# ESTIMATING GROUNDWATER RECHARGE VIA SURFACE INFILTRATION IN COLD SEMI-ARID REGIONS

By

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ESTIMATING GROUNDWATER RECHARGE VIA SURFACE INFILTRATION IN COLD SEMI-ARID REGIONS

Abstract

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Aquifer recharge from infiltration of precipitation and snowmelt runoff is a key component of the overall subsurface water balance. Movement of water through the unsaturated zone down to the water table is considered to be governed by factors such as existing site conditions (including soils, topography, and vegetation cover), geology, and climate. Predicting the movement of water in cold, semi-arid regions prove more complex due to the strong differences in seasonal precipitation and sub-freezing top soil temperatures. Such climate can be observed in the Spokane Valley- Rathdrum Prairie (SVRP) aquifer, which is the region examined in this study. Numerical modeling of the Richards' Equation with the UNSAT-H model is the method used to estimate flow through unsaturated soil, ultimately predicting groundwater recharge. UNSAT-H employs soil-water retention functions such as Brooks-Corey and van Genuchten to predict soil hydraulic properties needed to measure the recharge flux.

This study compares candidate soil-water retention functions with field data collected at four SVRP watershed locations, determines the influence of variables in the soil-water retention functions for cold, semi-arid conditions, examines the climatological

parameters and soil characteristics on vertical soil moisture distribution, and analyzes the spatial variation of recharge around the SVRP aquifer. The preferred method for modeling infiltration in cold, semi-arid conditions was determined to be the van Genuchten function. Results helped validate selection of the candidate soil-water retention function. The associated van Genuchten parameters determined for cold, semi-arid conditions were found to be lower than that of normal conditions. Results also estimated the four watershed locations to have a ratio of recharge from precipitation within a range of 27%-50%. Three of the four watershed sites slightly overestimated recharge, particularly in the fall, exhibiting the difficulty in measuring the recharge flux in cold, semi-arid regions. The prediction of the recharge flux will ultimately help to understand and properly manage groundwater resources for current and future uses.

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## 1.0 INTRODUCTION

Aquifer recharge from infiltration of precipitation and snowmelt runoff is a key component of the overall subsurface water balance necessary for understanding and sustainably managing groundwater resources (de Vries and Simmers, 2002; Sanford, 2002; Hsieh, 2007). It is difficult to predict recharge in semi-arid climates because the annual evapotranspiration is nearly equal to the annual precipitation which results in a very small recharge value. This is particularly true in cold climates where it is difficult to predict snow melt infiltration due to frozen topsoil moisture contents. Noy-Meir (1973) defined cold, semi-arid climates as regions which receive between 25- 50 cm of mean annual precipitation with the majority falling as snow during the winter months.

Factors affecting the rate of recharge include geomorphology (including soil, topography, and vegetation), geology, and climate (Sophocleous, 2002). Because of the complexity and uncertainty surrounding most of these variables, numerous approaches for estimating recharge can be found in the literature (Stephens and Knowlton, 1986; Gee and Hillel, 1988; de Vries and Simmers, 2002). Scanlon et al. (2002a) classified these recharge estimation techniques into physical (lysimeter, zero flux plan, and Darcy's Law), tracer (chemical, heat, and isotope), and numerical modeling approaches and recommended using multiple adaptive techniques in order to provide the most reliable estimates.

The movement of water through the unsaturated zone is generally considered to be governed by Richards' Equation (Hillel, 1980; Celia et al., 1990). In addition to boundary and initial conditions, the non-linear functions relating hydraulic conductivity

and soil water pressure to volumetric water content must be specified in order to solve Richards' Equation (Braud et al., 2005). It is often difficult, however, to take direct measurements of these independent expressions due to the multi-dimensional, non-homogeneous characteristics of unsaturated flow in soil (van Genuchten, 1980). Field measurements of recharge rates as well as laboratory measurements of hydraulic soil properties are very useful in estimating these relationships but they are often expensive and of limited spatial and temporal scope (Fayer, 2000). As a result, predicting soil hydraulic properties to model Richards' Equation is usually restricted to relatively simple expressions which are chosen for their practicability and versatility, as well as for their performance in past applications (Russo, 1988).

Widely used methods (Brooks-Corey, 1964; van Genuchten 1980) have been developed for estimating hydraulic conductivity based on simple physical and/or chemical soil properties (Nadagiri and Prasad, 1996). Brooks-Corey (1964) and van Genuchten (1980) derived soil hydraulic functions to relate the relative unsaturated hydraulic conductivity from more easily measured soil-water retention curves originally pioneered by Burdine (1953) and Mualem (1976). Examples of combined functions such as those developed by Brooks-Corey (BC) and van Genuchten (VG) are referred to as soil water retention-hydraulic-conductivity models (Russo, 1988). Further details of each function are described in *Section 2.3.1*.

Since then, numerous researchers have investigated field, laboratory, and theoretical methods to estimate the parameters needed in the models (Russo, 1988;

Nandagiri and Prasad, 1996; Cornelis et al., 2001; Wösten et al., 2001). Gupta and Larson (1979) developed regression equations (pedo-transfer functions) for estimating the soil-water retention curves of 43 agricultural soils based on particle-size distribution, percent of organic matter, and bulk density. Similarly, Haverkamp and Parlange (1986) derived an analytical expression for sandy soils using textural and structural soil properties. Carsel and Parrish (1988) provided typical VG parameters based on the U.S. Department of Agriculture (USDA)- Soil Conservation Service (SCS) soil textural classification. Leij et al. (1996) developed a database for the US Environmental Protection Agency (EPA) called UNsaturated SOil hydraulic DAtabase (UNSODA) which used the VG parameter values estimated by Carsel and Parrish (1988) for the well-known UNSODA manual. This database presents the average parameter value of each porous medium from data sets around the world.

In spite of the numerous studies found in the literature, uncertainties in parameter estimation continues to be a concern due to the variation of factors which influence rate of recharge (Wösten et al., 2001; Sanford, 2002; Scanlon et al., 2002a; Liggett and Allen, 2009). In particular, semi-arid climates are often misrepresented in groundwater modeling because they have not been widely explored nor have soil hydraulic parameters been estimated for such climates. Scanlon et al. (2002b) and Liggett and Allen (2009) compare various groundwater modeling approaches and discuss the difficulty all models have on predicting recharge due to infiltration-runoff excess after a precipitation event in semi-arid climates. This is particularly important in cold, semi-arid regions where strong differences in seasonal precipitation may also be accompanied by snowfall/melt and

frozen ground conditions. This can have significant impacts on the timing and quantity of water budget calculations at the watershed scale.

Hsieh et al. (2007) reported a nearly 15% change in minimum river flow prediction as a result of the recharge method adopted in the bi-state surface/groundwater model developed for the cold, semi-arid Spokane Valley-Rathdrum Prairie (SVRP) aquifer. The SVRP aquifer is of particular interest for this study because it is the region's only drinking water supply and has experienced recent growth to surrounding areas which includes Spokane, Spokane Valley and Liberty Lake, Washington, and Post Falls and Coeur d'Alene, Idaho. To properly manage the SVRP aquifer and sustain continued growth it is pertinent to understand the characteristics of the groundwater system. Previous recharge estimates in the SVRP aquifer have been determined by incorporating a soil water balance equation into a groundwater flow model. Recharge estimates using a surface infiltration numerical model has not been examined previously.

Improving recharge estimates is an important step in reducing the uncertainty in regional groundwater management in the SVRP aquifer area. The overall goal of this study is to use a combination of field measurements and numerical modeling to improve predicted net infiltration (recharge) rates below the root zone of porous soils at four locations in the SVRP region. It is also important to establish soil hydraulic function parameters for cold, semi-arid climates as previous studies have not specified parameters based on climate conditions. Specific objectives of this study will be to:

1) Compare candidate soil-water retention functions to experimental SVRP data collected at four locations to determine preferred method and parameter values for infiltration in cold, semi-arid regions,

2) Quantify the significance of variables in the soil hydraulic functions for cold, semi-arid conditions to ultimately predict more accurate recharge rates to the SVRP aquifer,

3) Examine the effects of climatological parameters and soil characteristics on vertical soil moisture distributions over time, and

4) Investigate the spatial variation in recharge throughout the SVRP aquifer.

These objectives will be completed by analyzing data collection at four sites including climatological data and soil moisture data, obtaining multiple soil core samples at four spatially located sites which will be used to evaluate the physical composition of each soil sample, and simulating the UNSAT-H computer program using various candidate functions and parameter settings to determine a best fit match to the actual field data. The spatial variation of precipitation and recharge will be explored to give valuable insight of the localized water budget. Previous investigations will be used throughout this study to assist in the validation of results. A sensitivity analysis will be performed on the hydraulic parameters to determine the significance of the empirical parameters. Ultimately, a best fit function will be recommended for cold, semi-arid regions to predict accurate recharge rates.

## 2.0 PREVIOUS STUDIES

### 2.1 SPOKANE VALLEY-RATHDRUM PRAIRIE RECHARGE ESTIMATES

Recharge estimates have previously been investigated for the SVRP aquifer from multiple research groups (Bolke and Vaccaro, 1981; CH2M Hill, 1998; Buchanan, 2000; Golder Associates, Inc., 2004; Bartolino, 2007). Bolke and Vaccaro (1981) presented a two-dimensional groundwater flow model which incorporated both a time-average simulation and a transient simulation for data from May 1977-April 1978. This study used the USDA method based on the Blaney-Criddle method (Blaney and Criddle, 1967) to determine the effective rainfall. The effective rainfall was then subtracted from precipitation to determine recharge. Bolke and Vaccaro (1981) uniformly distributed the recharge estimates throughout the SVRP aquifer model domain which were estimated to be 1.87 $m^3/s$ (66 $ft^3/s$), annually.

CH2M Hill (1998) used a steady-state three-dimensional groundwater flow model. The model used the previous work by Bolke and Vaccaro (1981) and incorporated an investigation of spatial precipitation completed by Olness (1993), which ultimately redistributed the annual 1.87 $m^3/s$ (66 $ft^3/s$) of recharge. CH2M Hill concluded that less than half of the volume previously predicted by Bolke and Vaccaro (1981) percolated the SVRP aquifer.

Buchanan (2000) developed the first finite-difference, steady-state, single layer model which utilized MODFLOW to simulate recharge estimations. Buchanan estimated

that recharge was 25 percent of precipitation; however there is no specified justification for this assumption.

Golder and Associates, Inc. (2004) used a transient model to simulate data from 1994- 1999. Golder and Associates, Inc. (2004) used the MIKE-SHE finite-difference, three-dimensional groundwater modeling program to model the Middle Spokane and Little Spokane watersheds. MIKE-SHE is capable of modeling precipitation and evapotranspiration separately. Therefore Golder and Associates, Inc. (2004) used the Blaney-Criddle method (Blaney and Criddle, 1967) to calculate the monthly potential evapotranspiration (PET) and the Parameter-elevation Regressions on Independent Slopes Model (PRISM) (Daly et al., 1994) method to determine the precipitation and temperature throughout the model domain. Results from this study concluded 26 and 36 percent of annual precipitation contributes to evapotranspiration in the Middle Spokane watershed and Little Spokane watershed, respectively.

The most recent recharge estimates were established to develop a groundwater flow model to simulate the groundwater/surface-water interaction by a joint team from the Washington State Department of Ecology, Idaho Department of Water Resources, University of Idaho, Washington State University, and the U.S. Geological Survey (Hsieh et al., 2007). Bartolino (2007) established recharge estimates for this study using six National Oceanic and Atmospheric Association (NOAA) weather stations located on the aquifer boundary or in the vicinity of the SVRP aquifer (Figure 1). Weather station data from January 1990-December 2005 was used to estimate the daily evapotranspiration

using the dual-coefficient Food and Agriculture Organization (FAO) Penman-Monteith method (Allen et al., 1998). The recharge was then estimated using a soil-water balance calculation which incorporates precipitation, runoff, net irrigation depth, evapotranspiration, and root zone depletion. The recharge estimates were linearly interpolated throughout the SVRP aquifer to establish a spatial distribution of deep percolation. The recharge estimates obtained from the Bartolino (2007) study as well as the previous studies mentioned above are summarized in Figure 2. The three weather stations located near the aquifer boundary used for the soil-water balance calculation predicted recharge estimates which fell within the range reported by Buchanan (2000) and similar to the recharge estimate of Golder and Associates, Inc. (2004) for the Middle Spokane watershed.

### 2.2 ASSESSING NUMERICAL RECHARGE MODELS

Using an unsaturated flow recharge model to estimate infiltration to the groundwater can help model more accurate predictions of recharge rates for current and future conditions. Numerical modeling has often been used to predict the water flux through the unsaturated zone. Models such as HYDRUS (Šimůnek et al., 2007), SWIM (Verburg et al., 1996), and UNSAT-H (Fayer, 2000) have been widely adopted to predict recharge estimates using the basis of Richards' Equation (Benson, 2007). These codes all employ van Genuchten (1980) and Brooks-Corey (1964) water retention functions and the Mualem (1976) hydraulic conductivity function. They have been fairly well documented and use meteorological data to estimate the output of the recharge flux

(Scanlon et al., 2002b). These models are able to simulate atmospheric interactions, plant transpiration, solute transport, heat transfer and vapor flow using modified forms of Richards' Equation (Fayer, 2000).

Codes which employ Richards' equation generally predict recharge more accurately than codes which employ a water-storage routing approach, such as HELP (Scanlon et al., 2002a; Liggett and Allen, 2009). HYDRUS (1, 2, or 3-D), is a newer model which uses the finite element method to solve Richards' equation. UNSAT-H is a 1-D model which uses the finite difference method to solve for Richards' equation (Benson, 2007). SWIMv2 combines Richards' equation with transient solute transport using the advection-dispersion equation to accommodate for more complex conditions (Ranatunga et al., 2008).

Scanlon et al. (2002b) conducted a review of various numerical recharge models to quantify the differences. UNSAT-H is the only model which allows precipitation to be input as a specified rate (cm/hr), allowing evapotranspiration to occur throughout the day. HYDRUS subtracts potential evapotranspiration from precipitation in order to apply a net increase or decrease of daily moisture. SWIM simulates evapotranspiration as a sink term therefore simulating infiltration and evapotranspiration at the same time. Due to the various techniques used to simulate daily water storage, Scanlon et al. (2002b) reported HYDRUS 1-D and SWIM to overestimate evapotranspiration and underestimate the change in water storage.

Benson (2007) conducted a comparison using a 1-D and 2-D HYDRUS model to determine how they differ. Results from his study concluded that, "the differences between the predictions are modest…and a 1-D simulation probably would be adequate." Multiple studies have also reported that a 1-D numerical model are appropriate for regions of flat topography with small to negligible runoff (Dawes et al., 1997; Hatton 1998; Liggett and Allen, 2009), similar to the region in this study. For this reason and the input technique of precipitation and evapotranspiration, the 1-D UNSAT-H model was considered most appropriate for this study.

### 2.3 THE BASIS OF UNSAT-H

In order to understand how UNSAT-H estimates recharge, it is important to conceptualize the various processes which occur within the numerical model. The differential equation used for liquid water flow in UNSAT-H for unsaturated soils is a modified form of Richards' equation (Richards, 1931). The original Richards' equation is,

$$\frac{\partial \theta}{\partial t} = \frac{\partial}{\partial z}\left[K(\varphi)\left(\frac{\partial h}{\partial z} - 1\right)\right] \qquad \text{Equation (1)}$$

which is a non-linear partial differential equation where $\Psi$ is the matric potential, cm, $\Theta$ is the volumetric water content, $cm^3/cm^3$, $K$ is the hydraulic conductivity, cm/s, $z$ is the depth, cm, positively oriented downward, and $t$ is time in second. Equation (1) is often more difficult to approximate then saturated flow. Unsaturated flow depends on both soil

moisture potential and hydraulic conductivity which is a function of the soil moisture content of the soil, which will always be non-linear.

The modified Richards' equation is based on the following two relations: (1) the water flux rate inside the soil is proportional to the water potential gradient, which is the basis of Darcy's law, and (2) the change in water content at a specific location is due to the convergence/divergence of water fluxes at another location, the basis of continuity (Ren, 2005). It is necessary to start with the concept of Darcy's Law to understand modified Richards' equation. Darcy's law represents an empirical relationship of saturated flow rate in porous media as a function of hydraulic head gradient (Bear and Verruijt, 1987). The one-dimensional differential form of Darcy's law is,

$$q_L = -K_s \frac{\partial H}{\partial z} \qquad \text{Equation (2)}$$

where $q_L$ is the flux density of water, cm/hr, $K_s$ is the saturated hydraulic conductivity, cm/hr, H is the hydraulic potential and z is the depth below the soil surface. Darcy's law can be related to unsaturated flow by replacing $K_s$ with liquid conductivity, $K_L$, as a function of matric potential, Ψ, resulting in,

$$q_L = -K_L(\varphi) \frac{\partial H}{\partial z} \qquad \text{Equation (3)}$$

In order to describe transient flow, Equation (3) must be combined with the continuity equation. The continuity equation states that the change in water content of a volume of soil must equal the difference between flux into and out of the soil (Fayer, 2000). For one-dimensional flow, the continuity equation is,

$$\frac{\partial \theta}{\partial t} = -\frac{\partial q_L}{\partial z} \qquad \text{Equation (4)}$$

where Θ is the volumetric water content, $cm^3/cm^3$, and t is time, hour. Combining Equation (3) with (4) gives,

$$\frac{\partial \theta}{\partial t} = -\frac{\partial}{\partial z}\left[-K_L(\varphi)\frac{\partial H}{\partial z}\right] \qquad \text{Equation (5)}$$

The reference elevation in the UNSAT-H model is the soil surface. Therefore the negative sign conventions in Equation (5) are used to represent the point in the soil with respect to the soil surface. The two negative conventions that relate to head are the gravitational head and the matric potential. In UNSAT-H, matric potential is replaced with suction head, h, which is negative of the matric potential, $-\varphi = h$. This results in a positive suction head to represent the matric potential. It is important to understand that Equation (5) requires the knowledge of matric potential and water content as a function of hydraulic conductivity. This can be achieved by eliminating Ψ or Θ through the matric potential-water content relationship (Ren, 2005). The calculation of hydraulic head then changes from $H = \varphi + Z$ to the UNSAT-H form,

$$H = -(h + Z) \qquad \text{Equation (6)}$$

Using the chain rule of differentiation, $\partial\theta/\partial t$ in Equation (5) can be replaced by $C(h)(\partial h/\partial t)$,where $C(h)$ represents $\partial\theta/\partial h$. Through derivation using the chain rule and replacing $-\varphi$ with h, Equation (5) now becomes,

$$C(h)\frac{\partial h}{\partial t} = \frac{\partial}{\partial z}\left[K_L(h)\left(\frac{\partial h}{\partial z} + 1\right)\right] - S(z,t) \qquad \text{Equation (7)}$$

where, $\partial H/_{\partial z} = \partial h/_{\partial z} + 1$, through differentiation of Equation (6). S(z,t) is a sink term added for water uptake by plants as a function of depth and time.

There are three assumptions which make this modified Richards' equation true. The first is fluid is incompressible in three dimensions. This follows the law of conservation of mass which states that for any closed-boundary system the density of a liquid does not change. The second and third assumptions for unsaturated flow are, air phase is continuous and the pore-air pressure is at atmospheric pressure (Lam et al., 1987). The last two assumptions usually hold true when the degree of saturation is less than 85% (Lam et al., 1987). These three assumptions are routinely made for modeling unsaturated conditions in soil.

Water content and hydraulic conductivity are functions of suction head which is displayed by the derived modified Richards' equation (Equation (7)). These properties are determined using the soil-water retention curve and hydraulic conductivity function. Soil-water retention curves show hydraulic conductivity or water content as a function of suction. Unfortunately, it is often difficult to predict these three independent parameters due to the multi-dimensional, non-homogeneous characteristics of soil in unsaturated flow (van Genuchten, 1980). Burdine (1953) and Mualem (1976) derived analytical expressions to accurately predict the hydraulic conductivity and the conductivity at saturation. Soil-water retention curves are often used to compare the analytical results with the graphical results as well. Mualem's (1976) expression is used in UNSAT-H, in

addition to being one of the most widely used models for predictions of hydraulic conductivity.

### 2.3.1 FUNCTIONS OF HYDRAULIC CONDUCTIVITY AND SOIL PROPERTIES

Mualem's derivation leads to a simple integral formula for the unsaturated hydraulic conductivity. This enables one to derive closed-form analytical expressions, provided suitable equations for the soil-water retention curves are available (van Genuchten, 1980). Mualem concluded the pore-size distribution of soils is a function of water retention characteristics by making assumptions about continuity and connectivity of pores. The assumptions led to the closed-form expression. The resulting conductivity model contains parameters which may be matched to the soil-water retention curve to obtain varying unsaturated hydraulic conductivities. Mualem's expression for conductivity can be written as,

$$K_L = K_s \frac{\{1-(\alpha h)^{nm}[1+(\alpha h)^n]^{-m}\}^2}{[1+(\alpha h)^n]^{lm}} \qquad m = 1 - \frac{1}{n} \quad (0 < m < 1) \qquad \text{Equation (8)}$$

where $n$ and $\alpha$ are curve-fitting parameters and $l$ is the exponent of the pore interaction term. Equation (8) is used to express hydraulic conductivity in the candidate functions. UNSAT-H offers eight functions to model the soil hydraulic properties. The VG and BC functions are the two most accepted closed-form models and are often contrasted in literature (Russo, 1988; Lenhard et al., 1989; Nandagiri and Prasad, 1996; Stankovich and Lockington, 1995; Vogel et al., 2000). Therefore, as they are the most widely

recognized and published functions used in modeling, only the details of the Brooks-Corey function (1964) and van Genuchten function (1980) will be examined and discussed in this study,.

Brooks and Corey (1964) introduced a well defined air-entry value, which is associated with the largest pore size through the linear relation of moisture content to matric potential, assuming complete wettability (Milly, 1987; Ippisch et al., 2006). Brooks and Corey (1964) predicted that the soil retention curve could be described reasonably well with the air-entry value and soil characteristic parameters. To obtain these values a median fit linear regression algorithm (Press et al., 1986) is used, given an initial estimate of residual water content, $\Theta_r$. A median fit regression is used because the model is linear when $\Theta_r$ is known. The nonlinear optimization is then iterated across a range of values of $\Theta_r$. New values of b and $h_e$ are fit for each new value of $\Theta_r$ that gives the smallest sum of squared differences (Timlin et al., 1999). The Brooks-Corey function does not describe data well near the saturation water content, which may result in discontinuity of the data. The Brooks-Corey functions can be defined as,

$$\theta = \theta_r + (\theta_s - \theta_r)\left[\frac{h_e}{h}\right]^{1/b} \qquad h > h_e$$

Equation (9)

$$\theta = \theta_s \qquad h \leq h_e$$

and

$$K_L = K_S \left[\frac{h_e}{h}\right]^{2+b'/b} \qquad h > h_e$$

Equation (10)

$$K_L = K_S \qquad h \leq h_e$$

where, $\Theta_r$ is the residual water content ($cm^3/cm^3$), $\Theta_s$ is the saturated water content ($cm^3/cm^3$), $h_e$ is the air-entry matric potential, cm, b is a curve-fitting parameter (which is the inverse of the original Brooks-Corey parameter, λ), b' represents *2+l* for the Mualem model (Mualem 1976), and *l* is the exponent of the pore interaction term.

The van Genuchten model describes a continuous function without a defined air entry value. Four independent parameters are included in the model ($\Theta_r$, $\Theta_s$, $n$, and $\alpha$) which can be estimated from field data or the soil-water retention curve. The model uses an optimization for several or all four parameters separately, sequentially or simultaneously using a nonlinear least squares equation (Schaap and van Genuchten, 2006). The resulting water retention curve is continuously differentiable, which simplifies the numerical solution of Richards' equations (Ippisch et al., 2006). Van Genutchen's model is useful because it can be combined analytically with pore size distribution models of hydraulic conductivity (e.g. Mualem, 1976). It also gives adequate fits to measured soil water contents across a wide range of pressure heads (Mayr et al., 1999). The van Genuchten function describes water retention as,

$$\theta = \theta_r + (\theta_S - \theta_r)[1 + (\alpha h)^n]^{-m} \qquad \text{Equation (11)}$$

where it is usually assumed that m=1-1/n. This model uses the Mualem hydraulic conductivity model, Equation (8) to describe conductivity properties.

## 3.0 METHODOLOGY

### 3.1 SITE DESCRIPTION

The Spokane Valley-Rathdrum Prairie (SVRP) aquifer is a designated sole-source water supply for the panhandle of Idaho and Northeastern Washington. The aquifer consists primarily of thick layers of coarse-grained sediments deposited during a series of outburst floods occurring about 15,000 years ago which has resulted in a highly permeable, unconfined aquifer (Kahle et al., 2005). The SVRP aquifer is a very transmissive aquifer ideal for modeling groundwater flow. However its cold, semi-arid condition creates a degree of uncertainty which is difficult for modeling vertical infiltration and estimating deep percolation. The SVRP aquifer is located in a cold, semi-arid climate with the majority of the precipitation occurring as snow from November-March. The Western Regional Climate Center (2005) reported the mean annual precipitation from (1971-2000) at weather stations in the area were 42.42 cm/yr at Spokane International Airport, WA, 65.79 cm/yr in Bayview, ID, and 71.37 cm/yr at Coeur d'Alene Airport, ID.

To account for soil and precipitation variability across the SVRP aquifer, four field locations were chosen based on the spatial distribution and access to the sites. The monitoring stations were located at the Spokane Valley Fire Department, WA (SVFD), the Consolidated Irrigation District (CID) pump station near the WA/ID state line, the

City of Athol, ID (Athol), and the US Forest Service (USFS) facility near Coeur d'Alene, Idaho. Figure 3 shows the approximate location of each site based on GPS coordinates obtained at each location. The spatial distribution of each site will prove useful when analyzing the variance of precipitation and recharge at each site and determining its significance around the aquifer.

### 3.2 FIELD DATA COLLECTION

Campbell Scientific Model #CS616 water content reflectometers, or soil moisture probes, have been established at each of the four sites (Figure 3). Three probes were installed at each site to measure vertical moisture contents at depths of 10 cm, 30 cm, and 100 cm below the ground surface. Trenches were dug at each location with the probes installed horizontally into the wall of the trench to minimize soil disturbance above the probes. Campbell Scientific Model #CR200 data loggers were programmed to record the volumetric water content from the probes at 15-minute intervals. Monthly downloads of this information to a laptop creates a data file which can be analyzed graphically on a water content versus time plot. This experimental data is used to calibrate the hydraulic soil parameters of the mathematical UNSAT-H model.

To further assist in understanding the soil moisture results, Davis-Vantage Pro 2 Plus Weather Stations, Model #6162 were also installed at each site. These stations recorded the mean, high, low and dew point temperatures, wind speed, wind direction, atmospheric pressure, rainfall, and many other atmospheric weather parameters. Data was recorded at 15-minute intervals and collected on a monthly basis as well. The

weather station data is used in an input file of the UNSAT-H model, which will be discussed further in *Section 3.5*.

### 3.3 THE CONSOLIDATED IRRIGATION DISTRICT (CID) SITE EXPERIMENT

On October 3, 2008 an experiment was conducted at the CID site to determine how rapidly soil water content responds to vertical infiltration during the end of the summer season. One hundred fifty one liters (40 gallons) of water was poured into a 1.52 meter (5 foot) diameter enclosed ring which allowed the water to infiltrate downward into the surface below. The experiment was conducted directly over the soil moisture probes to allow for accurate measurements of moisture content at each depth.

### 3.4 SOIL COLLECTION AND LABORATORY ANALYSIS

A sample of soil near each soil moisture probe location was collected on October 20, 2009. This data collection was completed to allow for a full analysis of the physical composition of the different soils around the soil moisture probes. Two 1-meter deep boreholes were dug directly next to each other at each site using a post-hole digger. Six samples were taken at each site, one sample in each borehole at each depth of 10, 30 and 100 cm with the exception of site USFS where one extra sample was taken at each 60 cm depth. This was done due to the soil's non-homogeneity observed at 60 cm. Two boreholes were dug at each site to determine the consistency of soil texture at each site depth.

The physical composition analysis was performed at Washington State University's Geotechnical Lab. A grain size distribution analysis was completed to determine the depositional medium of each soil sample. To perform this test a series of six sieves were stacked above the other with the largest opening at the top followed by sieves of successively smaller openings. Table 1 shows the standard sieve sizes used in the grain size distribution analysis and their opening size.

The sample of soil was poured over the top sieve and shaken using a mechanical sieve shaker until each soil particle had dropped to a sieve in which the particles could not pass. Each sieve was weighed before and after the sieve analysis to determine the amount of soil in each sieve pan. Results of each soil sample were tabulated and the percent passing each sieve was then calculated. A semi-log plot of the percent passing verses the sieve opening size created a curve called the grain size distribution curve. The experimental error was also calculated by weighing the initial weight of the soil and comparing it to the sum of the soil weight in each sieve pan. If the margin of error between the two weights measured were greater than 2%, than the experiment was not considered acceptable (Reddy, 1997). The margin of error in the experiments performed never exceeded 2%.

### 3.5 NUMERICAL MODELING IN UNSAT-H

As mentioned above, soil moisture probe measurements as well as physical soil properties are used to accurately compare the results computed in UNSAT-H. To produce modeling results, it is required to create an input file which establishes the site's

conditions. For this study, data collected from February 1 2009- January 31 2010 was used in the input files. A twelve month period was analyzed to establish an average precipitation and recharge value for each month.

Each input file is organized by three different sections, (1) options, constants and limits, (2) soil property information, and (3) boundary conditions. The first section of the input file is not site specific within the study. This section defines parameters such as the number of days of simulation, the type of meteorological information to be entered, the type of soil hydraulic function used, the number of different soil materials and many other specifications (Fayer, 2000).

The second section contains information about specific soil depth properties. Given there are three soil moisture probe depths, each input file had three independent soil layers to specify. The first soil layer ranged from 0-20 cm, the second layer ranged from 21-65 cm, and the last layer ranged from 66-125 cm. It is generally assumed water that drains below the root zone will not succumb to evapotranspiration (Scanlon et al., 2002a). During the site visit on October 20$^{th}$, 2009, the majority of root zones observed were about 30 cm deep with few exceptions of observed roots at depths up to 60 cm. For that reason, the third soil layer created for each input file can be assumed to solely contribute to recharge for each site. There were 126 vertical nodes specified for each input file equally spaced 1 cm apart. The initial suction head values for each node were site and soil layer specific.

This section also required various parameter values for each of the three specified layers. The parameters discussed in *Section 2.3.1* for both the VG and BC functions were used to calibrate the model to the soil moisture probe data. Previous studies (Vereecken et al., 1988; Lenhard et al., 1989; Nandargiri and Prasad, 1996; Leij et al., 1996) have established parameter values for various classes of soil texture. The UNSODA database values were used as initial parameter estimates then adjusted appropriately.

The third section of the input file was site specific information. This section included daily PET values and hourly rainfall events. The minimum, mean, maximum and dew point temperatures and daily average wind speed are required to determine the daily PET value using the FAO Penman-Monteith method (Allen et al., 1998). The FAO Penman-Monteith equation is,

$$PET = \frac{\Delta(R_n - G) + \rho_a c_p \frac{(e_a - e_s)}{r_a}}{\Delta + \gamma\left(1 + \frac{r_s}{r_a}\right)} \qquad \text{Equation (12)}$$

where $R_n$ is the net radiation, G is the soil heat flux, ($e_s$-$e_a$) is the vapor pressure deficit of the air, $p_a$ is the mean air density at constant pressure, $c_p$ is the specific heat of the air, $\Delta$ is the slope of the saturation vapor pressure temperature, $\gamma$ is the psychrometric constant, and $r_s$ and $r_a$ are the surface and aerodynamic resistances, respectively. The weather station data is used for Equation (12) to calculate the daily PET. To calculate this equation a spreadsheet is used which calculates the parameters specified above from many smaller equations.

The hourly rainfall is entered given the 15-minute interval weather station data. It should be noted that there were times when the weather station data did not get recorded due to various malfunctions. This occurred February 1- February 7 2009, November 16- November 20 2009, December 17- December 19 2009 and January 15- January 21 2010. When this occurred the NOAA station at the Spokane International Airport, WA was used for the SVFD and CID locations and the Idaho AgriMet Station located in Rathdrum, ID was used for the Athol and USFS locations. SVFD and CID are located 16.62 km (10.32 miles) and 33.73 km (20.95 miles) northeast of the Spokane Airport, respectively. Athol is located 20.27 km (12.59 miles) north of the AgriMet Station and USFS is location 8.77 km (5.45 miles) south of the AgriMet Station.

Both the VG and BC function were modeled at each site to determine which function was the best fit model. Two input files for each function and location were created to simulate the meteorological parameters for February-December 2009 as well as January 2010. As a result, sixteen separate input files were created. Full details of the input files are located in *Appendix A*.

## 4.0 RESULTS

### 4.1 PHYSICAL SOIL ANALYSIS

In order to determine the main soil texture class of each sample a USDA-SCS soil texture triangle (USDA, 1993) was used. Each corner of the soil texture triangle represents 100 percent of sand, silt or clay, as indicated. Bold lines show the division of 12 major soil texture classes. The textural class can be determined by knowing the

percentage for two of the soil mediums. Table 2 shows the results of the soil type of each sample. Eighteen sample depths classified as sand, five sample depths classified as loamy sand and three sample depths as sandy loam. Given that there were two boreholes dug at each site, some sites at the same sample depth resulted in different textural classes. This occurred at the 10 cm depth at Athol, the 10 cm depth at SVFD, and the 10 and 30 cm depth at USFS. For example, the two samples at the SVFD site at the 10 cm depth classified as sand and loamy sand. For the UNSAT-H model, only one texture class can be used for each site's defined soil layer. Ultimately the texture class chosen for these locations was based on how they classified on the soil texture triangle and how they were observed during the field visit. Table 3 shows the soil type determined for each site and depth.

At the Athol and USFS site there was large gravel and cobbles present. Both of these sites also appeared to contain a mixture of brown organic matter and sand. From observation Athol appeared to contain more organic matter than sand and USFS appeared to contain more sand than organic matter. Results of the texture triangle showed Athol to consist of loamy sand at the 10 and 100 cm depth and sandy loam at the 30 cm depth. Results of the texture triangle showed USFS to consist of loamy sand at the 10 cm depth and sand at the 30 and 100 cm depth. The CID site contained many cobbles with boulders present as well. The soil was classified as sand at all three depths however there was some brown organic matter present at CID as well. The SVFD site contained sand at all three depths with no observed grain size diameters smaller or larger than sand. The soil texture was very consistent throughout the site.

## 4.2 SOIL HYDRAULIC FUNCTION PARAMETER VALUES

Table 4 contains the values for the parameters used at each site and depth. The parameter values of each soil layer were estimated using a graphical comparison of the output file to the actual field data. Initial estimations of each parameter were obtained from the UNSODA Database (Leij et al., 1996). The approximate parameter values serve as an initial estimate for optimizing the model to the measured soil moisture probe data. Table 5 presents the initial parameter values from UNSODA. This database does not provide initial estimates for the curve fitting parameters $h_e$ and $b$ of the BC function. Van Genuchten (1980) compared the curve fitting parameters $\alpha$ and $n$ to $h_e$ and $b$ by using the similarities one sees in Equation (9) and Equation (11).

$$\theta = \theta_r + (\theta_S - \theta_r)\left[\frac{h_e}{h}\right]^{1/b} \quad and \quad \theta = \theta_r + (\theta_S - \theta_r)[1 + (\alpha h)^n]^{-m}$$

The air entry potential, $h_e$ is inversely related to $\alpha$ at large values of pressure head, thus,

$$\theta = (\alpha h)^{-mn} \qquad \text{when } h \gg 1 \qquad \text{Equation (13)}$$

hence,

$$h_e = 1/\alpha \qquad \text{Equation (14)}$$

The empirical values of $b$ and $n$ of each function can be related using Mualem's theory where $m=1-1/n$, setting them equal to each other we obtain,

$$b = -mn \qquad \text{Equation (15)}$$

by plugging in m and solving, $b= 1-n$ is then achieved. These two relationships obtained from $\alpha$ and $n$ provided initial estimations for the BC parameters based on the VG parameters provided in the database. The parameter comparison published by van Genuchten (1980) is a very simplistic conversion and used only to obtain initial estimates for the BC function. Several other researchers (Lenhard et al., 1989; Stankovich and Lockington, 1995; Nandagiri and Prasad, 1996) have since published more complex conversion techniques to quantify a more accurate comparison. However since the BC parameters determined are used only as initial estimation, the van Genuchten conversion is sufficient for this study. Similar to the VG parameters, the BC parameters were optimized from the initial estimation to best fit the field data.

The parameter values obtained at each location in this study were separated by texture class. All sites and depths which classified within each texture class was averaged together to provide a comparison with the UNSODA database. Figure 4 (a-b) and Figure 5 (a-b) shows the minimum, average, and maximum values of the VG and BC parameters, respectively, for sand and loamy sand as well as their standard deviations. Sandy loam was included each figure however since only one location classified as this texture class there is not a maximum or minimum value. The VG parameters, $\alpha$ and $n$, determined in this study were lower than the UNSODA predictions for all three texture classes. Furthermore, the BC parameters $h_e$ and $b$ determined in this study were higher than the average of the predicted parameters for all three soil texture classes.

## 4.3 THE CONSOLIDATED IRRIGATION DISTRICT (CID) SITE EXPERIMENT

Figure 6 shows the resulting water contents from the CID experiment at each depth. From this experiment it can be observed how a semi-arid climate significantly impacts the depth of vertical infiltration during the end of the summer season. There is a rapid response to the effective precipitation at the 10 cm depth; however, at the 30 cm depth, the soil water content shows very little response to this experiment. The 100 cm depth shows no response to the amount of water infiltrated. It was not anticipated to have such a low response in water content at the 30 cm depth. This proves how difficult it is to predict water flow processes in semi-arid conditions, particularly at the end of summer. Hendrickx et al. (2003) discusses the difficulty of estimating deep percolation due to actual evapotranspiration being almost equal to effective precipitation in semi-arid climates. This experiment shows that during the dry summer season nearly all effective rainfall contributes back to evapotranspiration. The surface topography of this site is flat with no impermeable subsurface present therefore it can be assumed that no large amount of water contributes to lateral flow.

