a cooler in the field but were transported to Golden, Colorado and refrigerated to approximately 2°C within four hours of collection. The samples were vacuum-filtered using 0.45 μm filter paper. Alkalinity (as bicarbonate), pH and Specific Conductivity were determined for each filtered sample. Approximately 60 mL of each filtered sample was sent to the Laboratory of Environmental and Geological Studies at the University of Colorado at Boulder, for major and trace ion analysis. The instruments used by the lab were an inductively coupled plasma mass spectrometer (ICP-MS) and an ion column chromatograph (IC).

5.2.3 Hydrological Data

In order to calculate a water budget for the ISDS, the following tasks were conducted:

- A small water-level sounder was used to measure the depth to water in each piezometer and the vent pipe.
- The volume of effluent leaving the leach pipes was measured using an *Orenco* digital dose counter, installed in the dosing chamber of the ISDS tank. The volume of water pumped from the well was measured with a turbine flow meter, installed on the water pipe between the well and the pressure tank.
- The volume of effluent migrating away from the leach field was estimated using Darcy's Law. Consequently, hydraulic gradient and plume area were determined by hydraulic head measurements in the piezometers. Hydraulic conductivity of the regolith was estimated using the Hvorslev Slug-Test method (Fetter, 2001). Five of the 31 piezometers installed are only screened over the bottom 15 centimeters, allowing slug tests to be performed by adding water to the piezometer. The falling hydraulic head was recorded as a function of time.
- Evapotranspiration (ET) over the leach field and surrounding yard was measured using an ET chamber, on loan from the USGS (Figure 5.1). Using a psychrometer, the ET chamber measures relative humidity over a 1m-diameter area as a function of time. A datum was collected every two seconds. The data collected by the logger included time (t), wet-bulb temperature (tw) and dry-bulb temperature (td).
- To determine ET from these data, a simple computer code was written.

Figure 5.1 The evapotranspiration (ET) chamber, on loan from the US Geological Survey, used to measure ET above the leach field.

CHAPTER 6

DATA

6.1 Geophysical Data

Two EM-31 surveys were conducted over the course of the study. The first survey, in May 2002, was over the ISDS infiltration area of House1. A 21-meter by 24-meter grid was laid out directly above the leach field. The second EM-31 survey, conducted in January 2003, was approximately 100 meters downhill from the infiltration area, over the small surface drainage. A 20-meter by 40-meter grid was laid out, stretching from the House2 ISDS infiltration area, down into the surface drainage and up onto the adjoining property of House3 to the west. The relative locations of the EM survey grids are presented in Figure 6.1.

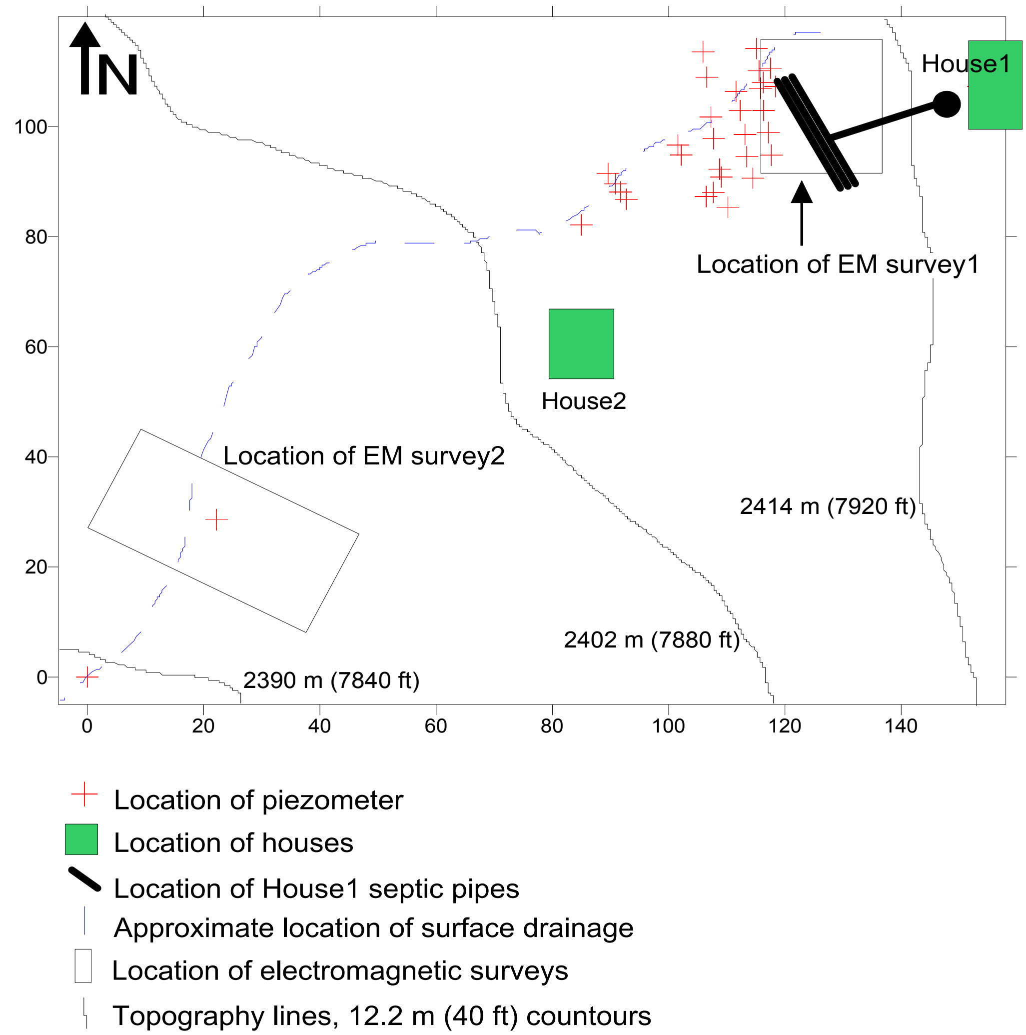


Figure 6.1 Relative locations of House1 and House2, ISDS of House1, EM-31 surveys and 31 piezometers. Axes are in meters.

Data were collected as the operator walked along each grid line. Each datum consisted of an X and Y location in space and a quadrature and in-phase component of the measured electromagnetic field. The data were transferred from the data recorder to a computer and were reduced and analyzed using *DAT31W* software (Geonics Limited, 2002). The software produced an XYZ file that was contoured by surface mapping software. These files are included in Appendix A.

Three dipole-dipole DC resistivity surveys were conducted to obtain cross-sectional distributions of the resistivity distribution. Two of the surveys, conducted in July 2002, ran east-west over the EM grid above the ISDS infiltration area of House1 and were 28 meters long. The third survey, conducted in October 2002, ran north-south several meters west of the grid's western boundary and was 30 meters long. The relative locations of the DC resistivity surveys are shown in Figure 6.2. Each DC survey consisted of 55 to 60 measurements. The raw data files are presented in Appendix A.

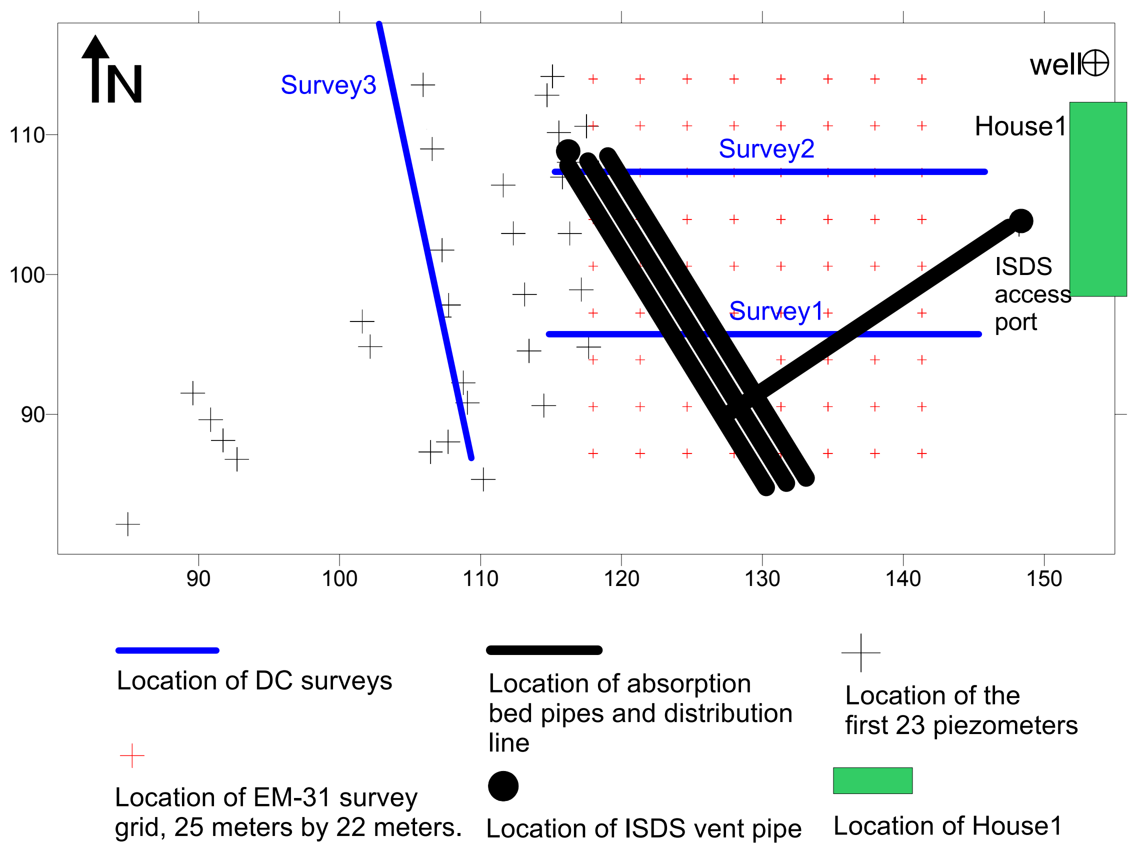


Figure 6.2 Relative locations of EM-31 survey 1, DC resistivity surveys, the eastern most 29 piezometers, House1, and the ISDS leach pipes. Axis scale is in meters.

<u>6.2 Geochemical Data</u>

A total of 86 samples were collected: 38 surface, 2 ISDS effluent, 39 piezometer, and 7 ground water samples. The surface water samples were collected in spring, summer and fall of 2002 and spring and summer of 2003. The surface water sample locations are indicated in Figure 6.3. The ISDS effluent samples were taken from the vent pipe for the absorption field of House1 and were collected in summer and fall of 2002. The piezometer samples were taken from the piezometers installed down-gradient from the absorption field of House1. The piezometer samples were collected in fall of 2002 and spring and summer of 2003. The relative locations of the piezometers are shown in Figures 6.1 and 6.2. The ground water

Figure 6.3 Squares represent surface water sampling locations. Most of the locations and designations are the same as those used by Bossong et al. (2003) to facilitate ease in data comparison.

samples were taken from the inside or outside taps of houses 1, 2, 3 and 4 in summer and fall of 2002 and winter of 2003.

Initially, the following parameters were analyzed for each sample: Ag, Al, As, Ca, Cd, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, Pb, Se, Si, Zn, Br, Cl, F, NO_2, NO_3, PO_4, SO_4, HCO_3. Also measured for each sample were pH and Specific Conductivity. As the research progressed, Ag, Cd, and Se, were no longer determined in the samples, as the concentrations for these parameters were always below detection level. The mean and median values for each parameter and the number of samples analyzed are presented in Table 6.1. All chemical data are listed in Appendix B.

Charge balances were calculated for all samples. 80% of samples balanced to within 10%, and 88% of samples balanced to within 15%. Samples that balanced to within 15% were used in analyses. Charge balances are tabulated in Appendix B.

The measurement of how efficiently water can conduct an electrical current, normalized to a water temperature of 25°C, is referred to as Specific Conductivity (SC). SC and temperature were measured in each piezometer on a semi-weekly basis a total of sixteen times from April to September 2003 (data are in Appendix B). Maps of contoured values of SC were produced for each sampling round. These maps were contoured with surface mapping software using a radial basis function gridding method.

<u>6.3 Hydrological Data</u>

The depth to water was measured in each piezometer on a semi-weekly basis eighteen times from April to September 2003 (data are in Appendix C).

The digital dose counter, installed in February 2003, was checked nine times from February to October 2003. The flow meter, installed in July 2003, was checked four times between July and October 2003. These data are in Appendix C.

Evapotranspiration measurements were taken on a single day during summer 2002 and five days during summer 2003. Two of the days during summer 2003 were "intensive" measurement days: measurements were taken every one or two hours over the course of the entire day. Four different locations in the yard were measured. Three of the locations were over the ISDS infiltration area; one location was not over the infiltration area. ET data are reported in Appendix C. The computer code written to calculate the ET rate is in Appendix D.

Only two of the five piezometers installed for the slug tests had screened areas completely within the saturated zone of the regolith. Three slug tests were performed in these two piezometers. Data from the slug tests are presented in Appendix C.

		Surface Waters			Ground Waters			Piezometer Samples			ISDS Effluent	
Parameter	units	A	B	N	A	B	N	A	B	N	A	N
Aluminum	μg/L	104	2.34	34	0.56	0.44	7	69.4	13.5	33	0.47	2
Arsenic	μg/L	0.95	0.69	34	0.76	0.69	7	0.99	1.50	33	1.44	2
Bicarbonate	mg/L	70.6	71.0	34	122	114	7	104	91.7	31	386	2
Bromide	mg/L	0.13	0.09	34	0.06	0.06	7	0.11	0.07	33	0.44	2
Cadmium	μg/L	0.04	0.03	30	0.05	0.06	7	0.24	0.24	2	0.04	2
Calcium	mg/L	38.4	39.8	34	13.3	0.06	7	85.4	49.0	33	79.8	2
Chloride	mg/L	95.7	82.0	34	33.0	20.5	7	284	126	33	1100	2
Chromium	μg/L	7.23	7.71	34	13.7	13.8	7	5.52	3.89	33	43.5	2
Copper	μg/L	1.68	1.50	34	101	72.1	7	7.09	5.70	33	2.14	2
Fluoride	mg/L	0.55	0.48	34	0.41	0.37	7	0.23	0.20	33	0.25	2
Iron	mg/L	0.01	0.01	34	0.01	0.01	7	0.28	0.02	33	1.66	2
Lead	μg/L	0.09	0.05	34	0.75	0.27	7	0.15	0.06	33	0.37	2
Magnesium	mg/L	10.6	10.3	34	1.96	0.01	7	20.4	11.9	33	13.5	2
Manganese	μg/L	19.7	0.76	34	0.45	0.22	7	523	214	33	786	2
Nickel	μg/L	6.92	6.00	34	3.40	0.60	7	20.7	11.7	33	17.8	2
Nitrate	mg/L	2.05	0.41	34	23.2	31.8	7	20.5	17.3	33	0.39	2
Nitrite	mg/L	0.01	0.01	26	0.01	0.01	6	0.01	0.01	31	N/A	1
Phosphate	mg/L	0.07	0.06	34	0.09	0.06	7	0.13	0.08	33	6.74	2
Potassium	mg/L	3.39	2.62	34	80.3	131	7	32.1	12.8	33	1100	2
Selenium	μg/L	2.80	2.26	30	2.33	2.26	7	5.62	5.62	2	3.94	2
Silica (as SiO_2)	mg/L	5.86	5.25	34	11.0	11.4	7	16.4	16.5	33	12.1	2
Silver	μg/L	0.48	0.53	30	0.46	0.53	7	0.58	0.58	2	0.47	2
Sodium	mg/L	31.5	30.6	34	27.0	1.58	7	80.8	61.3	33	41.2	2
Sulfate	mg/L	17.4	12.3	34	10.2	12.2	7	24.9	22.1	33	1.30	2
Zinc	mg/L	4.69	4.69	34	80.4	44.7	7	7.35	5.76	33	6.69	2
Specific Conductivity	mg/L	288	205	23	353	308	7	807	675	30	2623	15

Table 6.1 Mean and median values for each chemical parameter in the four kinds of water samples collected. A = concentration mean, B = concentration median, N is number of samples. No median value is calculated for the ISDS effluent samples because only two samples were collected. When the reported value for a parameter was “below detection limit” a value midway between the detection limit and zero was used to calculate the mean and median.

CHAPTER 7
DATA ANALYSIS

7.1 ISDS Effluent Plume Location

Surface geophysical surveys were conducted over the ISDS infiltration area to identify the location of the effluent plume. Piezometers were installed to sample the plume.

7.1.1 Distribution of Effluent from Geophysical Survey Interpretation

The first electromagnetic (EM) survey, conducted over the ISDS infiltration area of House1 in the summer of 2002, shows an area of higher electrical conductivity in the northwestern corner of the grid (Figure 7.1). This area of higher conductivity is likely due to

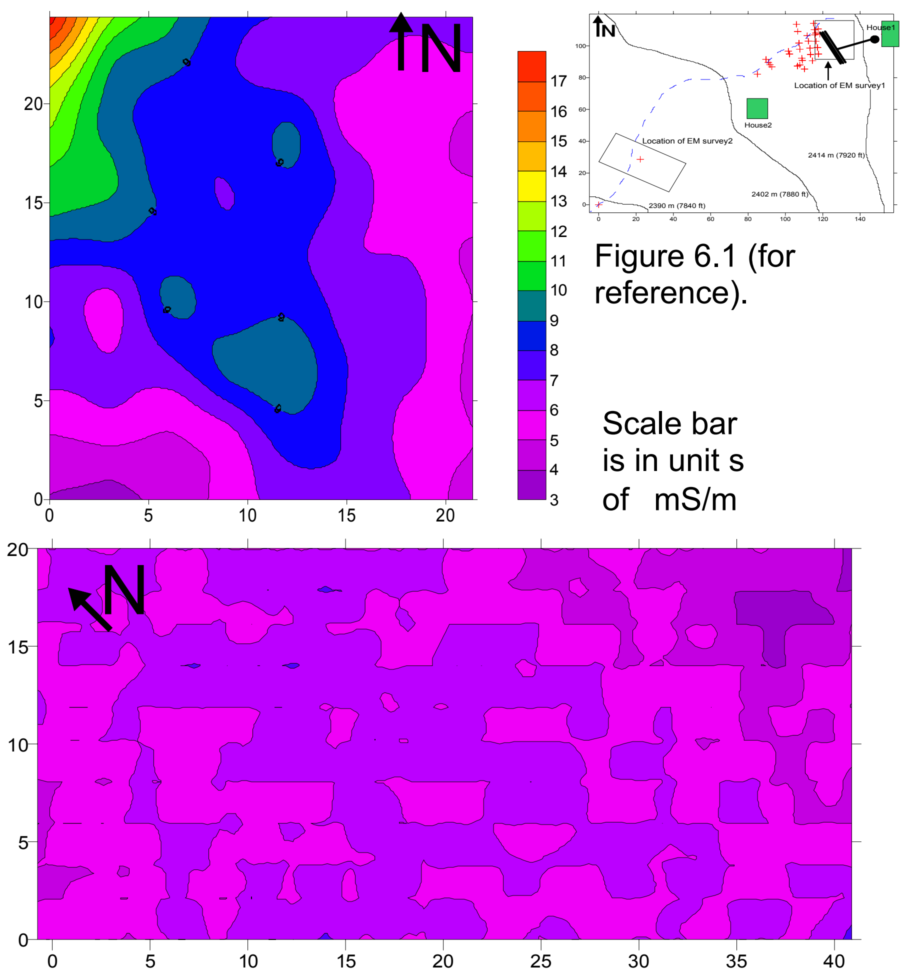


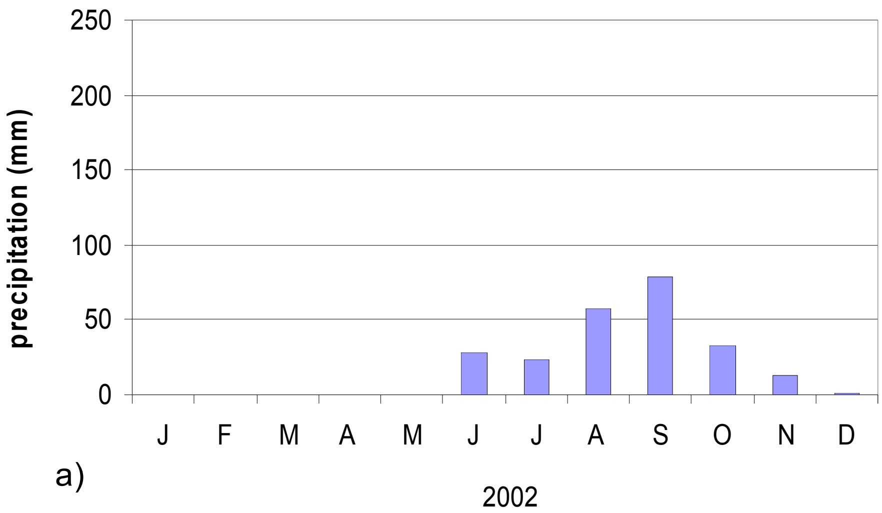
Figure 7.1 EM-31 maps show relative conductivity. Lighter areas are most conductive. Survey 1 (top) was conducted over the ISDS infiltration area of House1. Survey 2 (bottom) was conducted down-gradient from the ISDS infiltration area of House2. Both maps share the same scale. See Figure 6.1 (inset) for relative survey locations. Axes are in meters.

the presence of ISDS effluent. For a single x,y point, the EM-31 produces a value of apparent electrical conductivity averaged over a volume. Because of its higher porosity, the saturated regolith layer is more electrically conductive than saturated bedrock. The northwest corner of the survey has a relatively thick layer of regolith, as discussed in section 7.1.2, and piezometer water levels and water chemistry confirmed the presence of ISDS effluent. The high conductivity, therefore, is likely due to the ISDS effluent in a relatively thick regolith layer.

The presence of effluent in the regolith is confirmed by the vegetation over the ISDS infiltration area, and especially the northwestern corner of the grid, where it was thicker and greener when compared to the surrounding yard, in spring and summer of both 2002 and 2003 (Figure 7.2). Precipitation for both summers (Figure 7.3) was low enough to magnify the differences in conductivity between the effluent-saturated regolith and the surrounding drier regolith.

Figure 7.2 Vegetation over the ISDS infiltration area, summer 2002. It is much thicker and greener here than in the surrounding yard.

The first two direct current (DC) resistivity surveys conducted over the infiltration area of House1 reveal the depth of the highest conductivity to be approximately two to three meters below ground surface (Figure 7.4). This can be assumed to be ISDS effluent; ISDS leach pipes are buried approximately 1 meter under the ground surface. The areas of highest saturation in both surveys are seen where the surveys cross the infiltration area pipes. The third DC resistivity survey reveals an area with higher conductivity close to the surface, near the center of the survey line. While this location is more conductive than the surrounding area, it is less



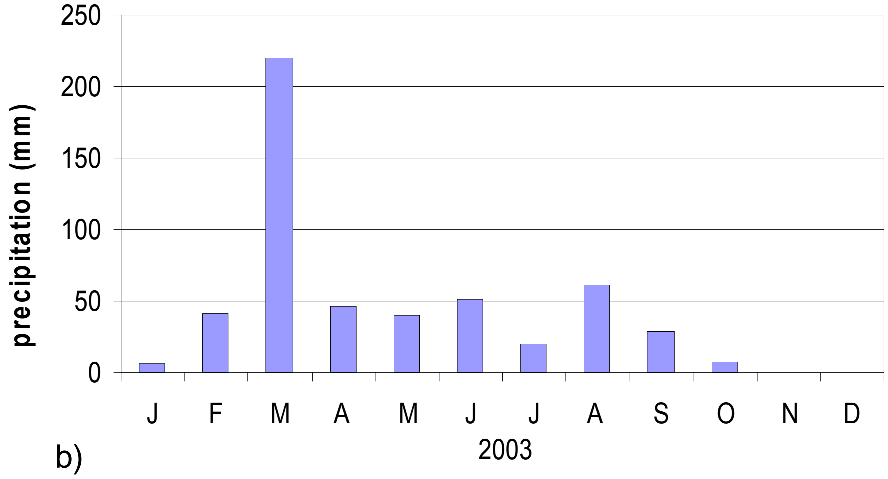
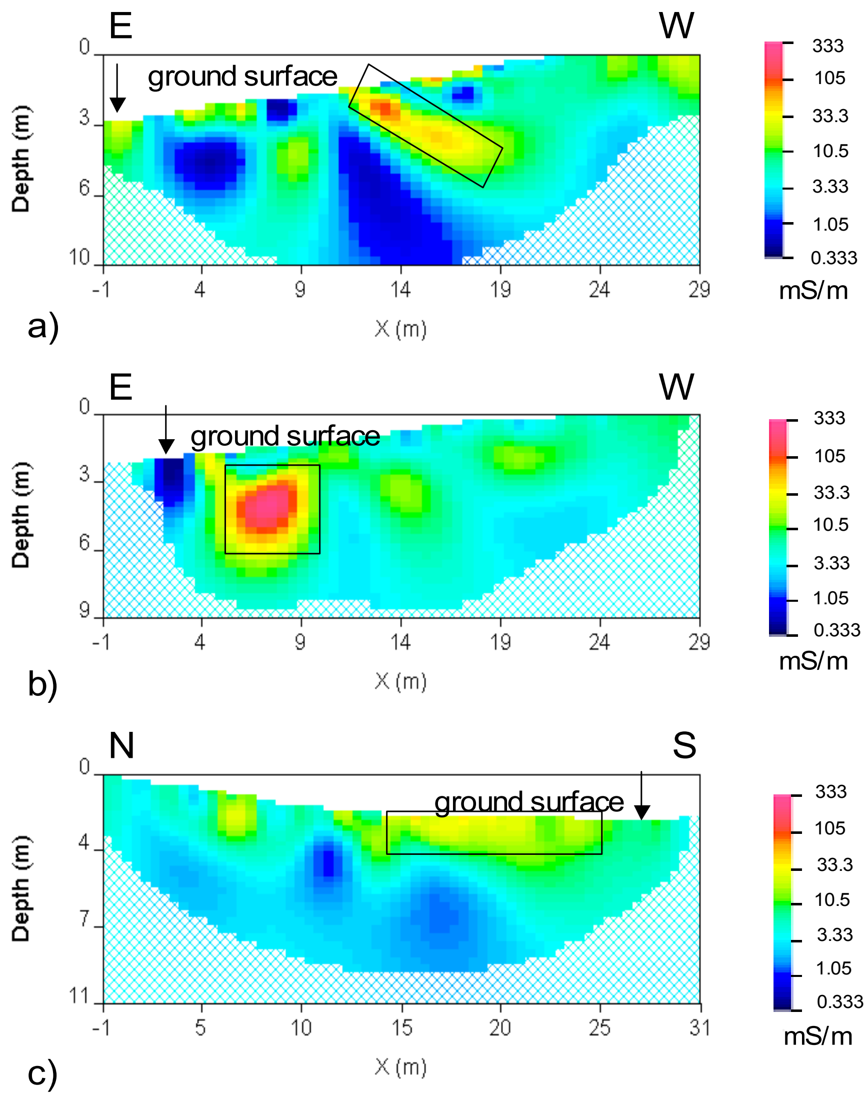


Figure 7.3 Average precipitation in Turkey Creek Basin for 2002 (a) and 2003 (b), based on six collection sites within the basin. Data are from the Community Collaborative Rain and Hail Study (CoCoRaHS) (Colorado State University, 2003). CSU project data collection in TCB began May 2002. Precipitation collection stations are shown in Appendix C.

conductive than the saturated areas in the first two surveys.

Theoretically, the leach pipes should be horizontal, or level, distributing effluent evenly throughout the infiltration area. However, based on the EM-31 map and the water levels, the effluent pools at the northwestern end of the pipes. It is possible that the pipes shifted slightly during the backfill process, causing the effluent to drain to the northwestern end. The effluent is flowing away from the leach pipes toward the northwest. The yard dips away from House1



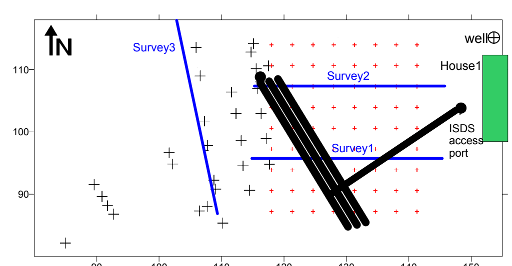


Figure 7.4 Final inverted sections of DC resistivity surveys 1 (a), 2 (b) and 3 (c). Blue areas are least conductive, red areas are most conductive. The area of highest conductivity for each survey is boxed within the black rectangle. The ground surface is shown with the black arrow. Hatched areas at the bottom of each survey are out of the range of the survey. See Figure 6.2 (right) for relative locations of the three surveys.

towards the west. A surface drainage runs towards the west along the northern border of the yard. It continues west past House2 then turns south and reaches North Turkey Creek, approximately 0.5 km away (Figure 6.1). The vertical drop from House1 to North Turkey Creek is about 85 meters.

The second EM-31 survey was conducted over this surface drainage, west of House2. This survey was intended to detect any ISDS effluent if it was present, whether it originated from Houses1,2 or 3. Although the ground beneath the drainage is slightly more conductive than the surrounding area (Figure 7.1), the range of conductivity is small (approximately 7 mS/m) compared to the range in the first electromagnetic survey (approximately 17 mS/m). A piezometer, installed within this second survey grid to a depth of 3.6 ft, confirmed these results: the piezometer remained dry throughout the study.

7.1.2 Flow Patterns from Piezometer Data

Piezometers were installed to the west of the ISDS pipes. The owners of House1 did not want piezometers installed over the pipes or to the east of the pipes. The first EM-31 survey did not extend further west into the area that would later become the piezometer grid due to the environmental conditions at the site: the area over the pipes was clear of bushes, rocks and trees, but the area in the piezometer grid contained all three. For these reasons, the first EM survey and the piezometer grid overlap by only a few meters (Figure 6.2). The third DC resistivity survey was the only resistivity survey within the piezometer grid.

The majority of the piezometers had been installed by March 2003. A record amount of snow fell in the Front Range on March 18 and 19, 2003. Approximately five feet of snow fell in Turkey Creek Basin. The piezometers were buried until the snow melted enough to expose them. Consequently, the first water level and Specific Conductivity measurements were taken April 3, 2003. During the first weeks of April and May, the regolith/soil layer was completely saturated with melt water. The depth to water was zero in most piezometers.

The estimated extent of the plume on June 5, July 10, and September 4, 2003, is illustrated in Figure 7.5a-c. Given that the piezometers are completed at the base of the regolith, the height of the column of water in each piezometer defines the saturated thickness (Figure 7.6). Water levels rose briefly after precipitation events, but dropped soon after. Most of the piezometers were dry by late July 2003.

The ground water mound in the vicinity of piezometer 17 (most visible in September 2003) may be due to a low hydraulic conductivity zone that drains more slowly than the surrounding material, or may result from an upwelling of water from a high conductivity fracture which is directly connected to the infiltration area (in such a case the high head occurs due to little head loss along the fracture).

In the first few weeks of measurements, Specific Conductivity was high in most of the piezometers, averaging 2100 μS/cm (micro-Siemens per centimeter). The average Specific Conductivity of well water from House1 was 312 μS/cm. Over the next two months (April and May, 2003), the Specific Conductivity in the piezometers declined slowly to an average conductivity of 930 μS/cm on May 1, 2003. In late May 2003, the conductivity began to rise slowly and continued to rise over the summer of 2003 (Figure 7.7).

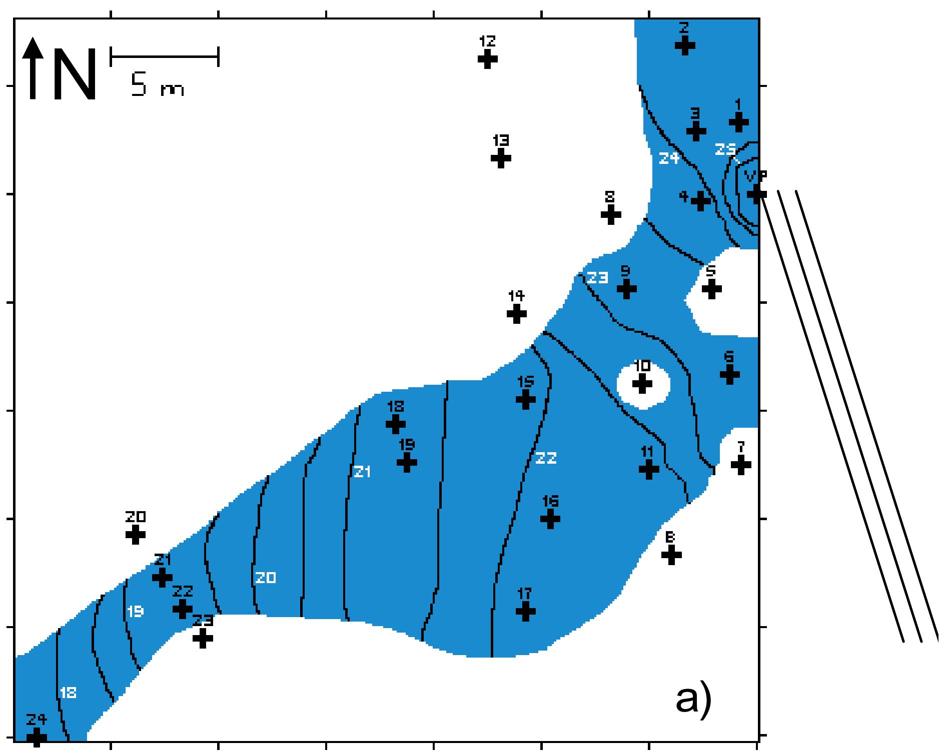


Figure 7.5 a) Head distribution and plume extent on June 5, 2003, determined by water level measurements in the piezometers. The ISDS infiltration pipes are to the east of each figure. In general, water flows to the west. The black crosses and numbers represent piezometer locations and designations. The black lines are contours of hydraulic head. The contour interval is 0.5 feet. The relative hydraulic heads are labeled on each figure with white numbers.

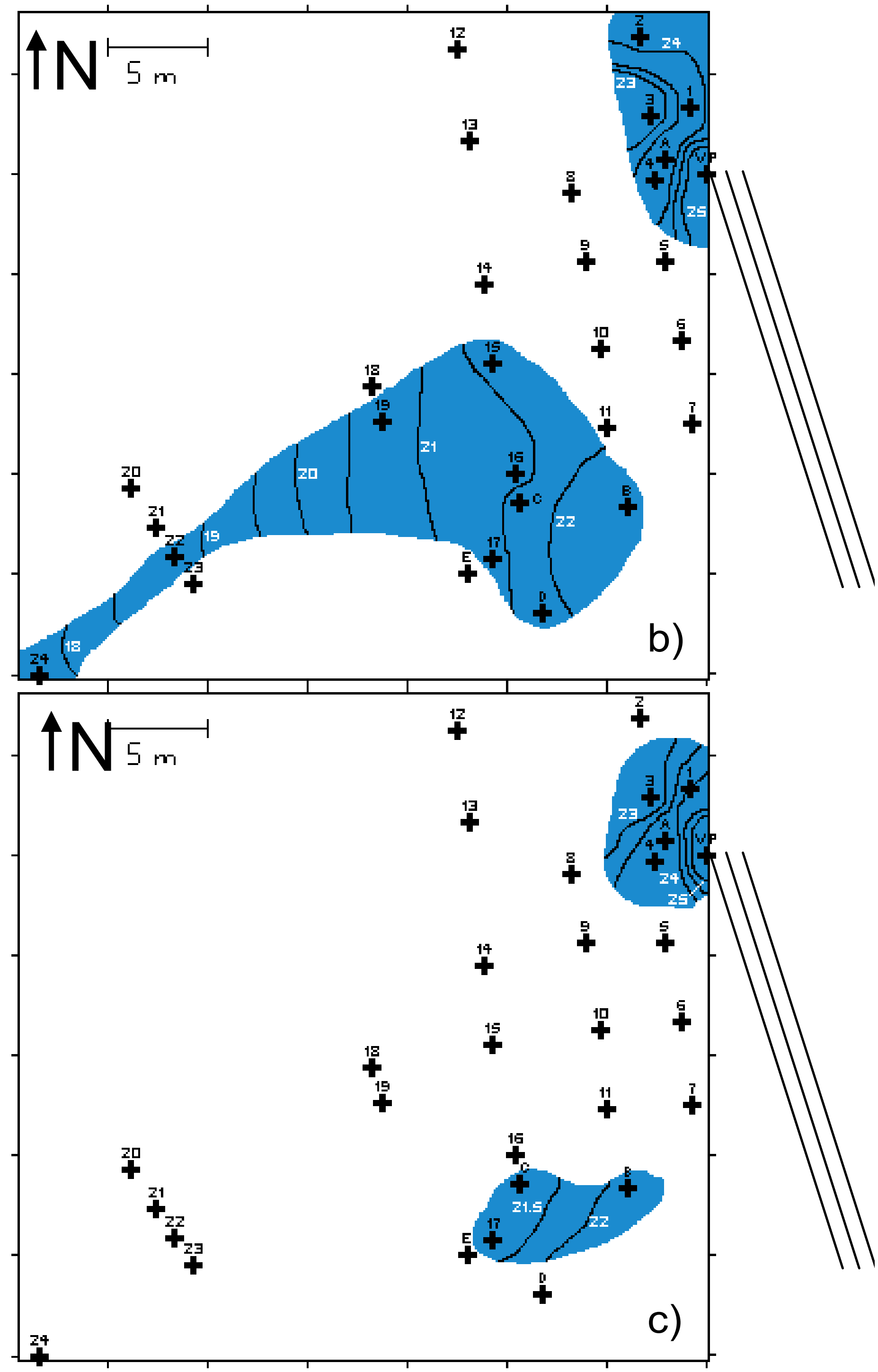
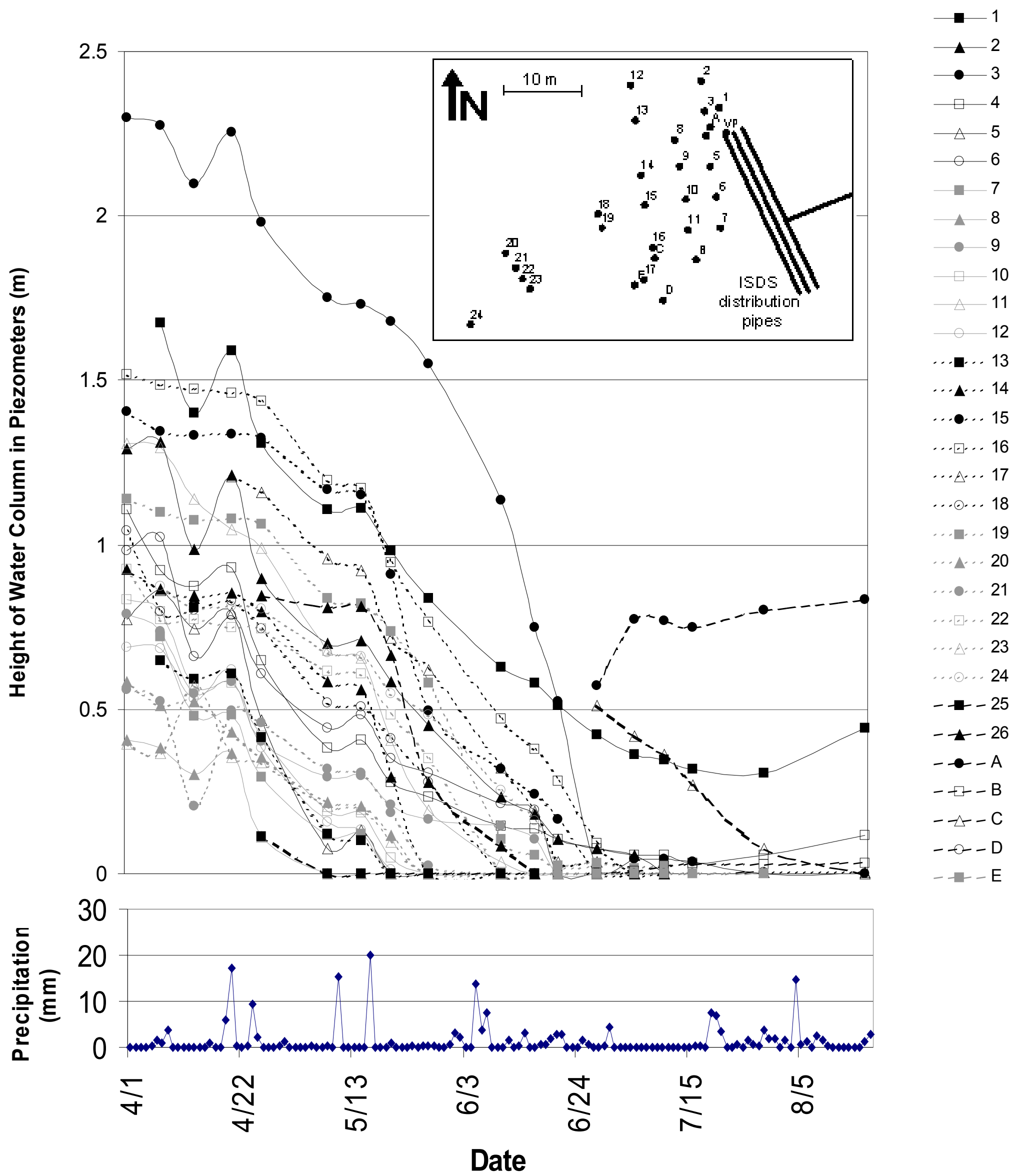


Figure 7.5 b) Head distribution and plume extent on July 10, 2003; and c) September 4, 2003, determined by water level measurements in the piezometers. The ISDS infiltration pipes are to the east of each figure. In general, water flows to the west. The black crosses and numbers represent piezometer locations and designations. The black lines are contours of hydraulic head. The contour interval is 0.5 feet. The relative hydraulic heads are labeled on each figure with white numbers.

a)



b)

Figure 7.6 Height of the water column (a) in the piezometers from April 2003 to Sept. 2003. Snowmelt from the large amount of snow received in March 2003 caused the high water levels in April. By late July most of the water heights in the piezometers had dropped to 0. The bottom graph (b) shows average precipitation (in mm) received in the basin over the same time period. Graphs have the same x-axis. Locations of the eastern most 29 piezometers are shown on the inset map. (Precipitation data from the Jefferson County CoCoRaHS study. Locations of the precipitation stations within the basin are shown in Appendix D.)

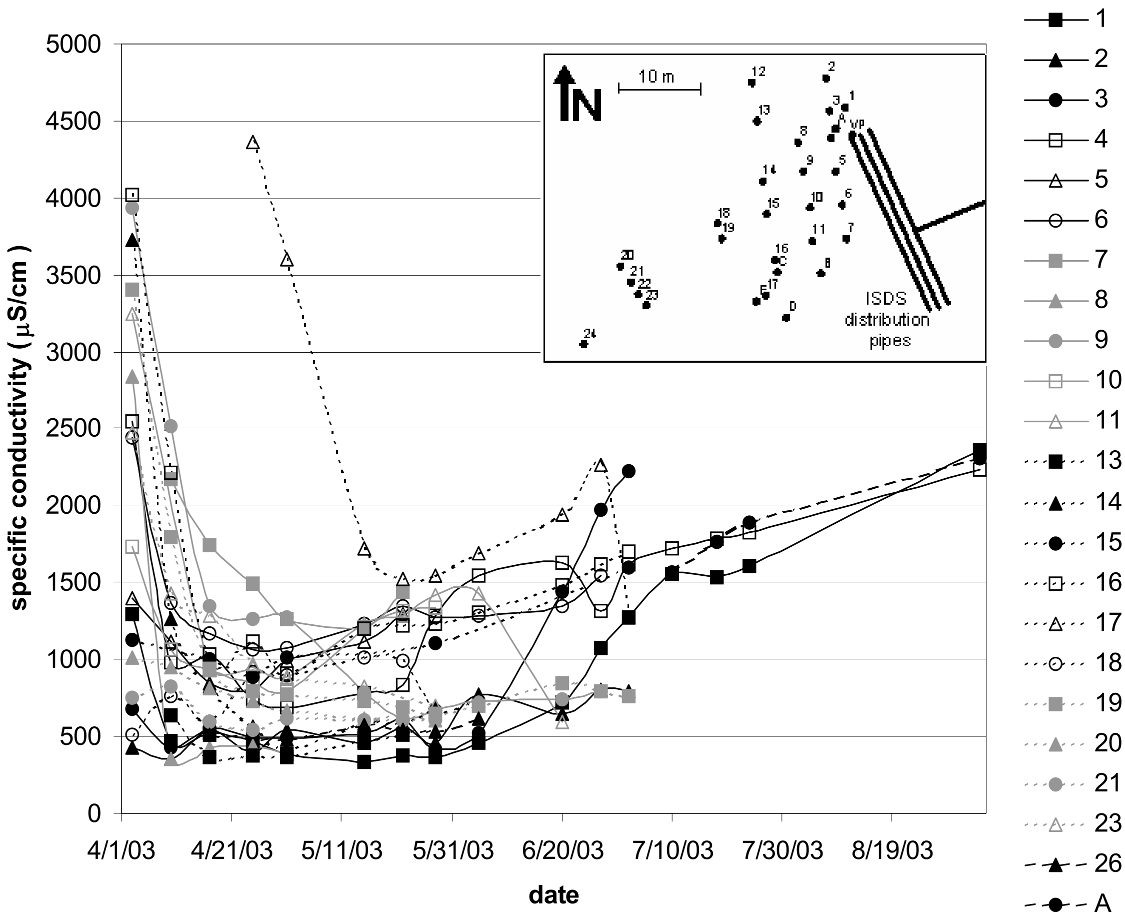


Figure 7.7 Variation of Specific Conductivity (μS/cm) with time for each of the piezometers with four or more specific conductivity data points. Piezometer locations are shown on the inset map.

High Specific Conductivity in the piezometers in April is attributed to snow melt water dissolving the salts and other precipitates left in the soil by the ISDS effluent during drier periods. The fresh water dissolved these precipitates and flushed them through the soil, cleaning the soil surrounding the infiltration area. Several weeks later, the precipitates had been dissolved and had passed through the piezometer field. Water in the piezometer field at that time had lower Specific Conductivity because it was a mixture of snow melt and effluent. The rising conductivity, beginning in late May, is attributed to the decreased volume of fresh water for dilution of the effluent. If measurement of the conductivity continued, it would be expected to reach a fairly constant concentration reflecting the character of treated effluent after traveling the distance to each piezometer.

The distribution of Specific Conductivity in space and time is presented in Figures 7.8a and 7.8b. After the initial flushing of precipitated salts from drier periods, the maps indicate treatment of the effluent by the regolith with declining constituent concentration with distance from the infiltration area. There are two distinct areas of elevated conductivity. One is near the vent pipe of the infiltration area, near piezometers A, 1, 3, and 4; and the other is southwest of the vent pipe, near piezometers B, C, 16 and 17 where the persistent groundwater mound occurs. Both of the alternative interpretations of the mound are supported by the Specific Conductivity data. If a low hydraulic conductivity zone is draining more slowly than the surrounding material, then solute concentrations would not be diluted as rapidly. If a high-conductivity fracture is well connected to the infiltration area, it would deliver poorly treated water to that location.

7.2 Distribution of Chemical Constituents

The chemical fingerprint diagrams of the major and trace ions for all four houses are shown in Figure 7.9. The well water for House1 (after going through a potassium chloride water-softening system) has a total dissolved solids (TDS) value of approximately 330 mg/L. The water is high in potassium (140 mg/L), nitrate (32 mg/L as NO_3^{-2}) and bicarbonate (110 mg/L). The high nitrate concentration was unexpected. This level is below the EPA drinking water standard of 44.3 mg/L (USEPA, 2003), but is higher than the background concentration of 2.26 mg/L for the basin (Bossong et al., 2003). This could be due to contamination from effluent of other ISDSs in the area.

The well waters for houses 2, 3, and 4 have TDS values of 200, 450 and 300 mg/L, and nitrate (as NO_3^{-2}) values of 3, 24, and 6 mg/L, respectively. They are all low in potassium. House3 is higher in sodium, due to the sodium chloride recharge solution used with the water softener. Houses 2 and 4 are chemically similar waters, with the exception that House4 has a higher chloride concentration than House2. Given the high nitrate concentration at House3 (24 mg/L), the well waters of House3 and House1 may be influenced by the same contamination source.

The chemistry of the ISDS effluent of House1 taken from the infiltration area through the vent pipe is significantly different than the ground water with an average TDS of approximately 2700 mg/L. The effluent is potassium-calcium chloride-bicarbonate water. The fingerprint diagrams of the major and trace ions in the ISDS effluent are presented in Figure 7.10.

Chemistry of the ISDS effluent is expected to remain relatively constant over the course of the study since the amounts and types of water use in the residence were not changed. TDS

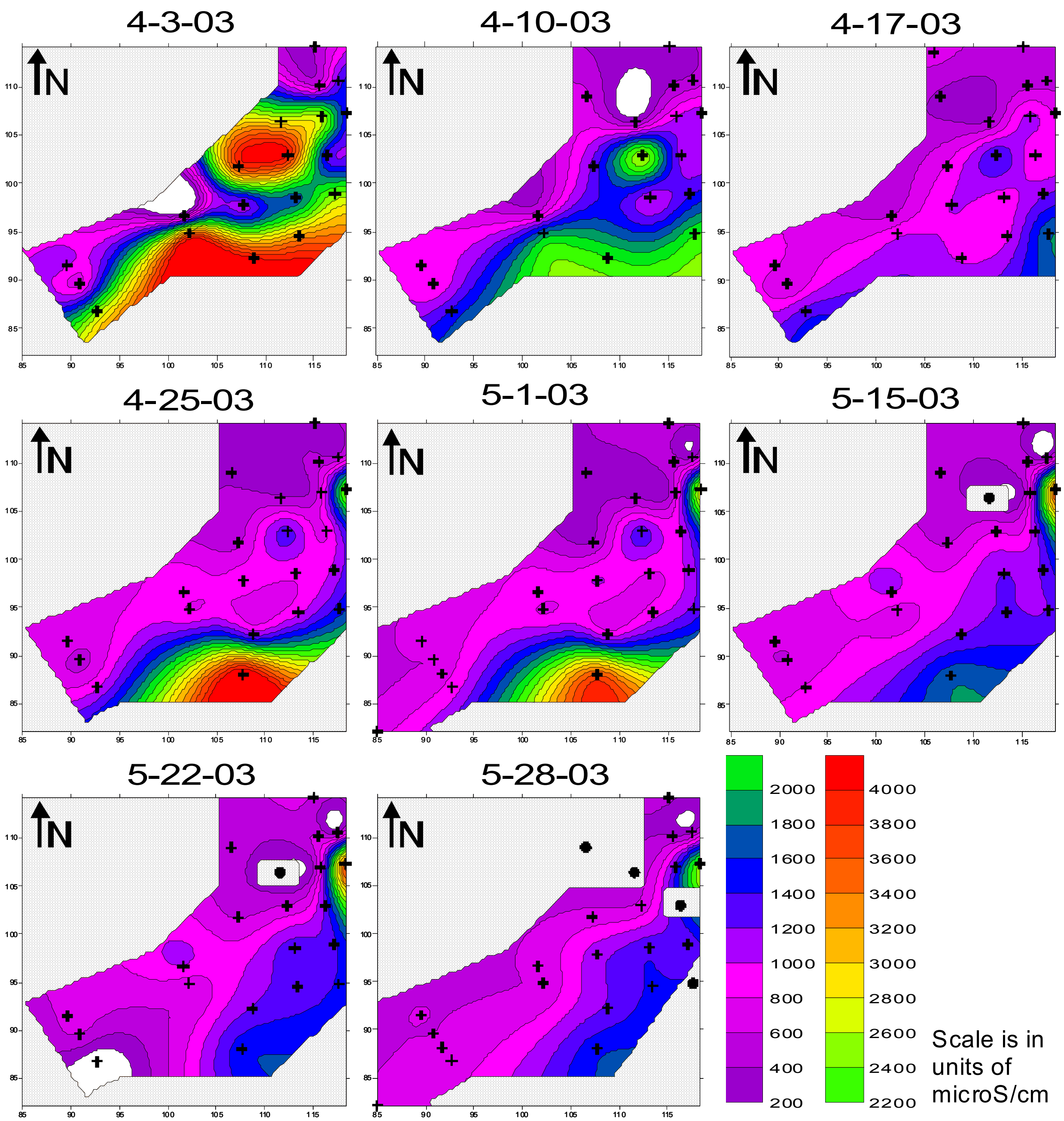


Figure 7.8a Contoured Specific Conductivity (SC) values of the piezometer samples for April and May 2003. Each map is a different sample date. Black crosses represent locations of sampled piezometers. Black circles represent piezometers that are dry or have too little water (<6 inches) to measure. White areas have the highest SC (4000-4200 μS/cm), black areas have the lowest SC (200-400 μS/cm). Contour interval is 200 μS/cm. Hatched areas have a computer-contoured SC value less than 200 μS/cm. Dotted areas represent areas where no data exist (no piezometers or piezometers are dry). The ISDS infiltration pipes lie along the eastern boundary of each map. Axes are in meters.