## 4.4 RESPONSE OF SOIL MOISTURE DISTRIBUTION FROM PRECIPITATION

The field data throughout the soil column is shown from February 1 2009- January 31 2010 to determine the response precipitation and water retention has at each site. Each site is divided into three quarters, February 1 2009- May 31 2009, June 1

2009- September 30 2009 and October 1 2009- January 31 2010. This allows the data to be observed in more detail throughout different times of the year. The results from each site will be discussed independently; however, there was one similarity throughout the four study sites which is discussed below.

The arid summer months result in the depletion of moisture content at all sites and depths. Generally during this time, rainfall does not infiltrate to lower depths and the moisture retained in the topsoil contributes to evapotranspiration (de Vries and Simmers, 2002). This occurs until a rainfall event high enough in concentration infiltrates below the topsoil. For this study, the initial wetting after summer occurred during the same rainfall event which increased the moisture content at the 10 cm depth for all sites. This occurred on October 14 2009. Figure 7 shows the precipitation amount and how it affected the soil moisture for each site. The Athol site received 2.36 cm (0.93 inches) of rain which increased the moisture content by 0.119 $cm^3/cm^3$ (Figure 8c). The USFS site received 1.70 cm (0.67 inches) of rain which increased the moisture content by 0.110 $cm^3/cm^3$ (Figure 11c). The CID site received 1.19 cm (0.47 inches) of rain which increased the moisture content by 0.051 $cm^3/cm^3$ (Figure 9c). The SVFD site received 1.35 cm (0.53 inches) of rain which increased the moisture content by 0.043 $cm^3/cm^3$ (Figure 10c). There was no response in moisture content to this rainfall event at the lower depths for any of the sites.

The 26 of October was the first day after summer that the 30 cm depth responded to rainfall for all four sites (Figure 7). Several rainfall events occurred between October

14 and October 26 2009 at each site. However, the 10 cm depth was not saturated enough to allow moisture to infiltrate to the 30 cm depth until then. The Athol site received 4.75 cm (1.87 inches) of rain which increased the moisture content at the 30 cm depth by 0.076 $cm^3/cm^3$ (Figure 8c). The USFS site received 2.97 cm (1.17 inches) of rain which increased the moisture content at the 30 cm depth by 0.064 $cm^3/cm^3$ (Figure 11c). The CID site received 2.24 cm (0.88 inches) of rain increasing the moisture content at the 30 cm depth by 0.081 $cm^3/cm^3$ (Figure 9c). The SVFD site received 1.68 cm (0.66 inches) of rain which increased the moisture content at the 30 cm depth by 0.082 $cm^3/cm^3$ (Figure 10c). CID and SVFD received the least amount of rain on October 26 2009 yet the moisture contents at the 30 cm depth had a higher response to the rainfall event (Figure 7). This day also resulted in the moisture content at the 10 cm depth to peak much higher at USFS and Athol yet the increase in moisture content at the 30 cm depth was lower than that seen at CID and SVFD. This indicates higher moisture retention in the topsoil layer at Athol and USFS. There was no response in moisture content to this rainfall event at the 100 cm depth for any of the sites.

Figure 8 (a-c) shows the water content throughout the soil column from February 2009- January 2010 for Athol. During a rain event the soil moisture increases almost instantly at the 10 cm depth and retains the moisture after the rain event. This moisture retention is evident from two things, the 30 cm depth rarely responds to rain events directly after the 10 cm depth and the observed moisture content at the 10 cm depth is much higher than the moisture content at the 30 cm depth throughout the year. One of the few exceptions of response to rain at the 30 cm depth occurred on August 12 (Figure

8b). The recorded precipitation for this day was 2.34 cm (0.92 inches). On August 13, 2.13 cm (0.84 inches) of precipitation was recorded. It took four hours for the moisture to infiltrate to the 30 cm depth after the start of the first rain event. There was no change in moisture content at the 100 cm depth during this event or any other time throughout the year from precipitation. This once again indicates the high moisture retention in the top soils and slow vertical infiltration. After the initial wetting at the 30 cm depth on October 26 2009, soil water content remains elevated retaining moisture from rainfall events.

Figure 9 (a-c) displays the soil column throughout water year for CID. All three depths respond to rains events from February- April 2009 and December- January 2010. At the 10 cm depth the moisture content increases immediately after rain events. It takes about one hour for the rain to infiltrate to the 30 cm depth and about eight hours for the rain to infiltrate the 100 cm depth. Rain events elevated the moisture content at the 10 cm depth throughout the year with the exception of the time periods with below freezing air temperatures. During the summer the response to rain events occurs immediately at the 10 cm depth and retains the moisture (Figure 9b) for multiple days. For example, on July 13, the CID site received 1.24 cm (0.49 inches) of rain which increased the topsoil moisture content from 0.108 to 0.145 $cm^3/cm^3$. It took until July 24 for the moisture content to decrease back to 0.108 and there were no other rain events during the eleven day period. Even though moisture is retained at the 10 cm depth, there is only one rainfall event on August 6 that infiltrated to the 30 cm depth during the warmer months. Other than this day, the 30 cm depth did not respond to rain events from May- October

2009. It appears the majority of rain during this time contributed to evapotranspiration. Response to precipitation at the 100 cm depth after the summer months did not occur until mid December (Figure 9c).

Figure 10 (a-c) shows the recorded moisture contents throughout the soil column from February 2009- January 2010 for SVFD. Response to rain events occurs at the 10 cm depth throughout the year. From mid April- mid October, the 30 cm depth does not respond to rain events. There are no rain events which occurred in this water year that increased the moisture content at the 100 cm depth. The rise in moisture content at the 10 cm depth on March 18 (Figure 10a) does not appear at the 30 cm depth until March 20, indicating about a two day delay for initial moisture to vertically infiltrate. After the initial wettings on March 20 and October 26, the moisture content at 30 cm responds to rain events directly after the 10 cm depth. Rain events did not significantly increase the soil moisture content at the 10 cm depth during the summer season. This site had the lowest moisture content of any sites at the 10 cm depth throughout the year. Moisture contents at SVFD at the 10 cm, 30 cm and 100 cm depth were also similar for the majority of the year, with the exception of March and November. These observations indicate that moisture is not retained as much as the other sites at the 10 cm depth, and that there is a higher response to vertical infiltration at this site.

Figure 11 (a-c) shows the moisture content throughout the soil column from February 2009-January 2010 at the USFS site. Rain events affect the 10 and 30 cm depth throughout the year and the 100 cm depth until March 21 (Figure 11a). It takes about

eight hours for rain to infiltrate the 100 cm depth after the start of a rain event. Peak rain events infiltrate the 30 cm depth immediately after the 10 cm depth throughout the whole year. For example, on June 16 water infiltrated both the 10 and 30 cm depth after the site received 1.47 cm (0.58 inches) of rain. The 30 cm depth responded to the infiltration only 15 minutes after the 10 cm site. However, when the soil at the 30 cm depth is near dry conditions at the end of the summer it took five rain events for enough water to vertically infiltrate the 30 cm depth (Figure 11c), as seen from October 14- October 26, 2009.

Quantifying the soil moisture distribution as a result of precipitation proves useful for analyzing the moisture retention and vertical infiltration in various soil mediums. Results will also help analyze the comparison of the field data to UNSAT-H's prediction of water content for the VG and BC water retention functions.

### 4.5 RESULTS OF FIELD DATA AND CANDIDATE SOIL WATER RETENTION FUNCTIONS

The UNSAT-H model of the VG and BC functions are graphically analyzed to the field data for each depth and site from February 1 2009- January 31 2010. Similar to the soil column graphs, each site is divided into three quarters, February 1 2009- May 31 2009, June 1 2009- September 30 2009 and October 1 2009- January 31 2010. Each graph compares the measured water content to the water content predicted by VG and BC at depths of 10, 30, and 100 cm. The results of each site and depth will be discussed

below with an emphasis on the 100 cm depth since the ultimate goal of this study is to predict recharge into an aquifer.

### 4.5.1 WATER CONTENT PREDICTIONS AT THE ATHOL SITE

Figure 12 (a-c) shows the comparison of the UNSAT-H model to the field data at the 10 cm depth at the Athol location. From February 1- July 12 the water content is underpredicted by both the VG and BC functions and from July 13- October 23 the predicted water content for both functions overpredicts the actual measured water content. During this time however, the model's prediction of water content fluctuations coincide with the peak rainfall events. From October 24- December 3 the measured water content (field data) is comparable to the VG function. The water contents are not analogous after December 3 due to the effect of freezing topsoil temperatures on measureable water content. December 3 was the third day of the season with maximum air temperatures below freezing. From there, daily high temperatures stayed below freezing until December 15 and then again from December 23- December 30. The Western Regional Climate Center in partnership with NOAA reports that in this region of Washington, the average soil frost depth is 10- 20 inches (WRCC, 2010). This frost depth coincides with the low water contents seen at the 10 cm depth in Figure 12c after December 3 and also with the freezing air temperatures reported above.

Figure 13 (a-c) compares the functions at a depth of 30 cm. At this depth the field data shows very little fluctuation during rain events. As a result, both functions underpredict the water content throughout the data set with the exception of August 11-

October 1 where the functions are similar to the field data. On December 21 an extreme peak in water content occurred (Figure 13c) to a value higher than 0.6. Even though 1.27 cm (0.50 inches) of rain occurred on this day, it is assumed that this water content value is the result of equipment malfunction due to the unrealistic value observed.

Figure 14 (a-c) compares the functions at a depth of 100 cm. From February 1-June 14 the VG and BC functions predict water content to values which are most accurate to the field data. The largest margin of difference between the field data and either function is 0.003 (Figure 14a) and the largest percentage of error is -6.1%. From July 1 - November 17 both functions overpredict the actual water content with the margin of difference no larger than 0.024 (Figure 14c). The largest percentage error for July, August, September, October, and November are 46.9%, 62.7%, 75.2%, 76.1% and 43.6%, respectively. It should be noted that large percentage errors throughout this study are expected due to the very small water content values. The slightest difference in water content value will result in a relatively large percent error. From November 18- January 31 the model functions show similar values to that of the field data. The largest difference in water content during this period is 0.016 however the majority of data during this period does not exceed 0.010 (Figure 14c). The largest percentage of error for December and January were -18.0% and -15.1%, respectively. The field data shows that the water content values remain within a range of 0.05-0.06 throughout the majority of the water year with the exception of the summer season. Water content steadily declines from July 1– October 1, and then begins to steadily increase until December 1 at which

time the water content remains constant within the range mentioned above for the remainder of the water year.

### 4.5.2 WATER CONTENT PREDICTIONS AT THE CONSOLIDATED IRRIGATION DISTRICT (CID) SITE

Figure 15 (a-c) shows the comparison of the two functions to the field data at a depth of 10 cm at the CID site. The field data from February 1- February 18 and November 30- January 16, 2010 shows two drastic drops in water content in the top soil layer indicating the soil was frozen or semi-frozen for the same reasons discussed above. The remaining time periods show similar predicted water contents and fluctuations during precipitation events to the field data. The VG function predicted similar water content results during the first two quarters Figure 15 (a and b) however the field data is more closely related to the BC function during the third quarter (Figure 15c).

Figure 16 (a-c) compares the functions at the 30 cm depth. During the first quarter (Figure 16a) the VG function and the field data are very comparable. The BC function underpredicts the measured water content. There is an unexpected peak in water content occurring on February 23 2009 due to the top soil moisture temperatures rising above freezing. Prior to February 23 the water content averaged around 0.20 $cm^3/cm^3$, on February 23 the water content peaked at 0.58 $cm^3/cm^3$. From June 1- January 31 both functions overpredict the water content because the field data at this depth shows less of a response to rain events than UNSAT-H predicts.

Figure 17 (a-c) compares the functions at the 100 cm depth. From February 1-May 23 both functions underpredict the actual water content observed (Figure 17a). The peak soil moisture content which occurred on February 23 at the 30 cm depth also occurred at the 100 cm depth, but was not as drastic. At this depth the water content peaked at 0.19 $cm^3/cm^3$, prior to this day the water content averaged around 0.11 $cm^3/cm^3$. As a result of this day, the water content shifts upward and remains elevated until around mid-April. Neglecting the peak in water content just mentioned, the largest margin of difference between the field data and the VG function during this time period is 0.037. The largest margins of error for February, March, April, and May were -14.8%, -25.9%, -24.8%, and -10.8%, respectively. The BC function underpredicts this value even more than the VG function. Between May 24 and July 6 the VG and BC function predict the actual water content relatively well with the largest difference being 0.012 resulting in a percent difference of 12.1%. From July 6-December 17 the VG and BC function overpredicts the water content by a margin no larger than 0.037. During July, August, and September the largest percentage of errors were 27.0%, 41.7%, and 63.3%, respectively. There is a steady decline in water content until October 1, at which time the water content remains at a constant value of 0.059 $cm^3/cm^3$ until December 17 (Figure 17c) resulting in a constant percent error of 63.3%. The decline between July and October indicates that no rain events during this period influence recharge. The increase in water content occurring on December 17 at the 100 cm depth is contributed from the increase in water content at the 30 cm depth which occurred on December 16 from the rise in atmospheric temperature. After December 17, the observed water content

increases to values above the predicted water contents for either function, underpredicting the actual water content until January 31 2010. During December 2009 and January 2010 the VG function underestimates the actual water content at most by, -23.6% and -25.4%, respectively.

### 4.5.3 WATER CONTENT PREDICTIONS AT THE SPOKANE VALLEY FIRE DEPARTMENT (SVFD) SITE

Figure 18 (a-c) shows the comparison of the model functions to the field data at the 10 cm depth at the SVFD site. From May 1- August 1 both the BC and VG functions replicated the field data relatively well showing similar sinusoidal fluctuations (Figure 18b). Neither the VG nor BC function model the large increase in moisture content which occurred on March 18 and again on October 26 Figure 18 (a and c). As a result, the BC and VG function underestimated the actual water content from March 18-May 1 and then again from October 26- December 3. The increase in moisture on the 18 of March is the result of top soil moisture rising above freezing. During this period, UNSAT-H accurately predicts the correspondence between rainfall events and water content fluctuations. The sudden drop in water content recorded during December 4-January 16 2010 (Figure 18c) implies the top soil moisture content was below freezing for reasons previously discussed.

Figure 19 (a-c) shows the comparison of the functions to the data at 30 cm. Similar to the results observed at the 10 cm depth, the time period with below freezing temperature show incomparable data. The summer months display similar water content

to the functions however there is a decline in the actual water content which is not demonstrated with either function. From October 27-November 30 the VG function predicts the measured field data relatively well.

Figure 20 (a-c) shows the field data and the functions at the 100 cm depth. From February 1- April 6 the predicted water content value for both functions are very similar to the measured data with the largest difference for either function being no larger than 0.009. The highest percent errors for February and March were -11.2% and 6.2%, respectively. From April 7- June 3 the water content for either function underpredicts the field data. During April and May the largest margin of difference was 0.020 and 0.017, respectively, with percent errors of -20.6% and -18.1%, respectively. From June 3-December 17 there is a steady decline in water content indicating that rainfall events do not affect the 100 cm depth during this time. Both functions overestimate the water content with the largest difference of 0.038 and occurring on December 15 (Figure 20c). The largest percent errors for June, July, August, September, October, and November are 45.1%, 57.0%, 60.3%, 63.7%, 74.8%, and 78.9%, respectively. In the mid December the measured water content shifts upward rising above the modeled VG water content causing the VG function to go from overpredicting the water content to underpredicting it. The largest percent errors for the beginning and end of December are 83.2% and -24.6%, respectively. From December 20 through January 31 the water content is slightly underestimated for the majority of the time period. The largest percent error for January was -23.1%.

### 4.5.4 WATER CONTENT PREDICTIONS AT THE UNITED STATES FOREST SERVICE (USFS) SITE

Figure 21 (a-c) shows the comparison of the field data to the UNSAT-H functions at 10 cm at USFS. Similar to the previous sites, there is a period of freezing soil moisture temperature making the results invalid. For this site it occurs from February 1- February 8 and November 30- January 16 2010. Figures 21 (a and c) show results for the VG function which are very comparable to the actual field data for the period of valid data. The BC function greatly underpredicts the water content throughout the study period. From May 20- September 5 both the BC and VG underestimate the actual water content however still display the same fluctuation of water content to rainfall events.

Figure 22 (a-c) shows the results for the comparison at the 30 cm depth. The results of the VG function predict the field data reasonably well throughout all three periods with the exception of the period from August 5- October 27. During this time the VG function overpredicts the measured water content value. The frozen soil temperatures prove to be an issue at this depth as well after November 30. The BC function underpredicts the measured water content value throughout the year with the exception of the period from August 5- October 27. During this time the BC function overpredicts the measured water content value.

Figure 23 (a-c) shows the comparison of results at the 100 cm depth. From February 1- July 1 the BC function predicts water content to values nearly identical to the measured field data. The VG function predicts very similar values as well, slightly

overestimating the water content by a margin of 0.004. The largest percent error from February- June 2009 was 16.0%. From July 2- December 3 both functions overestimate the water content. The VG function estimates water content values slightly higher than the BC function. Similar to other locations, the actual water content gradually decreases during this time displaying no response to rain events until December 3 (Figure 23c). The largest percentage of error for July, August, September, October and November is 46.8%, 59.0%, 73.4%, 78.9%, 84.6%, respectively. From December 4- January 31 the BC function estimated water content values which nearly match the measure field data. The VG function slightly underestimates the measured field data by a margin no larger than 0.011. The largest margin of error during this period is -14.5%.

The results quantified above for each soil water retention function help determine which function is the best fit model for this study, and verify the level of accuracy to which UNSAT-H calculates the modeled recharge. For each site and month, a prediction of water content can help state whether the recharge amount is overestimating or underestimating the actual amount of recharge.

### 4.6 UNSAT-H PREDICTED RECHARGE ESTIMATES

Based on the similarities to the field data discussed above, the UNSAT-H model estimated recharge using the van Genuchten function, further validation of candidate function is discussed in *Section 5.2*. Table 6 contains the results of the monthly and annual recharge values estimated by UNSAT-H for each site. The bold monthly recharge estimates indicate the VG function greatly over or under predicted the measured water

content. The recharge estimates during these months are not as accurate. The monthly and annual precipitation totals are also presented which were obtained from the weather station data. The monthly and annual ratio of recharge from precipitation is examined as well. From Table 6 and Figure 24, it can be observed that no recharge occurs at any site during the months of June, July, August and September during this particular water year. During April and May, recharge is predicted only at the Athol location. Recharge was not predicted to occur at CID in October 2009. This is the only site to have estimated zero recharge during October. The most northern site, Athol, has the highest recharge value for every month, with the exception of February 2009. The USFS site, located 27.71 kilometers (17.2 miles) directly south of Athol, ID, has the second highest recharge values for every month, with the exception of February 2009 and October 2009. CID and SVFD are laterally located in very similar locations. SVFD was estimated to have more recharge than CID three of the six months recharge occurred.

Figure 25 displays the annual precipitation and recharge for each location. Results show that annually Athol had the highest ratio of recharge from precipitation and followed by USFS, SVFD then CID. This also coincides with their locations throughout the aquifer from north to south. Annually, CID had 5.21% more precipitation than SVFD but 2.63% less recharge. Athol also had the highest annual precipitation of any site. On average, the months which had the highest ratio of recharge from precipitation for this water year, were March 2009, November 2009, December 2009, and January 2010. Results for February 2009 were not anticipated however the length of this study is not long enough to quantify any good justification for this data. It can however be noted the

monthly precipitation for February 2009 was lower than most months with the exception of the summer season.

# 5.0 DISCUSSION

## 5.1 EFFECTS CLIMATOLOGICAL PARAMETERS AND SOIL CHARACTERISTICS ON VERTICAL INFILTRATION

The Athol site was determined to consist of sandy loam and loamy sand, based on the USDA soil texture triangle. Cobbles were present as well. This site had the highest precipitation of any site, every month, yet moisture contents measured throughout the soil column did not respond to rainfall events (Figure 8) as often as other sites did. At the 10 cm depth the soil medium retained water throughout the year, displaying one of the higher moisture content values of any sites. However, at the 100 cm depth the moisture content remained relatively low. The soil texture medium observed at this location appeared to contain more organic matter than any other site observed. The actual soil organic matter content was not measured at any site. Organic matter cannot be classified on the soil texture triangle because of its wide range of grain size diameters. Organic matter is defined chemically, not physically. Many studies (Rawls and Brakensiek, 1982; Wösten et al., 2001; Rawls et al., 2003; Olness, 2005) have found soil organic matter content to greatly affect the water retention in soils, particularly in coarse-grained soils such as sand, loamy sand and sandy loam. The presence of organic matter increases the matric potential which is otherwise low in coarse-grained material. It is hypothesized that the soil moisture distribution throughout the column is controlled by the soil organic

matter content at the Athol site. Since the soil organic matter content cannot be quantified with data, this hypothesis is based on observations made during the soil collection field visit and from the small response rainfall events had on soil moisture contents as compared to other sites.

The soil moisture distribution at the CID and USFS sites modeled very similarly throughout the year (Figure 9 and 11, respectively). Both sites display comparable responses of soil moisture content to rainfall events. Each site contained a soil medium of cobbles, sand and organic matter. Additionally, the USFS site contained sandy loam and the CID site contained boulders. However, there are a few differences in the soil moisture distribution which demonstrates that the USFS site retains more soil moisture than CID. There is a larger difference in moisture content between the 10 and 30 cm depth at the USFS site indicating this site retained more water than CID at the 10 cm depth. The decline in moisture content in May at the 10 cm depth at CID (Figure 9a) also shows moisture retention is not as evident here. Lastly, Figure 7 shows that during the initial wetting of the 30 cm depth on October 26, the moisture content at the USFS site increased more at the 10 cm depth while the moisture content at the CID site increased more at the 30 cm depth.

The USFS site received an additional 9.65 cm (3.80 inches) of precipitation during this study year. While this factor may contribute to the higher water retention at the 10 cm depth, it does not justify why the moisture infiltration to the 30 cm depth is less. It is suggested that the soil medium at the USFS site has a higher organic matter

content causing the top layer of soil to retain more water than the CID site. CID is also believed to retain water from the soil organic matter content, but by a smaller factor. However with no substantial evidence from data values, it cannot be made certain that the USFS site retains more water from the presence of organic matter.

The SVFD site consisted of sand with a uniform distribution of grain size. The soil medium at this site did not compare to other soil samples around the SVRP aquifer. The measured soil moisture distribution at SVFD (Figure 10) was also unique to its location. The sand medium at the SVFD site has a low matric potential resulting in low moisture retention in the topsoil. This characteristic allows moisture to vertically infiltrate deeper soil depths. An example of this is displayed in Figure 7, where SVFD received the least amount of rainfall on October 26 2009 yet had the highest increase in moisture content at the 30 cm depth. The moisture content throughout the year at the 10 cm depth was the lowest of any site but the moisture content at the 100 cm depth was amongst the highest. Even though this site had the lowest annual precipitation (39.98 cm), its soil medium allows moisture to infiltrate to deeper depths.

## 5.2 VALIDATION OF PARAMETER VALUES AND CANDIDATE SOIL WATER RETENTION FUNCTION

Estimation of VG and BC parameters has not been specified for semi-arid climate conditions in previous studies. Leij et al. (1996) based their UNSODA database on VG parameters obtained by Carsel and Parrish (1988). While this study observed over two hundred samples around the world, it did not however, categorize the samples by climate.

The parameter values determined for the four SVRP locations (Table 4) do not compare well to the UNSODA database values as seen in Figure 4 (a-b) and Figure 5 (a-b). Based on the UNSODA database the VG parameters are underestimated and the BC parameters are overestimated. For sand, the VG parameters $\alpha$ and $n$ were underestimated by -74.3% and -28.7%, respectively. For loamy sand, the VG parameters $\alpha$ and $n$ were underestimated by -75.6% and -28.5%, respectively. For sand, the BC parameters $h_e$ and $b$ were overestimated by 255.1% and 1.2%, respectively. For loamy sand, the BC parameters $h_e$ and $b$ were overestimated by 280.5% and 33.6%, respectively. The UNSODA database was used for comparison because it is one of the most widely recognized databases used and documented by the EPA as the User's Manual for unsaturated soil hydraulic properties.

Prior to the Leij et al. (1996) publication, other well known studies (Russo, 1988; Wösten and van Genuchten, 1988) had predicted parameter values useful for comparisons. Wösten and van Genuchten (1988) categorized their estimated VG parameters by texture class and soil depth. For topsoil, coarse-grained material, their $\alpha$ and $n$ values ranged from 0.0157- 0.029 and 1.44- 1.83, respectively. For this study, the UNSAT-H average VG parameters, $\alpha$ and $n$, for topsoil, sand were 0.024 and 1.76, respectively. For sub-soil, coarse-grained material, Wösten and van Genuchten (1988) determined their $\alpha$ and $n$ values to range from 0.0154- 0.0551 and 1.75- 2.43, respectively. The $\alpha$ and $n$ parameter values determined in this study for sub-soil, coarse-grained material were 0.0417 and 1.96, respectively. Both the topsoil and sub-soil

values for $\alpha$ and $n$ determined in this study fall within the range reported by the Wösten and van Genuchten (1988).

Hendrickx et al. (2003) compared the VG parameters given by both Carsel and Parrish (1988) and Wösten and van Genuchten (1988) by calculating the maximum capillary rise using both sets of parameters for five different soil texture classes. Hendrickx et al. (2003) determined the Carsel and Parrish (1988) parameters will result in a much lower capillary rise than the parameters presented by Wösten and van Genuchten (1988). In semi-arid conditions the capillary flux will be much higher than that of normal conditions. This larger flux causes the matric potential gradients to orient upward which drives the water upwards at deeper depths (de Vries and Simmers, 2002). This is also evident from the soil moisture distribution discussion above. As a result, the parameters estimated by Wösten and van Genuchten (1988) model VG parameters in semi-arid conditions to better accuracy.

Russo (1988) published parameter estimates for loamy sand for the BC parameters $h_e$ and $b$. The values ranged from 17.80-46.10 and 0.532-1.738, respectively. The average parameter estimates for loamy sand in this study were 30.71 and 1.71, respectively. Both the $h_e$ and $b$ values determined in this study are within the range determined by Russo (1988). Russo (1988) did not publish a range of values for sand.

To evaluate the level of importance of the four parameters ($\alpha$, $n$, $h_e$ and $b$), a sensitivity index was performed for each site at each depth using the range of actual parameter values determined from each soil medium (Figure 4(a-b) and Figure 5(a-b)).

The 30 cm depth at Athol did not get analyzed because it was the only site with sandy loam therefore there was not a range of parameter values to use. To analyze $\alpha$ and $n$, the VG Equation (11) was used to calculate $\Theta$. Maximum and minimum values of $\alpha$ and $n$ were changed independently in the equation to determine the maximum and minimum output value of $\Theta$. The same process was used to analyze $h_e$ and $b$ however the BC Equation (9) was used to calculate $\Theta$. The sensitivity of each input parameter was then determined by calculating the percent difference of the output range. Table 7 contains the results of the sensitivity index performed. This analysis indicated that changing $n$ creates a larger change of $\Theta$ values and therefore, is more sensitive than $\alpha$ at all sites and depths except at CID at 10 cm and USFS at 100 cm. At these two locations $\alpha$ is more influential and creates a large change in water content values. Similarly, changing the parameter, $h_e$, created a wider range of $\Theta$ values as opposed to changing the $b$ parameter, concluding that $h_e$ is more influential to water content values than $b$ at all sites. Vereecken et al. (1988) suggest for sandy soils changes to the $n$ parameter is more sensitive when $\alpha$ is small, similar to the small $\alpha$ values observed in this study. Futhermore, Vereecken et al. (1988) also concluded if there is a low, well-defined $h_e$ value, the $b$ parameter will be more insensitive to change. Validation of the parameter values obtained in this study can also be justified from the comparison to the field data results discussed in *Section 4.5*.

When the van Genuchten and Brooks-Corey functions were compared to the field data in Figures 12-23, it was observed that the van Genuchten function approximated the measured data more accurately. The van Genuchten model was a closer fit to the data

particularly at the 10 and 30 cm depths. This observation can be made at the Athol and USFS sites where the van Genuchten function corresponds more closely to the measured field data and the Brooks-Corey function greatly underestimates the measured water contents. The difference between the van Genuchten and Brooks-Corey predicted water contents are not as evident at the CID and SVFD sites. At these two locations, both functions similarly overestimate and underestimate the measured water content during the same periods. Many researchers (Lehnard et al., 1989; Stankovich and Lockington, 1995; Nandagiri and Prasad, 1996) argue that van Genuchten's model is the superior choice when comparing the two models because it is a smoothly-continuous water retention function. The Brooks-Corey model is a less complex, linear model which can be easily manipulated mathematically. However, this simplicity also results in a discontinuity in the slope at the air-entry potential value when pressure head (matric potential) is plotted as a function of water content (Milly, 1987; Lehnard et al., 1989). At or near saturation the Brooks-Corey function is discontinuous, because the air-entry potential is zero or not well-defined (Lehnard et al., 1989). It is particularly important for this study to have a well-defined pressure head at saturated conditions because of the impact capillary forces have in semi-arid climates. Capillary forces play a significant role on infiltration rate into a vertical column when conditions are saturated (Morel-Seytoux et al., 1996). Therefore having discontinuity in the matric potential near saturation could misrepresent actual moisture retention contents in semi-arid conditions. The accuracy of the van Genuchten model is achieved by using a large number of analytical solutions which involve the use of complex non-linear least squares regression

technique (Rajkai et al., 2004). The data is easily fit to the soil-water retention curves which give adequate fit to measured soil water contents across a wide range of pressure heads (Mayr et al., 1999).

### 5.3 ACCURACY OF RECHARGE ESTIMATES

The recharge estimates determined by UNSAT-H from this study will first be evaluated using the comparisons made at the 100 cm depth in *Section 4.5*, and then further supported by recharge estimates predicted in previous studies. Quantifications of the recharge estimates at each site are discussed below and summarized in Table 8. As mentioned previously, Bartolino (2007) reviewed results of previous recharge studies as well as producing results for his own recharge study. Results from Athol and USFS can be directly compared to Bartolino's results from Bayview and Coeur d'Alene, respectively, as they are spatially located near each other. The Athol site is located 12.03 kilometers (7.47 miles) southwest of Bayview, ID. The USFS site is located 5.80 kilometers (3.60 miles) north of Coeur d'Alene, ID.

The study at Athol shows that from February 2009- January 2010, this site had 75.6 cm (29.8 inches) of rain and 38.0 cm (15.0 inches) of recharge resulting in 50.3 percent of recharge from precipitation. As discussed in detail in *Section 4.5.1,* at the 100 cm depth the UNSAT-H model predicted water content values near field conditions from February- June 2009 (Figure 14 a and b). The similar water content values between the field data and the UNSAT-H function gives good estimation of the recharge values predicted during this period. From July- November 2009 the UNSAT-H model

overpredicts the water content value, however even with the higher water content values, UNSAT-H estimated no recharge to occur in July, August or September 2009. The recharge estimates calculated for October and November 2009 are overestimated, however based on the steady rise in measured water content at the 100 cm depth (Figure 14c) it is assumed recharge still occurs during these months. Recharge estimates for December 2009 and January 2010 are slightly underestimated. October and November did overpredict the water content values to a higher degree (-76.1% and -43.6%, respectively) than the underestimation made in December and January which was 18.0% and 15.1%, respectively. Bartolino (2007) reports the monthly precipitation and estimated recharge for Bayview from 1990-2005. During the 15-year record, only one year is estimated to have over 50 percent ratio of recharge from precipitation. The remaining study years had a ratio of recharge from precipitation in a range of 19- 48 percent. The UNSAT-H model predicted Athol to have an annual percent of recharge from precipitation of 50.3 percent (Table 6). Based on the estimating error discussed above and Bartolino's (2007) report of recharge at Bayview, ID, it is believed the annual recharge estimation predicted for Athol is slightly overestimated, particularly during October and November.

At the CID location, it was estimated that from February 2009- January 2010 the total annual precipitation was 49.3 cm (19.4 inches) and the total annual recharge was 13.7 cm (5.4 inches) resulting in 27.8 percent of recharge from precipitation. As discussed in *Section 4.5.2* from February through May 2009 the VG function underestimates the actual water content. The VG function underestimated the water

content in April and May, ultimately influencing the amount of recharge predicted by UNSAT-H. However, even with this underestimation, it is likely the estimated recharge is still zero because there is no response to vertical infiltration observed at the 100 cm depth (Figure 17a) during this time. From June- September 2009 the measured water content continues to gradually decrease causing the VG function to increasingly overestimate the water content. Even with the overestimation, the model predicted zero recharge to occur in any of these months. The actual water content remained at a constant value of 0.059 throughout the end of September until mid-December. UNSAT-H calculated that no recharge occurred during October and 1.42 cm (0.56 inches) of recharge occurred in November. The recharge estimated to occur in November is overestimated and it is even arguable whether recharge occurs since the measured water content stays at a constant value and does not respond to vertical infiltration until December. During December 2009 and January 2010 the VG function underestimates the actual water content, indicating more recharge occurred than the UNSAT-H model predicted. The model underestimates the actual water content in all the months which recharge occurs, excluding November 2009 (Table 6). As a result, it is predicted that the model has underestimated the total annual amount of recharge which occurs at CID for this study. This site had the smallest ratio of recharge contributing to precipitation however it is very likely this ratio should be higher.

The total annual precipitation calculated from this study for the SVFD site was 40.0 cm (15.7 inches) with an estimated annual recharge of 15.2 cm (6.0 inches) resulting in 38.1 percent of recharge from precipitation. As discussed in *Section 4.5.3,* at the 100

cm depth, the VG function predicts the measured water content relatively well from February- March 2009, demonstrating good confidence in UNSAT-H's estimation of monthly recharge. The VG function underestimates the measured water content from April- May 2009 (Figure 20a). UNSAT-H predicted no recharge to occur in April or May (Table 6). However given the function underestimated water content, it's also possible the model underestimated recharge. The measured moisture content at the 100 cm depth also increased in April then decreased in May, indicating a response to vertical infiltration in April. As a result, it is likely recharge occurred during April however the prediction of no recharge in May is most likely valid. From June-November 2009 the actual water content decreases gradually with time while the VG function remains relatively constant. Even with the overestimation of water content from June-September 2009, the UNSAT-H model still estimates zero recharge to occur. The large overestimation of water content which occurred during October and November (74.8% and 78.9%, respectively) could cause a debatable argument as to whether the recharge reported actually occurs. Particularly since the soil moisture at the 100 cm depth shows no response to vertical infiltration until mid December. In mid December the measured water content shift's upward causing the VG function to slightly underpredict the actual field data until the end of the study period. The overestimation of water content from October- mid December has a higher degree of error than the underestimation of water content in April (-20.6%). For that reason, it is very probable the total annual recharge estimated is slightly overestimated as well.

The UNSAT-H model predicted the USFS site to have 23.6 cm (9.3 inches) of recharge from February 2009- January 2010. The total precipitation during this time was 58.9 cm (23.2 inches) resulting in 40.1 percent of recharge from precipitation. As discussed in *Section 4.5.4* at the 100 cm depth, from February- June 2009 the VG function slightly overestimates the measured water content. Even with the slight overestimation, the UNSAT-H model predicted no recharge to occur during the months of April, May or June. The accuracy of the predicted water content to the measured field data gives good certainty for the estimated monthly recharge from February- June as well. As the actual water content decreases from July- November (Figure 23 b and c), the VG function increasingly overestimates the water content values. Once again, the overestimation which occurs in July, August and September still result in a zero recharge prediction. The VG function overestimated the water content in October and November by 74.8% and 78.9%, respectively. Table 6 shows that at USFS in October and November 2009, the amount of recharge estimated was 0.63 cm (0.25 inches) and 3.57 cm (1.41 inches), respectively. It is likely recharge did not occur in October due to the low recharge estimate greatly overestimated. However, for November, the recharge estimate is much higher and it is not likely the overestimation was over 3.57 cm. Recharge is expected to occur in November at this site. Bartolino (2007) reported annual recharge values at Coeur d'Alene, ID from 1996- 2004. During this period, recharge was predicted to occur in October two of the nine times. However, in November Bartolino (2007) reported recharge to occur eight out of the nine years. The overestimation during December and January for the VG function is relatively small (Figure 23c) therefore,

predicted recharge estimates during this time are acceptable. USFS reported to have an annual ratio of recharge from precipitation of 40.1%. Bartolino (2007) estimated that Coeur d'Alene exceeded an annual ratio of recharge of 40.0% only once within the study period. The remaining study years had a ratio of recharge from precipitation in a range of 30- 35 percent. Based on the errors discussed above and the study of Coeur d'Alene by Bartolino (2007), it can be assumed with good confidence that the annual recharge estimate for the USFS site is overestimated as well.

Table 8 summarizes the discussion above which includes the highest monthly percent error of predicted water content for each month and site, as well as, if UNSAT-H predicted recharge to occur, and if it is likely for recharge to occur. The two factors considered when predicting if recharge is likely to occur were the percent error of water content values compared to the magnitude of the recharge value and the observed moisture content's response to vertical infiltration at the 100 cm depth. The Bartolino (2007) study also helped quantify results at Athol and USFS. This table also summarizes whether the annual estimated recharge is over or under estimated. Bartolino (2007) estimated that for the three sites (Bayview, Coeur d'Alene and Spokane Airport) on the SVRP aquifer boundary recharge from precipitation did not occur during the months of June- September for the majority of the water years. This statement holds true for this study as well. The Spokane Airport, WA and Coeur d'Alene, ID did not have recharge in the months of April, May and October for the majority of the water years, similar to the results seen at CID, SVFD and USFS. Recharge was only predicted to occur during April, May and October at the Athol site because of the climatological parameters unique

to this spatial location in the aquifer. From Figure 26 it can be seen that the Athol site experienced a much larger amount of total monthly precipitation for April, May and October than any other site. The USFS site had the next largest amount of precipitation for April, May and October however is still much less than Athol. Figure 27 shows the comparison of the mean monthly temperatures from February 2009- January 2010 for all four sites. The monthly average temperature for USFS, CID and SVFD for April, May and October were all relatively similar. Their values ranged from 6.96- 7.29°C for April, 13.09- 13.55°C for May and 5.87-6.35°C for October. For Athol, the monthly average temperature for April, May and October were 5.49°C, 11.26°C, and 4.08°C, respectively. On average, Athol experienced more rain and colder weather during April, May and October allowing a higher chance for recharge to occur rather than evapotranspiration. Further details of the spatial distribution of parameters which affect recharge throughout the aquifer will be discussed below.

## 5.4 SPATIAL ANALYSIS OF CLIMATOGLICAL PARAMETERS, RECHARGE ESTIMATES AND SOIL MEDIUMS

When recharge was estimated to occur, Athol had the highest monthly precipitation for every month and the highest percentage of recharge from precipitation with the exceptions of February and October (Figure 26 and Table 6). This same correlation between monthly precipitation and percentage of recharge from precipitation occurred at all sites in March, November, December and January as well. For example, in December, CID had the third highest monthly precipitation amount and the third

highest percentage of recharge from precipitation. As mentioned in the *Section 4.6* March, November, December, and January are the months when the most recharge is estimated to occur. Athol and USFS always had the highest and second highest, respectively, monthly precipitation and ratio of recharge from precipitation for these four months. Spatially, the locations of Athol and USFS correspond to this rank, as well, from north to south. SVFD and CID always had the third and fourth most monthly precipitation and percentage of recharge from precipitation, yet their position varied between three and four depending on the month. SVFD and CID are located on the same latitude line therefore it is expected to see the commonality between the two sites. There is no spatial correlation between precipitation amount and percent of recharge from precipitation during the other months, with the exception of Athol, discussed above.

The mean monthly temperature at each location was graphically compared to determine if there was a distinct correlation between parameters (Figure 27). Every month Athol had the lowest temperatures. No distinctions can be made at the other three sites. USFS, SVFD and CID varied amongst the rank of highest temperature every month.

The spatial distribution of soil mediums were related as well. As previously mentioned the aquifer consists primarily of coarse-grained sediments deposited during a series of outburst floods 15,000 years ago. As a result, the presence of large cobbles and gravel was seen at Athol, USFS, and CID. Each of these three sites also contained similar organic soil as well. The SVFD site did not contain any cobbles or organic soil

instead consisted of uniformly grain sized sand. It can be seen in Figure 3 that the location of Athol, USFS and CID follow the same flow path water and sediment deposition would travel in the event of a large flood, contributing to their similarities. It is estimated that, spatially, there is a higher organic matter content from north to south based on the relationship of organic matter content and moisture retention. SVFD is located in the northwest portion of the aquifer which is separated from the main flow path by a high ridge. The location of SVFD causes the soil medium to be independent of the other three site's soil mediums.

The recognition of spatial variation between the soil and climatic parameters and recharge estimates is essential to understand. It is especially important to recognize the influence that precipitation has on recharge values during the months of March, November, December, and January when the ratio of recharge is at its highest. The UNSAT-H estimated recharge values appear to be less influenced by the variation of soil medium and more dependent on climatic conditions. This seems logical since UNSAT-H did not properly model soils with high retention characteristics (as seen in Figure 13). The UNSAT-H soil characteristics were based solely on the soil texture. Since the soil classifications from each site are similar when compared to the possible 12 soil texture classes defined by the USDA, it seems reasonable that climatological parameters controlled recharge estimates.

Previous recharge studies for the SVRP aquifer have not spatially estimated recharge throughout the area using estimates quantified by a surface infiltration-recharge

model. With the recharge estimates from the four locations within the aquifer and the three locations on the aquifer boundary from Bartolino (2007) an improved spatial distribution of recharge estimates throughout the aquifer can now be quantified.

There is an uncertainty to the accuracy of the recharge estimates as discussed above. The UNSAT-H model estimates recharge based on the calculation of soil texture, daily evapotranspiration and precipitation estimates. For semi-arid conditions, there is a larger uncertainty in daily evapotranspiration estimates (Gee and Hillel, 1988), as well as a potential large margin of error that can occur when determining a small recharge value in such climates (Hendrickx et al., 2003). The uncertainty in recharge estimates in semi-arid climates is a factor which should be recognized. Nevertheless, in the absence of additional location-specific data, the UNSAT-H model provides reasonable estimates of surface infiltration rates using the parameters found in this study, the comparison of the measured water contents to the predicted and the comparison to Bartolino (2007) study.

## 6.0 CONCLUSIONS

The SVRP aquifer is the sole source drinking water for over 500,000 residents with expectations of continued growth to the area. Accurately estimating groundwater recharge is an important issue to anticipate higher demands in groundwater withdrawals and properly manage the fresh water resources in the area.

(1) This study accurately modeled the water content during from February through May 2009 and again in December 2009- January 2010 for the majority of the field sites. Predicted water contents were overpredicted during the dry months and when

topsoil moisture contents were below freezing. The UNSAT-H model does not estimate the measured water content well during the late summer and fall because it does not anticipate the decrease in moisture content which occurs. However, UNSAT-H did not predict recharge to occur even with the overestimation of water content at all four sites during June- September. UNSAT-H predicts recharge to occur during October at SVFD and USFS and in November at CID and SVFD, however the observed soil moisture distribution at the 100 cm depth during this time indicates zero response to moisture making these recharge estimates debatable.

November, December, January and March were estimated to contribute most to groundwater recharge for all four sites. Recharge values at each location during December, January, and March are considered reasonable estimates. The percentage error of water content never exceeds 26% at any site during these months. This number may seem high, but when you consider how small the water content value is, a high percentage error is expected. Recharge was overestimated in November at all four locations due to decline in moisture content which occurred after summer. UNSAT-H overestimated water content at Athol, CID, SVFD and USFS in November by 43.6%, 78.9%, 63.3%, 84.6%, respectively. Table 8 shows the further details of percentage errors for other months. The annual recharge amounts predicted by UNSAT-H at Athol, CID, SVFD, and USFS were 38.04 cm, 13.70 cm, 15.22 cm, and 23.61 cm, respectively. This resulted in an annual percent of recharge from precipitation of 50.3%, 27.8%, 38.1%, and 40.1%, respectively. Annual recharge estimates are overestimated at Athol, SVFD and USFS and underestimated at CID. Bartolino (2007) 15-year average ratio of

recharge for Bayview, ID, Coeur d'Alene, ID and Spokane Airport, WA remained within a range of 34.8% - 38.2% further verifying the overestimations made at Athol, SVFD and USFS and underestimation at CID. To further enhance the confidence of the results, it is recommended to continue the study for multi-year simulation of the numerical model.

(2) Using the van Genuchten function in the UNSAT-H program proved to be a useful tool when modeling groundwater recharge for conditions similar to the SVRP aquifer. This function was chosen because it compared best to the field data for the majority of the time and sites. The van Genuchten function was more closely matched to the field data than the Brooks-Corey function at all three depths for the entire period at Athol and USFS. The van Genuchten function was also a closer fit to the field data at the 10 cm depth during the first two periods at CID and during the first and third periods at SVFD. This function was also a better fit at the 30 cm depth at CID during the first period and at SVFD during the first and third periods. The van Genuchten and Brooks-Corey water content predictions at the 100 cm depth at CID and SVFD were very similar. However based on the contrast at other sites and depths the van Genuchten function was chosen as the superior choice to model recharge for the SVRP aquifer.

This investigation was able to establish reasonable estimates for the van Genuchten parameters using basic soil classification analysis and measured field data. The estimated VG parameters fell within the range of the Wösten and van Genuchten (1988) parameters which were shown by Hendrickx et al. (2003) to be good estimates for cold, semi-arid conditions due to the higher capillary flux present in semi-arid climates.

This study estimated average VG parameters, $\alpha$ and $n$, for sand to be 0.037 and 1.91, respectively. Average VG parameters, $\alpha$ and $n$, for loamy sand were 0.030 and 1.63, respectively. The one site which estimated VG parameters, $\alpha$ and $n$, for sandy loam estimated values of 0.040 and 1.41, respectively. The sensitivity index revealed that $n$ has a heavier influence on the model with low values of $\alpha$. To further improve the understanding of water movement through soil in cold, semi-arid climates, additional soil information which quantifies the soil structure and organic chemistry should be analyzed.

(3) Both the climatological parameters and soil characteristics had an influence on the soil moisture distribution at each SVRP location. The Athol site had the most precipitation during this study yet very little response to rain events at the 30 cm and 100 cm depth. Conversely, the SVFD site had the smallest precipitation amount yet the highest response to rain events at the 30 and 100 cm depth. The USFS site's soil characteristics were more influential on the soil moisture distribution than at CID, demonstrated by the retention observed in the topsoil at the USFS site. The soil moisture distribution was more influenced by the soil characteristics at Athol and USFS whereas the precipitation events were more influential to the soil moisture distribution at SVFD and CID. Further analysis of each site's soil chemistry should be conducted to accurately quantify the moisture retention observed throughout the various soil columns. It is recommended that soil organic matter content, organic carbon content and bulk density is analyzed for more precise recharge estimates.

(4) The spatial variation of climatic conditions and soil medium coincide with the site locations throughout the aquifer. Precipitation and recharge were the highest at the most northeastern site (Athol) and lowest at the most southwestern site (SVFD). The Athol site also had the coolest mean annual temperature of any site. The soil retention was observed to be highest at Athol followed by USFS then CID. The amount of soil organic matter also appeared to be highest at Athol followed by USFS then CID. SVFD had the least amount of moisture retention and very little, if any, soil organic matter. The quantification of influence from the soil medium on the soil moisture distribution may be more distinguishable after a soil chemical analysis at each site is conducted. Recharge estimates were highest at Athol and lowest at CID and SVFD indicating the climatic conditions are more influential on the recharge estimates determined by UNSAT-H.

The refinement for improved recharge estimates in cold, semi-arid climates is a factor acknowledged by many researchers and still not fully understood. Choosing the best technique for estimating recharge is not straightforward and is contingent upon site conditions and time scales. Hence, Bartolino's (2007) report of 15 water years with various annual precipitation amounts and recharge estimates for each year. Longer-term estimates of spatial recharge are needed to more accurately predict water balances over the typical range of climatic conditions experienced in the region and to help understand the future impacts of climate change and land development on recharge.

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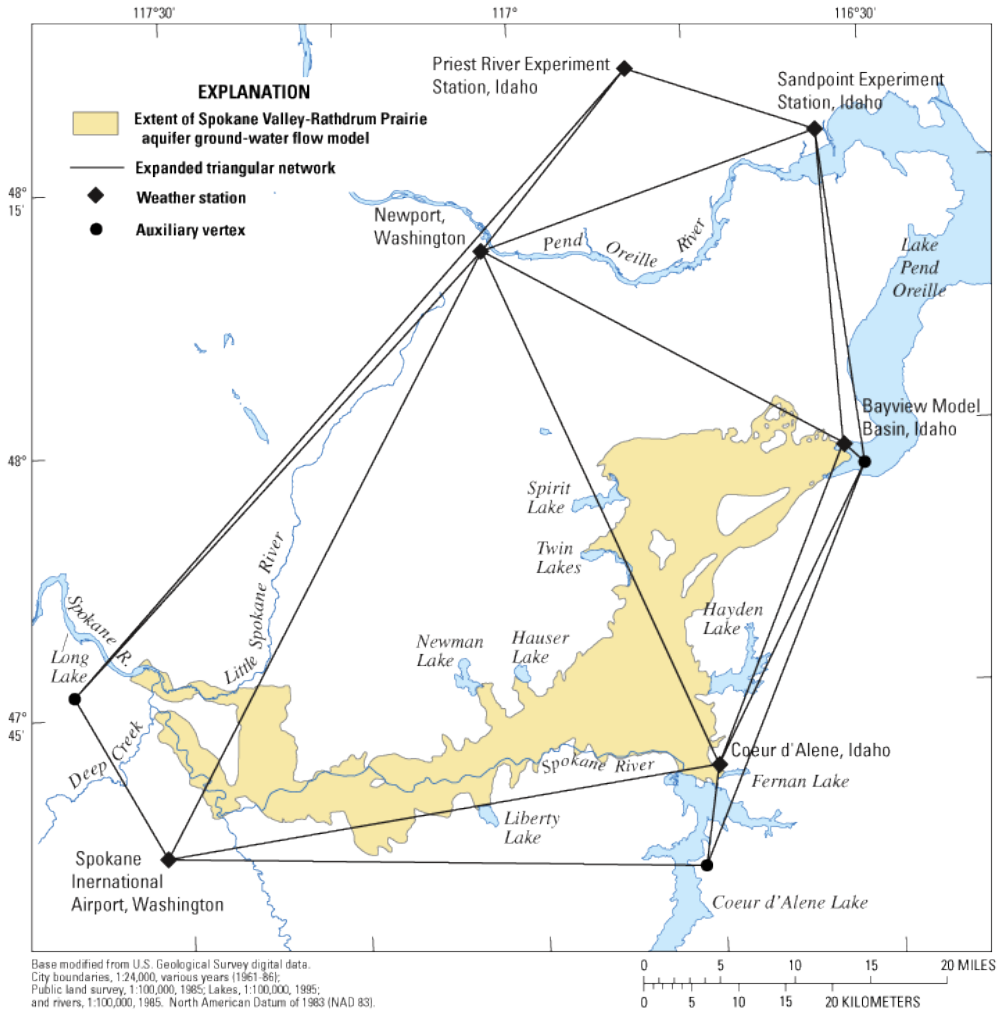



**Figure 1: U.S. Geological Survey map of six weather stations in vicinity of Spokane Valley-Rathdrum Prairie aquifer (Hsieh et al., 2007)**

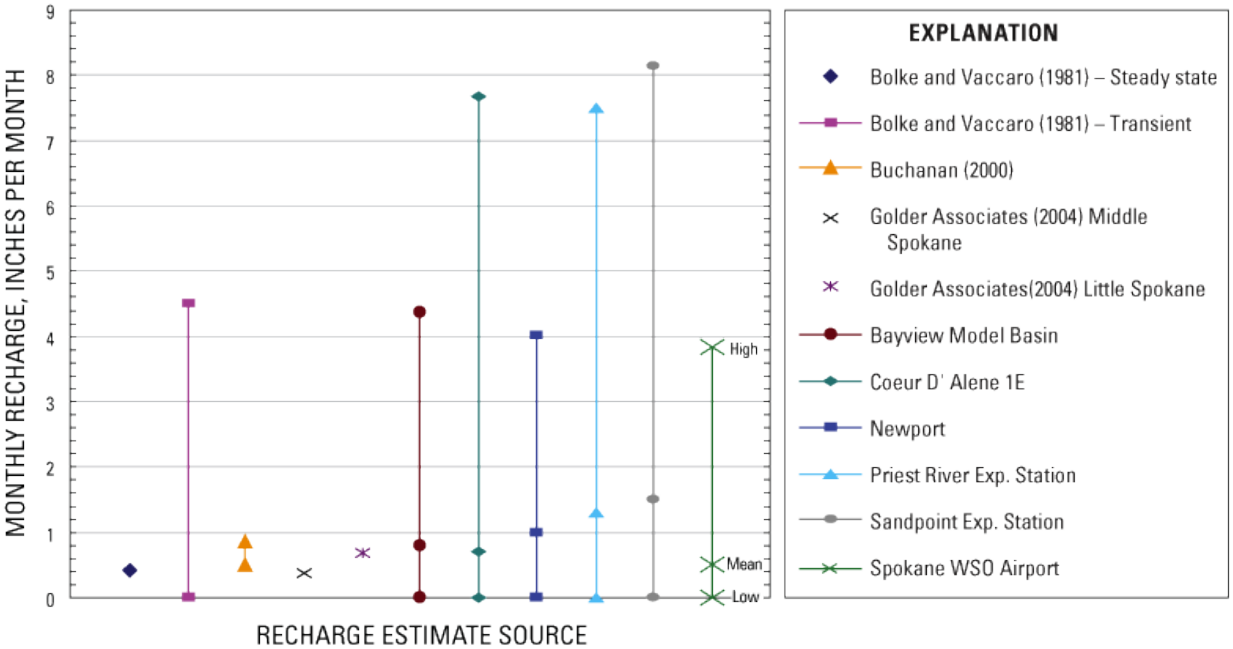



**Figure 2: Monthly recharge estimates from previous studies (Bartolino, 2007)**

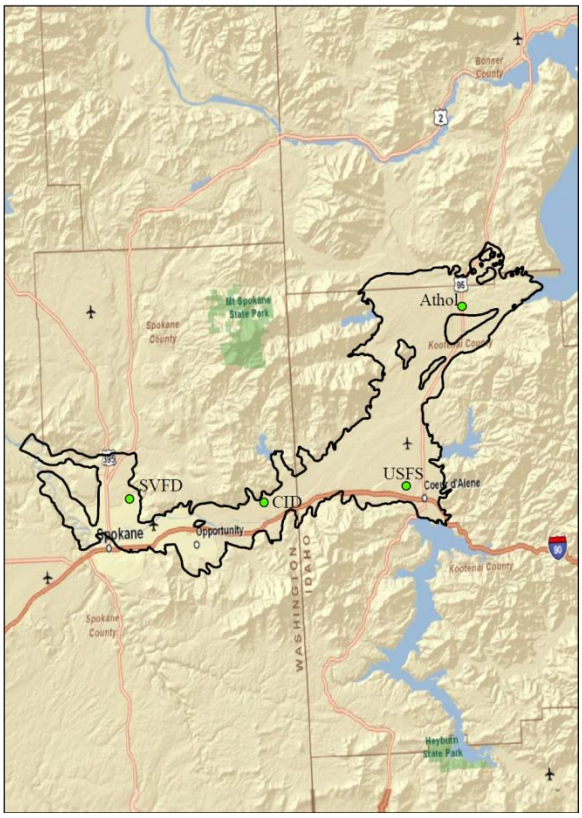
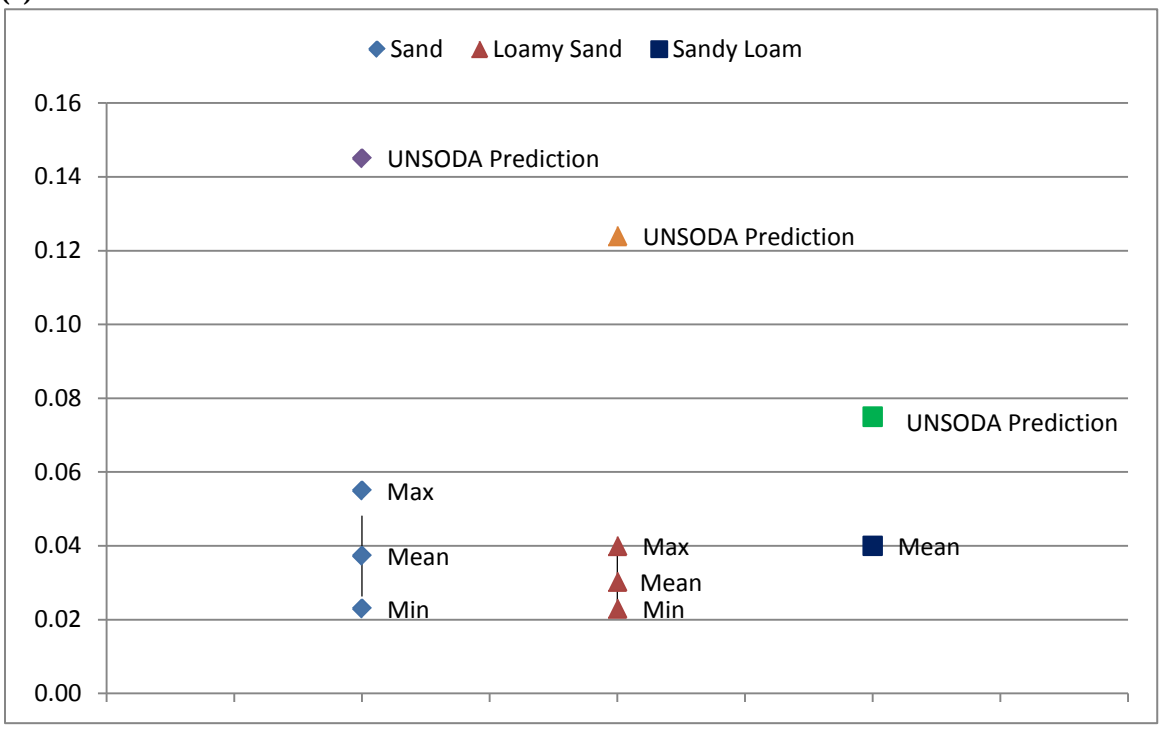



**Figure 3: Location of four field locations in Spokane Valley- Rathdrum Prairie aquifer**

**(a) van Genuchten's "α"**




**(b) van Genuchten's "n"**

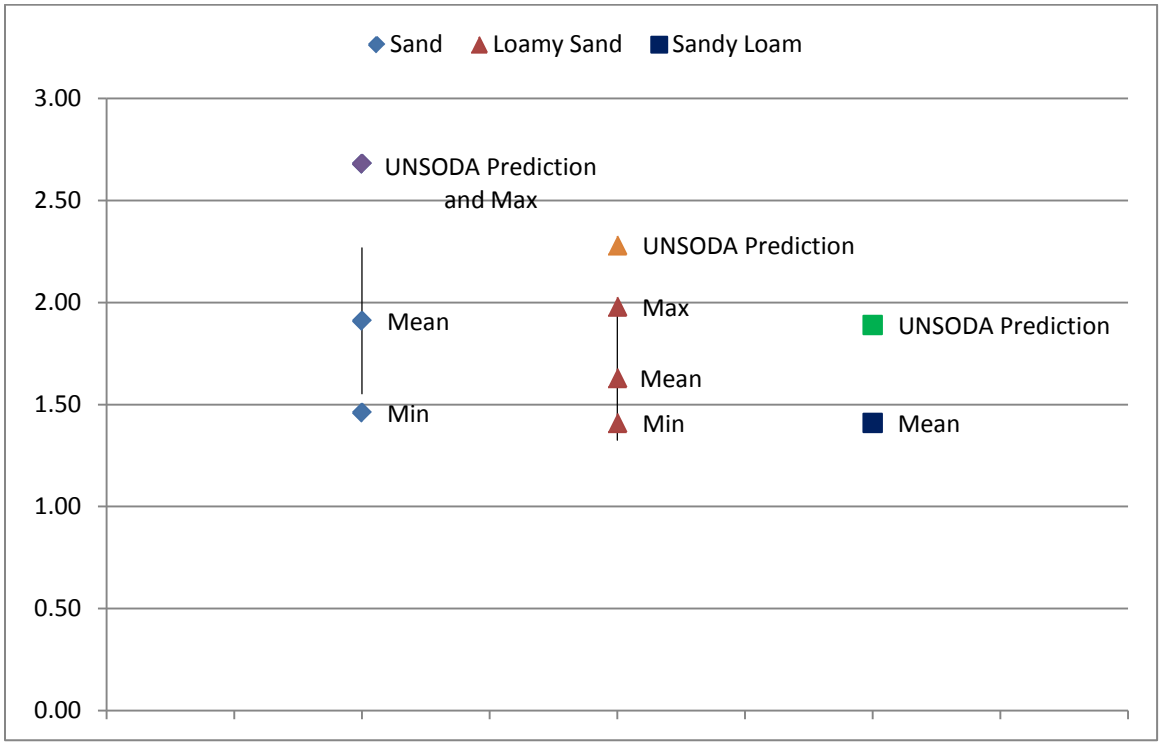
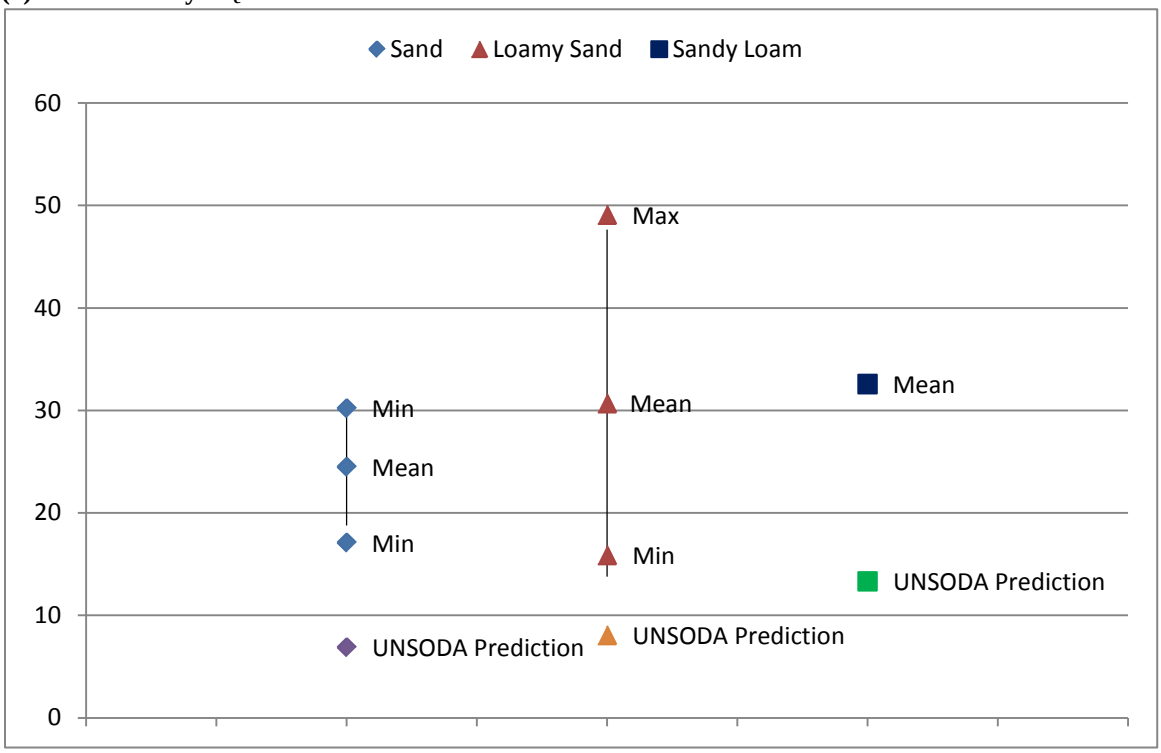



**Figure 4 (a-b): VG parameter values compared with UNSODA database**

**(a) Brooks-Corey "$h_e$"**




**(b) Brooks-Corey "b"**

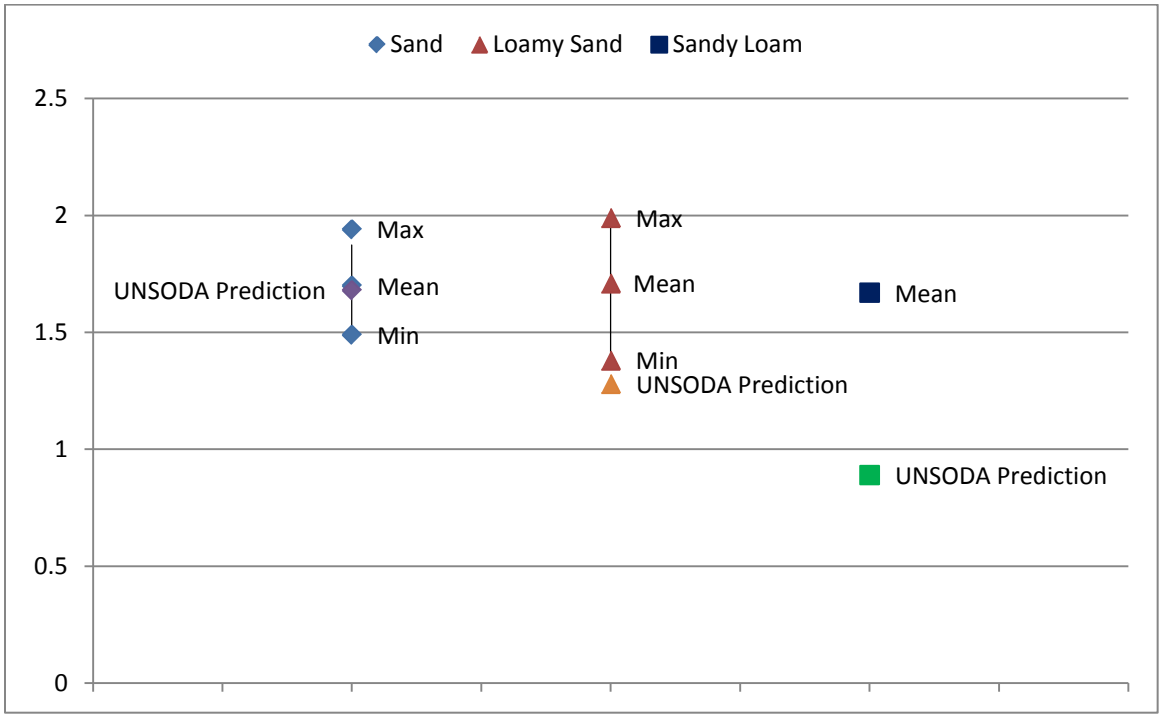



**Figure 5 (a-b): BC parameter values compared with UNSODA database**

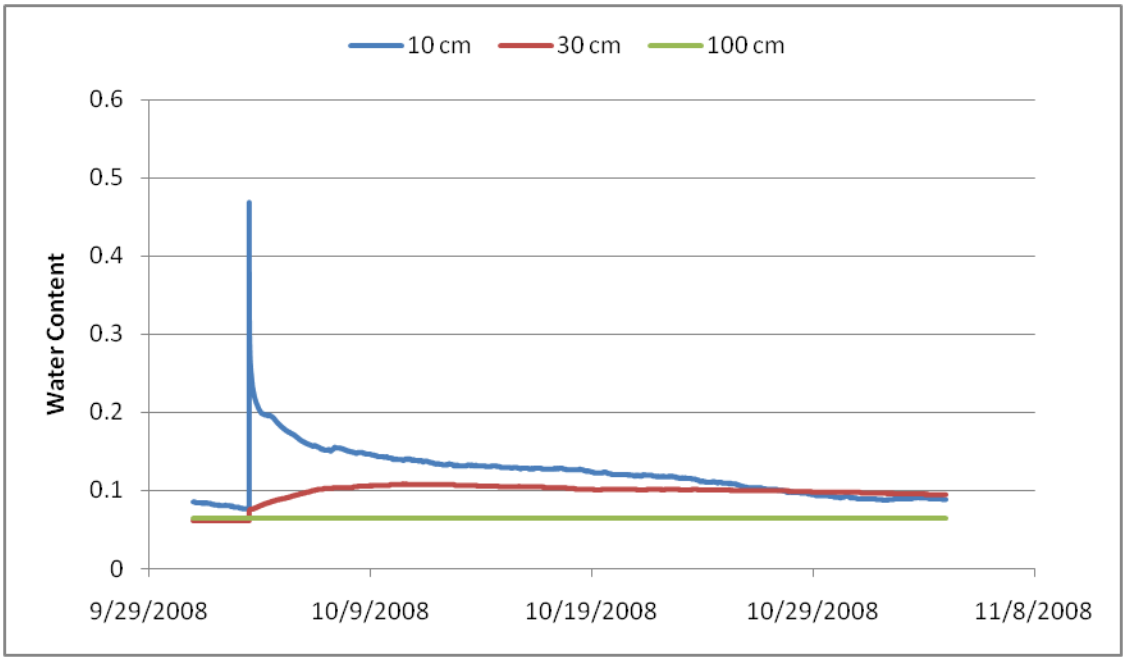



**Figure 6: CID experiment on October 3, 2008 to determine water content response to infiltration**

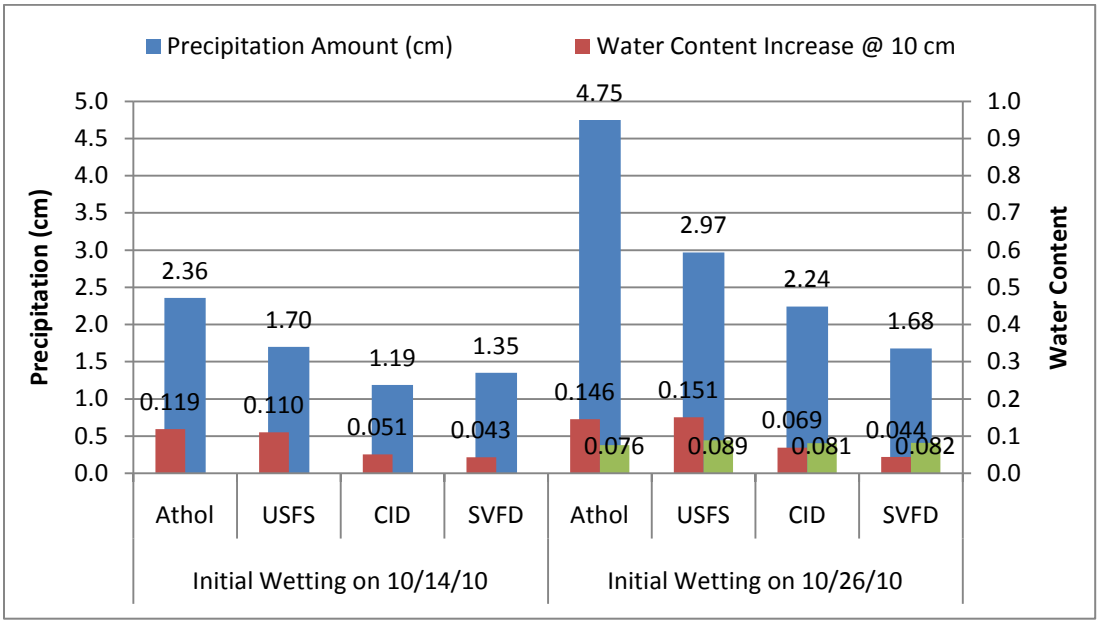
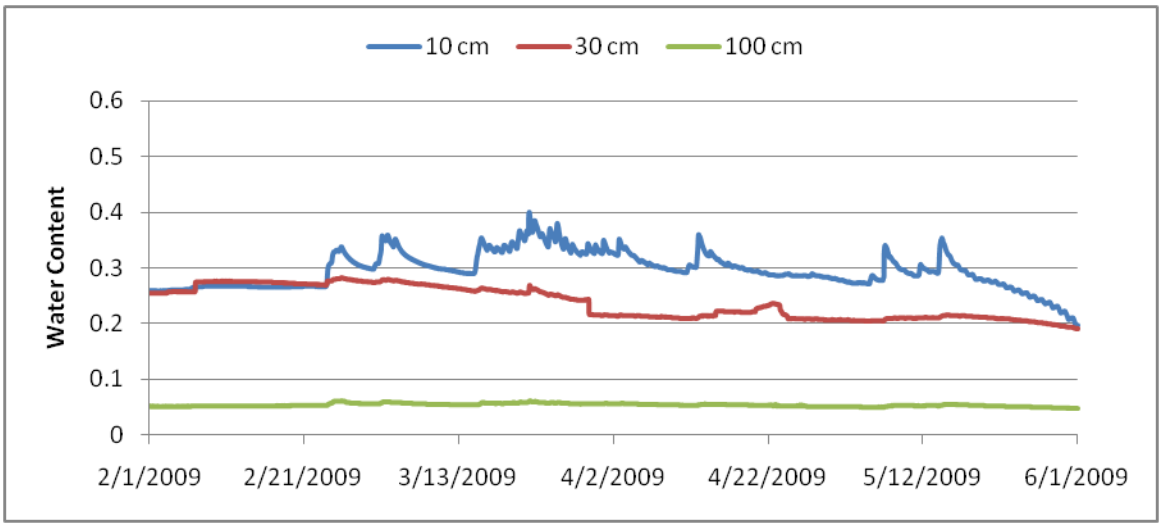
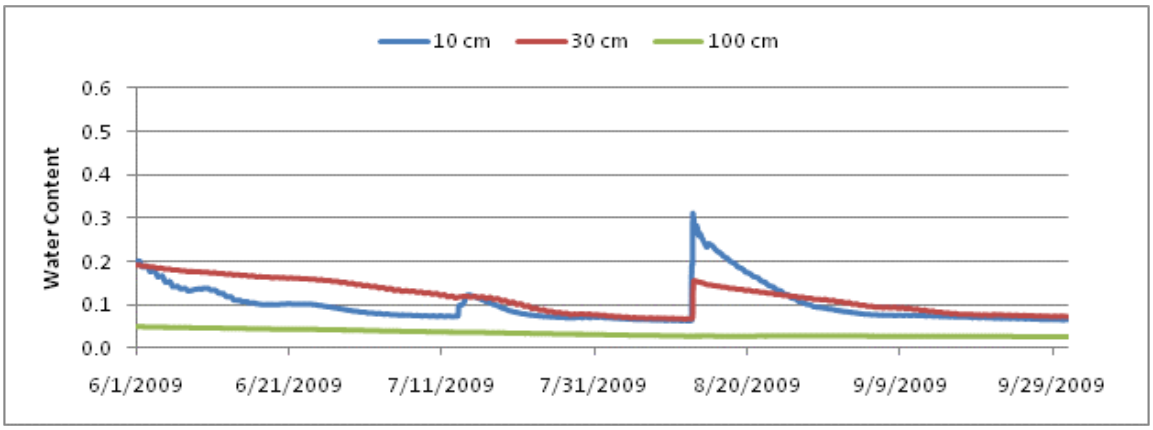