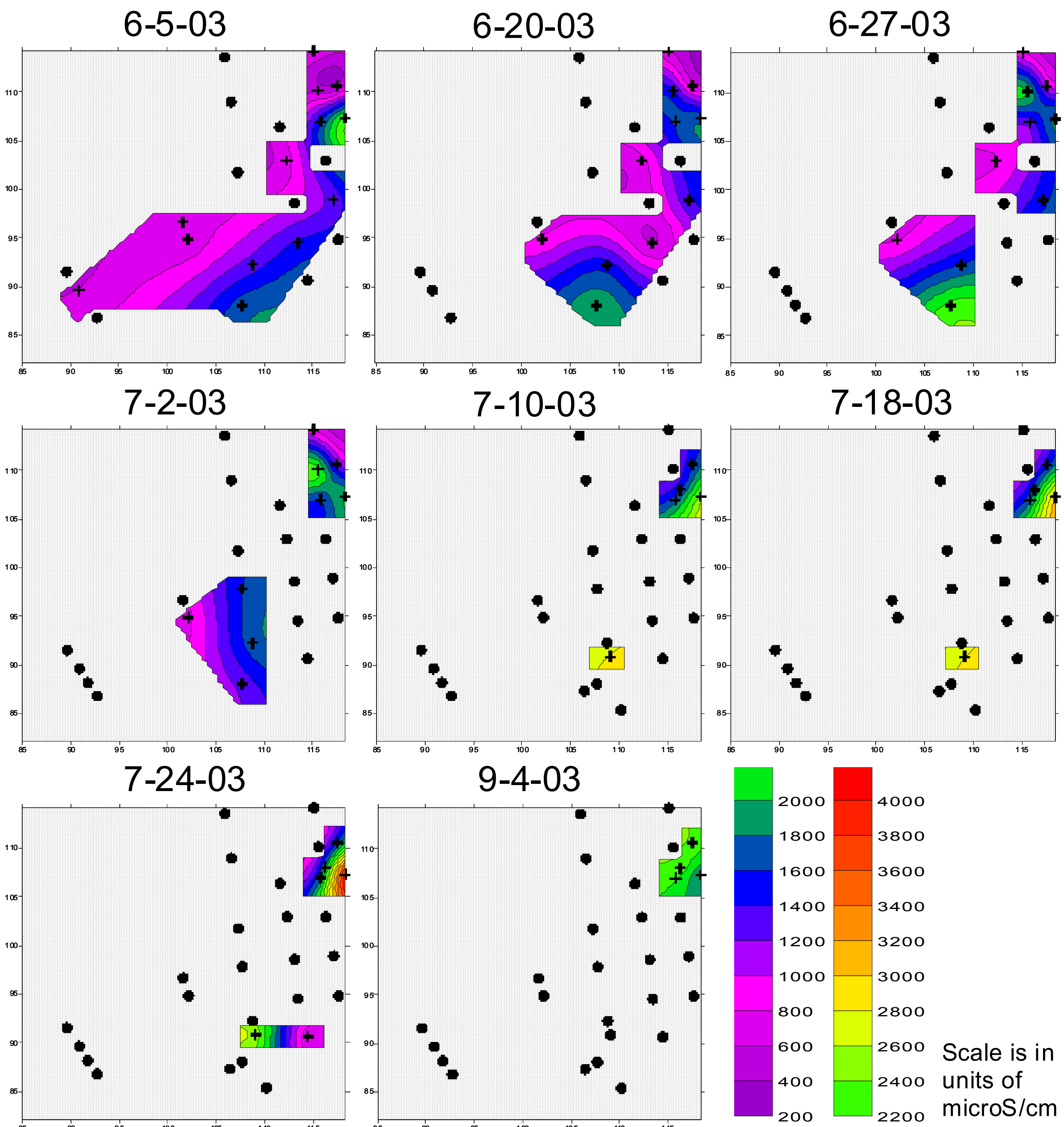


Figure 7.8b Contoured Specific Conductivity (SC) values of the piezometer samples for June to Sept 2003. Each map is a different sample date. Black crosses represent locations of sampled piezometers. Black circles represent piezometers that have too little water (<6 inches) to measure. White areas have the highest SC (4000-4200 μS/cm), black areas have the lowest SC (200-400 μS/cm). Contour interval is 200 μS/cm. Hatched areas have a computer-contoured SC value less than 200 μS/cm. Dotted areas represent areas where no data exist (no piezometers or piezometers are dry). The ISDS infiltration pipes lie along the eastern boundary of each map. Axes are in meters.

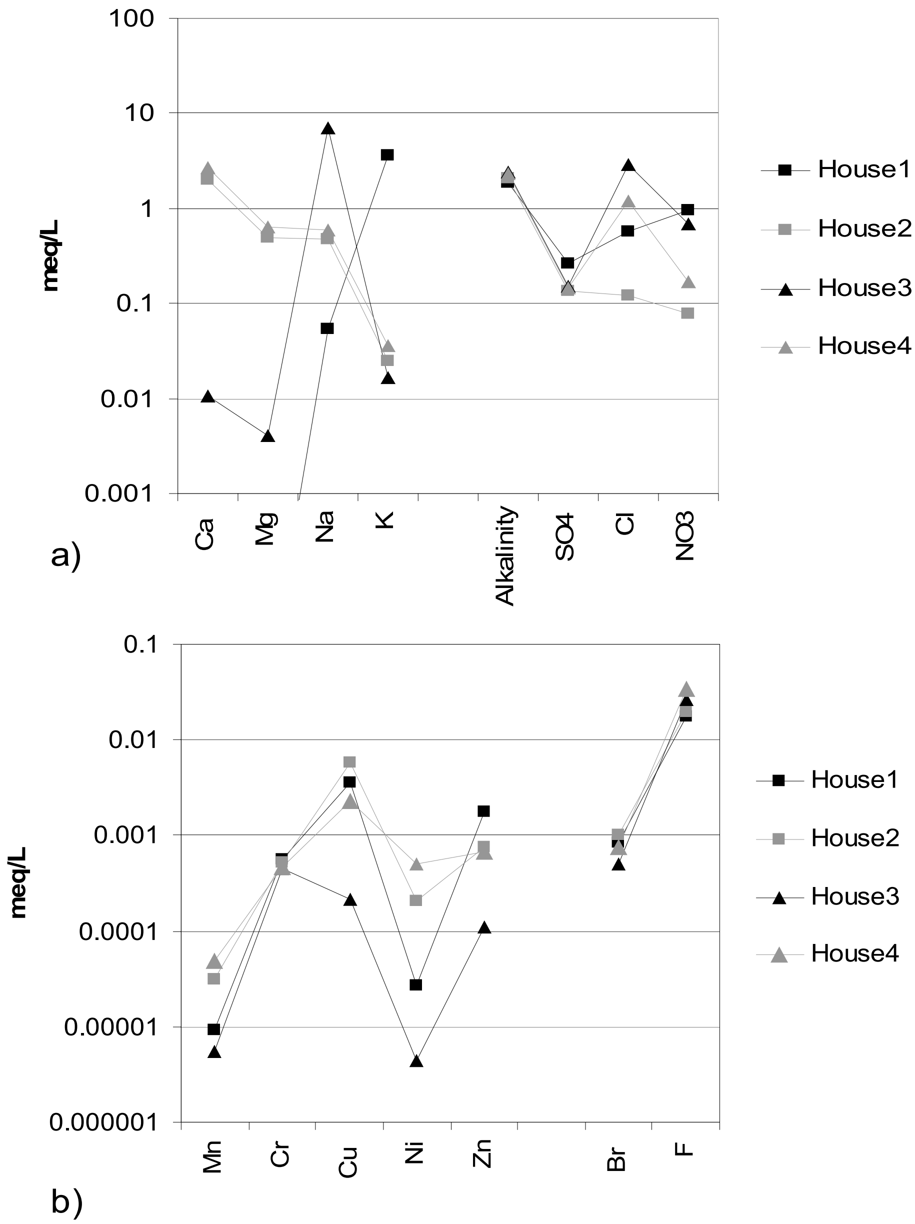


Figure 7.9 Chemical fingerprint diagrams of major ions (a) and trace ions (b) for ground water from houses 1, 2, 3 and 4.

increases significantly between the well and septic tank of house1, mainly due to increases in sodium, calcium, potassium and chloride content. Sulfate and nitrate concentrations are higher in the well water than in the ISDS effluent. This is probably due to biological processes altering the oxidation state of the nitrogen and sulfur in the septic tank. Nitrogen is assumed to be present in the form of ammonium; however, ammonium was not measured in the samples.

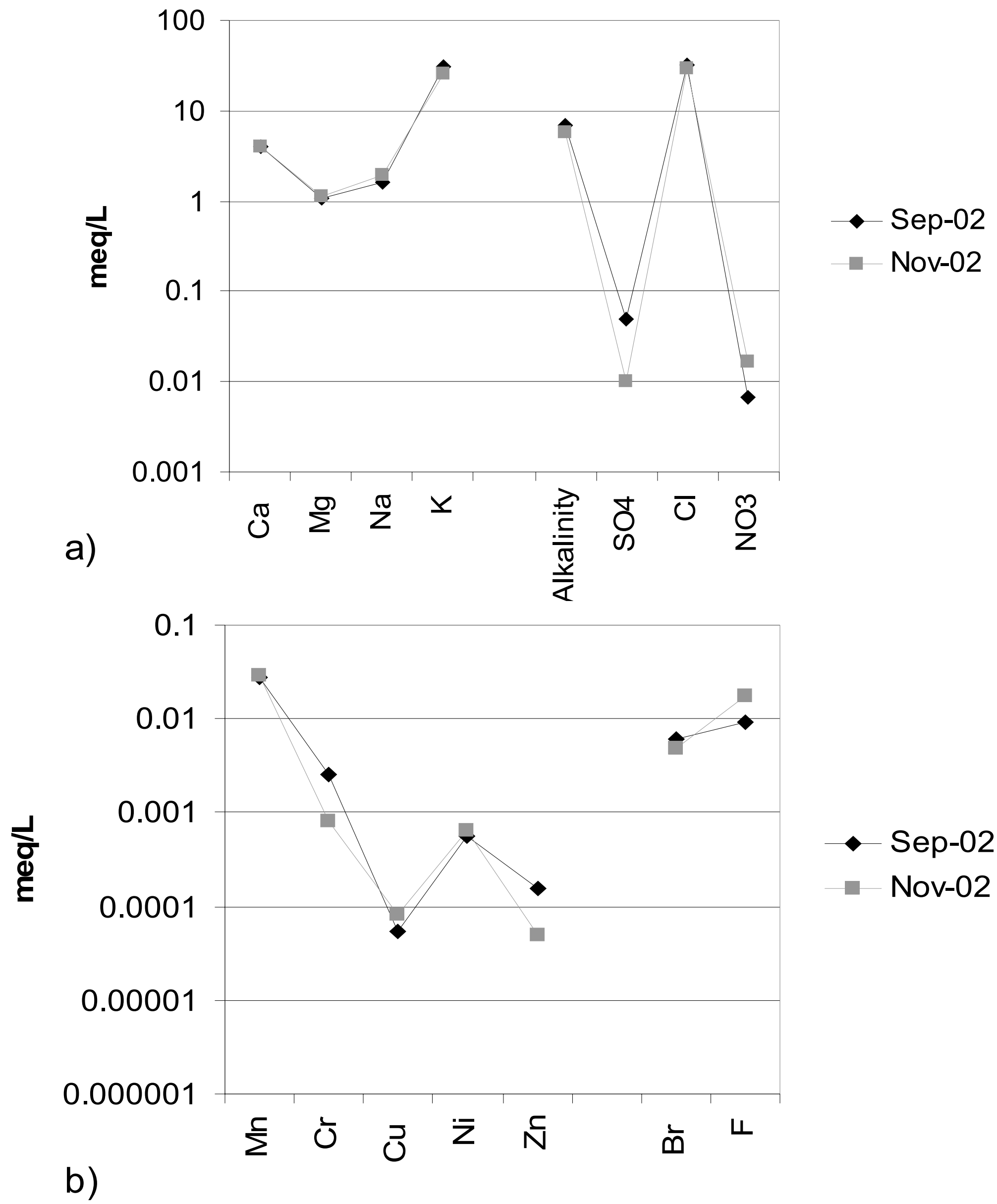


Figure 7.10 Chemical fingerprint diagrams for major (a) and trace (b) ions in ISDS effluent taken from the vent pipe of the infiltration area of House 1.

Chemistry of water from the piezometers varies along the flow path and involves two major sources of water: ISDS effluent and precipitation. In April and May 2003, precipitation diluted the ISDS effluent water in the piezometers, while in September 2003, the piezometers contained primarily ISDS effluent. Major chemical trends during the period are a reduction in potassium and highly variable nitrate concentrations. Fingerprint diagrams of major and trace ions of the piezometer chemistry on four different dates are presented in Figures 7.11a-c.

In the samples from both April and May 2003, potassium varies from 1100 mg/L at the vent pipe to 6 mg/L near piezometer 22, approximately 33 horizontal meters from the vent pipe (Figure 7.12a-b). Potassium is preferentially absorbed by plants through their roots; the level of potassium in piezometer samples decreases with distance from the infiltration area.

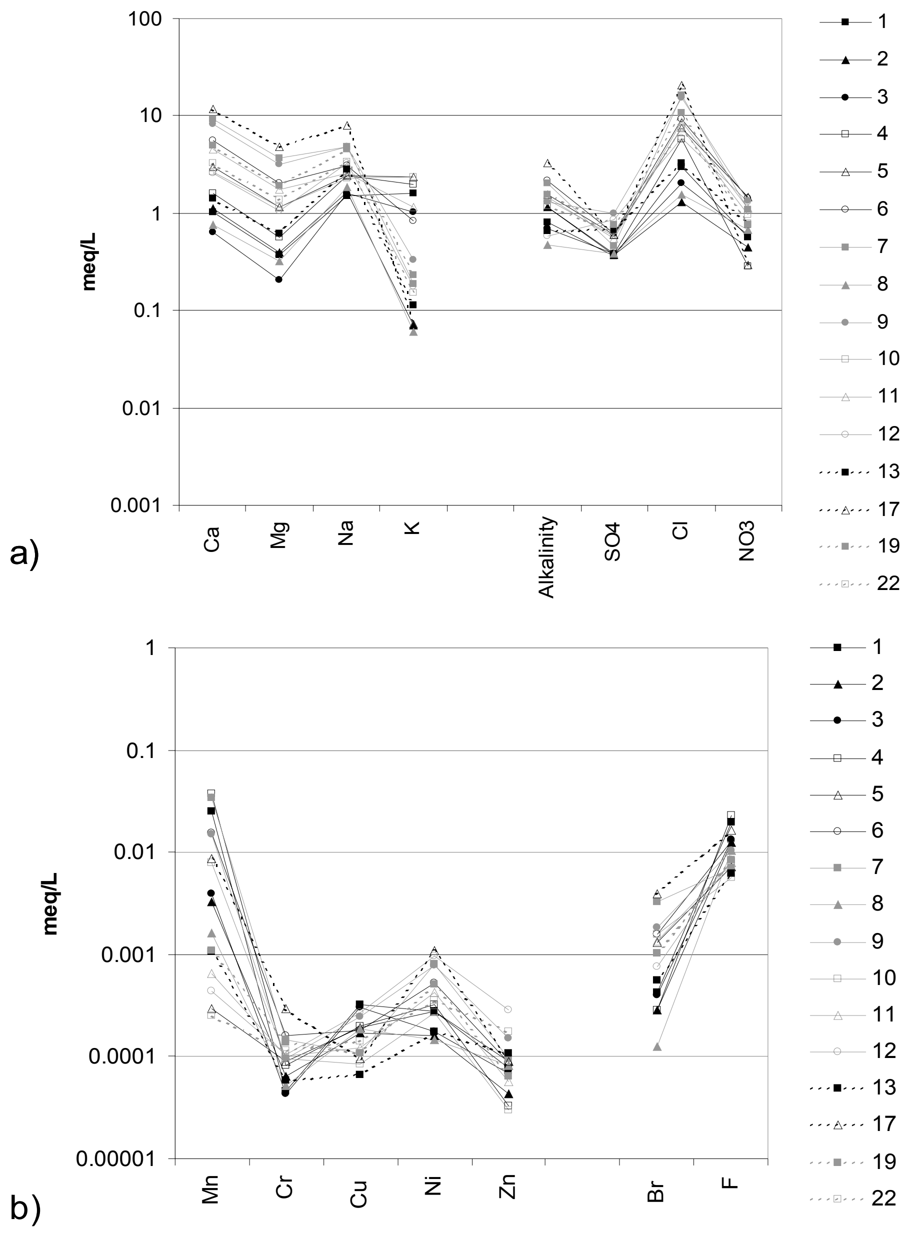


Figure 7.11a Chemical fingerprint diagrams of major (a) and trace (b) ions for 17 piezometer water samples taken April 10, 2003. See piezometer locations in Figure 7.5.

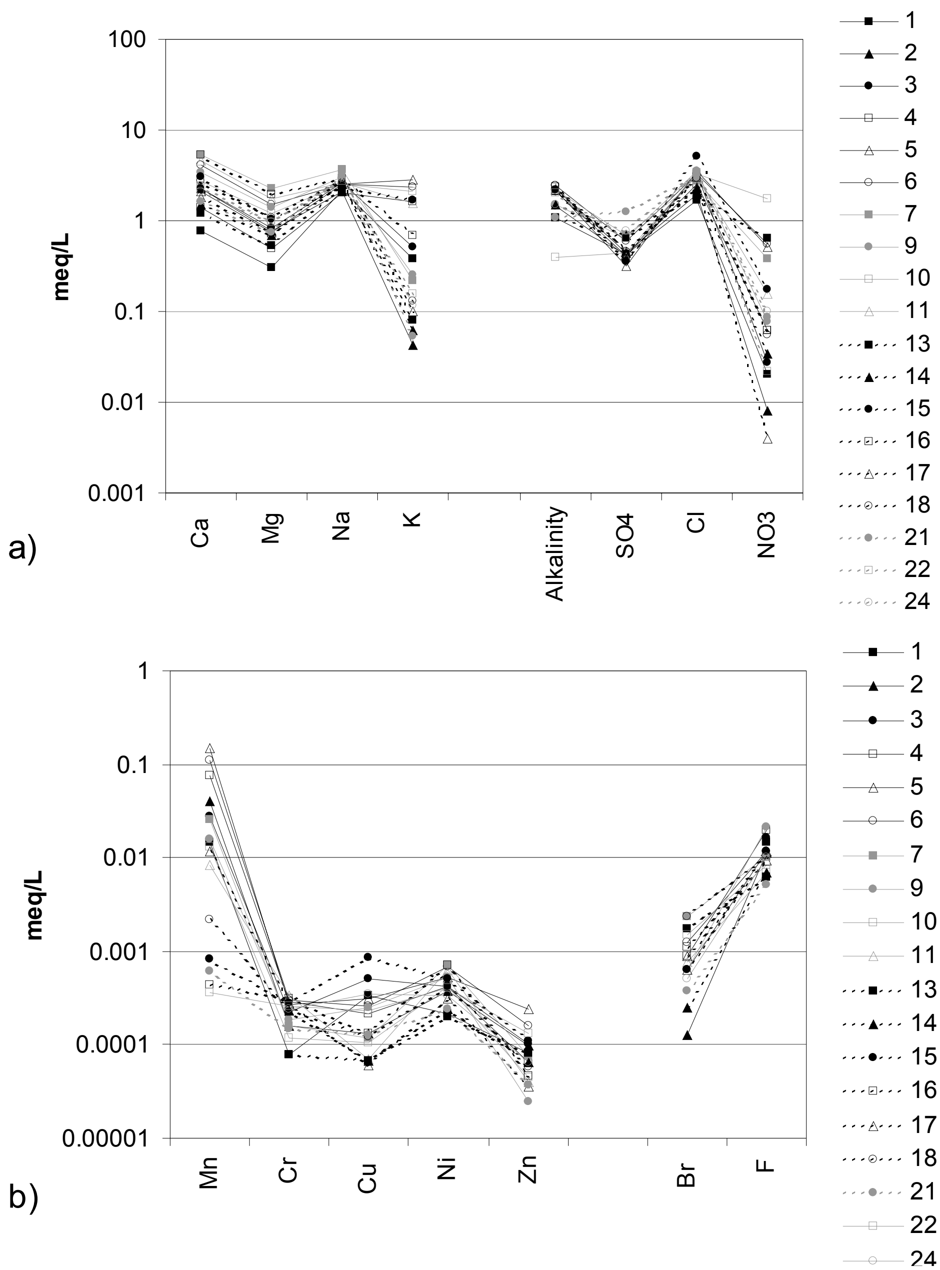


Figure 7.11b Chemical fingerprint diagrams of major (a) and trace (b) ions for 19 piezometer water samples taken May 22, 2003. See piezometer locations in Figure 7.5.

Calcium also varies along the plume flowpath. The calcium concentrations from the piezometers do not correlate with distance from the infiltration area. In both the April and May samples, there is a relatively high concentration near piezometers 16 and 17 (100-200 mg/L), while the concentration at the vent pipe is lower, approximately 80 mg/L (Figure 7.12c-d). The piezometers between the vent pipe and 16 and 17 have varying calcium concentrations.

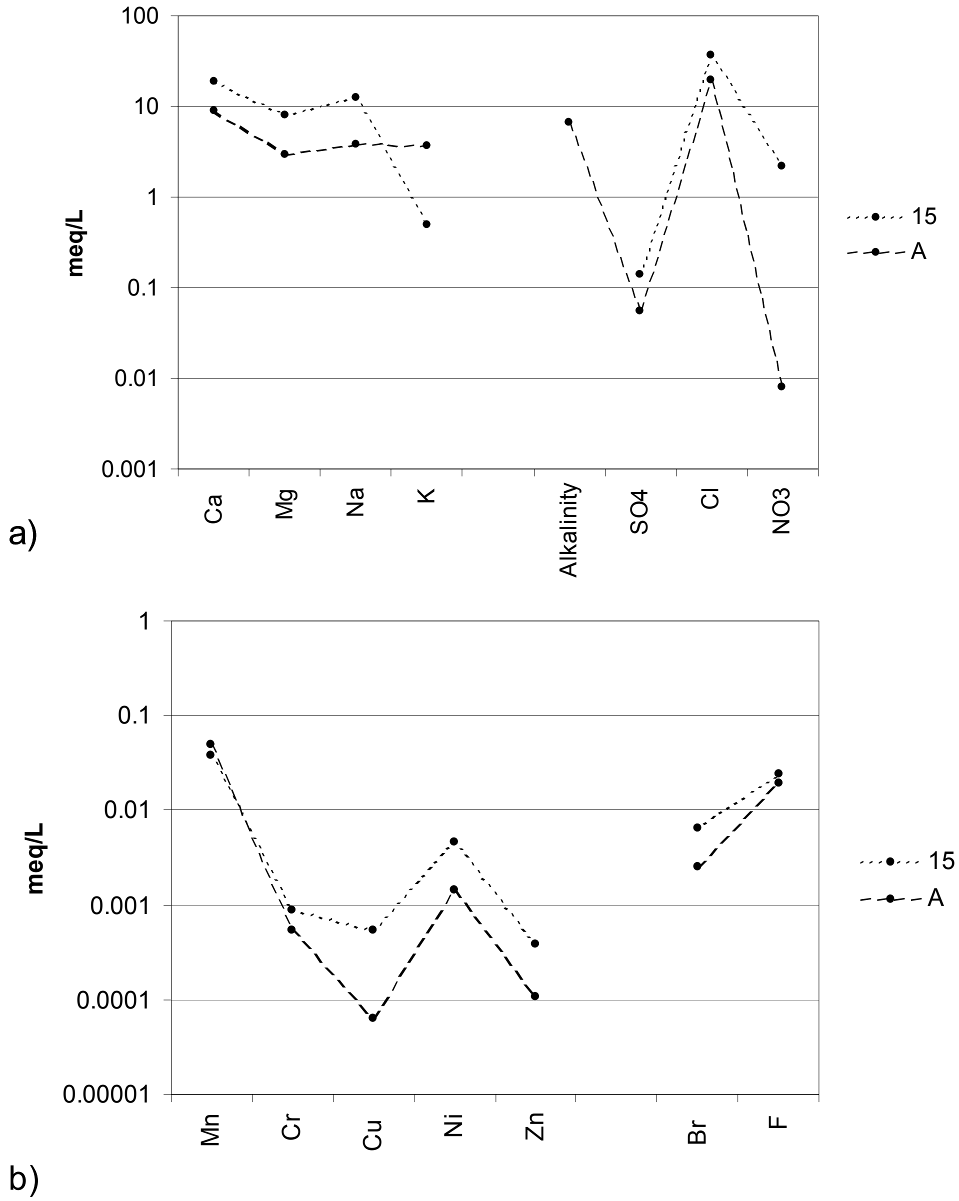


Figure 7.11c Chemical fingerprint diagrams of major (a) and trace (b) ions for 2 piezometer water samples taken Nov 2002 (15) and Sept, 2003 (A). See piezometer locations in Figure 7.5.

Chloride is considered a conservative ion: once chloride is in the regolith water, the concentration should remain constant, as long as the effluent volume is not diluted or concentrated. Similar to the chemical evolution of potassium, initial chloride concentrations decrease quickly from 1100 mg/L at the vent pipe to 100-200 mg/L at piezometer 4, 2.5

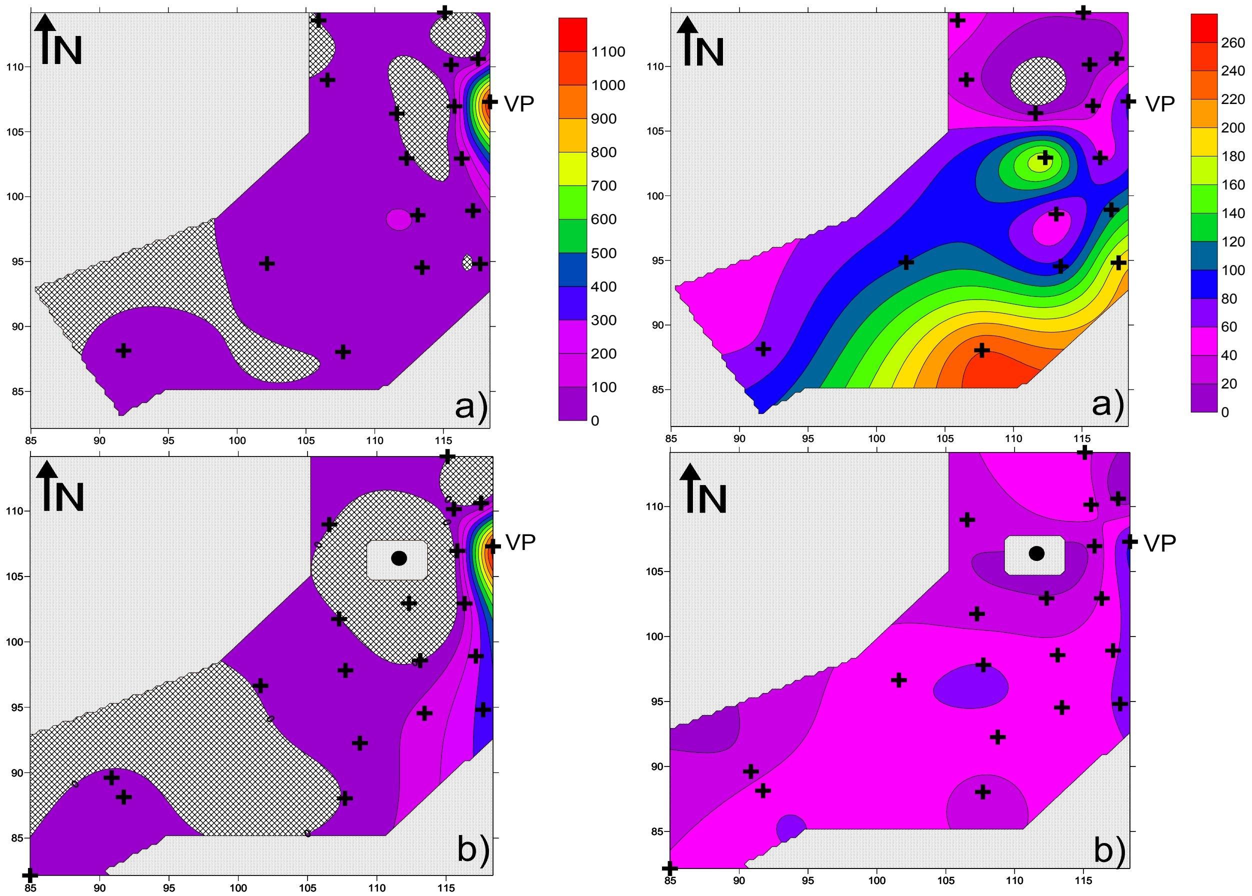


Figure 7.12 Potassium concentrations (scale bar is in mg/L) in piezometer water samples for April (a) and May (b), 2003, and Calcium concentrations (scale bar is in mg/L) in piezometer water samples for April (c) and May (d), 2003. VP is the ISDS vent pipe; the ISDS infiltration pipes lie along the eastern boundary of each map. Black crosses represent locations of sampled piezometers. Black circles represent piezometers with too little water (<6 inches) to measure. White areas have the highest potassium or calcium concentrations, black areas have the lowest potassium or calcium concentrations. Contour interval is 100 mg/L for potassium and 20 mg/L for calcium. Hatched areas have computer-contoured values of less than zero. Dotted areas represent areas where no SC data exist (no piezometers or piezometers are dry). Axes are in meters.

horizontal meters from the vent pipe, due to plant uptake or dilution. After this initial decrease in concentration, the chloride concentrations should remain relatively constant across the piezometer grid. However, chloride concentrations in the piezometers in April 2003 show a variation across the piezometer grid; concentrations range from 50 to 730 mg/L (Figure 7.13a-b). This large variation is likely due to either differences in salt concentration in the regolith water due to the flushing effect, or to differences in dilution. Chloride concentrations in May

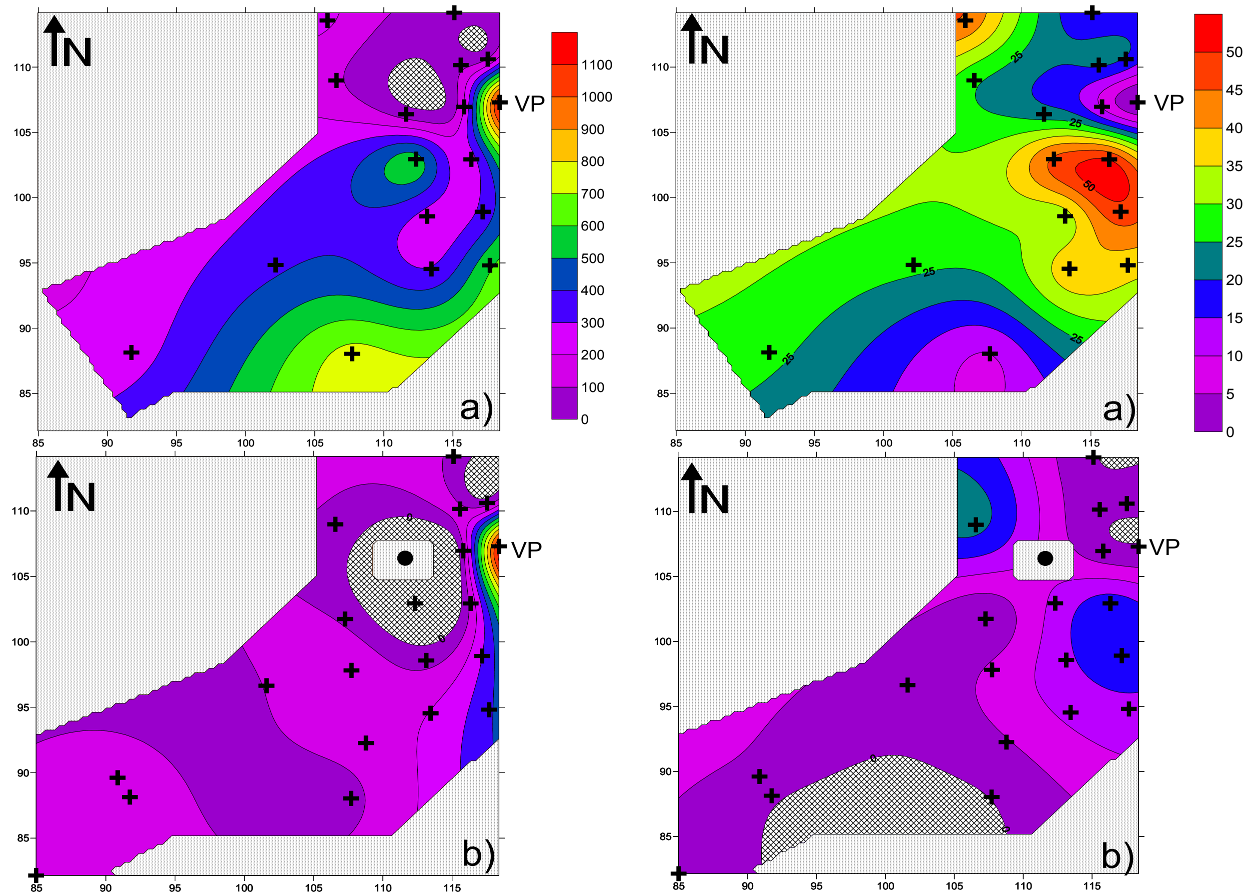


Figure 7.13 Chloride concentrations (scale bar is in mg/L) in piezometer water samples for April (a) and May (b), 2003, and Nitrate concentrations (scale bar is in mg/L) in piezometer water samples for April (c) and May (d), 2003. VP is the ISDS vent pipe; the ISDS infiltration pipes lie along the eastern boundary of each map. Black crosses represent locations of sampled piezometers. Black circles represent piezometers that have too little water (<6 inches) to measure. White areas have the highest chloride or nitrate concentrations, black areas have the lowest chloride or nitrate concentrations. Contour interval is 100 mg/L for chloride and 5 mg/L for nitrate. Hatched areas have computer-contoured values of less than zero. Dotted areas represent areas where no SC data exist (no piezometers or piezometers are dry). Axes are in meters.

behave more conservatively; the concentrations range from 60 to 180 mg/L across the piezometer grid.

Because of the chemically reducing environment present in the ISDS tank, nitrogen in the tank is present in its reduced forms. The reduced nitrogen is converted to nitrate by oxidation reactions when the nitrogen is exposed to oxygen in the regolith. Low nitrate concentrations near the vent pipe are seen in both April and May 2003 (Figure 7.13c-d). In April 2003, the overall concentrations in the piezometers are higher, averaging 30 mg/L. In May, the average concentration is 8 mg/L. The higher concentrations in April may be due to the flushing effect, dissolving nitrate salts.

Determining the chemical composition of the effluent that infiltrates the bedrock is important; this effluent is likely influencing surface and ground water chemistry. The concentrations of most chemical parameters in the piezometer water vary with distance from the vent pipe. Therefore, the chemical fingerprint of the effluent infiltrating the shallow fractured bedrock is determined by plotting the average chemical concentration of each of the eight major ions versus horizontal distance from the source for each piezometer (Figure 7.14). For these graphs, the “source” is considered to be the entire length of the ISDS infiltration pipes. Chloride is considered a conservative ion; its concentration should not change over the flowpath. Therefore, the data were normalized to concentrations of chloride (i.e. chloride concentrations were set to equal 1 meq/L) to filter out the variations. (The average value of chloride in the piezometer samples is approximately 5 meq/L.) The polynomial trend line for each parameter is shown on the graph. The distance between the piezometer and the source was calculated along a straight east-west line between the piezometer and the ISDS infiltration pipes.

In September 2003, the effluent traveled a maximum of 24 meters in the regolith before infiltrating the bedrock (Figure 7.5c). The effluent is infiltrating the fractured bedrock along the entire flowpath. The average concentration at which each constituent enters the bedrock can be estimated from the trend lines in Figure 7.14.

As discussed in detail in section 7.3.4, in June 2003 approximately 90% of the effluent infiltrated the bedrock within 5 meters from the source. Assuming a similar infiltration rate for drier times of the year, the chemistry of the majority of the infiltrating water is somewhere between that of full strength ISDS effluent and the chemistry taken from Figure 7.14 at 5 meters from the source. The effluent infiltrating at a distance of 5 meters from the source has calcium and sodium concentrations approximately equal to the concentration of chloride. Bicarbonate and potassium concentrations are 0.5 times that of chloride, and magnesium, sulfate and nitrate concentrations are 0.3, 0.15 and 0.1 times that of chloride, respectively.

Because the regolith layer has more ion sorption sites per square centimeter than bedrock, it can be assumed that flow through regolith will alter the chemical composition of ISDS effluent more than flow through bedrock. Therefore, once the effluent enters the fractured bedrock, and if the fracture flow is relatively rapid, the chemical composition may remain relatively constant, assuming the effluent is not diluted.

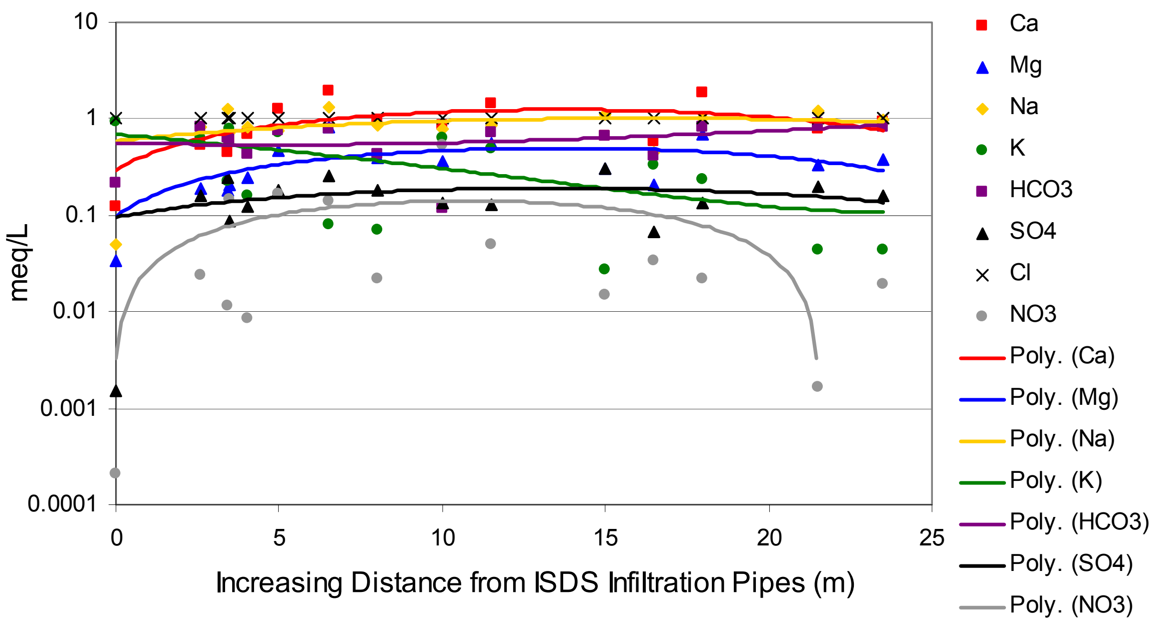


Figure 7.14 Hydrochemical evolution of ISDS effluent normalized to chloride concentrations, as a function of distance from the ISDS infiltration pipes. The polynomial trend lines for seven of the eight parameters are shown. Because chloride is a conservative ion, all data have been normalized to chloride in an attempt to filter out some of the background noise from the data. All data were taken from piezometer samples collected on May 22, 2003.

7.3 Rate of Infiltration to Regional Aquifer

To determine the rate of infiltration to the regional aquifer, a water budget was evaluated. For a defined zone within the plume, the water budget is considered as:

Input = Output

Input = Evapotranspiration

+ Lateral Flux Out of Zone Boundary

+ Vertical Infiltration to the Fractured Bedrock within Zone Boundary

7.3.1 Input

The flow meter installed on the incoming water pipe to House1 measures the total water volume pumped from the well. The meter recorded an average of 644 L (170 gallons) of water pumped per day over the period of July to October 2003. The digital dose counter installed on the dosing siphon chamber measures the number of doses, and therefore the volume of effluent that leaves the ISDS tank per day. Over the same time period measured by the flow meter, the counter recorded an average of 466 L (123 gallons) of effluent dosed per day. The volume of effluent generated is 72% of the volume of water pumped to the surface. This return is less than 90%, estimated by the Colorado Division of Water Resources (CDWR). Investigations are currently underway to evaluate this finding.

7.3.2 Evapotranspiration

Evapotranspiration (ET) was measured in four locations in the yard of House1. One location is in a dry area close to the house (site 1), and does not overly the infiltration area. The other three locations are over the infiltration area (sites 2A, 2B, and 2C) (Figure 7.15). The rates calculated at all four sites ranged from 4 mm/day (55 inches/year) to 13 mm/day (188 inches/year). The majority of the rates, however, were in the range of six to seven mm/day (Figures 7.16a-b). These chamber ET rates are similar to the rates obtained from the ET tower in the basin, operated by the US Geological Survey. The tower rates were calculated for 30-minute intervals from millions of data points taken throughout the day. The data form a bell-shaped curve with rates increasing from morning to midday and decreasing from midday to evening (Figure 7.17). The chamber data, however, do not produce a bell-shaped curve. The rates fluctuate throughout the day, but there is no apparent trend for any of the sites. Precipitation occurred prior to the two intensive days of chamber measurements, which would decrease the contrast in measurements throughout the day (Stannard, 2003). During the three days before July 24, average precipitation in TCB was 3.62 mm/day. During the three days before August 5, average precipitation was 16.06 mm/day (Colorado State University, 2003). Changes in the intensity of solar energy also affect the rates and conditions were partly cloudy on the days that chamber data were collected. Despite the changing cloud cover and humid conditions, a bell-shaped curve should be obtained (Stannard, 2003). The small number of data throughout the day may be the reason for the apparent lack of a trend. ET from the tower is reported at 30 minute intervals using an average of thousands of measurements during the period. Only five to eight data points were produced with the chamber at each location for each of the intensive-measurement days. It is possible to produce a similar distribution by selecting values from the tower data at the same times the chamber data were collected, thus producing a similar lack of a trend, so the lack of trend in the chamber data may result from too few measurements.

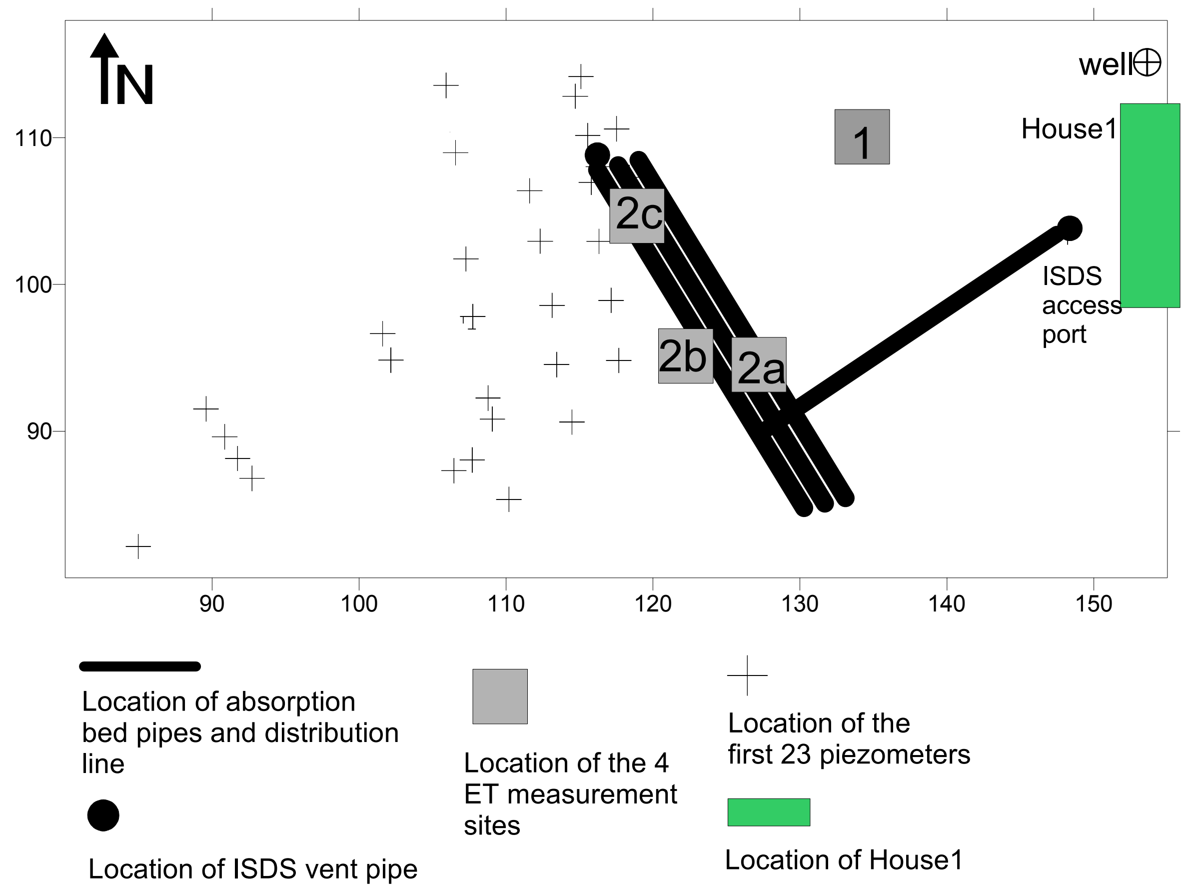


Figure 7.15 The four locations of evapotranspiration measurements. Three locations were over the ISDS infiltration area, one was not.

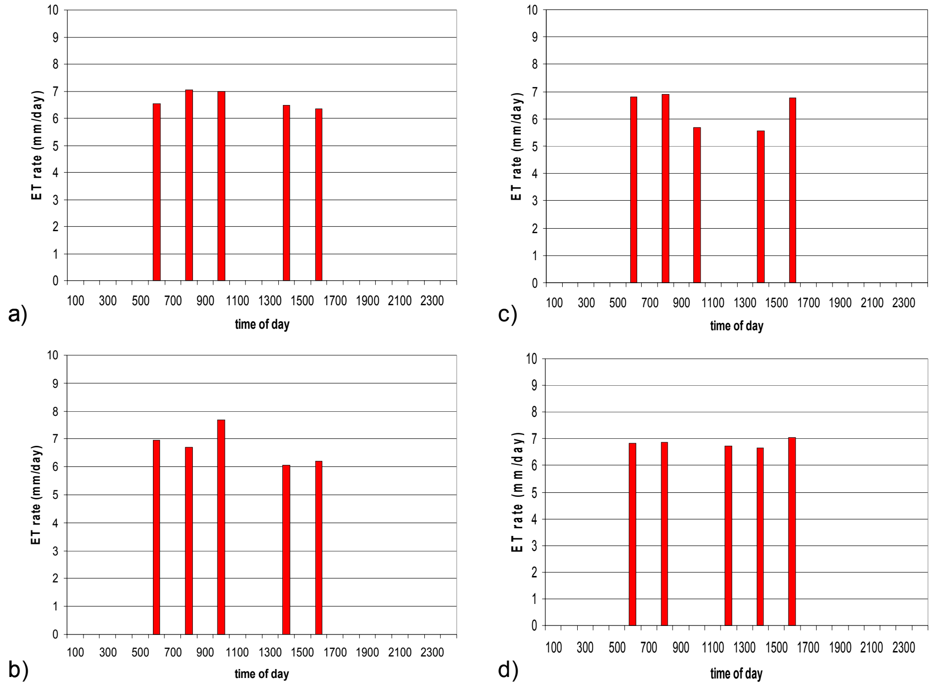


Figure 7.16a ET rates in mm/day for site 1 (a), site 2A (b), site 2B (c) and site 2C (d), calculated from ET chamber data. Date of data collection was July 24, 2003.

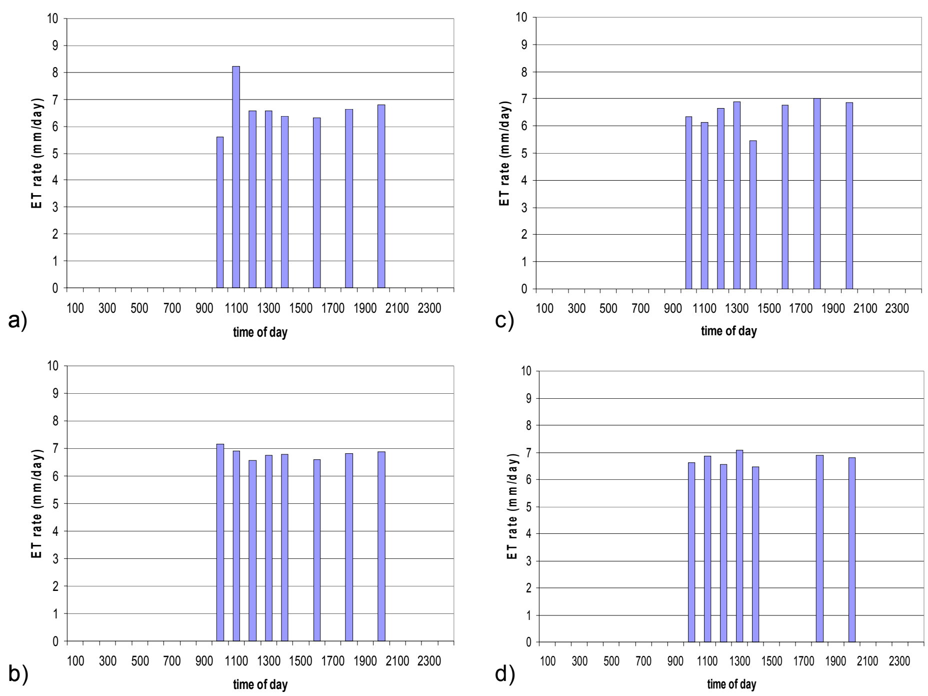


Figure 7.16b ET rates in mm/day for site 1 (a), site 2A (b), site 2B (c) and site 2C (d), calculated from ET chamber data. Date of data collection was August 5, 2003.

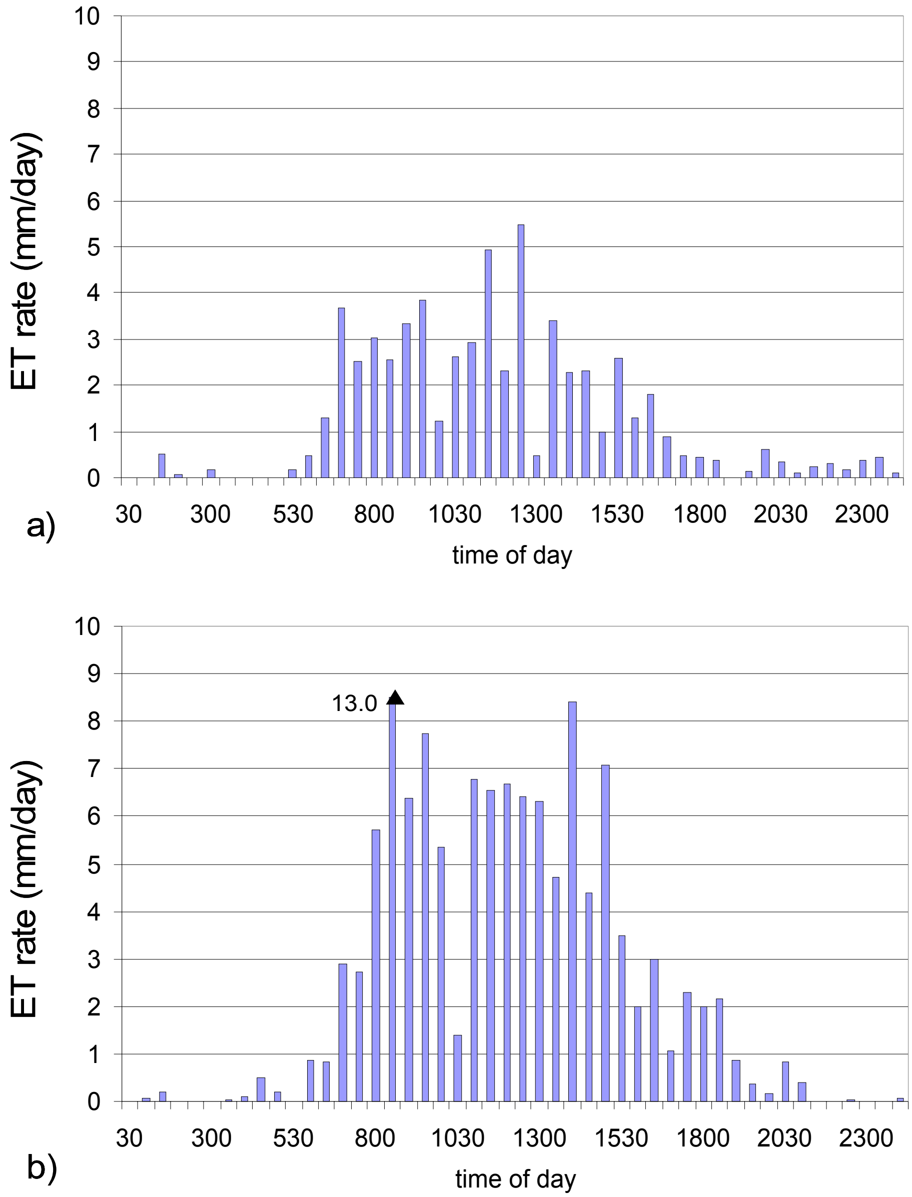


Figure 7.17 Thirty-minute average ET rates in mm/day for July 24, 2003 (a) and August 5, 2003 (b) from the USGS evapotranspiration tower located in Turkey Creek Basin. Data from Stannard (2003).

Although no data points were collected before 06:00 or after 20:00, it can be assumed that ET rates slow considerably at night due to less plant transpiration. Using an average ET rate of 6.5 mm/day for the day (06:00 to 18:00) and an average rate of 0.5 mm/day (estimated from the tower data) for the night (18:00 to 06:00), the rate for the 24-hour period would be approximately 3.5 mm/day. This rate applies only to the warm months, when the vegetation is actively transpiring water. The rate would be much lower during the cold months. For example, from March to September 2001, the tower ET data averaged approximately 2.3 mm/day. From January to February and October to December 2001, the average was approximately 0.5 mm/day (Bossong et al, 2003).