**Figure 7: Initial soil wetting after the summer period at each SVRP site**

**(a)**




**(b)**




**(c)**

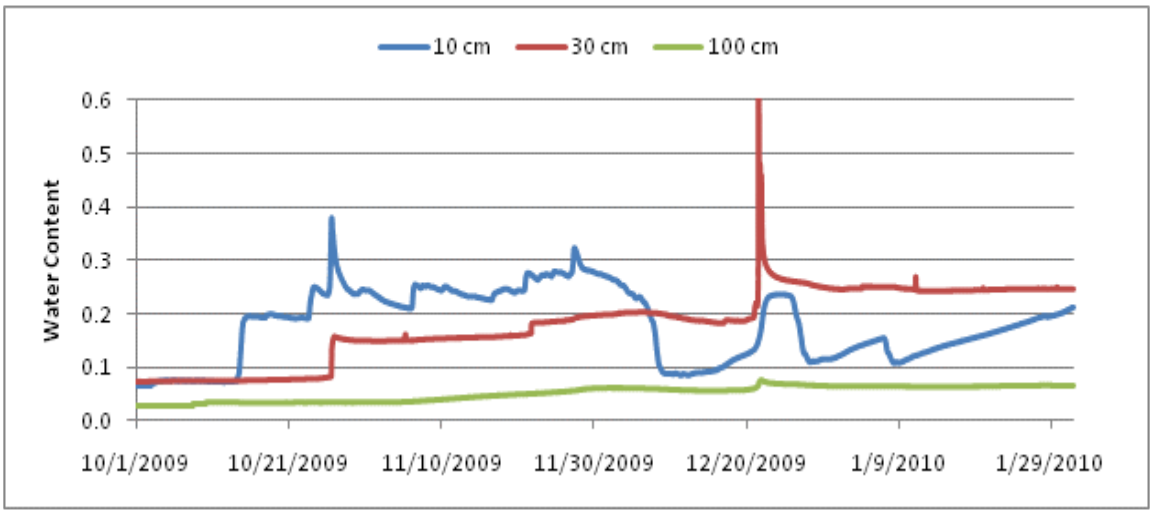
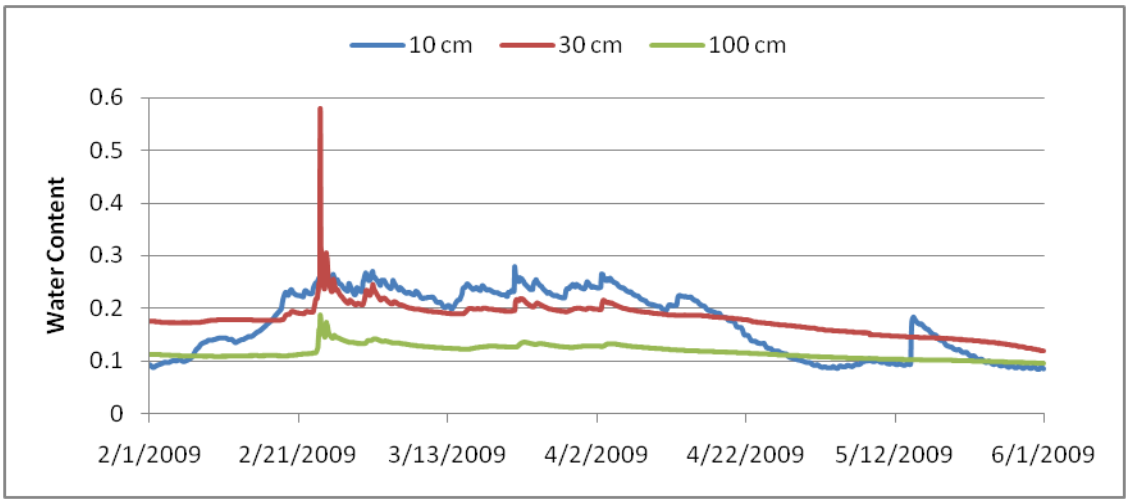
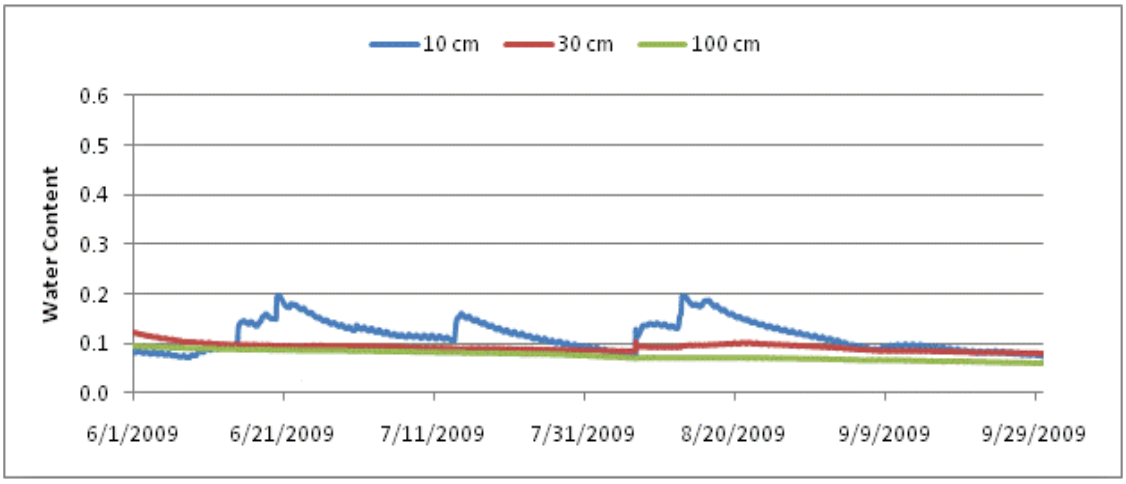



**Figure 8 (a-c): Athol recorded field data throughout soil column**

**(a)**




**(b)**




**(c)**

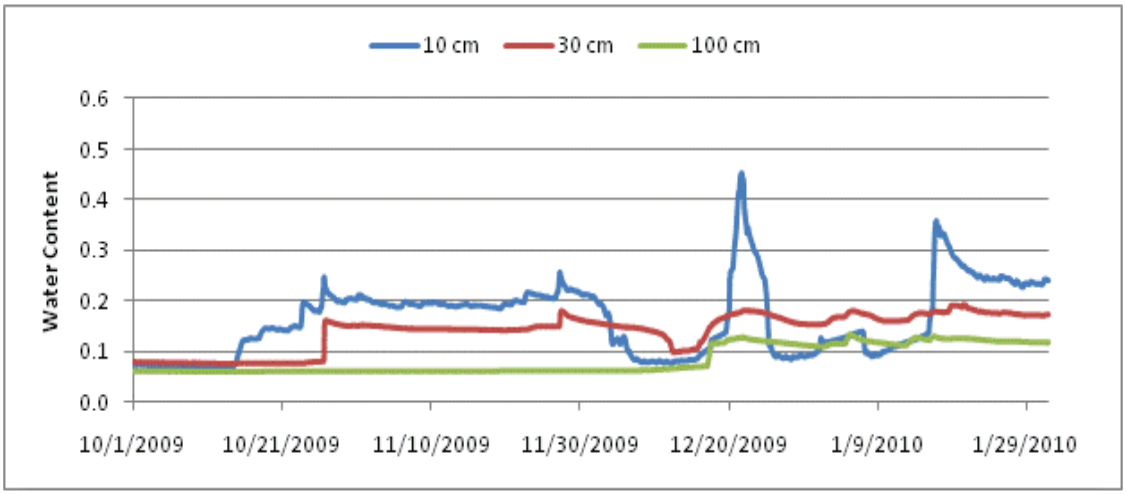
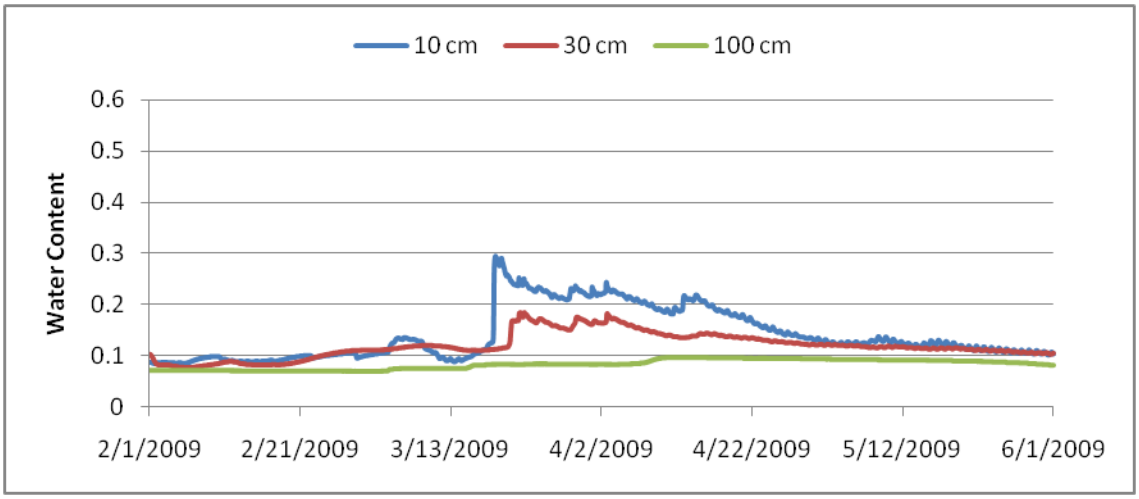
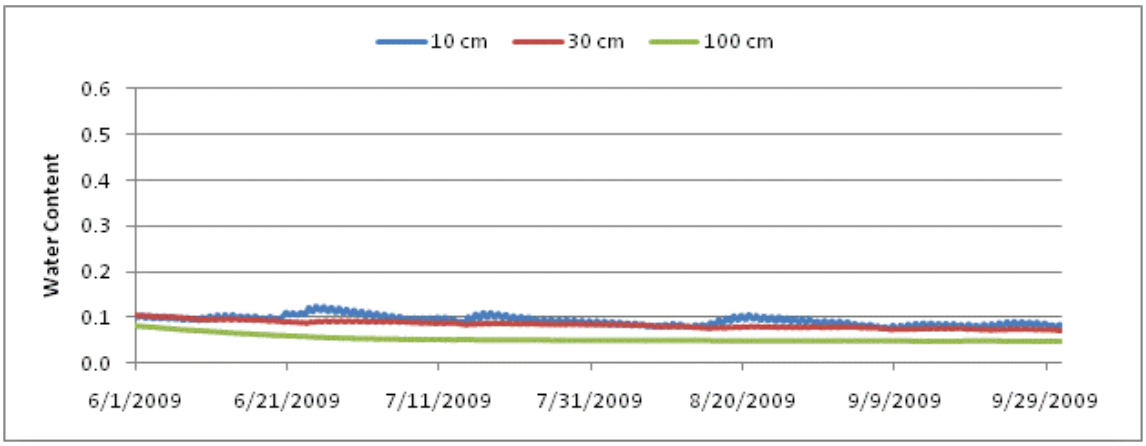



**Figure 9 (a-c): CID recorded field data throughout soil column**

**(a)**




**(b)**




**(c)**

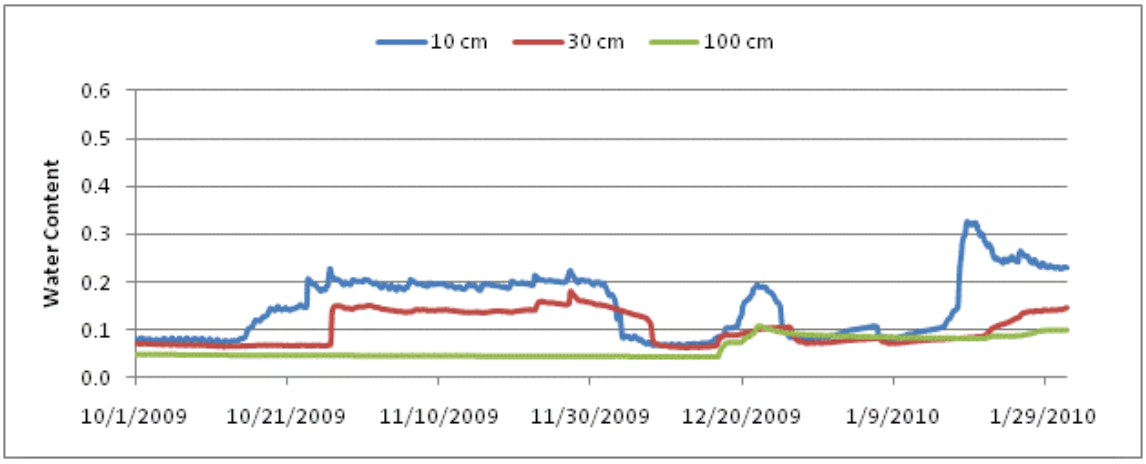
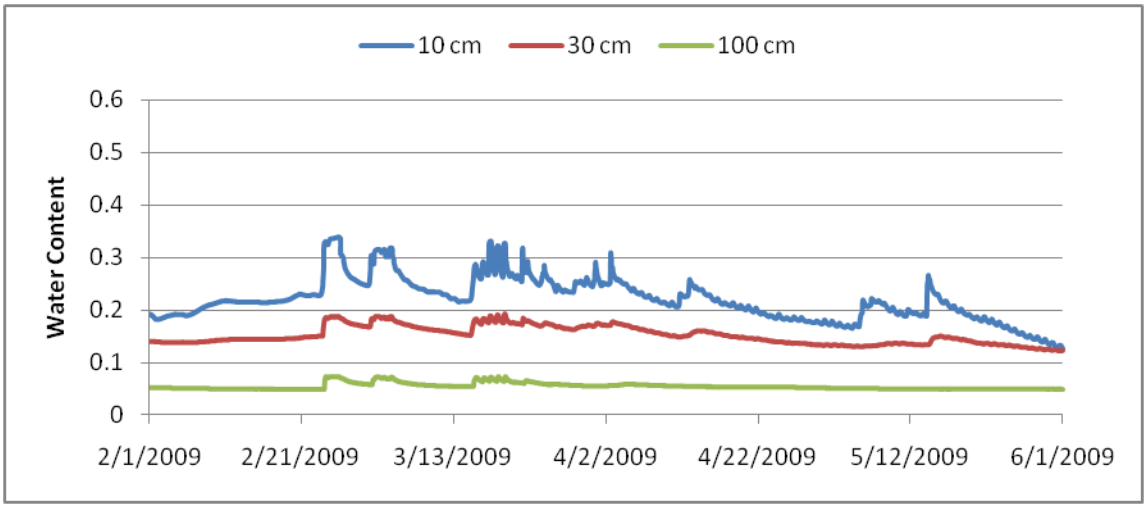
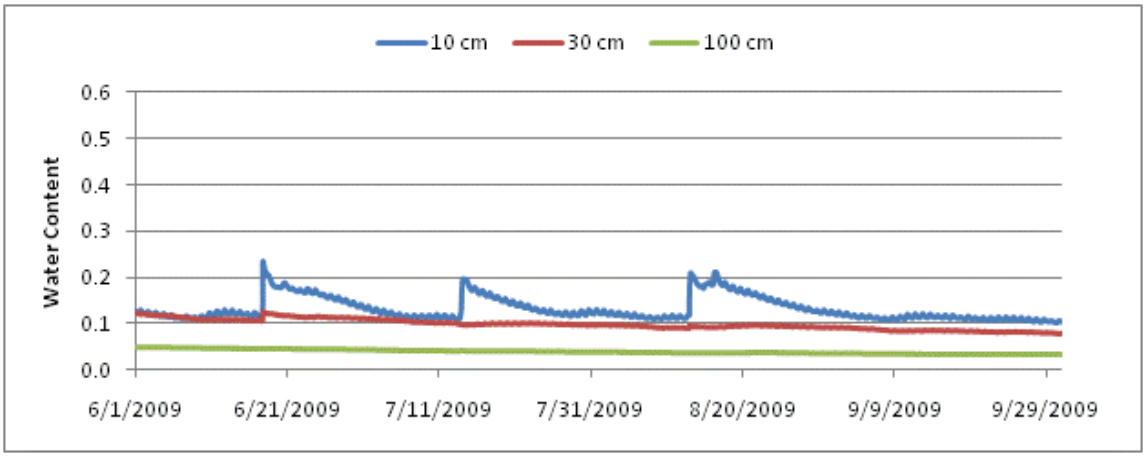



**Figure 10 (a-c): SVFD recorded field data throughout soil column**

**(a)**




**(b)**




**(c)**

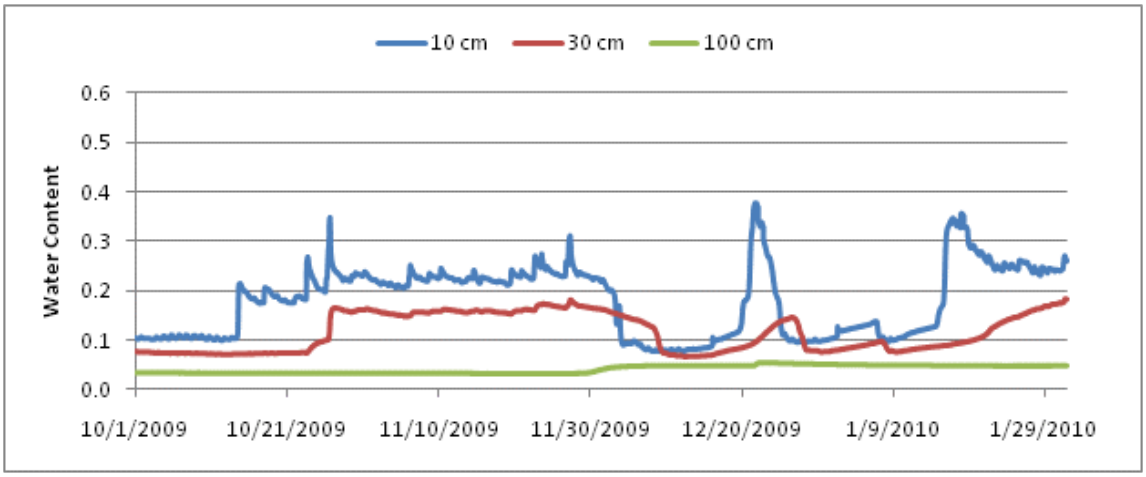
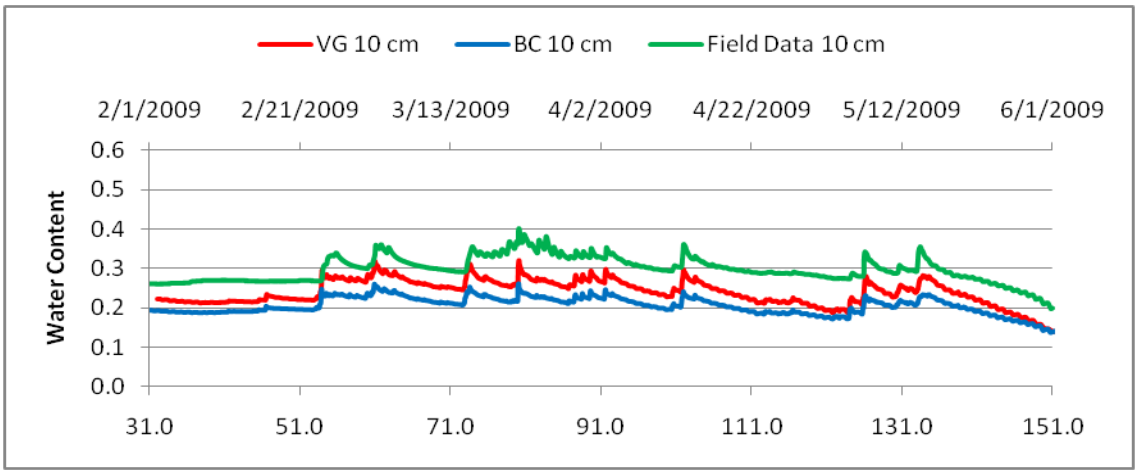
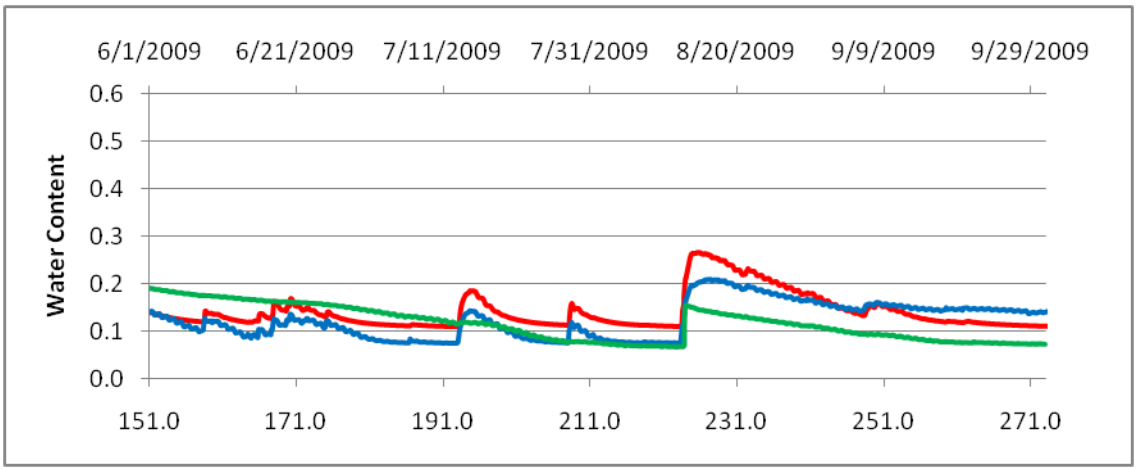



**Figure 11 (a-c): USFS recorded field data throughout soil column**

(a)




(b)




(c)

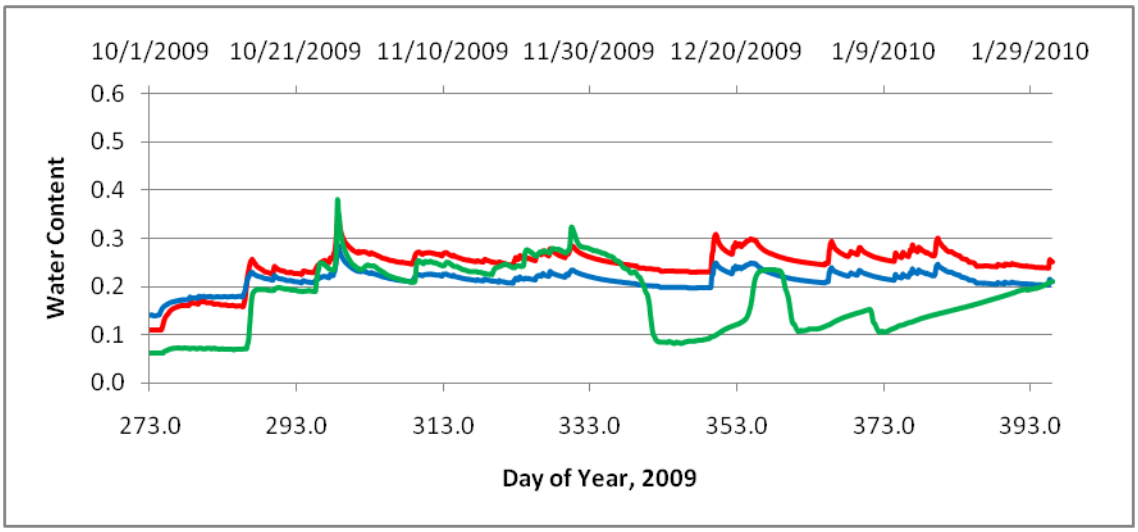
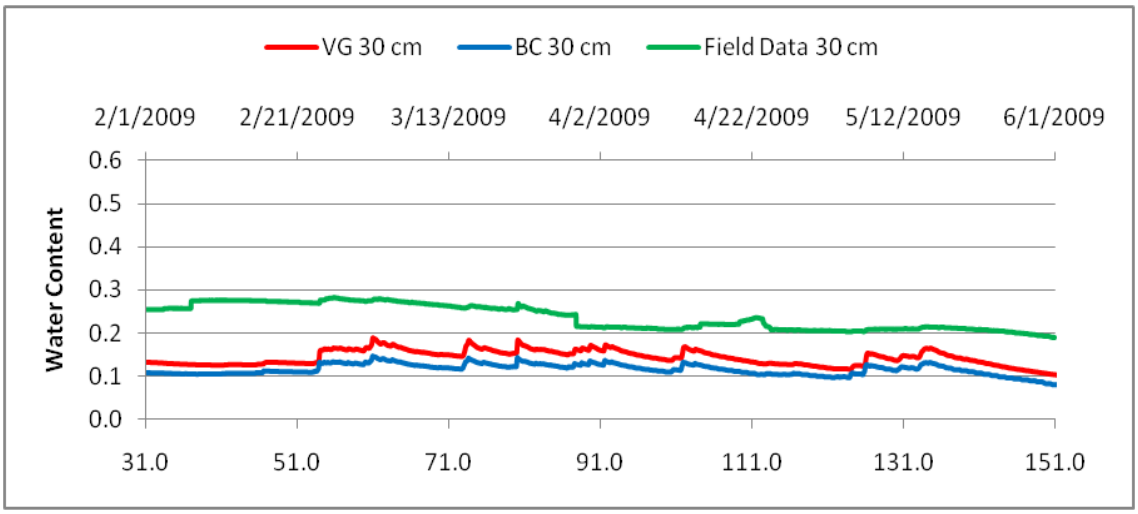
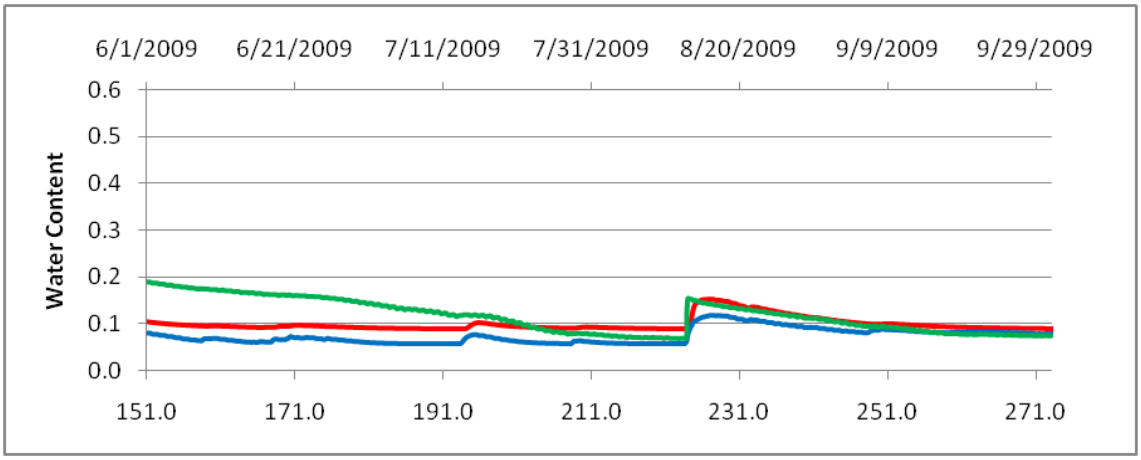



**Figure 12 (a-c): Comparison of field data to BC and VG functions at 10 cm at Athol**

**(a)**




**(b)**




**(c)**

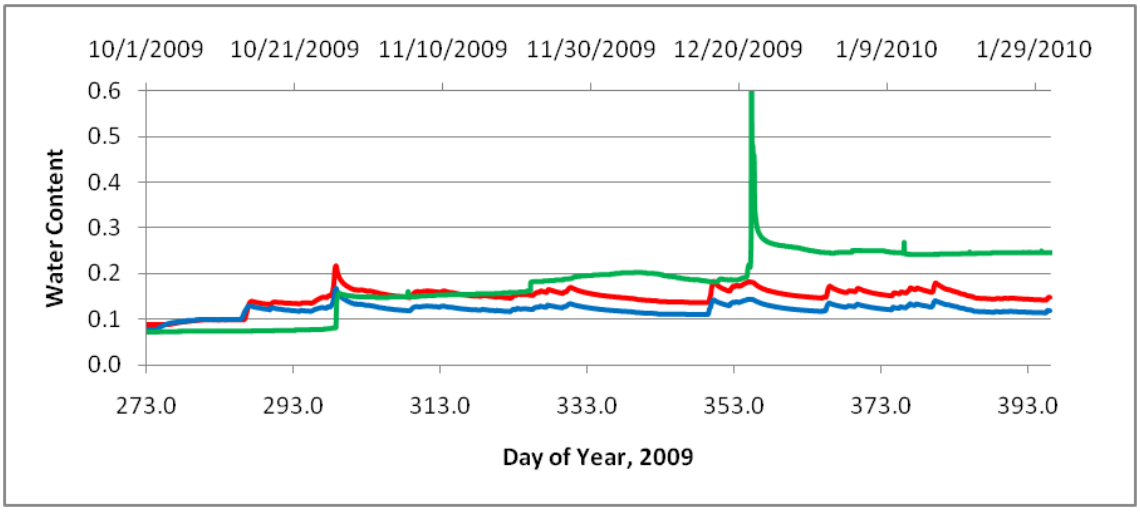
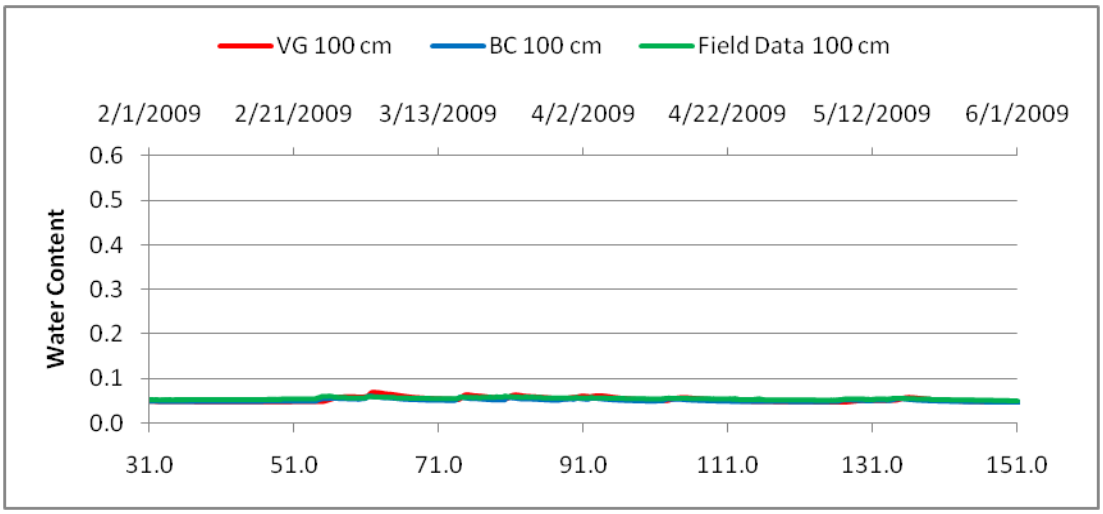
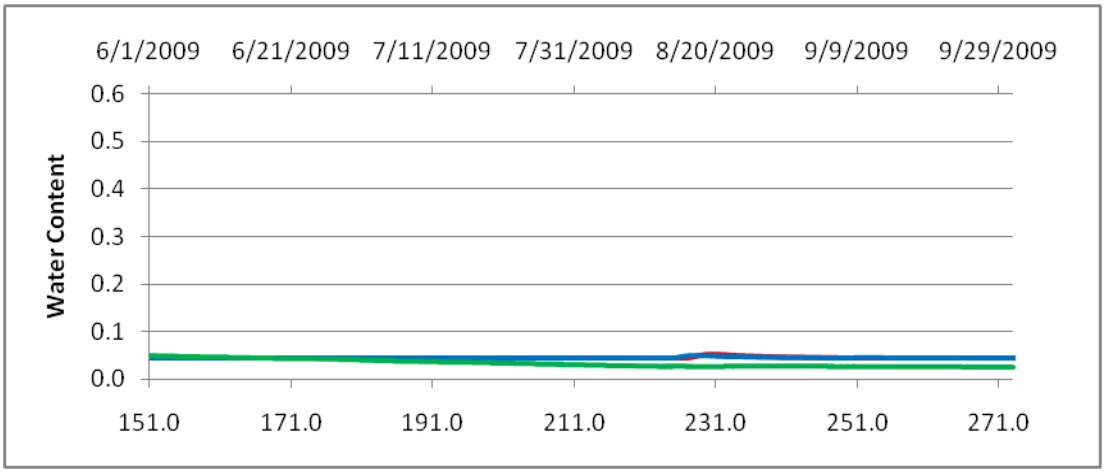



**Figure 13 (a-c): Comparison of field data to BC and VG functions at 30 cm at Athol**

**(a)**




**(b)**




**(c)**

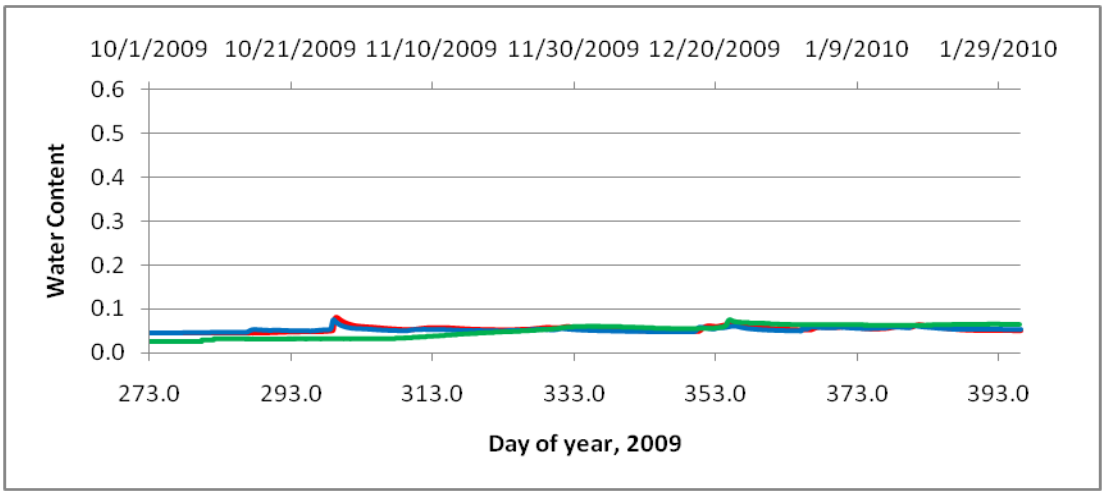
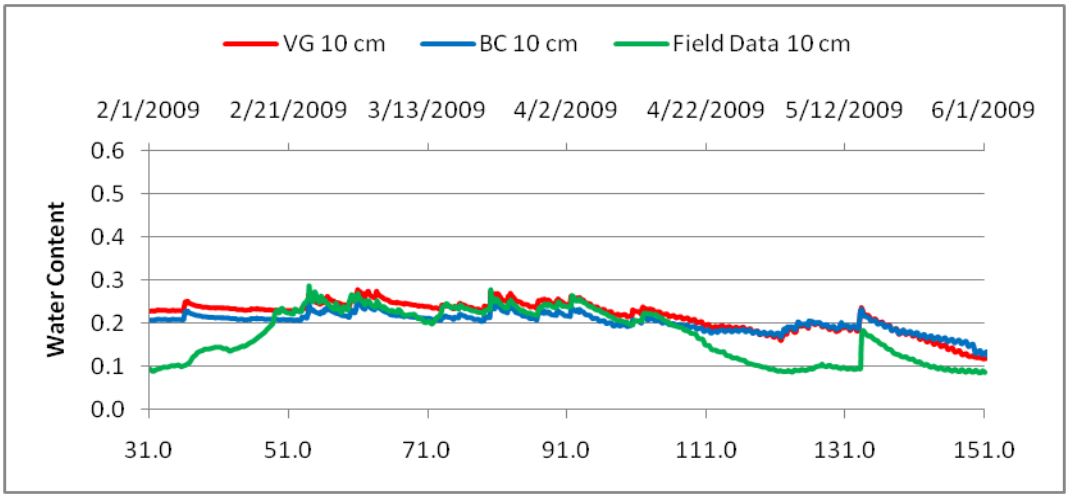
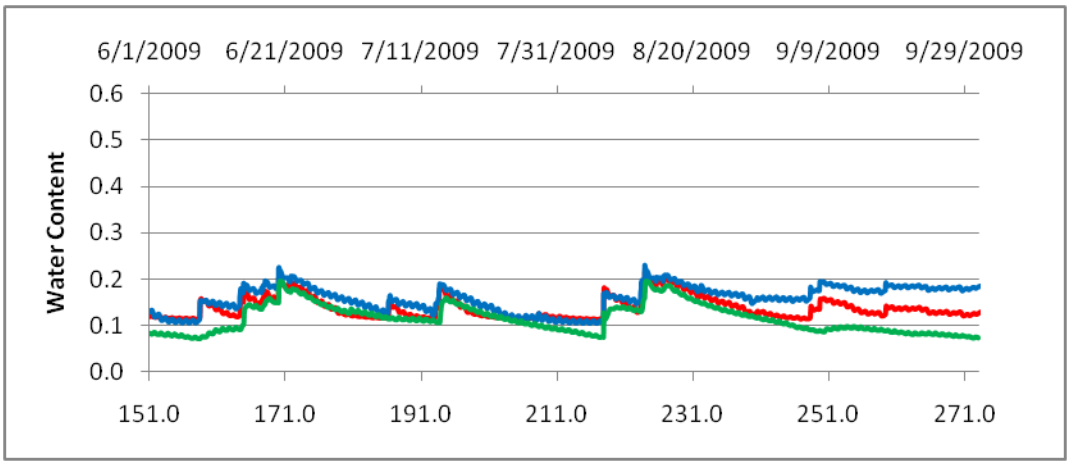



**Figure 14 (a-c): Comparison of field data to VG and BC functions at 100 cm at Athol**

**(a)**




**(b)**




**(c)**

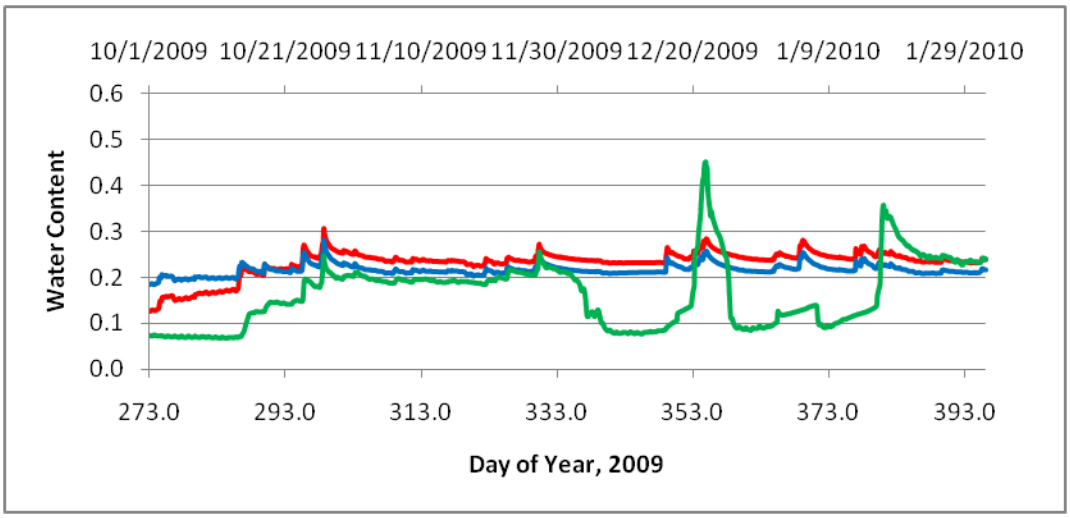
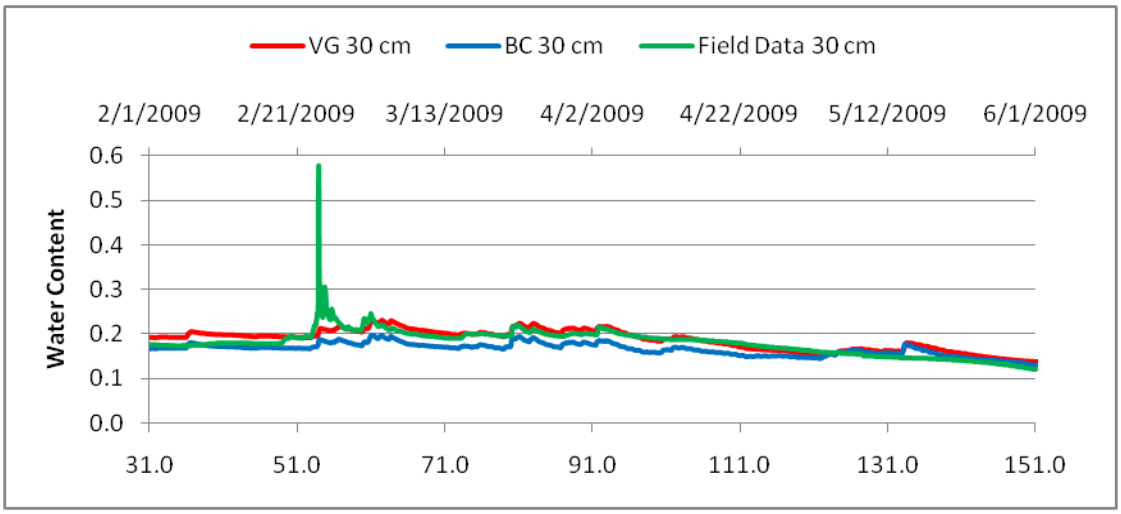
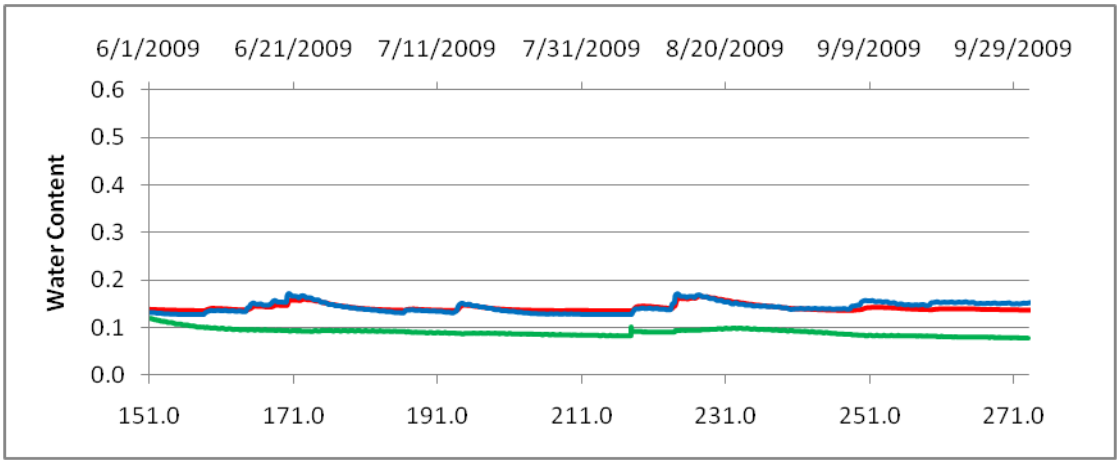