Although the data are sparse, when the data for a particular site on a particular day are averaged, sites 2A and 2C have slightly higher ET rates (6.76 and 6.79 mm/day, respectively) than site 1 (6.66 mm/day). Site 2B, however, has a lower average ET rate (6.43 mm/day) than site 1. The fact that the vegetation over the infiltration area is thicker and greener suggests the ET rate would be higher at all three locations over the infiltration area. Because the natural grass over site 2B was very long, it was cut to a height of approximately 15 cm. The natural grass over 2C was also long, but was only cut to a length of approximately 30 cm. The shorter grass, resulting in less plant surface area to transpire water, may be the cause of the lower ET rate over site 2B (Stannard, 2003).

Sites 2A and 2C have ET rates an average of 0.12 mm/day higher than site 1. Assuming 0.12 mm/day is the ET due solely to the presence of the ISDS effluent under the ground surface, and using the infiltration bed area of 89.2 m^2, the total amount of effluent lost to ET each day is approximately 11 L (3 gallons), or approximately 2.5% of the total effluent produced each day. It is probable that the increased ET rate over the infiltration area is underestimated due to the humid conditions. This effect would result in a greater amount of ISDS effluent being lost to ET. However, it is reasonable to conclude that the percentage of the total output is small.

The ET value estimated using the chamber, 11 L/day, reflects ET from grasses over the infiltration area. While no trees grow in the infiltration area, large evergreen trees ring the absorption field (Figure 3.3). The only available means of measuring ET was the chamber, so it was impossible to measure effluent lost to ET through the trees. It can be assumed, however, that the trees transpire a significant amount of the effluent along the plume flow path.

7.3.3 Lateral Flux

Lateral flux through the regolith was determined by Darcy's law:

$$Q = -K\left(\frac{dh}{dl}\right)A \qquad (7.1)$$

where Q is the lateral flux, K is hydraulic conductivity, dh/dl is the hydraulic gradient, and A is the cross-sectional area of flow. The lateral flux was estimated at six different areas of the plume (Figure 7.18). The values used for each parameter at each of the six locations are presented in Table 7.1.

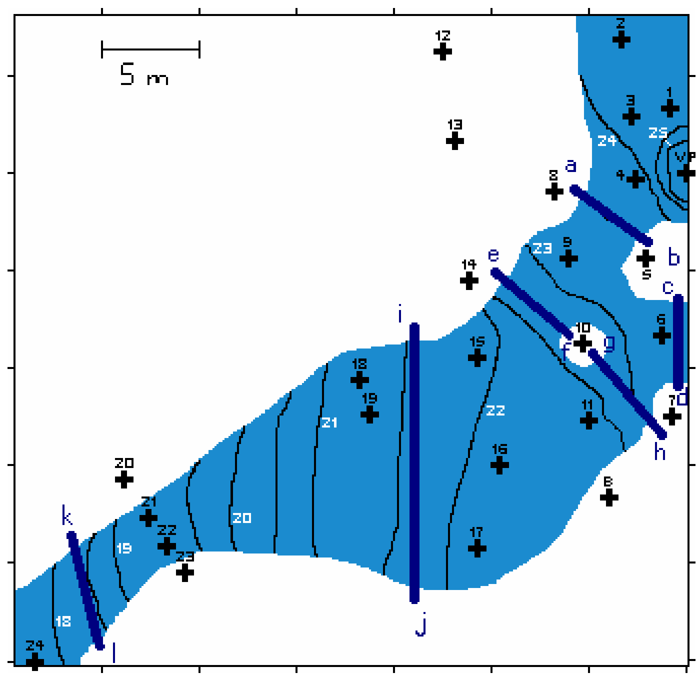


Figure 7.18 Estimated extent of the ISDS plume on June 5, 2003. The ISDS infiltration area lies to the east of the plume. The cross-sectional lines (a-b, c-d, e-f, g-h, i-j, k-l) show areas through which the lateral flow, Q, was calculated.

	Parameter				
Cross-section	Hydraulic Conductivity, K (m/s)	Hydraulic Gradient, dh/dl (m/m)	Cross-sectional Area, A (m^2)	Lateral Flux, Q (m^3/s)	Lateral Flux, Q (L/day)
a-b	$5x10^{-7}$	0.14	3.24	$2.2x10^{-7}$	19.0
c-d	$5x10^{-7}$	0.20	4.37	$4.3x10^{-7}$	36.8
e-f	$3x10^{-7}$	0.20	3.60	$1.8x10^{-7}$	15.4
g-h	$3x10^{-7}$	0.25	4.24	$2.6x10^{-7}$	22.6
i-j	$3x10^{-7}$	0.13	9.25	$2.9x10^{-7}$	24.7
k-l	$1x10^{-7}$	0.25	2.16	$6.8x10^{-8}$	5.9

Table 7.1 Values of the parameters used in the lateral and vertical flux calculations for each cross-section. Hydraulic gradient and cross-sectional area were estimated from Figure 7.18. These values are based on data collected in June 2003.

Hydraulic conductivity (K) was calculated using data from slug tests. In July 2003, five piezometers (A, B, C, D, and E) were installed specifically for slug tests: they were screened over the bottom 15 centimeters of pipe. Only two of these piezometers, one near the vent pipe (A) and one southwest of the infiltration pipes (C), collected enough water to have a measurable head value. Several falling-head slug tests were conducted in these two piezometers in July 2003. Locations of these piezometers are presented in Figure 7.19. Using the Hvorslev slug-test method, K values were calculated from the collected data. This slug-test method requires the height of the sand pack around the piezometer to be known. When the piezometers were installed, however, the height of the sand pack was not recorded. Therefore, the K values have been calculated for a range of sand pack heights. The geometric mean of the K values calculated for the plume near the vent pipe is 2.5×10^{-7} m/s. The geometric mean of the K values for the plume near piezometer 17 is 4.4×10^{-6} m/s. This higher value might be used to refute the interpretation of the mounded area resulting form a low K zone. However, the slug test evaluates a small volume of material (~a few inches beyond the hole) around the piezometer and does not necessarily reflect the large scale hydraulic conductivity. The slug test data and resulting K values are presented in Appendix C.

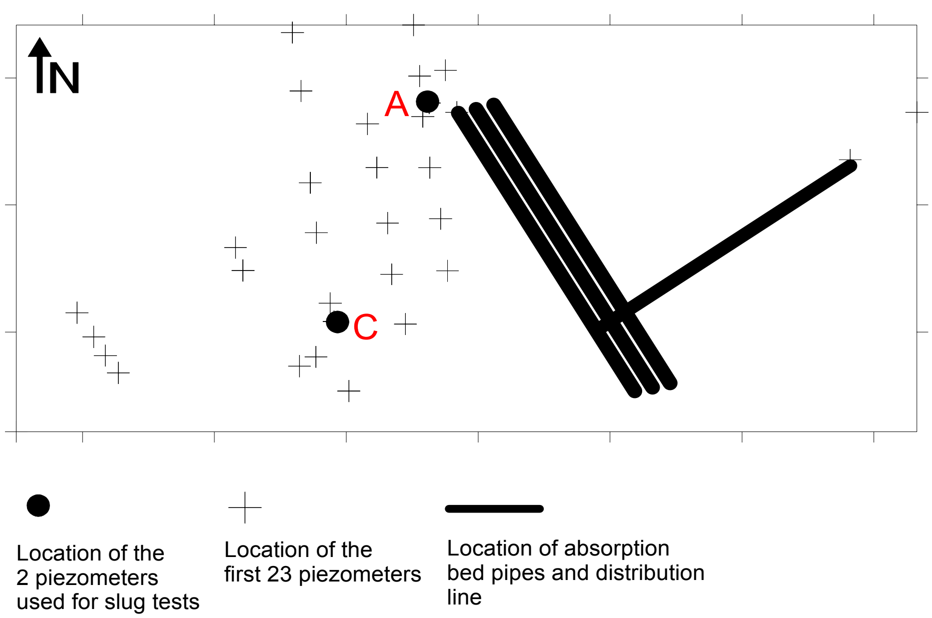


Figure 7.19 Location of the two piezometers, A and C, in which hydraulic conductivity was measured.

The hydraulic gradient for each cross-section of the plume (Figure 7.18) is estimated from the two closest water level contour lines. The hydraulic gradients are listed in Table 7.1. The area of flow for each cross-section of the plume is calculated by multiplying the estimated width of the plume by the thickness of the water table (averaged from nearby piezometers). The cross-sectional areas of flow are listed in Table 7.1.

The resulting values of lateral flux (from Equation 7.1), Q, for each cross-section of the plume in Figure 7.18 are listed in Table 7.1. Cross-sections a-b and c-d have a combined lateral flow of 55.8 L/day. Cross-sections e-f and g-h have a combined lateral flow of 38.0 L/day. Cross-sections i-j and k-l have lateral flows of 24.7 and 5.9 L/day, respectively.

7.3.4 Vertical Flux

The vertical flux is equal to the input minus the ET minus the lateral flux. In June, the input was 466 L/day. The ET rate was not measured in June, so the July ET rate (11 L/day) is used in the following vertical flux calculations. This results in an adjusted input of 455 L/day. The ET rate in June was likely slightly higher than the July rate due to increased moisture in the regolith. Because of the above-mentioned inability to measure ET lost to trees, the following vertical flux volumes represent a theoretical maximum.

The area of the plume between the source (ISDS infiltration pipes) and cross-sections a-b and c-d is approximately 54m^2 (Figure 7.18). The amount of effluent flowing laterally across these cross-sections is approximately 56 L/day, as discussed in section 7.3.3. This results in a vertical infiltration rate of 399 L/day (455 L/day – 56 L/day) per 54 m^2, or 7.4 L/m^2/day. The plume area between cross-sections a-b and c-d, and, e-f and g-h is approximately 40 m^2. The amount of effluent flowing laterally across cross-sections e-f and g-h is 38 L/day. This results in a vertical infiltration rate of 18 L/day (56 L/day – 38 L/day) per 40 m^2, or 0.45 L/m^2/day.

The plume area between cross-sections e-f and g-h, and i-j is approximately 110 m^2. The amount of effluent flowing laterally across cross-section i-j is approximately 25 L/day. This results in a vertical infiltration rate of 13 L/day (38 L/day – 25 L/day) per 110 m^2, or 0.12 L/m^2/day. The area of plume between the cross-sections i-j and k-l is approximately 110 m^2. Approximately 6 L/day of effluent flow laterally across cross-section k-l. This results in a vertical flow of 19 L/day (25 L/day – 6 L/day) per 110 m^2, or 0.17 L/m^2/day.

These calculations reveal almost 90% of the plume infiltrates vertically in the first 54m^2 of plume area in June 2003. This high infiltration rate near the ISDS infiltration is likely due in part to effluent pooling in the bowl created by the bedrock elevation low near piezometer 3. In addition, a higher hydraulic head is most likely present near the source of the plume, causing the effluent to infiltrate faster. In some cases, the effluent may migrate laterally until it encounters a large fracture in the bedrock. All or most of the effluent will seep into this fracture (Figure 7.20).

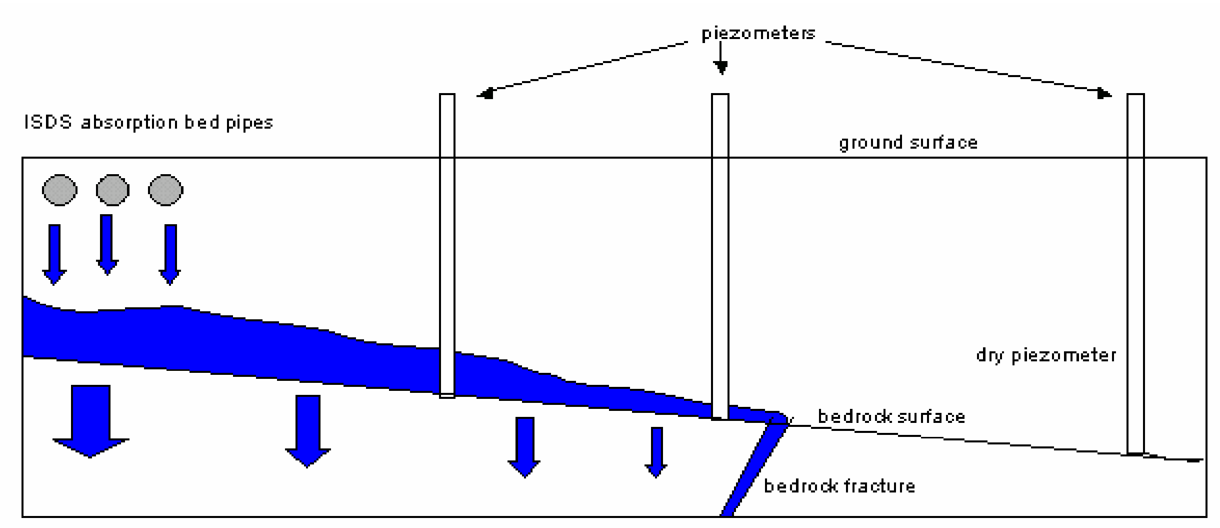


Figure 7.20 Conceptual cross-sectional view of an ISDS effluent plumes in TCB. The plume travels along the bedrock-regolith interface, slowly infiltrating the bedrock through the small fractures. It will infiltrate more rapidly near the infiltration area because the greater saturated thickness yields a higher hydraulic head. If the plume reaches a large fracture, the effluent will drain more quickly into this large fracture.

The effluent migrating vertically is not necessarily directly infiltrating the regional aquifer. This vertical flux may be infiltrating the shallow fractured bedrock layer directly below the regolith layer, and flowing laterally in the bedrock. Determining the extent of lateral fractured bedrock flow is beyond the scope of this study.

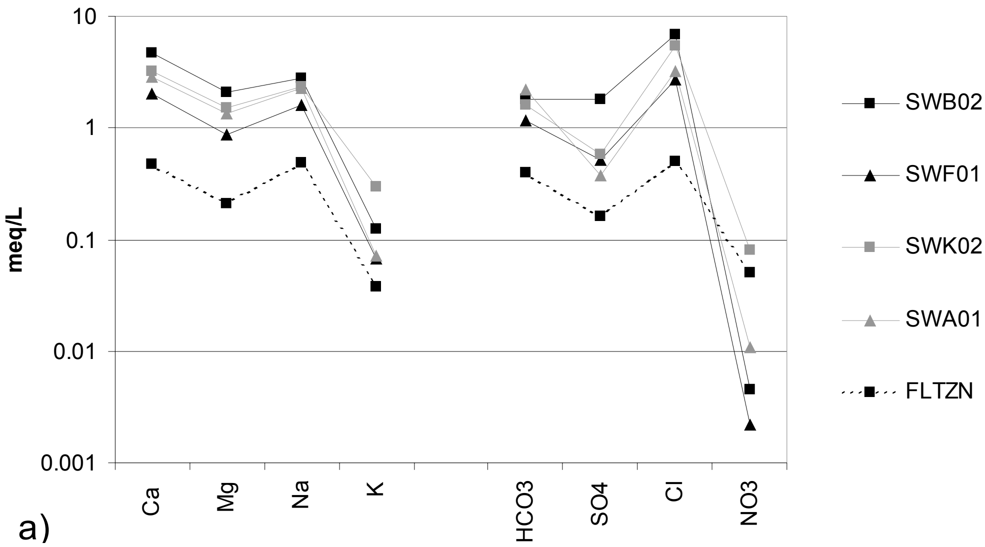
To determine the residence time of the effluent in the vadose zone of the regolith (and therefore, the amount of time the effluent is exposed to aerobic “soil treatment”), the volume of the pore space in the vadose zone must be estimated. Approximately 455 L/day leaves the ISDS pipes. The majority of the plume infiltrates into the bedrock within the first 54 m^2. Jefferson County regulations state the infiltration pipes of the ISDS must be a minimum of 1.23 m (4 ft) above the ground water level and/or the bedrock (JCBH, 1999). Assuming this minimum separation, the effluent flows through approximately 1.23 vertical meters of regolith, 0.78 m of which are unsaturated. Using an area of 54 m^2 yields a vadose zone volume of 42.1 m^3. The pore space volume is obtained by multiplying the volume of vadose zone regolith by the estimated porosity of 0.2. This results in a pore space volume of 8.424 m^3, or 8424 L. At steady state, if 455 L/day are added to the top of the unsaturated regolith near the ISDS pipes, then 455 L/day exits the unsaturated zone either by infiltrating the bedrock, or entering the saturated zone of the regolith. This results in a maximum residence time of 18.5 days in the vadose zone. This duration assumes the vadose zone is nearly saturated and effluent infiltration is uniform across the area. More than likely, these conditions are not met, resulting in shorter residence times. Preferential flow paths will also develop, causing some effluent to move through the vadose zone at more rapidly. The velocity calculated at House1 is approximately 0.042 m/day.

Tackett (2004) completed a residence time study in regolith of Jefferson County, Colorado, near Golden. The study used a bromide tracer to measure the velocities of clean water flowing through an ISDS. Lysimeters were installed at 2 ft and 4 ft below the ISDS infiltration pipes. The reported travel times of the water were 5 days to reach the 2-foot lysimeter and 14 days to reach the 4-foot lysimeter. The velocity of the water in the Tackett (2004) study was approximately 0.087 m/day.

The travel times reported by Tackett (2004) are shorter than those calculated for House1, indicating velocity was approximately a factor of two greater. Assuming the material has the same properties suggests the average vadose zone moisture content at House1 is 50%. The clean water measured by Tackett (2004) also might have a faster velocity due to the low TDS and biological activity in the clean water. Chemical precipitation and biological material accumulate under most ISDS infiltration areas, slowing vertical effluent infiltration.

7.4 Basin Surface Water Chemistry

The basin surface water chemistry is variable (Figure 7.21). TDS values are lower in the head waters. Average TDS values at sampling stations CGRAN and FLTZN near the head of North Turkey Creek stream are 51 and 78 mg/L, respectively. The average TDS value in the mid-basin is 277 mg/L on North Turkey Creek at sampling station SWF01 and 518 mg/L at station SWB02 on South Turkey Creek, which is more impacted by road salting from highway 285 and sewage treatment effluent, as well as flow through bedrock along regional flow paths. The average TDS value at the mouth of the basin (sampling station SWA01), 311 mg/L, reflects the mix of North and South Turkey Creek waters. Increasing TDS along the stream is likely a combination of increased concentration of constituents in surface runoff in lower, more developed, portions of the basin and higher TDS of groundwater entering the stream at lower elevations where ground water from longer flow paths discharges to the stream. Long flow paths generally have higher TDS, because there is more time for water-rock interaction. The average TDS of ground water in the basin is 245 mg/L (Bossong et al, 2003). The average TDS value



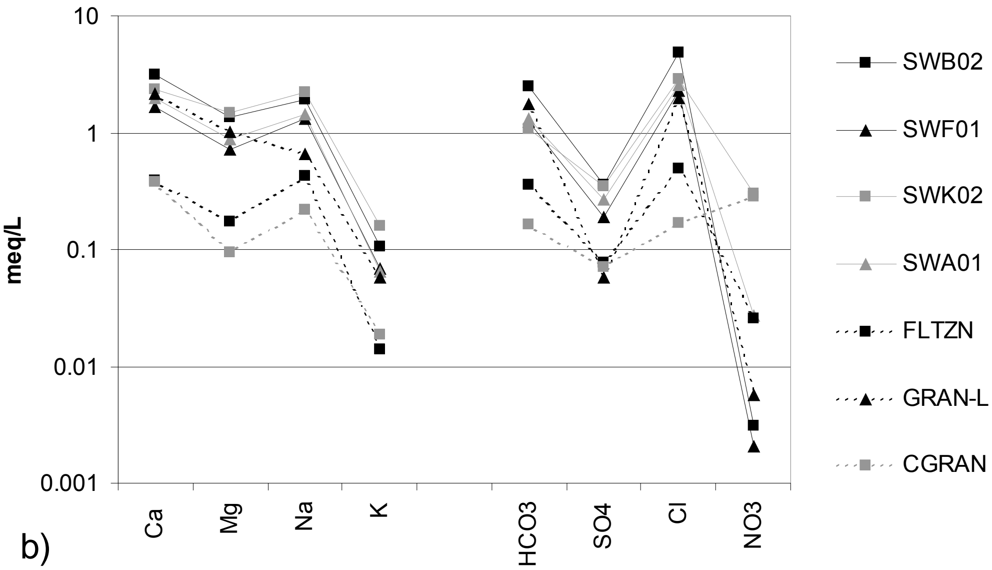


Figure 7.21 Chemical fingerprint of major ions in surface water samples for spring runoff (a) and baseflow (b) conditions. Sample locations GRAN-L and CGRAN were not sampled during baseflow conditions because they were dry. Refer to figure 6.3 for sample locations within the basin.

for the houses in this study is 318 mg/L. This average is slightly above the Bossong et al (2003) value, likely due to the use of water-softening systems in two of the four houses; the average TDS in the two houses that do not use water-softening systems is 245 mg/L. Because the TDS in the stream water is higher than the TDS in the ground water, there must be additional sources of ions contributing to the increased TDS in the surface water.

7.5 Chemical Effects of ISDS Effluent on Basin's Waters

Based on the comparison of the chemical fingerprints of ISDS effluent and the anthropogenic component identified by Thyne, et al. (2004), ISDS effluent is likely present in the affected ground water. The anthropogenic component is high in total nitrogen, chloride and sulfate, and has a lower pH. The chemical fingerprint of the piezometer water that infiltrates 5 meters from the source (for discussion, see section 7.2) is high in total nitrogen and chloride, with a lower pH, and matches the fingerprint of the anthropogenic component (Figure 7.22).

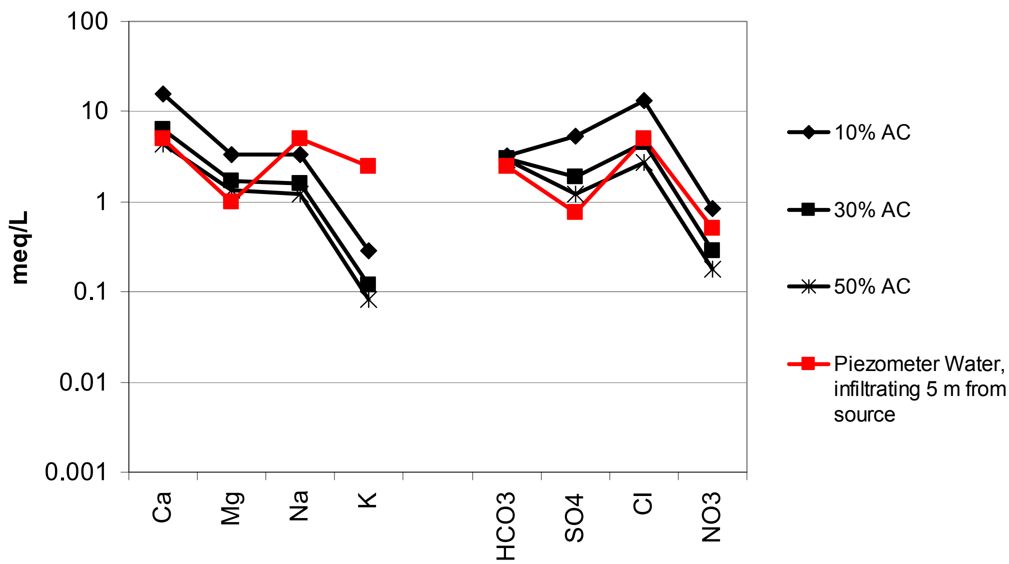


Figure 7.22 Chemical fingerprint of major ions in the anthropogenic component (AC) identified by Thyne, et al. (2004) and the ISDS effluent. The black lines show the AC at different dilutions (10, 30, 50%) with unaffected ground water (GW) to form the affected ground water (see Figure 2.1). The grey line is the chemical fingerprint of infiltrating ISDS effluent after flowing through 5 meters of regolith. The effluent has a low nitrate concentration due to the nitrogen being present in a reduced form. The piezometer effluent most closely matches the chemistry of the 30% AC, 70% GW ratio.

The chemical fingerprints of the stream water chemistry show calcium, sodium, chloride and bicarbonate to be the most abundant ions in the waters near the mouth of the basin (Figure 7.21). In the piezometer water that vertically infiltrates the bedrock 5 meters from the source, the most abundant ions match those of the stream water: calcium, sodium, chloride and bicarbonate. The fingerprint of this piezometer water that infiltrates the bedrock is plotted with the fingerprints of the stream water in Figure 7.23. The fingerprint of the piezometer water in the bedrock matches the fingerprints of the stream water samples taken at locations closer to the mouth of the basin more closely than those at the head waters. However, further investigation is needed to confirm the presence of ISDS effluent in the basin's stream waters.

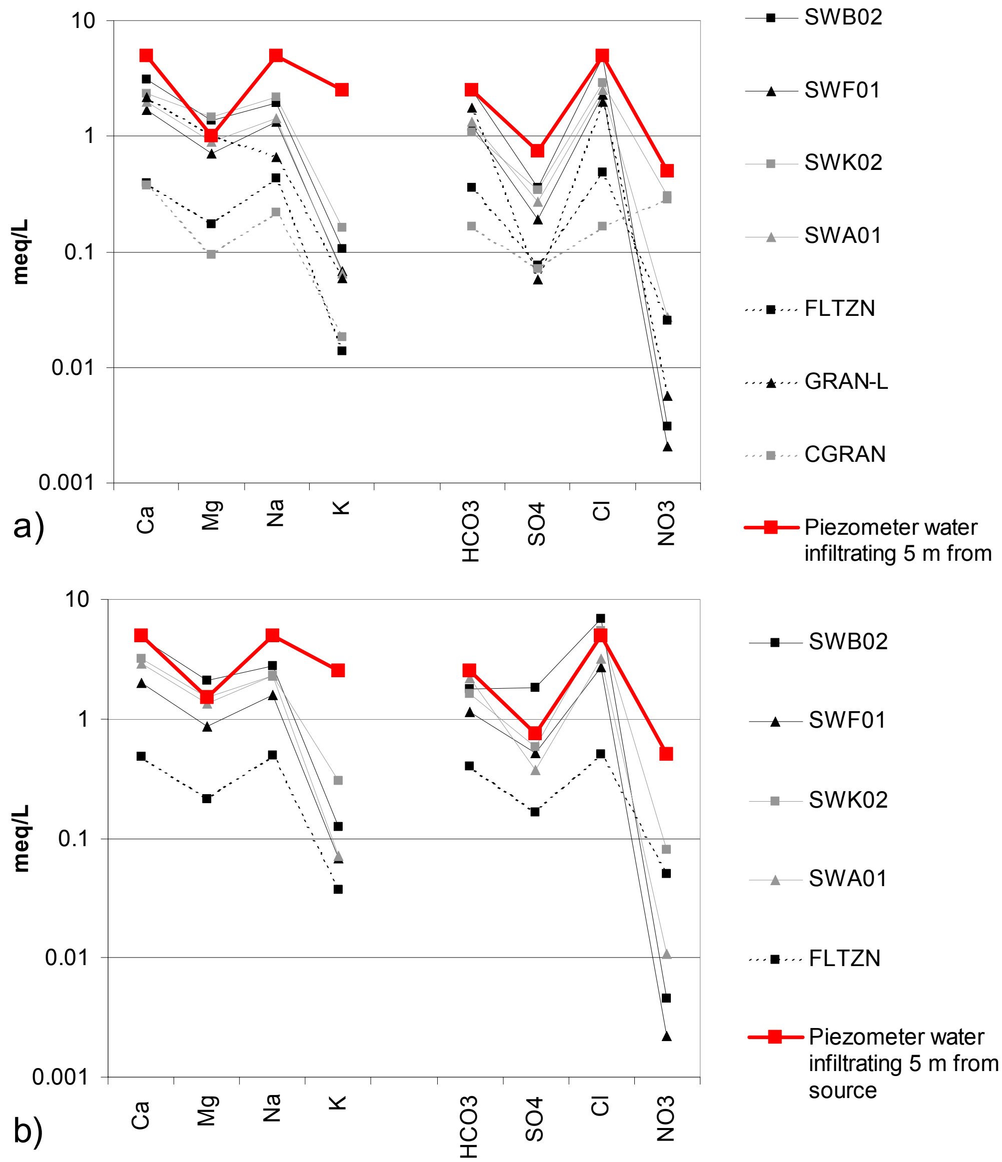


Figure 7.23 Chemical fingerprint of major ions in surface water samples during spring runoff (a) and baseflow (b) conditions, and ISDS effluent. Sample locations GRAN-L and CGRAN were not sampled during baseflow conditions because they were dry. Refer to figure 6.3 for location map. The “ISDS effluent—infiltration 5 m from source” fingerprint shows the chemistry of the effluent when it infiltrates the shallow fractured bedrock.

There are other possible sources for the increased TDS in streams, such as construction, road salt, and fertilizers. Separating the affects of these sources on stream water chemistry is beyond the scope of this project.

CHAPTER 8
SUMMARY, CONCLUSIONS AND FUTURE WORK

8.1 Summary of Project Activities

Surface and ground water quality in the Turkey Creek Basin of Jefferson County, Colorado, have degraded over the past 30 years. Previous studies have identified the source of the increase in total dissolved solids (TDS) as being anthropogenic. This study investigates the fate of effluent from septic systems, or individual sewage disposal systems (ISDSs), and its potential as a source for the increased TDS.

The effluent plume from an ISDS in the Turkey Creek Basin was first located using surface geophysical techniques. A grid of piezometers was installed in the regolith layer to further define and sample the plume. Water volume pumped into the home and discharged to the septic tank was measured. Evapotranspiration was measured in the yard and over the infiltration area. Slug tests were conducted to estimate the hydraulic conductivity of the regolith. A water budget confirmed a reasonable accounting of all the discharged water.

The ISDS effluent and plume were chemically characterized and compared to the fingerprints of ground and surface water samples collected in the basin.

8.2 Conclusions

The ISDS plume flows downward and laterally in the regolith away from the ISDS infiltration area before infiltrating the fractured bedrock. During average precipitation years, the effluent does not flow all the way to North Turkey Creek (approximately 0.5 kilometers to the south) via the regolith before infiltrating into the shallow fractured bedrock several meters down-gradient from the infiltration area. In April and May of 2003, following a period of unusually high spring precipitation, the plume migrated 50 to 100 meters before infiltrating the fractured bedrock. September 2003 is expected to represent typical conditions. At this time the ISDS plume from House1 flowed laterally in the regolith and infiltrated the fractured bedrock within approximately 5 meters of the infiltration area.

The effluent fingerprint matches the fingerprint of an anthropogenic component affecting the ground water, identified by Thyne, et al. (2004). The effluent fingerprint is also similar to fingerprints of stream water near the mouth of the basin suggesting ISDS effluent is also contributing to surface water chemistry.

In years of high precipitation, ISDS plumes will travel further along the regolith/bedrock interface before infiltrating the fractured bedrock. In settings where the ISDS infiltration area is near surface water (the minimum distance required by county regulation is 15.2 meters) effluent from the plume could travel directly to the surface water with relatively high concentrations of chloride and nitrate (as NO_3) as noted in the investigated plume. These contributions may be diluted by elevated runoff resulting from the increased precipitation.

8.3 Future Work

Investigations of ISDS plumes at additional sites would delineate variability. Sites closer to surface water would provide better definition of the impact of ISDS effluent on stream and ground water. Stable isotope investigations of ISDS effluent, surface and ground water may provide additional evidence of effluent-influenced surface and ground water chemistry.

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APPENDIX A
GEOPHYSICAL DATA

Table A.1
Electromagnetic Survey 1
May 2002

X (m)	Y (m)	Z (Ω-1m-1)	X (m)	Y (m)	Z (Ω-1m-1)	X (m)	Y (m)	Z (Ω-1m-1)	X (m)	Y (m)	Z (Ω-1m-1
21.34	25.64	7.30	18.29	6.10	7.30	15.24	9.91	7.50	12.19	21.34	7.40
21.34	26.88	7.20	18.29	6.86	7.30	15.24	9.14	7.43	12.19	21.85	7.10
21.34	26.12	7.10	18.29	7.62	7.23	15.24	8.38	7.60	12.19	22.36	7.20
21.34	25.31	7.20	18.29	8.38	7.30	15.24	7.62	7.80	12.19	22.88	7.20
21.34	24.38	7.30	18.29	9.14	7.25	15.24	6.86	7.90	12.19	23.39	7.50
21.34	23.62	7.20	18.29	9.91	7.10	15.24	6.10	7.85	12.19	23.90	7.80
21.34	22.86	7.10	18.29	10.67	7.00	15.24	5.49	7.88	12.19	24.42	8.15
21.34	22.10	6.90	18.29	11.43	6.80	15.24	4.88	7.80	12.19	24.93	8.50
21.34	21.34	6.63	18.29	12.19	6.60	15.24	4.27	7.80	12.19	25.44	8.40
21.34	20.57	6.30	18.29	12.95	6.30	15.24	3.66	7.70	9.14	25.30	8.30
21.34	19.81	6.10	18.29	13.72	6.20	15.24	3.05	7.78	9.14	24.67	8.20
21.34	19.05	5.70	18.29	14.48	6.20	15.24	2.29	7.90	9.14	24.03	8.20
21.34	18.29	5.63	18.29	15.24	6.20	15.24	1.52	7.80	9.14	23.39	8.30
21.34	17.53	5.75	18.29	15.85	6.30	15.24	0.76	7.60	9.14	22.75	8.10
21.34	16.76	5.90	18.29	16.46	6.55	15.24	0.00	7.50	9.14	22.12	8.03
21.34	16.00	6.10	18.29	17.07	6.60	15.24	-0.71	7.50	9.14	21.48	8.10
21.34	15.24	6.10	18.29	17.68	6.70	15.24	-1.41	7.60	9.14	20.84	8.20
21.34	14.48	6.20	18.29	18.29	6.90	15.24	-2.12	7.60	9.14	20.20	8.23
21.34	13.72	6.30	18.29	19.05	6.80	12.19	-1.84	7.10	9.14	19.56	8.10
21.34	12.95	5.80	18.29	19.81	6.60	12.19	-1.23	7.20	9.14	18.93	8.00
21.34	12.19	5.60	18.29	20.57	6.50	12.19	-0.61	7.35	9.14	18.29	8.03
21.34	11.18	5.90	18.29	21.34	6.60	12.19	0.00	7.40	9.14	17.53	8.10
21.34	10.16	6.00	18.29	21.95	6.90	12.19	0.76	7.60	9.14	16.76	8.10
21.34	9.14	6.00	18.29	22.56	7.10	12.19	1.52	7.90	9.14	16.00	8.00
21.34	8.53	5.93	18.29	23.16	7.48	12.19	2.29	8.20	9.14	15.24	7.90
21.34	7.92	5.80	18.29	23.77	7.60	12.19	3.05	8.60	9.14	14.48	8.00
21.34	7.31	5.80	18.29	24.38	7.80	12.19	3.81	8.80	9.14	13.72	8.10
21.34	6.71	5.80	15.24	26.64	7.30	12.19	4.57	9.13	9.14	12.95	8.20
21.34	6.10	5.70	15.24	26.07	7.20	12.19	5.33	9.50	9.14	12.19	8.20
21.34	5.33	5.80	15.24	25.51	7.00	12.19	6.10	9.78	9.14	11.43	8.30
21.34	4.57	5.90	15.24	24.95	7.20	12.19	6.86	9.80	9.14	10.67	8.30
21.34	3.81	6.00	15.24	24.38	7.40	12.19	7.62	9.63	9.14	9.91	8.30
21.34	3.05	6.05	15.24	23.62	7.40	12.19	8.38	9.30	9.14	9.14	8.50
21.34	2.29	6.00	15.24	22.86	7.40	12.19	9.14	9.00	9.14	8.38	8.90
21.34	1.52	5.78	15.24	22.10	7.23	12.19	9.91	8.70	9.14	7.62	9.50
21.34	0.76	5.50	15.24	21.34	7.00	12.19	10.67	8.50	9.14	6.86	9.50
21.34	0.00	5.30	15.24	20.57	6.60	12.19	11.43	8.30	9.14	6.10	9.20
21.34	-0.73	5.18	15.24	19.81	6.30	12.19	12.19	8.20	9.14	5.33	8.45
21.34	-1.46	5.00	15.24	19.05	6.40	12.19	12.80	8.20	9.14	4.57	7.70
18.29	-1.89	7.20	15.24	18.29	6.70	12.19	13.41	8.30	9.14	3.81	7.00
18.29	-1.26	7.30	15.24	17.53	7.10	12.19	14.02	8.45	9.14	3.05	6.60
18.29	-0.63	7.30	15.24	16.76	7.60	12.19	14.63	8.68	9.14	2.44	6.38
18.29	0.00	7.10	15.24	16.00	7.60	12.19	15.24	8.80	9.14	1.83	6.30
18.29	0.61	6.90	15.24	15.24	7.60	12.19	16.00	8.90	9.14	1.22	6.38
18.29	1.22	6.80	15.24	14.48	7.40	12.19	16.76	9.00	9.14	0.61	6.45
18.29	1.83	6.70	15.24	13.72	7.20	12.19	17.53	9.20	9.14	0.00	6.70
18.29	3.05	6.70	15.24	12.95	7.05	12.19	18.29	9.40	9.14	-1.06	6.60
18.29	3.81	6.90	15.24	12.19	7.10	12.19	19.05	9.10	6.10	-1.52	4.93
18.29	4.57	7.20	15.24	11.43	7.20	12.19	19.81	8.60	6.10	-1.01	5.00
18.29	5.33	7.40	15.24	10.67	7.40	12.19	20.57	8.00	6.10	-0.51	5.10

Table A.1 (cont)
Electromagnetic Survey 1
May 2002

X (m)	Y (m)	Z (Ω-1m-1)	X (m)	Y (m)	Z (Ω-1m-1)	X (m)	Y (m)	Z (Ω-1m-1)
6.10	0.00	5.20	3.05	20.73	9.70	0.00	9.14	7.90
6.10	0.61	5.33	3.05	20.12	9.60	0.00	9.91	7.78
6.10	1.22	5.50	3.05	19.51	9.40	0.00	10.67	7.63
6.10	1.83	5.70	3.05	18.90	9.38	0.00	11.43	7.83
6.10	2.44	5.78	3.05	18.29	9.60	0.00	12.19	8.30
6.10	3.05	5.90	3.05	17.68	10.00	0.00	12.95	8.90
6.10	3.81	6.10	3.05	17.07	10.10	0.00	13.72	9.50
6.10	4.57	6.30	3.05	16.46	10.20	0.00	14.48	10.20
6.10	5.33	6.75	3.05	15.85	10.30	0.00	15.24	10.60
6.10	6.10	7.48	3.05	15.24	10.00	0.00	15.85	10.80
6.10	7.11	7.90	3.05	14.48	9.63	0.00	16.46	10.83
6.10	8.13	8.50	3.05	13.72	9.40	0.00	17.07	11.05
6.10	9.14	8.90	3.05	12.95	9.00	0.00	17.68	11.50
6.10	9.75	9.30	3.05	12.19	8.50	0.00	18.29	11.80
6.10	10.36	9.50	3.05	11.58	7.80	0.00	18.90	12.10
6.10	10.97	9.33	3.05	10.97	7.18	0.00	19.51	12.38
6.10	11.58	8.80	3.05	10.36	6.75	0.00	20.12	12.60
6.10	12.19	8.40	3.05	9.75	6.50	0.00	20.73	12.90
6.10	12.80	8.30	3.05	9.14	6.60	0.00	21.34	13.50
6.10	13.41	8.30	3.05	8.38	6.80	0.00	22.10	14.48
6.10	14.02	8.60	3.05	7.62	6.90	0.00	22.86	15.40
6.10	14.63	8.90	3.05	6.86	7.10	0.00	23.62	16.70
6.10	15.24	8.90	3.05	6.10	7.30	0.00	24.38	17.70
6.10	15.85	8.38	3.05	5.33	7.40	0.00	25.44	18.80
6.10	16.46	8.30	3.05	4.57	7.00			
6.10	17.07	8.20	3.05	3.81	6.65			
6.10	17.68	8.40	3.05	3.05	6.20			
6.10	18.29	8.50	3.05	2.44	5.90			
6.10	19.05	8.60	3.05	1.83	5.50			
6.10	19.81	8.60	3.05	1.22	5.00			
6.10	20.57	8.63	3.05	0.61	4.90			
6.10	21.34	9.00	3.05	0.00	4.80			
6.10	21.77	9.20	3.05	-0.53	4.70			
6.10	22.21	9.40	3.05	-1.06	4.70			
6.10	22.64	9.60	0.00	-1.38	4.90			
6.10	23.08	9.80	0.00	-0.69	4.90			
6.10	23.51	9.93	0.00	0.00	4.90			
6.10	23.95	10.10	0.00	0.61	5.10			
6.10	24.38	10.20	0.00	1.22	5.30			
6.10	24.59	10.15	0.00	1.83	5.50			
6.10	24.81	10.40	0.00	2.44	5.70			
6.10	25.02	10.60	0.00	3.05	5.90			
6.10	25.23	12.30	0.00	3.81	6.23			
6.10	25.44	12.20	0.00	4.57	6.60			
3.05	25.24	12.20	0.00	5.33	6.90			
3.05	24.46	11.98	0.00	6.10	7.20			
3.05	23.68	11.40	0.00	6.70	7.60			
3.05	22.90	10.70	0.00	7.31	7.90			
3.05	22.12	10.10	0.00	7.92	8.18			
3.05	21.34	9.80	0.00	8.53	8.10			

Table A2
Direct Current Survey 1
Dipole-Dipole, west to east
July 2002

Xa	Xb	Xm	Xn	pot
0	2	6	4	3.907
0	2	8	6	1.324
0	2	10	8	1.245
0	2	12	10	0.351
0	2	14	12	0.041
0	2	16	14	0.031
2	4	8	6	5.048
2	4	10	8	3.234
2	4	12	10	0.854
2	4	14	12	0.143
2	4	16	14	0.105
2	4	18	16	0.085
4	6	10	8	5.550
4	6	12	10	0.883
4	6	14	12	0.100
4	6	16	14	0.060
4	6	18	16	0.040
4	6	20	18	0.043
6	8	12	10	9.308
6	8	14	12	0.498
6	8	16	14	0.212
6	8	18	16	0.116
6	8	20	18	0.105
6	8	22	20	0.089
8	10	14	12	2.277
8	10	16	14	0.695
8	10	18	16	0.336
8	10	20	18	0.266
8	10	22	20	0.211
8	10	24	22	0.126
10	12	16	14	1.216
10	12	18	16	0.431
10	12	20	18	0.316
10	12	22	20	0.253
10	12	24	22	0.184
10	12	26	24	0.148
12	14	18	16	3.050
12	14	20	18	0.885
12	14	22	20	0.239
12	14	24	22	0.089
12	14	26	24	0.038
12	14	28	26	0.024
14	16	20	18	3.711
14	16	22	20	0.734
14	16	24	22	0.220
14	16	26	24	0.086
14	16	28	26	0.050
16	18	22	20	2.831
16	18	24	22	0.633
16	18	26	24	0.248
16	18	28	26	0.161
18	20	24	22	3.808
18	20	26	24	0.924
18	20	28	26	0.430
20	22	26	24	3.342
20	22	28	26	1.081
22	24	28	26	2.712

Direct Current Survey 2
Dipole-Dipole, west to east
July 2002

Xa	Xb	Xm	Xn	pot
0	2	6	4	0.972
0	2	8	6	0.340
0	2	10	8	0.031
0	2	12	10	0.100
0	2	14	12	0.085
0	2	16	14	0.045
2	4	8	6	2.592
2	4	10	8	0.907
2	4	12	10	0.246
2	4	14	12	0.214
2	4	16	14	0.165
2	4	18	16	0.129
4	6	10	8	4.344
4	6	12	10	0.159
4	6	14	12	0.077
4	6	16	14	0.018
4	6	18	16	0.029
4	6	20	18	0.004
6	8	12	10	0.974
6	8	14	12	0.289
6	8	16	14	0.134
6	8	18	16	0.043
6	8	20	18	0.020
6	8	22	20	0.017
8	10	14	12	3.192
8	10	16	14	0.953
8	10	18	16	0.334
8	10	20	18	0.125
8	10	22	20	0.110
8	10	24	22	0.089
10	12	16	14	4.784
10	12	18	16	0.964
10	12	20	18	0.251
10	12	22	20	0.154

Table A2 (cont)
Direct Current Survey 2 (cont)
Dipole-Dipole, west to east
July 2002

Xa	Xb	Xm	Xn	pot
10	12	24	22	0.097
10	12	26	24	0.074
12	14	18	16	5.220
12	14	20	18	0.807
12	14	22	20	0.390
12	14	24	22	0.203
12	14	26	24	0.143
12	14	28	26	0.053
14	16	20	18	3.552
14	16	22	20	0.961
14	16	24	22	0.424
14	16	26	24	0.292
14	16	28	26	0.142
16	18	22	20	4.444
16	18	24	22	0.854
16	18	26	24	0.453
16	18	28	26	0.248
18	20	24	22	3.232
18	20	26	24	0.860
18	20	28	26	0.303
20	22	26	24	4.410
20	22	28	26	0.939
22	24	28	26	4.111

Direct Current Survey 3
Dipole-Dipole, west to east
October 2002

Xa	Xb	Xm	Xn	pot
0	2	6	4	7.026
0	2	8	6	0.743
0	2	10	8	0.741
0	2	12	10	0.478
0	2	14	12	0.167
0	2	16	14	0.083
2	4	8	6	2.750
2	4	10	8	1.288
2	4	12	10	0.662
2	4	14	12	0.260
2	4	16	14	0.123
2	4	18	16	0.084
4	6	10	8	2.774
4	6	12	10	1.071
4	6	14	12	0.306
4	6	16	14	0.147
4	6	18	16	0.084
4	6	20	18	0.052
6	8	12	10	3.726

Xa	Xb	Xm	Xn	pot
6	8	14	12	0.603
6	8	16	14	0.242
6	8	18	16	0.112
6	8	20	18	0.056
6	8	22	20	0.035
8	10	14	12	3.652
8	10	16	14	1.102
8	10	18	16	0.447
8	10	20	18	0.215
8	10	22	20	0.134
8	10	24	22	0.107
10	12	16	14	2.939
10	12	18	16	0.798
10	12	20	18	0.361
10	12	22	20	0.224
10	12	24	22	0.185
10	12	26	24	0.125
12	14	18	16	1.533
12	14	20	18	0.426
12	14	22	20	0.194
12	14	24	22	0.139
12	14	26	24	0.078
12	14	28	26	0.077
14	16	20	18	1.145
14	16	22	20	0.362
14	16	24	22	0.234
14	16	26	24	0.130
14	16	28	26	0.117
14	16	30	28	0.086
16	18	22	20	1.080
16	18	24	22	0.413
16	18	26	24	0.177
16	18	28	26	0.138
16	18	30	28	0.085
18	20	24	22	1.307
18	20	26	24	0.346
18	20	28	26	0.218
18	20	30	28	0.121
20	22	26	24	1.305
20	22	28	26	0.482
20	22	30	28	0.206
22	24	28	26	1.996
22	24	30	28	0.603
24	26	30	28	2.697

Table A.5
Direct Current Geophysical Survey
Relative elevations, surveyed by Total Station

Survey 1, west to east		Survey 2, west to east		Survey 3, north to south	
point on survey line (m)	relative elveation (m)	point on survey line (m)	relative elveation (m)	point on survey line (m)	relative elveation (m)
0	100.00	0	100.96	0	100.74
2	100.29	2	101.28	2	100.37
4	100.60	4	101.49	4	100.23
6	100.91	6	101.65	6	99.86
8	101.08	8	101.83	8	99.47
10	101.35	10	101.98	10	99.16
12	101.58	12	102.17	12	99.07
14	101.86	14	102.53	14	98.88
16	102.15	16	102.82	16	98.74
18	102.54	18	103.00	18	98.69
20	102.87	20	103.09	20	98.80
22	103.03	22	103.17	22	98.67
24	103.07	24	103.22	24	98.61
26	103.07	26	103.26	26	98.47
28	103.08	28	103.30	28	98.53
				30	98.66

APPENDIX B

GEOCHEMICAL DATA

Table B.1
Aqueous Chemistry See bottom of page 116 for notes.
type of water : surface water

Sample ID	Sample location	Date collected	Date analyzed	Ag (µg/L)	Al (µg/L)	As (µg/L)	Ca (mg/L)	Cd (mg/L)	Cr (mg/L)
1001	SWB02	5/10/02	10/1-6/02	-0.69	-0.87	-1.38	63.79	-0.12	18.56
1002	SWK01	5/3/02	10/1-6/02	-0.69	5.99	-1.38	7.13	-0.12	4.32
1003	SWF01	5/3/02	10/1-6/02	-0.69	2.30	-1.38	32.08	-0.12	12.72
1004	GRAN-L	5/3/02	10/1-6/02	-0.69	-0.87	-1.38	45.01	-0.12	17.28
1005	CGRAN	5/3/02	10/1-6/02	-0.69	140.59	-1.38	7.47	-0.12	2.83
1006	SWB02	5/3/02	10/1-6/02	-0.69	2.38	-1.38	61.13	-0.12	19.80
1007	SWA01	5/10/02	10/1-6/02	-0.69	1.52	-1.38	50.01	-0.12	17.50
1008	SWF01	5/10/02	10/1-6/02	-0.69	-0.87	-1.38	34.65	-0.12	13.58
1009	SWK01	5/10/02	10/1-6/02	-0.69	-0.87	-1.38	29.99	-0.12	9.53
1010	FLTZN	9/26/02	10/1-6/02	-0.69	20.90	-1.38	10.23	-0.12	3.86
1011	SWB02	9/26/02	10/1-6/02	-0.69	-0.87	-1.38	105.62	-0.12	17.14
1012	SWK02	9/26/02	10/1-6/02	-0.69	2.11	-1.38	64.54	-0.12	17.07
1013	GRAN-L	5/10/02	12/1-9/02	-1.16	-2.19	-4.38	45.59	-0.04	8.42
1014	SWK02	11/21/02	12/1-9/02	-1.16	-2.19	-4.38	67.09	-0.04	10.32
1015	SWH01	11/22/02	12/1-9/02	-1.16	-2.19	-4.38	35.69	-0.04	-5.20
1016	SWB02	11/21/02	12/1-9/02	-1.16	-2.19	-4.38	83.03	-0.04	8.30
1017	SWF01	11/21/02	12/1-9/02	-1.16	-2.19	-4.38	41.33	-0.04	7.26
1018	FLTZN	11/21/02	12/1-9/02	-1.16	11.92	-4.38	9.21	0.11	-5.20
1019	SWK02	10/2/02	12/1-9/02	-1.16	3.32	-4.38	60.59	-0.04	8.49
1020	FLTZN	10/2/02	12/1-9/02	-1.16	36.56	-4.38	11.02	-0.04	-5.20
1021	SWF01	10/2/02	2/1-5/03	-1.05	3.10	-0.71	39.25	-0.05	7.79
1022	SWB02	10/2/02	2/1-5/03	-1.05	-0.68	-0.71	94.84	0.05	12.05
1023	SWK02	5/17/02	2/1-5/03	-1.05	-0.68	-0.71	46.63	-0.05	7.70
1024	CGRAN	5/17/02	2/1-5/03	-1.05	39.10	-0.71	7.63	-0.05	1.50
1025	GRAN-L	5/17/02	2/1-5/03	-1.05	-0.68	-0.71	40.33	0.05	13.77
1026	FLTZN	5/17/02	2/1-5/03	-1.05	5.43	-0.71	8.11	-0.05	2.89
1027	SWB02	5/17/02	2/1-5/03	-1.05	-0.68	-0.71	64.77	-0.05	12.76
1028	SWF01	5/17/02	2/1-5/03	-1.05	-0.68	-0.71	33.80	-0.05	7.71
1029	SWA01	5/17/02	2/1-5/03	-1.05	-0.68	-0.71	48.89	-0.05	9.35
1030	FLTZN	5/10/02	2/1-5/03	-1.05	3.32	-0.71	7.74	-0.05	1.51
1031	SWK02	5/10/02	2/1-5/03	-1.05	-0.68	-0.71	66.07	-0.05	11.18
1032	CGRAN	5/10/02	2/1-5/03	-1.05	273.70	-0.71	7.68	-0.05	1.36
1033	FLTZN	8/16/02	2/1-5/03	-1.05	10.17	-0.71	9.46	-0.05	2.40
1034	FLTZN	8/5/02	2/1-5/03	-1.05	55.29	-0.71	8.14	-0.05	-1.03
1035	SWF01	3/25/03	6/5/03		-27	-0.26	41.36		2.73
1036	SWB02	3/25/03	6/5/03		-27	-0.26	69.97		3.74
1037	SWA01	5/22/03	10/2/03		2024	-3.00	20.44		1.54
1038	SWA01	9/7/03	10/2/03		878	-3.00	57.71		5.68

type of water: ground water

Sample ID	Sample location	Date collected	Date analyzed	Ag (µg/L)	Al (µg/L)	As (µg/L)	Ca (mg/L)	Cd (mg/L)	Cr (mg/L)
3001	H1-tap	5/10/02	10/1-6/02	-0.69	-0.87	-1.38	-0.12	-0.12	18.47
3002	H1-tap	9/26/02	10/1-6/02	-0.69	-0.87	-1.38	-0.12	-0.12	17.58
3003	H1-tap	5/10/02	10/1-6/02	-0.69	-0.87	-1.38	-0.12	-0.12	16.50
3004	H1-tap	11/22/02	12/1-9/02	-1.16	-2.19	-4.38	-0.12	0.06	6.30
3005	H2-tap	11/23/02	2/1-5/03	-1.05	-0.68	-0.71	39.41	-0.05	13.76
3006	H3-tap	1/10/03	2/1-5/03	-1.05	0.79	-0.71	0.21	-0.05	11.55
3007	H4-tap	1/10/03	2/1-5/03	-1.05	-0.68	-0.71	53.41	-0.05	12.05

Table B.1 (cont)

Aqueous Chemistry See bottom of page 116 for notes.