**Figure 15 (a-c): Comparison of field data to VG and BC functions at 10 cm at CID**

**(a)**




**(b)**




**(c)**

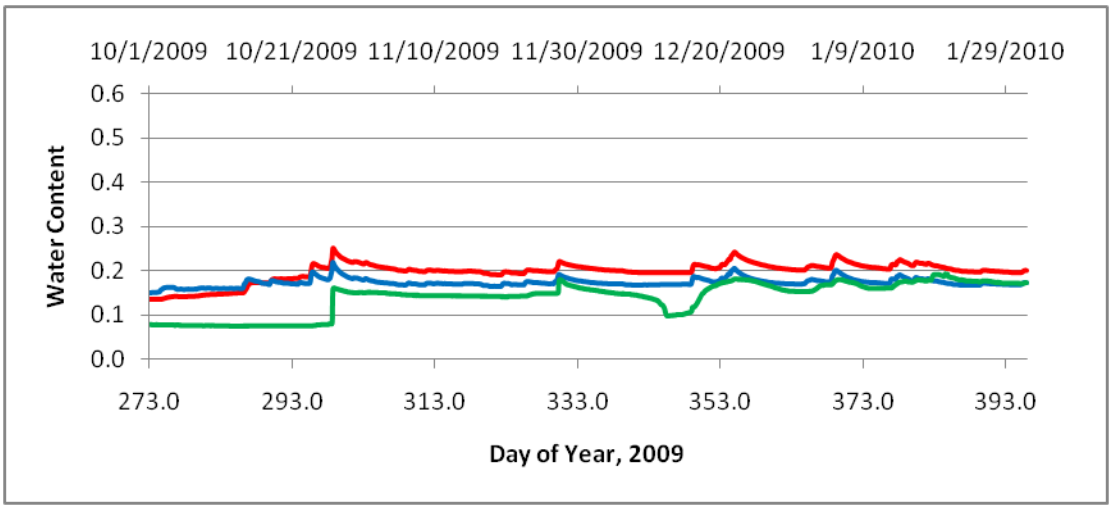
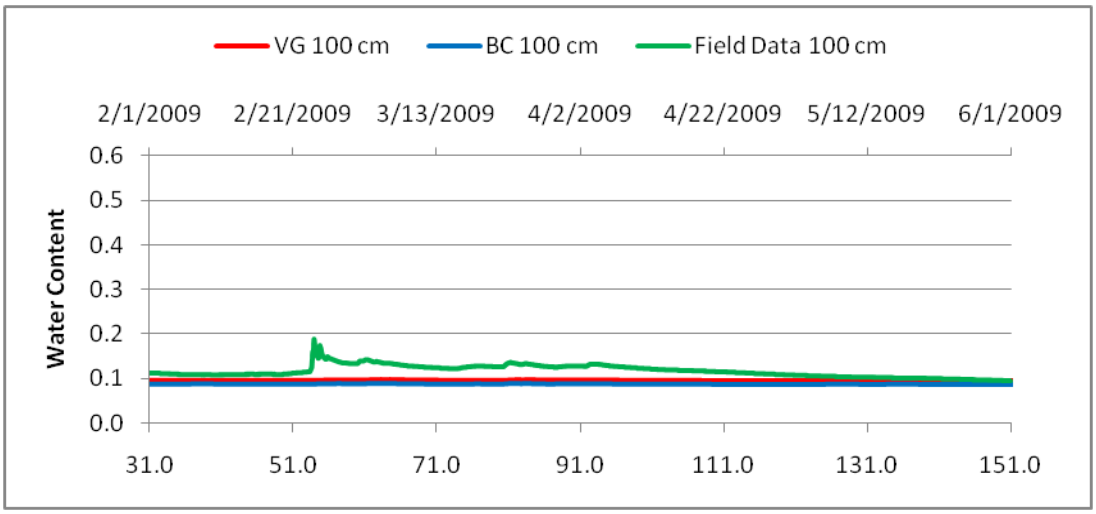
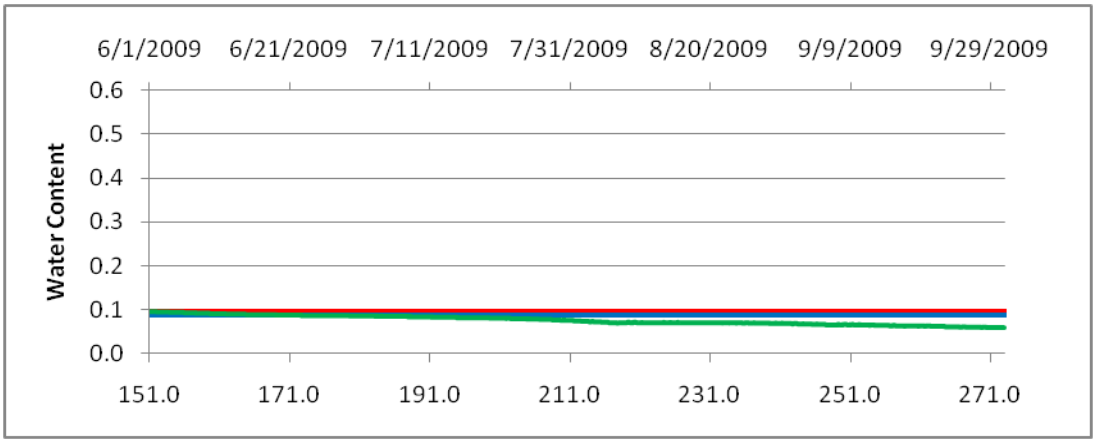



**Figure 16 (a-c): Comparison of field data at VG and BC functions at 30 cm at CID**

**(a)**




**(b)**




**(c)**

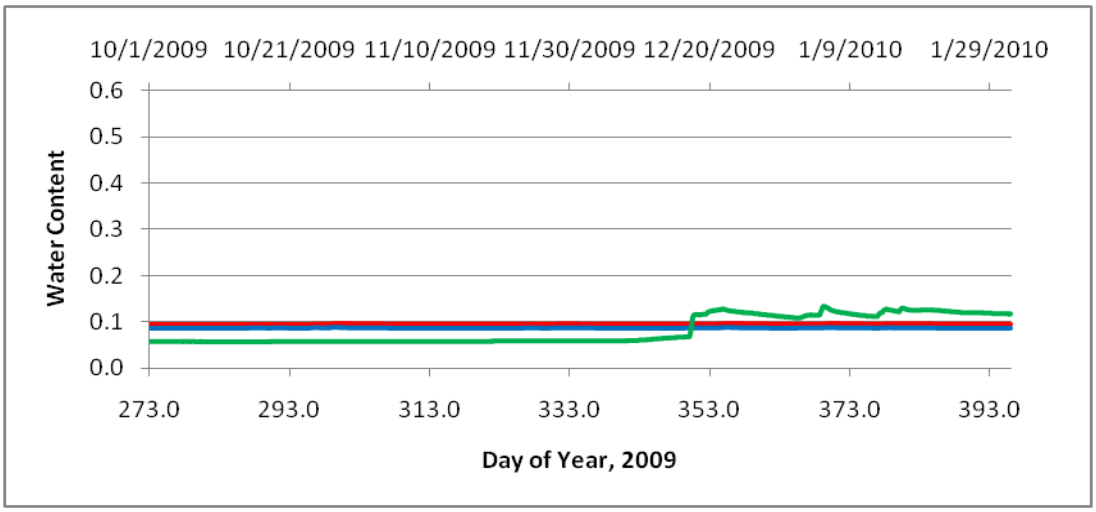
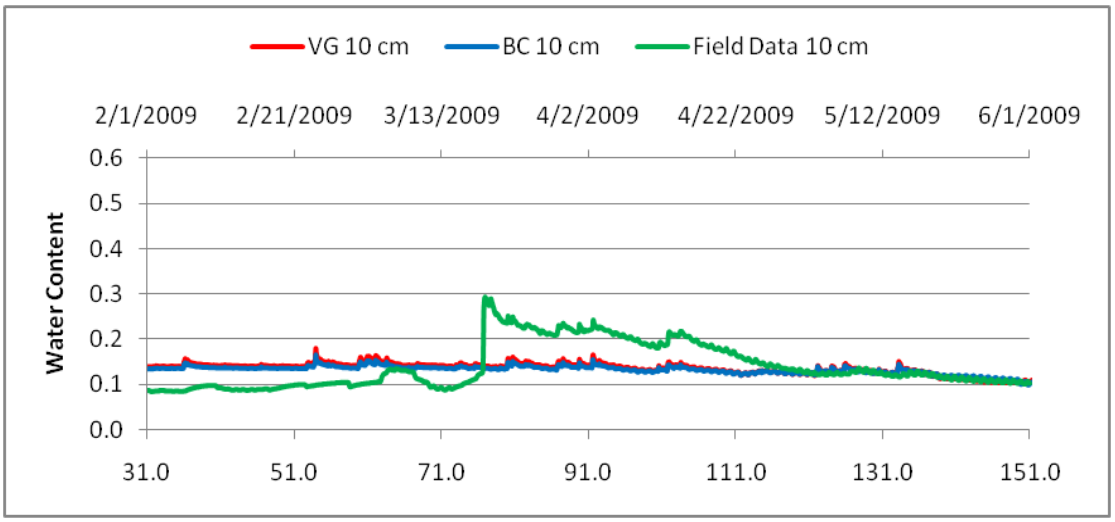
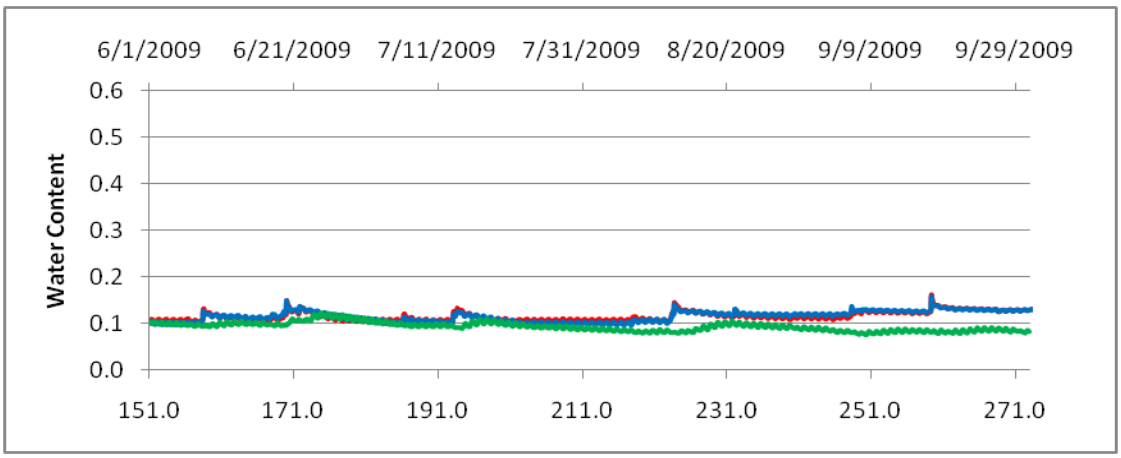



**Figure 17 (a-c): Comparison of field data to VG and BC functions at100 cm at CID**

**(a)**




**(b)**




**(c)**

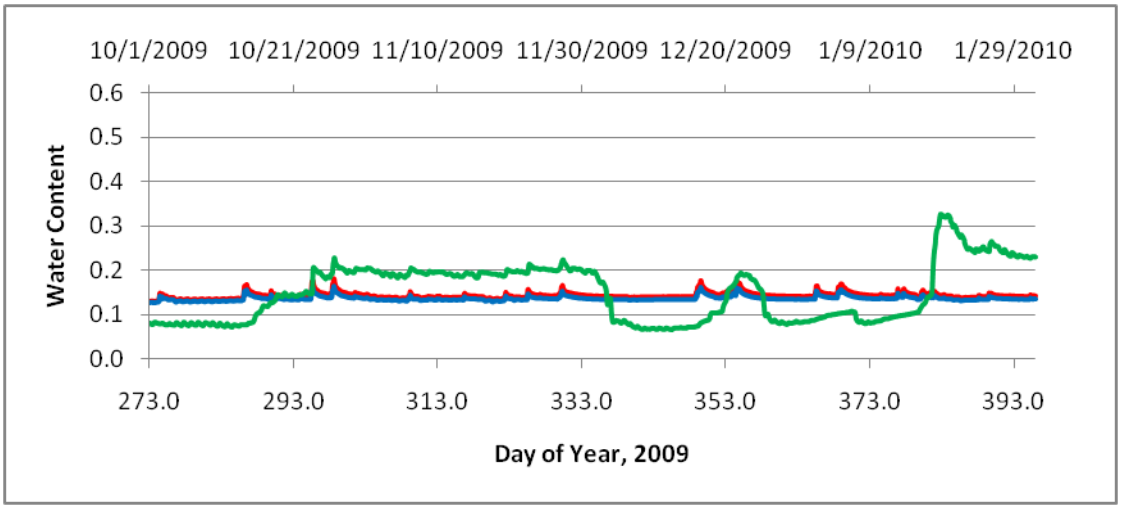
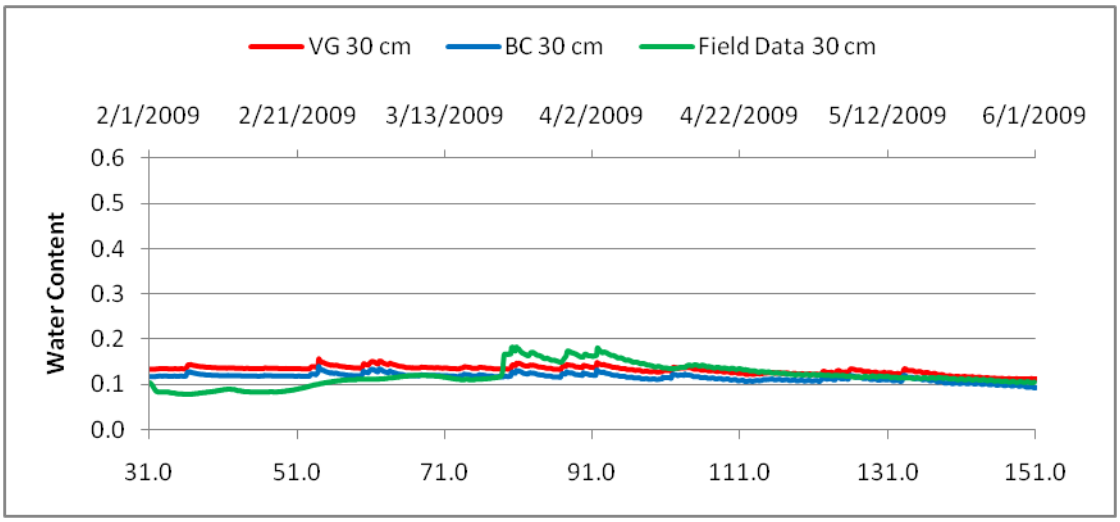
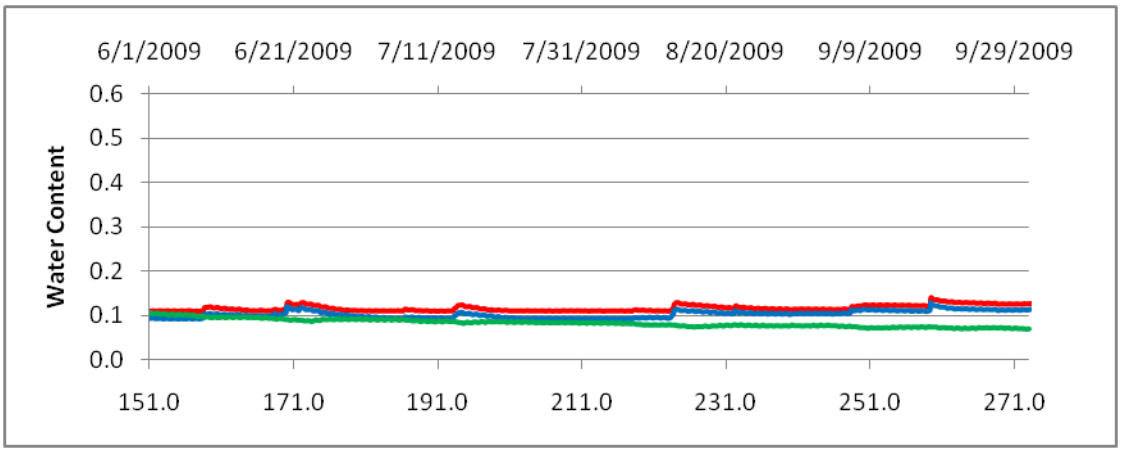



**Figure 18 (a-c): Comparison of field data to VG and BC functions at 10 cm at SVFD**

**(a)**




**(b)**




**(c)**

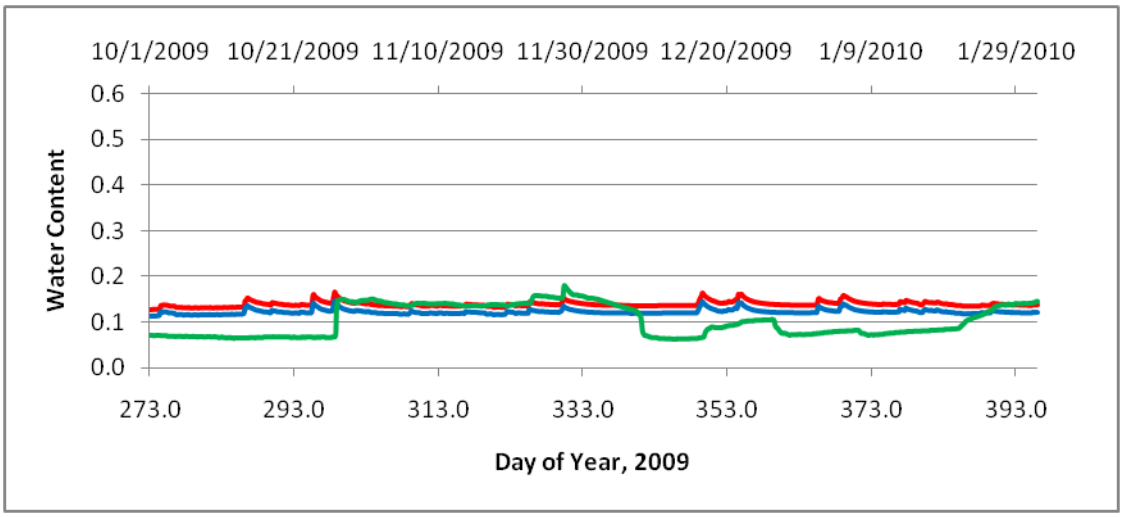
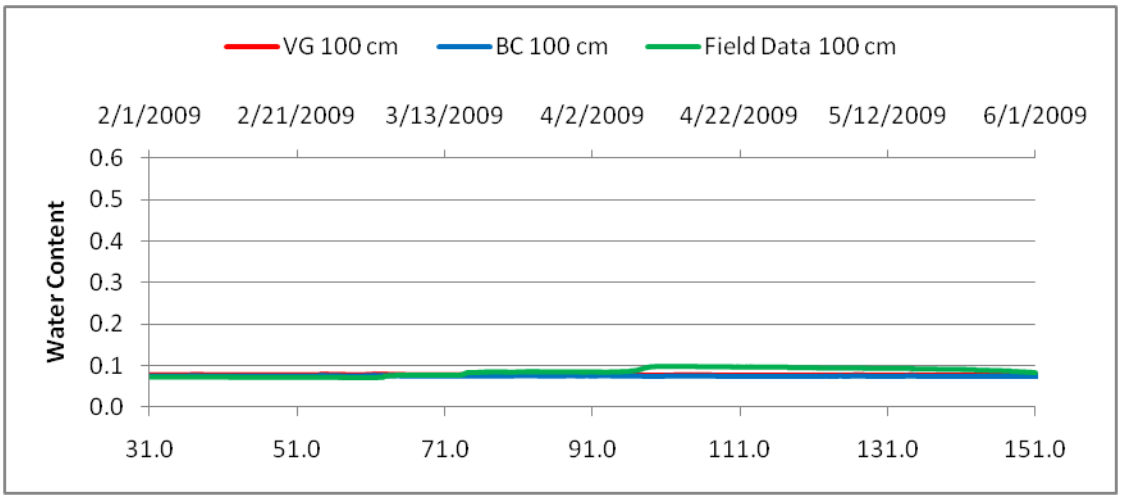
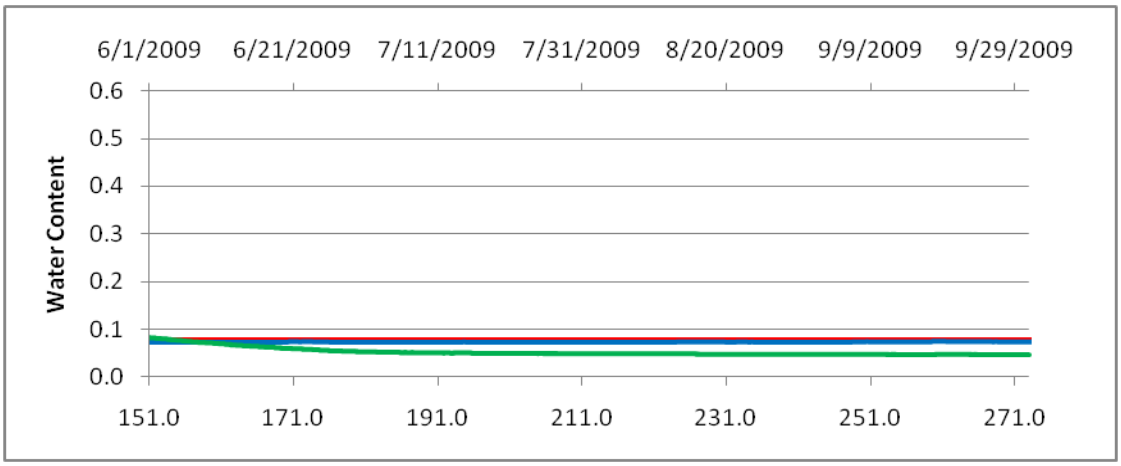



**Figure 19 (a-c): Comparison of field data to VG and BC functions at 30 cm at SVFD**

**(a)**




**(b)**




**(c)**

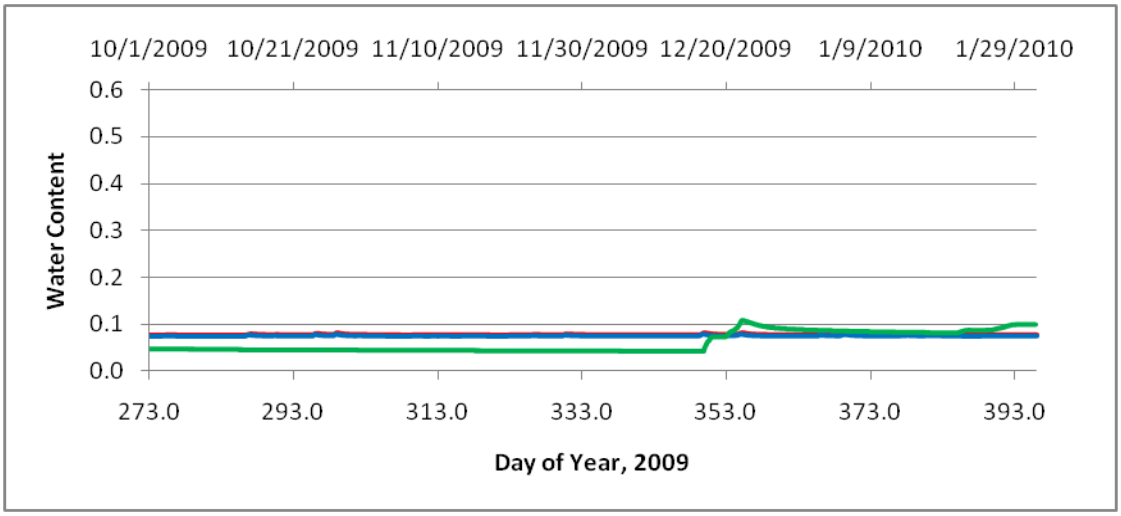
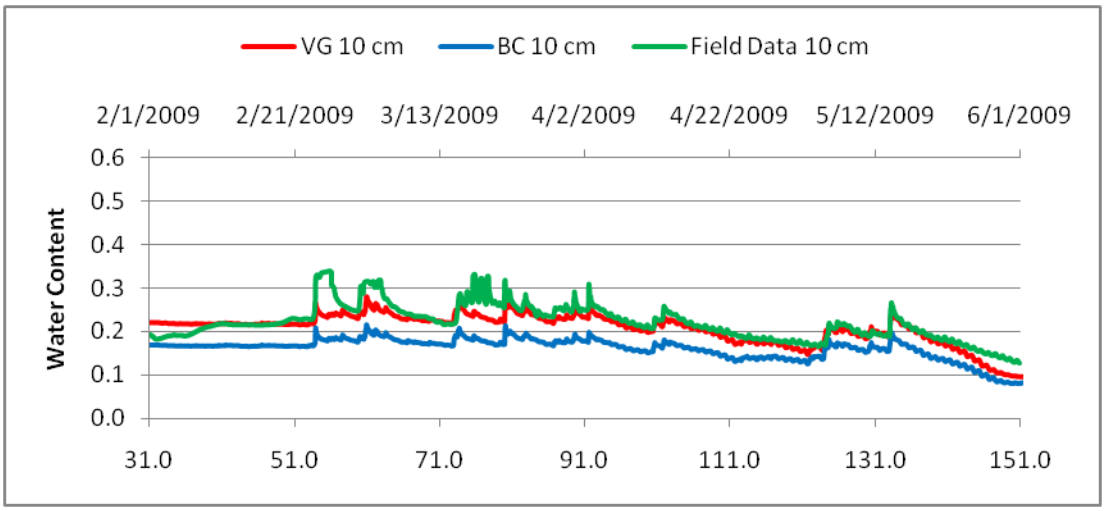
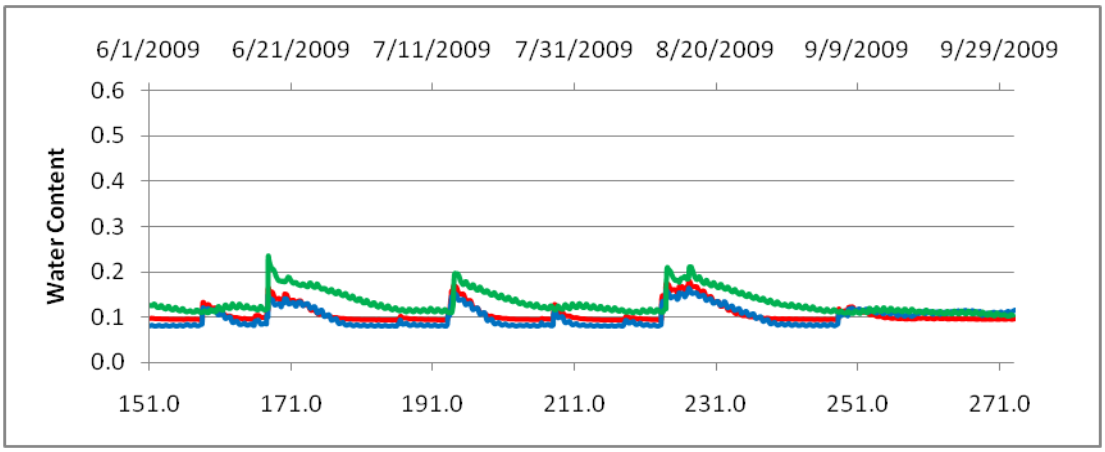



**Figure 20 (a-c): Comparison of field data to VG and BC functions at 100 cm at SVFD**

**(a)**




**(b)**




**(c)**

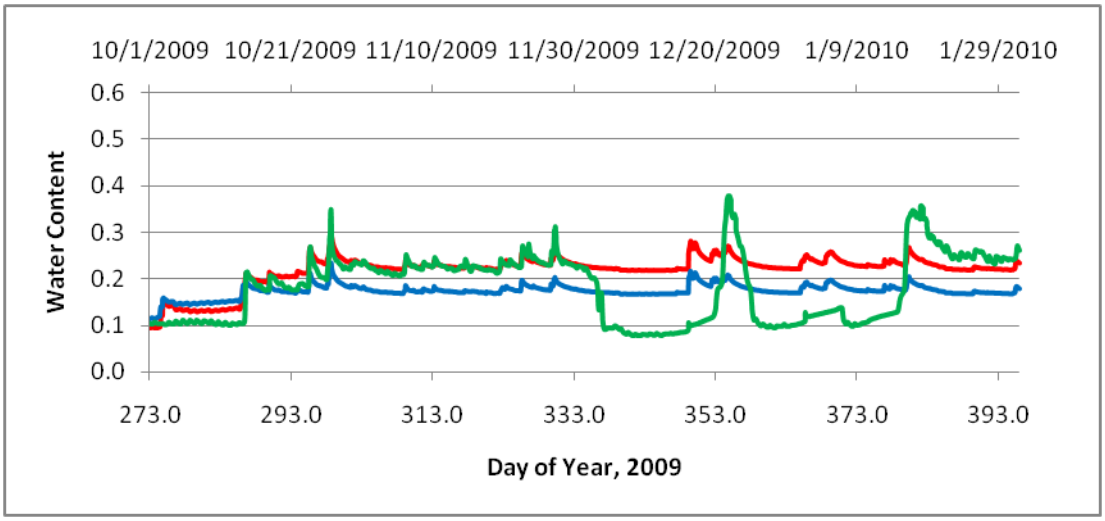
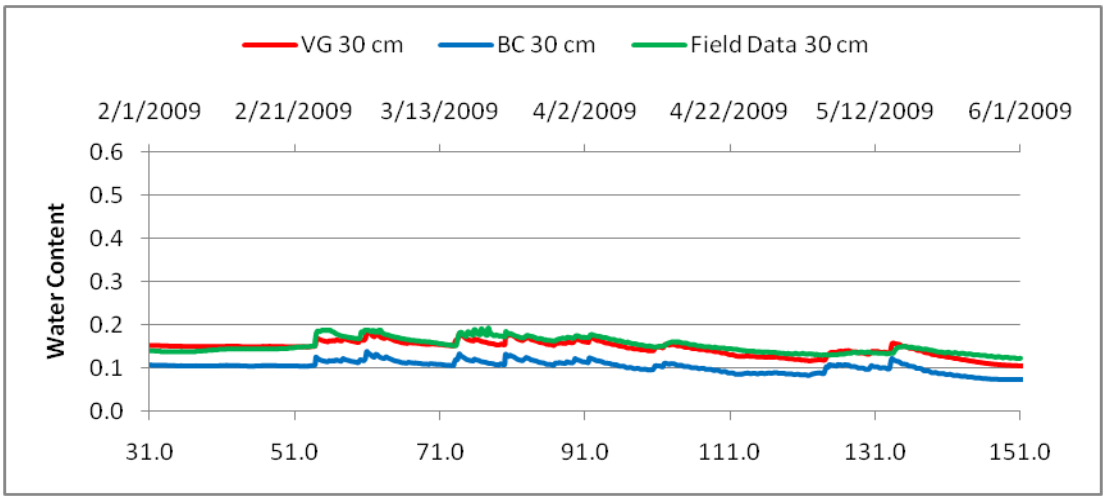
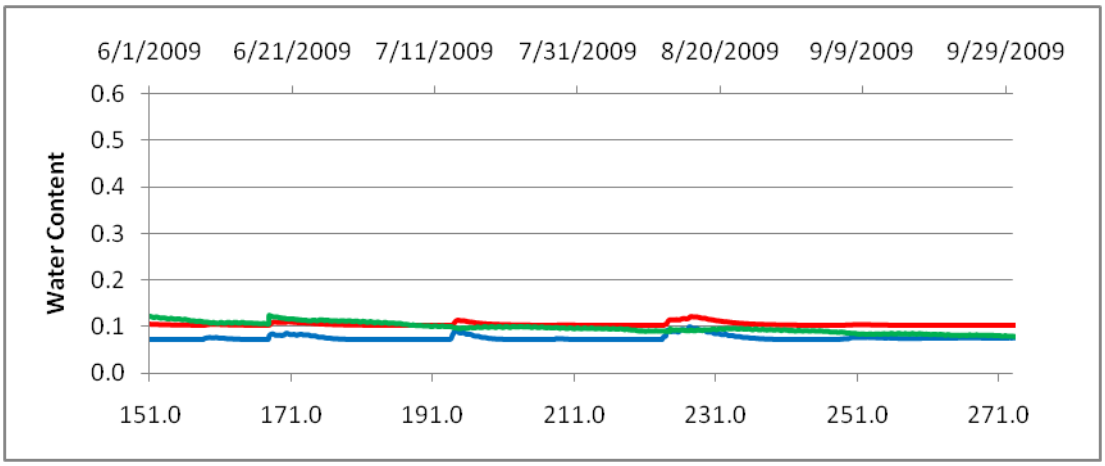



**Figure 21 (a-c): Comparison of field data to VG and BC functions at 10 cm at USFS**

**(a)**




**(b)**




**(c)**

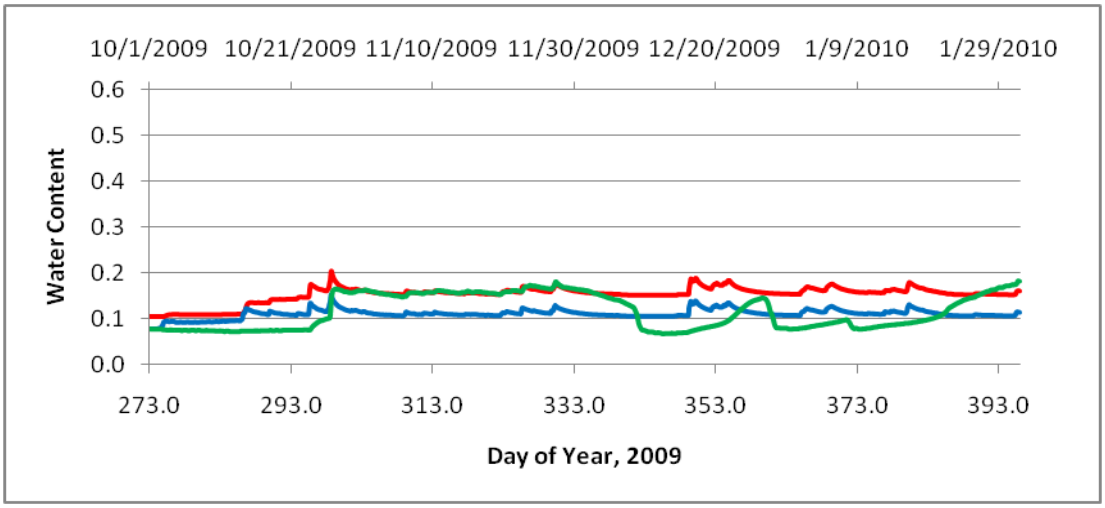
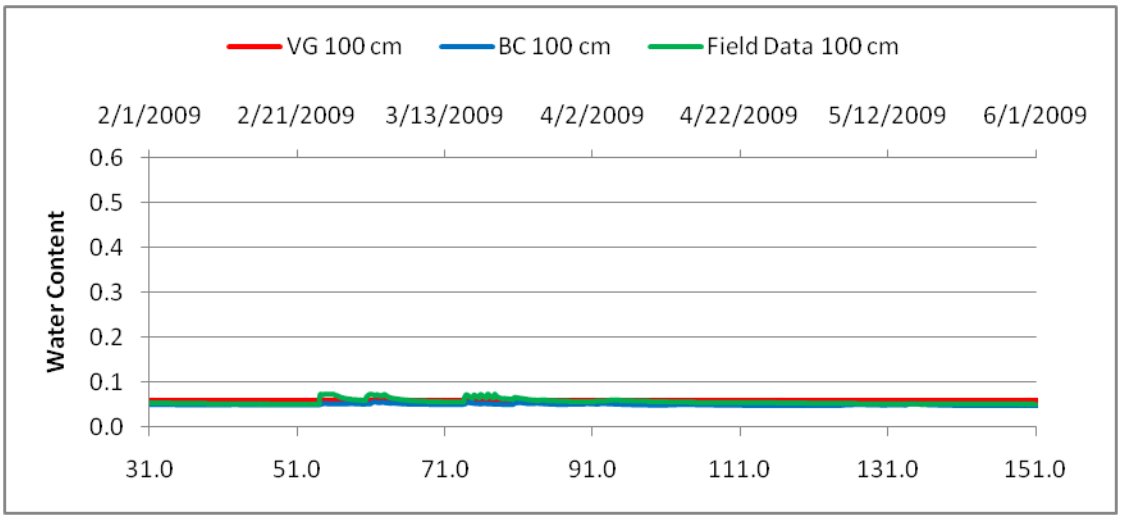
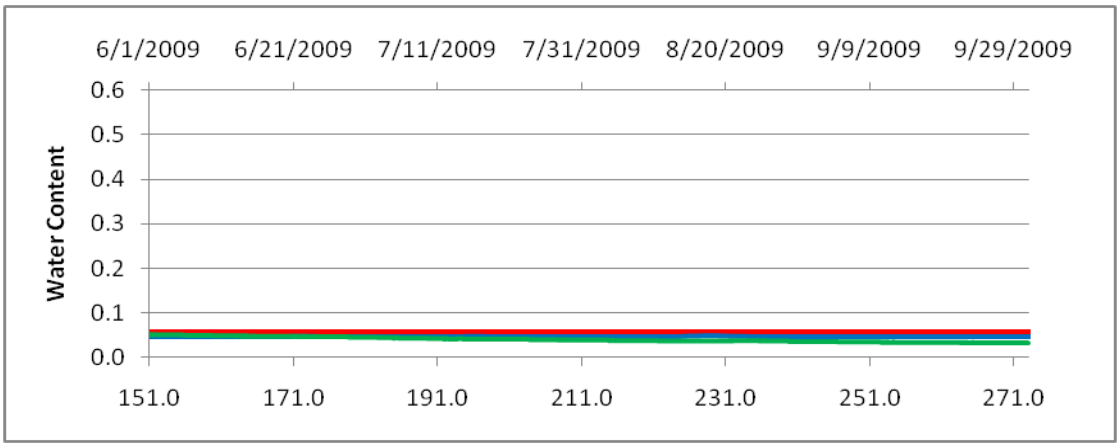