type of water : surface water

Sample ID	Cu (μg/L)	total Fe (mg/L)	K (mg/L)	Mg (mg/L)	Mn (μg/L)	Na (mg/L)	Ni (μg/L)	Pb (μg/L)	Se (μg/L)	Si (mg/L)	Zn (μg/L)
1001	1.72	-0.01	4.17	17.09	1.42	45.07	8.87	0.19	-4.52	4.83	3.14
1002	0.89	0.02	1.08	2.02	0.32	9.17	1.03	-0.04	-4.52	5.35	3.51
1003	4.72	-0.01	2.44	8.24	0.28	28.31	4.42	-0.04	-4.52	2.85	4.74
1004	1.02	-0.01	2.54	13.36	-0.17	15.48	5.82	-0.04	-4.52	6.52	2.03
1005	0.60	-0.01	1.15	1.19	0.32	5.26	0.96	-0.04	-4.52	6.28	1.97
1006	1.67	-0.01	4.17	16.22	0.77	43.86	12.70	-0.04	-4.52	4.60	4.63
1007	0.77	-0.01	2.91	14.12	-0.17	35.90	6.87	-0.04	-4.52	3.25	2.50
1008	0.89	-0.01	2.85	9.04	-0.17	29.90	4.90	0.04	-4.52	2.96	3.57
1009	1.54	-0.01	2.85	9.17	-0.17	24.74	4.48	0.07	-4.52	5.14	5.82
1010	2.19	0.04	1.56	2.77	25.42	11.15	1.59	0.38	-4.52	6.27	7.29
1011	1.98	0.02	5.72	28.70	216.44	53.98	15.90	0.15	-4.52	7.97	11.21
1012	2.37	0.02	15.64	18.16	122.54	45.52	11.11	0.06	-4.52	6.60	9.68
1013	1.31	-0.01	2.20	13.46	0.84	15.90	9.44	-0.04	-11.23	5.80	2.98
1014	3.33	-0.01	9.73	21.04	161.74	56.25	18.36	0.18	-11.23	5.06	8.40
1015	1.21	0.02	2.25	9.81	29.12	31.38	7.74	0.14	-11.23	3.57	-2.31
1016	2.34	-0.01	3.95	22.02	52.46	73.48	19.03	0.11	-11.23	4.66	5.96
1017	2.55	-0.01	1.88	11.20	25.61	37.94	10.44	0.11	-11.23	3.75	6.06
1018	2.22	-0.01	1.09	2.57	9.90	11.29	2.59	0.23	-11.23	5.33	9.58
1019	3.94	0.02	9.80	16.22	-0.43	57.62	15.58	0.12	-11.23	5.72	9.57
1020	1.80	0.09	1.37	3.22	0.75	13.08	2.96	0.24	-11.23	5.77	7.18
1021	1.94	-0.01	3.47	9.93	0.19	35.75	6.58	0.12	-2.60	4.82	3.05
1022	1.44	0.01	5.84	26.73	0.39	71.71	14.98	0.20	-2.60	7.20	3.70
1023	4.95	0.01	6.29	17.87	0.29	50.62	9.75	0.21	-2.60	5.33	5.63
1024	0.98	0.01	1.01	1.15	0.20	5.08	1.08	-0.09	-2.60	2.70	4.76
1025	1.67	-0.01	2.11	10.56	0.19	14.11	5.94	0.10	-2.60	6.31	2.04
1026	0.58	0.01	0.67	2.16	-0.09	10.09	1.08	-0.09	-2.60	5.17	2.66
1027	1.18	0.01	3.76	15.86	0.12	57.76	9.92	0.11	-2.60	4.57	1.47
1028	0.79	-0.01	2.70	8.68	0.22	33.64	5.70	-0.09	-2.60	3.17	2.31
1029	1.11	-0.01	3.04	12.76	-0.09	43.73	7.95	-0.09	-2.60	3.83	1.92
1030	0.61	0.01	1.08	2.05	0.10	9.71	1.34	-0.09	-2.60	4.94	5.62
1031	1.69	0.01	6.12	19.19	0.09	51.18	12.61	-0.09	-2.60	5.43	5.66
1032	0.54	0.01	1.10	1.12	4.18	4.86	1.45	-0.09	-2.60	5.86	7.19
1033	0.69	0.02	1.38	2.42	0.11	11.60	1.50	-0.09	-2.60	6.22	6.79
1034	2.07	0.02	1.91	1.87	1.17	9.08	1.47	0.16	-2.60	4.22	5.08
1035	1.34	0.01	3.49	11.04	-2	61.14	6.06	-0.04		11.23	3.47
1036	1.45	-0.01	4.36	18.62	-2	74.25	9.75	-0.04		10.91	4.33
1037	-0.20	0.01	1.57	5.54	-7.00	19.35	3.10	-0.05		15.23	-0.60
1038	-0.20	-0.01	2.79	16.44	8.00	52.89	8.73	-0.05		12.36	-0.60

type of water : ground water

Sample ID	Cu (μg/L)	total Fe (mg/L)	K (mg/L)	Mg (mg/L)	Mn (μg/L)	Na (mg/L)	Ni (μg/L)	Pb (μg/L)	Se (μg/L)	Si (mg/L)	Zn (μg/L)
3001	11.57	-0.01	141.45	-0.02	0.20	1.58	-0.52	0.27	-4.52	11.42	12.64
3002	17.47	-0.01	130.83	-0.02	0.17	1.20	-0.52	0.21	-4.52	11.54	18.50
3003	99.47	-0.01	135.87	-0.02	0.23	1.41	0.60	1.09	-4.52	11.54	139.75
3004	320.39	-0.01	150.81	-0.02	-0.43	0.79	1.48	2.80	-11.23	10.41	290.78
3005	181.95	-0.01	0.96	5.98	0.86	10.95	6.16	0.54	-2.60	9.36	48.88
3006	6.86	0.01	0.65	0.05	0.15	159.05	-0.13	0.19	-2.60	10.59	7.22
3007	72.12	-0.01	1.41	7.68	1.32	13.77	14.99	0.15	-2.60	11.88	44.73

Table B.1 (cont)
Aqueous Chemistry See bottom of page 116 for notes.
type of water : surface water

Sample ID	Br (mg/L)	Cl (mg/L)	F (mg/L)	NO2 (mg/L)	NO3 (mg/L)	PO4 (mg/L)	SO4 (mg/L)	Bicarb. (mg/L)	TDS (mg/L)	pH	Charge Balance
1001	0.16	173.03	0.26	-0.01	0.21	0.09	17.1	196.8	17.19	7.42	-12.05%
1002	0.03	122.49	0.62	-0.01	0.86	0.09	3.5	19.2	3.59	6.90	-60.82%
1003	0.05	80.00	0.51	-0.01	-0.10	-0.05	9.1	74.9	9.05	7.61	-1.73%
1004	0.53	80.02	0.34	-0.01	0.20	0.13	2.1	96.0	2.23	7.62	2.24%
1005	0.02	5.34	1.64	-0.01	8.89	-0.05	3.5	10.6	3.45	6.65	0.01%
1006	0.13	168.84	0.24	-0.01	-0.10	-0.05	17.6	108.0	17.55	7.69	-3.83%
1007	0.10	127.06	0.40	-0.01	0.33	-0.05	13.2	104.2	13.15	7.81	-2.77%
1008	-0.01	83.07	0.54	-0.01	0.19	-0.05	9.5	82.1	9.45	7.75	-0.92%
1009	0.08	83.94	0.33	-0.01	0.63	-0.05	8.7	52.8	8.65	7.58	-0.72%
1010	0.03	16.10	0.69	-0.01	1.24	0.13	8.9	24.5	9.03	7.33	6.41%
1011	0.22	247.98	0.19	-0.01	0.31	0.07	114.9	117.1	114.97	7.97	-5.55%
1012	0.17	187.07	0.19	-0.01	0.60	-0.05	31.5	102.7	31.45	7.79	-3.68%
1013	0.54	80.04	0.39		0.34	0.09	1.6	120.5	1.67	7.98	-2.03%
1014	0.16	202.34	0.19		6.89	-0.05	25.3	101.3	25.24	7.86	-2.05%
1015	0.07	92.69	0.36		0.23	0.20	18.5	62.4	18.68	7.72	-0.48%
1016	0.16	237.14	0.23		-0.10	-0.05	59.2	100.8	59.16	7.89	-1.76%
1017	0.07	111.09	0.55		-0.10	0.06	23.2	72.0	23.24	7.85	-1.49%
1018	0.05	18.87	0.73		1.46	0.07	6.2	22.1	6.31	7.30	3.69%
1019	0.13	189.35	0.20		0.60	-0.05	27.3	93.6	27.29	7.58	-2.43%
1020	0.04	22.64	0.58		0.46	-0.05	12.6	22.6	12.56	7.33	7.37%
1021	0.09	80.95	0.48	-0.01	0.15	-0.05	26.3	68.6	26.25	7.90	5.17%
1022	0.30	81.69	0.19	-0.01	0.61	-0.05	71.2	119.0	71.15	7.79	27.77%
1023	0.17	102.52	0.17	-0.01	10.33	0.06	16.5	66.2	16.56	8.08	14.13%
1024	0.02	6.26	1.81	-0.01	10.30	0.16	3.4	8.6	3.56	7.03	-4.16%
1025	0.34	48.69	0.47	-0.01	0.03	-0.05	4.6	105.1	4.55	7.92	4.87%
1026	0.09	18.34	0.66	-0.01	0.96	0.07	3.8	22.1	3.87	7.30	-0.04%
1027	0.16	102.07	0.28	-0.01	0.20	0.07	15.5	108.5	15.57	8.06	17.66%
1028	0.08	79.38	0.56	-0.01	0.02	0.07	8.8	70.1	8.87	7.68	4.40%
1029	0.12	96.77	0.48	-0.01	0.35	0.05	11.9	92.6	11.95	7.82	9.38%
1030	0.02	16.40	0.69	-0.01	0.76	0.09	3.5	21.6	3.59	7.15	2.88%
1031	0.21	100.18	0.21	-0.01	1.63	0.07	17.2	98.9	17.27	7.94	19.75%
1032	0.02	6.20	1.88	-0.01	9.54	-0.05	3.4	11.0	3.35	6.79	-5.78%
1033	0.04	18.26	0.88	-0.01	0.33	0.06	5.9	28.3	5.96	7.33	2.29%
1034	0.05	13.43	0.73	-0.01	5.03	0.08	5.6	16.8	5.68	7.02	2.65%
1035	0.09	139.9	0.36	-0.01	3.33	0.22	21.8	61.9	22.02	7.63	1.65%
1036	0.15	260.4	0.19	-0.01	3.18	0.20	33.5	83.5	33.72	7.73	-6.46%
1037	0.02	45.31	0.36	-0.01	2.12	0.06	13.8	44.6	13.85	7.52	4.14%
1038	0.29	113.30	0.48	-0.01	0.37	0.09	17.8	133.4	17.89	8.09	7.29%

type of water : surface water

Sample ID	Br (mg/L)	Cl (mg/L)	F (mg/L)	NO2 (mg/L)	NO3 (mg/L)	PO4 (mg/L)	SO4 (mg/L)	Bicarb. (mg/L)	TDS (mg/L)	pH	Charge Balance
3001	0.06	20.65	0.32	-0.01	31.80	0.33	12.6	113.8	12.93	7.49	0.39%
3002	0.06	19.94	0.31	-0.01	32.22	0.09	12.3	111.8	12.39	7.42	-3.04%
3003	0.09	20.50	0.31	-0.01	31.88	-0.05	13.5	112.8	13.45	7.61	-1.62%
3004	0.06	20.35	0.40		34.82	0.08	12.2	108.5	12.31	7.62	3.41%
3005	0.08	4.29	0.37	-0.01	2.62	-0.05	6.5	125.3	6.45	7.49	10.46%
3006	0.04	102.54	0.50	-0.01	23.65	0.06	7.3	147.4	7.36	8.17	5.88%
3007	0.06	42.80	0.65	-0.01	5.72	-0.05	7.1	139.2	7.05	8.15	1.27%

Table B.1 (cont)
Aqueous Chemistry See bottom of page 116 for notes.
type of water : ISDS water

Sample ID	Sample location	Date collected	Date analyzed	Ag (μg/L)	Al (μg/L)	As (μg/L)	Ca (mg/L)	Cd (mg/L)	Cr (mg/L)
2001	H1-ISDS	9/26/02	10/1-6/02	-0.69	5.56	-1.38	81.08	-0.12	65.53
2002	PEIZ15	11/22/02	12/1-9/02	-1.16	2.24	-4.38	407.01	0.31	11.26
2003	H1-ISDS	11/22/02	12/1-9/02	-1.16	-2.19	-4.38	78.55	-0.04	21.49
2004	PIEZ15	11/22/02	12/1-9/02	-1.16	3.89	-4.38	381.89	0.16	33.91
2005	PIEZ01	4/10/03	6/5/03		-27	-0.26	20.61		1.21
2006	PIEZ02	4/10/03	6/5/03		-27	-0.26	22.27		1.67
2007	PIEZ03	4/10/03	6/5/03		-27	0.60	12.88		1.13
2008	PIEZ04	4/10/03	6/5/03		-27	1.05	32.18		2.13
2009	PIEZ05	4/10/03	6/5/03		-27	1.13	59.77		2.35
2010	PIEZ06	4/10/03	6/5/03		-27	0.38	110.45		4.19
2011	PIEZ07	4/10/03	6/5/03		-27	-0.26	184.94		3.78
2012	PIEZ08	4/10/03	6/5/03		51	0.57	15.35		1.33
2013	PIEZ09	4/10/03	6/5/03		-27	0.26	166.96		2.51
2014	PIEZ10	4/10/03	6/5/03		-27	0.37	53.77		2.50
2015	PIEZ11	4/10/03	6/5/03		-27	0.37	89.70		2.66
2016	PIEZ12	4/10/03	6/5/03		-27	-0.26	51.16		2.74
2017	PIEZ13	4/10/03	6/5/03		33	-0.26	28.85		1.53
2018	PIEZ19	4/10/03	6/5/03		-27	-0.26	99.99		3.62
2019	PIEZ22	4/10/03	6/5/03		-27	-0.26	65.42		2.98
2020	PIEZ17	5/1/03	6/5/03		-27	-0.26	238.47		7.71
2021	PIEZ01	5/15/03	10/2/03		19	-3	15.25		2.01
2022	PIEZ02	5/15/03	10/2/03		10	-3	44.90		4.15
2023	PIEZ03	5/15/03	10/2/03		14	-3	45.14		5.72
2024	PIEZ04	5/15/03	10/2/03		18	-3	27.79		7.44
2025	PIEZ05	5/15/03	10/2/03		-9	-3	42.84		7.02
2026	PIEZ06	5/15/03	10/2/03		-9	-3	82.49		7.91
2027	PIEZ07	5/15/03	10/2/03		-9	-3	107.11		4.10
2028	PIEZ09	5/15/03	10/2/03		-9	-3	68.84		4.76
2029	PIEZ10	5/15/03	10/2/03		13	-3	55.51		3.05
2030	PIEZ11	5/15/03	10/2/03		-9	-3	90.36		8.71
2031	PIEZ13	5/15/03	10/2/03		122	-3	24.38		2.04
2032	PIEZ14	5/15/03	10/2/03		28	-3	30.57		5.91
2033	PIEZ15	5/15/03	10/2/03		-9	-3	60.13		7.21
2034	PIEZ16	5/22/03	10/2/03		-9	-3	106.95		8.21
2035	PIEZ17	5/22/03	10/2/03		14	-3	36.66		7.27
2036	PIEZ18	5/22/03	10/2/03		16	-3	55.38		6.16
2037	PIEZ21	5/22/03	10/2/03		27	-3	32.30		3.89
2038	PIEZ22	5/22/03	10/2/03		13	-3	48.99		6.77
2039	PIEZ24	5/22/03	10/2/03		20	-3	42.15		6.18
2040	PIEZA	9/7/03	10/2/03		1695	-3	88.10		7.11
2041	PIEZA	9/8/03	10/2/03		-9	-3	182.05		13.96

Table B.1 (cont)
Aqueous Chemistry See bottom of page 116 for notes.
type of water : surface water

Sample ID	Cu (µg/L)	total Fe (mg/L)	K (mg/L)	Mg (mg/L)	Mn (µg/L)	Na (mg/L)	Ni (µg/L)	Pb (µg/L)	Se (µg/L)	Si (mg/L)	Zn (µg/L)
2001	1.69	1.40	1180.84	13.32	776.43	37.21	16.28	0.15	-4.52	13.11	10.17
2002	26.44	-0.01	15.37	102.52	1006.14	297.51	146.63	1.65	-11.23	4.24	41.19
2003	2.59	1.92	1008.77	13.64	796.26	45.20	19.25	0.58	-11.23	11.02	3.20
2004	8.40	-0.01	19.16	95.72	1109.96	291.30	124.63	0.09	-11.23	3.87	9.83
2005	10.22	0.01	62.50	4.58	683	34.64	8.13	0.14		15.62	5.10
2006	5.40	0.02	2.74	4.84	89	37.71	4.66	0.14		12.87	2.82
2007	9.74	0.03	40.14	2.47	109	36.46	5.08	0.17		16.26	4.46
2008	6.28	0.01	76.13	6.93	1038	55.66	9.37	0.08		15.41	2.14
2009	6.06	0.01	91.87	13.93	8	56.40	8.21	0.07		15.75	5.95
2010	5.70	-0.01	32.23	24.84	429	71.30	15.41	0.06		18.23	5.76
2011	3.44	-0.01	7.25	44.40	932	109.40	23.47	0.05		14.28	6.31
2012	5.97	0.07	2.39	3.85	45	42.91	4.28	0.18		14.49	5.27
2013	7.80	-0.01	12.82	38.95	405	109.73	22.58	0.05		15.28	9.70
2014	2.70	0.01	91.59	14.08	214	52.97	7.97	0.04		13.49	1.97
2015	3.83	0.01	45.16	20.99	18	59.85	12.43	0.06		16.54	3.69
2016	8.40	0.02	6.96	12.72	12	75.98	28.13	0.88		14.96	18.77
2017	2.13	0.05	4.37	7.52	29	64.46	5.08	0.07		16.63	7.05
2018	3.37	0.02	9.14	23.41	30	105.17	14.98	0.08		13.79	4.24
2019	4.53	0.01	5.88	16.57	7	77.15	10.47	0.11		15.86	11.33
2020	3.07	0.01	2.87	57.73	240	186.04	32.17	0.21		11.64	5.85
2021	10.55	0.03	14.75	3.74	397	50.67	6.24	-0.05		21.53	5.25
2022	4.13	0.37	1.69	9.54	1088	48.34	10.84	0.12		20.26	6.47
2023	16.32	0.01	20.05	9.94	753	61.26	12.56	0.05		18.95	6.76
2024	6.83	0.13	62.19	5.91	2121	47.21	12.53	-0.05		18.76	4.28
2025	9.80	-0.01	108.85	9.02	4155	58.71	15.35	-0.05		21.66	15.47
2026	8.22	-0.01	91.77	18.48	3036	57.15	20.28	-0.05		18.67	10.26
2027	3.71	-0.01	8.68	27.39	712	82.94	20.52	-0.05		17.13	4.92
2028	7.96	-0.01	9.76	16.83	439	69.62	15.63	-0.05		13.92	1.59
2029	3.33	0.01	80.96	14.70	365	58.37	12.23	-0.05		10.68	2.92
2030	2.21	-0.01	60.13	21.17	229	60.83	18.30	-0.05		16.92	2.59
2031	2.16	0.10	3.17	6.52	-7	54.54	5.75	0.08		18.94	5.28
2032	2.16	0.07	2.45	8.39	-7	57.44	7.14	-0.05		18.47	4.23
2033	27.20	-0.01	66.32	12.76	23	54.05	15.11	-0.05		17.54	7.04
2034	4.17	-0.01	26.54	23.89	12	67.25	20.71	-0.05		17.30	3.05
2035	1.92	0.86	3.95	9.40	326	64.64	9.17	0.09		19.96	2.30
2036	3.90	0.06	4.99	13.22	59	66.49	12.35	-0.05		18.45	3.78
2037	4.00	0.06	2.11	8.96	17	72.66	7.12	-0.05		16.62	2.46
2038	7.31	0.03	6.16	11.87	10	61.93	11.72	-0.05		18.06	8.61
2039	10.94	0.03	4.50	11.86	-7	66.90	9.86	-0.05		15.95	4.25
2040	1.12	0.16	86.63	17.99	571	49.13	22.76	-0.05		16.73	8.12
2041	2.02	7.16	143.26	36.23	1332	88.16	41.61	-0.09		28.50	6.94

Table B.1 (cont)

Aqueous Chemistry See bottom of page 116 for notes.

type of water : surface water

Sample ID	Br (mg/L)	Cl (mg/L)	F (mg/L)	NO2 (mg/L)	NO3 (mg/L)	PO4 (mg/L)	SO4 (mg/L)	Bicarb. (mg/L)	TDS (mg/L)	pH	Charge Balance
2001	0.49	1155.8	0.17	-0.01	0.23	10.98	2.4	424.8	13.38	8.16	-3.59%
2002	0.51	1294.0	0.35		70.32	-0.05	6.0		5.96		4.21%
2003	0.39	1052.0	0.33		0.55	2.50	-0.4	348.0	2.10	7.70	-3.66%
2004	0.51	1305.0	0.55		74.04	0.08	6.7		6.82		1.23%
2005	0.03	106.4	0.37	-0.01	19.40	-0.01	17.3	49.0	17.28	7.52	-2.32%
2006	0.02	45.9	0.24	0.01	14.98	0.06	17.6	70.6	17.68	7.82	-0.73%
2007	0.03	71.2	0.25	-0.01	20.49	-0.01	18.3	42.7	18.30	7.47	-3.35%
2008	0.02	204.8	0.44	-0.01	9.63	0.06	18.7	71.0	18.74	7.77	-7.40%
2009	0.10	267.2	0.14	-0.01	49.79	0.08	28.5	95.5	28.53	7.97	-11.11%
2010	0.12	330.8	0.25	-0.01	48.13	-0.01	29.4	130.1	29.38	7.80	-8.02%
2011	0.26	580.0	0.13	-0.01	37.31	0.08	21.8	122.9	21.92	7.95	-5.49%
2012	0.01	55.7	0.20	-0.01	22.66	0.07	18.7	28.8	18.73	7.61	-1.43%
2013	0.15	536.1	0.20	-0.01	45.74	0.08	48.4	79.2	48.52	7.83	-6.02%
2014	0.12	266.8	0.11	-0.01	33.05	-0.01	27.9	85.0	27.86	7.92	-10.43%
2015	0.11	308.5	0.15	-0.01	37.97	0.01	26.4	90.7	26.38	7.79	-8.70%
2016	0.06	212.4	0.16	0.01	44.05	-0.01	41.1	35.0	41.05	7.60	-10.37%
2017	0.05	114.5	0.12	-0.01	26.11	0.03	32.0	39.8	32.06	7.74	-3.33%
2018	0.08	378.4	0.16	-0.01	26.22	0.04	36.1	95.0	36.09	7.90	-7.98%
2019	0.08	255.5	0.15	-0.01	26.43	0.06	31.4	73.4	31.41	7.80	-9.53%
2020	0.32	731.7	0.31	-0.01	10.06	-0.01	28.4	198.2	28.39	7.96	0.07%
2021	-0.01	60.60	0.28	-0.01	0.68	0.14	20.4	65.3	20.52	7.24	6.21%
2022	0.01	68.20	0.22	-0.01	0.27	0.09	21.3	136.8	21.42	7.31	6.12%
2023	-0.01	116.61	0.32	-0.01	0.93	0.08	19.6	87.4	19.68	7.56	9.65%
2024	0.07	90.64	0.38	-0.01	2.09	0.31	19.4	127.7	19.66	7.25	4.35%
2025	0.05	125.53	0.22	-0.01	17.33	0.36	15.0	133.4	15.38	7.29	12.08%
2026	0.10	114.85	0.22	-0.01	18.64	0.16	28.7	147.4	28.85	7.65	21.66%
2027	0.19	96.90	0.20	-0.01	13.16	0.17	33.7	133.0	33.83	7.78	31.15%
2028	0.05	125.05	0.40	-0.01	2.58	0.57	30.4	91.2	30.95	7.88	16.96%
2029	-0.01	117.01	0.13	-0.01	59.18	0.42	21.1	24.0	21.48	7.65	18.75%
2030	0.06	110.41	0.13	-0.01	5.27	0.32	18.9	136.8	19.24	7.50	27.67%
2031	0.14	69.55	0.12	-0.01	21.48	0.45	30.8	65.8	31.28	7.54	-1.21%
2032	0.02	80.49	0.13	-0.01	1.17	0.10	32.6	92.2	32.70	7.44	3.05%
2033	0.05	183.47	0.23	-0.01	5.84	0.55	16.7	132.5	17.26	7.91	1.34%
2034	0.09	102.39	0.17	-0.01	2.13	0.10	18.5	142.1	18.58	7.75	31.57%
2035	0.07	83.72	0.18	-0.01	0.13	0.03	22.1	131.0	22.10	7.78	5.63%
2036	0.19	103.14	0.20	-0.01	1.87	0.32	22.1	148.8	22.42	7.75	7.83%
2037	0.03	113.66	0.10	-0.01	2.93	0.31	60.7	66.2	61.00	7.77	-0.72%
2038	0.12	118.68	0.16	-0.01	0.73	0.46	30.4	123.8	30.81	7.82	1.86%
2039	0.04	121.21	0.19	-0.01	3.44	0.09	36.7	91.7	36.75	7.93	2.62%
2040	0.08	287.09	0.42	-0.01	0.80	0.09	17.1	109.0	17.18	7.83	0.79%
2041	0.20	694.01	0.36	-0.01	0.28	0.09	2.6	403.7	2.72	7.90	-13.55%

Samples collected by CSM (May 2002 to September 2003). See figure 6.3 for sample locations.
All values in mg/L unless otherwise stated.
Negative values denote concentrations below instrument detection level. (Value listed is instrument detection level.)
If a parameter was not determined in a sample, the result was left blank.

Table B.2 Specific Conductivity (SC, mS/cm) and Temperature (T, celcius) of Piezometer Water Samples. All data collected by CSM (April 2003 to September 2003). The term "NA" denotes not enough water was present in the piezometer to collect SC or T data. The * symbol was used when no data were collected for that piezometer on that date. Piezometer B was installed 5/27/03. Piezometers A, C, D and E were installed 7/1/03. VP is the ISDS infiltration area vent pipe. See figure 7.7 for piezometer locations.

	4/3/03		4/10/03		4/17/03		4/25/03		5/1/03		5/15/03	
Piezo.	SC	T	SC	T	SC	T	SC	T	SC	T	SC	T
VP	1417	2.6	*	*	778	5.1	2450	4.4	2730	5.3	3470	6.2
1	1291	2.8	467	2.8	523	4.1	472	4.2	387	4.7	337	5.2
2	430	2.5	356	2.6	540	4.3	394	4.4	541	5.0	458	5.3
3	680	3.8	423	3.8	557	3.8	495	4.2	492	4.4	525	5.0
4	2550	2.5	979	9.2	1037	4.4	746	4.4	688	5.0	782	5.3
5	1395	2.1	1122	3.0	845	4.4	801	3.9	990	5.8	1115	5.8
6	2440	1.2	1365	2.4	1164	3.8	1060	3.8	1074	4.9	1236	5.6
7	*	*	2170	0.7	1748	1.5	1495	1.8	1260	3.7	1216	4.9
8	2840	1.9	360	3.2	428	4.8	436	4.2	390	5.1	NA	NA
9	3940	2.0	2520	3.6	1345	4.5	1265	4.3	1275	5.4	783	5.6
10	1730	0.4	1061	2.9	927	4.3	847	3.8	791	5.6	1197	6.1
11	3250	1.1	*	*	965	3.6	955	4.1	890	5.1	1227	5.3
12	*	*	*	*	694	7.4	*	*	*	*	*	*
13	*	*	632	2.6	367	4.7	379	4.0	366	5.8	467	6.3
14	3730	1.8	1267	2.4	825	4.5	566	4.2	422	5.4	586	5.7
15	1130	1.0	*	*	1007	5.0	884	4.4	1012	5.2	*	*
16	4020	1.4	2210	1.4	976	2.4	1120	2.7	913	3.5	1196	4.4
17	*	*	*	*	*	*	4360	2.0	3600	3.0	1720	4.0
18	514	1.0	760	2.5	595	4.5	920	4.2	897	5.6	1009	5.9
19	3400	1.5	1798	2.1	944	3.9	792	4.1	776	5.4	729	5.7
20	1012	1.3	955	1.4	817	2.5	732	3.2	664	4.8	619	5.9
21	753	1.4	825	1.4	598	2.4	539	3.2	617	4.8	601	6.0
22	*	*	*	*	*	*	*	*	724	4.6	*	*
23	2470	1.6	1435	1.8	1285	2.7	970	3.4	880	4.4	821	5.5
24	*	*	*	*	*	*	*	*	726	4.1	*	*
25	*	*	*	*	533	3.9	*	*	524	4.8	NA	NA
26	*	*	*	*	515	2.1	*	*	484	3.9	575	4.7
A												
B												
C												
D												
E												

	5/22/03		5/28/03		6/5/03		6/20/03		6/27/03		7/2/03	
Piezo.	SC	T	SC	T	SC	T	SC	T	SC	T	SC	T
VP	3540	7.3	2400	8.9	2240	10.4	1727	11.1	1831	11.3	2000	12.0
1	371	6.0	364	7.1	463	7.9	716	8.8	1080	9.5	1277	9.5
2	566	6.4	459	7.6	770	8.8	650	10.0	801	9.9	797	12.4
3	601	5.4	414	5.8	520	6.3	1444	7.5	1972	7.7	2220	8.3
4	837	6.4	1284	7.6	1549	8.3	1631	9.6	1311	9.5	1623	10.1
5	1299	7.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6	1344	7.0	1275	8.2	1288	9.2	1349	10.4	1543	10.5	NA	NA
7	1438	6.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
9	620	6.6	668	8.0	726	8.7	738	9.8	792	9.7	NA	NA

Table B.2 (cont.)

	5/22/03		5/28/03		6/5/03		6/20/03		6/27/03		7/2/03	
Piezo.	SC	T	SC	T	SC	T	SC	T	SC	T	SC	T
10	1312	7.2	1335	8.9	NA	NA	NA	NA	NA	NA	NA	NA
11	1286	6.7	1417	8.1	1426	8.2	592	10.2	NA	NA	NA	NA
12	*	*	*	*	NA	NA	NA	NA	NA	NA	NA	NA
13	508	7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
14	585	6.8	694	8.6	NA	NA	NA	NA	NA	NA	NA	NA
15	*	*	1107	11.8	*	*	*	*	*	*	1596	18.1
16	1220	5.6	1231	6.8	1303	8.7	1486	9.3	1613	10.0	1704	11.2
17	1525	5.2	1540	6.5	1695	7.8	1937	8.9	2270	9.2	1275	9.8
18	988	7.0	665	8.3	729	9.4	NA	NA	NA	NA	NA	NA
19	692	7.0	647	8.4	699	9.7	844	10.4	795	10.2	763	11.4
20	639	7.3	604	8.6	NA	NA	NA	NA	NA	NA	NA	NA
21	603	6.8	601	8.5	605	9.1	NA	NA	NA	NA	NA	NA
22	*	*	650	13.3	*	*	*	*	NA	NA	NA	NA
23	*	6.1	700	7.6	NA	NA	NA	NA	NA	NA	NA	NA
24	*	*	644	14.0	*	*	*	*	*	*	*	*
25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	*	*
26	548	5.3	530	7.1	616	6.9	*	*	NA	NA	*	*
A											NA	NA
B			*	*	NA	NA	NA	NA	NA	NA	NA	NA
C											NA	NA
D											NA	NA
E											NA	NA

	7/10/03		7/18/03		7/24/03		9/4/03	
Piezo.	SC	T	SC	T	SC	T	SC	T
VP	2480	12.5	3000	13.0	3870	13.5	1829	13.6
1	1559	10.9	1535	11.1	1604	12.4	2360	12.9
2	NA	NA	NA	NA	NA	NA	*	*
3	NA	NA	NA	NA	NA	NA	*	*
4								
5	NA	NA	NA	NA	NA	NA	*	*
6	NA	NA	NA	NA	NA	NA	*	*
7	NA	NA	NA	NA	NA	NA	*	*
8	NA	NA	NA	NA	NA	NA	*	*
9	NA	NA	NA	NA	NA	NA	*	*
10	NA	NA	NA	NA	NA	NA	*	*
11	NA	NA	NA	NA	NA	NA	*	*
12	NA	NA	NA	NA	NA	NA	*	*
13	NA	NA	NA	NA	NA	NA	*	*
14	NA	NA	NA	NA	NA	NA	*	*
15	*	*	NA	NA	NA	NA	*	*
16	NA	NA	NA	NA	NA	NA	*	*
17	NA	NA	NA	NA	NA	NA	*	*
18	NA	NA	NA	NA	NA	NA	*	*
19	NA	NA	NA	NA	NA	NA	*	*
20	NA	NA	*	*	*	*	*	*
21	NA	NA	*	*	*	*	*	*
22	*	*	*	*	*	*	*	*
23	NA	NA	*	*	*	*	*	*
24	*	*	*	*	*	*	*	*

Table B.2 (cont.)

	7/10/03		7/18/03		7/24/03		9/4/03	
Piezo.	SC	T	SC	T	SC	T	SC	T
25	*	*	*	*	*	*	*	*
26	*	*	*	*	*	*	*	*
A	1570	9.2	1760	9.8	1890	10.2	2310	11.5
B	*	*	NA	NA	673	11.1	*	*
C	2810	8.9	2790	9.6	2490	10.2	*	*
D	*	*	NA	NA	NA	NA	*	*
D	*	*	NA	NA	NA	NA	*	*

Table B.3
Surface Water Sampling Location Descriptions in Turkey Creek Basin
See figure 6.3 for sampling locations within the basin.

Site ID	Site Description
CGRAN	Tributary of NTC, USGS weir on Christopher Road, above Aspen Park, CO. E = 2743 m (above sea level)
FLTZN	NTC, USGS weir on Shadow Mountain Road, near Aspen Park, CO. E = 2590 m (above sea level)
SWK01	NTC (above tributary), Shadow Mountain Road and Hwy 73, near Aspen Park, CO. E = 2484 m (above sea level)
SWK02	Tributary of NTC, Shadow Mountain Road and Hwy 73, near Aspen Park, CO. E = 2487 m (above sea level)
SWH01	NTC (above tributary), Danks Drive and North Turkey Creek Road, near Aspen Park, CO. E = 2345 m (above sea level)
GRAN-L	Tributary of NTC, USGS weir on Danks Drive, near Aspen Park, CO. E = 2337 m (above sea level)
SWF01	NTC (above the confluence of NTC and STC) at Turkey Creek Park, near Indian Hills, CO. E = 2097 m (above sea level)
SWB01	STC (above the confluence of NTC and STC) at Turkey Creek Park, near Indian Hills, CO. E = 2097 m (above sea level)
SWA01	Turkey Creek, USGS monitoring station, US HWY 285, near Morrison, CO. E = 1890 m (above sea level)

NTC = North Turkey Creek
STC = South Turkey Creek
USGS = United States Geological Survey
E = elevation (in meters)

APPENDIX C
HYDROLOGICAL DATA

Table C.1 Depth to Water, meters, April to September 2003.
Notes: Starting July 18, a different water-level sounder was used.
The new sounder allowed very small amounts of water in the bottom of each piezometer to be measured. The * symbol indicates no measurement was taken. Grey squares indicate the piezometer was not yet installed. The term "NA" denotes too little water in the piezometer to be measured.

Piezo	4/3/03	4/10/03	4/17/03	4/25/03	5/1/03	5/15/03	5/22/03
VP	*	*	0.70	0.66	0.70	0.78	0.76
1	*	0.11	0.39	0.20	0.48	0.68	0.68
2	0.17	0.15	0.48	0.25	0.56	0.76	0.75
3	0.40	0.42	0.60	0.44	0.72	0.95	0.97
4	0.10	0.28	0.33	0.27	0.56	0.82	0.80
5	0.20	0.11	0.22	0.18	0.50	0.89	0.84
6	0.30	0.26	0.62	0.49	0.67	0.84	0.79
7	*	0.29	0.53	0.53	0.72	0.90	0.89
8	0.20	0.23	0.31	0.24	0.50	NA	NA
9	0.25	0.30	0.49	0.46	0.64	0.75	0.74
10	0.40	0.43	0.66	0.65	0.81	1.04	1.05
11	0.34	0.35	0.50	0.59	0.65	0.96	0.99
12	0.18	0.19	0.34	0.25	0.49	0.72	0.74
13	*	0.05	0.10	0.08	0.28	0.57	0.59
14	0.00	0.06	0.09	0.07	0.13	0.34	0.37
15	0.00	0.06	0.07	0.07	0.08	0.24	0.25
16	0.00	0.03	0.05	0.05	0.08	0.32	0.34
17	*	*	*	0.08	0.13	0.33	0.37
18	0.00	0.25	0.24	0.21	0.30	0.52	0.53
19	0.00	0.04	0.07	0.06	0.08	0.30	0.32
20	0.32	0.39	0.38	0.47	0.55	0.69	0.70
21	0.10	0.14	0.46	0.17	0.20	0.34	0.36
22	0.00	0.15	0.16	0.18	0.18	0.31	0.32
23	0.34	0.37	0.16	0.38	0.39	0.53	0.53
24	*	0.11	0.17	0.17	0.18	0.31	0.32
25	*	*	0.28	0.00	0.97	NA	NA
26	*	*	0.21	0.00	0.21	0.25	0.25
A							
B							
C							
D							
E							

Piezo	5/28/03	6/5/03	6/20/03	6/27/03	7/2/03	7/10/03	7/18/03
VP	0.87	1.00	1.12	1.14	1.16	1.22	1.20
1	0.81	0.95	1.16	1.21	1.28	1.37	1.40
2	0.87	1.01	1.23	1.28	1.35	1.38	1.37
3	1.02	1.15	1.56	1.95	2.17	2.68	2.62
4	0.93	0.97	1.06	1.07	1.10	1.13	1.12
5	NA	NA	NA	NA	NA	dry	0.97
6	0.93	0.97	1.06	1.08	NA	NA	1.27
7	NA	NA	NA	NA	NA	NA	1.01
8	NA	NA	NA	NA	NA	NA	0.61
9	0.83	0.88	0.90	0.94	NA	NA	1.04
10	1.18	NA	NA	NA	NA	NA	1.23

Table C.1 (cont.)

Piezo	5/28/03	6/5/03	6/20/03	6/27/03	7/2/03	7/10/03	7/18/03
11	1.24	1.45	1.61	NA	NA	NA	1.61
12	0.86	NA	NA	NA	NA	NA	0.87
13	NA	NA	NA	NA	NA	NA	0.68
14	0.63	NA	NA	NA	NA	NA	0.93
15	0.49	0.91	1.09	1.16	1.24	NA	1.39
16	0.57	0.75	1.05	1.14	1.24	1.43	1.45
17	0.57	0.66	0.96	1.10	NA	NA	1.26
18	0.63	0.77	NA	NA	NA	NA	1.04
19	0.40	0.56	1.03	1.08	1.12	1.11	1.09
20	0.79	NA	NA	NA	NA	NA	*
21	0.48	0.64	NA	NA	NA	NA	*
22	0.44	0.58	0.92	NA	NA	NA	*
23	0.63	NA	NA	NA	NA	NA	*
24	0.44	0.50	0.73	0.82	0.96	0.96	*
25	NA	NA	NA	NA	NA	NA	*
26	0.40	0.78	0.98	NA	NA	NA	*
A					NA	1.51	1.30
B	1.27	NA	NA	NA	NA	NA	1.30
C					NA	1.73	1.82
D					NA	NA	NA
E					NA	NA	NA

Piezo	7/24/03	7/30/03	8/14/03	9/4/03
VP	1.22	1.23	1.26	1.26
1	1.41	1.44	1.45	1.32
2	1.37	NA	NA	NA
3	2.62	2.63	NA	NA
4	1.12	1.14	1.12	1.06
5	0.96	*	*	*
6	1.27	*	*	*
7	1.01	*	*	*
8	0.60	*	*	*
9	1.04	*	*	*
10	1.23	*	*	*
11	1.61	*	*	*
12	0.88	*	*	*
13	0.69	*	*	*
14	0.91	*	*	*
15	1.40	*	*	*
16	1.45	*	*	*
17	1.26	*	1.25	NA
18	1.04	*	*	*
19	1.09	*	*	*
20	*	*	*	*
21	*	*	*	*
22	*	*	*	*
23	*	*	*	*
24	*	*	*	*
25	*	*	*	*
26	*	*	*	*
A	1.31	1.33	1.27	1.24

Table C.1 (cont.)

Piezo	7/24/03	7/30/03	8/14/03	9/4/03
B	1.29	1.28	1.28	1.28
C	1.87	1.97	2.16	2.26
D	NA	NA	1.27	*
E	0.92	0.92	NA	*

Table C.2
Digital Dose Counter Measurements

Date	Dose Counter Reading	Average Dose per Day	Average Gallons Per Day
2/21/03	21		
3/7/03	28	0.50	115.0
4/3/03	38	0.37	85.19
4/17/03	44	0.43	98.57
6/5/03	66	0.45	103.3
Battery Replaced			
7/18/03	15		
7/24/03	18	0.50	115.0
8/14/03	29	0.52	120.5
9/4/03	40	0.52	120.5
9/26/03	53	0.59	135.9

Flow Meter Measurements

Date	Meter Reading (gal)	Average Gallons Per Day
7/24/03	30	
8/14/03	3560	168
9/4/03	7540	190
9/26/03	11160	165
10/16/03	14320	158

Table C.3

Evapotranspiration Data
August 2,2002 SITE 1

Time	sec	Temp wet	Temp dry
1403	12	22.60	32.87
1403	14	22.57	32.92
1403	16	22.60	33.05
1403	18	22.64	33.25
1403	20	22.78	33.62
1403	22	22.91	34.01
1403	24	23.06	34.40
1403	26	23.25	34.83
1403	28	23.47	35.27
1403	30	23.59	35.55
1403	32	23.78	36.02
1403	34	23.96	36.34
1403	36	24.16	36.78
1403	38	24.29	37.05
1403	40	24.49	37.42
1403	48	25.10	38.58
1403	50	25.21	38.76
1403	52	25.36	39.05
1403	54	25.48	39.30
1403	56	25.60	39.51
1403	58	25.74	39.74
1403	42	24.62	37.72
1403	44	24.80	38.07
1403	46	24.93	38.29
1404	0	25.83	39.92
1404	2	25.92	40.05
1404	4	26.03	40.25
1404	6	26.10	40.37
1404	8	26.20	40.56
1404	10	26.28	40.70
1404	12	26.38	40.87
1404	14	26.47	41.01
1404	16	26.55	41.18
1404	18	26.61	41.25
1404	20	26.69	41.38
1404	22	26.79	41.54
1404	24	26.86	41.65
1404	26	26.97	41.76
1404	28	27.03	41.92
1404	30	27.12	42.08
1404	32	27.20	42.17
1404	34	27.28	42.31
1404	36	27.37	42.42
1404	38	27.45	42.54
1404	40	27.48	42.61
1404	42	27.58	42.73
1404	44	27.66	42.83
1404	46	27.71	42.96
1404	48	27.77	43.02

Evapotranspiration Data
August 2,2002 SITE 2A

Time	sec	Temp wet	Temp dry
1407	18	24.49	35.63
1407	20	24.39	35.40
1407	22	24.32	35.34
1407	24	24.28	35.45
1407	26	24.33	35.62
1407	28	24.39	35.86
1407	30	24.48	36.13
1407	32	24.58	36.46
1407	34	24.74	36.79
1407	36	24.86	37.06
1407	38	25.00	37.37
1407	40	25.12	37.63
1407	42	25.30	38.00
1407	44	25.44	38.26
1407	46	25.58	38.52
1407	48	25.73	38.83
1407	50	25.87	39.06
1407	52	26.00	39.30
1407	54	26.11	39.51
1407	56	26.28	39.80
1407	58	26.37	39.98
1408	0	26.51	40.21
1408	2	26.61	40.39
1408	4	26.72	40.58
1408	6	26.86	40.83
1408	8	26.94	40.97
1408	10	27.04	41.14
1408	12	27.12	41.28
1408	14	27.23	41.44
1408	16	27.34	41.61
1408	18	27.43	41.77
1408	20	27.55	41.93
1408	22	27.61	42.06
1408	24	27.70	42.19
1408	26	27.80	42.30
1408	28	27.85	42.45
1408	30	27.93	42.53
1408	32	28.01	42.68
1408	34	28.06	42.74
1408	36	28.11	42.85
1408	38	28.21	43.02
1408	40	28.28	43.07
1408	42	28.38	43.25
1408	44	28.45	43.35
1408	46	28.48	43.39
1408	48	28.57	43.51
1408	50	28.64	43.59
1408	52	28.70	43.72
1408	54	28.77	43.81

Evapotranspiration Data
July 2, 2003 SITE 1

Time	sec	Temp wet	Temp dry
919	8	17.41	25.98
919	10	17.32	25.97
919	12	17.24	25.94
919	14	17.24	25.95
919	16	17.32	26.02
919	18	17.40	26.10
919	20	17.53	26.19
919	22	17.68	26.26
919	24	17.81	26.33
919	26	17.97	26.41
919	28	18.12	26.48
919	30	18.27	26.55
919	32	18.40	26.61
919	34	18.53	26.64
919	36	18.64	26.70
919	38	18.76	26.74
919	40	18.89	26.81
919	42	18.97	26.83
919	44	19.03	26.88
919	46	19.13	26.93
919	48	19.23	26.97
919	50	19.29	27.01
919	52	19.35	27.04
919	54	19.43	27.10
919	56	19.47	27.13
919	58	19.53	27.17
920	0	19.60	27.22
920	2	19.65	27.26
920	4	19.71	27.32
920	6	19.77	27.34
920	8	19.80	27.38
920	10	19.88	27.43
920	12	19.92	27.46
920	14	19.98	27.52
920	16	20.03	27.54
920	18	20.07	27.58
920	20	20.12	27.60
920	22	20.18	27.66
920	24	20.19	27.67
920	26	20.25	27.71
920	28	20.31	27.76
920	30	20.33	27.79
920	32	20.36	27.82
920	34	20.37	27.85
920	36	20.42	27.88
920	38	20.44	27.89
920	40	20.48	27.92
920	42	20.51	27.96
920	44	20.55	27.98

Table C.3
Evapotranspiration Data
July 2,2003 SITE 1

Time	sec	Temp wet	Temp dry
1153	32	20.65	31.34
1153	34	20.63	31.28
1153	36	20.65	31.34
1153	38	20.74	31.48
1153	40	20.87	31.61
1153	42	21.06	31.78
1153	44	21.24	31.95
1153	46	21.43	32.10
1153	48	21.63	32.24
1153	50	21.82	32.39
1153	52	22.02	32.55
1153	54	22.21	32.69
1153	56	22.35	32.80
1153	58	22.52	32.90
1154	0	22.67	33.05
1154	2	22.82	33.16
1154	4	22.95	33.27
1154	6	23.10	33.38
1154	8	23.23	33.50
1154	10	23.35	33.59
1154	12	23.46	33.66
1154	14	23.60	33.77
1154	16	23.71	33.88
1154	18	23.82	33.95
1154	20	23.92	34.02
1154	22	24.02	34.10
1154	24	24.11	34.17
1154	26	24.21	34.28
1154	28	24.25	34.31
1154	30	24.34	34.37
1154	32	24.43	34.47
1154	34	24.49	34.51
1154	36	24.58	34.58
1154	38	24.66	34.62
1154	40	24.71	34.69
1154	42	24.78	34.74
1154	44	24.83	34.80
1154	46	24.88	34.84
1154	48	24.94	34.89
1154	50	25.00	34.93
1154	52	25.00	34.94
1154	54	25.06	35.02
1154	56	25.10	35.04
1154	58	25.11	35.10
1155	0	25.14	35.14
1155	2	25.17	35.17
1155	4	25.22	35.22
1155	6	25.24	35.25

Evapotranspiration Data
July 2, 2003 SITE 2A

Time	sec	Temp wet	Temp dry
924	44	17.50	26.39
924	46	17.42	26.33
924	48	17.33	26.23
924	50	17.52	26.09
924	52	17.76	25.87
924	54	18.07	25.69
924	56	18.35	25.51
924	58	18.63	25.33
925	0	18.90	25.19
925	2	19.16	25.05
925	4	19.41	24.94
925	6	19.66	24.86
925	8	19.90	24.79
925	10	20.10	24.71
925	12	20.30	24.65
925	14	20.45	24.59
925	16	20.61	24.56
925	18	20.74	24.52
925	20	20.85	24.49
925	22	20.97	24.47
925	24	21.05	24.43
925	26	21.16	24.44
925	28	21.22	24.42
925	30	21.30	24.40
925	32	21.39	24.42
925	34	21.46	24.39
925	36	21.50	24.40
925	38	21.57	24.41
925	40	21.60	24.40
925	42	21.65	24.42
925	44	21.67	24.41
925	46	21.71	24.44
925	48	21.76	24.44
925	50	21.78	24.47
925	52	21.84	24.45
925	54	21.88	24.46
925	56	21.93	24.47
925	58	21.96	24.49
926	0	21.97	24.51
926	2	22.01	24.52
926	4	22.03	24.54
926	6	22.02	24.55
926	8	22.04	24.56
926	10	22.03	24.56
926	12	22.10	24.63
926	14	22.10	24.65
926	16	22.15	24.66
926	18	22.16	24.68
926	20	22.19	24.68

Evapotranspiration Data
July 2, 2003 SITE 2A

Time	sec	Temp wet	Temp dry
1156	34	22.30	32.63
1156	36	22.22	32.48
1156	38	22.14	32.23
1156	40	22.46	32.00
1156	42	22.76	31.76
1156	44	23.17	31.60
1156	46	23.52	31.37
1156	48	23.83	31.21
1156	50	24.16	31.04
1156	52	24.31	30.90
1156	54	24.46	30.74
1156	56	24.68	30.60
1156	58	24.77	30.48
1157	0	24.96	30.39
1157	2	25.19	30.33
1157	4	25.47	30.26
1157	6	25.69	30.20
1157	8	25.84	30.16
1157	10	26.06	30.15
1157	12	26.20	30.11
1157	14	26.32	30.08
1157	16	26.40	30.05
1157	18	26.52	30.04
1157	20	26.64	30.05
1157	22	26.71	30.02
1157	24	26.77	30.00
1157	26	26.87	30.03
1157	28	26.93	30.01
1157	30	27.04	30.03
1157	32	27.08	30.02
1157	34	27.15	30.05
1157	36	27.26	30.05
1157	38	27.29	30.05
1157	40	27.32	30.05
1157	42	27.36	30.06
1157	44	27.37	30.07
1157	46	27.39	30.08
1157	48	27.43	30.08
1157	50	27.47	30.11
1157	52	27.50	30.13
1157	54	27.47	30.12
1157	56	27.52	30.15
1157	58	27.55	30.18
1158	0	27.55	30.17
1158	2	27.58	30.17
1158	4	27.67	30.20
1158	6	27.70	30.22
1158	8	27.72	30.22
1158	10	27.75	30.20

Table C.3 (cont)

Evapotranspiration Data
July 2, 2003 SITE 2C

Time	sec	Temp wet	Temp dry
934	32	17.89	25.88
934	34	17.86	25.81
934	36	17.87	25.81
934	38	17.77	25.77
934	40	17.95	25.70
934	42	18.08	25.69
934	44	18.16	25.68
934	46	18.21	25.66
934	48	18.27	25.66
934	50	18.50	25.63
934	52	18.65	25.62
934	54	18.86	25.58
934	56	19.08	25.57
934	58	19.34	25.55
935	0	19.54	25.54
935	2	19.80	25.55
935	4	20.04	25.55
935	6	20.26	25.52
935	8	20.52	25.54
935	10	20.74	25.54
935	12	21.00	25.54
935	14	21.18	25.54
935	16	21.36	25.55
935	18	21.55	25.55
935	20	21.69	25.55
935	22	21.80	25.53
935	24	21.94	25.55
935	26	22.08	25.56
935	28	22.17	25.54
935	30	22.25	25.51
935	32	22.32	25.51
935	34	22.39	25.49
935	36	22.48	25.47
935	38	22.55	25.48
935	40	22.56	25.48
935	42	22.64	25.51
935	44	22.76	25.56
935	46	22.83	25.56
935	48	22.90	25.59
935	50	22.93	25.57
935	52	23.01	25.60
935	54	23.05	25.62
935	56	23.10	25.64
935	58	23.11	25.66
936	0	23.14	25.70
936	2	23.21	25.76
936	4	23.24	25.79
936	6	23.29	25.84
936	8	23.35	25.93

Evapotranspiration Data
July 2, 2003 SITE 2C

Time	sec	Temp wet	Temp dry
1200	28	20.15	30.27
1200	30	20.17	30.20
1200	32	20.21	30.14
1200	34	20.22	30.11
1200	36	20.27	30.04
1200	38	20.22	30.01
1200	40	20.22	29.95
1200	42	20.17	29.88
1200	44	20.69	29.85
1200	46	20.61	29.80
1200	48	20.91	29.79
1200	50	21.19	29.77
1200	52	21.52	29.73
1200	54	21.85	29.75
1200	56	22.14	29.73
1200	58	22.42	29.75
1201	0	22.73	29.76
1201	2	22.98	29.79
1201	4	23.27	29.82
1201	6	23.45	29.87
1201	8	23.70	29.89
1201	10	23.89	29.92
1201	12	24.63	29.97
1201	14	24.67	30.04
1201	16	24.99	30.06
1201	18	25.21	30.11
1201	20	25.39	30.13
1201	22	25.54	30.13
1201	24	25.67	30.14
1201	26	25.81	30.17
1201	28	25.99	30.22
1201	30	25.96	30.24
1201	32	26.08	30.28
1201	34	26.05	30.30
1201	36	26.18	30.35
1201	38	26.23	30.37
1201	40	26.32	30.40
1201	42	26.39	30.43
1201	44	26.46	30.45
1201	46	26.56	30.48
1201	48	26.66	30.50
1201	50	26.72	30.51
1201	52	26.75	30.55
1201	54	26.85	30.60
1201	56	26.86	30.60
1201	58	26.92	30.66
1202	0	26.93	30.65
1202	2	27.02	30.73
1202	4	27.04	30.74

Evapotranspiration Data
July 11, 2003 SITE 1

Time	sec	Temp wet	Temp dry
2109	2	15.60	19.90
2109	4	15.55	19.83
2109	6	15.53	19.80
2109	8	15.50	19.76
2109	10	15.46	19.71
2109	12	15.44	19.65
2109	14	15.42	19.59
2109	16	15.41	19.55
2109	18	15.40	19.50
2109	20	15.40	19.47
2109	22	15.40	19.44
2109	24	15.39	19.39
2109	26	15.40	19.36
2109	28	15.40	19.33
2109	30	15.39	19.29
2109	32	15.39	19.26
2109	34	15.39	19.23
2109	36	15.40	19.20
2109	38	15.41	19.18
2109	40	15.46	19.15
2109	42	15.47	19.13
2109	44	15.47	19.09
2109	46	15.45	19.08
2109	48	15.43	19.04
2109	50	15.44	19.01
2109	52	15.45	19.01
2109	54	15.45	18.99
2109	56	15.45	18.97
2109	58	15.44	18.94
2110	0	15.44	18.93
2110	2	15.43	18.88
2110	4	15.42	18.88
2110	6	15.41	18.85
2110	8	15.44	18.86
2110	10	15.41	18.81
2110	12	15.40	18.81
2110	14	15.41	18.78
2110	16	15.40	18.77
2110	18	15.38	18.74
2110	20	15.39	18.74
2110	22	15.37	18.72
2110	24	15.36	18.71
2110	26	15.36	18.68
2110	28	15.36	18.67
2110	30	15.32	18.65
2110	32	15.35	18.64
2110	34	15.34	18.63
2110	36	15.33	18.61
2110	38	15.30	18.57

Table C.3 (cont)

Evapotranspiration Data
July 11, 2003 SITE 2A

Time	sec	Temp wet	Temp dry
2114	10	13.84	17.44
2114	12	13.82	17.43
2114	14	13.80	17.43
2114	16	13.79	17.40
2114	18	13.79	17.32
2114	20	13.79	17.21
2114	22	13.81	17.10
2114	24	13.83	17.01
2114	26	13.86	16.93
2114	28	13.90	16.86
2114	30	13.91	16.79
2114	32	13.94	16.73
2114	34	13.95	16.66
2114	36	14.00	16.62
2114	38	14.02	16.59
2114	40	14.06	16.54
2114	42	14.08	16.50
2114	44	14.10	16.46
2114	46	14.13	16.43
2114	48	14.16	16.41
2114	50	14.18	16.37
2114	52	14.21	16.36
2114	54	14.23	16.33
2114	56	14.25	16.33
2114	58	14.27	16.31
2115	0	14.28	16.27
2115	2	14.28	16.25
2115	4	14.30	16.24
2115	6	14.30	16.23
2115	8	14.32	16.20
2115	10	14.34	16.19
2115	12	14.37	16.20
2115	14	14.39	16.19
2115	16	14.38	16.18
2115	18	14.37	16.15
2115	20	14.40	16.17
2115	22	14.41	16.15
2115	24	14.41	16.15
2115	26	14.40	16.13
2115	28	14.41	16.13
2115	30	14.42	16.13
2115	32	14.43	16.12
2115	34	14.44	16.13
2115	36	14.43	16.12
2115	38	14.44	16.10
2115	40	14.45	16.12
2115	42	14.43	16.09
2115	44	14.47	16.10
2115	46	14.45	16.09

Evapotranspiration Data
July 11, 2003 SITE 2B

Time	sec	Temp wet	Temp dry
2117	32	13.18	16.63
2117	34	13.11	16.64
2117	36	13.01	16.61
2117	38	13.18	16.56
2117	40	13.19	16.50
2117	42	13.23	16.42
2117	44	13.27	16.32
2117	46	13.30	16.25
2117	48	13.35	16.20
2117	50	13.36	16.12
2117	52	13.42	16.08
2117	54	13.45	16.04
2117	56	13.49	16.00
2117	58	13.52	15.94
2118	0	13.54	15.91
2118	2	13.57	15.87
2118	4	13.61	15.86
2118	6	13.65	15.84
2118	8	13.67	15.82
2118	10	13.69	15.79
2118	12	13.70	15.78
2118	14	13.73	15.76
2118	16	13.75	15.73
2118	18	13.78	15.74
2118	20	13.78	15.71
2118	22	13.82	15.73
2118	24	13.81	15.68
2118	26	13.82	15.68
2118	28	13.85	15.68
2118	30	13.86	15.68
2118	32	13.88	15.66
2118	34	13.90	15.68
2118	36	13.89	15.66
2118	38	13.88	15.64
2118	40	13.93	15.66
2118	42	13.92	15.66
2118	44	13.93	15.64
2118	46	13.93	15.63
2118	48	13.93	15.65
2118	50	13.94	15.65
2118	52	13.94	15.63
2118	54	13.94	15.63
2118	56	13.95	15.62
2118	58	13.95	15.62
2119	0	13.96	15.62
2119	2	13.97	15.63
2119	4	13.94	15.61
2119	6	13.95	15.62
2119	8	13.95	15.61

Evapotranspiration Data
July 11, 2003 SITE 2C

Time	sec	Temp wet	Temp dry
2121	50	12.90	16.24
2121	52	12.89	16.24
2121	54	12.89	16.25
2121	56	12.89	16.20
2121	58	12.91	16.05
2122	0	12.93	15.88
2122	2	12.98	15.74
2122	4	13.04	15.60
2122	6	13.04	15.44
2122	8	13.06	15.36
2122	10	13.10	15.25
2122	12	13.14	15.16
2122	14	13.14	15.07
2122	16	13.16	14.99
2122	18	13.18	14.94
2122	20	13.21	14.89
2122	22	13.21	14.80
2122	24	13.24	14.79
2122	26	13.24	14.73
2122	28	13.23	14.68
2122	30	13.26	14.67
2122	32	13.27	14.63
2122	34	13.28	14.61
2122	36	13.28	14.56
2122	38	13.30	14.55
2122	40	13.30	14.53
2122	42	13.32	14.50
2122	44	13.32	14.50
2122	46	13.33	14.48
2122	48	13.35	14.47
2122	50	13.34	14.45
2122	52	13.35	14.43
2122	54	13.35	14.43
2122	56	13.34	14.40
2122	58	13.36	14.41
2123	0	13.35	14.38
2123	2	13.33	14.36
2123	4	13.34	14.36
2123	6	13.32	14.34
2123	8	13.34	14.34
2123	10	13.35	14.34
2123	12	13.31	14.31
2123	14	13.34	14.32
2123	16	13.33	14.30
2123	18	13.32	14.28
2123	20	13.32	14.28
2123	22	13.33	14.28
2123	24	13.32	14.27
2123	26	13.32	14.26

Table C.3 (cont)
Evapotranspiration Data
July 24, 2003 SITE 1

Time	sec	Temp wet	Temp dry
628	32	12.50	15.11
628	34	12.44	15.10
628	36	12.36	15.09
628	38	12.30	15.06
628	40	12.25	15.00
628	42	12.25	14.95
628	44	12.26	14.90
628	46	12.29	14.84
628	48	12.29	14.77
628	50	12.34	14.70
628	52	12.40	14.68
628	54	12.43	14.63
628	56	12.50	14.58
628	58	12.54	14.55
629	0	12.58	14.52
629	2	12.64	14.49
629	4	12.68	14.46
629	6	12.71	14.43
629	8	12.77	14.43
629	10	12.77	14.39
629	12	12.82	14.38
629	14	12.85	14.37
629	16	12.87	14.33
629	18	12.92	14.35
629	20	12.93	14.33
629	22	12.95	14.30
629	24	12.96	14.30
629	26	12.95	14.29
629	28	12.92	14.29
629	30	12.93	14.26
629	32	12.92	14.26
629	34	13.06	14.26
629	36	13.12	14.24
629	38	13.14	14.25
629	40	13.16	14.25
629	42	13.16	14.23
629	44	13.16	14.22
629	46	13.18	14.24
629	48	13.21	14.23
629	50	13.19	14.21
629	52	13.20	14.21
629	54	13.21	14.21
629	56	13.22	14.21
629	58	13.21	14.19
630	0	13.23	14.20
630	2	13.21	14.18
630	4	13.23	14.18
630	6	13.24	14.19
630	8	13.23	14.19

Evapotranspiration Data
July 24, 2003 SITE 1

Time	sec	Temp wet	Temp dry
747	22	17.62	23.12
747	24	17.65	23.11
747	26	17.70	23.11
747	28	17.72	23.14
747	30	17.76	23.13
747	32	17.84	23.11
747	34	17.96	23.09
747	36	18.11	23.08
747	38	18.25	23.07
747	40	18.38	23.07
747	42	18.54	23.05
747	44	18.68	23.06
747	46	18.82	23.04
747	48	18.97	23.07
747	50	19.07	23.03
747	52	19.17	23.03
747	54	19.30	23.06
747	56	19.42	23.09
747	58	19.49	23.06
748	0	19.59	23.07
748	2	19.69	23.10
748	4	19.76	23.10
748	6	19.86	23.12
748	8	19.94	23.14
748	10	20.01	23.14
748	12	20.10	23.16
748	14	20.17	23.19
748	16	20.24	23.19
748	18	20.31	23.22
748	20	20.36	23.22
748	22	20.43	23.26
748	24	20.48	23.27
748	26	20.52	23.28
748	28	20.59	23.31
748	30	20.60	23.31
748	32	20.66	23.35
748	34	20.70	23.36
748	36	20.74	23.38
748	38	20.79	23.41
748	40	20.82	23.43
748	42	20.86	23.44
748	44	20.89	23.47
748	46	20.89	23.48
748	48	20.95	23.51
748	50	21.00	23.53
748	52	21.00	23.54
748	54	21.05	23.57
748	56	21.10	23.60
748	58	21.11	23.61

Evapotranspiration Data
July 24, 2003 SITE 1

Time	sec	Temp wet	Temp dry
1000	42	20.51	29.53
1000	44	20.51	29.54
1000	46	20.52	29.55
1000	48	20.55	29.55
1000	50	20.59	29.62
1000	52	20.75	29.81
1000	54	20.93	29.94
1000	56	21.09	30.11
1000	58	21.29	30.24
1001	0	21.49	30.41
1001	2	21.69	30.58
1001	4	21.87	30.68
1001	6	22.07	30.84
1001	8	22.24	30.95
1001	10	22.41	31.09
1001	12	22.57	31.19
1001	14	22.70	31.28
1001	16	22.84	31.36
1001	18	22.97	31.48
1001	20	23.11	31.59
1001	22	23.23	31.68
1001	24	23.34	31.77
1001	26	23.41	31.82
1001	28	23.48	31.88
1001	30	23.56	31.95
1001	32	23.61	32.03
1001	34	23.67	32.07
1001	36	23.73	32.13
1001	38	23.77	32.20
1001	40	23.84	32.28
1001	42	23.90	32.33
1001	44	23.94	32.37
1001	46	23.98	32.42
1001	48	24.02	32.46
1001	50	24.08	32.51
1001	52	24.11	32.53
1001	54	24.14	32.59
1001	56	24.19	32.64
1001	58	24.23	32.68
1002	0	24.28	32.74
1002	2	24.33	32.77
1002	4	24.36	32.83
1002	6	24.40	32.85
1002	8	24.43	32.91
1002	10	24.47	32.96
1002	12	24.51	32.97
1002	14	24.60	33.06
1002	16	24.62	33.11
1002	18	24.66	33.13

Table C.3 (cont)

Evapotranspiration Data
July 24, 2003 SITE 1

Time	sec	Temp wet	Temp dry
1358	38	25.46	37.22
1358	40	25.42	37.18
1358	42	25.40	37.08
1358	44	25.35	36.99
1358	46	25.30	36.98
1358	48	25.35	37.07
1358	50	25.44	37.20
1358	52	25.57	37.36
1358	54	25.72	37.54
1358	56	25.86	37.70
1358	58	26.02	37.84
1359	0	26.19	38.02
1359	2	26.35	38.14
1359	4	26.49	38.27
1359	6	26.63	38.39
1359	8	26.75	38.49
1359	10	26.90	38.63
1359	12	27.04	38.75
1359	14	27.14	38.84
1359	16	27.24	38.93
1359	18	27.33	38.99
1359	20	27.44	39.08
1359	22	27.53	39.14
1359	24	27.62	39.20
1359	26	27.69	39.28
1359	28	27.74	39.29
1359	30	27.82	39.32
1359	32	27.90	39.39
1359	34	27.93	39.38
1359	36	27.99	39.41
1359	38	28.00	39.40
1359	40	28.02	39.40
1359	42	28.05	39.42
1359	44	28.10	39.47
1359	46	28.13	39.47
1359	48	28.13	39.47
1359	50	28.14	39.51
1359	52	28.16	39.52
1359	54	28.20	39.55
1359	56	28.21	39.56
1359	58	28.23	39.58
1400	0	28.24	39.64
1400	2	28.29	39.67
1400	4	28.28	39.71
1400	6	28.33	39.77
1400	8	28.35	39.84
1400	10	28.39	39.85
1400	12	28.44	39.90
1400	14	28.49	39.98

Evapotranspiration Data
July 24, 2003 SITE 1

Time	sec	Temp wet	Temp dry
1547	42	20.80	30.15
1547	44	20.75	30.08
1547	46	20.77	30.09
1547	48	20.72	30.06
1547	50	20.68	30.05
1547	52	20.69	30.06
1547	54	20.72	30.08
1547	56	20.77	30.08
1547	58	20.84	30.12
1548	0	20.88	30.14
1548	2	20.93	30.19
1548	4	21.01	30.19
1548	6	21.08	30.25
1548	8	21.15	30.25
1548	10	21.21	30.30
1548	12	21.27	30.31
1548	14	21.34	30.34
1548	16	21.42	30.41
1548	18	21.44	30.42
1548	20	21.51	30.44
1548	22	21.56	30.49
1548	24	21.60	30.48
1548	26	21.65	30.52
1548	28	21.69	30.55
1548	30	21.71	30.54
1548	32	21.76	30.58
1548	34	21.81	30.62
1548	36	21.82	30.63
1548	38	21.88	30.66
1548	40	21.91	30.68
1548	42	21.94	30.68
1548	44	21.95	30.68
1548	46	21.95	30.71
1548	48	22.03	30.76
1548	50	22.04	30.76
1548	52	22.06	30.77
1548	54	22.08	30.75
1548	56	22.09	30.80
1548	58	22.14	30.81
1549	0	22.16	30.85
1549	2	22.18	30.83
1549	4	22.20	30.82
1549	6	22.23	30.86
1549	8	22.26	30.85
1549	10	22.29	30.90
1549	12	22.28	30.90
1549	14	22.29	30.88
1549	16	22.31	30.91
1549	18	22.35	30.96

Evapotranspiration Data
July 24, 2003 SITE 2A

Time	sec	Temp wet	Temp dry
634	34	12.73	15.37
634	36	12.77	15.40
634	38	12.77	15.39
634	40	12.80	15.38
634	42	12.76	15.35
634	44	12.68	15.29
634	46	12.68	15.17
634	48	12.70	15.08
634	50	12.71	14.96
634	52	12.76	14.91
634	54	12.79	14.84
634	56	12.80	14.76
634	58	12.87	14.73
635	0	12.91	14.66
635	2	12.95	14.63
635	4	12.99	14.57
635	6	13.00	14.53
635	8	13.06	14.52
635	10	13.09	14.49
635	12	13.11	14.47
635	14	13.15	14.43
635	16	13.17	14.41
635	18	13.19	14.40
635	20	13.23	14.39
635	22	13.23	14.37
635	24	13.27	14.38
635	26	13.27	14.35
635	28	13.30	14.33
635	30	13.30	14.33
635	32	13.31	14.31
635	34	13.34	14.31
635	36	13.33	14.29
635	38	13.33	14.29
635	40	13.34	14.27
635	42	13.36	14.25
635	44	13.34	14.26
635	46	13.35	14.24
635	48	13.36	14.25
635	50	13.34	14.25
635	52	13.36	14.23
635	54	13.35	14.23
635	56	13.37	14.24
635	58	13.35	14.22
636	0	13.36	14.21
636	2	13.38	14.23
636	4	13.38	14.22
636	6	13.36	14.20
636	8	13.35	14.19
636	10	13.35	14.20

Table C.3 (cont)
Evapotranspiration Data
July 24, 2003 SITE 2A

Time	sec	Temp wet	Temp dry
751	22	18.35	24.23
751	24	18.38	24.23
751	26	18.39	24.22
751	28	18.38	24.16
751	30	18.37	24.12
751	32	18.43	24.06
751	34	18.54	24.04
751	36	18.68	23.97
751	38	18.87	23.92
751	40	19.09	23.89
751	42	19.31	23.82
751	44	19.52	23.78
751	46	19.66	23.75
751	48	19.83	23.71
751	50	19.93	23.67
751	52	20.09	23.65
751	54	20.16	23.62
751	56	20.30	23.61
751	58	20.37	23.56
752	0	20.49	23.59
752	2	20.55	23.57
752	4	20.65	23.57
752	6	20.73	23.57
752	8	20.79	23.54
752	10	20.86	23.57
752	12	20.88	23.54
752	14	20.91	23.54
752	16	20.95	23.54
752	18	20.96	23.53
752	20	21.01	23.51
752	22	21.07	23.54
752	24	21.10	23.53
752	26	21.11	23.52
752	28	21.18	23.54
752	30	21.17	23.53
752	32	21.18	23.53
752	34	21.20	23.52
752	36	21.19	23.53
752	38	21.21	23.52
752	40	21.23	23.53
752	42	21.21	23.51
752	44	21.23	23.53
752	46	21.25	23.55
752	48	21.27	23.54
752	50	21.24	23.52
752	52	21.24	23.53
752	54	21.27	23.53
752	56	21.29	23.56
752	58	21.32	23.57

Evapotranspiration Data
July 24, 2003 SITE 2A

Time	sec	Temp wet	Temp dry
1004	44	22.06	31.49
1004	46	22.09	31.48
1004	48	22.15	31.51
1004	50	22.28	31.60
1004	52	22.45	31.72
1004	54	22.60	31.74
1004	56	22.79	31.81
1004	58	23.00	31.88
1005	0	23.25	31.99
1005	2	23.42	32.02
1005	4	23.61	32.10
1005	6	23.82	32.19
1005	8	23.97	32.21
1005	10	24.18	32.31
1005	12	24.34	32.37
1005	14	24.52	32.41
1005	16	24.64	32.44
1005	18	24.84	32.54
1005	20	24.96	32.58
1005	22	25.06	32.59
1005	24	25.16	32.66
1005	26	25.26	32.74
1005	28	25.33	32.76
1005	30	25.40	32.79
1005	32	25.47	32.84
1005	34	25.54	32.90
1005	36	25.57	32.89
1005	38	25.62	32.97
1005	40	25.66	33.02
1005	42	25.68	33.02
1005	44	25.69	33.03
1005	46	25.75	33.12
1005	48	25.79	33.12
1005	50	25.85	33.20
1005	52	25.87	33.20
1005	54	25.93	33.24
1005	56	25.97	33.28
1005	58	26.01	33.32
1006	0	26.03	33.35
1006	2	26.03	33.37
1006	4	26.05	33.40
1006	6	26.07	33.46
1006	8	26.08	33.47
1006	10	26.12	33.52
1006	12	26.15	33.57
1006	14	26.17	33.56
1006	16	26.21	33.61
1006	18	26.29	33.64
1006	20	26.33	33.68

Evapotranspiration Data
July 24, 2003 SITE 2A

Time	sec	Temp wet	Temp dry
1402	56	24.91	36.81
1402	58	24.92	36.76
1403	0	24.94	36.73
1403	2	24.95	36.68
1403	4	24.96	36.66
1403	6	24.98	36.65
1403	8	24.96	36.65
1403	10	24.99	36.72
1403	12	25.04	36.74
1403	14	25.12	36.82
1403	16	25.20	36.85
1403	18	25.31	36.92
1403	20	25.40	36.96
1403	22	25.48	37.01
1403	24	25.61	37.07
1403	26	25.75	37.16
1403	28	25.87	37.22
1403	30	25.98	37.27
1403	32	26.09	37.36
1403	34	26.20	37.41
1403	36	26.30	37.46
1403	38	26.40	37.53
1403	40	26.50	37.60
1403	42	26.58	37.64
1403	44	26.67	37.74
1403	46	26.73	37.79
1403	48	26.81	37.83
1403	50	26.83	37.90
1403	52	26.88	37.97
1403	54	26.91	37.99
1403	56	26.93	38.04
1403	58	26.92	38.09
1404	0	26.95	38.15
1404	2	26.94	38.16
1404	4	26.87	38.21
1404	6	26.80	38.22
1404	8	26.77	38.29
1404	10	26.77	38.32
1404	12	26.80	38.39
1404	14	26.81	38.40
1404	16	26.83	38.45
1404	18	26.90	38.52
1404	20	26.89	38.54
1404	22	26.94	38.57
1404	24	27.00	38.65
1404	26	27.02	38.64
1404	28	27.09	38.71
1404	30	27.11	38.74
1404	32	27.12	38.78

Table C.3 (cont)

Evapotranspiration Data
July 24, 2003 SITE 2A

Time	sec	Temp wet	Temp dry
1551	40	20.91	29.94
1551	42	20.90	29.92
1551	44	20.86	29.88
1551	46	20.76	29.83
1551	48	20.69	29.79
1551	50	20.64	29.70
1551	52	20.65	29.68
1551	54	20.66	29.63
1551	56	20.69	29.62
1551	58	20.74	29.60
1552	0	20.83	29.59
1552	2	20.90	29.58
1552	4	20.98	29.56
1552	6	21.04	29.55
1552	8	21.11	29.53
1552	10	21.19	29.51
1552	12	21.25	29.51
1552	14	21.31	29.51
1552	16	21.38	29.53
1552	18	21.44	29.53
1552	20	21.51	29.55
1552	22	21.56	29.54
1552	24	21.63	29.55
1552	26	21.65	29.54
1552	28	21.69	29.55
1552	30	21.73	29.54
1552	32	21.75	29.54
1552	34	21.79	29.56
1552	36	21.83	29.59
1552	38	21.83	29.56
1552	40	21.87	29.58
1552	42	21.90	29.57
1552	44	21.93	29.58
1552	46	21.94	29.61
1552	48	21.97	29.59
1552	50	21.96	29.59
1552	52	21.98	29.59
1552	54	22.01	29.62
1552	56	22.00	29.62
1552	58	22.00	29.60
1553	0	22.00	29.60
1553	2	22.00	29.62
1553	4	22.00	29.64
1553	6	21.98	29.62
1553	8	22.01	29.65
1553	10	22.01	29.66
1553	12	22.00	29.64
1553	14	21.98	29.65
1553	16	21.99	29.65

Evapotranspiration Data
July 24, 2003 SITE 2B

Time	sec	Temp wet	Temp dry
638	26	12.45	15.21
638	28	12.44	15.24
638	30	12.44	15.24
638	32	12.49	15.13
638	34	12.57	14.99
638	36	12.69	14.86
638	38	12.79	14.71
638	40	12.89	14.60
638	42	12.98	14.49
638	44	13.05	14.40
638	46	13.13	14.33
638	48	13.19	14.27
638	50	13.26	14.21
638	52	13.29	14.17
638	54	13.33	14.12
638	56	13.39	14.09
638	58	13.40	14.06
639	0	13.45	14.05
639	2	13.47	14.02
639	4	13.50	14.00
639	6	13.53	13.98
639	8	13.55	13.98
639	10	13.58	13.98
639	12	13.57	13.95
639	14	13.62	13.97
639	16	13.62	13.96
639	18	13.67	13.97
639	20	13.65	13.94
639	22	13.68	13.95
639	24	13.69	13.94
639	26	13.72	13.97
639	28	13.72	13.96
639	30	13.72	13.95
639	32	13.74	13.95
639	34	13.75	13.97
639	36	13.77	13.97
639	38	13.77	13.96
639	40	13.77	13.97
639	42	13.77	13.96
639	44	13.78	13.98
639	46	13.80	13.97
639	48	13.81	13.98
639	50	13.83	13.97
639	52	13.82	13.98
639	54	13.83	13.99
639	56	13.83	13.99
639	58	13.84	13.99
640	0	13.85	14.00
640	2	13.85	14.00

Evapotranspiration Data
July 24, 2003 SITE 2B

Time	sec	Temp wet	Temp dry
755	4	18.40	24.47
755	6	18.43	24.45
755	8	18.44	24.48
755	10	18.42	24.47
755	12	18.37	24.47
755	14	18.40	24.42
755	16	18.53	24.26
755	18	18.74	24.02
755	20	19.00	23.79
755	22	19.27	23.57
755	24	19.53	23.33
755	26	19.73	23.13
755	28	19.93	22.99
755	30	20.09	22.83
755	32	20.27	22.70
755	34	20.37	22.57
755	36	20.50	22.49
755	38	20.61	22.42
755	40	20.69	22.33
755	42	20.77	22.27
755	44	20.83	22.21
755	46	20.91	22.19
755	48	20.98	22.13
755	50	21.01	22.11
755	52	21.04	22.09
755	54	21.10	22.07
755	56	21.14	22.03
755	58	21.15	22.01
756	0	21.18	21.99
756	2	21.23	22.01
756	4	21.21	21.97
756	6	21.27	21.99
756	8	21.28	21.97
756	10	21.31	21.96
756	12	21.35	21.98
756	14	21.33	21.97
756	16	21.35	21.97
756	18	21.36	21.97
756	20	21.37	21.96
756	22	21.37	21.97
756	24	21.38	21.97
756	26	21.41	21.97
756	28	21.38	21.98
756	30	21.44	21.99
756	32	21.43	21.98
756	34	21.44	22.00
756	36	21.44	21.99
756	38	21.54	22.01
756	40	21.46	22.00

Table C.3 (cont)
Evapotranspiration Data
July 24, 2003 SITE 2B

Time	sec	Temp wet	Temp dry
1009	4	22.69	31.94
1009	6	22.68	31.88
1009	8	22.67	31.84
1009	10	22.62	31.72
1009	12	22.62	31.61
1009	14	22.73	31.55
1009	16	22.97	31.38
1009	18	23.28	31.26
1009	20	23.60	31.15
1009	22	24.00	31.11
1009	24	24.41	31.12
1009	26	24.75	31.08
1009	28	25.11	31.06
1009	30	25.44	31.05
1009	32	25.78	31.04
1009	34	26.12	31.06
1009	36	26.39	31.08
1009	38	26.65	31.09
1009	40	26.89	31.09
1009	42	27.11	31.12
1009	44	27.31	31.17
1009	46	27.52	31.20
1009	48	27.70	31.22
1009	50	27.84	31.23
1009	52	28.01	31.30
1009	54	28.17	31.33
1009	56	28.28	31.36
1009	58	28.44	31.42
1010	0	28.55	31.43
1010	2	28.65	31.47
1010	4	28.73	31.43
1010	6	28.83	31.35
1010	8	28.91	31.36
1010	10	28.98	31.38

Evapotranspiration Data
July 24, 2003 SITE 2B

Time	sec	Temp wet	Temp dry
1407	12	23.78	34.98
1407	14	23.77	34.89
1407	16	23.78	34.81
1407	18	23.71	34.77
1407	20	23.64	34.65
1407	22	23.70	34.58
1407	24	23.85	34.49
1407	26	24.06	34.40
1407	28	24.32	34.34
1407	30	24.56	34.26
1407	32	24.87	34.24
1407	34	25.11	34.22
1407	36	25.37	34.19
1407	38	25.57	34.14
1407	40	25.80	34.18
1407	42	26.00	34.17
1407	44	26.18	34.15
1407	46	26.37	34.17
1407	48	26.52	34.14
1407	50	26.71	34.20
1407	52	26.85	34.20
1407	54	27.03	34.23
1407	56	27.17	34.26
1407	58	27.33	34.27
1408	0	27.45	34.32
1408	2	27.58	34.35
1408	4	27.69	34.37
1408	6	27.83	34.43
1408	8	27.97	34.46
1408	10	28.04	34.48
1408	12	28.18	34.55
1408	14	28.28	34.57
1408	16	28.38	34.64
1408	18	28.44	34.66
1408	20	28.55	34.75
1408	22	28.61	34.76
1408	24	28.70	34.84
1408	26	28.76	34.89
1408	28	28.83	34.92
1408	30	28.94	35.01
1408	32	29.01	35.07
1408	34	29.06	35.07
1408	36	29.15	35.13
1408	38	29.19	35.16
1408	40	29.27	35.22
1408	42	29.32	35.26
1408	44	29.36	35.33
1408	46	29.41	35.39
1408	48	29.42	35.39

Evapotranspiration Data
July 24, 2003 SITE 2B

Time	sec	Temp wet	Temp dry
1555	10	20.22	29.42
1555	12	20.20	29.42
1555	14	20.22	29.42
1555	16	20.19	29.41
1555	18	20.15	29.36
1555	20	20.18	29.26
1555	22	20.30	29.13
1555	24	20.44	28.96
1555	26	20.62	28.83
1555	28	20.81	28.72
1555	30	20.99	28.63
1555	32	21.13	28.50
1555	34	21.33	28.45
1555	36	21.50	28.36
1555	38	21.64	28.29
1555	40	21.80	28.25
1555	42	21.93	28.19
1555	44	22.10	28.16
1555	46	22.20	28.10
1555	48	22.33	28.07
1555	50	22.43	28.03
1555	52	22.53	28.01
1555	54	22.65	28.01
1555	56	22.70	27.97
1555	58	22.79	27.97
1556	0	22.84	27.94
1556	2	22.92	27.94
1556	4	22.97	27.92
1556	6	23.00	27.91
1556	8	23.01	27.91
1556	10	23.02	27.88
1556	12	23.05	27.89
1556	14	23.06	27.86
1556	16	23.07	27.87
1556	18	23.09	27.85
1556	20	23.08	27.84
1556	22	23.13	27.85
1556	24	23.12	27.83
1556	26	23.18	27.84
1556	28	23.16	27.83
1556	30	23.18	27.82
1556	32	23.18	27.80
1556	34	23.18	27.81
1556	36	23.21	27.80
1556	38	23.21	27.78
1556	40	23.21	27.80
1556	42	23.20	27.79
1556	44	23.21	27.77
1556	46	23.19	27.78

Table C.3 (cont)
Evapotranspiration Data
July 24, 2003 SITE 2C

Time	sec	Temp wet	Temp dry
645	20	13.06	14.99
645	22	13.08	14.93
645	24	13.07	14.94
645	26	13.04	14.98
645	28	13.05	14.92
645	30	13.07	14.83
645	32	13.15	14.72
645	34	13.20	14.61
645	36	13.28	14.51
645	38	13.32	14.43
645	40	13.36	14.35
645	42	13.40	14.27
645	44	13.45	14.23
645	46	13.47	14.18
645	48	13.49	14.12
645	50	13.52	14.07
645	52	13.53	14.05
645	54	13.55	14.03
645	56	13.56	13.97
645	58	13.58	13.97
646	0	13.60	13.95
646	2	13.60	13.92
646	4	13.61	13.91
646	6	13.61	13.90
646	8	13.65	13.89
646	10	13.64	13.87
646	12	13.64	13.87
646	14	13.67	13.87
646	16	13.66	13.86
646	18	13.68	13.86
646	20	13.67	13.84
646	22	13.68	13.85
646	24	13.67	13.84
646	26	13.64	13.84
646	28	13.61	13.83
646	30	13.69	13.83
646	32	13.68	13.82
646	34	13.68	13.81
646	36	13.71	13.83
646	38	13.69	13.83
646	40	13.70	13.83
646	42	13.69	13.82
646	44	13.72	13.82
646	46	13.73	13.82
646	48	13.73	13.82
646	50	13.73	13.82
646	52	13.72	13.80
646	54	13.72	13.80
646	56	13.74	13.81

Evapotranspiration Data
July 24, 2003 SITE 2C

Time	sec	Temp wet	Temp dry
800	24	18.67	23.27
800	26	18.73	23.21
800	28	18.71	23.26
800	30	18.61	23.30
800	32	18.59	23.25
800	34	18.75	23.08
800	36	18.97	22.92
800	38	19.25	22.77
800	40	19.46	22.61
800	42	19.69	22.49
800	44	19.88	22.37
800	46	20.05	22.28
800	48	20.17	22.20
800	50	20.31	22.11
800	52	20.41	22.05
800	54	20.50	21.99
800	56	20.57	21.93
800	58	20.61	21.85
801	0	20.69	21.79
801	2	20.73	21.77
801	4	20.76	21.70
801	6	20.79	21.68
801	8	20.80	21.63
801	10	20.82	21.61
801	12	20.83	21.56
801	14	20.86	21.53
801	16	20.85	21.51
801	18	20.85	21.47
801	20	20.85	21.44
801	22	20.86	21.45
801	24	20.86	21.43
801	26	20.86	21.39
801	28	20.87	21.39
801	30	20.86	21.37
801	32	20.86	21.36
801	34	20.87	21.35
801	36	20.88	21.34
801	38	20.84	21.32
801	40	20.84	21.30
801	42	20.86	21.30
801	44	20.83	21.26
801	46	20.83	21.27
801	48	20.84	21.25
801	50	20.82	21.22
801	52	20.80	21.20
801	54	20.81	21.17
801	56	20.80	21.18
801	58	20.81	21.18
802	0	20.80	21.14

Evapotranspiration Data
July 24, 2003 SITE 2C

Time	sec	Temp wet	Temp dry
1203	26	38.01	35.28
1203	28	37.91	35.18
1203	30	37.92	35.02
1203	32	37.67	34.92
1203	34	37.43	34.89
1203	36	37.50	35.03
1203	38	37.74	35.14
1203	40	38.17	35.26
1203	42	38.69	35.38
1203	44	39.27	35.51
1203	46	39.83	35.62
1203	48	40.39	35.70
1203	50	40.89	35.76
1203	52	41.36	35.85
1203	54	41.82	35.91
1203	56	42.27	36.05
1203	58	42.62	36.09
1204	0	42.95	36.17
1204	2	43.27	36.27
1204	4	43.51	36.32
1204	6	43.72	36.38
1204	8	43.91	36.41
1204	10	44.18	36.51
1204	12	44.33	36.53
1204	14	44.51	36.59
1204	16	44.60	36.62
1204	18	44.75	36.67
1204	20	44.86	36.76
1204	22	44.97	36.82
1204	24	45.01	36.85
1204	26	45.00	36.88
1204	28	45.09	36.91
1204	30	45.14	36.96
1204	32	45.15	37.01
1204	34	45.19	37.02
1204	36	45.24	37.08
1204	38	45.25	37.14
1204	40	45.29	37.20
1204	42	45.30	37.29
1204	44	45.23	37.30
1204	46	45.32	37.36
1204	48	45.29	37.38
1204	50	45.28	37.42
1204	52	45.27	37.46
1204	54	45.23	37.51
1204	56	45.16	37.49
1204	58	45.12	37.48
1205	0	45.12	37.57
1205	2	44.99	37.54

Table C.3 (cont)

Evapotranspiration Data
July 24, 2003 SITE 2C

Time	sec	Temp wet	Temp dry
1412	48	24.19	34.77
1412	50	24.15	34.71
1412	52	24.03	34.59
1412	54	23.94	34.59
1412	56	23.94	34.59
1412	58	24.09	34.69
1413	0	24.38	34.83
1413	2	24.73	34.96
1413	4	25.13	35.11
1413	6	25.56	35.26
1413	8	25.98	35.41
1413	10	26.40	35.53
1413	12	26.79	35.63
1413	14	27.11	35.71
1413	16	27.45	35.84
1413	18	27.71	35.95
1413	20	27.94	36.02
1413	22	28.16	36.11
1413	24	28.38	36.22
1413	26	28.65	36.31
1413	28	28.83	36.38
1413	30	29.07	36.51
1413	32	29.23	36.55
1413	34	29.39	36.60
1413	36	29.53	36.68
1413	38	29.68	36.75
1413	40	29.83	36.78
1413	42	29.99	36.88
1413	44	30.08	36.89
1413	46	30.25	36.99
1413	48	30.34	37.03
1413	50	30.44	37.12
1413	52	30.53	37.18
1413	54	30.61	37.21
1413	56	30.64	37.29
1413	58	30.74	37.31
1414	0	30.78	37.32
1414	2	30.84	37.39
1414	4	30.86	37.40
1414	6	30.94	37.48
1414	8	30.94	37.48
1414	10	30.97	37.51
1414	12	31.00	37.55
1414	14	31.00	37.57
1414	16	31.02	37.60
1414	18	31.04	37.62
1414	20	31.11	37.69
1414	22	31.10	37.69
1414	24	31.11	37.71

Evapotranspiration Data
July 24, 2003 SITE 2C

Time	sec	Temp wet	Temp dry
1600	12	19.98	28.17
1600	14	19.98	28.19
1600	16	19.98	28.23
1600	18	19.96	28.22
1600	20	19.97	28.16
1600	22	20.05	28.04
1600	24	20.20	27.90
1600	26	20.37	27.78
1600	28	20.52	27.64
1600	30	20.72	27.55
1600	32	20.90	27.46
1600	34	21.05	27.38
1600	36	21.17	27.32
1600	38	21.32	27.27
1600	40	21.46	27.22
1600	42	21.57	27.15
1600	44	21.70	27.14
1600	46	21.80	27.11
1600	48	21.91	27.07
1600	50	21.99	27.05
1600	52	22.05	27.00
1600	54	22.12	26.98
1600	56	22.18	26.97
1600	58	22.23	26.96
1601	0	22.31	26.93
1601	2	22.35	26.93
1601	4	22.41	26.92
1601	6	22.44	26.91
1601	8	22.49	26.91
1601	10	22.54	26.91
1601	12	22.58	26.88
1601	14	22.59	26.86
1601	16	22.65	26.89
1601	18	22.67	26.87
1601	20	22.70	26.86
1601	22	22.75	26.87
1601	24	22.76	26.85
1601	26	22.80	26.85
1601	28	22.83	26.85
1601	30	22.84	26.85
1601	32	22.86	26.85
1601	34	22.86	26.83
1601	36	22.88	26.83
1601	38	22.91	26.83
1601	40	22.92	26.83
1601	42	22.95	26.83
1601	44	22.96	26.80
1601	46	22.97	26.83
1601	48	22.97	26.83

Evapotranspiration Data
July 30, 2003 SITE 1

Time	sec	Temp wet	Temp dry
1449	30	23.46	33.08
1449	32	23.35	33.03
1449	34	23.28	33.00
1449	36	23.28	33.03
1449	38	23.32	33.13
1449	40	23.43	33.34
1449	42	23.57	33.53
1449	44	23.70	33.73
1449	46	23.86	33.95
1449	48	23.99	34.12
1449	50	24.14	34.30
1449	52	24.32	34.54
1449	54	24.50	34.73
1449	56	24.67	34.93
1449	58	24.83	35.12
1450	0	25.03	35.33
1450	2	25.19	35.45
1450	4	25.33	35.64
1450	6	25.45	35.79
1450	8	25.60	35.93
1450	10	25.78	36.13
1450	12	25.91	36.24
1450	14	26.05	36.39
1450	16	26.21	36.55
1450	18	26.29	36.64
1450	20	26.45	36.79
1450	22	26.53	36.87
1450	24	26.68	37.01
1450	26	26.78	37.16
1450	28	26.89	37.24
1450	30	26.98	37.30
1450	32	27.11	37.41
1450	34	27.19	37.52
1450	36	27.26	37.62
1450	38	27.32	37.65
1450	40	27.39	37.72
1450	42	27.48	37.80
1450	44	27.55	37.88
1450	46	27.62	37.92
1450	48	27.69	37.97
1450	50	27.73	38.03
1450	52	27.78	38.09
1450	54	27.79	38.10
1450	56	27.78	38.11
1450	58	27.77	38.16
1451	0	27.72	38.12
1451	2	27.75	38.15
1451	4	27.74	38.15
1451	6	27.75	38.16

Table C.3 (cont)

Evapotranspiration Data
July 30, 2003 SITE 1

Time	sec	Temp wet	Temp dry
1555	50	17.73	24.64
1555	52	17.69	24.59
1555	54	17.68	24.53
1555	56	17.68	24.56
1555	58	17.67	24.57
1556	0	17.71	24.59
1556	2	17.72	24.59
1556	4	17.80	24.64
1556	6	17.83	24.64
1556	8	17.90	24.69
1556	10	17.96	24.73
1556	12	18.01	24.73
1556	14	18.06	24.78
1556	16	18.10	24.80
1556	18	18.16	24.82
1556	20	18.22	24.85
1556	22	18.28	24.89
1556	24	18.34	24.90
1556	26	18.38	24.94
1556	28	18.43	24.96
1556	30	18.48	24.99
1556	32	18.49	24.99
1556	34	18.52	25.00
1556	36	18.56	25.03
1556	38	18.59	25.05
1556	40	18.63	25.08
1556	42	18.66	25.10
1556	44	18.68	25.10
1556	46	18.71	25.12
1556	48	18.75	25.17
1556	50	18.75	25.15
1556	52	18.77	25.17
1556	54	18.82	25.19
1556	56	18.85	25.21
1556	58	18.88	25.23
1557	0	18.89	25.26
1557	2	18.89	25.25
1557	4	18.94	25.26
1557	6	18.94	25.27
1557	8	18.97	25.30
1557	10	18.99	25.31
1557	12	19.01	25.31
1557	14	19.04	25.34
1557	16	19.07	25.36
1557	18	19.07	25.35
1557	20	19.11	25.38
1557	22	19.11	25.39
1557	24	19.12	25.38
1557	26	19.14	25.41

Evapotranspiration Data
July 30, 2003 SITE 2A

Time	sec	Temp wet	Temp dry
1452	56	22.65	31.59
1452	58	22.51	31.49
1453	0	22.40	31.44
1453	2	22.40	31.32
1453	4	22.39	31.33
1453	6	22.48	31.37
1453	8	22.51	31.33
1453	10	22.62	31.37
1453	12	22.65	31.34
1453	14	22.74	31.37
1453	16	22.79	31.35
1453	18	22.87	31.37
1453	20	22.93	31.37
1453	22	23.02	31.37
1453	24	23.08	31.36
1453	26	23.13	31.38
1453	28	23.11	31.33
1453	30	23.13	31.37
1453	32	23.10	31.32
1453	34	23.08	31.29
1453	36	23.04	31.27
1453	38	23.00	31.24
1453	40	22.92	31.17
1453	42	22.86	31.15
1453	44	22.78	31.08
1453	46	22.77	31.08
1453	48	22.77	31.07
1453	50	22.76	31.05
1453	52	22.80	31.04
1453	54	22.83	31.02
1453	56	22.83	30.98
1453	58	22.87	30.99
1454	0	22.91	30.98
1454	2	22.89	30.93
1454	4	22.91	30.93
1454	6	22.91	30.91
1454	8	22.94	30.91
1454	10	22.94	30.89
1454	12	22.99	30.86
1454	14	23.00	30.84
1454	16	22.99	30.81
1454	18	22.99	30.78
1454	20	23.00	30.78
1454	22	22.98	30.77
1454	24	22.95	30.75
1454	26	22.93	30.71
1454	28	22.89	30.72
1454	30	22.87	30.68
1454	32	22.87	30.71

Evapotranspiration Data
July 30, 2003 SITE 2A

Time	sec	Temp wet	Temp dry
1558	30	17.45	24.26
1558	32	17.42	24.24
1558	34	17.40	24.21
1558	36	17.37	24.15
1558	38	17.40	24.14
1558	40	17.45	24.12
1558	42	17.52	24.12
1558	44	17.57	24.11
1558	46	17.66	24.11
1558	48	17.76	24.11
1558	50	17.85	24.12
1558	52	17.91	24.12
1558	54	17.98	24.14
1558	56	18.00	24.13
1558	58	18.07	24.13
1559	0	18.12	24.15
1559	2	18.17	24.16
1559	4	18.20	24.16
1559	6	18.28	24.19
1559	8	18.29	24.17
1559	10	18.32	24.21
1559	12	18.36	24.21
1559	14	18.40	24.21
1559	16	18.43	24.22
1559	18	18.49	24.26
1559	20	18.51	24.27
1559	22	18.53	24.26
1559	24	18.56	24.26
1559	26	18.57	24.27
1559	28	18.63	24.29
1559	30	18.67	24.32
1559	32	18.71	24.31
1559	34	18.72	24.31
1559	36	18.78	24.33
1559	38	18.81	24.33
1559	40	18.85	24.33
1559	42	18.87	24.35
1559	44	18.92	24.37
1559	46	18.94	24.35
1559	48	18.96	24.36
1559	50	19.01	24.39
1559	52	19.04	24.40
1559	54	19.07	24.41
1559	56	19.12	24.43
1559	58	19.12	24.43
1600	0	19.11	24.44
1600	2	19.11	24.46
1600	4	19.10	24.46
1600	6	19.09	24.46

Table C.3 (cont)

Evapotranspiration Data
July 30, 2003 SITE 2B

Time	sec	Temp wet	Temp dry
1457	46	19.42	26.77
1457	48	19.42	26.74
1457	50	19.44	26.68
1457	52	19.56	26.66
1457	54	19.73	26.61
1457	56	19.91	26.57
1457	58	20.15	26.56
1458	0	20.34	26.53
1458	2	20.56	26.51
1458	4	20.75	26.51
1458	6	20.96	26.51
1458	8	21.13	26.53
1458	10	21.29	26.50
1458	12	21.45	26.52
1458	14	21.61	26.50
1458	16	21.75	26.51
1458	18	21.91	26.52
1458	20	22.02	26.56
1458	22	22.15	26.55
1458	24	22.28	26.57
1458	26	22.34	26.56
1458	28	22.44	26.59
1458	30	22.50	26.61
1458	32	22.55	26.58
1458	34	22.59	26.60
1458	36	22.64	26.60
1458	38	22.68	26.62
1458	40	22.68	26.61
1458	42	22.73	26.63
1458	44	22.75	26.61
1458	46	22.74	26.60
1458	48	22.76	26.62
1458	50	22.78	26.63
1458	52	22.79	26.64
1458	54	22.80	26.62
1458	56	22.81	26.63
1458	58	22.82	26.62
1459	0	22.82	26.62
1459	2	22.84	26.62
1459	4	22.84	26.63
1459	6	22.85	26.61
1459	8	22.83	26.61
1459	10	22.87	26.62
1459	12	22.84	26.60
1459	14	22.83	26.60
1459	16	22.83	26.58
1459	18	22.84	26.58
1459	20	22.85	26.58
1459	22	22.85	26.58

Evapotranspiration Data
July 30, 2003 SITE 2B

Time	sec	Temp wet	Temp dry
1601	18	17.62	23.96
1601	20	17.52	23.93
1601	22	17.43	23.90
1601	24	17.38	23.84
1601	26	17.42	23.80
1601	28	17.48	23.75
1601	30	17.62	23.69
1601	32	17.77	23.68
1601	34	17.92	23.62
1601	36	18.09	23.61
1601	38	18.25	23.60
1601	40	18.37	23.53
1601	42	18.52	23.53
1601	44	18.70	23.54
1601	46	18.81	23.52
1601	48	18.96	23.52
1601	50	19.07	23.53
1601	52	19.20	23.54
1601	54	19.30	23.52
1601	56	19.40	23.53
1601	58	19.51	23.54
1602	0	19.58	23.55
1602	2	19.68	23.56
1602	4	19.77	23.56
1602	6	19.84	23.58
1602	8	19.88	23.59
1602	10	19.94	23.62
1602	12	19.99	23.62
1602	14	19.99	23.62
1602	16	20.00	23.62
1602	18	20.03	23.63
1602	20	20.06	23.64
1602	22	20.09	23.67
1602	24	20.13	23.68
1602	26	20.16	23.70
1602	28	20.18	23.70
1602	30	20.21	23.72
1602	32	20.22	23.72
1602	34	20.26	23.74
1602	36	20.29	23.77
1602	38	20.31	23.76
1602	40	20.32	23.77
1602	42	20.34	23.77
1602	44	20.39	23.80
1602	46	20.41	23.82
1602	48	20.46	23.85
1602	50	20.49	23.87
1602	52	20.52	23.85
1602	54	20.55	23.92

Evapotranspiration Data
July 30, 2003 SITE 2C

Time	sec	Temp wet	Temp dry
1501	14	18.71	25.25
1501	16	18.65	25.20
1501	18	18.59	25.17
1501	20	18.57	25.10
1501	22	18.60	25.00
1501	24	18.74	24.94
1501	26	18.89	24.87
1501	28	19.08	24.82
1501	30	19.25	24.76
1501	32	19.42	24.72
1501	34	19.59	24.70
1501	36	19.79	24.68
1501	38	19.91	24.62
1501	40	20.07	24.62
1501	42	20.19	24.59
1501	44	20.31	24.59
1501	46	20.44	24.57
1501	48	20.53	24.57
1501	50	20.62	24.55
1501	52	20.69	24.54
1501	54	20.77	24.57
1501	56	20.84	24.53
1501	58	20.89	24.54
1502	0	20.96	24.51
1502	2	21.01	24.54
1502	4	21.03	24.52
1502	6	21.10	24.51
1502	8	21.12	24.52
1502	10	21.13	24.52
1502	12	21.17	24.51
1502	14	21.19	24.50
1502	16	21.22	24.50
1502	18	21.22	24.52
1502	20	21.24	24.51
1502	22	21.26	24.50
1502	24	21.25	24.50
1502	26	21.25	24.50
1502	28	21.21	24.45
1502	30	21.22	24.48
1502	32	21.20	24.47
1502	34	21.19	24.47
1502	36	21.19	24.47
1502	38	21.16	24.45
1502	40	21.18	24.46
1502	42	21.18	24.47
1502	44	21.21	24.47
1502	46	21.22	24.47
1502	48	21.25	24.46
1502	50	21.26	24.47

Table C.3 (cont)

Evapotranspiration Data
July 30, 2003 SITE 2C

Time	sec	Temp wet	Temp dry
1605	54	18.44	25.81
1605	56	18.43	25.84
1605	58	18.42	25.82
1606	0	18.41	25.79
1606	2	18.51	25.78
1606	4	18.63	25.81
1606	6	18.90	25.88
1606	8	19.25	25.95
1606	10	19.64	26.04
1606	12	20.02	26.13
1606	14	20.38	26.24
1606	16	20.75	26.31
1606	18	21.08	26.42
1606	20	21.39	26.51
1606	22	21.67	26.60
1606	24	21.96	26.68
1606	26	22.22	26.79
1606	28	22.46	26.87
1606	30	22.63	26.93
1606	32	22.84	27.02
1606	34	22.99	27.11
1606	36	23.18	27.17
1606	38	23.32	27.28
1606	40	23.46	27.35
1606	42	23.61	27.44
1606	44	23.74	27.50
1606	46	23.87	27.58
1606	48	23.98	27.64
1606	50	24.08	27.71
1606	52	24.17	27.78
1606	54	24.26	27.83
1606	56	24.34	27.90
1606	58	24.44	27.98
1607	0	24.51	28.04
1607	2	24.56	28.08
1607	4	24.60	28.15
1607	6	24.67	28.20
1607	8	24.74	28.26
1607	10	24.80	28.33
1607	12	24.80	28.34
1607	14	24.87	28.43
1607	16	24.92	28.48
1607	18	24.94	28.50
1607	20	24.98	28.55
1607	22	24.99	28.59

Evapotranspiration Data
August 5, 2003 SITE 1

Time	sec	Temp wet	Temp dry
959	32	20.79	28.23
959	34	20.63	28.06
959	36	20.52	27.91
959	38	20.49	27.86
959	40	20.52	27.88
959	42	20.60	27.94
959	44	20.72	28.01
959	46	20.86	28.13
959	48	21.01	28.21
959	50	21.21	28.33
959	52	21.37	28.40
959	54	21.53	28.48
959	56	21.72	28.59
959	58	21.90	28.70
1000	0	22.04	28.77
1000	2	22.21	28.88
1000	4	22.39	28.97
1000	6	22.54	29.04
1000	8	22.67	29.10
1000	10	22.81	29.21
1000	12	22.93	29.26
1000	14	23.06	29.35
1000	16	23.15	29.39
1000	18	23.24	29.46
1000	20	23.34	29.52
1000	22	23.43	29.56
1000	24	23.54	29.65
1000	26	23.64	29.72
1000	28	23.69	29.75
1000	30	23.76	29.81
1000	32	23.80	29.84
1000	34	23.85	29.88
1000	36	23.89	29.94
1000	38	23.92	29.97
1000	40	23.96	30.02
1000	42	23.98	30.04
1000	44	23.97	30.05
1000	46	23.97	30.08
1000	48	23.95	30.09
1000	50	23.92	30.09
1000	52	23.88	30.09
1000	54	23.87	30.14
1000	56	23.86	30.12
1000	58	23.87	30.15
1001	0	23.87	30.16
1001	2	23.87	30.19
1001	4	23.94	30.23
1001	6	23.99	30.24
1001	8	24.01	30.27