**Figure 22 (a-c): Comparison of field data to VG and BC functions at 30 cm at USFS**

**(a)**




**(b)**




**(c)**

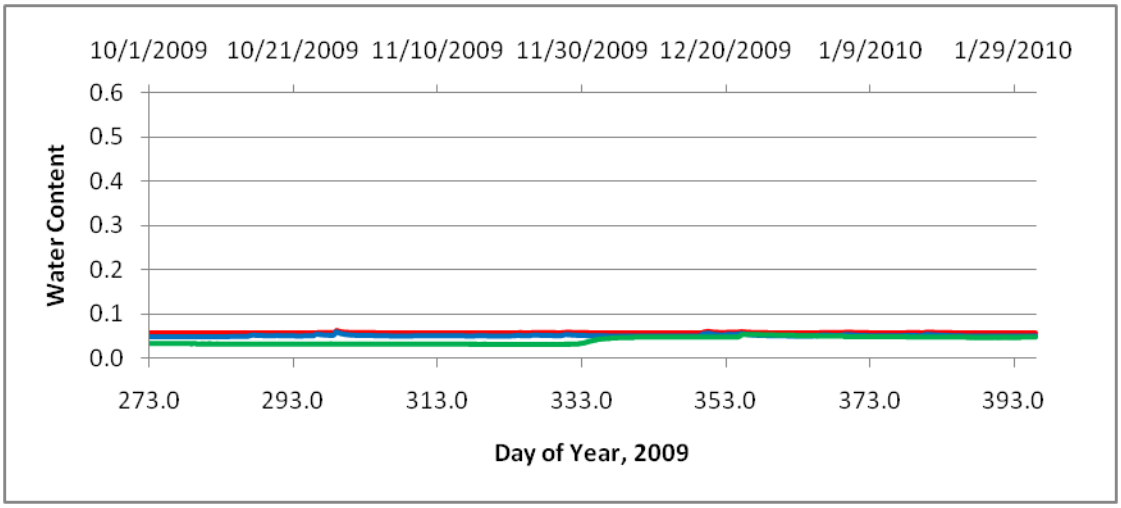



**Figure 23 (a-c): Comparison of field data to VG and BC functions at 100 cm at USFS**

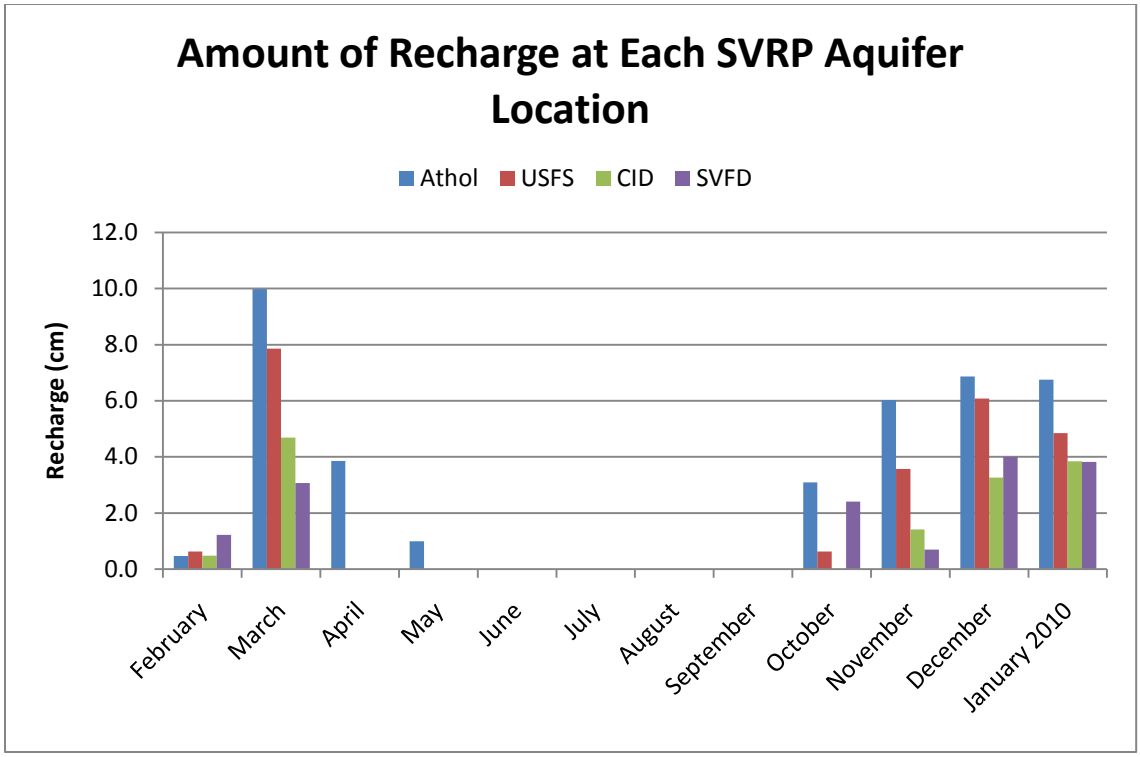



**Figure 24: Monthly recharge at each SVRP site**

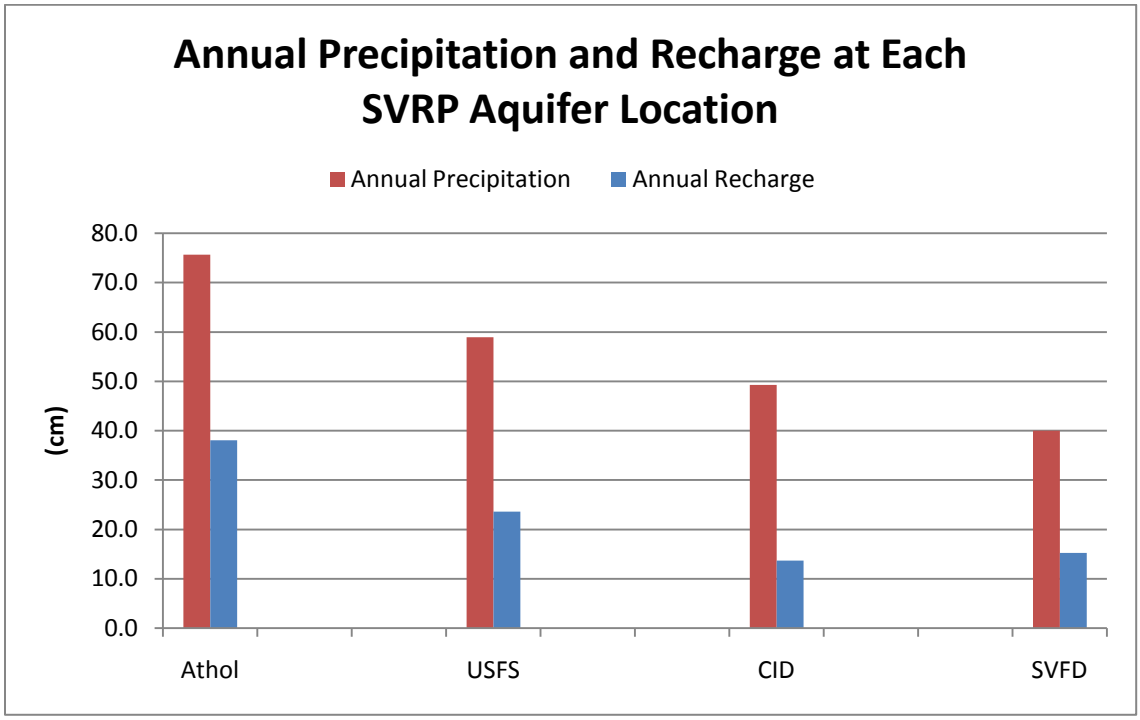



**Figure 25: Total annual precipitation and recharge at each SVRP site**

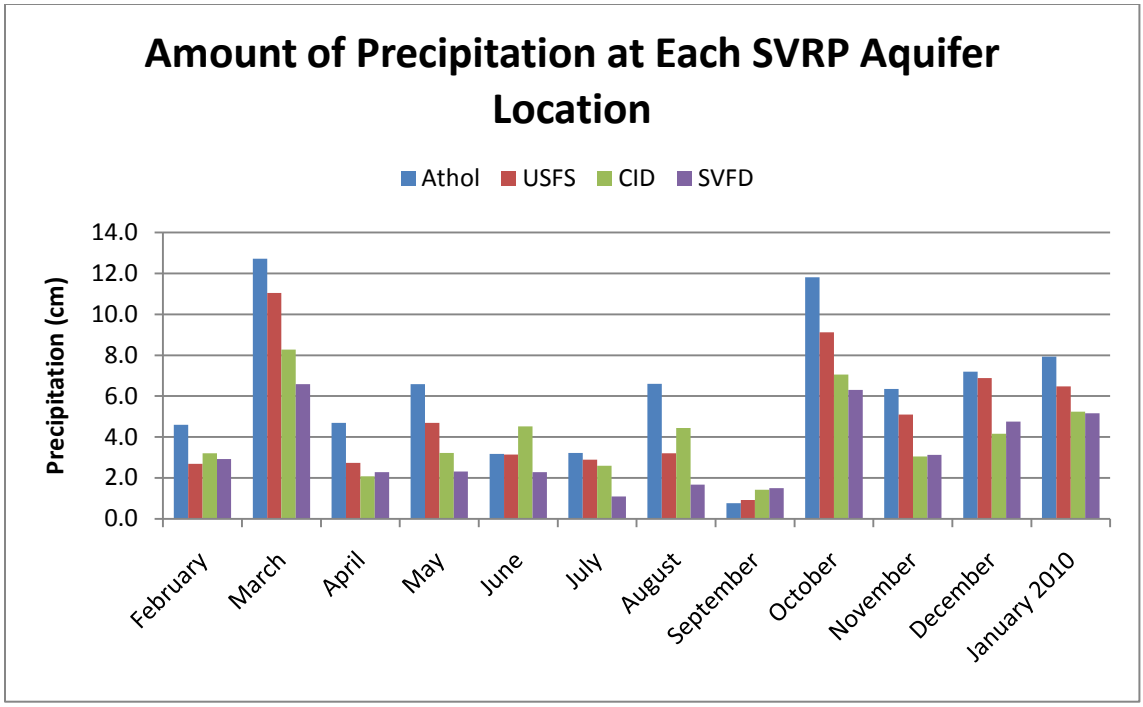



**Figure 26: Monthly precipitation at each SVRP site**

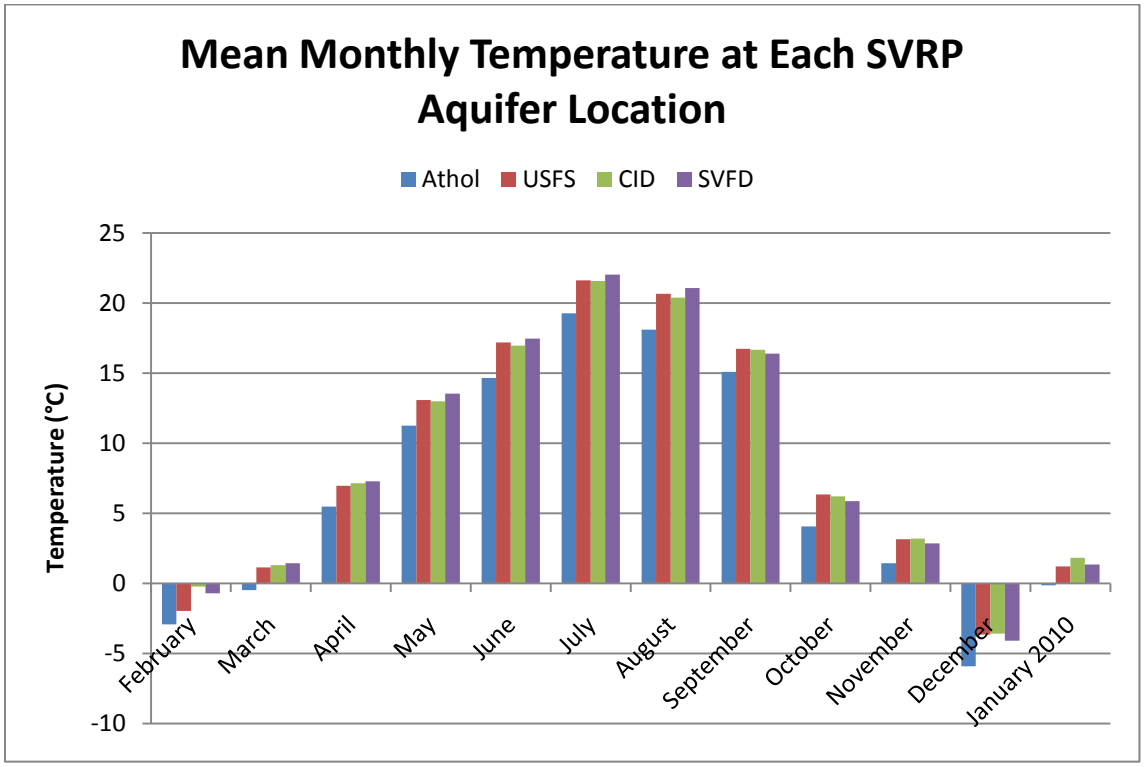



**Figure 27: Mean monthly temperature at each SVRP site (°C)**

**Table 1: Standard Sieve Sizes Used**

| Sieve Number | Opening Size (mm) |
|---|---|
| 8 | 2.36 |
| 20 | 0.85 |
| 50 | 0.3 |
| 80 | 0.18 |
| 100 | 0.15 |
| 200 | 0.075 |

**Table 2: Type of soil at each site and depth**

| Site of Sample | Depth of Sample (cm) | Type of Soil |
|---|---|---|
| 1 Athol | 10 | Sand |
| 1 Athol | 30 | Sandy Loam |
| 1 Athol | 100 | Loamy Sand |
| 2 Athol | 10 | Sandy Loam |
| 2 Athol | 30 | Sandy Loam |
| 2 Athol | 100 | Loamy Sand |
| 1 CID | 10 | Sand |
| 1 CID | 30 | Sand |
| 1 CID | 100 | Sand |
| 2 CID | 10 | Sand |
| 2 CID | 30 | Sand |
| 2 CID | 100 | Sand |
| 1 SVFD | 10 | Sand |
| 1 SVFD | 30 | Sand |
| 1 SVFD | 100 | Sand |
| 2 SVFD | 10 | Loamy Sand |
| 2 SVFD | 30 | Sand |
| 2 SVFD | 100 | Sand |
| 1 USFS | 10 | Sand |
| 1 USFS | 30 | Sand |
| 1 USFS | 60 | Sand |
| 1 USFS | 100 | Sand |
| 2 USFS | 10 | Loamy Sand |
| 2 USFS | 30 | Loamy Sand |
| 2 USFS | 60 | Sand |
| 2 USFS | 100 | Sand |

**Table 3: USDA Soil Texture Classification for each UNSAT-H soil layer**

| | Athol | CID | SVFD | USFS |
|---|---|---|---|---|
| 10 cm | Loamy Sand | Sand | Sand | Loamy Sand |
| 30 cm | Sandy Loam | Sand | Sand | Sand |
| 100 cm | Loamy Sand | Sand | Sand | Sand |

**Table 4: Parameter values for each SVRP location**

| Curve-fitting Parameters | | Athol | | | CID | | | SVFD | | | USFS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0-20 cm | 21-65 cm | 66-125 cm | 0-20 cm | 21-65 cm | 66-125 cm | 0-20 cm | 21-65 cm | 66-125 cm | 0-20 cm | 21-65 cm | 66-125 cm |
| van Genuchten | $\alpha$ | 0.023 | 0.04 | 0.04 | 0.023 | 0.037 | 0.055 | 0.025 | 0.032 | 0.045 | 0.028 | 0.036 | 0.045 |
| | n | 1.41 | 1.41 | 1.98 | 1.71 | 1.81 | 2.08 | 1.81 | 1.81 | 1.89 | 1.51 | 1.46 | 2.68 |
| | m | 0.2908 | 0.2908 | 0.4949 | 0.4152 | 0.4475 | 0.5192 | 0.4475 | 0.4475 | 0.4709 | 0.3377 | 0.3151 | 0.6269 |
| Brooks-Corey | b | 1.76 | 1.67 | 1.38 | 1.85 | 1.61 | 1.52 | 1.94 | 1.55 | 1.49 | 1.99 | 1.79 | 1.81 |
| | $h_e$ | 49.11 | 32.57 | 15.89 | 30.21 | 18.18 | 18.18 | 29.13 | 29.60 | 26.48 | 27.11 | 27.11 | 17.11 |
| Soil Moisture Characteristics | | | | | | | | | | | | | |
| Type of Soil | | Loamy Sand | Sandy Loam | Loamy Sand | Sand | Sand | Sand | Sand | Sand | Sand | Loamy Sand | Sand | Sand |
| $\Theta_s$ | | 0.42 | 0.29 | 0.20 | 0.50 | 0.57 | 0.20 | 0.30 | 0.30 | 0.13 | 0.39 | 0.27 | 0.13 |
| $\Theta_r$ | | 0.028 | 0.018 | 0.01 | 0.02 | 0.02 | 0.015 | 0.045 | 0.045 | 0.01 | 0.048 | 0.025 | 0.01 |
| $K_s$ (cm/d) | | 842.40 | 472.80 | 552.00 | 940.80 | 556.80 | 556.80 | 715.20 | 715.20 | 235.20 | 820.80 | 244.32 | 388.32 |
| $K_s$ (cm/hr) | | 35.10 | 19.70 | 23.00 | 39.20 | 23.20 | 23.20 | 29.80 | 29.80 | 9.80 | 34.20 | 10.18 | 16.18 |

**Table 5: UNSODA Database (Leij, 1996; after Carsel and Parrish, 1988)**

| Textural Class | N | $\Theta_r$ | $\Theta_s$ | $\alpha$ (1/cm) | n | m | $K_s$ (cm/d) |
|---|---|---|---|---|---|---|---|
| Sand | 126 | 0.045 | 0.43 | 0.145 | 2.68 | 0.62 | 712.20 |
| Loamy sand | 51 | 0.057 | 0.41 | 0.124 | 2.28 | 0.56 | 350.20 |
| Sandy loam | 78 | 0.065 | 0.41 | 0.075 | 1.89 | 0.47 | 106.10 |
| Loam | 61 | 0.078 | 0.43 | 0.036 | 1.56 | 0.36 | 25.00 |
| Silt | 3 | 0.034 | 0.46 | 0.016 | 1.37 | 0.27 | 60.00 |
| Silt loam | 101 | 0.067 | 0.45 | 0.02 | 1.41 | 0.29 | 10.80 |
| Sandy clay loam | 37 | 0.100 | 0.39 | 0.059 | 1.48 | 0.32 | 31.40 |
| Clay loam | 23 | 0.095 | 0.41 | 0.019 | 1.31 | 0.24 | 6.24 |
| Silty clay loam | 20 | 0.089 | 0.43 | 0.01 | 1.23 | 0.19 | 1.68 |
| Sandy clay[a] | -- | 0.100 | 0.38 | 0.027 | 1.23 | 0.19 | 2.88 |
| Silty clay | 12 | 0.070 | 0.36 | 0.001 | 1.09 | 0.08 | 0.48 |
| Clay | 25 | 0.068 | 0.38 | 0.001 | 1.09 | 0.08 | 4.80 |

[a]Number of samples not included with estimated parameter values

**Table 6: Amount of precipitation and recharge estimates**

| | Athol | | | USFS | | | CID | | | SVFD | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Recharge (cm) | Precipitation (cm) | Percent of Precipitation | Recharge (cm) | Precipitation (cm) | Percent of Precipitation | Recharge (cm) | Precipitation (cm) | Percent of Precipitation | Recharge (cm) | Precipitation (cm) | Percent of Precipitation |
| February | 0.4697 | 4.60 | 10.2% | 0.6335 | 2.69 | 23.5% | **0.4777** | 3.20 | 14.9% | 1.2194 | 2.92 | 41.7% |
| March | 9.9808 | 12.73 | 78.4% | 7.8587 | 11.05 | 71.1% | **4.6902** | 8.28 | 56.6% | 3.0695 | 6.58 | 46.7% |
| April | 3.8537 | 4.70 | 82.0% | 0.0000 | 2.74 | 0.0% | **0.0000** | 2.08 | 0.0% | **0.0000** | 2.29 | 0.0% |
| May | 0.9968 | 6.58 | 15.2% | 0.0000 | 4.70 | 0.0% | **0.0000** | 3.23 | 0.0% | **0.0000** | 2.31 | 0.0% |
| June | **0.0000** | 3.18 | 0.0% | 0.0000 | 3.15 | 0.0% | **0.0000** | 4.52 | 0.0% | **0.0000** | 2.29 | 0.0% |
| July | **0.0000** | 3.23 | 0.0% | **0.0000** | 2.90 | 0.0% | **0.0000** | 2.59 | 0.0% | **0.0000** | 1.09 | 0.0% |
| August | **0.0000** | 6.60 | 0.0% | **0.0000** | 3.20 | 0.0% | **0.0000** | 4.45 | 0.0% | **0.0000** | 1.68 | 0.0% |
| September | **0.0000** | 0.76 | 0.0% | **0.0000** | 0.91 | 0.0% | **0.0000** | 1.42 | 0.0% | **0.0000** | 1.50 | 0.0% |
| October | **3.0964** | 11.81 | 26.2% | **0.6262** | 9.12 | 6.9% | **0.0000** | 7.06 | 0.0% | **2.4031** | 6.30 | 38.1% |
| November | **6.0197** | 6.35 | 94.8% | **3.5680** | 5.11 | 69.9% | **1.4208** | 3.05 | 46.6% | **0.7018** | 3.12 | 22.5% |
| December | 6.8670 | 7.19 | 95.5% | 6.0804 | 6.88 | 88.3% | **3.2623** | 4.17 | 78.3% | **4.0054** | 4.75 | 84.3% |
| January 2010 | 6.7554 | 7.92 | 85.2% | 4.8468 | 6.48 | 74.8% | **3.8498** | 5.23 | 73.6% | **3.8205** | 5.16 | 74.1% |
| Annual Recharge (cm) | 38.0394 | | | 23.6136 | | | 13.7007 | | | 15.2197 | | |
| Annual Precipitation (cm) | 75.64 | | | 58.93 | | | 49.28 | | | 39.98 | | |
| Annual Percent of Precipitation | | | 50.29% | | | 40.07% | | | 27.80% | | | 38.07% |

**Blue indicates the VG function overpredicted water content during month**
**Green indicates the VG function underpredicted water content during month**

**Table 7: Sensitivity Index of each SVRP site and depth**

| | Depth (cm) | Sand | | | | Loamy Sand | |
|---|---|---|---|---|---|---|---|
| | | USFS | CID | SVFD | | USFS | Athol |
| α | 10 | -- | 34.0% | 32.1% | | 14.2% | 12.4% |
| | 30 | 21.5% | 38.3% | 32.1% | | -- | -- |
| | 100 | 60.3% | 47.1% | 38.8% | | -- | 28.9% |
| n | 10 | -- | 25.3% | 48.1% | | 19.1% | 15.5% |
| | 30 | 44.8% | 50.2% | 41.7% | | -- | -- |
| | 100 | 55.0% | 64.4% | 62.5% | | -- | 31.5% |
| $h_e$ | 10 | -- | 64.7% | 65.4% | | 88.1% | 85.5% |
| | 30 | 62.9% | 59.6% | 56.7% | | -- | -- |
| | 100 | 63.5% | 57.3% | 56.2% | | -- | 78.1% |
| b | 10 | -- | 20.0% | 20.3% | | 29.9% | 1.0% |
| | 30 | 23.4% | 36.4% | 19.8% | | -- | -- |
| | 100 | 37.9% | 36.3% | 24.3% | | -- | 50.0% |

**Table 8: Accuracy of the UNSAT-H recharge estimates**

| | Athol | | | USFS | | | CID | | | SVFD | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | % error of VG predicted water content | Did UNSAT-H predict recharge to occur? | Is recharge likely to occur? | % error of VG predicted water content | Did UNSAT-H predict recharge to occur? | Is recharge likely to occur? | % error of VG predicted water content | Did UNSAT-H predict recharge to occur? | Is recharge likely to occur? | % error of VG predicted water content | Did UNSAT-H predict recharge to occur? | Is recharge likely to occur? |
| February | -6.1% | Yes | Yes | 16.0% | Yes | Yes | -14.8% | Yes | Yes | -11.2% | Yes | Yes |
| March | -6.1% | Yes | Yes | 16.0% | Yes | Yes | -25.9% | Yes | Yes | 6.2% | Yes | Yes |
| April | -6.1% | Yes | Yes | 16.0% | No | No | -24.8% | No | No | -20.6% | No | Yes |
| May | -6.1% | Yes | Yes | 16.0% | No | No | -10.8% | No | No | -18.1% | No | No |
| June | -6.1% | No | No | 16.0% | No | No | 12.1% | No | No | 45.1% | No | No |
| July | 46.9% | No | No | 46.8% | No | No | 27.0% | No | No | 57.0% | No | No |
| August | 62.7% | No | No | 59.0% | No | No | 41.7% | No | No | 60.3% | No | No |
| September | 75.2% | No | No | 73.4% | No | No | 63.3% | No | No | 63.7% | No | No |
| October | 76.1% | Yes | Yes | 78.9% | Yes | No | 63.3% | No | No | 74.8% | Yes | No |
| November | 43.6% | Yes | Yes | 84.6% | Yes | Yes | 63.3% | Yes | No | 78.9% | Yes | No |
| December | -18.0% | Yes | Yes | 14.5% | Yes | Yes | -23.6% | Yes | Yes | 83.2%/ -24.6% | Yes | Yes |
| January 2010 | -15.1% | Yes | Yes | 14.5% | Yes | Yes | -25.4% | Yes | Yes | -23.1% | Yes | Yes |
| Estimation of overall annual recharge | Overestimated, based on errors during October and November when recharge occurred | | | Overestimated, based on errors during October and November when recharge most likely did not occur in October | | | Underestimated, based on errors during February, March, December and January when recharge occurred | | | Overestimated, based on errors during October-mid December when recharge most likely did not occur | | |