Evapotranspiration Data
August 5, 2003 SITE 1

Time	sec	Temp wet	Temp dry
1002	38	19.82	27.04
1002	40	19.79	27.05
1002	42	19.77	26.98
1002	44	19.69	26.90
1002	46	19.73	26.97
1002	48	19.82	27.04
1002	50	19.90	27.09
1002	52	20.01	27.18
1002	54	20.16	27.28
1002	56	20.30	27.35
1002	58	20.47	27.46
1003	0	20.61	27.58
1003	2	20.73	27.64
1003	4	20.91	27.72
1003	6	21.06	27.82
1003	8	21.20	27.90
1003	10	21.39	27.99
1003	12	21.53	28.06
1003	14	21.64	28.13
1003	16	21.77	28.22
1003	18	21.85	28.23
1003	20	22.00	28.35
1003	22	22.08	28.41
1003	24	22.17	28.50
1003	26	22.27	28.52
1003	28	22.34	28.60
1003	30	22.41	28.63
1003	32	22.48	28.69
1003	34	22.52	28.73
1003	36	22.57	28.76
1003	38	22.60	28.81
1003	40	22.66	28.86
1003	42	22.68	28.88
1003	44	22.72	28.93
1003	46	22.76	28.96
1003	48	22.79	29.00
1003	50	22.82	29.02
1003	52	22.83	29.04
1003	54	22.84	29.05
1003	56	22.89	29.12
1003	58	22.93	29.15
1004	0	22.95	29.18
1004	2	23.00	29.22
1004	4	23.02	29.24
1004	6	23.05	29.27
1004	8	23.08	29.30
1004	10	23.13	29.34
1004	12	23.19	29.37
1004	14	23.20	29.40

Table C.3 (cont)
Evapotranspiration Data
August 5, 2003 SITE 1

Time	sec	Temp wet	Temp dry
1100	32	20.61	27.11
1100	34	20.71	27.16
1100	36	20.75	27.21
1100	38	20.84	27.37
1100	40	21.01	27.54
1100	42	21.20	27.75
1100	44	21.37	27.93
1100	46	21.61	28.14
1100	48	21.80	28.31
1100	50	22.03	28.51
1100	52	22.24	28.70
1100	54	22.43	28.85
1100	56	22.62	28.99
1100	58	22.83	29.18
1101	0	23.00	29.31
1101	2	23.16	29.43
1101	4	23.34	29.58
1101	6	23.52	29.73
1101	8	23.63	29.82
1101	10	23.79	29.96
1101	12	23.90	30.06
1101	14	24.05	30.19
1101	16	24.17	30.30
1101	18	24.27	30.40
1101	20	24.39	30.50
1101	22	24.51	30.60
1101	24	24.64	30.69
1101	26	24.75	30.78
1101	28	24.85	30.88
1101	30	24.94	30.94
1101	32	25.01	31.02
1101	34	25.12	31.09
1101	36	25.21	31.19
1101	38	25.30	31.26
1101	40	25.35	31.32
1101	42	25.45	31.40
1101	44	25.51	31.48
1101	46	25.58	31.53
1101	48	25.68	31.62
1101	50	25.74	31.69
1101	52	25.80	31.75
1101	54	25.87	31.81
1101	56	25.92	31.88
1101	58	25.96	31.95
1102	0	26.01	32.00
1102	2	26.01	32.06
1102	4	26.04	32.08
1102	6	26.07	32.12
1102	8	26.08	32.18

Evapotranspiration Data
August 5, 2003 SITE 1

Time	sec	Temp wet	Temp dry
1103	34	20.98	27.82
1103	36	21.07	27.93
1103	38	21.18	28.01
1103	40	21.27	28.11
1103	42	21.42	28.28
1103	44	21.60	28.44
1103	46	21.76	28.62
1103	48	21.98	28.79
1103	50	22.19	28.95
1103	52	22.42	29.13
1103	54	22.63	29.29
1103	56	22.84	29.47
1103	58	23.07	29.62
1104	0	23.28	29.78
1104	2	23.49	29.94
1104	4	23.68	30.10
1104	6	23.90	30.22
1104	8	24.06	30.34
1104	10	24.24	30.49
1104	12	24.46	30.65
1104	14	24.60	30.75
1104	16	24.77	30.86
1104	18	24.96	31.01
1104	20	25.10	31.12
1104	22	25.27	31.23
1104	24	25.38	31.31
1104	26	25.57	31.47
1104	28	25.68	31.55
1104	30	25.80	31.64
1104	32	25.93	31.74
1104	34	26.05	31.84
1104	36	26.16	31.94
1104	38	26.28	32.02
1104	40	26.40	32.17
1104	42	26.48	32.18
1104	44	26.55	32.26
1104	46	26.68	32.35
1104	48	26.76	32.41
1104	50	26.87	32.52
1104	52	26.97	32.61
1104	54	27.08	32.67
1104	56	27.18	32.74
1104	58	27.28	32.84
1105	0	27.36	32.92
1105	2	27.46	32.99
1105	4	27.53	33.03
1105	6	27.62	33.14
1105	8	27.71	33.18
1105	10	27.80	33.26

Evapotranspiration Data
August 5, 2003 SITE 1

Time	sec	Temp wet	Temp dry
1200	34	23.47	27.79
1200	36	23.46	27.76
1200	38	23.39	27.77
1200	40	23.36	27.78
1200	42	23.34	27.77
1200	44	23.37	27.79
1200	46	23.37	27.80
1200	48	23.45	27.82
1200	50	23.51	27.82
1200	52	23.57	27.84
1200	54	23.66	27.83
1200	56	23.75	27.88
1200	58	23.83	27.88
1201	0	23.89	27.90
1201	2	23.96	27.90
1201	4	24.02	27.92
1201	6	24.11	27.92
1201	8	24.18	27.94
1201	10	24.29	27.97
1201	12	24.33	27.92
1201	14	24.38	27.94
1201	16	24.46	27.94
1201	18	24.50	27.96
1201	20	24.54	27.97
1201	22	24.58	27.97
1201	24	24.60	27.97
1201	26	24.63	27.98
1201	28	24.68	28.01
1201	30	24.70	27.97
1201	32	24.73	27.98
1201	34	24.78	27.99
1201	36	24.77	27.97
1201	38	24.80	27.97
1201	40	24.83	28.00
1201	42	24.82	27.99
1201	44	24.84	27.99
1201	46	24.85	27.99
1201	48	24.88	27.99
1201	50	24.89	27.99
1201	52	24.92	28.01
1201	54	24.90	28.00
1201	56	24.90	28.00
1201	58	24.90	27.99
1202	0	24.92	28.02
1202	2	24.92	28.01
1202	4	24.91	27.99
1202	10	24.92	27.99
1202	12	24.92	27.99
1202	14	24.91	27.98

Table C.3 (cont)
Evapotranspiration Data
August 5, 2003 SITE 1

Time	sec	Temp wet	Temp dry
1203	42	23.61	27.48
1203	44	23.53	27.44
1203	46	23.45	27.48
1203	48	23.40	27.44
1203	50	23.34	27.45
1203	52	23.33	27.46
1203	54	23.31	27.46
1203	56	23.30	27.47
1203	58	23.29	27.46
1204	0	23.31	27.46
1204	2	23.31	27.45
1204	4	23.35	27.46
1204	6	23.38	27.46
1204	8	23.43	27.47
1204	10	23.47	27.46
1204	12	23.49	27.45
1204	14	23.53	27.46
1204	16	23.56	27.45
1204	18	23.60	27.47
1204	20	23.60	27.47
1204	22	23.65	27.48
1204	24	23.68	27.47
1204	26	23.71	27.48
1204	28	23.74	27.50
1204	30	23.75	27.49
1204	32	23.80	27.53
1204	34	23.84	27.50
1204	36	23.89	27.50
1204	38	23.97	27.56
1204	40	24.01	27.57
1204	42	24.07	27.59
1204	44	24.12	27.62
1204	46	24.16	27.62
1204	48	24.21	27.63
1204	50	24.27	27.67
1204	52	24.32	27.66
1204	54	24.38	27.71
1204	56	24.43	27.74
1204	58	24.47	27.75
1205	0	24.51	27.75
1205	2	24.54	27.78
1205	4	24.58	27.81
1205	6	24.57	27.82
1205	8	24.62	27.85
1205	10	24.65	27.86
1205	12	24.67	27.88
1205	14	24.66	27.88
1205	16	24.67	27.92
1205	18	24.70	27.95

Evapotranspiration Data
August 5, 2003 SITE 1

Time	sec	Temp wet	Temp dry
1259	38	22.35	26.04
1259	40	22.32	26.03
1259	42	22.24	26.00
1259	44	22.11	25.98
1259	46	22.01	25.99
1259	48	21.87	25.95
1259	50	21.79	25.95
1259	52	21.74	25.93
1259	54	21.73	25.91
1259	56	21.73	25.91
1259	58	21.68	25.87
1300	0	21.74	25.88
1300	2	21.71	25.84
1300	4	21.69	25.80
1300	6	21.69	25.78
1300	8	21.71	25.77
1300	10	21.69	25.73
1300	12	21.66	25.72
1300	14	21.66	25.68
1300	16	21.64	25.67
1300	18	21.64	25.67
1300	20	21.61	25.62
1300	22	21.62	25.58
1300	24	21.60	25.60
1300	26	21.59	25.56
1300	28	21.62	25.56
1300	30	21.56	25.53
1300	32	21.57	25.50
1300	34	21.54	25.47
1300	36	21.53	25.43
1300	38	21.51	25.43
1300	40	21.51	25.42
1300	42	21.50	25.38
1300	44	21.51	25.38
1300	46	21.52	25.36
1300	48	21.50	25.34
1300	50	21.49	25.32
1300	52	21.50	25.30
1300	54	21.50	25.29
1300	56	21.50	25.27
1300	58	21.50	25.27
1301	0	21.50	25.23
1301	2	21.50	25.22
1301	4	21.48	25.21
1301	6	21.47	25.18
1301	8	21.46	25.16
1301	10	21.43	25.12
1301	12	21.44	25.10
1301	14	21.44	25.09

Evapotranspiration Data
August 5, 2003 SITE 1

Time	sec	Temp wet	Temp dry
1302	30	20.65	24.46
1302	32	20.72	24.42
1302	34	20.75	24.41
1302	36	20.77	24.38
1302	38	20.69	24.34
1302	40	20.62	24.36
1302	42	20.57	24.34
1302	44	20.50	24.31
1302	46	20.47	24.29
1302	48	20.44	24.29
1302	50	20.43	24.27
1302	52	20.42	24.26
1302	54	20.41	24.24
1302	56	20.42	24.22
1302	58	20.45	24.22
1303	0	20.42	24.20
1303	2	20.41	24.18
1303	4	20.42	24.20
1303	6	20.43	24.15
1303	8	20.44	24.14
1303	10	20.45	24.12
1303	12	20.45	24.12
1303	14	20.45	24.11
1303	16	20.43	24.06
1303	18	20.45	24.07
1303	20	20.46	24.06
1303	22	20.47	24.04
1303	24	20.46	24.04
1303	26	20.49	24.03
1303	28	20.48	24.00
1303	30	20.47	23.99
1303	32	20.48	23.98
1303	34	20.48	23.95
1303	36	20.48	23.94
1303	38	20.50	23.95
1303	40	20.48	23.93
1303	42	20.46	23.92
1303	44	20.48	23.91
1303	46	20.46	23.90
1303	48	20.49	23.90
1303	50	20.48	23.88
1303	52	20.47	23.86
1303	54	20.45	23.84
1303	56	20.45	23.84
1303	58	20.44	23.83
1304	0	20.42	23.82
1304	2	20.41	23.78
1304	4	20.45	23.83
1304	6	20.42	23.79

Table C.3 (cont)

Evapotranspiration Data
August 5, 2003 SITE 1

Time	sec	Temp wet	Temp dry
1359	50	28.76	33.15
1359	52	28.48	33.14
1359	54	28.30	33.14
1359	56	28.16	33.14
1359	58	27.99	33.16
1400	0	27.80	33.16
1400	2	27.66	33.16
1400	4	27.50	33.14
1400	6	27.35	33.06
1400	8	27.25	33.05
1400	10	27.21	33.06
1400	12	27.15	33.03
1400	14	27.08	32.99
1400	16	27.04	32.94
1400	18	27.00	32.93
1400	20	26.97	32.94
1400	22	26.95	32.87
1400	24	26.95	32.84
1400	26	26.93	32.83
1400	28	26.89	32.78
1400	30	26.92	32.80
1400	32	26.87	32.76
1400	34	26.83	32.69
1400	36	26.81	32.69
1400	38	26.84	32.69
1400	40	26.85	32.68
1400	42	26.80	32.60
1400	44	26.78	32.58
1400	46	26.79	32.57
1400	48	26.79	32.57
1400	50	26.79	32.54
1400	52	26.79	32.52
1400	54	26.78	32.49
1400	56	26.77	32.47
1400	58	26.75	32.45
1401	0	26.75	32.40
1401	2	26.76	32.39
1401	4	26.78	32.40
1401	6	26.71	32.33
1401	8	26.73	32.31
1401	10	26.69	32.31
1401	12	26.62	32.27
1401	14	26.58	32.23
1401	16	26.59	32.21
1401	18	26.54	32.15
1401	20	26.52	32.12
1401	22	26.53	32.15
1401	24	26.50	32.11
1401	26	26.48	32.07

Evapotranspiration Data
August 5, 2003 SITE 1

Time	sec	Temp wet	Temp dry
1402	38	25.20	31.15
1402	40	25.15	31.11
1402	42	25.18	31.12
1402	44	25.22	31.11
1402	46	25.25	31.13
1402	48	25.26	31.15
1402	50	25.28	31.11
1402	52	25.33	31.15
1402	54	25.37	31.14
1402	56	25.50	31.18
1402	58	25.56	31.20
1403	0	25.63	31.22
1403	2	25.69	31.22
1403	4	25.78	31.23
1403	6	25.86	31.29
1403	8	25.96	31.29
1403	10	26.07	31.33
1403	12	26.16	31.35
1403	14	26.25	31.37
1403	16	26.32	31.37
1403	18	26.42	31.42
1403	20	26.53	31.46
1403	22	26.62	31.50
1403	24	26.68	31.52
1403	26	26.77	31.55
1403	28	26.84	31.59
1403	30	26.89	31.60
1403	32	26.96	31.64
1403	34	27.04	31.69
1403	36	27.08	31.72
1403	38	27.15	31.75
1403	40	27.24	31.80
1403	42	27.33	31.82
1403	44	27.40	31.88
1403	46	27.48	31.92
1403	48	27.53	31.95
1403	50	27.61	32.00
1403	52	27.66	32.03
1403	54	27.74	32.07
1403	56	27.83	32.11
1403	58	27.90	32.14
1404	0	27.95	32.15
1404	2	28.00	32.20
1404	4	28.04	32.26
1404	6	28.14	32.28
1404	8	28.21	32.32
1404	10	28.23	32.36
1404	12	28.29	32.39
1404	14	28.33	32.42

Evapotranspiration Data
August 5, 2003 SITE 1

Time	sec	Temp wet	Temp dry
1545	42	25.46	31.53
1545	44	25.42	31.50
1545	46	25.33	31.44
1545	48	25.26	31.42
1545	50	25.16	31.39
1545	52	25.08	31.35
1545	54	25.00	31.31
1545	56	24.92	31.23
1545	58	24.90	31.23
1546	0	24.84	31.17
1546	2	24.80	31.13
1546	4	24.77	31.10
1546	6	24.74	31.03
1546	8	24.71	31.04
1546	10	24.66	30.96
1546	12	24.59	30.93
1546	14	24.60	30.88
1546	16	24.58	30.80
1546	18	24.54	30.75
1546	20	24.55	30.74
1546	22	24.51	30.66
1546	24	24.50	30.63
1546	26	24.56	30.61
1546	28	24.55	30.51
1546	30	24.53	30.51
1546	32	24.49	30.42
1546	34	24.51	30.40
1546	36	24.44	30.31
1546	38	24.46	30.28
1546	40	24.45	30.21
1546	42	24.45	30.20
1546	44	24.42	30.14
1546	46	24.39	30.11
1546	48	24.38	30.08
1546	50	24.34	30.04
1546	52	24.35	29.99
1546	54	24.29	29.94
1546	56	24.28	29.93
1546	58	24.27	29.88
1547	0	24.24	29.85
1547	2	24.22	29.81
1547	4	24.23	29.76
1547	6	24.20	29.73
1547	8	24.17	29.67
1547	10	24.18	29.65
1547	12	24.17	29.59
1547	14	24.15	29.56
1547	16	24.13	29.52
1547	18	24.16	29.50

Table C.3 (cont)
Evapotranspiration Data
August 5, 2003 SITE 1

Time	sec	Temp wet	Temp dry
1549	4	22.27	27.80
1549	6	22.25	27.82
1549	8	22.23	27.77
1549	10	22.23	27.73
1549	12	22.17	27.72
1549	14	22.12	27.69
1549	16	22.11	27.67
1549	18	22.09	27.65
1549	20	22.08	27.63
1549	22	22.08	27.61
1549	24	22.09	27.57
1549	26	22.14	27.53
1549	28	22.17	27.55
1549	30	22.17	27.49
1549	32	22.17	27.47
1549	34	22.17	27.45
1549	36	22.18	27.42
1549	38	22.17	27.38
1549	40	22.20	27.37
1549	42	22.19	27.34
1549	44	22.22	27.32
1549	46	22.24	27.29
1549	48	22.26	27.28
1549	50	22.29	27.27
1549	52	22.31	27.24
1549	54	22.29	27.22
1549	56	22.31	27.21
1549	58	22.27	27.14
1550	0	22.30	27.15
1550	2	22.27	27.13
1550	4	22.28	27.11
1550	6	22.30	27.10
1550	8	22.36	27.07
1550	10	22.34	27.04
1550	12	22.32	27.04
1550	14	22.29	26.98
1550	16	22.32	26.99
1550	18	22.31	26.97
1550	20	22.34	26.95
1550	22	22.36	26.94
1550	24	22.36	26.92
1550	26	22.37	26.90
1550	28	22.38	26.87
1550	30	22.36	26.85
1550	32	22.35	26.81
1550	34	22.36	26.80
1550	36	22.36	26.81
1550	38	22.36	26.77
1550	40	22.35	26.75

Evapotranspiration Data
August 5, 2003 SITE 1

Time	sec	Temp wet	Temp dry
1750	14	20.79	22.28
1750	16	20.76	22.26
1750	18	20.72	22.24
1750	20	20.67	22.22
1750	22	20.66	22.23
1750	24	20.64	22.21
1750	26	20.65	22.20
1750	28	20.62	22.16
1750	30	20.65	22.15
1750	32	20.65	22.13
1750	34	20.67	22.10
1750	36	20.68	22.08
1750	38	20.67	22.04
1750	40	20.70	22.03
1750	42	20.70	22.00
1750	44	20.71	21.96
1750	46	20.72	21.96
1750	48	20.74	21.91
1750	50	20.73	21.91
1750	52	20.73	21.87
1750	54	20.74	21.85
1750	56	20.74	21.83
1750	58	20.73	21.80
1751	0	20.73	21.78
1751	2	20.74	21.75
1751	4	20.74	21.72
1751	6	20.73	21.72
1751	8	20.73	21.70
1751	10	20.72	21.67
1751	12	20.72	21.64
1751	14	20.75	21.65
1751	16	20.72	21.61
1751	18	20.72	21.60
1751	20	20.71	21.56
1751	22	20.73	21.57
1751	24	20.70	21.54
1751	26	20.69	21.50
1751	28	20.69	21.50
1751	30	20.70	21.48
1751	32	20.68	21.46
1751	34	20.68	21.45
1751	36	20.67	21.44
1751	38	20.67	21.44
1751	40	20.65	21.40
1751	42	20.64	21.37
1751	44	20.65	21.37
1751	46	20.65	21.36
1751	48	20.64	21.34
1751	50	20.62	21.31

Evapotranspiration Data
August 5, 2003 SITE 1

Time	sec	Temp wet	Temp dry
1754	6	18.66	20.06
1754	8	18.66	20.01
1754	10	18.62	20.01
1754	12	18.63	20.01
1754	14	18.65	20.02
1754	16	18.69	20.04
1754	18	18.74	20.04
1754	20	18.78	20.04
1754	22	18.83	20.04
1754	24	18.89	20.05
1754	26	18.92	20.04
1754	28	18.97	20.04
1754	30	18.99	20.03
1754	32	19.06	20.03
1754	34	19.07	20.02
1754	36	19.10	20.02
1754	38	19.11	20.00
1754	40	19.16	20.01
1754	42	19.19	19.99
1754	44	19.19	19.98
1754	46	19.22	19.97
1754	48	19.26	19.97
1754	50	19.26	19.97
1754	52	19.26	19.95
1754	54	19.31	19.96
1754	56	19.31	19.94
1754	58	19.31	19.93
1755	0	19.33	19.93
1755	2	19.35	19.92
1755	4	19.35	19.91
1755	6	19.35	19.91
1755	8	19.35	19.88
1755	10	19.37	19.89
1755	12	19.39	19.90
1755	14	19.38	19.88
1755	16	19.39	19.87
1755	18	19.41	19.86
1755	20	19.42	19.86
1755	22	19.41	19.87
1755	24	19.42	19.84
1755	26	19.42	19.84
1755	28	19.43	19.83
1755	30	19.42	19.83
1755	32	19.44	19.83
1755	34	19.45	19.82
1755	36	19.45	19.83
1755	38	19.45	19.82
1755	40	19.43	19.80
1755	42	19.44	19.80

Table C.3 (cont)

Evapotranspiration Data
August 5, 2003 SITE 1

Time	sec	Temp wet	Temp dry
2003	28	16.19	17.57
2003	30	16.19	17.58
2003	32	16.16	17.57
2003	34	16.12	17.57
2003	36	16.09	17.57
2003	38	16.08	17.57
2003	40	16.07	17.55
2003	42	16.11	17.56
2003	44	16.13	17.56
2003	46	16.16	17.56
2003	48	16.21	17.55
2003	50	16.21	17.55
2003	52	16.21	17.51
2003	54	16.26	17.52
2003	56	16.27	17.49
2003	58	16.31	17.50
2004	0	16.35	17.49
2004	2	16.36	17.46
2004	4	16.40	17.45
2004	6	16.42	17.44
2004	8	16.44	17.45
2004	10	16.44	17.40
2004	12	16.44	17.37
2004	14	16.47	17.37
2004	16	16.49	17.37
2004	18	16.49	17.36
2004	20	16.51	17.35
2004	22	16.51	17.34
2004	24	16.53	17.32
2004	26	16.53	17.29
2004	28	16.56	17.29
2004	30	16.55	17.28
2004	32	16.52	17.24
2004	34	16.56	17.26
2004	36	16.56	17.24
2004	38	16.56	17.22
2004	40	16.57	17.22
2004	42	16.57	17.19
2004	44	16.59	17.20
2004	46	16.59	17.20
2004	48	16.56	17.17
2004	50	16.59	17.16
2004	52	16.58	17.16
2004	54	16.58	17.15
2004	56	16.59	17.14
2004	58	16.59	17.14
2005	0	16.58	17.13
2005	2	16.57	17.09
2005	4	16.59	17.11

Evapotranspiration Data
August 5, 2003 SITE 1

Time	sec	Temp wet	Temp dry
2007	10	15.23	16.53
2007	12	15.23	16.52
2007	14	15.22	16.51
2007	16	15.20	16.52
2007	18	15.19	16.53
2007	20	15.20	16.54
2007	22	15.22	16.54
2007	24	15.22	16.53
2007	26	15.28	16.55
2007	28	15.33	16.55
2007	30	15.35	16.55
2007	32	15.39	16.55
2007	34	15.44	16.57
2007	36	15.49	16.56
2007	38	15.51	16.56
2007	40	15.57	16.56
2007	42	15.58	16.54
2007	44	15.63	16.54
2007	46	15.65	16.53
2007	48	15.67	16.52
2007	50	15.70	16.51
2007	52	15.74	16.51
2007	54	15.76	16.51
2007	56	15.78	16.50
2007	58	15.79	16.50
2008	0	15.81	16.49
2008	2	15.84	16.50
2008	4	15.84	16.48
2008	6	15.84	16.46
2008	8	15.86	16.44
2008	10	15.88	16.44
2008	12	15.90	16.45
2008	14	15.90	16.45
2008	16	15.92	16.44
2008	18	15.93	16.44
2008	20	15.93	16.41
2008	22	15.96	16.43
2008	24	15.98	16.43
2008	26	15.96	16.42
2008	28	15.95	16.40
2008	30	15.98	16.40
2008	32	15.99	16.40
2008	34	15.98	16.40
2008	36	15.99	16.40
2008	38	15.99	16.39
2008	40	16.02	16.40
2008	42	15.99	16.36
2008	44	15.99	16.36
2008	46	16.01	16.36

Evapotranspiration Data
August 5, 2003 SITE 2A

Time	sec	Temp wet	Temp dry
1009	4	20.53	27.64
1009	6	20.58	27.67
1009	8	20.63	27.71
1009	10	20.76	27.79
1009	12	20.99	27.88
1009	14	21.22	27.94
1009	16	21.46	28.02
1009	18	21.68	28.10
1009	20	21.90	28.18
1009	22	22.08	28.25
1009	24	22.33	28.33
1009	26	22.54	28.40
1009	28	22.71	28.46
1009	30	22.81	28.51
1009	32	22.89	28.55
1009	34	23.00	28.60
1009	36	23.08	28.67
1009	38	23.19	28.73
1009	40	23.30	28.79
1009	42	23.38	28.83
1009	44	23.44	28.86
1009	46	23.53	28.91
1009	48	23.61	28.96
1009	50	23.70	29.02
1009	52	23.75	29.04
1009	54	23.83	29.08
1009	56	23.87	29.12
1009	58	23.89	29.15
1010	0	23.95	29.21
1010	2	24.00	29.23
1010	4	24.02	29.27
1010	6	24.13	29.32
1010	8	24.17	29.33
1010	10	24.20	29.39
1010	12	24.24	29.44
1010	14	24.29	29.45
1010	16	24.33	29.49
1010	18	24.38	29.51
1010	20	24.43	29.55
1010	22	24.45	29.59
1010	24	24.54	29.64
1010	26	24.57	29.65
1010	28	24.67	29.70
1010	30	24.73	29.75
1010	32	24.81	29.79
1010	34	24.79	29.78
1010	36	24.79	29.82
1010	38	24.76	29.85
1010	40	24.74	29.90

Table C.3 (cont)
Evapotranspiration Data
August 5, 2003 SITE 2A

Time	sec	Temp wet	Temp dry
1012	10	20.36	27.66
1012	12	20.39	27.67
1012	14	20.37	27.67
1012	16	20.34	27.60
1012	18	20.17	27.55
1012	20	20.12	27.50
1012	22	20.21	27.50
1012	24	20.29	27.48
1012	26	20.45	27.51
1012	28	20.60	27.54
1012	30	20.76	27.58
1012	32	20.90	27.60
1012	34	21.09	27.66
1012	36	21.27	27.73
1012	38	21.40	27.76
1012	40	21.58	27.82
1012	42	21.73	27.89
1012	44	21.89	27.97
1012	46	22.03	28.01
1012	48	22.18	28.08
1012	50	22.33	28.16
1012	52	22.45	28.23
1012	54	22.57	28.28
1012	56	22.71	28.36
1012	58	22.80	28.41
1013	0	22.89	28.47
1013	2	22.99	28.53
1013	4	23.08	28.60
1013	6	23.16	28.66
1013	8	23.23	28.72
1013	10	23.27	28.77
1013	12	23.36	28.85
1013	14	23.40	28.90
1013	16	23.42	28.93
1013	18	23.48	28.99
1013	20	23.55	29.05
1013	22	23.56	29.12
1013	24	23.59	29.18
1013	26	23.59	29.20
1013	28	23.63	29.27
1013	30	23.67	29.31
1013	32	23.70	29.36
1013	34	23.74	29.39
1013	36	23.82	29.46
1013	38	23.87	29.52
1013	40	23.92	29.57
1013	42	23.89	29.59
1013	44	23.91	29.65
1013	46	23.94	29.68

Evapotranspiration Data
August 5, 2003 SITE 2A

Time	sec	Temp wet	Temp dry
1106	42	21.57	29.11
1106	44	21.61	29.11
1106	46	21.62	29.09
1106	48	21.64	29.05
1106	50	21.73	29.07
1106	52	21.90	29.11
1106	54	22.06	29.15
1106	56	22.24	29.19
1106	58	22.43	29.25
1107	0	22.63	29.30
1107	2	22.75	29.36
1107	4	22.94	29.42
1107	6	23.07	29.48
1107	8	23.25	29.53
1107	10	23.43	29.56
1107	12	23.54	29.63
1107	14	23.71	29.67
1107	16	23.85	29.73
1107	18	23.96	29.77
1107	20	24.09	29.82
1107	22	24.24	29.91
1107	24	24.36	29.97
1107	26	24.46	30.00
1107	28	24.57	30.06
1107	30	24.61	30.09
1107	32	24.69	30.15
1107	34	24.76	30.21
1107	36	24.80	30.23
1107	38	24.85	30.28
1107	40	24.90	30.30
1107	42	24.94	30.36
1107	44	24.95	30.41
1107	46	24.97	30.46
1107	48	24.99	30.48
1107	50	24.99	30.52
1107	52	25.03	30.54
1107	54	25.09	30.59
1107	56	25.16	30.65
1107	58	25.25	30.69
1108	0	25.28	30.73
1108	2	25.30	30.77
1108	4	25.35	30.79
1108	6	25.40	30.84
1108	8	25.42	30.86
1108	10	25.44	30.87
1108	12	25.51	30.95
1108	14	25.56	30.99
1108	16	25.60	31.02
1108	18	25.65	31.05

Evapotranspiration Data
August 5, 2003 SITE 2A

Time	sec	Temp wet	Temp dry
1110	0	21.38	28.64
1110	2	21.46	28.72
1110	4	21.44	28.70
1110	6	21.40	28.70
1110	8	21.51	28.68
1110	10	21.62	28.74
1110	12	21.77	28.78
1110	14	21.93	28.83
1110	16	22.12	28.87
1110	18	22.36	28.95
1110	20	22.54	29.02
1110	22	22.74	29.07
1110	24	22.94	29.15
1110	26	23.11	29.20
1110	28	23.30	29.29
1110	30	23.43	29.35
1110	32	23.59	29.45
1110	34	23.71	29.48
1110	36	23.85	29.56
1110	38	23.98	29.62
1110	40	24.12	29.72
1110	42	24.23	29.76
1110	44	24.31	29.82
1110	46	24.40	29.89
1110	48	24.51	29.96
1110	50	24.55	30.01
1110	52	24.64	30.09
1110	54	24.66	30.10
1110	56	24.75	30.21
1110	58	24.81	30.27
1111	0	24.87	30.32
1111	2	24.91	30.36
1111	4	24.98	30.43
1111	6	25.01	30.46
1111	8	25.12	30.55
1111	10	25.16	30.57
1111	12	25.20	30.62
1111	14	25.25	30.65
1111	16	25.31	30.73
1111	18	25.38	30.78
1111	20	25.44	30.81
1111	22	25.51	30.86
1111	24	25.55	30.90
1111	26	25.63	30.97
1111	28	25.68	31.00
1111	30	25.71	31.04
1111	32	25.77	31.10
1111	34	25.78	31.14
1111	36	25.79	31.19

Table C.3 (cont)

Evapotranspiration Data
August 5, 2003 SITE 2A

Time	sec	Temp wet	Temp dry
1206	54	23.82	27.80
1206	56	23.71	27.77
1206	58	23.68	27.76
1207	0	23.66	27.75
1207	2	23.75	27.74
1207	4	23.86	27.73
1207	6	23.98	27.73
1207	8	24.10	27.73
1207	10	24.20	27.73
1207	12	24.31	27.71
1207	14	24.44	27.75
1207	16	24.52	27.72
1207	18	24.61	27.71
1207	20	24.69	27.72
1207	22	24.73	27.69
1207	24	24.78	27.69
1207	26	24.86	27.71
1207	28	24.92	27.69
1207	30	24.97	27.70
1207	32	25.02	27.69
1207	34	25.06	27.69
1207	36	25.09	27.67
1207	38	25.12	27.66
1207	40	25.14	27.66
1207	42	25.18	27.64
1207	44	25.20	27.62
1207	46	25.25	27.62
1207	48	25.29	27.62
1207	50	25.32	27.62
1207	52	25.33	27.64
1207	54	25.37	27.64
1207	56	25.37	27.62
1207	58	25.39	27.62
1208	0	25.36	27.60
1208	2	25.37	27.61
1208	4	25.39	27.63
1208	6	25.39	27.62
1208	8	25.38	27.60
1208	10	25.38	27.62
1208	12	25.41	27.61
1208	14	25.40	27.58
1208	16	25.40	27.57
1208	18	25.41	27.57
1208	20	25.39	27.55
1208	22	25.40	27.57
1208	24	25.41	27.55
1208	26	25.44	27.55
1208	28	25.48	27.56
1208	30	25.48	27.54

Evapotranspiration Data
August 5, 2003 SITE 2A

Time	sec	Temp wet	Temp dry
1209	52	23.06	27.06
1209	54	23.05	27.06
1209	56	23.05	27.03
1209	58	23.05	27.00
1210	0	23.13	26.98
1210	2	23.22	26.98
1210	4	23.28	26.94
1210	6	23.37	26.95
1210	8	23.43	26.93
1210	10	23.51	26.93
1210	12	23.53	26.91
1210	14	23.59	26.91
1210	16	23.65	26.92
1210	18	23.68	26.88
1210	20	23.75	26.89
1210	22	23.84	26.90
1210	24	23.85	26.87
1210	26	23.90	26.87
1210	28	23.95	26.86
1210	30	23.99	26.87
1210	32	24.03	26.84
1210	34	24.07	26.83
1210	36	24.09	26.81
1210	38	24.14	26.81
1210	40	24.16	26.82
1210	42	24.19	26.83
1210	44	24.19	26.80
1210	46	24.21	26.81
1210	48	24.25	26.80
1210	50	24.24	26.76
1210	52	24.30	26.78
1210	54	24.31	26.80
1210	56	24.29	26.74
1210	58	24.33	26.78
1211	0	24.34	26.74
1211	2	24.36	26.74
1211	4	24.38	26.74
1211	6	24.38	26.74
1211	8	24.40	26.74
1211	10	24.43	26.74
1211	12	24.42	26.72
1211	14	24.49	26.74
1211	16	24.48	26.70
1211	18	24.50	26.71
1211	20	24.50	26.70
1211	22	24.51	26.72
1211	24	24.51	26.70
1211	26	24.51	26.68
1211	28	24.50	26.68

Evapotranspiration Data
August 5, 2003 SITE 2A

Time	sec	Temp wet	Temp dry
1306	20	19.40	23.09
1306	22	19.39	23.09
1306	24	19.36	23.08
1306	26	19.38	23.05
1306	28	19.43	23.03
1306	30	19.49	23.03
1306	32	19.57	23.02
1306	34	19.64	23.02
1306	36	19.72	23.03
1306	38	19.78	23.01
1306	40	19.84	23.02
1306	42	19.91	23.01
1306	44	20.00	23.01
1306	46	20.03	23.00
1306	48	20.08	22.98
1306	50	20.13	23.00
1306	52	20.18	23.00
1306	54	20.24	22.99
1306	56	20.28	23.00
1306	58	20.35	23.00
1307	0	20.37	22.99
1307	2	20.41	22.98
1307	4	20.46	22.98
1307	6	20.47	23.00
1307	8	20.49	22.98
1307	10	20.52	22.98
1307	12	20.54	22.97
1307	14	20.56	22.96
1307	16	20.59	22.97
1307	18	20.63	22.97
1307	20	20.63	22.96
1307	22	20.67	22.97
1307	24	20.69	22.95
1307	26	20.72	22.97
1307	28	20.73	22.98
1307	30	20.72	22.95
1307	32	20.75	22.96
1307	34	20.75	22.95
1307	36	20.75	22.94
1307	38	20.76	22.95
1307	40	20.73	22.94
1307	42	20.73	22.93
1307	44	20.74	22.96
1307	46	20.73	22.93
1307	48	20.73	22.93
1307	50	20.76	22.94
1307	52	20.76	22.96
1307	54	20.76	22.94
1307	56	20.76	22.92

Table C.3 (cont)
Evapotranspiration Data
August 5, 2003 SITE 2A

Time	sec	Temp wet	Temp dry
1309	28	19.75	22.64
1309	30	19.72	22.65
1309	32	19.72	22.64
1309	34	19.74	22.61
1309	36	19.75	22.61
1309	38	19.78	22.60
1309	40	19.83	22.60
1309	42	19.84	22.60
1309	44	19.88	22.60
1309	46	19.90	22.60
1309	48	19.87	22.57
1309	50	19.93	22.60
1309	52	19.93	22.57
1309	54	19.96	22.58
1309	56	20.02	22.60
1309	58	20.04	22.58
1310	0	20.06	22.56
1310	2	20.12	22.58
1310	4	20.14	22.57
1310	6	20.18	22.57
1310	8	20.23	22.59
1310	10	20.22	22.56
1310	12	20.27	22.57
1310	14	20.28	22.56
1310	16	20.33	22.55
1310	18	20.34	22.58
1310	20	20.36	22.56
1310	22	20.38	22.56
1310	24	20.40	22.54
1310	26	20.43	22.56
1310	28	20.45	22.56
1310	30	20.47	22.57
1310	32	20.49	22.56
1310	34	20.50	22.55
1310	36	20.51	22.55
1310	38	20.54	22.55
1310	40	20.54	22.54
1310	42	20.55	22.56
1310	44	20.59	22.55
1310	46	20.59	22.55
1310	48	20.55	22.52
1310	50	20.58	22.54
1310	52	20.57	22.53
1310	54	20.60	22.56
1310	56	20.60	22.55
1310	58	20.61	22.55
1311	0	20.64	22.54
1311	2	20.65	22.55
1311	4	20.67	22.55

Evapotranspiration Data
August 5, 2003 SITE 2A

Time	sec	Temp wet	Temp dry
1405	44	26.84	32.70
1405	46	26.76	32.66
1405	48	26.87	32.69
1405	50	26.94	32.65
1405	52	26.98	32.65
1405	54	27.17	32.66
1405	56	27.33	32.65
1405	58	27.50	32.66
1406	0	27.66	32.67
1406	2	27.85	32.65
1406	4	28.07	32.70
1406	6	28.23	32.70
1406	8	28.33	32.66
1406	10	28.45	32.66
1406	12	28.57	32.66
1406	14	28.69	32.65
1406	16	28.84	32.69
1406	18	28.89	32.68
1406	20	29.00	32.70
1406	22	29.10	32.69
1406	24	29.23	32.69
1406	26	29.40	32.73
1406	28	29.48	32.74
1406	30	29.55	32.74
1406	32	29.70	32.74
1406	34	29.75	32.75
1406	36	29.88	32.78
1406	38	29.91	32.77
1406	40	29.99	32.78
1406	42	30.11	32.82
1406	44	30.15	32.83
1406	46	30.19	32.83
1406	48	30.25	32.83
1406	50	30.27	32.83
1406	52	30.34	32.86
1406	54	30.39	32.86
1406	56	30.48	32.87
1406	58	30.58	32.91
1407	0	30.60	32.91
1407	2	30.64	32.92
1407	4	30.68	32.93
1407	6	30.69	32.94
1407	8	30.75	32.97
1407	10	30.80	32.99
1407	12	30.88	33.02
1407	14	30.90	33.00
1407	16	30.93	33.02
1407	18	30.95	33.05
1407	20	31.05	33.09

Evapotranspiration Data
August 5, 2003 SITE 2A

Time	sec	Temp wet	Temp dry
1408	48	27.22	32.87
1408	50	27.26	32.84
1408	52	27.29	32.87
1408	54	27.38	32.83
1408	56	27.40	32.82
1408	58	27.43	32.82
1409	0	27.42	32.81
1409	2	27.47	32.83
1409	4	27.52	32.81
1409	6	27.60	32.81
1409	8	27.66	32.83
1409	10	27.73	32.84
1409	12	27.76	32.82
1409	14	27.83	32.83
1409	16	27.91	32.84
1409	18	28.04	32.88
1409	20	28.12	32.87
1409	22	28.19	32.88
1409	24	28.29	32.90
1409	26	28.38	32.91
1409	28	28.48	32.92
1409	30	28.56	32.92
1409	32	28.73	32.95
1409	34	28.76	32.97
1409	36	28.85	32.97
1409	38	28.94	33.00
1409	40	29.04	33.03
1409	42	29.12	33.02
1409	44	29.18	33.01
1409	46	29.25	33.06
1409	48	29.23	33.02
1409	50	29.30	33.04
1409	52	29.36	33.06
1409	54	29.38	33.08
1409	56	29.42	33.11
1409	58	29.45	33.12
1410	0	29.45	33.09
1410	2	29.42	33.10
1410	4	29.46	33.15
1410	6	29.48	33.16
1410	8	29.48	33.19
1410	10	29.48	33.18
1410	12	29.52	33.19
1410	14	29.57	33.24
1410	16	29.58	33.21
1410	18	29.64	33.24
1410	20	29.65	33.25
1410	22	29.69	33.25
1410	24	29.73	33.27

Table C.3 (cont)
Evapotranspiration Data
August 5, 2003 SITE 2A

Time	sec	Temp wet	Temp dry
1552	4	21.99	25.91
1552	6	21.90	25.92
1552	8	21.83	25.92
1552	10	21.83	25.92
1552	12	21.90	25.91
1552	14	21.95	25.88
1552	16	22.03	25.90
1552	18	22.07	25.85
1552	20	22.12	25.84
1552	22	22.19	25.84
1552	24	22.30	25.82
1552	26	22.36	25.82
1552	28	22.41	25.81
1552	30	22.46	25.81
1552	32	22.50	25.81
1552	34	22.48	25.78
1552	36	22.49	25.77
1552	38	22.52	25.77
1552	40	22.55	25.78
1552	42	22.57	25.75
1552	44	22.64	25.75
1552	46	22.68	25.75
1552	48	22.71	25.73
1552	50	22.75	25.73
1552	52	22.74	25.70
1552	54	22.77	25.70
1552	56	22.80	25.71
1552	58	22.82	25.69
1553	0	22.85	25.67
1553	2	22.85	25.65
1553	4	22.89	25.68
1553	6	22.91	25.65
1553	8	22.96	25.66
1553	10	22.98	25.65
1553	12	23.05	25.67
1553	14	23.03	25.63
1553	16	23.03	25.62
1553	18	23.06	25.60
1553	20	23.11	25.61
1553	22	23.08	25.60
1553	24	23.11	25.61
1553	26	23.09	25.59
1553	28	23.09	25.57
1553	30	23.10	25.56
1553	32	23.12	25.57
1553	34	23.11	25.55
1553	36	23.09	25.54
1553	38	23.10	25.56
1553	40	23.12	25.54

Evapotranspiration Data
August 5, 2003 SITE 2A

Time	sec	Temp wet	Temp dry
1554	50	21.55	25.21
1554	52	21.45	25.20
1554	54	21.38	25.20
1554	56	21.34	25.19
1554	58	21.38	25.20
1555	0	21.47	25.18
1555	2	21.57	25.17
1555	4	21.65	25.16
1555	6	21.76	25.15
1555	8	21.82	25.13
1555	10	21.90	25.14
1555	12	21.94	25.11
1555	14	21.98	25.10
1555	16	22.04	25.10
1555	18	22.07	25.07
1555	20	22.12	25.06
1555	22	22.16	25.06
1555	24	22.17	25.04
1555	26	22.23	25.07
1555	28	22.22	25.04
1555	30	22.27	25.04
1555	32	22.28	25.02
1555	34	22.32	25.02
1555	36	22.34	25.03
1555	38	22.37	25.02
1555	40	22.37	25.00
1555	42	22.38	24.97
1555	44	22.41	24.98
1555	46	22.38	24.96
1555	48	22.43	24.95
1555	50	22.43	24.95
1555	52	22.42	24.93
1555	54	22.45	24.94
1555	56	22.46	24.92
1555	58	22.49	24.91
1556	0	22.50	24.91
1556	2	22.49	24.88
1556	4	22.51	24.88
1556	6	22.54	24.89
1556	8	22.53	24.87
1556	10	22.57	24.88
1556	12	22.58	24.88
1556	14	22.59	24.87
1556	16	22.58	24.84
1556	18	22.60	24.81
1556	20	22.63	24.82
1556	22	22.63	24.80
1556	24	22.64	24.78
1556	26	22.65	24.81

Evapotranspiration Data
August 5, 2003 SITE 2A

Time	sec	Temp wet	Temp dry
1759	46	17.88	18.87
1759	48	17.85	18.84
1759	50	17.85	18.84
1759	52	17.83	18.83
1759	54	17.88	18.85
1759	56	17.93	18.85
1759	58	17.95	18.87
1800	0	18.00	18.89
1800	2	18.04	18.88
1800	4	18.07	18.88
1800	6	18.11	18.89
1800	8	18.14	18.88
1800	10	18.17	18.88
1800	12	18.21	18.87
1800	14	18.23	18.87
1800	16	18.24	18.86
1800	18	18.26	18.86
1800	20	18.28	18.87
1800	22	18.29	18.86
1800	24	18.33	18.88
1800	26	18.34	18.85
1800	28	18.36	18.86
1800	30	18.34	18.84
1800	32	18.39	18.85
1800	34	18.38	18.84
1800	36	18.41	18.84
1800	38	18.40	18.82
1800	40	18.42	18.83
1800	42	18.43	18.83
1800	44	18.42	18.81
1800	46	18.46	18.82
1800	48	18.45	18.81
1800	50	18.46	18.82
1800	52	18.45	18.80
1800	54	18.47	18.80
1800	56	18.49	18.80
1800	58	18.51	18.83
1801	0	18.47	18.78
1801	2	18.51	18.80
1801	4	18.52	18.81
1801	6	18.52	18.80
1801	8	18.51	18.79
1801	10	18.54	18.79
1801	12	18.54	18.80
1801	14	18.55	18.79
1801	16	18.56	18.80
1801	18	18.54	18.79
1801	20	18.56	18.78
1801	22	18.57	18.79

Table C.3 (cont)
Evapotranspiration Data
August 5, 2003 SITE 2A

Time	sec	Temp wet	Temp dry
1804	8	17.29	18.18
1804	10	17.28	18.16
1804	12	17.29	18.16
1804	14	17.33	18.16
1804	16	17.39	18.20
1804	18	17.42	18.21
1804	20	17.43	18.21
1804	22	17.50	18.23
1804	24	17.55	18.25
1804	26	17.59	18.26
1804	28	17.62	18.26
1804	30	17.65	18.26
1804	32	17.71	18.29
1804	34	17.72	18.28
1804	36	17.73	18.27
1804	38	17.77	18.29
1804	40	17.79	18.29
1804	42	17.82	18.30
1804	44	17.82	18.29
1804	46	17.85	18.29
1804	48	17.88	18.28
1804	50	17.89	18.28
1804	52	17.93	18.30
1804	54	17.92	18.30
1804	56	17.93	18.28
1804	58	17.94	18.27
1805	0	17.95	18.29
1805	2	17.97	18.29
1805	4	17.99	18.30
1805	6	17.99	18.28
1805	8	18.02	18.28
1805	10	18.03	18.31
1805	12	18.02	18.28
1805	14	18.05	18.31
1805	16	18.04	18.29
1805	18	18.06	18.29
1805	20	18.08	18.30
1805	22	18.07	18.31
1805	24	18.09	18.32
1805	26	18.09	18.30
1805	28	18.11	18.31
1805	30	18.10	18.30
1805	32	18.12	18.31
1805	34	18.12	18.30
1805	36	18.11	18.29
1805	38	18.12	18.30
1805	40	18.14	18.30
1805	42	18.15	18.31
1805	44	18.13	18.30

Evapotranspiration Data
August 5, 2003 SITE 2A

Time	sec	Temp wet	Temp dry
2010	0	15.20	16.01
2010	2	15.20	16.00
2010	4	15.17	15.98
2010	6	15.19	16.02
2010	8	15.18	16.02
2010	10	15.21	16.04
2010	12	15.24	16.04
2010	14	15.28	16.05
2010	16	15.29	16.04
2010	18	15.32	16.05
2010	20	15.35	16.06
2010	22	15.37	16.05
2010	24	15.37	16.04
2010	26	15.40	16.05
2010	28	15.42	16.06
2010	30	15.44	16.05
2010	32	15.46	16.04
2010	34	15.45	16.03
2010	36	15.48	16.05
2010	38	15.50	16.04
2010	40	15.52	16.04
2010	42	15.52	16.04
2010	44	15.54	16.02
2010	46	15.53	16.02
2010	48	15.54	16.02
2010	50	15.55	16.02
2010	52	15.57	16.01
2010	54	15.57	16.00
2010	56	15.58	16.00
2010	58	15.58	15.99
2011	0	15.58	15.98
2011	2	15.59	15.98
2011	4	15.58	15.98
2011	6	15.60	15.97
2011	8	15.58	15.96
2011	10	15.60	15.97
2011	12	15.60	15.96
2011	14	15.60	15.96
2011	16	15.60	15.96
2011	18	15.60	15.95
2011	20	15.61	15.94
2011	22	15.61	15.95
2011	24	15.60	15.94
2011	26	15.61	15.94
2011	28	15.63	15.94
2011	30	15.61	15.92
2011	32	15.60	15.90
2011	34	15.59	15.90
2011	36	15.61	15.91

Evapotranspiration Data
August 5, 2003 SITE 2A

Time	sec	Temp wet	Temp dry
2013	28	14.55	15.61
2013	30	14.53	15.62
2013	32	14.55	15.61
2013	34	14.56	15.62
2013	36	14.60	15.65
2013	38	14.63	15.64
2013	40	14.69	15.67
2013	42	14.73	15.68
2013	44	14.75	15.67
2013	46	14.82	15.70
2013	48	14.85	15.69
2013	50	14.88	15.69
2013	52	14.91	15.69
2013	54	14.95	15.70
2013	56	14.99	15.69
2013	58	14.99	15.69
2014	0	15.05	15.70
2014	2	15.07	15.70
2014	4	15.09	15.70
2014	6	15.11	15.70
2014	8	15.12	15.70
2014	10	15.16	15.72
2014	12	15.17	15.69
2014	14	15.19	15.70
2014	16	15.20	15.69
2014	18	15.22	15.70
2014	20	15.23	15.71
2014	22	15.25	15.69
2014	24	15.27	15.70
2014	26	15.27	15.68
2014	28	15.29	15.69
2014	30	15.29	15.67
2014	32	15.30	15.67
2014	34	15.31	15.66
2014	36	15.31	15.67
2014	38	15.35	15.69
2014	40	15.34	15.69
2014	42	15.35	15.67
2014	44	15.37	15.68
2014	46	15.36	15.66
2014	48	15.39	15.69
2014	50	15.38	15.66
2014	52	15.39	15.68
2014	54	15.39	15.66
2014	56	15.41	15.67
2014	58	15.42	15.67
2015	0	15.41	15.67
2015	2	15.41	15.65
2015	4	15.41	15.65

Table C.3 (cont)
Evapotranspiration Data
August 5, 2003 SITE 2B

Time	sec	Temp wet	Temp dry
1015	14	20.90	28.43
1015	16	20.96	28.50
1015	18	20.95	28.41
1015	20	20.86	28.32
1015	22	20.85	28.28
1015	24	20.95	28.27
1015	26	21.19	28.32
1015	28	21.48	28.34
1015	30	21.79	28.37
1015	32	22.11	28.42
1015	34	22.44	28.40
1015	36	22.74	28.49
1015	38	23.03	28.51
1015	40	23.28	28.55
1015	42	23.54	28.59
1015	44	23.76	28.64
1015	46	23.96	28.68
1015	48	24.11	28.70
1015	50	24.27	28.77
1015	52	24.40	28.78
1015	54	24.53	28.83
1015	56	24.67	28.89
1015	58	24.81	28.93
1016	0	24.92	28.96
1016	2	25.05	29.01
1016	4	25.10	29.03
1016	6	25.24	29.08
1016	8	25.28	29.10
1016	10	25.40	29.15
1016	12	25.48	29.20
1016	14	25.53	29.22
1016	16	25.64	29.26
1016	18	25.67	29.28
1016	20	25.73	29.31
1016	22	25.82	29.38
1016	24	25.87	29.39
1016	26	25.92	29.42
1016	28	25.96	29.48
1016	30	26.00	29.49
1016	32	26.02	29.51
1016	34	26.07	29.54
1016	36	26.10	29.58
1016	38	26.14	29.61
1016	40	26.17	29.61
1016	42	26.20	29.68
1016	44	26.17	29.68
1016	46	26.23	29.70
1016	48	26.25	29.73
1016	50	26.27	29.74

Evapotranspiration Data
August 5, 2003 SITE 2B

Time	sec	Temp wet	Temp dry
1018	30	19.83	26.62
1018	32	19.79	26.56
1018	34	19.76	26.56
1018	36	19.71	26.51
1018	38	19.66	26.46
1018	40	19.74	26.47
1018	42	19.85	26.49
1018	44	20.12	26.56
1018	46	20.39	26.62
1018	48	20.71	26.65
1018	50	21.01	26.71
1018	52	21.33	26.74
1018	54	21.59	26.78
1018	56	21.86	26.80
1018	58	22.10	26.83
1019	0	22.35	26.85
1019	2	22.55	26.91
1019	4	22.73	26.90
1019	6	22.91	26.91
1019	8	23.02	26.93
1019	10	23.20	26.96
1019	12	23.32	26.96
1019	14	23.45	26.98
1019	16	23.55	27.02
1019	18	23.64	27.03
1019	20	23.73	27.08
1019	22	23.82	27.13
1019	24	23.91	27.16
1019	26	23.98	27.19
1019	28	24.07	27.26
1019	30	24.14	27.32
1019	32	24.22	27.39
1019	34	24.29	27.46
1019	36	24.38	27.50
1019	38	24.41	27.53
1019	40	24.48	27.57
1019	42	24.52	27.62
1019	44	24.61	27.66
1019	46	24.62	27.67
1019	48	24.64	27.70
1019	50	24.68	27.76
1019	52	24.69	27.77
1019	54	24.71	27.80
1019	56	24.73	27.78
1019	58	24.72	27.80
1020	0	24.73	27.82
1020	2	24.73	27.84
1020	4	24.73	27.82
1020	6	24.74	27.82