***Appendix A:*** *UNSAT-H Input Files*

***Athol, van Genuchten, 2009***

```
Spokane Valley Rathdrum Prairie ATHOL Simulation:  VGATHOL2009.inp
0, 1,                          IPLANT, NGRAV
365, 1, 365,                   IFDEND, IDTBEG, IDTEND
2009, 1, 0, 0, 0,              IYS, NYEARS, ISTEAD, IFLIST, NFLIST
1, 24.0,                       NPRINT, STOPHR
0, 3, 1, 1.0E-4,               ISMETH, INMAX, ISWDIF, DMAXBA
1.0, 1.0E-5, 1.0,              DELMAX, DELMIN, OUTTIM
2.0, 1.0E-05, 0.0, 0.0, 0.0,   RFACT, RAINIF, DHTOL, DHMAX, DHFACT
4, 3, 0,                       KOPT, KEST, WTF
0, 1, 2, 2,                    ITOPBC, IEVOPT, NFHOUR, LOWER
0.0, 2.0E+04, 20.73, 0.0,      HIRRI, HDRY, HTOP, RHA
0, 0, 0,                       IETOPT, ICLOUD, ISHOPT
0, 0,                          IRAIN, HPR
0, 0, 0, 0, 0,                 IHYS, AIRTOL, HYSTOL, HYSMXH, HYFILE
0, 0, 0,                       IHEAT, ICONVH, DMAXHE
0, 0, 0, 0,                    UPPERH, TSMEAN, TSAMP, QHCTOP
0, 0.0, 0.0,                   LOWERH, QHLEAK, TGRAD
0, 0.66, 288.46, 0.24,         IVAPOR, TORT, TSOIL, VAPDIF
3, 126,                        MATN, NPT
1,    0.00,  1,    1.00,  1,    2.00,  1,    3.00,
1,    4.00,  1,    5.00,  1,    6.00,  1,    7.00,
1,    8.00,  1,    9.00,  1,   10.00,  1,   11.00,
1,   12.00,  1,   13.00,  1,   14.00,  1,   15.00,
1,   16.00,  1,   17.00,  1,   18.00,  1,   19.00,
1,   20.00,  2,   21.00,  2,   22.00,  2,   23.00,
2,   24.00,  2,   25.00,  2,   26.00,  2,   27.00,
2,   28.00,  2,   29.00,  2,   30.00,  2,   31.00,
2,   32.00,  2,   33.00,  2,   34.00,  2,   35.00,
2,   36.00,  2,   37.00,  2,   38.00,  2,   39.00,
2,   40.00,  2,   41.00,  2,   42.00,  2,   43.00,
2,   44.00,  2,   45.00,  2,   46.00,  2,   47.00,
2,   48.00,  2,   49.00,  2,   50.00,  2,   51.00,
2,   52.00,  2,   53.00,  2,   54.00,  2,   55.00,
2,   56.00,  2,   57.00,  2,   58.00,  2,   59.00,
2,   60.00,  2,   61.00,  2,   62.00,  2,   63.00,
2,   64.00,  2,   65.00,  3,   66.00,  3,   67.00
3,   68.00,  3,   69.00,  3,   70.00,  3,   71.00,
3,   72.00,  3,   73.00,  3,   74.00,  3,   75.00,
3,   76.00,  3,   77.00,  3,   78.00,  3,   79.00,
3,   80.00,  3,   81.00,  3,   82.00,  3,   83.00,
3,   84.00,  3,   85.00,  3,   86.00,  3,   87.00,
3,   88.00,  3,   89.00,  3,   90.00,  3,   91.00,
3,   92.00,  3,   93.00,  3,   94.00,  3,   95.00,
3,   96.00,  3,   97.00,  3,   98.00,  3,   99.00,
3,  100.00,  3,  101.00,  3,  102.00,  3,  103.00,
3,  104.00,  3,  105.00,  3,  106.00,  3,  107.00,
3,  108.00,  3,  109.00,  3,  110.00,  3,  111.00,
3,  112.00,  3,  113.00,  3,  114.00,  3,  115.00,
3,  116.00,  3,  117.00,  3,  118.00,  3,  119.00,
3,  120.00,  3,  121.00,  3,  122.00,  3,  123.00,
3,  124.00,  3,  125.00,
```

```
Sand Layer #1: 0-20 cm (van Genuchten et al.)         Retention
0.42, 0.028, 0.023, 1.41,                             THET, THTR, A, N
Sand Layer #1: 0-20 cm (van Genuchten et al.)         Hydraulic
Conductivity
2, 35.1, 0.023, 1.41, 0.5,                            RKMODEL, SK, A,
N, EPIT
Sandy Loam Layer #2: 21-65 cm (van Genuchten et al.)  Retention
0.29, 0.018, 0.04, 1.41,                              THET, THTR, A, N
Sandy Loam Layer #2: 21-65 cm (van Genuchten et al.)  Hydraulic
Conductivity
2, 19.7, 0.04, 1.41, 0.5,                             RKMODEL, SK, A,
N, EPIT
Loamy Sand Layer #3: 66-125 cm (van Genuchten et al.) Retention
0.20, 0.01, 0.04, 1.98,                         THET, THTR, A, N
Loamy Sand Layer #3: 66-125 cm (van Genuchten et al.) Hydraulic
Conductivity
2, 23.0, 0.04, 1.98, 0.5,                             RKMODEL, SK, A,
N, EPIT
0,    NDAY
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
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100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0,
0.0197, 0.0220, 0.0055, -0.0032, 0.0068, 0.0259, 0.0631, 0.1509,
0.1559, 0.0908, 0.0966, 0.1278, 0.0727, 0.0593, 0.0610, 0.0450,
0.0639, 0.0823, 0.0769, 0.1055, 0.0789, 0.0593, 0.0304, 0.0818,
```

```
0.0392, 0.0506, 0.1137, 0.1266, 0.1092, 0.1045, 0.0615, 0.0708,
0.0811, 0.1037, 0.0929, 0.0724, 0.0721, 0.0788, 0.0298, 0.0439,
0.0364, 0.0309, 0.0323, 0.0442, 0.0424, 0.0402, 0.0438, 0.0433,
0.0448, 0.0524, 0.0478, 0.0457, 0.0470, 0.0543, 0.0700, 0.0623,
0.0661, 0.0611, 0.0520, 0.0646, 0.0791, 0.0757, 0.0888, 0.0884,
0.1030, 0.0964, 0.0782, 0.0675, 0.0857, 0.0514, 0.0570, 0.0709,
0.0794, 0.1376, 0.1420, 0.1086, 0.1012, 0.1098, 0.1245, 0.1318,
0.1086, 0.1193, 0.1057, 0.1173, 0.1108, 0.1285, 0.1399, 0.1314,
0.1383, 0.1370, 0.1512, 0.1290, 0.1373, 0.1529, 0.1558, 0.1630,
0.1776, 0.1639, 0.1665, 0.1885, 0.1501, 0.1502, 0.1636, 0.1734,
0.1829, 0.1896, 0.1760, 0.1930, 0.1988, 0.2104, 0.2306, 0.3009,
0.2002, 0.1978, 0.2044, 0.2106, 0.1976, 0.2334, 0.2405, 0.2250,
0.2289, 0.2302, 0.2161, 0.2436, 0.2462, 0.2219, 0.2179, 0.2132,
0.2607, 0.2688, 0.2475, 0.2632, 0.2402, 0.2408, 0.2555, 0.2664,
0.2974, 0.2984, 0.3170, 0.2510, 0.2836, 0.2987, 0.3306, 0.3289,
0.3243, 0.2793, 0.2952, 0.3076, 0.3515, 0.4816, 0.3743, 0.3508,
0.3542, 0.3513, 0.3714, 0.4077, 0.3254, 0.3273, 0.3162, 0.2982,
0.3265, 0.3656, 0.3681, 0.3964, 0.3815, 0.3270, 0.3569, 0.3033,
0.3198, 0.3278, 0.3412, 0.2777, 0.2773, 0.3379, 0.3632, 0.3299,
0.3272, 0.3349, 0.3242, 0.3383, 0.3288, 0.4027, 0.4147, 0.4337,
0.4223, 0.4459, 0.3891, 0.3531, 0.3287, 0.3618, 0.4034, 0.4124,
0.4443, 0.2876, 0.3524, 0.4030, 0.4038, 0.4260, 0.4113, 0.3965,
0.4024, 0.4159, 0.4569, 0.4077, 0.4001, 0.3944, 0.4115, 0.4334,
0.4250, 0.3995, 0.4026, 0.4100, 0.4003, 0.4203, 0.3725, 0.3696,
0.4050, 0.3905, 0.2850, 0.2829, 0.3046, 0.2980, 0.3144, 0.3258,
0.3118, 0.2493, 0.2604, 0.3042, 0.3043, 0.3180, 0.3350, 0.3455,
0.3120, 0.2899, 0.2706, 0.2828, 0.2627, 0.2654, 0.2709, 0.2844,
0.2745, 0.2926, 0.2819, 0.2860, 0.2800, 0.2292, 0.2337, 0.2334,
0.1790, 0.1614, 0.1790, 0.1954, 0.1766, 0.2169, 0.2397, 0.1993,
0.1773, 0.1950, 0.1789, 0.1682, 0.1435, 0.1578, 0.1568, 0.1434,
0.1315, 0.1671, 0.1636, 0.1520, 0.1879, 0.1641, 0.2659, 0.1259,
0.1112, 0.1273, 0.1082, 0.0847, 0.1405, 0.1017, 0.0953, 0.0796,
0.0821, 0.0952, 0.0726, 0.0667, 0.0627, 0.0761, 0.0575, 0.0523,
0.0720, 0.0587, 0.0548, 0.0677, 0.0545, 0.0512, 0.0312, 0.0538,
0.0470, 0.0466, 0.0053, 0.0455, 0.0425, 0.0221, -0.0272, -0.0072,
0.0491, 0.0355, 0.0292, 0.0253, 0.0243, 0.0215, 0.0330, 0.0153,
0.0213, 0.0174, 0.0257, 0.0216, 0.0208, 0.0254, 0.0113, 0.0488,
0.0754, 0.0520, 0.0226, 0.0710, 0.0680, 0.0193, 0.0341, 0.0150,
0.0152, 0.0191, 0.0198, 0.0080, 0.0101, 0.0188, 0.0211, 0.0186,
0.0108, 0.0276, 0.0259, 0.1256, 0.0498, 0.0289, 0.1192, 0.0133,
0.0091, 0.0028, 0.0520, 0.0133, 0.0016, -0.0011, 0.0106, 0.0123,
0.0070, 0.0107, 0.0095, 0.0354, 0.0197, 0.0063, 0.0104, 0.0152,
0.0107, 0.0036, 0.0029, 0.0039, 0.0040,
168,        NWATER      (rain data 2009)
     1,   1,  17,1.000,
  3.0, 0.0254,
  4.0, 0.0000,
  5.0, 0.0254,
  6.0, 0.0254,
  7.0, 0.0762,
  8.0, 0.0762,
  9.0, 0.0762,
 10.0, 0.0762,
 11.0, 0.0254,
```

```
12.0, 0.0508,
13.0, 0.0508,
14.0, 0.0508,
15.0, 0.0508,
16.0, 0.0254,
17.0, 0.0000,
18.0, 0.0254,
19.0, 0.0000,
  2,   1,  11,1.000,
 0.0, 0.0508,
 1.0, 0.0762,
 2.0, 0.0762,
 3.0, 0.0000,
 4.0, 0.0762,
 5.0, 0.1270,
 6.0, 0.1016,
 7.0, 0.0508,
 8.0, 0.0000,
 9.0, 0.0254,
10.0, 0.0000,
  4,   1,   5,1.000,
11.0, 0.1524,
12.0, 0.0000,
14.0, 0.1270,
15.0, 0.0254,
16.0, 0.0000,
  5,   1,  18,1.000,
 1.0, 0.0508,
 2.0, 0.0508,
 3.0, 0.0508,
 4.0, 0.0254,
 5.0, 0.0000,
 6.0, 0.0254,
 7.0, 0.0508,
 8.0, 0.1016,
 9.0, 0.1524,
10.0, 0.0762,
11.0, 0.0508,
12.0, 0.0762,
13.0, 0.0254,
14.0, 0.0000,
15.0, 0.0254,
16.0, 0.0000,
18.0, 0.0762,
19.0, 0.0000,
  6,   1,  20,1.000,
 3.0, 0.0254,
 4.0, 0.0000,
 6.0, 0.0254,
 7.0, 0.0508,
 8.0, 0.0254,
 9.0, 0.0508,
10.0, 0.0508,
11.0, 0.1778,
```

```
12.0, 0.1016,
13.0, 0.4064,
14.0, 0.0000,
15.0, 0.1016,
16.0, 0.1016,
17.0, 0.1778,
18.0, 0.1778,
19.0, 0.1270,
20.0, 0.0254,
21.0, 0.0254,
22.0, 0.0254,
23.0, 0.0000,
  7,   1,  14,1.000,
 1.0, 0.0254,
 2.0, 0.0000,
 8.0, 0.0508,
 9.0, 0.0254,
10.0, 0.0254,
11.0, 0.0254,
12.0, 0.1016,
13.0, 0.0000,
14.0, 0.0254,
15.0, 0.0000,
19.0, 0.0254,
20.0, 0.0762,
21.0, 0.0508,
22.0, 0.0000,
  8,   1,  12,1.000,
 1.0, 0.0254,
 2.0, 0.0000,
 8.0, 0.1016,
 9.0, 0.0254,
10.0, 0.0254,
11.0, 0.0254,
12.0, 0.1016,
13.0, 0.0254,
14.0, 0.0000,
21.0, 0.0254,
22.0, 0.0254,
23.0, 0.0000,
  9,   1,   4,1.000,
 2.0, 0.0254,
 3.0, 0.0000,
 6.0, 0.0254,
 7.0, 0.0000,
 10,   1,   9,1.000,
11.0, 0.0254,
12.0, 0.1016,
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16.0, 0.0254,
17.0, 0.0000,
22.0, 0.0508,
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19.0, 0.0000,
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15.0, 0.0000,
18.0, 0.0254,
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22.0, 0.0254,
23.0, 0.0000,
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 9.0, 0.0000,
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 5.0, 0.0000,
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20.0, 0.0254,
21.0, 0.0000,
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14.0, 0.0000,
 27,   1,   6,1.000,
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17.0, 0.0254,
18.0, 0.0000,
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16.0, 0.0000,
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11.0, 0.0000,
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12.0, 0.0254,
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12.0, 0.0254,
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 5.0, 0.0254,
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11.0, 0.0254,
12.0, 0.0508,
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 9.0, 0.0254,
10.0, 0.0000,
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11.0, 0.0000,
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22.0, 0.1016,
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16.0, 0.1016,
17.0, 0.1016,
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19.0, 0.2540,
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21.0, 0.1778,
22.0, 0.0000,
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 2.0, 0.1016,
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24.0, 0.0000,
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 4.0, 0.0254,
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23.0, 0.0254,
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 5.0, 0.0254,
 6.0, 0.0000,
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10.0, 0.0762,
11.0, 0.0508,
12.0, 0.0762,
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10.0, 0.0254,
11.0, 0.0508,
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17.0, 0.0000,
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13.0, 0.0508,
14.0, 0.0254,
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11.0, 0.0508,
12.0, 0.0000,
 70,   1,   4,1.000,
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15.0, 0.0508,
16.0, 0.0254,
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13.0, 0.0254,
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16.0, 0.0508,
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11.0, 0.1016,
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13.0, 0.0762,
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13.0, 0.0508,
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22.0, 0.9906,
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21.0, 0.0254,
22.0, 0.0000,
23.0, 0.0254,
24.0, 0.0000,
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10.0, 0.0508,
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17.0, 0.0000,
21.0, 0.0254,
22.0, 0.0508,
23.0, 0.0254,
24.0, 0.0000,
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12.0, 0.0000,
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 9.0, 0.0254,
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16.0, 0.1016,
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18.0, 0.0254,
19.0, 0.0254,
20.0, 0.0000,
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11.0, 0.1778,
12.0, 0.1524,
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11.0, 0.2286,
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13.0, 0.2032,
14.0, 0.0508,
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11.0, 0.2794,
12.0, 0.2286,
13.0, 0.1524,
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 9.0, 0.0762,
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11.0, 0.0254,
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13.0, 0.1016,
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15.0, 0.0000,
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14.0, 0.1270,
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17.0, 0.2032,
18.0, 0.1524,
19.0, 0.2032,
20.0, 0.2794,
21.0, 0.2032,
22.0, 0.0000,
23.0, 0.0254,
24.0, 0.0000,
103,   1,   7,1.000,
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 1.0, 0.0508,
 2.0, 0.0000,
 4.0, 0.0254,
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15.0, 0.0000,
16.0, 0.0254,
17.0, 0.1016,
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19.0, 0.0254,
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14.0, 0.0000,
23.0, 0.0254,
24.0, 0.0000,
116,   1,   8,1.000,
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 4.0, 0.0000,
13.0, 0.0254,
14.0, 0.0000,
22.0, 0.0508,
23.0, 0.0000,
117,   1,   7,1.000,
 3.0, 0.0508,
 4.0, 0.0000,
 7.0, 0.0254,
 8.0, 0.0000,
 9.0, 0.1524,
10.0, 0.0254,
11.0, 0.0000,
122,   1,   3,1.000,
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21.0, 0.0254,
22.0, 0.0000,
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 3.0, 0.0254,
 4.0, 0.0000,
 5.0, 0.0254,
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 4.0, 0.1524,
 5.0, 0.0000,
11.0, 0.0254,
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17.0, 0.0254,
18.0, 0.0000,
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19.0, 0.0254,
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15.0, 0.0762,
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17.0, 0.0254,
18.0, 0.0000,
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13.0, 0.0000,
131,   1,  19,1.000,
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 3.0, 0.0254,
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 5.0, 0.0762,
 6.0, 0.0254,
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 9.0, 0.0508,
10.0, 0.0762,
11.0, 0.0762,
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16.0, 0.0508,
17.0, 0.0508,
18.0, 0.0000,
19.0, 0.0254,
20.0, 0.0000,
132,   1,   9,1.000,
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11.0, 0.0254,
12.0, 0.0000,
19.0, 0.0254,
20.0, 0.0254,
21.0, 0.0254,
22.0, 0.0254,
23.0, 0.0254,
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133,   1,   8,1.000,
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 1.0, 0.0000,
19.0, 0.0254,
20.0, 0.0000,
21.0, 0.0508,
22.0, 0.0508,
23.0, 0.0508,
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134,   1,  24,1.000,
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10.0, 0.0254,
11.0, 0.0508,
12.0, 0.0254,
13.0, 0.0508,
14.0, 0.0508,
15.0, 0.1016,
16.0, 0.0762,
17.0, 0.0254,
18.0, 0.0254,
19.0, 0.0254,
20.0, 0.0254,
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22.0, 0.0254,
23.0, 0.0254,
24.0, 0.0000
135,   1,  10,1.000,
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11.0, 0.0254,
12.0, 0.0254,
13.0, 0.0254,
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 3.0, 0.0000,
159,   1,   7,1.000,
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 8.0, 0.1270,
 9.0, 0.1016,
10.0, 0.1016,
11.0, 0.0508,
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12.0, 0.0254,
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14.0, 0.0254,
15.0, 0.0000,
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 7.0, 0.0254,
 8.0, 0.0000,
19.0, 0.0254,
20.0, 0.0762,
21.0, 0.0000,
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17.0, 0.1270,
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20.0, 0.1016,
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11.0, 0.0000,
12.0, 0.0508,
13.0, 0.0762,
14.0, 0.0762,
15.0, 0.0508,
16.0, 0.0000,
23.0, 0.0762,
24.0, 0.0000,
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 2.0, 0.0508,
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172,   1,   5,1.000,
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19.0, 0.0000,
20.0, 0.0254,
21.0, 0.0254,
22.0, 0.0000,
173,   1,   6,1.000,
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 7.0, 0.0000,
 8.0, 0.0254,
 9.0, 0.0000,
10.0, 0.0254,
11.0, 0.0000,
175,   1,   4,1.000,
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22.0, 0.0762,
23.0, 0.0508,
24.0, 0.0000,
176,   1,   3,1.000,
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187,   1,   4,1.000,
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 8.0, 0.0762,
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10.0, 0.0000,
193,   1,   6,1.000,
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23.0, 0.1016,
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 8.0, 0.0508,
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10.0, 0.0508,
11.0, 0.0508,
12.0, 0.0508,
13.0, 0.0508,
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15.0, 0.0508,
16.0, 0.0508,
17.0, 0.0254,
18.0, 0.0508,
19.0, 0.0254,
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10.0, 0.0508,
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13.0, 0.2286,
14.0, 0.1524,
15.0, 0.1270,
16.0, 0.0762,
17.0, 0.1270,
18.0, 0.2286,
19.0, 0.3048,
20.0, 0.1524,
21.0, 0.1778,
22.0, 0.2540,
23.0, 0.2286,
351,   1,   9,1.000,
 0.0, 0.2286,
 1.0, 0.1778,
 2.0, 0.1270,
 3.0, 0.0762,
 4.0, 0.0508,
 5.0, 0.0508,
 6.0, 0.0000,
 7.0, 0.0254,
 8.0, 0.0000,
353,   1,  12,1.000,
 8.0, 0.0508,
 9.0, 0.0762,
10.0, 0.1270,
11.0, 0.1778,
12.0, 0.0254,
13.0, 0.0000,
14.0, 0.1270,
15.0, 0.0762,
16.0, 0.0508,
17.0, 0.0000,
18.0, 0.1778,
19.0, 0.0000,
354,   1,  20,1.000,
 0.0, 0.0508,
 1.0, 0.0508,
 2.0, 0.0762,
 3.0, 0.0508,
 4.0, 0.0508,
 5.0, 0.0254,
 6.0, 0.0508,
 7.0, 0.0254,
 8.0, 0.0254,
 9.0, 0.0000,
14.0, 0.0254,
15.0, 0.0254,
16.0, 0.0508,
17.0, 0.0508,
18.0, 0.0508,
19.0, 0.0508,
20.0, 0.0508,
21.0, 0.0508,
22.0, 0.0508,
```

```
23.0, 0.0762,
355,   1,  24,1.000,
 0.0, 0.0508,
 1.0, 0.0508,
 2.0, 0.0762,
 3.0, 0.0508,
 4.0, 0.0508,
 5.0, 0.0762,
 6.0, 0.0508,
 7.0, 0.0508,
 8.0, 0.0254,
 9.0, 0.0508,
10.0, 0.0508,
11.0, 0.0508,
12.0, 0.0508,
13.0, 0.0508,
14.0, 0.0508,
15.0, 0.0508,
16.0, 0.0762,
17.0, 0.0508,
18.0, 0.0508,
19.0, 0.0762,
20.0, 0.0508,
21.0, 0.0508,
22.0, 0.0508,
23.0, 0.0254,
356,   1,  16,1.000,
 0.0, 0.0508,
 1.0, 0.0508,
 2.0, 0.0508,
 3.0, 0.0254,
 4.0, 0.0254,
 5.0, 0.0508,
 6.0, 0.0254,
 7.0, 0.0508,
 8.0, 0.0508,
 9.0, 0.0254,
10.0, 0.0000,
11.0, 0.0254,
12.0, 0.0508,
13.0, 0.0254,
14.0, 0.0254,
15.0, 0.0000,
358,   1,   2,1.000,
14.0, 0.0254,
15.0, 0.0000,
365,   1,   5,1.000,
11.0, 0.0254,
12.0, 0.0254,
13.0, 0.0508,
14.0, 0.0254,
15.0, 0.0000,
```

***Athol, van Genuchten, 2010***

```
Spokane Valley Rathdrum Prairie ATHOL Simulation:  VGATHOL2010.inp
0, 1,                          IPLANT, NGRAV
62, 1, 62,                     IFDEND, IDTBEG, IDTEND
2009, 1, 0, 0, 0,              IYS, NYEARS, ISTEAD, IFLIST, NFLIST
1, 24.0,                       NPRINT, STOPHR
0, 3, 1, 1.0E-4,               ISMETH, INMAX, ISWDIF, DMAXBA
1.0, 1.0E-5, 1.0,              DELMAX, DELMIN, OUTTIM
2.0, 1.0E-05, 0.0, 0.0, 0.0,   RFACT, RAINIF, DHTOL, DHMAX, DHFACT
4, 3, 0,                       KOPT, KEST, WTF
0, 1, 2, 2,                    ITOPBC, IEVOPT, NFHOUR, LOWER
0.0, 2.0E+04, 20.73, 0.0,      HIRRI, HDRY, HTOP, RHA
0, 0, 0,                       IETOPT, ICLOUD, ISHOPT
0, 0,                          IRAIN, HPR
0, 0, 0, 0, 0,                 IHYS, AIRTOL, HYSTOL, HYSMXH, HYFILE
0, 0, 0,                       IHEAT, ICONVH, DMAXHE
0, 0, 0, 0,                    UPPERH, TSMEAN, TSAMP, QHCTOP
0, 0.0, 0.0,                   LOWERH, QHLEAK, TGRAD
0, 0.66, 288.46, 0.24,         IVAPOR, TORT, TSOIL, VAPDIF
3, 126,                        MATN, NPT
1,    0.00,  1,    1.00,  1,    2.00,  1,    3.00,
1,    4.00,  1,    5.00,  1,    6.00,  1,    7.00,
1,    8.00,  1,    9.00,  1,   10.00,  1,   11.00,
1,   12.00,  1,   13.00,  1,   14.00,  1,   15.00,
1,   16.00,  1,   17.00,  1,   18.00,  1,   19.00,
1,   20.00,  2,   21.00,  2,   22.00,  2,   23.00,
2,   24.00,  2,   25.00,  2,   26.00,  2,   27.00,
2,   28.00,  2,   29.00,  2,   30.00,  2,   31.00,
2,   32.00,  2,   33.00,  2,   34.00,  2,   35.00,
2,   36.00,  2,   37.00,  2,   38.00,  2,   39.00,
2,   40.00,  2,   41.00,  2,   42.00,  2,   43.00,
2,   44.00,  2,   45.00,  2,   46.00,  2,   47.00,
2,   48.00,  2,   49.00,  2,   50.00,  2,   51.00,
2,   52.00,  2,   53.00,  2,   54.00,  2,   55.00,
2,   56.00,  2,   57.00,  2,   58.00,  2,   59.00,
2,   60.00,  2,   61.00,  2,   62.00,  2,   63.00,
2,   64.00,  2,   65.00,  3,   66.00,  3,   67.00
3,   68.00,  3,   69.00,  3,   70.00,  3,   71.00,
3,   72.00,  3,   73.00,  3,   74.00,  3,   75.00,
3,   76.00,  3,   77.00,  3,   78.00,  3,   79.00,
3,   80.00,  3,   81.00,  3,   82.00,  3,   83.00,
3,   84.00,  3,   85.00,  3,   86.00,  3,   87.00,
3,   88.00,  3,   89.00,  3,   90.00,  3,   91.00,
3,   92.00,  3,   93.00,  3,   94.00,  3,   95.00,
3,   96.00,  3,   97.00,  3,   98.00,  3,   99.00,
3,  100.00,  3,  101.00,  3,  102.00,  3,  103.00,
3,  104.00,  3,  105.00,  3,  106.00,  3,  107.00,
3,  108.00,  3,  109.00,  3,  110.00,  3,  111.00,
3,  112.00,  3,  113.00,  3,  114.00,  3,  115.00,
3,  116.00,  3,  117.00,  3,  118.00,  3,  119.00,
3,  120.00,  3,  121.00,  3,  122.00,  3,  123.00,
3,  124.00,  3,  125.00,
```

```
Sand Layer #1: 0-20 cm (van Genuchten et al.)         Retention
0.42, 0.028, 0.023, 1.41,                             THET, THTR, A, N
Sand Layer #1: 0-20 cm (van Genuchten et al.)         Hydraulic
Conductivity
2, 35.1, 0.023, 1.41, 0.5,                            RKMODEL, SK, A,
N, EPIT
Sandy Loam Layer #2: 21-65 cm (van Genuchten et al.)  Retention
0.29, 0.018, 0.04, 1.41,                              THET, THTR, A, N
Sandy Loam Layer #2: 21-65 cm (van Genuchten et al.)  Hydraulic
Conductivity
2, 19.7, 0.04, 1.41, 0.5,                             RKMODEL, SK, A,
N, EPIT
Loamy Sand Layer #3: 66-125 cm (van Genuchten et al.) Retention
0.20, 0.01, 0.04, 1.98,                         THET, THTR, A, N
Loamy Sand Layer #3: 66-125 cm (van Genuchten et al.) Hydraulic
Conductivity
2, 23.0, 0.04, 1.98, 0.5,                             RKMODEL, SK, A,
N, EPIT
0,    NDAY
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0,
0.0211, 0.0186, 0.0108, 0.0276, 0.0259, 0.1256, 0.0498, 0.0289,
0.1192, 0.0133, 0.0091, 0.0028, 0.0520, 0.0133, 0.0016, -0.0011,
0.0106, 0.0123, 0.0070, 0.0107, 0.0095, 0.0354, 0.0197, 0.0063,
```

```
0.0104, 0.0152, 0.0107, 0.0036, 0.0029, 0.0039, 0.0040, 0.0061,
0.0266, 0.0133, 0.0113, 0.0166, 0.0324, 0.0199, 0.0093, 0.0013,
0.0075, 0.0103, 0.0108, 0.0085, 0.0145, 0.0377, 0.0207, 0.0835,
0.0342, 0.1617, 0.1597, 0.2280, 0.0243, 0.0213, 0.0217, 0.0226,
0.0261, 0.0224, 0.0199, 0.0235, 0.0262, 0.0284,
31,         NWATER      (rain data 2010)
  14,   1,   2,1.000,
 13.0, 0.0254,
 14.0, 0.0000,
  16,   1,  14,1.000,
 10.0, 0.0254,
 11.0, 0.2286,
 12.0, 0.2794,
 13.0, 0.2286,
 14.0, 0.1524,
 15.0, 0.1270,
 16.0, 0.0762,
 17.0, 0.1270,
 18.0, 0.2286,
 19.0, 0.3048,
 20.0, 0.1524,
 21.0, 0.1778,
 22.0, 0.2540,
 23.0, 0.2286,
  17,   1,   9,1.000,
  0.0, 0.2286,
  1.0, 0.1778,
  2.0, 0.1270,
  3.0, 0.0762,
  4.0, 0.0508,
  5.0, 0.0508,
  6.0, 0.0000,
  7.0, 0.0254,
  8.0, 0.0000,
  19,   1,  12,1.000,
  8.0, 0.0508,
  9.0, 0.0762,
 10.0, 0.1270,
 11.0, 0.1778,
 12.0, 0.0254,
 13.0, 0.0000,
 14.0, 0.1270,
 15.0, 0.0762,
 16.0, 0.0508,
 17.0, 0.0000,
 18.0, 0.1778,
 19.0, 0.0000,
  20,   1,  20,1.000,
  0.0, 0.0508,
  1.0, 0.0508,
  2.0, 0.0762,
  3.0, 0.0508,
  4.0, 0.0508,
  5.0, 0.0254,
```

```
 6.0, 0.0508,
 7.0, 0.0254,
 8.0, 0.0254,
 9.0, 0.0000,
14.0, 0.0254,
15.0, 0.0254,
16.0, 0.0508,
17.0, 0.0508,
18.0, 0.0508,
19.0, 0.0508,
20.0, 0.0508,
21.0, 0.0508,
22.0, 0.0508,
23.0, 0.0762,
 21,   1,  24,1.000,
 0.0, 0.0508,
 1.0, 0.0508,
 2.0, 0.0762,
 3.0, 0.0508,
 4.0, 0.0508,
 5.0, 0.0762,
 6.0, 0.0508,
 7.0, 0.0508,
 8.0, 0.0254,
 9.0, 0.0508,
10.0, 0.0508,
11.0, 0.0508,
12.0, 0.0508,
13.0, 0.0508,
14.0, 0.0508,
15.0, 0.0508,
16.0, 0.0762,
17.0, 0.0508,
18.0, 0.0508,
19.0, 0.0762,
20.0, 0.0508,
21.0, 0.0508,
22.0, 0.0508,
23.0, 0.0254,
 22,   1,  16,1.000,
 0.0, 0.0508,
 1.0, 0.0508,
 2.0, 0.0508,
 3.0, 0.0254,
 4.0, 0.0254,
 5.0, 0.0508,
 6.0, 0.0254,
 7.0, 0.0508,
 8.0, 0.0508,
 9.0, 0.0254,
10.0, 0.0000,
11.0, 0.0254,
12.0, 0.0508,
13.0, 0.0254,
```

```
14.0, 0.0254,
15.0, 0.0000,
 24,   1,   2,1.000,
14.0, 0.0254,
15.0, 0.0000,
 31,   1,   5,1.000,
11.0, 0.0254,
12.0, 0.0254,
13.0, 0.0508,
14.0, 0.0254,
15.0, 0.0000,
 32,   1,  16,1.000,
 6.0, 0.0254,
 7.0, 0.0000,
10.0, 0.1270,
11.0, 0.1524,
12.0, 0.2032,
13.0, 0.2286,
14.0, 0.0508,
15.0, 0.1778,
16.0, 0.1778,
17.0, 0.1270,
18.0, 0.0508,
19.0, 0.1016,
20.0, 0.1270,
21.0, 0.0762,
22.0, 0.0254,
23.0, 0.0254,
 33,   1,   4,1.000,
 0.0, 0.0254,
 1.0, 0.0000,
13.0, 0.0254,
14.0, 0.0000,
 35,   1,  17,1.000,
 3.0, 0.0254,
 4.0, 0.0000,
 5.0, 0.0508,
 6.0, 0.0254,
 7.0, 0.0254,
 8.0, 0.0508,
 9.0, 0.0254,
10.0, 0.0254,
11.0, 0.0762,
12.0, 0.0508,
13.0, 0.0000,
15.0, 0.0254,
16.0, 0.0000,
17.0, 0.0254,
18.0, 0.0000,
20.0, 0.0254,
21.0, 0.0000,
 36,   1,  14,1.000,
 0.0, 0.0254,
 1.0, 0.0000,
```

```
 9.0, 0.0254,
10.0, 0.0762,
11.0, 0.0508,
12.0, 0.1016,
13.0, 0.0762,
14.0, 0.0762,
15.0, 0.0762,
16.0, 0.0508,
17.0, 0.0254,
18.0, 0.0254,
19.0, 0.0254,
20.0, 0.0000,
 37,   1,   2,1.000,
13.0, 0.0254,
14.0, 0.0000,
 41,   1,   6,1.000,
10.0, 0.0508,
11.0, 0.1270,
12.0, 0.1524,
13.0, 0.1016,
14.0, 0.0508,
15.0, 0.0000,
 42,   1,   6,1.000,
10.0, 0.0254,
11.0, 0.0508,
12.0, 0.1016,
13.0, 0.1016,
14.0, 0.0508,
15.0, 0.0000,
 43,   1,  14,1.000,
 9.0, 0.1016,
10.0, 0.0762,
11.0, 0.0254,
12.0, 0.0254,
13.0, 0.1270,
14.0, 0.0762,
15.0, 0.0254,
16.0, 0.0000,
17.0, 0.0254,
18.0, 0.0000,
19.0, 0.1016,
20.0, 0.2032,
21.0, 0.1016,
22.0, 0.0000,
 44,   1,  10,1.000,
14.0, 0.0508,
15.0, 0.0762,
16.0, 0.1016,
17.0, 0.0762,
18.0, 0.0254,
19.0, 0.0000,
20.0, 0.0254,
21.0, 0.0254,
22.0, 0.0000,
```

```
23.0, 0.0508,
 45,   1,   7,1.000,
 0.0, 0.0000,
 1.0, 0.0254,
 2.0, 0.0000,
 8.0, 0.0254,
 9.0, 0.0000,
19.0, 0.0508,
20.0, 0.0000,
 46,   1,   5,1.000,
17.0, 0.0254,
18.0, 0.0000,
21.0, 0.0508,
22.0, 0.1016,
23.0, 0.2794,
 47,   1,  20,1.000,
 0.0, 0.1778,
 1.0, 0.1524,
 2.0, 0.2286,
 3.0, 0.1778,
 4.0, 0.1016,
 5.0, 0.0762,
 6.0, 0.1524,
 7.0, 0.1016,
 8.0, 0.1016,
 9.0, 0.0000,
10.0, 0.0254,
11.0, 0.0000,
12.0, 0.0254,
13.0, 0.0000,
14.0, 0.0254,
15.0, 0.0000,
17.0, 0.0254,
18.0, 0.0000,
19.0, 0.0254,
20.0, 0.0000,
 48,   1,   7,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
13.0, 0.0254,
14.0, 0.0000,
21.0, 0.0254,
22.0, 0.0000,
23.0, 0.0508,
 49,   1,   6,1.000,
 0.0, 0.0254,
 1.0, 0.0000,
 2.0, 0.0254,
 3.0, 0.0000,
 4.0, 0.0254,
 5.0, 0.0000,
 50,   1,   2,1.000,
 7.0, 0.0254,
 8.0, 0.0000,
```

```
  53,   1,   2,1.000,
 14.0, 0.0254,
 15.0, 0.0000,
  55,   1,   4,1.000,
 10.0, 0.0254,
 11.0, 0.0762,
 12.0, 0.0254,
 13.0, 0.0000,
  56,   1,   4,1.000,
 11.0, 0.1016,
 12.0, 0.0000,
 16.0, 0.0254,
 17.0, 0.0000,
  57,   1,   5,1.000,
  6.0, 0.0254,
  7.0, 0.0000,
  9.0, 0.0254,
 10.0, 0.0508,
 11.0, 0.0000,
  59,   1,   2,1.000,
  8.0, 0.0254,
  9.0, 0.0000,
  61,   1,   2,1.000,
 10.0, 0.0254,
 11.0, 0.0000,
  62,   1,   6,1.000,
 11.0, 0.1270,
 12.0, 0.1270,
 13.0, 0.1270,
 14.0, 0.0508,
 15.0, 0.0254,
 16.0, 0.0000,
```

***Athol, Brooks-Corey, 2009***

```
Spokane Valley Rathdrum Prairie ATHOL Simulation:  BCATHOL2009.inp
0, 1,                          IPLANT, NGRAV
365, 1, 365,                   IFDEND, IDTBEG, IDTEND
2009, 1, 0, 0, 0,              IYS, NYEARS, ISTEAD, IFLIST, NFLIST
1, 24.0,                       NPRINT, STOPHR
0, 3, 1, 1.0E-4,               ISMETH, INMAX, ISWDIF, DMAXBA
1.0, 1.0E-5, 1.0,              DELMAX, DELMIN, OUTTIM
2.0, 1.0E-05, 0.0, 0.0, 0.0,   RFACT, RAINIF, DHTOL, DHMAX, DHFACT
3, 3, 0,                       KOPT, KEST, WTF
0, 1, 2, 2,                    ITOPBC, IEVOPT, NFHOUR, LOWER
0.0, 2.0E+04, 20.73, 0.0,      HIRRI, HDRY, HTOP, RHA
0, 0, 0,                       IETOPT, ICLOUD, ISHOPT
0, 0,                          IRAIN, HPR
0, 0, 0, 0, 0,                 IHYS, AIRTOL, HYSTOL, HYSMXH, HYFILE
0, 0, 0,                       IHEAT, ICONVH, DMAXHE
0, 0, 0, 0,                    UPPERH, TSMEAN, TSAMP, QHCTOP
0, 0.0, 0.0,                   LOWERH, QHLEAK, TGRAD
0, 0.66, 288.46, 0.24,         IVAPOR, TORT, TSOIL, VAPDIF
```

```
3, 126,                          MATN, NPT
1,    0.00,  1,    1.00,  1,    2.00,  1,    3.00,
1,    4.00,  1,    5.00,  1,    6.00,  1,    7.00,
1,    8.00,  1,    9.00,  1,   10.00,  1,   11.00,
1,   12.00,  1,   13.00,  1,   14.00,  1,   15.00,
1,   16.00,  1,   17.00,  1,   18.00,  1,   19.00,
1,   20.00,  2,   21.00,  2,   22.00,  2,   23.00,
2,   24.00,  2,   25.00,  2,   26.00,  2,   27.00,
2,   28.00,  2,   29.00,  2,   30.00,  2,   31.00,
2,   32.00,  2,   33.00,  2,   34.00,  2,   35.00,
2,   36.00,  2,   37.00,  2,   38.00,  2,   39.00,
2,   40.00,  2,   41.00,  2,   42.00,  2,   43.00,
2,   44.00,  2,   45.00,  2,   46.00,  2,   47.00,
2,   48.00,  2,   49.00,  2,   50.00,  2,   51.00,
2,   52.00,  2,   53.00,  2,   54.00,  2,   55.00,
2,   56.00,  2,   57.00,  2,   58.00,  2,   59.00,
2,   60.00,  2,   61.00,  2,   62.00,  2,   63.00,
2,   64.00,  2,   65.00,  3,   66.00,  3,   67.00
3,   68.00,  3,   69.00,  3,   70.00,  3,   71.00,
3,   72.00,  3,   73.00,  3,   74.00,  3,   75.00,
3,   76.00,  3,   77.00,  3,   78.00,  3,   79.00,
3,   80.00,  3,   81.00,  3,   82.00,  3,   83.00,
3,   84.00,  3,   85.00,  3,   86.00,  3,   87.00,
3,   88.00,  3,   89.00,  3,   90.00,  3,   91.00,
3,   92.00,  3,   93.00,  3,   94.00,  3,   95.00,
3,   96.00,  3,   97.00,  3,   98.00,  3,   99.00,
3,  100.00,  3,  101.00,  3,  102.00,  3,  103.00,
3,  104.00,  3,  105.00,  3,  106.00,  3,  107.00,
3,  108.00,  3,  109.00,  3,  110.00,  3,  111.00,
3,  112.00,  3,  113.00,  3,  114.00,  3,  115.00,
3,  116.00,  3,  117.00,  3,  118.00,  3,  119.00,
3,  120.00,  3,  121.00,  3,  122.00,  3,  123.00,
3,  124.00,  3,  125.00,
Sand Layer #1: 0-20 cm (Brooks-Corey et al.)          Retention
0.42, 0.028, 49.114, 1.7633,                          THET, THTR,
AIRENT, B
Sand Layer #1: 0-20 cm (Brooks-Corey et al.)          Hydraulic
Conductivity
2.0, 35.1, 49.114, 1.7633, 0.5,                       RKMOD, SK,
AIRENK, B, EPIT
Sandy Loam Layer #2: 21-65 cm (Brooks-Corey et al.)   Retention
0.29, 0.018, 32.574, 1.6731,                          THET, THTR,
AIRENT, B
Sandy Loam Layer #2: 21-65 cm (Brooks-Corey et al.)   Hydraulic
Conductivity
2.0, 19.7, 32.574, 1.6731, 0.5,                       RKMOD, SK,
AIRENK, B, EPIT
Loamy Sand Layer #3: 66-125 cm (Brooks-Corey et al.)  Retention
0.20, 0.01, 15.889, 1.3826,                           THET, THTR,
AIRENT, B
Loamy Sand Layer #3: 66-125 cm (Brooks-Corey et al.)  Hydraulic
Conductivity
2.0, 23.0, 15.889, 1.3826, 0.5,                       RKMOD, SK,
AIRENK, B, EPIT
```

```
0,    NDAY
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
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100.0, 100.0, 100.0, 100.0,
100.0, 100.0,
0.0197, 0.0220, 0.0055, -0.0032, 0.0068, 0.0259, 0.0631, 0.1509,
0.1559, 0.0908, 0.0966, 0.1278, 0.0727, 0.0593, 0.0610, 0.0450,
0.0639, 0.0823, 0.0769, 0.1055, 0.0789, 0.0593, 0.0304, 0.0818,
0.0392, 0.0506, 0.1137, 0.1266, 0.1092, 0.1045, 0.0615, 0.0708,
0.0811, 0.1037, 0.0929, 0.0724, 0.0721, 0.0788, 0.0298, 0.0439,
0.0364, 0.0309, 0.0323, 0.0442, 0.0424, 0.0402, 0.0438, 0.0433,
0.0448, 0.0524, 0.0478, 0.0457, 0.0470, 0.0543, 0.0700, 0.0623,
0.0661, 0.0611, 0.0520, 0.0646, 0.0791, 0.0757, 0.0888, 0.0884,
0.1030, 0.0964, 0.0782, 0.0675, 0.0857, 0.0514, 0.0570, 0.0709,
0.0794, 0.1376, 0.1420, 0.1086, 0.1012, 0.1098, 0.1245, 0.1318,
0.1086, 0.1193, 0.1057, 0.1173, 0.1108, 0.1285, 0.1399, 0.1314,
0.1383, 0.1370, 0.1512, 0.1290, 0.1373, 0.1529, 0.1558, 0.1630,
0.1776, 0.1639, 0.1665, 0.1885, 0.1501, 0.1502, 0.1636, 0.1734,
0.1829, 0.1896, 0.1760, 0.1930, 0.1988, 0.2104, 0.2306, 0.3009,
0.2002, 0.1978, 0.2044, 0.2106, 0.1976, 0.2334, 0.2405, 0.2250,
0.2289, 0.2302, 0.2161, 0.2436, 0.2462, 0.2219, 0.2179, 0.2132,
0.2607, 0.2688, 0.2475, 0.2632, 0.2402, 0.2408, 0.2555, 0.2664,
0.2974, 0.2984, 0.3170, 0.2510, 0.2836, 0.2987, 0.3306, 0.3289,
0.3243, 0.2793, 0.2952, 0.3076, 0.3515, 0.4816, 0.3743, 0.3508,
0.3542, 0.3513, 0.3714, 0.4077, 0.3254, 0.3273, 0.3162, 0.2982,
0.3265, 0.3656, 0.3681, 0.3964, 0.3815, 0.3270, 0.3569, 0.3033,
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0.3198, 0.3278, 0.3412, 0.2777, 0.2773, 0.3379, 0.3632, 0.3299,
0.3272, 0.3349, 0.3242, 0.3383, 0.3288, 0.4027, 0.4147, 0.4337,
0.4223, 0.4459, 0.3891, 0.3531, 0.3287, 0.3618, 0.4034, 0.4124,
0.4443, 0.2876, 0.3524, 0.4030, 0.4038, 0.4260, 0.4113, 0.3965,
0.4024, 0.4159, 0.4569, 0.4077, 0.4001, 0.3944, 0.4115, 0.4334,
0.4250, 0.3995, 0.4026, 0.4100, 0.4003, 0.4203, 0.3725, 0.3696,
0.4050, 0.3905, 0.2850, 0.2829, 0.3046, 0.2980, 0.3144, 0.3258,
0.3118, 0.2493, 0.2604, 0.3042, 0.3043, 0.3180, 0.3350, 0.3455,
0.3120, 0.2899, 0.2706, 0.2828, 0.2627, 0.2654, 0.2709, 0.2844,
0.2745, 0.2926, 0.2819, 0.2860, 0.2800, 0.2292, 0.2337, 0.2334,
0.1790, 0.1614, 0.1790, 0.1954, 0.1766, 0.2169, 0.2397, 0.1993,
0.1773, 0.1950, 0.1789, 0.1682, 0.1435, 0.1578, 0.1568, 0.1434,
0.1315, 0.1671, 0.1636, 0.1520, 0.1879, 0.1641, 0.2659, 0.1259,
0.1112, 0.1273, 0.1082, 0.0847, 0.1405, 0.1017, 0.0953, 0.0796,
0.0821, 0.0952, 0.0726, 0.0667, 0.0627, 0.0761, 0.0575, 0.0523,
0.0720, 0.0587, 0.0548, 0.0677, 0.0545, 0.0512, 0.0312, 0.0538,
0.0470, 0.0466, 0.0053, 0.0455, 0.0425, 0.0221, -0.0272, -0.0072,
0.0491, 0.0355, 0.0292, 0.0253, 0.0243, 0.0215, 0.0330, 0.0153,
0.0213, 0.0174, 0.0257, 0.0216, 0.0208, 0.0254, 0.0113, 0.0488,
0.0754, 0.0520, 0.0226, 0.0710, 0.0680, 0.0193, 0.0341, 0.0150,
0.0152, 0.0191, 0.0198, 0.0080, 0.0101, 0.0188, 0.0211, 0.0186,
0.0108, 0.0276, 0.0259, 0.1256, 0.0498, 0.0289, 0.1192, 0.0133,
0.0091, 0.0028, 0.0520, 0.0133, 0.0016, -0.0011, 0.0106, 0.0123,
0.0070, 0.0107, 0.0095, 0.0354, 0.0197, 0.0063, 0.0104, 0.0152,
0.0107, 0.0036, 0.0029, 0.0039, 0.0040,
168,        NWATER      (rain data 2009)
     1,   1,  17,1.000,
  3.0, 0.0254,
  4.0, 0.0000,
  5.0, 0.0254,
  6.0, 0.0254,
  7.0, 0.0762,
  8.0, 0.0762,
  9.0, 0.0762,
 10.0, 0.0762,
 11.0, 0.0254,
 12.0, 0.0508,
 13.0, 0.0508,
 14.0, 0.0508,
 15.0, 0.0508,
 16.0, 0.0254,
 17.0, 0.0000,
 18.0, 0.0254,
 19.0, 0.0000,
   2,   1,  11,1.000,
  0.0, 0.0508,
  1.0, 0.0762,
  2.0, 0.0762,
  3.0, 0.0000,
  4.0, 0.0762,
  5.0, 0.1270,
  6.0, 0.1016,
  7.0, 0.0508,
  8.0, 0.0000,
```