Evapotranspiration Data
August 5, 2003 SITE 2B

Time	sec	Temp wet	Temp dry
1113	26	21.52	28.82
1113	28	21.55	28.74
1113	30	21.44	28.58
1113	32	21.32	28.45
1113	34	21.31	28.46
1113	36	21.42	28.53
1113	38	21.69	28.68
1113	40	21.97	28.78
1113	42	22.29	28.86
1113	44	22.68	29.04
1113	46	23.05	29.17
1113	48	23.38	29.27
1113	50	23.71	29.37
1113	52	24.04	29.49
1113	54	24.32	29.56
1113	56	24.59	29.65
1113	58	24.86	29.76
1114	0	25.10	29.87
1114	2	25.32	29.94
1114	4	25.49	30.01
1114	6	25.69	30.12
1114	8	25.88	30.20
1114	10	26.02	30.27
1114	12	26.17	30.33
1114	14	26.31	30.40
1114	16	26.45	30.46
1114	18	26.60	30.58
1114	20	26.72	30.65
1114	22	26.79	30.69
1114	24	26.89	30.75
1114	26	27.02	30.82
1114	28	27.11	30.87
1114	30	27.23	30.95
1114	32	27.34	31.00
1114	34	27.38	31.06
1114	36	27.47	31.09
1114	38	27.51	31.15
1114	40	27.60	31.22
1114	42	27.62	31.26
1114	44	27.69	31.32
1114	46	27.73	31.34
1114	48	27.74	31.39
1114	50	27.77	31.44
1114	52	27.78	31.46
1114	54	27.85	31.52
1114	56	27.86	31.55
1114	58	27.89	31.56
1115	0	27.94	31.62
1115	2	27.98	31.66

Table C.3 (cont)
Evapotranspiration Data
August 5, 2003 SITE 2B

Time	sec	Temp wet	Temp dry
1116	24	21.88	29.37
1116	26	21.93	29.43
1116	28	22.01	29.42
1116	30	22.05	29.39
1116	32	22.04	29.39
1116	34	22.13	29.43
1116	36	22.37	29.48
1116	38	22.69	29.58
1116	40	22.99	29.64
1116	42	23.37	29.75
1116	44	23.69	29.80
1116	46	24.06	29.91
1116	48	24.39	30.00
1116	50	24.69	30.06
1116	52	24.97	30.15
1116	54	25.23	30.20
1116	56	25.48	30.30
1116	58	25.70	30.33
1117	0	25.89	30.42
1117	2	26.11	30.52
1117	4	26.28	30.58
1117	6	26.45	30.67
1117	8	26.55	30.71
1117	10	26.66	30.77
1117	12	26.72	30.80
1117	14	26.83	30.86
1117	16	26.93	30.95
1117	18	27.00	30.97
1117	20	27.07	31.05
1117	22	27.15	31.08
1117	24	27.18	31.11
1117	26	27.24	31.14
1117	28	27.29	31.18
1117	30	27.33	31.24
1117	32	27.39	31.27
1117	34	27.42	31.31
1117	36	27.47	31.35
1117	38	27.54	31.41
1117	40	27.59	31.43
1117	42	27.63	31.47
1117	44	27.67	31.50
1117	46	27.72	31.55
1117	48	27.77	31.58
1117	50	27.81	31.61
1117	52	27.83	31.65
1117	54	27.81	31.65
1117	56	27.84	31.68
1117	58	27.87	31.73
1118	0	27.89	31.75

Evapotranspiration Data
August 5, 2003 SITE 2B

Time	sec	Temp wet	Temp dry
1212	44	22.60	26.22
1212	46	22.49	26.22
1212	48	22.45	26.19
1212	50	22.45	26.17
1212	52	22.43	26.18
1212	54	22.42	26.19
1212	56	22.46	26.21
1212	58	22.52	26.19
1213	0	22.60	26.25
1213	2	22.70	26.23
1213	4	22.80	26.21
1213	6	22.95	26.26
1213	8	23.04	26.26
1213	10	23.18	26.31
1213	12	23.32	26.30
1213	14	23.41	26.33
1213	16	23.54	26.35
1213	18	23.66	26.35
1213	20	23.79	26.41
1213	22	23.89	26.42
1213	24	24.00	26.43
1213	26	24.10	26.46
1213	28	24.21	26.51
1213	30	24.30	26.50
1213	32	24.39	26.53
1213	34	24.46	26.55
1213	36	24.58	26.59
1213	38	24.68	26.62
1213	40	24.76	26.66
1213	42	24.85	26.68
1213	44	24.92	26.68
1213	46	25.00	26.70
1213	48	25.07	26.72
1213	50	25.16	26.74
1213	52	25.23	26.78
1213	54	25.27	26.79
1213	56	25.33	26.81
1213	58	25.40	26.83
1214	0	25.47	26.85
1214	2	25.52	26.87
1214	4	25.53	26.85
1214	6	25.61	26.87
1214	8	25.64	26.89
1214	10	25.70	26.90
1214	12	25.74	26.91
1214	14	25.74	26.91
1214	16	25.76	26.93
1214	18	25.74	26.90
1214	20	25.76	26.91

Evapotranspiration Data
August 5, 2003 SITE 2B

Time	sec	Temp wet	Temp dry
1216	0	23.38	26.91
1216	2	23.37	26.91
1216	4	23.26	26.93
1216	6	23.26	26.94
1216	8	23.22	26.94
1216	10	23.19	26.94
1216	12	23.23	26.96
1216	14	23.34	27.00
1216	16	23.44	27.00
1216	18	23.64	27.09
1216	20	23.80	27.14
1216	22	23.97	27.17
1216	24	24.14	27.19
1216	26	24.30	27.22
1216	28	24.46	27.28
1216	30	24.61	27.30
1216	32	24.75	27.33
1216	34	24.92	27.38
1216	36	25.06	27.41
1216	38	25.21	27.46
1216	40	25.32	27.50
1216	42	25.42	27.50
1216	44	25.54	27.55
1216	46	25.64	27.57
1216	48	25.75	27.61
1216	50	25.86	27.67
1216	52	25.93	27.67
1216	54	26.02	27.71
1216	56	26.11	27.76
1216	58	26.20	27.80
1217	0	26.27	27.82
1217	2	26.35	27.82
1217	4	26.39	27.86
1217	6	26.47	27.91
1217	8	26.54	27.91
1217	10	26.60	27.94
1217	12	26.67	27.98
1217	14	26.70	27.99
1217	16	26.77	28.04
1217	18	26.78	28.05
1217	20	26.86	28.08
1217	22	26.91	28.12
1217	24	26.97	28.16
1217	26	26.97	28.17
1217	28	27.04	28.21
1217	30	27.06	28.23
1217	32	27.10	28.26
1217	34	27.15	28.29
1217	36	27.20	28.33

Table C.3 (cont)
Evapotranspiration Data
August 5, 2003 SITE 2B

Time	sec	Temp wet	Temp dry
1312	48	19.64	22.51
1312	50	19.62	22.51
1312	52	19.61	22.51
1312	54	19.61	22.51
1312	56	19.62	22.50
1312	58	19.66	22.53
1313	0	19.64	22.52
1313	2	19.67	22.54
1313	4	19.75	22.54
1313	6	19.81	22.55
1313	8	19.88	22.55
1313	10	20.00	22.57
1313	12	20.12	22.58
1313	14	20.20	22.58
1313	16	20.29	22.57
1313	18	20.36	22.56
1313	20	20.44	22.58
1313	22	20.52	22.58
1313	24	20.58	22.58
1313	26	20.65	22.58
1313	28	20.69	22.59
1313	30	20.76	22.59
1313	32	20.77	22.57
1313	34	20.84	22.57
1313	36	20.88	22.60
1313	38	20.92	22.60
1313	40	20.97	22.61
1313	42	20.98	22.58
1313	44	21.01	22.58
1313	46	21.04	22.58
1313	48	21.07	22.59
1313	50	21.10	22.62
1313	52	21.10	22.60
1313	54	21.12	22.58
1313	56	21.13	22.59
1313	58	21.17	22.60
1314	0	21.20	22.61
1314	2	21.22	22.60
1314	4	21.26	22.63
1314	6	21.25	22.61
1314	8	21.26	22.60
1314	10	21.29	22.63
1314	12	21.32	22.61
1314	14	21.31	22.61
1314	16	21.33	22.61
1314	18	21.33	22.62
1314	20	21.36	22.63
1314	22	21.36	22.63
1314	24	21.35	22.61

Evapotranspiration Data
August 5, 2003 SITE 2B

Time	sec	Temp wet	Temp dry
1316	6	19.88	22.60
1316	8	19.84	22.60
1316	10	19.86	22.63
1316	12	19.88	22.64
1316	14	19.88	22.65
1316	16	19.88	22.64
1316	18	19.89	22.66
1316	20	19.96	22.69
1316	22	20.05	22.73
1316	24	20.15	22.75
1316	26	20.27	22.80
1316	28	20.39	22.83
1316	30	20.51	22.85
1316	32	20.63	22.88
1316	34	20.78	22.91
1316	36	20.91	22.94
1316	38	21.02	22.96
1316	40	21.16	23.00
1316	42	21.26	23.01
1316	44	21.35	23.03
1316	46	21.45	23.08
1316	48	21.56	23.11
1316	50	21.66	23.14
1316	52	21.76	23.17
1316	54	21.87	23.20
1316	56	21.96	23.23
1316	58	22.04	23.25
1317	0	22.16	23.31
1317	2	22.20	23.32
1317	4	22.26	23.34
1317	6	22.36	23.38
1317	8	22.42	23.39
1317	10	22.47	23.41
1317	12	22.54	23.43
1317	14	22.58	23.44
1317	16	22.63	23.47
1317	18	22.71	23.50
1317	20	22.73	23.49
1317	22	22.78	23.52
1317	24	22.83	23.54
1317	26	22.85	23.56
1317	28	22.89	23.59
1317	30	22.94	23.62
1317	32	22.97	23.64
1317	34	23.01	23.67
1317	36	23.05	23.67
1317	38	23.08	23.72
1317	40	23.15	23.77
1317	42	23.18	23.78

Evapotranspiration Data
August 5, 2003 SITE 2B

Time	sec	Temp wet	Temp dry
1411	54	27.53	33.11
1411	56	27.44	33.11
1411	58	27.29	33.02
1412	0	27.20	32.86
1412	2	27.15	32.86
1412	4	27.15	32.84
1412	6	27.22	32.87
1412	8	27.34	32.91
1412	10	27.47	32.91
1412	12	27.67	32.94
1412	14	27.83	32.96
1412	16	28.04	32.97
1412	18	28.25	33.01
1412	20	28.45	33.05
1412	22	28.63	33.06
1412	24	28.78	33.05
1412	26	28.96	33.10
1412	28	29.13	33.11
1412	30	29.31	33.15
1412	32	29.46	33.19
1412	34	29.56	33.17
1412	36	29.74	33.24
1412	38	29.87	33.23
1412	40	30.00	33.26
1412	42	30.13	33.33
1412	44	30.23	33.31
1412	46	30.36	33.33
1412	48	30.47	33.37
1412	50	30.57	33.38
1412	52	30.65	33.41
1412	54	30.75	33.45
1412	56	30.83	33.44
1412	58	30.91	33.47
1413	0	31.04	33.52
1413	2	31.03	33.49
1413	4	31.11	33.55
1413	6	31.14	33.54
1413	8	31.22	33.59
1413	10	31.28	33.60
1413	12	31.32	33.60
1413	14	31.38	33.64
1413	16	31.46	33.65
1413	18	31.50	33.65
1413	20	31.53	33.69
1413	22	31.60	33.74
1413	24	31.61	33.74
1413	26	31.68	33.75
1413	28	31.71	33.77
1413	30	31.76	33.79

Table C.3 (cont)

Evapotranspiration Data
August 5, 2003 SITE 2B

Time	sec	Temp wet	Temp dry
1415	4	27.77	33.61
1415	6	27.67	33.54
1415	8	27.44	33.53
1415	10	27.44	33.49
1415	12	27.44	33.43
1415	14	27.46	33.41
1415	16	27.55	33.43
1415	18	27.62	33.44
1415	20	27.76	33.48
1415	22	27.90	33.47
1415	24	28.04	33.45
1415	26	28.20	33.49
1415	28	28.35	33.49
1415	30	28.49	33.49
1415	32	28.65	33.53
1415	34	28.77	33.52
1415	36	28.92	33.53
1415	38	29.06	33.54
1415	40	29.20	33.57
1415	42	29.32	33.58
1415	44	29.42	33.57
1415	46	29.55	33.59
1415	48	29.65	33.61
1415	50	29.73	33.62
1415	52	29.83	33.63
1415	54	29.97	33.66
1415	56	30.09	33.66
1415	58	30.17	33.69
1416	0	30.27	33.68
1416	2	30.36	33.70
1416	4	30.44	33.73
1416	6	30.51	33.71
1416	8	30.56	33.74
1416	10	30.63	33.75
1416	12	30.68	33.75
1416	14	30.72	33.76
1416	16	30.76	33.80
1416	18	30.81	33.81
1416	20	30.81	33.83
1416	22	30.84	33.81
1416	24	30.88	33.82
1416	26	30.92	33.86
1416	28	31.00	33.86
1416	30	31.01	33.86
1416	32	31.09	33.89
1416	34	31.13	33.91
1416	36	31.14	33.90
1416	38	31.18	33.92
1416	40	31.19	33.92

Evapotranspiration Data
August 5, 2003 SITE 2B

Time	sec	Temp wet	Temp dry
1557	46	20.52	24.44
1557	48	20.53	24.43
1557	50	20.57	24.40
1557	52	20.60	24.37
1557	54	20.61	24.37
1557	56	20.61	24.37
1557	58	20.61	24.38
1558	0	20.63	24.35
1558	2	20.63	24.33
1558	4	20.67	24.33
1558	6	20.72	24.31
1558	8	20.79	24.30
1558	10	20.83	24.27
1558	12	20.89	24.26
1558	14	20.89	24.23
1558	16	20.96	24.23
1558	18	20.99	24.24
1558	20	21.02	24.19
1558	22	21.07	24.17
1558	24	21.12	24.17
1558	26	21.17	24.13
1558	28	21.19	24.13
1558	30	21.23	24.11
1558	32	21.23	24.10
1558	34	21.27	24.09
1558	36	21.30	24.09
1558	38	21.33	24.05
1558	40	21.35	24.06
1558	42	21.34	24.01
1558	44	21.38	24.01
1558	46	21.37	23.98
1558	48	21.40	23.97
1558	50	21.39	23.96
1558	52	21.41	23.94
1558	54	21.42	23.92
1558	56	21.45	23.90
1558	58	21.48	23.90
1559	0	21.47	23.86
1559	2	21.48	23.88
1559	4	21.48	23.86
1559	6	21.48	23.82
1559	8	21.51	23.82
1559	10	21.50	23.79
1559	12	21.53	23.81
1559	14	21.52	23.77
1559	16	21.52	23.76
1559	18	21.52	23.75
1559	20	21.54	23.73
1559	22	21.54	23.72

Evapotranspiration Data
August 5, 2003 SITE 2B

Time	sec	Temp wet	Temp dry
1600	38	19.98	23.24
1600	40	19.91	23.25
1600	42	19.90	23.22
1600	44	19.94	23.23
1600	46	19.92	23.23
1600	48	19.88	23.21
1600	50	19.88	23.19
1600	52	19.92	23.20
1600	54	19.95	23.20
1600	56	19.99	23.18
1600	58	20.03	23.17
1601	0	20.09	23.16
1601	2	20.13	23.14
1601	4	20.20	23.13
1601	6	20.26	23.12
1601	8	20.32	23.11
1601	10	20.38	23.10
1601	12	20.43	23.09
1601	14	20.51	23.07
1601	16	20.53	23.04
1601	18	20.57	23.03
1601	20	20.60	23.02
1601	22	20.64	23.01
1601	24	20.69	22.99
1601	26	20.72	22.99
1601	28	20.75	22.96
1601	30	20.78	22.97
1601	32	20.79	22.93
1601	34	20.81	22.94
1601	36	20.84	22.93
1601	38	20.87	22.93
1601	40	20.89	22.93
1601	42	20.92	22.93
1601	44	20.90	22.88
1601	46	20.93	22.88
1601	48	20.96	22.87
1601	50	20.99	22.87
1601	52	21.00	22.87
1601	54	21.02	22.84
1601	56	21.01	22.82
1601	58	21.01	22.82
1602	0	21.05	22.82
1602	2	21.06	22.81
1602	4	21.06	22.80
1602	6	21.07	22.80
1602	8	21.05	22.79
1602	10	21.04	22.76
1602	12	21.04	22.76
1602	14	21.03	22.73

Table C.3 (cont)
Evapotranspiration Data
August 5, 2003 SITE 2B

Time	sec	Temp wet	Temp dry
1807	52	17.21	17.76
1807	54	17.21	17.76
1807	56	17.20	17.77
1807	58	17.24	17.82
1808	0	17.30	17.85
1808	2	17.33	17.89
1808	4	17.38	17.93
1808	6	17.42	17.93
1808	8	17.46	17.96
1808	10	17.53	18.00
1808	12	17.55	18.00
1808	14	17.61	18.03
1808	16	17.65	18.05
1808	18	17.67	18.04
1808	20	17.70	18.05
1808	22	17.75	18.08
1808	24	17.77	18.08
1808	26	17.79	18.08
1808	28	17.81	18.09
1808	30	17.84	18.09
1808	32	17.88	18.11
1808	34	17.88	18.12
1808	36	17.91	18.15
1808	38	17.92	18.14
1808	40	17.94	18.14
1808	42	17.96	18.15
1808	44	17.98	18.15
1808	46	18.00	18.16
1808	48	17.99	18.15
1808	50	18.02	18.16
1808	52	18.03	18.17
1808	54	18.06	18.18
1808	56	18.06	18.18
1808	58	18.07	18.19
1809	0	18.08	18.19
1809	2	18.11	18.20
1809	4	18.09	18.18
1809	6	18.12	18.21
1809	8	18.15	18.22
1809	10	18.14	18.22
1809	12	18.13	18.21
1809	14	18.16	18.22
1809	16	18.17	18.22
1809	18	18.16	18.23
1809	20	18.16	18.21
1809	22	18.18	18.22
1809	24	18.20	18.24
1809	26	18.20	18.23
1809	28	18.20	18.22

Evapotranspiration Data
August 5, 2003 SITE 2B

Time	sec	Temp wet	Temp dry
1811	24	16.80	17.58
1811	26	16.79	17.59
1811	28	16.81	17.60
1811	30	16.84	17.65
1811	32	16.89	17.68
1811	34	16.93	17.70
1811	36	17.00	17.73
1811	38	17.05	17.75
1811	40	17.11	17.77
1811	42	17.16	17.78
1811	44	17.18	17.78
1811	46	17.23	17.79
1811	48	17.29	17.81
1811	50	17.32	17.82
1811	52	17.34	17.82
1811	54	17.37	17.83
1811	56	17.42	17.82
1811	58	17.46	17.87
1812	0	17.47	17.85
1812	2	17.49	17.85
1812	4	17.50	17.84
1812	6	17.53	17.84
1812	8	17.54	17.85
1812	10	17.57	17.86
1812	12	17.58	17.85
1812	14	17.61	17.88
1812	16	17.62	17.87
1812	18	17.63	17.87
1812	20	17.66	17.89
1812	22	17.68	17.90
1812	24	17.68	17.88
1812	26	17.69	17.88
1812	28	17.68	17.87
1812	30	17.72	17.90
1812	32	17.71	17.88
1812	34	17.72	17.88
1812	36	17.75	17.90
1812	38	17.76	17.89
1812	40	17.79	17.91
1812	42	17.77	17.90
1812	44	17.78	17.91
1812	46	17.80	17.92
1812	48	17.80	17.91
1812	50	17.81	17.91
1812	52	17.83	17.92
1812	54	17.82	17.90
1812	56	17.83	17.93
1812	58	17.82	17.92
1813	0	17.84	17.92

Evapotranspiration Data
August 5, 2003 SITE 2B

Time	sec	Temp wet	Temp dry
2018	32	14.21	15.21
2018	34	14.20	15.20
2018	36	14.22	15.22
2018	38	14.19	15.22
2018	40	14.21	15.24
2018	42	14.24	15.28
2018	44	14.27	15.29
2018	46	14.30	15.30
2018	48	14.35	15.31
2018	50	14.38	15.30
2018	52	14.42	15.30
2018	54	14.44	15.28
2018	56	14.49	15.30
2018	58	14.54	15.29
2019	0	14.57	15.31
2019	2	14.58	15.28
2019	4	14.63	15.29
2019	6	14.65	15.28
2019	8	14.68	15.29
2019	10	14.71	15.29
2019	12	14.72	15.28
2019	14	14.74	15.27
2019	16	14.76	15.26
2019	18	14.78	15.27
2019	20	14.80	15.26
2019	22	14.81	15.27
2019	24	14.85	15.28
2019	26	14.83	15.26
2019	28	14.86	15.25
2019	30	14.87	15.24
2019	32	14.90	15.25
2019	34	14.90	15.24
2019	36	14.91	15.23
2019	38	14.91	15.23
2019	40	14.92	15.23
2019	42	14.94	15.23
2019	44	14.95	15.23
2019	46	14.94	15.23
2019	48	14.97	15.22
2019	50	14.98	15.23
2019	52	14.97	15.21
2019	54	14.98	15.21
2019	56	15.00	15.22
2019	58	15.00	15.21
2020	0	15.01	15.22
2020	2	15.00	15.20
2020	4	15.02	15.21
2020	6	15.00	15.18
2020	8	15.02	15.21

Table C.3 (cont)

Evapotranspiration Data
August 5, 2003 SITE 2B

Time	sec	Temp wet	Temp dry
2022	26	14.14	14.98
2022	28	14.13	14.98
2022	30	14.11	14.99
2022	32	14.10	15.01
2022	34	14.11	15.02
2022	36	14.14	15.03
2022	38	14.19	15.06
2022	40	14.24	15.07
2022	42	14.30	15.08
2022	44	14.36	15.10
2022	46	14.39	15.11
2022	48	14.41	15.10
2022	50	14.45	15.11
2022	52	14.48	15.10
2022	54	14.54	15.11
2022	56	14.56	15.11
2022	58	14.58	15.12
2023	0	14.61	15.12
2023	2	14.63	15.10
2023	4	14.67	15.12
2023	6	14.68	15.10
2023	8	14.70	15.11
2023	10	14.72	15.10
2023	12	14.75	15.11
2023	14	14.77	15.11
2023	16	14.77	15.11
2023	18	14.78	15.11
2023	20	14.80	15.10
2023	22	14.82	15.12
2023	24	14.83	15.12
2023	26	14.86	15.12
2023	28	14.86	15.10
2023	30	14.86	15.10
2023	32	14.88	15.10
2023	34	14.88	15.10
2023	36	14.89	15.09
2023	38	14.91	15.10
2023	40	14.91	15.11
2023	42	14.92	15.11
2023	44	14.92	15.10
2023	46	14.93	15.09
2023	48	14.95	15.10
2023	50	14.94	15.09
2023	52	14.95	15.10
2023	54	14.97	15.10
2023	56	14.96	15.08
2023	58	14.97	15.10
2024	0	14.96	15.07
2024	2	14.98	15.10

Evapotranspiration Data
August 5, 2003 SITE 2C

Time	sec	Temp wet	Temp dry
1022	0	19.48	25.57
1022	2	19.44	25.59
1022	4	19.41	25.60
1022	6	19.41	25.61
1022	8	19.39	25.64
1022	10	19.51	25.70
1022	12	19.74	25.77
1022	14	20.09	25.86
1022	16	20.45	25.93
1022	18	20.84	26.03
1022	20	21.19	26.13
1022	22	21.55	26.17
1022	24	21.86	26.27
1022	26	22.17	26.35
1022	28	22.44	26.41
1022	30	22.69	26.49
1022	32	22.90	26.55
1022	34	23.13	26.64
1022	36	23.34	26.72
1022	38	23.50	26.74
1022	40	23.66	26.81
1022	42	23.84	26.92
1022	44	23.94	26.96
1022	46	24.07	27.01
1022	48	24.20	27.06
1022	50	24.28	27.11
1022	52	24.34	27.16
1022	54	24.38	27.19
1022	56	24.47	27.25
1022	58	24.51	27.30
1023	0	24.59	27.34
1023	2	24.66	27.37
1023	4	24.74	27.44
1023	6	24.79	27.47
1023	8	24.86	27.52
1023	10	24.89	27.55
1023	12	24.96	27.60
1023	14	25.01	27.63
1023	16	25.06	27.70
1023	18	25.12	27.74
1023	20	25.18	27.81
1023	22	25.18	27.83
1023	24	25.24	27.88
1023	26	25.29	27.92
1023	28	25.33	27.94
1023	30	25.36	27.98
1023	32	25.40	28.00
1023	34	25.44	28.04
1023	36	25.50	28.07

Evapotranspiration Data
August 5, 2003 SITE 2C

Time	sec	Temp wet	Temp dry
1024	48	20.12	26.37
1024	50	20.02	26.33
1024	52	19.99	26.28
1024	54	19.95	26.27
1024	56	19.99	26.23
1024	58	20.15	26.18
1025	0	20.36	26.17
1025	2	20.61	26.11
1025	4	20.89	26.11
1025	6	21.14	26.07
1025	8	21.40	26.05
1025	10	21.64	26.03
1025	12	21.85	26.03
1025	14	22.08	26.01
1025	16	22.21	25.99
1025	18	22.39	25.97
1025	20	22.56	25.97
1025	22	22.67	25.94
1025	24	22.80	25.97
1025	26	22.92	25.94
1025	28	22.99	25.94
1025	30	23.09	25.96
1025	32	23.20	25.97
1025	34	23.24	25.95
1025	36	23.30	25.98
1025	38	23.38	25.97
1025	40	23.43	25.97
1025	42	23.47	25.99
1025	44	23.51	25.96
1025	46	23.56	25.97
1025	48	23.55	25.95
1025	50	23.59	25.95
1025	52	23.59	25.94
1025	54	23.65	25.94
1025	56	23.63	25.92
1025	58	23.66	25.92
1026	0	23.68	25.91
1026	2	23.70	25.90
1026	4	23.69	25.88
1026	6	23.69	25.86
1026	8	23.67	25.85
1026	10	23.71	25.86
1026	12	23.69	25.85
1026	14	23.72	25.84
1026	16	23.71	25.83
1026	18	23.69	25.80
1026	20	23.67	25.79
1026	22	23.64	25.76
1026	24	23.66	25.77

Table C.3 (cont)
Evapotranspiration Data
August 5, 2003 SITE 2C

Time	sec	Temp wet	Temp dry
1121	8	24.37	30.30
1121	10	24.39	30.35
1121	12	24.38	30.36
1121	14	24.42	30.36
1121	16	24.49	30.39
1121	18	24.66	30.43
1121	20	24.87	30.47
1121	22	25.06	30.48
1121	24	25.29	30.49
1121	26	25.49	30.53
1121	28	25.70	30.55
1121	30	25.90	30.61
1121	32	26.07	30.60
1121	34	26.25	30.62
1121	36	26.43	30.61
1121	38	26.57	30.65
1121	40	26.70	30.71
1121	42	26.82	30.75
1121	44	26.96	30.78
1121	46	27.06	30.78
1121	48	27.16	30.79
1121	50	27.28	30.84
1121	52	27.37	30.87
1121	54	27.47	30.88
1121	56	27.55	30.91
1121	58	27.65	30.91
1122	0	27.71	30.93
1122	2	27.80	30.98
1122	4	27.85	30.98
1122	6	27.87	30.97
1122	8	27.94	30.98
1122	10	27.99	31.00
1122	12	28.04	31.02
1122	14	28.09	31.05
1122	16	28.16	31.06
1122	18	28.23	31.08
1122	20	28.30	31.12
1122	22	28.33	31.11
1122	24	28.39	31.15
1122	26	28.43	31.15
1122	28	28.46	31.17
1122	30	28.50	31.16
1122	32	28.56	31.18
1122	34	28.60	31.20
1122	36	28.65	31.22
1122	38	28.68	31.24
1122	40	28.70	31.24
1122	42	28.73	31.23
1122	44	28.78	31.25

Evapotranspiration Data
August 5, 2003 SITE 2C

Time	sec	Temp wet	Temp dry
1124	34	25.23	30.49
1124	36	25.20	30.48
1124	38	25.12	30.44
1124	40	25.09	30.45
1124	42	25.10	30.44
1124	44	25.18	30.43
1124	46	25.31	30.44
1124	48	25.46	30.43
1124	50	25.65	30.46
1124	52	25.83	30.49
1124	54	25.96	30.49
1124	56	26.13	30.50
1124	58	26.26	30.51
1125	0	26.41	30.52
1125	2	26.56	30.55
1125	4	26.66	30.55
1125	6	26.78	30.54
1125	8	26.89	30.55
1125	10	26.98	30.54
1125	12	27.03	30.52
1125	14	27.18	30.56
1125	16	27.28	30.58
1125	18	27.35	30.58
1125	20	27.42	30.55
1125	22	27.47	30.55
1125	24	27.54	30.55
1125	26	27.62	30.58
1125	28	27.71	30.61
1125	30	27.78	30.61
1125	32	27.83	30.61
1125	34	27.85	30.59
1125	36	27.97	30.62
1125	38	28.02	30.63
1125	40	28.08	30.64
1125	42	28.12	30.65
1125	44	28.20	30.68
1125	46	28.25	30.66
1125	48	28.30	30.68
1125	50	28.32	30.71
1125	52	28.39	30.70
1125	54	28.45	30.72
1125	56	28.48	30.72
1125	58	28.53	30.74
1126	0	28.59	30.75
1126	2	28.62	30.74
1126	4	28.68	30.77
1126	6	28.69	30.75
1126	8	28.69	30.77
1126	10	28.73	30.81

Evapotranspiration Data
August 5, 2003 SITE 2C

Time	sec	Temp wet	Temp dry
1219	32	24.38	28.55
1219	34	24.46	28.59
1219	36	24.46	28.55
1219	38	24.42	28.55
1219	40	24.49	28.60
1219	42	24.64	28.62
1219	44	24.83	28.67
1219	46	25.02	28.68
1219	48	25.25	28.73
1219	50	25.46	28.75
1219	52	25.70	28.78
1219	54	25.91	28.85
1219	56	26.07	28.83
1219	58	26.26	28.88
1220	0	26.45	28.91
1220	2	26.60	28.93
1220	4	26.76	28.98
1220	6	26.89	28.99
1220	8	27.08	29.03
1220	10	27.15	29.02
1220	12	27.27	29.03
1220	14	27.36	29.05
1220	16	27.46	29.07
1220	18	27.57	29.11
1220	20	27.67	29.15
1220	22	27.77	29.17
1220	24	27.83	29.19
1220	26	27.93	29.23
1220	28	28.00	29.23
1220	30	28.04	29.26
1220	32	28.13	29.31
1220	34	28.18	29.33
1220	36	28.22	29.31
1220	38	28.30	29.36
1220	40	28.33	29.37
1220	42	28.35	29.37
1220	44	28.40	29.39
1220	46	28.45	29.42
1220	48	28.48	29.43
1220	50	28.56	29.50
1220	52	28.60	29.52
1220	54	28.63	29.54
1220	56	28.68	29.56
1220	58	28.74	29.59
1221	0	28.79	29.59
1221	2	28.80	29.60
1221	4	28.84	29.64
1221	6	28.86	29.66
1221	8	28.87	29.68

Table C.3 (cont)

Evapotranspiration Data
August 5, 2003 SITE 2C

Time	sec	Temp wet	Temp dry
1222	42	25.55	29.73
1222	44	25.49	29.72
1222	46	25.29	29.68
1222	48	25.17	29.69
1222	50	25.18	29.68
1222	52	25.26	29.68
1222	54	25.40	29.70
1222	56	25.55	29.70
1222	58	25.67	29.72
1223	0	25.83	29.74
1223	2	25.96	29.73
1223	4	26.17	29.76
1223	6	26.30	29.74
1223	8	26.45	29.77
1223	10	26.58	29.77
1223	12	26.70	29.77
1223	14	26.81	29.76
1223	16	26.94	29.79
1223	18	27.06	29.80
1223	20	27.16	29.82
1223	22	27.27	29.85
1223	24	27.35	29.88
1223	26	27.45	29.90
1223	28	27.52	29.89
1223	30	27.61	29.91
1223	32	27.70	29.93
1223	34	27.78	29.97
1223	36	27.87	29.97
1223	38	27.97	29.97
1223	40	28.07	30.03
1223	42	28.13	30.01
1223	44	28.18	30.03
1223	46	28.25	30.06
1223	48	28.30	30.07
1223	50	28.35	30.08
1223	52	28.45	30.11
1223	54	28.50	30.12
1223	56	28.55	30.14
1223	58	28.60	30.15
1224	0	28.68	30.18
1224	2	28.73	30.20
1224	4	28.80	30.19
1224	6	28.81	30.21
1224	8	28.87	30.23
1224	10	28.89	30.26
1224	12	28.95	30.27
1224	14	28.96	30.27
1224	16	29.01	30.30
1224	18	29.06	30.33

Evapotranspiration Data
August 5, 2003 SITE 2C

Time	sec	Temp wet	Temp dry
1320	46	21.35	24.65
1320	48	21.35	24.65
1320	50	21.37	24.65
1320	52	21.36	24.67
1320	54	21.41	24.70
1320	56	21.48	24.73
1320	58	21.60	24.75
1321	0	21.75	24.77
1321	2	21.90	24.79
1321	4	22.05	24.82
1321	6	22.18	24.82
1321	8	22.35	24.85
1321	10	22.50	24.88
1321	12	22.63	24.90
1321	14	22.77	24.92
1321	16	22.88	24.91
1321	18	23.01	24.94
1321	20	23.13	24.95
1321	22	23.23	24.98
1321	24	23.33	24.99
1321	26	23.39	25.01
1321	28	23.49	25.02
1321	30	23.58	25.02
1321	32	23.66	25.04
1321	34	23.73	25.05
1321	36	23.80	25.06
1321	38	23.88	25.06
1321	40	23.92	25.08
1321	42	23.98	25.10
1321	44	24.02	25.10
1321	46	24.07	25.09
1321	48	24.13	25.13
1321	50	24.18	25.12
1321	52	24.21	25.12
1321	54	24.25	25.15
1321	56	24.30	25.16
1321	58	24.31	25.14
1322	0	24.37	25.19
1322	2	24.40	25.19
1322	4	24.42	25.20
1322	6	24.44	25.19
1322	8	24.47	25.23
1322	10	24.49	25.22
1322	12	24.50	25.23
1322	14	24.53	25.23
1322	16	24.55	25.23
1322	18	24.58	25.25
1322	20	24.60	25.25
1322	22	24.63	25.27

Evapotranspiration Data
August 5, 2003 SITE 2C

Time	sec	Temp wet	Temp dry
1323	52	21.97	25.32
1323	54	22.02	25.32
1323	56	22.06	25.33
1323	58	22.09	25.38
1324	0	22.13	25.41
1324	2	22.26	25.44
1324	4	22.44	25.49
1324	6	22.63	25.54
1324	8	22.83	25.57
1324	10	23.04	25.62
1324	12	23.25	25.68
1324	14	23.46	25.72
1324	16	23.69	25.79
1324	18	23.86	25.82
1324	20	24.03	25.85
1324	22	24.22	25.91
1324	24	24.39	25.95
1324	26	24.55	25.98
1324	28	24.70	26.01
1324	30	24.84	26.05
1324	32	24.97	26.08
1324	34	25.09	26.13
1324	36	25.19	26.16
1324	38	25.32	26.21
1324	40	25.42	26.23
1324	42	25.55	26.31
1324	44	25.61	26.30
1324	46	25.72	26.36
1324	48	25.79	26.38
1324	50	25.87	26.41
1324	52	25.99	26.43
1324	54	26.05	26.49
1324	56	26.13	26.54
1324	58	26.22	26.59
1325	0	26.29	26.64
1325	2	26.35	26.68
1325	4	26.43	26.72
1325	6	26.51	26.77
1325	8	26.55	26.80
1325	10	26.64	26.85
1325	12	26.72	26.90
1325	14	26.75	26.90
1325	16	26.81	26.95
1325	18	26.87	26.98
1325	20	26.92	27.01
1325	22	26.99	27.06
1325	24	27.02	27.09
1325	26	27.09	27.13
1325	28	27.14	27.17

Table C.3 (cont)

Evapotranspiration Data August 5, 2003 SITE 2C				Evapotranspiration Data August 5, 2003 SITE 2C				Evapotranspiration Data August 5, 2003 SITE 2C			
Time	sec	Temp wet	Temp dry	Time	sec	Temp wet	Temp dry	Time	sec	Temp wet	Temp dry
1419	16	26.89	32.86	1422	26	27.97	33.06	1814	54	16.91	17.31
1419	18	26.88	32.79	1422	28	27.95	33.00	1814	56	16.89	17.31
1419	20	26.92	32.76	1422	30	27.85	33.00	1814	58	16.87	17.32
1419	22	27.02	32.80	1422	32	27.68	33.01	1815	0	16.87	17.36
1419	24	27.14	32.83	1422	34	27.69	33.05	1815	2	16.88	17.37
1419	26	27.32	32.84	1422	36	27.80	33.07	1815	4	16.89	17.38
1419	28	27.56	32.87	1422	38	27.99	33.08	1815	6	16.91	17.41
1419	30	27.80	32.88	1422	40	28.17	33.09	1815	8	16.92	17.43
1419	32	28.03	32.92	1422	42	28.39	33.13	1815	10	16.96	17.44
1419	34	28.24	32.92	1422	44	28.58	33.13	1815	12	17.00	17.44
1419	36	28.42	32.92	1422	46	28.78	33.18	1815	14	17.02	17.46
1419	38	28.63	32.98	1422	48	28.98	33.21	1815	16	17.04	17.47
1419	40	28.83	33.02	1422	50	29.12	33.20	1815	18	17.05	17.46
1419	42	29.01	33.03	1422	52	29.26	33.19	1815	20	17.06	17.46
1419	44	29.15	33.04	1422	54	29.42	33.24	1815	22	17.10	17.46
1419	46	29.32	33.07	1422	56	29.52	33.22	1815	24	17.09	17.47
1419	48	29.43	33.04	1422	58	29.62	33.25	1815	26	17.11	17.48
1419	50	29.54	33.05	1423	0	29.79	33.28	1815	28	17.13	17.48
1419	52	29.67	33.10	1423	2	29.94	33.29	1815	30	17.15	17.48
1419	54	29.79	33.10	1423	4	30.04	33.30	1815	32	17.17	17.49
1419	56	29.91	33.14	1423	6	30.17	33.34	1815	34	17.17	17.48
1419	58	30.00	33.15	1423	8	30.29	33.35	1815	36	17.18	17.46
1420	0	30.13	33.19	1423	10	30.38	33.36	1815	38	17.19	17.49
1420	2	30.20	33.19	1423	12	30.48	33.39	1815	40	17.22	17.48
1420	4	30.28	33.20	1423	14	30.55	33.40	1815	42	17.21	17.48
1420	6	30.37	33.23	1423	16	30.60	33.41	1815	44	17.23	17.48
1420	8	30.43	33.23	1423	18	30.70	33.43	1815	46	17.23	17.49
1420	10	30.57	33.26	1423	20	30.78	33.45	1815	48	17.24	17.49
1420	12	30.61	33.24	1423	22	30.84	33.45	1815	50	17.26	17.49
1420	14	30.69	33.27	1423	24	30.93	33.46	1815	52	17.27	17.50
1420	16	30.78	33.29	1423	26	31.01	33.52	1815	54	17.27	17.49
1420	18	30.87	33.34	1423	28	31.07	33.55	1815	56	17.30	17.48
1420	20	30.91	33.30	1423	30	31.11	33.52	1815	58	17.29	17.48
1420	22	30.96	33.34	1423	32	31.18	33.55	1816	0	17.30	17.49
1420	24	31.04	33.37	1423	34	31.22	33.57	1816	2	17.31	17.49
1420	26	31.06	33.37	1423	36	31.27	33.59	1816	4	17.31	17.49
1420	28	31.13	33.38	1423	38	31.35	33.60	1816	6	17.32	17.48
1420	30	31.18	33.42	1423	40	31.36	33.60	1816	8	17.32	17.48
1420	32	31.21	33.41	1423	42	31.39	33.57	1816	10	17.32	17.48
1420	34	31.29	33.44	1423	44	31.44	33.58	1816	12	17.33	17.49
1420	36	31.29	33.44	1423	46	31.52	33.65	1816	14	17.34	17.48
1420	38	31.35	33.46	1423	48	31.54	33.66	1816	16	17.34	17.49
1420	40	31.40	33.47	1423	50	31.57	33.64	1816	18	17.34	17.49
1420	42	31.39	33.47	1423	52	31.62	33.67	1816	20	17.34	17.48
1420	44	31.42	33.49	1423	54	31.67	33.69	1816	22	17.35	17.48
1420	46	31.44	33.53	1423	56	31.70	33.70	1816	24	17.35	17.48
1420	48	31.42	33.52	1423	58	31.72	33.70	1816	26	17.36	17.48
1420	50	31.49	33.55	1424	0	31.75	33.72	1816	28	17.38	17.48
1420	52	31.48	33.55	1424	2	31.79	33.75	1816	30	17.37	17.48

Table C.3 (cont)

Evapotranspiration Data August 5, 2003 SITE 2C				Evapotranspiration Data August 5, 2003 SITE 2C				Evapotranspiration Data August 5, 2003 SITE 2C			
Time	sec	Temp wet	Temp dry	Time	sec	Temp wet	Temp dry	Time	sec	Temp wet	Temp dry
1818	8	16.79	17.09	2025	50	14.30	14.84	2029	26	14.01	14.37
1818	10	16.79	17.09	2025	52	14.29	14.82	2029	28	14.00	14.36
1818	12	16.77	17.08	2025	54	14.27	14.82	2029	30	14.00	14.37
1818	14	16.79	17.10	2025	56	14.27	14.83	2029	32	13.98	14.35
1818	16	16.77	17.12	2025	58	14.26	14.83	2029	34	13.98	14.39
1818	18	16.79	17.13	2026	0	14.25	14.84	2029	36	13.98	14.38
1818	20	16.79	17.15	2026	2	14.26	14.85	2029	38	13.99	14.42
1818	22	16.82	17.18	2026	4	14.28	14.84	2029	40	14.03	14.44
1818	24	16.86	17.20	2026	6	14.29	14.87	2029	42	14.02	14.44
1818	26	16.84	17.18	2026	8	14.29	14.87	2029	44	14.05	14.45
1818	28	16.89	17.21	2026	10	14.30	14.87	2029	46	14.04	14.43
1818	30	16.89	17.21	2026	12	14.32	14.87	2029	48	14.08	14.46
1818	32	16.90	17.20	2026	14	14.34	14.87	2029	50	14.09	14.44
1818	34	16.92	17.22	2026	16	14.33	14.85	2029	52	14.09	14.45
1818	36	16.96	17.22	2026	18	14.37	14.85	2029	54	14.11	14.46
1818	38	16.97	17.24	2026	20	14.37	14.85	2029	56	14.12	14.45
1818	40	16.97	17.23	2026	22	14.37	14.83	2029	58	14.16	14.47
1818	42	16.99	17.22	2026	24	14.37	14.83	2030	0	14.15	14.46
1818	44	16.99	17.23	2026	26	14.38	14.82	2030	2	14.18	14.46
1818	46	17.01	17.24	2026	28	14.39	14.81	2030	4	14.17	14.46
1818	48	17.03	17.24	2026	30	14.40	14.81	2030	6	14.18	14.44
1818	50	17.02	17.23	2026	32	14.39	14.80	2030	8	14.18	14.44
1818	52	17.01	17.23	2026	34	14.41	14.79	2030	10	14.22	14.46
1818	54	17.05	17.26	2026	36	14.40	14.79	2030	12	14.21	14.44
1818	56	17.07	17.26	2026	38	14.42	14.79	2030	14	14.20	14.45
1818	58	17.07	17.26	2026	40	14.42	14.79	2030	16	14.21	14.45
1819	0	17.08	17.26	2026	42	14.43	14.78	2030	18	14.23	14.44
1819	2	17.07	17.25	2026	44	14.44	14.79	2030	20	14.23	14.43
1819	4	17.07	17.25	2026	46	14.43	14.75	2030	22	14.23	14.42
1819	6	17.09	17.24	2026	48	14.43	14.77	2030	24	14.24	14.42
1819	8	17.09	17.24	2026	50	14.44	14.76	2030	26	14.23	14.43
1819	10	17.11	17.25	2026	52	14.44	14.75	2030	28	14.25	14.43
1819	12	17.11	17.25	2026	54	14.45	14.75	2030	30	14.25	14.43
1819	14	17.12	17.25	2026	56	14.45	14.75	2030	32	14.26	14.43
1819	16	17.12	17.26	2026	58	14.47	14.73	2030	34	14.25	14.42
1819	18	17.14	17.27	2027	0	14.47	14.74	2030	36	14.26	14.41
1819	20	17.15	17.26	2027	2	14.46	14.73	2030	38	14.27	14.42
1819	22	17.15	17.26	2027	4	14.46	14.73	2030	40	14.27	14.41
1819	24	17.15	17.26	2027	6	14.45	14.72	2030	42	14.27	14.42
1819	26	17.13	17.25	2027	8	14.44	14.71	2030	44	14.26	14.40
1819	28	17.15	17.25	2027	10	14.44	14.70	2030	46	14.26	14.38
1819	30	17.16	17.26	2027	12	14.46	14.70	2030	48	14.27	14.40
1819	32	17.17	17.26	2027	14	14.47	14.69	2030	50	14.28	14.40
1819	34	17.18	17.28	2027	16	14.47	14.69	2030	52	14.27	14.40
1819	36	17.18	17.26	2027	18	14.48	14.69	2030	54	14.29	14.40
1819	38	17.19	17.27	2027	20	14.48	14.70	2030	56	14.29	14.39
1819	40	17.19	17.26	2027	22	14.45	14.68	2030	58	14.30	14.40
1819	42	17.20	17.27	2027	24	14.46	14.68	2031	0	14.27	14.38
1819	44	17.21	17.27	2027	26	14.47	14.66	2031	2	14.29	14.41

Table C.4 Test 1
Hvorslev Slug-Test Method
Piezometer A 7/11/2003

$K = (r^2 * \ln(L_e/R))/(2L_e t_{37})$ **t_{37} = 900**

Variable		**Units**
K	hydraulic conductivity	m/s
R	radius of well casing	m
R	radius of well screen	m
Le	length of well screen	m
t_{37}	time for water level to fall to 37% of initial change	s

K	**r**	**R**	**L_e**	**gravel pack (m)**
4.77E-07	0.0127	0.0508	0.0762	0.1524
6.36E-07	0.0127	0.0508	0.1143	0.2286
6.46E-07	0.0127	0.0508	0.1524	0.3048
6.22E-07	0.0127	0.0508	0.1905	0.3810
5.90E-07	0.0127	0.0508	0.2286	0.4572
5.57E-07	0.0127	0.0508	0.2667	0.5334
5.27E-07	0.0127	0.0508	0.3048	0.6096
4.99E-07	0.0127	0.0508	0.3429	0.6858
4.74E-07	0.0127	0.0508	0.3810	0.7620
4.51E-07	0.0127	0.0508	0.4191	0.8382
4.31E-07	0.0127	0.0508	0.4572	0.9144

ho	**h**	**h/h_0**	**t (s)**	**DTW (m)**
2.11	2.11	1.000	0	0.00
2.11	1.37	0.646	30	0.75
2.11	1.34	0.632	45	0.78
2.11	1.30	0.618	60	0.81
2.11	1.29	0.610	70	0.82
2.11	1.28	0.605	80	0.84
2.11	1.27	0.602	90	0.84
2.11	1.26	0.596	100	0.85
2.11	1.25	0.593	110	0.86
2.11	1.24	0.589	120	0.87
2.11	1.24	0.586	130	0.87
2.11	1.23	0.584	140	0.88
2.11	1.23	0.582	150	0.88
2.11	1.22	0.579	160	0.89
2.11	1.22	0.576	170	0.90
2.11	1.21	0.574	180	0.90
2.11	1.21	0.571	190	0.91
2.11	1.20	0.570	200	0.91
2.11	1.20	0.567	210	0.91
2.11	1.19	0.564	220	0.92
2.11	1.19	0.563	230	0.92
2.11	1.18	0.560	240	0.93
2.11	1.15	0.545	300	0.96
2.11	1.14	0.540	360	0.97
2.11	1.12	0.530	420	0.99
2.11	1.10	0.521	480	1.01
2.11	1.08	0.512	540	1.03
2.11	1.07	0.505	600	1.05
2.11	1.00	0.472	900	1.12
2.11	0.97	0.459	1200	1.14
2.11	0.92	0.436	1800	1.19
2.11	0.90	0.424	2400	1.22

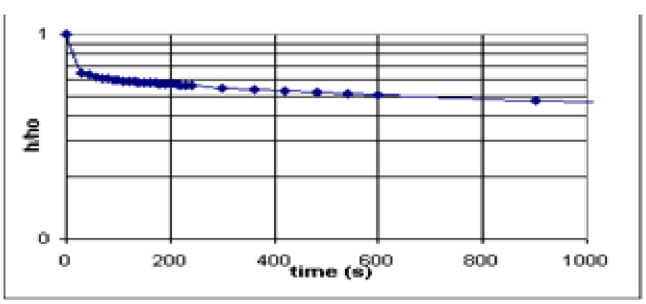

Table C.4 Test 2
Hvorslev Slug-Test Method
Piezometer A 7/30/2003

$K = (r^2 * \ln(L_e/R))/(2 L_e t_{37})$ **t_{37} = 3500**

Variable		**Units**
K	hydraulic conductivity	m/s
R	radius of well casing	m
R	radius of well screen	m
Le	length of well screen	m
t_{37}	time for water level to fall to 37% of initial change	s

K	**r**	**R**	**L_e**	**gravel pack (m)**
1.23E-07	0.0127	0.0508	0.0762	0.1524
1.63E-07	0.0127	0.0508	0.1143	0.2286
1.66E-07	0.0127	0.0508	0.1524	0.3048
1.60E-07	0.0127	0.0508	0.1905	0.3810
1.52E-07	0.0127	0.0508	0.2286	0.4572
1.43E-07	0.0127	0.0508	0.2667	0.5334
1.35E-07	0.0127	0.0508	0.3048	0.6096
1.28E-07	0.0127	0.0508	0.3429	0.6858
1.22E-07	0.0127	0.0508	0.3810	0.7620
1.16E-07	0.0127	0.0508	0.4191	0.8382
1.11E-07	0.0127	0.0508	0.4572	0.9144

ho	**h**	**h/h_0**	**t (s)**	**DTW (m)**
2.34	2.34	1.00	0	0
2.34	2.08	0.889	10	0.26
2.34	2.06	0.883	20	0.27
2.34	2.03	0.870	30	0.31
2.34	2.01	0.858	40	0.33
2.34	1.95	0.833	50	0.39
2.34	1.77	0.756	60	0.57
2.34	1.61	0.690	70	0.73
2.34	1.56	0.668	80	0.78
2.34	1.53	0.655	90	0.81
2.34	1.51	0.645	100	0.83
2.34	1.49	0.636	110	0.85
2.34	1.47	0.628	120	0.87
2.34	1.45	0.622	130	0.88
2.34	1.44	0.617	140	0.89
2.34	1.43	0.612	150	0.91
2.34	1.42	0.609	160	0.91
2.34	1.41	0.605	170	0.92
2.34	1.41	0.602	180	0.93
2.34	1.40	0.600	190	0.94
2.34	1.39	0.593	210	0.95
2.34	1.36	0.583	270	0.98
2.34	1.35	0.579	330	0.98
2.34	1.35	0.578	390	0.99
2.34	1.34	0.571	690	1.00
2.34	1.24	0.532	1290	1.09
2.34	1.20	0.515	1890	1.13
2.34	1.16	0.498	2490	1.17
2.34	1.13	0.485	3090	1.20

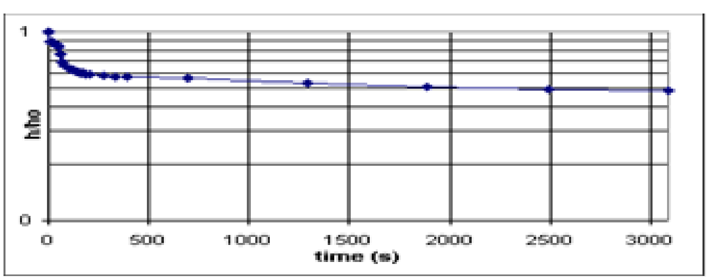

Table C.4 Test 3
Hvorslev Slug-Test Method
Piezometer C 7/30/2003

$K = (r^2 * \ln(L_e/R))/(2L_e t_{37})$ **t_{37} = 110**

Variable		**Units**
K	hydraulic conductivity	m/s
R	radius of well casing	m
R	radius of well screen	m
Le	length of well screen	m
t_{37}	time for water level to fall to 37% of initial change	s

K	**r**	**R**	**L_e**	**gravel pack (m)**
3.90E-07	0.0127	0.0508	0.0762	0.1524
5.20E-07	0.0127	0.0508	0.1143	0.2286
5.28E-07	0.0127	0.0508	0.1524	0.3048
5.09E-07	0.0127	0.0508	0.1905	0.3810
4.28E-07	0.0127	0.0508	0.2286	0.4572
4.565E-07	0.0127	0.0508	0.2667	0.5334
4.31E-07	0.0127	0.0508	0.3048	0.6096
4.08E-07	0.0127	0.0508	0.3429	0.6858
3.88E-07	0.0127	0.0508	0.3810	0.7620
3.69E-07	0.0127	0.0508	0.4191	0.8382
3.52E-07	0.0127	0.0508	0.4572	0.9144

ho	**h**	**h/h_0**	**t (s)**	**DTW (m)**
2.26	2.26	1.000	0	0.00
2.26	1.96	0.865	10	0.31
2.26	1.39	0.616	30	0.87
2.26	1.19	0.528	40	1.07
2.26	1.14	0.505	50	1.12
2.26	1.11	0.489	60	1.16
2.26	1.09	0.481	70	1.17
2.26	1.07	0.474	80	1.19
2.26	1.06	0.469	90	1.20
2.26	1.06	0.468	100	1.20
2.26	1.05	0.465	110	1.21
2.26	1.05	0.462	120	1.22
2.26	1.04	0.460	130	1.22
2.26	1.03	0.457	140	1.23
2.26	1.03	0.456	150	1.23
2.26	1.03	0.454	160	1.23
2.26	1.02	0.451	170	1.24
2.26	1.02	0.450	180	1.24
2.26	1.01	0.449	190	1.25
2.26	1.00	0.441	250	1.26
2.26	0.98	0.433	310	1.28
2.26	0.98	0.434	370	1.28
2.26	0.95	0.420	430	1.31
2.26	0.92	0.406	730	1.34
2.26	0.90	0.399	1030	1.36
2.26	0.85	0.377	1630	1.41
2.26	0.82	0.364	2230	1.44

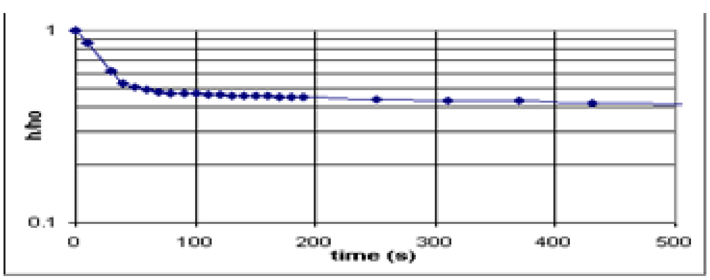

Table C.5 (2002)
Community Collaborative Rain and Hail Study
Precipitation Data taken from the CoCoRaHS website. Data collection began in April 2002.
Precipitation values are in inches.

Date	JF 51	JF 87	JF 53	JF 106	JF 54	JF 32	JF 24	JF 94
4/20/02			0.02				0.04	
4/21/02			0				0.01	
4/22/02			0				0	
4/23/02			0				0	
4/24/02			0				0	
4/25/02			0				0	
4/26/02			0				0	
4/27/02			0.01				0	
4/28/02			0				0	
4/29/02			0				0	
4/30/02			0				0	
5/1/02			0			T	0	
5/2/02			T			T	0.07	
5/3/02			0.04			0	T	
5/4/02			0			T	0	
5/5/02			0			0	0.01	
5/6/02			0			0	0	
5/7/02			0			0	0	
5/8/02			0			0	0	
5/9/02			0			0	0	
5/10/02			0			0	0	
5/11/02			0			0	0	
5/12/02			0.24			0.44+	0.38	
5/13/02			0.05			0	0.12	
5/14/02			0			0	0	
5/15/02			0			T	0	
5/16/02			T			0.02	0.01	
5/17/02			0.02			0.18	0.19	
5/18/02			0			0.01	0	
5/19/02			0			0	0	
5/20/02			0			0	0	
5/21/02			0			0	0	
5/22/02			0			0	0	
5/23/02			0			0	0	
5/24/02			0.62			T	1.1	
5/25/02			0.91			?	0.34	
5/26/02	0		0			0.31	0	
5/27/02	0		0			T	0	
5/28/02	T		0			0	0	
5/29/02	0		0			0	0	
5/30/02	0		0			0	0	
5/31/02	T		T			T		
6/1/02	T		T			0	0	
6/2/02	0					0	0	
6/3/02	0					0.37	0	
6/4/02	0.25				0.3	0.33	0.28	
6/5/02	0.18				0.33	0	0.29	
6/6/02	0				0	0	0	
6/7/02	0				0	0	0	

Table C.5 (2002) (cont)
Community Collaborative Rain and Hail Study
Precipitation Data taken from the CoCoRaHS website. Data collection began in April 2002.
Precipitation values are in inches.

Date	JF 51	JF 87	JF 53	JF 106	JF 54	JF 32	JF 24	JF 94
6/8/02	0				0	0	0	
6/9/02	0				0	0	0	
6/10/02	0				0	T	0	
6/11/02	T				T	0		
6/12/02	0				0	0	0	
6/13/02	0				0	0	0	
6/14/02	0				0	0	0	
6/15/02	T		0		Trace	0	0	
6/16/02	T		T		0	T	0	
6/17/02	T		T		0	0	0	
6/18/02	0		0		0	0		
6/19/02	0		0		0	0.14	0	
6/20/02	0.07		0.11		0.07	0.02	0.05	
6/21/02	0.07		0.04		0.11	0	0.02	
6/22/02	0.08		0.14		0.17	0.32	0.32	
6/23/02	0		0		0	0	0	
6/24/02	0.01		0		T	0	0	
6/25/02	T		0		T	0	0	
6/26/02	0.06		0.15		0.19	0.04	0	
6/27/02	0		0		T	0.01	0	
6/28/02	0.02		0.1		0.05	T	0	
6/29/02	0		0		T	0	0	
6/30/02	0		0		0	0	0	
7/1/02	0		0		0	0	0	
7/2/02	0		0		0	0	0	
7/3/02	0		T		0	0	0	
7/4/02	T		0.02		0.02	0.15	0.1	
7/5/02	0		0		0	0	0	
7/6/02	0.03		0.7		0.37	0.35	0.28	
7/7/02	0.19		0			0.04	0.1	
7/8/02	0		0		0.3	0	0.04	
7/9/02	0				0	0		
7/10/02	0		0		0	0.02	0	
7/11/02	0.04		0.29		0.25	0	0.29	
7/12/02	0		0		0	0	0	
7/13/02	0		0		0	0	0	
7/14/02	0		0		0	0	0	
7/15/02	0		0			0	0	
7/16/02	0		0		0	0	0	
7/17/02	0		0		0	0	0	
7/18/02	0		0		0	0	0	
7/19/02	0		0		0	0	0	
7/20/02	0		0		0	0	0	
7/21/02	T		0		0.01	0	0	
7/22/02	T		0.04		0.16	0.07	0.17	
7/23/02	T		T		T	0	0	
7/24/02	0.02		0.02		0.04	0	0	
7/25/02	0		0		0	0	0	
7/26/02	0.02		0.02		0.03	0.02	T	

Table C.5 (2002) (cont)
Community Collaborative Rain and Hail Study
Precipitation Data taken from the CoCoRaHS website. Data collection began in April 2002.
Precipitation values are in inches.

Date	JF 51	JF 87	JF 53	JF 106	JF 54	JF 32	JF 24	JF 94
7/27/02	0		0		0	0	0	
7/28/02	0		0		0	T	0	
7/29/02	0		0		0	T	T	
7/30/02	0		0.03		T	0	0	
7/31/02	T		T		T	0.04	0.02	
8/1/02	0		0		0	0	0	
8/2/02	T		0		0	0	0	
8/3/02	0.02		T		0.01	0.26	0.2	
8/4/02	0.16		0.15		0.23	0.16	0.13	
8/5/02	0.11		0.29		0.2	0.36	0.27	
8/6/02	0.58	0.47	0.94		1.25	0.4	0.27	
8/7/02	0.05	0.06			0.07	0.03	0	
8/8/02	0.07	0.07	0.11		0.2	0.18	0.25	
8/9/02	0.03	0.025	T		T	0.06	0	
8/10/02	0	0	0		0	0	0	
8/11/02	0	0	0		0	0	0	
8/12/02	0	0	0		0	0	0	
8/13/02	0.01	0.01	T		T	0	0.01	
8/14/02	0	0	0		0	0	0	
8/15/02	0	0	0		0	0	0	
8/16/02	0	0	0		0	0	0	
8/17/02	0	0	0		0	0	0	
8/18/02	0	0	0		0	0	0	
8/19/02	0	0	0		0	0	0	
8/20/02	T	0	T		0	T	0	
8/21/02	0.11	0.09	0.05		0.04	0.15	0.12	
8/22/02	0.26	0.15	0.08		0.03	0.13	0.14	
8/23/02	0.03	0.04	0.11		0.01	0.17	0.14	
8/24/02	0.03	0.04	0.03		0.04	0.03	0.02	
8/25/02	T	0	0		0	0	T	
8/26/02	0	0	0		0	0	0	
8/27/02	T	0.01	T		T	T	0.02	
8/28/02	0.15	0.18	0.26		0.22	0.15	0.16	
8/29/02	0.05	0.07			0.16	0.13	0.09	
8/30/02	0.33	0.18	0.23		0.14	0.2	0.2	
8/31/02	0	0	0		0.01	0	0	
9/1/02	0	0	0		0	0	0	
9/2/02	0	0	0		0	T	0	
9/3/02	0	0	0		0	0	0	
9/4/02	T	0	0.01		0.02	T	0	
9/5/02	0	0			0	0	0	
9/6/02	0	0	0		0	0	0	
9/7/02	0	0			0	0	0	
9/8/02	0	0	0		0	0	0	
9/9/02	0.09	0.26	0.13		0.17	0.06	0.05	
9/10/02	0.92	0.9	0.92		0.97	1.02	0.98	
9/11/02	0.01	0.02	T		0.01	0.01	0.02	
9/12/02	0.51	0.3	0.25		0.43	0.08	0.05	
9/13/02	0.34	0.51	0.23			0.51	0.48	

Table C.5 (2002) (cont)
Community Collaborative Rain and Hail Study
Precipitation Data taken from the CoCoRaHS website. Data collection began in April 2002.
Precipitation values are in inches.

Date	JF 51	JF 87	JF 53	JF 106	JF 54	JF 32	JF 24	JF 94
9/14/02	0.16	0.18	0.26			0.15	0.11	
9/15/02	0	0	0			0	0	
9/16/02	0	0	0			0	0	
9/17/02	0	0	0		multipl	0	0	
9/18/02	0	0	0		T	0	0	
9/19/02	1.05	1.3	1.21		1.03	0	0.98	
9/20/02	0	0	0	0	0	0	0	
9/21/02	0	0	0		0	0	0	
9/22/02	0	0	0		0	0	0	
9/23/02	0	0	0		0	0	0	
9/24/02	0	0	0			0	0	0
9/25/02	0	0	0		0	0	0	0
9/26/02	0.1	0.1	0.06		0.11	0.07	0.07	0.17
9/27/02	0	0.13	0.19		0.13	0.1	0.05	0.04
9/28/02	0	0.01	0		0	0	0.01	
9/29/02	0.12	0	0		0	0	0	0.02
9/30/02	0	0	0		0	0	0	0
10/1/02	0	0	0		0	0	0	0
10/2/02	0.75	0.78	0.73		0.64	0.44	0.8	0.89
10/3/02	0.03	0.02	0.02	0	T	T	0.11	0
10/4/02	0.02	0	0		0	0	0	0.02
10/5/02	0	0	0		0	0	0	0
10/6/02	0	0	0		0	0	0	0
10/7/02	0	0	0		0	0	0	0
10/8/02	0		0		0	0	0	0
10/9/02	0	0	0		0	0	0	0
10/10/02	0	0	0		0	0	0	0
10/11/02	0	0	0		0	0	0	0
10/12/02	0	0	0		0	0	0	0
10/13/02	0	0	0			0	0	0
10/14/02	0	0	0		0	0	0	0
10/15/02	0	0	0		0	0	0	0
10/16/02	0	0	0		0	0	0	0
10/17/02	0	0	0		0	0	0	0
10/18/02	0	0	0		0	0	0	0
10/19/02	0	0	0		0	0	0	0
10/20/02	0	0	0			0	0	0
10/21/02	0	0	0		0	0	0	0
10/22/02	0	0	0		0	0	0	0
10/23/02	0.02	0.04	0.04		0.04	0	0.05	0.05
10/24/02	0.01	0.02	T		0.01	0	0.01	0.01
10/25/02	0	0	T		T	0	0	0
10/26/02	0	0	0		0	0	0	0
10/27/02	T	0	0		0.03	0	0	0
10/28/02	T	0	T		0.04	0	T	0
10/29/02	0.25	0.28	0.16	0	0.21	0.25	0.23	0.21
10/30/02	0.36	0.2	0.16		0.22	0.35	0.23	0.29
10/31/02	0.02	0.04	0.02	0	0.05	0	0.02	0.02
11/1/02	0.02	0.02	T		0.01	0	0.01	0.08

Table C.5 (2002) (cont)
Community Collaborative Rain and Hail Study
Precipitation Data taken from the CoCoRaHS website. Data collection began in April 2002.
Precipitation values are in inches.

Date	JF 51	JF 87	JF 53	JF 106	JF 54	JF 32	JF 24	JF 94
11/2/02	0	0	0	0	0	0	T	0
11/3/02	0.05	0.06	0.04		0.06	0	0.04	0.22
11/4/02	0	0	0		0	0	0	0
11/5/02	0	0	0		0	0	0	0
11/6/02	0	0	0		0	0	0	0
11/7/02	0	0	0		0	0	0	0
11/8/02	0	0	0		0	0	0	0
11/9/02	0	0	0	0	T	0	0	0
11/10/02	0.13	0.1	0.08		0.13	0	0.03	T
11/11/02	0	0	0	0	0	0	0	0
11/12/02	0	0.01	T		T	0	T	0
11/13/02	0	0	0		0	0	0	0
11/14/02	0.04	0.05	0.01	0	0.02	0	0.05	0.04
11/15/02	0.01	0.025	0.09	0	0.12	0	T	0
11/16/02	0.18	0.22	0.25		0.3	0	0.11	0.17
11/17/02	0	0	0	0	0	0	0	0
11/18/02	0	0	0	0	0	0	0	0
11/19/02	0	0	0	0	0	0	0	0
11/20/02	0	0	0	0	0	0	0	0
11/21/02	0	0		0	0	0	0	0
11/22/02	0	0	0	0	0	0	0	0
11/23/02	0	0	0	0	0	0	0	0
11/24/02	0.02	0.05	0.01	NA	0.02	0	T	0.07
11/25/02	0.12	0.1	0.04	0	0.1	T	0.18	0.12
11/26/02	0	0	0		0	0	0	0
11/27/02	0	0	0	0	0	0	0	0
11/28/02	0	0	0	0	0	0	0	0
11/29/02	0	0		0	0	0	0	0
11/30/02	0	0	0	0		0	0	0
12/1/02	0	0	0	0		T	0	0
12/2/02	0	0		0		0	0	0
12/3/02	0	0	0	0	0	0	0	0
12/4/02	0	0	T	0	0	0	0	0
12/5/02	0	0		0	0	0	0	0
12/6/02	0	0	0	0	0	0	0	0
12/7/02	0	0		0	0	0	0	0
12/8/02	0	0	0	0	0	0	0	0
12/9/02	0	0	0	0	0	0	0	0
12/10/02	0	0	0	0	0	0	0	0
12/11/02	0	0	0	0	0	0	0	0
12/12/02	0	0	0	0	0	0	0	0
12/13/02	0	0	0	0	0	0	0	0
12/14/02	0	0	0	0	0	0	0	0
12/15/02	0	0	0	0	0	0	0	0
12/16/02	0	0	0	0	0	0	0	0
12/17/02	0	0	0	0	0	0	0	0
12/18/02	T	0	0	0	0	0	0	0
12/19/02	0.01	0.01	0.07	0	0.07	0	T	0
12/20/02	0	0	0	0	0	0	0	0

Table C.5 (2002) (cont)
Community Collaborative Rain and Hail Study
Precipitation Data taken from the CoCoRaHS website. Data collection began in April 2002.
Precipitation values are in inches.

Date	JF 51	JF 87	JF 53	JF 106	JF 54	JF 32	JF 24	JF 94
12/21/02	0	0	0	0	T	0	0	0
12/22/02	0	0	0	0	0	0	0	0
12/23/02	0.01	0.01	0.01	0	0.01	T	0	0
12/24/02	0.02	0.02	0.01	0	0.02	0	0.045	0.01
12/25/02	0	0	0	0	0	0	0	0
12/26/02	0	0	0	0	0	0	0	0
12/27/02	0	0		0	0	0	0	0
12/28/02	0	0		0	0	0	0	0
12/29/02	0	0		0	0	0	0	0
12/30/02	0	0	0.00*		0	0	0	0
12/31/02	0	0	0	0	0	0		0

(2003)
Community Collaborative Rain and Hail Study
Precipitation Data taken from the CoCoRaHS website. Data collection began in April 2002.
Precipitation values are in inches.

Date	JF 51	JF 87	JF 53	JF106	JF54	JF118	JF32	JF24	JF115	JF128	JF94
1/1/03	0.03	0.03	0.04	0	0.05		m	0.09	0.02		0.01
1/2/03	0.01	T		0	0.02		m	0.01	0		0
1/3/03	0	0		0	0		0	0	0		0
1/4/03	0	0	0	0			0	0	0		0
1/5/03	0	0	0	0	0		0	0	0		0
1/6/03	0.21	0.24	0.18	0	0.27		0	0.31	0.33		0.14
1/7/03	0	0	0	0	0		0	0	0		0
1/8/03	0	0	0	0	0		0	0	0		0
1/9/03	0	0	0	0	0		0	0	0		0
1/10/03	0	0	0	0	0		0	0	0		0
1/11/03	0	0	0	0	0		0	0	0		0
1/12/03	0.01	T	T	0	0.02		na	0	0.02		T
1/13/03	0	0	0	0			0	0	0		0
1/14/03	0	0	0	0	0		0	0	0		0
1/15/03	0	0	0	0	0		0	0	0		0
1/16/03	0.02	0.02		0	0.01		0	0	0.02		0
1/17/03	0	T		0	0.01		0	0	0.01		0
1/18/03	0	0		0	0		0	0	0		0
1/19/03	0	0		0	0		0	0	0		0
1/20/03	0	0	0	0	0		0	0	0		0
1/21/03	0	0	0	0	0		0	0	0		0
1/22/03	0		0	0	0		0	0	0		0
1/23/03	0	0	0	0			0	0	0		0
1/24/03	0	0	0	0	0		0	0			0
1/25/03	0	0	0	0	0		0	0	0		0
1/26/03	0	0	0	0	0		0	0	0		0
1/27/03	0	0	0	0	0		0	0	0		0
1/28/03	0	0	0	0	0		0	0	0		0
1/29/03	0	0	0	0	0		0	0	0		0

Table C.5 (2003) (cont)
Community Collaborative Rain and Hail Study
Precipitation Data taken from the CoCoRaHS website. Data collection began in April 2002.
Precipitation values are in inches.

Date	JF 51	JF 87	JF 53	JF106	JF54	JF118	JF32	JF24	JF115	JF128	JF94
1/30/03	0	0	0	0	0		0	0	0		0
1/31/03	0	0	0	0	0		0	0	0		0
2/1/03	0	0	0	0	0		0	0	0		0
2/2/03	0	0	0	0	0		0	0	0		0
2/3/03	0.43	0.4	0.43	0.4	0.4		na	0.44	0.58		0.34
2/4/03	T	0	T	0	T		0	0	0		0
2/5/03	0.12	0.1	0.04	0	0.07		0.14	0.13	0.17		0.15
2/6/03	0.27	0.24	0.25	0.4	0.26		na	0.4	0.31		0.35
2/7/03	0.02	0.03	0.01	0	0.05		0.09	0.04	0.06		0.03
2/8/03	0	0	0	0	0		0	0	0		0
2/9/03	T	0	0	0	0		0	0	0		0
2/10/03	0	0	0	0	0		0	0	0		0
2/11/03	0	0	0	0	0		0	0	0		0
2/12/03	0	0	0	0	0		0	0	0		0
2/13/03	0	0	0	0	0		0	0	0		0
2/14/03	0	0	0	0	0		0	0	0		0
2/15/03	0.16	0.2	0.19	0.2	0.25		0.3	0.25	0.3		0.35
2/16/03	0	T	0.02	0	0.03		0	0.01	0.005		0
2/17/03	0.01	0.02	0.01	0	0.02		0	0	0.06		0
2/18/03	T	0	0	0	0		0	0	0		0
2/19/03	0.01		T	0			0	0	Trace		0
2/20/03	0		0	0			0	0	0		0
2/21/03	0	0	0	0			0	0	0		0
2/22/03	0.01	T		0			0	0	0.01		0
2/23/03	0.01	0.01	T	0				0.01	0.01		0.01
2/24/03	0.01	T	T	0			na	0.03	T		0.01
2/25/03	0	0	0	0			0	0	0		0
2/26/03	0.19	0.25	0.27	0.23			0.36	0.33	0.155		0.07
2/27/03	0.09	0.1	0.07	0.08			na	0.08	0.11		0.08
2/28/03	0.08	0.06	0.06	0.03			na	0.07	0.16		0.42
3/1/03	0.07	0.08	0.04	0.03			na	0.04	0.14		0.06
3/2/03	0.29	0.33	0.2	0.36		na	na	0.51	0.43		0.24
3/3/03	0	0	0	0	0.57	0	0	0	0		0
3/4/03	0	0	0	0	0	0	0	0	0		0
3/5/03	0.04	0.08	0.08	na	0.09	0.13	na	0.11	0.04		0.02
3/6/03	0	0	0	0		0	0	0	0		0
3/7/03	0	0	0	0	0	0	0	0			0
3/8/03	0	0	0	0	0	0	0	0	0		0
3/9/03	0	0	0	0	0	0	0	0	0		0
3/10/03	0	0	0	0	0	0	0	0	0		0
3/11/03	0	0	0	0	0	0	0	0	0		0
3/12/03	0	0	0	0	0	0	0	0	0		0
3/13/03	0	0	0	0	0	0	0	0	0		0
3/14/03	0	0	0	0	0	0	0	0	0		0
3/15/03	0	0	0	0		0	0	0			0
3/16/03	0	0	0	0	0	0	0	0			0
3/17/03		0.01	0.01	0	0.08	0.03	T	0			0.02
3/18/03	2.15	1.57	2.12	2.65	1.97		NA	2.1			1.71
3/19/03	3.71	4.48		4.53		3.02	na	na			na *

Table C.5 (2003) (cont)
Community Collaborative Rain and Hail Study
Precipitation Data taken from the CoCoRaHS website. Data collection began in April 2002.
Precipitation values are in inches.

Date	JF 51	JF 87	JF 53	JF106	JF54	JF118	JF32	JF24	JF115	JF128	JF94
3/20/03	0.9	1.06		1.22		1.48	na	na			na *
3/21/03	0.24	0.25	na	0.18	0.13	0.48	0	0.17			na *
3/22/03	0	T	na	0.19		0	0	T	2.08		0
3/23/03	0	0	0	0		0	0	0	0		0
3/24/03	0	0	0	0		0	0	0	0		0
3/25/03	0.03	0.04	0.02	0	0.03	T	na	0.02	0.04		0
3/26/03	0	0	0	0		0	0	0			0
3/27/03	0.02	0.02	0.01	0	T	T	0	T	0		0
3/28/03	0.37	0.44	0.19	0.35	0.14	0.39	na	0.43	0.31		0.28
3/29/03	0	0	T	0		0	na	0	T		0
3/30/03	0.01	0.02	T	0	0.01	0.04	na	0.03	0.005		0.03
3/31/03	0	0		0	0	0	na	0	0		0
4/1/03	0	0	0	0	0	0	0	0			0
4/2/03	0	0	0	0	0	0	0	0			0
4/3/03	0	0	0	0	0	0	0	0	0		0
4/4/03	0.01	0	0	0	0	T	0	T	T		0
4/5/03	T	0.015	T	0	0.02	0.02	na	0.01	T		0
4/6/03	0.06	0.08	0.09	0	0.05	0.12	na	0.12	0.06		0.2
4/7/03	0	0	0	0.29	0	0	0	0	0		0.16
4/8/03	0.11	0.14	0.22	0	0.25		na	0.11	0.26		0
4/9/03	0	0	0	0	0	0	0	0	0		0
4/10/03	0	0	0	0	0	0	0	0	0		0
4/11/03	0	0	0	0	0	0	0	0	0		0
4/12/03	0	0	0	0	0	0		0	0		
4/13/03	0	0	0	0	0	0		0	0		
4/14/03	0	0	0	0	0	0		0	0		
4/15/03	0	0	0	0	0	0		0.05	0		
4/16/03	0.05	0.04	0	0	0.02	0.08		0.05	0.01		
4/17/03	0	0		0	0	0	0	0	0		
4/18/03	0	0	0	0		0		0	0		
4/19/03	0.25	0.21	0.28	0	0.15	0.29	0.42	0.44	0.17		
4/20/03	0.61	0.73	0.49	0.85	0.68	0.71	na	0.65	0.51		
4/21/03	T	T	T	0	0.025	0	0	0	Tr		
4/22/03	T	0	T	0	T	0	0.01	0.02	0.01		
4/23/03	0.01	T	0	0	T	T	0.02	0.01	T		
4/24/03	0.15	0.24	0.3	0.7	0.46	0.38	na	0.46	0.12		
4/25/03	0.16	0.13	0.05	0	0.06	T	na	0.11	0.27		
4/26/03	0	0	0	0	0	0	0	0			
4/27/03	0	0	0	0	0	0	0	0			0.76
4/28/03	0	0	0	0	0	0	0	0	0		0.01
4/29/03	T	0.02	T	0	0	T	0.02	0.02	0		0
4/30/03	0.12	0.07	0.03	0	0.01	0.07	0.08	0.02	T		0
5/1/03	0.01	0.01	0	0	0		0	0.02	T		0.01
5/2/03	T	0	0	0	0		0	0.01			0.01
5/3/03	0	0	0	0	0	0	0	0	0		0
5/4/03	0	0	0	0.01	0	0	0	0	0		0
5/5/03	T	T	0.01	0	0.02	T		0	T		0
5/6/03	T	0	0	0	0	0		0	0		0
5/7/03	0	0	0	0.01	0	0		0	0		0

Table C.5 (2003) (cont)
Community Collaborative Rain and Hail Study
Precipitation Data taken from the CoCoRaHS website. Data collection began in April 2002.
Precipitation values are in inches.

Date	JF 51	JF 87	JF 53	JF106	JF54	JF118	JF32	JF24	JF115	JF128	JF94
5/8/03	0.02	0.02		0	T	0		0	0		0
5/9/03	T	T		0	0			0.02			0
5/10/03	0.73	0.73	na	0.47	0.46	0.64		0.85	0.61		0.74
5/11/03	0	0	0	0	0	0	0	0			0
5/12/03	0	0	0	0	0	0	0	0	0		0
5/13/03	0	0	0	0	0	0	0	0	0		0
5/14/03	0	0	0	0		0	0	0	0		0
5/15/03	0	0	0	0	0	0	0	0	0		0
5/16/03	0.8	0.94	0.77	0.69	0.65	0.88	0.78	0.72	0.57		0
5/17/03	0	0	0	0	0.01		0	0	0		0.59
5/18/03	0	0	0	0	0	0	0	0	0		0
5/19/03	T	0	0	0	0	0	T	0.04	T		0.02
5/20/03	0.01	0.06	0.05	0	0.04	0.04	0.03	0.12	0.12		0.15
5/21/03	0	0	T	0	0	0	0	0	0		0
5/22/03	0	0	0	0	0	0	0	0			0
5/23/03	0	0		0	0	0	0	0			0
5/24/03	T	0		0	0.03	0.02	0	0	0		0
5/25/03	T	0		0	0.03	0	0	T	0.04		0.02
5/26/03	0.01	0.02		0	T		0	T	T		0
5/27/03	T	0.03	0.05	0	0.02	0	0	T	0.05		0
5/28/03	0.03	0.02	T	0		0	0	0	0		0
5/29/03	0	0	0	0	0.T	0	0	0	0		0
5/30/03	0	0	0	0	0	0	0.01	0.05			0
5/31/03	T	0	T	0.07	0.01		0	T	0.01		0.07
6/1/03	0.11	0.09	0.14	0	0.21	0.23	0.12	0.05	0.155	0.24	0.12
6/2/03	0.1	0.09	0.06	0.07	0.05	0.08	0.17	0.11	0.07	0.15	0.06
6/3/03	T	0.01	T	0	0.01	0	0	0	0.005	0	0
6/4/03	T	0	T	0	0.01	T	0	0	T	0	0
6/5/03	0.48	0.45	0.64	0.5	0.52	0.61	0.58	0.46	0.45	0.42	0.39
6/6/03	0.08	0.08	0.18	0.22	0.27	0.13	0.11	0.07	0.01	0.08	0.05
6/7/03	0.3	0.36	0.31	0.27	0.23	0.34	0.24	0.31	0.39	0.3	0.27
6/8/03	0.02	0	0	0	0.01	0	0	0	0	0.08	0
6/9/03	0	0	0	0	0	0	0	0	0	0.08	0
6/10/03	0	T	0	0	0.01	0	T	T	0.06	0.18	0.12
6/11/03	0.03	0.04	0.15	0	0.04	0.1	0.05	T		0.26	0.14
6/12/03	0	0	0	0	T	T	T	0		0	0
6/13/03	0.01	T	0.01	0	0.02		T	T		0.01	0
6/14/03	0.1	0.03	0.06	0.15			0.27	0.02		0.04	0
6/15/03	0	0	0	0		0	0	0		0	0
6/16/03	0	0	0	0		0	0	0		0	0
6/17/03	0	0	T	0	0.09		0	0	0.05	0	0
6/18/03	0.03	0.04	0.04	T	0.03	T	0	0	0.02	0	0
6/19/03	0.02	0.02	0.02	0.2	0.09	T	T	0	0.03	0	0
6/20/03	T	0.02	0.15	0.19	0.17	0.05	0.06	0.03	0.02	0	0
6/21/03	0.07	0.13	0.02	0.13	0.05	0.13	0.21	0.265	0.37	0.13	0.09
6/22/03	0	0	0	0	0.01	0	0	0	0	0	0
6/23/03	0	0	0	0	0.01		0	0	0	0	0
6/24/03	0	0		0	T	0	0	0	0	0	0
6/25/03	0.03	0.08	0.02	0	0.03	0.04	0.16	0.16	0.1	0.15	0.12

Table C.5 (2003) (cont)
Community Collaborative Rain and Hail Study
Precipitation Data taken from the CoCoRaHS website. Data collection began in April 2002.
Precipitation values are in inches.

Date	JF 51	JF 87	JF 53	JF106	JF54	JF118	JF32	JF24	JF115	JF128	JF94
6/26/03	0.04	0	0	0.08	T		0	0.01	0.005	0	0
6/27/03	0	0	0	0	0	0	0	0	0	0	0
6/28/03	0	0	0	0	0	0	0	0		0	0
6/29/03	0.04	0.03	T	0	0	0	0	0.02	0.01	0.05	0.04
6/30/03	0.13	0.38	0.08	0.08	0.07	0.29	0.17	0.22	0.21	0.11	0
7/1/03	0	0	0	0.01	0.01	0	0	0	0	0	0
7/2/03	T	0	0	0	0	0	0	0	0	0	0
7/3/03	0	0	0	0	0	0	0	0	0	0	0
7/4/03	T	0	0	0	0	0	0	0	0	0	0
7/5/03	0	0	0	0	0	0	0	0	0	0	0
7/6/03	0	0	0	0	0	0	0	0	0	0	0
7/7/03	0	0	T	0	0	0	0	0	T	0.01	0
7/8/03	0	0	0	T	T	0	0	0	0	0	0
7/9/03	0	0	0	0	0	0	0	0		0	0
7/10/03	0	0	0	0	0	0	0	0	0	0	0
7/11/03	0	0	0	0		0	0	0	0	0	0
7/12/03	0	0	0	0		0	0	0	0	0	0
7/13/03	0	0	0	0		0	0	0	0	0	0
7/14/03	0	0	0	0		0	0	0	0	0	0
7/15/03	0	0	0	0		0	0	0	0	0	0.19
7/16/03	0.06	0.03		0		0	0	0	T	0.01	0
7/17/03	0	0.01	T	0	0		0.02	0	T	T	0
7/18/03	0	0	0	0			0	0		0	0
7/19/03	0.27	0.32	0.25	0.25	0.34	0.31	0.35	0.43	0.25	0.29	0.31
7/20/03	0.12	0.07	0.45	0.55	0.54	0.08	0.08	0.03	0.11	0.05	0.14
7/21/03	0.01	0.02	0.14	0.35	0.38	0.05	0.01	0	0.12	0.01	0
7/22/03	0.01	T	0	0	T	0	0	0	0.01	0.02	0
7/23/03	0	0	0	0.01	0.01		0	0	0	0	0
7/24/03	0.01	0.02	0.02	0	0.02	0.05	0.05	0.02	0.02	0.03	0
7/25/03	T	0	0	0	0	0	0	0		0	
7/26/03	0.04	0.08	0.06	0	0.05	0.09	0.1	0.02	0.18	0.05	
7/27/03	0	0	0.02	0.1	0.04		0	0.01	0.01	0.02	
7/28/03	0	0	0	0	T		0.04	0.03		0.05	
7/29/03	0.27	0.2		0.25	0.09	0.03	0.06	T	0.35	0.01	0.15
7/30/03	0.1	0.17	0.03	0.1	0.02	0.1	0.02	0.01	0.12	0.02	0.02
7/31/03	0.11	0.11	0.01	0		0.08	0.1	0.05	0.02	0.14	0.14
8/1/03	0	0		0	0	0	0	0	0	0	0
8/2/03	0	0.03	0.14	0	0.2	0.06	0.03	0.01	0.05	0	0
8/3/03	0	0		0	0.01		0	0	0		0.12
8/4/03	0.68	0.46	0.64	0.47	0.51	0.26	1.02	0.22	0.65		0
8/5/03	0.04	0.05	0.04	0	0.02	T	0	0	0		0
8/6/03	0.08	0.06		0	0.03	0	0.09	0.01	0.095		0
8/7/03	0	0		0	0.01		T	0	0		0
8/8/03	0.38	0.12	0.05	0	T	0.02	0.01	0	0		0.24
8/9/03	0.01	0.02		0.16	0.13	0.02	0	0	0.05		0
8/10/03	T	0	0.01	0	0.03	0	0	0	T	0.54	0
8/11/03	0	0		0	0.01	0	0	0	0	0	0
8/12/03	T	0		0	0	0	0	0		0	0
8/13/03	0	0		0	0	0	0	0	0	0	0

Table C.5 (2003) (cont)
Community Collaborative Rain and Hail Study
Precipitation Data taken from the CoCoRaHS website. Data collection began in April 2002.
Precipitation values are in inches.

Date	JF 51	JF 87	JF 53	JF106	JF54	JF118	JF32	JF24	JF115	JF128	JF94
8/14/03	0	0		0	0	0	0	0	0	0	0
8/15/03	0	0		0	0	0	0	0	0	0	0
8/16/03	0	0		0	0	0	0	0	0	0	0
8/17/03	0.04	0.02	0.18	0	0.07	0	0.02	T	0.02		0.04
8/18/03	0.04	0.06	0.05	0	0.13	0.33	0.17	0.06	0.03	0.04	0.03
8/19/03	0.05	0.06	0.15	0	0.18	0.1	0.07	0.03	0.14	0.64	0.37
8/20/03	0	0	0	0	0	0	0	0	0	0	0
8/21/03	0	0	0	0	0		0	0		0	0
8/22/03	0	0	0	0	0	0	0	0	0	0	0
8/23/03	0.15	0.1	0	0	0.05	0.28	0.23	0.31	0.04	0.11	0.07
8/24/03	0.33	0.37	0.22	0.15	0.15	0.04	T	0	1.18	0.08	0.19
8/25/03	0.06	0.03	0.02	0.05	0.08	0.02	0.02	0.02	0.02	0.02	0.03
8/26/03	T	0	0	0	T	0		0	0	0	0
8/27/03	T	0.01		0	0	0	0	0	0	0	0
8/28/03	T	0.01		0		0	0.23	0.01	0.01	0.06	0
8/29/03	0	0		0		0	0	0	0	0	0
8/30/03	0.67	0.61		0		0.62	0.58	0.55	0.82	0.59	0.92
8/31/03	0.36	0.34		1		0.64	0.77	0.63	0.17	0.72	0.6
9/1/03	T	0.01		0			0.01	0	0	0.02	0.02
9/2/03	0	0		0		0	0	0	0	0	0
9/3/03	0.22	0.16		0.23		0.25	0.17	0.17	0.25	0.27	0.34
9/4/03	0.07	0.08		0		0.006	0.01	0.01	0.2	0.04	0.09
9/5/03	0	0		0		0	0	0	0	0	0
9/6/03	T	0.02		0		0	T	0	0	T	0.02
9/7/03	0.05	0.04	1.6	0		0.06	0.05	0.03	0.02	0.03	0
9/8/03	0.32	0.26	0	0.28			0.19	0.15	0.29	0.26	0.24
9/9/03	0.03	0.03	0.06	0			0.03	0.02	0.01	0.01	0
9/10/03	T	0.01	0	0.16		0.04	T	0	0	0.02	0.02
9/11/03	0	0	0.01	0		T	0.01	T	0	T	0
9/12/03	0		0.03	0	1.77	0	0	0	0	0	0
9/13/03	T		0.02	0	0.02	0	0	0	0.01	0.01	0
9/14/03	0.06		0.11	0.16	0.13	0.09	0.11	0.09	0.14	0.1	0.08
9/15/03	0		0	0	0		0	0	0	0	0
9/16/03	0		0	0	0	0	0	0	0	0	0
9/17/03	0		0	0	0	0	0	0	0	0	0
9/18/03	0.01	0.07	0.02	T	0.02	0.08	0.17	0.15	0.08	0.15	0
9/19/03	0	0	0	0	0	0	0	0	0	0	0
9/20/03	0	0	0	0	0	0	0	0	0	0	0
9/21/03	0	0	0	0	0	0	0	0	0	0	0
9/22/03	0	0	0	0	0	0	0	0	0	0	0
9/23/03	0		0	0	0	0	0	0	0	0	0
9/24/03	0		0	0	0	0	0	0	0	0	0
9/25/03	0	0	0	0	0	0	0	0	0	0	0
9/26/03	0	0		0	0	0	0	0	0	0	0
9/27/03	0	0	0	0	0	0	0	0		0	0
9/28/03	0	0	0	0	0	0	0	0	0		0
9/29/03	0	0	0	0	0	0	0	0	0	0	0
9/30/03	0	0	0	0	0	0	0	0	0	0	0
10/1/03	0	0	0	0	0	0	0	0	0	0	0

Table C.5 (2003) (cont)
Community Collaborative Rain and Hail Study
Precipitation Data taken from the CoCoRaHS website. Data collection began in April 2002.
Precipitation values are in inches.

Date	JF 51	JF 87	JF 53	JF106	JF54	JF118	JF32	JF24	JF115	JF128	JF94
10/2/03	0	0	0.03	0.02	T	T	T	T	0	T	0
10/3/03	0.17	0.18	0.36	0.3	0.29	0.19	0.19	0.07	0.22	0.2	0
10/4/03	0	0	0	0	T	0.02	0	0	0.01	0.02	0
10/5/03	0	0	0	0	0	0	0	0	0	0	0
10/6/03	T	0	T	0	0	0	0	0	0	0	0
10/7/03	0	0		0	0	0	0	0		0	0
10/8/03	0	0		0	0	0	0	0	0	0	0
10/9/03	0	0		0	0	0	0	0	0	0	0
10/10/03	0	0		0	0	0	0	0	0	0	0
10/11/03	0.03	0.04		0	0.01	0.01	0	0.09	0.01	0.04	0.02
10/12/03	0	0		0	0	0	0	0		0	0
10/13/03	0	0		0	0	0	0	0		0	0
10/14/03	0	0		0	0	0	0	0	0	0	0
10/15/03	0	0		0	0	0	0	0	0	0	0
10/16/03	0	0		0	0	0	0	0	0	0	0
10/17/03	0	0		0	0	0	0	0	0	0	0
10/18/03	0	0	0	0	0	0	0	0	0	0	0
10/19/03	0	0	0	0	0	0	0	0	0	0	0
10/20/03	0	0	0	0	0	0	0	0	0	0	0
10/21/03	0	0	0	0	0	0	0	0	0	0	0
10/22/03	0	0	0	0	0	0	0	0	0	0	0
10/23/03	0	0	0	0	0	0	0	0		0	0
10/24/03	0	0	0	0	0	0	0	0	0	0	0
10/25/03	0	T	T	0	T	T.	0	T	T	T	0
10/26/03	0	0	0	0	0		0	0	0	0	0
10/27/03	0	0	0	0	0	0	0	0	0	0	0
10/28/03	0	0	0	0	0	0	0	0	0	0	0
10/29/03	0	0	0	0	0	0	T	0	0	0	0
10/30/03	T	T	T	0	0	T	T	0	0	T	0
10/31/03	T	T	T	0	T	T	T	0.2	0.02	0.03	0
11/1/03	T	T	0	0	T	T	T	0.01	T	0.08	0.09
11/2/03	0	0	0	T	0	0	0	T	0	T	0
11/3/03	0.02	0.03	0.01	T	0.01	0.01	T	0.03	0.01	0.01	0
11/4/03	0	0	T	0	T	0	0	T	0.01	0.02	0
11/5/03	0	0	0	0	0	0	0	T	0	0	0
11/6/03	0	T	0	0	T	0	T	T	T	T	0
11/7/03	0	0	0	0	0	0	0	0	0	T	0.03
11/8/03	0	0	0	0	0		0	0		0	0
11/9/03	0	0	0	0	0	0	0	0	0	0	0
11/10/03	0		0	0	0	0	0	0	0	0	0
11/11/03	0	0	0	0	0	0	0	0	0	0	0
11/12/03	0	0	0	0	0	0	0	0	0	0	0
11/13/03	0	0	0	0	0	0	0	0	0	0	0
11/14/03	0	0	0	0	0	0	0	0	0	0	0
11/15/03	0	0	0	0	0	0	0	0	0	0	0
11/16/03	0	0	0	0	0	0	0	0		0	0
11/17/03	0	0	0	0	0	0	0	0		0	0
11/18/03	0	T	T	0	T	0	0	0		0	0
11/19/03	0	0	0	0	0	0	0	0		0	0

Table C.5 (2003) (cont)
Community Collaborative Rain and Hail Study
Precipitation Data taken from the CoCoRaHS website. Data collection began in April 2002.
Precipitation values are in inches.

Date	JF 51	JF 87	JF 53	JF106	JF54	JF118	JF32	JF24	JF115	JF128	JF94
11/20/03	0	0	0	0	0	0	0	0		0	0
11/21/03	0	0	0	0	0	0	0	0		0	0
11/22/03	0	0	0	0	0	0	0	0		0	0.27
11/23/03	0.3	0.3	0.24	0.27	0.33	0.26	0	0.27		0.35	0
11/24/03	0	0	0	0	0	0	0	0		0	0
11/25/03	0	0	0	0	0	0	0	0		0	0
11/26/03	0	0	0	0	0	0	0	0		0	0
11/27/03	0	0		0	0	0	0	0		0	0
11/28/03	0	0	0	0	0	0	0	0		0	0
11/29/03	0	0	0	0	0	0	0	0	0.39	0	0
11/30/03	0	0	0	0	0	0	0	0	0	0	0
12/1/03	0	0	0	0	0	0	0	0	0	T	0
12/2/03	0	0	0	0	0	0	0	0	0	0	0
12/3/03	0	0	0	0	0		0	0	0	0	0
12/4/03	0	0	0	0	0	0	0	0	0	0	0
12/5/03	0	0		0	0	0	0	0	0	0	0
12/6/03	0	0		0	0	0	0	0	0	0	0
12/7/03	0	0	0	0	0	0	0	0	0	0	0
12/8/03	0	0	0	0	0	0	0	0	0	0	0.37
12/9/03	0.4	0.4	0.39	0.23	0.45	0.31	0.56	0.48	0.55	0.32	0
12/10/03	0	0	0	0	0	0	0	0	0	0	0
12/11/03	0	0	0	0	0	0	0	0	0	0	0
12/12/03	0	0	0	0	0	0	0	0		0	0
12/13/03	0	0	0		0	0	0	0	0	0	0
12/14/03	0	0	0		0	0	0	0		0	0
12/15/03	0.15	0.22	0.17	0.26	0.24	0.25	0	0.17	0.03	T	0.06
12/16/03	0.07	0.05	T	0	0.05	0.12	0	0.14	0.17	0.12	0
12/17/03	0	0	0		0	0	0	0	0	0	0
12/18/03	0	0	0		0	0	0	0	0	0	0
12/19/03	0	0	0		0	0	0	0	0	0	0
12/20/03	0	0	0		0	0	0	0	0	0	0
12/21/03	0	0			0	0	0	0	0	0	0.05
12/22/03	0.07	0.06	0.09		0.11	0.18	0	0.1	0.06	0.07	0
12/23/03	0	0	0		0.01	T	0	0	0.06	0	0
12/24/03	0	0	0		0	0	0	0	0	0	0
12/25/03	0	0	0		0	0	0		0	0	0
12/26/03	0	0	0		0	0	0		0	0	0
12/27/03	0	0	0		T	T	0	0	T	T	0
12/28/03	0	0			0	0	0	0	0	0	0
12/29/03		0			0	0	0	0	0	0	
12/30/03		0				0	0	0	0	0	
12/31/03		0			0	0	0	0	0	0	

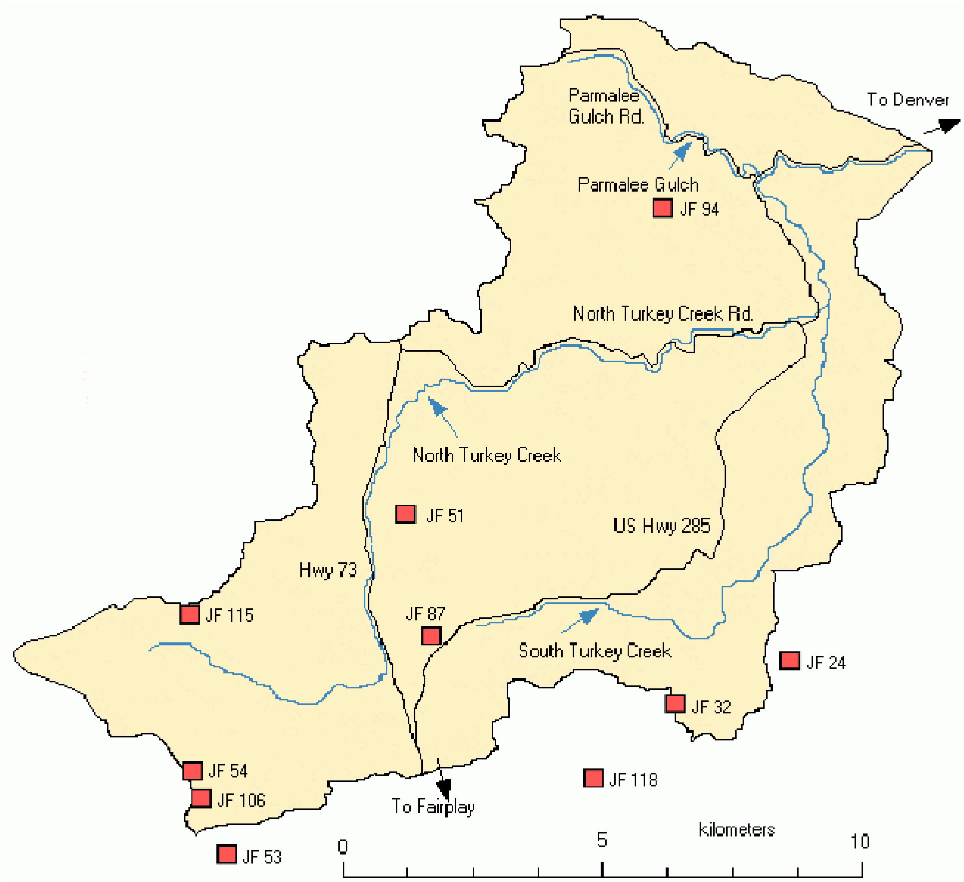

Figure C.1 Locations of stations within or near Turkey Creek Basin reporting precipitation to the Community Collaborative Rain and Hail Study (CoCoRaHS). Precipitation data (Table C.4) taken from the CoCoRaHS website: http://www.cocorahs.com.

APPENDIX D
EVAPOTRANSPIRATION CODE

Computer Code for Evapotranspiration Data

The following Fortran code was written to determine a rate of evapotranspiration, in mm H2O/day and inches H2O/year, using data collected by the ET chamber.

```
! declare variables
        dimension tm(5000),ts(5000),tw(5000),td(5000),vpk(5000),&
        vpa(5000),slo(5000),etr(5000),svp(5000),vdm(5000),vdg(5000),aslo(5000)
        integer i,j,k,l,m,n,o,p,q,nsamples
        real tw,td,tm,ts,VPk,VPa,SVP,VDm,VDg,SLO,ASLO,ETR,maxetr,maxetrin


        open(10,status='replace',file='ET.out')
        open(9,status='old',file='ET.in')

! read data, define variables tm,ts,tw,td,
        do i=1,100000
                read(9,*)dum1,dum2,tm(i),ts(i),tw(i),td(i)
                if(dum1.eq.-999)go to 100
        end do

        100   nsamples=i-1
        2    format(6f10.3)
        3    format(6f12.6)

! calculate saturated vapor pressure (SVP) (in kilopascals)
        do j=1,nsamples
                SVP(j)=(6.112*2.7183**((17.67*(real(td(j)))/(real(td(j))+243.5))))*0.1
        end do

! calculate vapor pressure (VPk)(in kilopascals)
        do k=1,nsamples
                VPk(k)=(SVP(k)-0.000660*(1.+(0.00115*tw(k)))*(td(k)-tw(k))*76.97)
        end do

! calculate vapor pressure (VPa) (in atm)
        do l=1,nsamples
                VPa(l)=(VPk(l)*0.00987)
        end do
```

```
! calculate vapor density (VDm) (in moles per liter)
        do m=1,nsamples
                VDm(m)=(VPa(m)/(0.082058*(td(m)+273)))
        end do

! calculate vapor density (VDg) (in grams per cubic meter)
        do n=1,nsamples
                VDg(n)=(VDm(n)*18/0.001)
        end do

! caluculate slope of line (SLO) (in grams per cubic meter per second)
        do o=1,nsamples
                SLO(o)=(VDg(o+1)-VDg(o))/2              !2 seconds is the time
interval
        end do

! calculate running average of slope of line (ASLO)(5 slopes averaged)
        do p=1,nsamples
                ASLO(p)=(SLO(p-2)+SLO(p-1)+SLO(p)+SLO(p+1)+SLO(p+2))/5.
        end do

! calculate et rate for 5 data averaged (ETR) (in millimeters water per day)
        maxetr=0.0
        do q=1,nsamples
                ETR(q)=86.4*(ASLO(q)*0.3079*1.136)/0.8808
                if(ETR(q)>maxetr)then
                        maxetr=ETR(q)
                end if
        end do

      write(10,*)'Max ET rate for data set'
      write(10,*)'(mm H2O/day):'
      write(10,3)maxetr

! calculate maxetrin (inches of water per year)
        maxetrin=(maxetr*0.03937*365)
        write(10,*)'(inches H2O/year):'
        write(10,3)maxetrin

        close(unit=10)
```

```
close(unit=9)

end
```

Explanation of Computer Code for Evapotranspiration Data

The following text explains the calculations in the computer code written to estimate a rate of evapotranspiration from ET chamber data.

The data must be organized into a file with one datum per line.

A saturated vapor pressure for the dry-bulb temperature is calculated, using the following equation (the Clausius-Clapeyron Equation):

Es = Eo * (e^((17.67*td)/(td+243.5)))

where:

Es is the saturated vapor pressure in kilo-pascals
Eo is the saturation vapor pressure at 0 degrees C, 0.6122 kp
td is the dry-bulb temperature in degrees C

A vapor pressure is then calculated from the wet- and dry-bulb temperatures, using the following equation taken from the ET chamber user manual (Stannard, 1988):

VP = Es-0.00066*(1+(0.00115*tw)*td-tw)*76.97

where:

VP is the vapor pressure in kp
Es is the saturated vapor pressure in kp
tw is the wet-bulb temperature in degrees C
td is the dry-bulb temperature in degrees C
76.97 is the air pressure at this elevation in kp

This vapor pressure is converted from kilo-pascals into atmospheres:

VP(atm) = VP(kp)*(0.00987 atm/1 kp)

The vapor density for these wet- and dry-bulb temperatures is calculated:

VD = VP/(R*(td+273)

where:

VD is vapor density in moles/liter
VP is vapor pressure in atm
R is the gas constant, 0.082058 L*atm/mole*Kelvin
td is the dry-bulb temperature in degrees C

The vapor density is converted from mol/L to grams/cubic meter:

VD(g/m3) = VD(mol/l)*(18 g H2O/1 mol H2O)*(1 L/0.001 m3)

The slope of the line between two consecutive points (when vapor density is plotted against the time) is calculated:

m = (VD2-VD1)/(t2-t1)

where:

m is the slope of the line between points 1 and 2
VD2 is the vapor density in g/m3 of point 2
VD1 is the vapor density in g/m3 of point 1
t2 is the time in seconds of point 2
t1 is the time in seconds of point 1

The code repeats the above calculations for each line of data in the input file.

A running average of 5 consecutive slopes is determined:

ma = ((m-2)+(m-1)+(m)+(m+1)+m(+2))/5

The evapotranspiration rate based the vapor density and time for points 1 and 2 is calculated, using the following equation taken from the ET chamber user manual (Stannard, 1988):

ET = 86.4*((ma*vol*1.136)/area)

where:

ET is the evapotranspiration in mmH2O/day
ma is the average of 5 consecutive slopes
vol is the volume inside the dome, 0.3079 m3
area is the area of the bottom of the dome, 0.8808 m2

The ET rate is converted from mmH2O/day to inH2O/year:

ET(in/year) = (mmH2O/day)*(0.03937 in/1 mm)*(365 d/1 year)

The highest number calculated for the ET rate is printed in an output file.