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 9.0, 0.0254,
10.0, 0.0000,
  4,   1,   5,1.000,
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12.0, 0.0000,
14.0, 0.1270,
15.0, 0.0254,
16.0, 0.0000,
  5,   1,  18,1.000,
 1.0, 0.0508,
 2.0, 0.0508,
 3.0, 0.0508,
 4.0, 0.0254,
 5.0, 0.0000,
 6.0, 0.0254,
 7.0, 0.0508,
 8.0, 0.1016,
 9.0, 0.1524,
10.0, 0.0762,
11.0, 0.0508,
12.0, 0.0762,
13.0, 0.0254,
14.0, 0.0000,
15.0, 0.0254,
16.0, 0.0000,
18.0, 0.0762,
19.0, 0.0000,
  6,   1,  20,1.000,
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 4.0, 0.0000,
 6.0, 0.0254,
 7.0, 0.0508,
 8.0, 0.0254,
 9.0, 0.0508,
10.0, 0.0508,
11.0, 0.1778,
12.0, 0.1016,
13.0, 0.4064,
14.0, 0.0000,
15.0, 0.1016,
16.0, 0.1016,
17.0, 0.1778,
18.0, 0.1778,
19.0, 0.1270,
20.0, 0.0254,
21.0, 0.0254,
22.0, 0.0254,
23.0, 0.0000,
  7,   1,  14,1.000,
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 2.0, 0.0000,
 8.0, 0.0508,
 9.0, 0.0254,
10.0, 0.0254,
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11.0, 0.0254,
12.0, 0.1016,
13.0, 0.0000,
14.0, 0.0254,
15.0, 0.0000,
19.0, 0.0254,
20.0, 0.0762,
21.0, 0.0508,
22.0, 0.0000,
  8,   1,  12,1.000,
 1.0, 0.0254,
 2.0, 0.0000,
 8.0, 0.1016,
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10.0, 0.0254,
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12.0, 0.1016,
13.0, 0.0254,
14.0, 0.0000,
21.0, 0.0254,
22.0, 0.0254,
23.0, 0.0000,
  9,   1,   4,1.000,
 2.0, 0.0254,
 3.0, 0.0000,
 6.0, 0.0254,
 7.0, 0.0000,
 10,   1,   9,1.000,
11.0, 0.0254,
12.0, 0.1016,
13.0, 0.0508,
14.0, 0.0000,
15.0, 0.0508,
16.0, 0.0254,
17.0, 0.0000,
22.0, 0.0508,
23.0, 0.0254,
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 1.0, 0.0254,
 2.0, 0.0000,
 3.0, 0.0254,
 4.0, 0.0508,
 5.0, 0.0254,
 6.0, 0.0762,
 7.0, 0.0254,
 8.0, 0.0000,
 12,   1,   2,1.000,
18.0, 0.0254,
19.0, 0.0000,
 13,   1,   6,1.000,
14.0, 0.0254,
15.0, 0.0000,
18.0, 0.0254,
```

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19.0, 0.0000,
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23.0, 0.0000,
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 8.0, 0.0254,
 9.0, 0.0000,
 24,   1,   4,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
 8.0, 0.0254,
 9.0, 0.0000,
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12.0, 0.0254,
13.0, 0.0000,
14.0, 0.0254,
15.0, 0.0000,
20.0, 0.0254,
21.0, 0.0000,
 26,   1,   2,1.000,
13.0, 0.0254,
14.0, 0.0000,
 27,   1,   6,1.000,
12.0, 0.0254,
13.0, 0.0000,
14.0, 0.0254,
15.0, 0.0000,
17.0, 0.0254,
18.0, 0.0000,
 28,   1,   2,1.000,
15.0, 0.0254,
16.0, 0.0000,
 29,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
 30,   1,   4,1.000,
12.0, 0.0254,
13.0, 0.0000,
15.0, 0.0254,
16.0, 0.0000,
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11.0, 0.0254,
12.0, 0.0000,
 42,   1,   4,1.000,
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10.0, 0.0254,
11.0, 0.0254,
12.0, 0.0000,
 45,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0000,
 46,   1,   5,1.000,
 9.0, 0.0254,
10.0, 0.0508,
11.0, 0.0254,
```

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10.0, 0.1270,
11.0, 0.1016,
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13.0, 0.0000,
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21.0, 0.0254,
22.0, 0.0000,
23.0, 0.0254,
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13.0, 0.0254,
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20.0, 0.4064,
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 5.0, 0.0254,
 6.0, 0.0254,
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 9.0, 0.0762,
10.0, 0.0508,
11.0, 0.1524,
12.0, 0.0000,
13.0, 0.0000,
15.0, 0.0254,
16.0, 0.0000,
20.0, 0.0254,
21.0, 0.1016,
22.0, 0.0254,
23.0, 0.0254,
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 7.0, 0.0000,
 9.0, 0.1016,
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11.0, 0.0254,
12.0, 0.0508,
13.0, 0.0254,
14.0, 0.0000,
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 9.0, 0.0000,
12.0, 0.0762,
13.0, 0.1270,
14.0, 0.0508,
15.0, 0.0254,
16.0, 0.0000,
 59,   1,  10,1.000,
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 9.0, 0.0254,
10.0, 0.0000,
11.0, 0.0762,
12.0, 0.0762,
13.0, 0.0254,
14.0, 0.0254,
15.0, 0.0000,
16.0, 0.0254,
17.0, 0.0000,
 60,   1,  10,1.000,
10.0, 0.0254,
11.0, 0.0000,
16.0, 0.0254,
17.0, 0.0762,
18.0, 0.0762,
19.0, 0.1524,
20.0, 0.0762,
21.0, 0.1016,
22.0, 0.1016,
23.0, 0.0000,
```

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 61,   1,  16,1.000,
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 7.0, 0.0000,
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10.0, 0.0254,
11.0, 0.0508,
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13.0, 0.1270,
14.0, 0.0000,
15.0, 0.0508,
16.0, 0.1016,
17.0, 0.1016,
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19.0, 0.2540,
20.0, 0.3302,
21.0, 0.1778,
22.0, 0.0000,
 62,   1,  12,1.000,
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 1.0, 0.0762,
 2.0, 0.1016,
 3.0, 0.0000,
 4.0, 0.0508,
 5.0, 0.0254,
 6.0, 0.0762,
 7.0, 0.0000,
13.0, 0.0254,
14.0, 0.0000,
23.0, 0.1270,
24.0, 0.0000,
 63,   1,  14,1.000,
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 1.0, 0.0000,
 2.0, 0.0762,
 3.0, 0.1270,
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 5.0, 0.0254,
 6.0, 0.0254,
 7.0, 0.0508,
 8.0, 0.0254,
 9.0, 0.0254,
10.0, 0.0000,
22.0, 0.0254,
23.0, 0.0254,
24.0, 0.0000,
 64,   1,  12,1.000,
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 1.0, 0.0000,
 4.0, 0.0254,
 5.0, 0.0254,
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 7.0, 0.0254,
 8.0, 0.0762,
 9.0, 0.1270,
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10.0, 0.0762,
11.0, 0.0508,
12.0, 0.0762,
13.0, 0.0000,
 65,   1,   5,1.000,
 9.0, 0.0254,
10.0, 0.0254,
11.0, 0.0508,
12.0, 0.0254,
13.0, 0.0000,
 66,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0000,
 67,   1,   4,1.000,
12.0, 0.0254,
13.0, 0.0508,
14.0, 0.0254,
15.0, 0.0000,
 68,   1,   3,1.000,
10.0, 0.0254,
11.0, 0.0508,
12.0, 0.0000,
 70,   1,   4,1.000,
14.0, 0.0254,
15.0, 0.0508,
16.0, 0.0254,
17.0, 0.0000,
 71,   1,   4,1.000,
11.0, 0.0254,
12.0, 0.0254,
13.0, 0.0254,
14.0, 0.0000,
 73,   1,  11,1.000,
12.0, 0.0254,
13.0, 0.0000,
16.0, 0.0508,
17.0, 0.1016,
18.0, 0.0254,
19.0, 0.0000,
20.0, 0.1778,
21.0, 0.2286,
22.0, 0.0762,
23.0, 0.1270,
24.0, 0.0000,
 74,   1,  17,1.000,
 0.0, 0.1270,
 1.0, 0.1778,
 2.0, 0.2286,
 3.0, 0.1524,
 4.0, 0.1270,
 5.0, 0.0508,
 6.0, 0.0254,
 7.0, 0.0508,
 8.0, 0.1270,
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15.0, 0.0254,
16.0, 0.0000,
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13.0, 0.0508,
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22.0, 0.0508,
23.0, 0.0254,
24.0, 0.0000,
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12.0, 0.0000,
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24.0, 0.0000,
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13.0, 0.0254,
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23.0, 0.0000,
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12.0, 0.0000,
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12.0, 0.0762,
13.0, 0.0508,
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17.0, 0.0508,
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12.0, 0.0000,
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22.0, 0.0254,
23.0, 0.0254,
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14.0, 0.0508,
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19.0, 0.0254,
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159,   1,   7,1.000,
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19.0, 0.0254,
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19.0, 0.1016,
20.0, 0.1016,
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14.0, 0.0762,
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 2.0, 0.0508,
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21.0, 0.0254,
22.0, 0.0000,
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10.0, 0.0254,
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22.0, 0.0762,
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176,   1,   3,1.000,
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 5.0, 0.0508,
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10.0, 0.0508,
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12.0, 0.0508,
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16.0, 0.0508,
17.0, 0.0254,
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10.0, 0.0254,
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16.0, 0.0000,
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10.0, 0.0254,
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18.0, 0.0762,
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22.0, 0.0254,
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10.0, 0.0254,
11.0, 0.0000,
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10.0, 0.0254,
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16.0, 0.0508,
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23.0, 0.0254,
24.0, 0.0000,
277,   1,  18,1.000,
 2.0, 0.0254,
 3.0, 0.0000,
 4.0, 0.0254,
 5.0, 0.0000,
 7.0, 0.0254,
 8.0, 0.0000,
 9.0, 0.0254,
10.0, 0.0000,
11.0, 0.0254,
12.0, 0.0000,
13.0, 0.0254,
14.0, 0.0000,
15.0, 0.0254,
16.0, 0.0000,
19.0, 0.0254,
20.0, 0.0000,
23.0, 0.0254,
24.0, 0.0000,
278,   1,   8,1.000,
 4.0, 0.0254,
```

```
 5.0, 0.0000,
 8.0, 0.0254,
 9.0, 0.0000,
12.0, 0.0254,
13.0, 0.0000,
16.0, 0.0254,
17.0, 0.0000,
279,   1,   5,1.000,
 8.0, 0.0508,
 9.0, 0.0254,
10.0, 0.0508,
11.0, 0.0254,
12.0, 0.0000,
280,   1,   4,1.000,
14.0, 0.0508,
15.0, 0.0508,
16.0, 0.0254,
17.0, 0.0000,
281,   1,   2,1.000,
 7.0, 0.0254,
 8.0, 0.0000,
286,   1,   8,1.000,
17.0, 0.0762,
18.0, 0.0254,
19.0, 0.0508,
20.0, 0.0508,
21.0, 0.0508,
22.0, 0.0508,
23.0, 0.1016,
24.0, 0.0000,
287,   1,  24,1.000,
 0.0, 0.0762,
 1.0, 0.1270,
 2.0, 0.1270,
 3.0, 0.1270,
 4.0, 0.1524,
 5.0, 0.1524,
 6.0, 0.1270,
 7.0, 0.1016,
 8.0, 0.1270,
 9.0, 0.1016,
10.0, 0.1016,
11.0, 0.1016,
12.0, 0.1016,
13.0, 0.1016,
14.0, 0.1016,
15.0, 0.1016,
16.0, 0.1016,
17.0, 0.0762,
18.0, 0.0762,
19.0, 0.0508,
20.0, 0.0508,
21.0, 0.0762,
22.0, 0.0508,
```

```
23.0, 0.0508,
288,   1,   3,1.000,
 0.0, 0.0254,
 1.0, 0.0254,
 2.0, 0.0000,
290,   1,   6,1.000,
19.0, 0.1016,
20.0, 0.1016,
21.0, 0.0762,
22.0, 0.0762,
23.0, 0.0508,
24.0, 0.0000,
293,   1,   2,1.000,
 3.0, 0.0254,
 4.0, 0.0000,
294,   1,   7,1.000,
17.0, 0.0254,
18.0, 0.0000,
19.0, 0.0508,
20.0, 0.0508,
21.0, 0.0254,
22.0, 0.0254,
23.0, 0.0000,
296,   1,  16,1.000,
 8.0, 0.0254,
 9.0, 0.0254,
10.0, 0.0254,
11.0, 0.0254,
12.0, 0.0254,
13.0, 0.0254,
14.0, 0.0508,
15.0, 0.0254,
16.0, 0.0254,
17.0, 0.0508,
18.0, 0.0254,
19.0, 0.0254,
20.0, 0.0508,
21.0, 0.0254,
22.0, 0.0254,
23.0, 0.0508,
297,   1,  23,1.000,
 0.0, 0.0254,
 1.0, 0.0254,
 2.0, 0.0254,
 3.0, 0.0254,
 4.0, 0.0254,
 5.0, 0.0508,
 6.0, 0.0254,
 7.0, 0.0000,
 8.0, 0.0508,
 9.0, 0.0000,
10.0, 0.0254,
11.0, 0.0254,
12.0, 0.0254,
```

```
13.0, 0.0254,
14.0, 0.0254,
15.0, 0.0254,
16.0, 0.0254,
17.0, 0.0000,
18.0, 0.0254,
19.0, 0.0254,
20.0, 0.0000,
21.0, 0.0254,
22.0, 0.0000,
298,   1,  11,1.000,
10.0, 0.0254,
11.0, 0.0508,
12.0, 0.1016,
13.0, 0.0762,
14.0, 0.0254,
15.0, 0.0508,
16.0, 0.0000,
18.0, 0.0254,
19.0, 0.0000,
22.0, 0.0254,
23.0, 0.1270,
299,   1,  20,1.000,
 0.0, 0.1016,
 1.0, 0.1524,
 2.0, 0.1016,
 3.0, 0.0000,
 4.0, 0.0762,
 5.0, 0.1524,
 6.0, 0.2032,
 7.0, 0.2032,
 8.0, 0.2286,
 9.0, 0.2794,
10.0, 0.3302,
11.0, 0.3810
12.0, 0.4318,
13.0, 0.5080,
14.0, 0.4064,
15.0, 0.3556,
16.0, 0.3048,
17.0, 0.2794,
18.0, 0.1778,
19.0, 0.0000,
302,   1,  10,1.000,
10.0, 0.1016,
11.0, 0.0000,
12.0, 0.0254,
13.0, 0.0000,
18.0, 0.0254,
19.0, 0.0000,
20.0, 0.0254,
21.0, 0.0254,
22.0, 0.0254,
23.0, 0.0254,
```

```
303,   1,  10,1.000,
 0.0, 0.0254,
 1.0, 0.0254,
 2.0, 0.0000,
 3.0, 0.0254,
 4.0, 0.0000,
 6.0, 0.0254,
 7.0, 0.0000,
 9.0, 0.0254,
10.0, 0.0000,
23.0, 0.0254,
304,   1,   8,1.000,
 0.0, 0.0254,
 1.0, 0.0254,
 2.0, 0.0000,
 3.0, 0.0254,
 4.0, 0.0508,
 5.0, 0.0000,
13.0, 0.0254,
14.0, 0.0000,
308,   1,   2,1.000,
 8.0, 0.0254,
 9.0, 0.0000,
309,   1,   6,1.000,
18.0, 0.0254,
19.0, 0.0254,
20.0, 0.0508,
21.0, 0.0508,
22.0, 0.0762,
23.0, 0.0508,
310,   1,  22,1.000,
 0.0, 0.0762,
 1.0, 0.0762,
 2.0, 0.0762,
 3.0, 0.0508,
 4.0, 0.0762,
 5.0, 0.0508,
 6.0, 0.0508,
 7.0, 0.0254,
 8.0, 0.0508,
 9.0, 0.0254,
10.0, 0.0508,
11.0, 0.0254,
12.0, 0.0254,
13.0, 0.0254,
14.0, 0.0254,
15.0, 0.0254,
16.0, 0.0000,
17.0, 0.0254,
18.0, 0.0254,
19.0, 0.0000,
22.0, 0.0254,
23.0, 0.0000,
311,   1,  21,1.000,
```

```
 4.0, 0.0254,
 5.0, 0.0254,
 6.0, 0.0254,
 7.0, 0.0254,
 8.0, 0.0254,
 9.0, 0.0254,
10.0, 0.0254,
11.0, 0.0000,
12.0, 0.0254,
13.0, 0.0254,
14.0, 0.0254,
15.0, 0.0000,
16.0, 0.0254,
17.0, 0.0000,
18.0, 0.0254,
19.0, 0.0254,
20.0, 0.0254,
21.0, 0.0000,
22.0, 0.0254,
23.0, 0.0254,
24.0, 0.0000,
312,   1,  18,1.000,
 1.0, 0.0254,
 2.0, 0.0000,
 3.0, 0.0254,
 4.0, 0.0000,
 5.0, 0.0254,
 6.0, 0.0000,
 7.0, 0.0254,
 8.0, 0.0000,
 9.0, 0.0254,
10.0, 0.0000,
12.0, 0.0254,
13.0, 0.0000,
15.0, 0.0254,
16.0, 0.0000,
17.0, 0.0254,
18.0, 0.0000,
21.0, 0.0254,
22.0, 0.0000,
313,   1,  11,1.000,
 1.0, 0.0254,
 2.0, 0.0000,
 5.0, 0.0254,
 6.0, 0.0000,
 8.0, 0.0254,
 9.0, 0.0254,
10.0, 0.0000,
20.0, 0.0254,
21.0, 0.0762,
22.0, 0.0508,
23.0, 0.0254,
314,   1,  12,1.000,
 0.0, 0.0254,
```

```
 1.0, 0.0254,
 2.0, 0.0254,
 3.0, 0.0254,
 4.0, 0.0254,
 5.0, 0.0254,
 6.0, 0.0000,
 7.0, 0.0254,
 8.0, 0.0254,
 9.0, 0.0000,
10.0, 0.0254,
11.0, 0.0000,
315,   1,   2,1.000,
 8.0, 0.0762,
 9.0, 0.0000,
317,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
318,   1,   5,1.000,
11.0, 0.0254,
12.0, 0.0254,
13.0, 0.0000,
14.0, 0.0254,
15.0, 0.0000,
319,   1,   7,1.000,
10.0, 0.0254,
11.0, 0.0000,
12.0, 0.0762,
13.0, 0.0254,
14.0, 0.0254,
15.0, 0.0254,
16.0, 0.0000,
320,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0000,
321,   1,   3,1.000,
13.0, 0.0508,
14.0, 0.0508,
15.0, 0.0000,
323,   1,  10,1.000,
12.0, 0.0508,
13.0, 0.0508,
14.0, 0.0508,
15.0, 0.0508,
16.0, 0.0508,
17.0, 0.0508,
18.0, 0.0508,
19.0, 0.0508,
20.0, 0.0508,
21.0, 0.0000,
324,  1,   7,1.000,
 5.0, 0.0762,
 6.0, 0.0508,
 7.0, 0.0000,
 8.0, 0.0508,
```

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 9.0, 0.0762,
10.0, 0.0254,
11.0, 0.0000,
325,   1,  12,1.000,
 0.0, 0.0254,
 1.0, 0.0254,
 2.0, 0.0254,
 3.0, 0.0254,
 4.0, 0.0000,
 8.0, 0.0254,
 9.0, 0.0000,
11.0, 0.0254,
12.0, 0.0254,
13.0, 0.0000,
14.0, 0.0254,
15.0, 0.0000,
326,   1,  11,1.000,
13.0, 0.1016,
14.0, 0.0762,
15.0, 0.0254,
16.0, 0.0508,
17.0, 0.0508,
18.0, 0.0508,
19.0, 0.0254,
20.0, 0.0254,
21.0, 0.0508,
22.0, 0.0254,
23.0, 0.0508,
327,   1,  11,1.000,
 0.0, 0.0508,
 1.0, 0.0254,
 2.0, 0.0254,
 3.0, 0.0000,
 8.0, 0.0254,
 9.0, 0.0508,
10.0, 0.0508,
11.0, 0.0762,
12.0, 0.0508,
13.0, 0.0508,
14.0, 0.0000,
328,   1,   9,1.000,
 9.0, 0.0508,
10.0, 0.1270,
11.0, 0.1524,
12.0, 0.0762,
13.0, 0.0508,
14.0, 0.0254,
15.0, 0.0000,
17.0, 0.0254,
18.0, 0.0000,
329,   1,   2,1.000,
 2.0, 0.0254,
 3.0, 0.0000,
330,   1,   9,1.000,
```

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14.0, 0.0508,
15.0, 0.0762,
16.0, 0.0762,
17.0, 0.0254,
18.0, 0.0508,
19.0, 0.0000,
20.0, 0.0254,
21.0, 0.0000,
23.0, 0.0254,
331,   1,  19,1.000,
 0.0, 0.0254,
 1.0, 0.0508,
 2.0, 0.0508,
 3.0, 0.0762,
 4.0, 0.0508,
 5.0, 0.0762,
 6.0, 0.0508,
 7.0, 0.0762,
 8.0, 0.0508,
 9.0, 0.0508,
10.0, 0.0762,
11.0, 0.0254,
12.0, 0.0508,
13.0, 0.0508,
14.0, 0.0254,
15.0, 0.0254,
16.0, 0.0254,
17.0, 0.0254,
18.0, 0.0000,
348,   1,   2,1.000,
13.0, 0.0254,
14.0, 0.0000,
350,   1,  14,1.000,
10.0, 0.0254,
11.0, 0.2286,
12.0, 0.2794,
13.0, 0.2286,
14.0, 0.1524,
15.0, 0.1270,
16.0, 0.0762,
17.0, 0.1270,
18.0, 0.2286,
19.0, 0.3048,
20.0, 0.1524,
21.0, 0.1778,
22.0, 0.2540,
23.0, 0.2286,
351,   1,   9,1.000,
 0.0, 0.2286,
 1.0, 0.1778,
 2.0, 0.1270,
 3.0, 0.0762,
 4.0, 0.0508,
 5.0, 0.0508,
```

```
 6.0, 0.0000,
 7.0, 0.0254,
 8.0, 0.0000,
353,   1,  12,1.000,
 8.0, 0.0508,
 9.0, 0.0762,
10.0, 0.1270,
11.0, 0.1778,
12.0, 0.0254,
13.0, 0.0000,
14.0, 0.1270,
15.0, 0.0762,
16.0, 0.0508,
17.0, 0.0000,
18.0, 0.1778,
19.0, 0.0000,
354,   1,  20,1.000,
 0.0, 0.0508,
 1.0, 0.0508,
 2.0, 0.0762,
 3.0, 0.0508,
 4.0, 0.0508,
 5.0, 0.0254,
 6.0, 0.0508,
 7.0, 0.0254,
 8.0, 0.0254,
 9.0, 0.0000,
14.0, 0.0254,
15.0, 0.0254,
16.0, 0.0508,
17.0, 0.0508,
18.0, 0.0508,
19.0, 0.0508,
20.0, 0.0508,
21.0, 0.0508,
22.0, 0.0508,
23.0, 0.0762,
355,   1,  24,1.000,
 0.0, 0.0508,
 1.0, 0.0508,
 2.0, 0.0762,
 3.0, 0.0508,
 4.0, 0.0508,
 5.0, 0.0762,
 6.0, 0.0508,
 7.0, 0.0508,
 8.0, 0.0254,
 9.0, 0.0508,
10.0, 0.0508,
11.0, 0.0508,
12.0, 0.0508,
13.0, 0.0508,
14.0, 0.0508,
15.0, 0.0508,
```

```
 16.0, 0.0762,
 17.0, 0.0508,
 18.0, 0.0508,
 19.0, 0.0762,
 20.0, 0.0508,
 21.0, 0.0508,
 22.0, 0.0508,
 23.0, 0.0254,
 356,   1,  16,1.000,
  0.0, 0.0508,
  1.0, 0.0508,
  2.0, 0.0508,
  3.0, 0.0254,
  4.0, 0.0254,
  5.0, 0.0508,
  6.0, 0.0254,
  7.0, 0.0508,
  8.0, 0.0508,
  9.0, 0.0254,
 10.0, 0.0000,
 11.0, 0.0254,
 12.0, 0.0508,
 13.0, 0.0254,
 14.0, 0.0254,
 15.0, 0.0000,
 358,   1,   2,1.000,
 14.0, 0.0254,
 15.0, 0.0000,
 365,   1,   5,1.000,
 11.0, 0.0254,
 12.0, 0.0254,
 13.0, 0.0508,
 14.0, 0.0254,
 15.0, 0.0000,
```

***Athol, Brooks-Corey, 2010***

```
Spokane Valley Rathdrum Prairie ATHOL Simulation:  BCATHOL2010.inp
0, 1,                          IPLANT, NGRAV
62, 1, 62,                     IFDEND, IDTBEG, IDTEND
2010, 1, 0, 0, 0,              IYS, NYEARS, ISTEAD, IFLIST, NFLIST
1, 24.0,                       NPRINT, STOPHR
0, 3, 1, 1.0E-4,               ISMETH, INMAX, ISWDIF, DMAXBA
1.0, 1.0E-5, 1.0,              DELMAX, DELMIN, OUTTIM
2.0, 1.0E-05, 0.0, 0.0, 0.0,   RFACT, RAINIF, DHTOL, DHMAX, DHFACT
3, 3, 0,                       KOPT, KEST, WTF
0, 1, 2, 2,                    ITOPBC, IEVOPT, NFHOUR, LOWER
0.0, 2.0E+04, 20.73, 0.0,      HIRRI, HDRY, HTOP, RHA
0, 0, 0,                       IETOPT, ICLOUD, ISHOPT
0, 0,                          IRAIN, HPR
0, 0, 0, 0, 0,                 IHYS, AIRTOL, HYSTOL, HYSMXH, HYFILE
0, 0, 0,                       IHEAT, ICONVH, DMAXHE
0, 0, 0, 0,                    UPPERH, TSMEAN, TSAMP, QHCTOP
```

```
0, 0.0, 0.0,                    LOWERH, QHLEAK, TGRAD
0, 0.66, 288.46, 0.24,          IVAPOR, TORT, TSOIL, VAPDIF
3, 126,                         MATN, NPT
1,    0.00,  1,    1.00,  1,    2.00,  1,    3.00,
1,    4.00,  1,    5.00,  1,    6.00,  1,    7.00,
1,    8.00,  1,    9.00,  1,   10.00,  1,   11.00,
1,   12.00,  1,   13.00,  1,   14.00,  1,   15.00,
1,   16.00,  1,   17.00,  1,   18.00,  1,   19.00,
1,   20.00,  2,   21.00,  2,   22.00,  2,   23.00,
2,   24.00,  2,   25.00,  2,   26.00,  2,   27.00,
2,   28.00,  2,   29.00,  2,   30.00,  2,   31.00,
2,   32.00,  2,   33.00,  2,   34.00,  2,   35.00,
2,   36.00,  2,   37.00,  2,   38.00,  2,   39.00,
2,   40.00,  2,   41.00,  2,   42.00,  2,   43.00,
2,   44.00,  2,   45.00,  2,   46.00,  2,   47.00,
2,   48.00,  2,   49.00,  2,   50.00,  2,   51.00,
2,   52.00,  2,   53.00,  2,   54.00,  2,   55.00,
2,   56.00,  2,   57.00,  2,   58.00,  2,   59.00,
2,   60.00,  2,   61.00,  2,   62.00,  2,   63.00,
2,   64.00,  2,   65.00,  3,   66.00,  3,   67.00
3,   68.00,  3,   69.00,  3,   70.00,  3,   71.00,
3,   72.00,  3,   73.00,  3,   74.00,  3,   75.00,
3,   76.00,  3,   77.00,  3,   78.00,  3,   79.00,
3,   80.00,  3,   81.00,  3,   82.00,  3,   83.00,
3,   84.00,  3,   85.00,  3,   86.00,  3,   87.00,
3,   88.00,  3,   89.00,  3,   90.00,  3,   91.00,
3,   92.00,  3,   93.00,  3,   94.00,  3,   95.00,
3,   96.00,  3,   97.00,  3,   98.00,  3,   99.00,
3,  100.00,  3,  101.00,  3,  102.00,  3,  103.00,
3,  104.00,  3,  105.00,  3,  106.00,  3,  107.00,
3,  108.00,  3,  109.00,  3,  110.00,  3,  111.00,
3,  112.00,  3,  113.00,  3,  114.00,  3,  115.00,
3,  116.00,  3,  117.00,  3,  118.00,  3,  119.00,
3,  120.00,  3,  121.00,  3,  122.00,  3,  123.00,
3,  124.00,  3,  125.00,
Sand Layer #1: 0-20 cm (Brooks-Corey et al.)          Retention
0.42, 0.028, 49.114, 1.7633,                          THET, THTR,
AIRENT, B
Sand Layer #1: 0-20 cm (Brooks-Corey et al.)          Hydraulic
Conductivity
2.0, 35.1, 49.114, 1.7633, 0.5,                       RKMOD, SK,
AIRENK, B, EPIT
Sandy Loam Layer #2: 21-65 cm (Brooks-Corey et al.)   Retention
0.29, 0.018, 32.574, 1.6731,                          THET, THTR,
AIRENT, B
Sandy Loam Layer #2: 21-65 cm (Brooks-Corey et al.)   Hydraulic
Conductivity
2.0, 19.7, 32.574, 1.6731, 0.5,                       RKMOD, SK,
AIRENK, B, EPIT
Loamy Sand Layer #3: 66-125 cm (Brooks-Corey et al.)  Retention
0.20, 0.01, 15.889, 1.3826,                           THET, THTR,
AIRENT, B
Loamy Sand Layer #3: 66-125 cm (Brooks-Corey et al.)  Hydraulic
Conductivity
```

```
2.0, 23.0, 15.889, 1.3826, 0.5,                        RKMOD, SK,
AIRENK, B, EPIT
0,    NDAY
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0,
0.0211, 0.0186, 0.0108, 0.0276, 0.0259, 0.1256, 0.0498, 0.0289,
0.1192, 0.0133, 0.0091, 0.0028, 0.0520, 0.0133, 0.0016, -0.0011,
0.0106, 0.0123, 0.0070, 0.0107, 0.0095, 0.0354, 0.0197, 0.0063,
0.0104, 0.0152, 0.0107, 0.0036, 0.0029, 0.0039, 0.0040, 0.0061,
0.0266, 0.0133, 0.0113, 0.0166, 0.0324, 0.0199, 0.0093, 0.0013,
0.0075, 0.0103, 0.0108, 0.0085, 0.0145, 0.0377, 0.0207, 0.0835,
0.0342, 0.1617, 0.1597, 0.2280, 0.0243, 0.0213, 0.0217, 0.0226,
0.0261, 0.0224, 0.0199, 0.0235, 0.0262, 0.0284,
31,         NWATER      (rain data 2010)
  14,   1,   2,1.000,
 13.0, 0.0254,
 14.0, 0.0000,
  16,   1,  14,1.000,
 10.0, 0.0254,
 11.0, 0.2286,
 12.0, 0.2794,
 13.0, 0.2286,
 14.0, 0.1524,
 15.0, 0.1270,
```

```
16.0, 0.0762,
17.0, 0.1270,
18.0, 0.2286,
19.0, 0.3048,
20.0, 0.1524,
21.0, 0.1778,
22.0, 0.2540,
23.0, 0.2286,
 17,   1,   9,1.000,
 0.0, 0.2286,
 1.0, 0.1778,
 2.0, 0.1270,
 3.0, 0.0762,
 4.0, 0.0508,
 5.0, 0.0508,
 6.0, 0.0000,
 7.0, 0.0254,
 8.0, 0.0000,
 19,   1,  12,1.000,
 8.0, 0.0508,
 9.0, 0.0762,
10.0, 0.1270,
11.0, 0.1778,
12.0, 0.0254,
13.0, 0.0000,
14.0, 0.1270,
15.0, 0.0762,
16.0, 0.0508,
17.0, 0.0000,
18.0, 0.1778,
19.0, 0.0000,
 20,   1,  20,1.000,
 0.0, 0.0508,
 1.0, 0.0508,
 2.0, 0.0762,
 3.0, 0.0508,
 4.0, 0.0508,
 5.0, 0.0254,
 6.0, 0.0508,
 7.0, 0.0254,
 8.0, 0.0254,
 9.0, 0.0000,
14.0, 0.0254,
15.0, 0.0254,
16.0, 0.0508,
17.0, 0.0508,
18.0, 0.0508,
19.0, 0.0508,
20.0, 0.0508,
21.0, 0.0508,
22.0, 0.0508,
23.0, 0.0762,
 21,   1,  24,1.000,
 0.0, 0.0508,
```

```
 1.0, 0.0508,
 2.0, 0.0762,
 3.0, 0.0508,
 4.0, 0.0508,
 5.0, 0.0762,
 6.0, 0.0508,
 7.0, 0.0508,
 8.0, 0.0254,
 9.0, 0.0508,
10.0, 0.0508,
11.0, 0.0508,
12.0, 0.0508,
13.0, 0.0508,
14.0, 0.0508,
15.0, 0.0508,
16.0, 0.0762,
17.0, 0.0508,
18.0, 0.0508,
19.0, 0.0762,
20.0, 0.0508,
21.0, 0.0508,
22.0, 0.0508,
23.0, 0.0254,
 22,   1,  16,1.000,
 0.0, 0.0508,
 1.0, 0.0508,
 2.0, 0.0508,
 3.0, 0.0254,
 4.0, 0.0254,
 5.0, 0.0508,
 6.0, 0.0254,
 7.0, 0.0508,
 8.0, 0.0508,
 9.0, 0.0254,
10.0, 0.0000,
11.0, 0.0254,
12.0, 0.0508,
13.0, 0.0254,
14.0, 0.0254,
15.0, 0.0000,
 24,   1,   2,1.000,
14.0, 0.0254,
15.0, 0.0000,
 31,   1,   5,1.000,
11.0, 0.0254,
12.0, 0.0254,
13.0, 0.0508,
14.0, 0.0254,
15.0, 0.0000,
 32,   1,  16,1.000,
 6.0, 0.0254,
 7.0, 0.0000,
10.0, 0.1270,
11.0, 0.1524,
```

```
12.0, 0.2032,
13.0, 0.2286,
14.0, 0.0508,
15.0, 0.1778,
16.0, 0.1778,
17.0, 0.1270,
18.0, 0.0508,
19.0, 0.1016,
20.0, 0.1270,
21.0, 0.0762,
22.0, 0.0254,
23.0, 0.0254,
 33,   1,   4,1.000,
 0.0, 0.0254,
 1.0, 0.0000,
13.0, 0.0254,
14.0, 0.0000,
 35,   1,  17,1.000,
 3.0, 0.0254,
 4.0, 0.0000,
 5.0, 0.0508,
 6.0, 0.0254,
 7.0, 0.0254,
 8.0, 0.0508,
 9.0, 0.0254,
10.0, 0.0254,
11.0, 0.0762,
12.0, 0.0508,
13.0, 0.0000,
15.0, 0.0254,
16.0, 0.0000,
17.0, 0.0254,
18.0, 0.0000,
20.0, 0.0254,
21.0, 0.0000,
 36,   1,  14,1.000,
 0.0, 0.0254,
 1.0, 0.0000,
 9.0, 0.0254,
10.0, 0.0762,
11.0, 0.0508,
12.0, 0.1016,
13.0, 0.0762,
14.0, 0.0762,
15.0, 0.0762,
16.0, 0.0508,
17.0, 0.0254,
18.0, 0.0254,
19.0, 0.0254,
20.0, 0.0000,
 37,   1,   2,1.000,
13.0, 0.0254,
14.0, 0.0000,
 41,   1,   6,1.000,
```

```
10.0, 0.0508,
11.0, 0.1270,
12.0, 0.1524,
13.0, 0.1016,
14.0, 0.0508,
15.0, 0.0000,
 42,   1,   6,1.000,
10.0, 0.0254,
11.0, 0.0508,
12.0, 0.1016,
13.0, 0.1016,
14.0, 0.0508,
15.0, 0.0000,
 43,   1,  14,1.000,
 9.0, 0.1016,
10.0, 0.0762,
11.0, 0.0254,
12.0, 0.0254,
13.0, 0.1270,
14.0, 0.0762,
15.0, 0.0254,
16.0, 0.0000,
17.0, 0.0254,
18.0, 0.0000,
19.0, 0.1016,
20.0, 0.2032,
21.0, 0.1016,
22.0, 0.0000,
 44,   1,  10,1.000,
14.0, 0.0508,
15.0, 0.0762,
16.0, 0.1016,
17.0, 0.0762,
18.0, 0.0254,
19.0, 0.0000,
20.0, 0.0254,
21.0, 0.0254,
22.0, 0.0000,
23.0, 0.0508,
 45,   1,   7,1.000,
 0.0, 0.0000,
 1.0, 0.0254,
 2.0, 0.0000,
 8.0, 0.0254,
 9.0, 0.0000,
19.0, 0.0508,
20.0, 0.0000,
 46,   1,   5,1.000,
17.0, 0.0254,
18.0, 0.0000,
21.0, 0.0508,
22.0, 0.1016,
23.0, 0.2794,
 47,   1,  20,1.000,
```

```
 0.0, 0.1778,
 1.0, 0.1524,
 2.0, 0.2286,
 3.0, 0.1778,
 4.0, 0.1016,
 5.0, 0.0762,
 6.0, 0.1524,
 7.0, 0.1016,
 8.0, 0.1016,
 9.0, 0.0000,
10.0, 0.0254,
11.0, 0.0000,
12.0, 0.0254,
13.0, 0.0000,
14.0, 0.0254,
15.0, 0.0000,
17.0, 0.0254,
18.0, 0.0000,
19.0, 0.0254,
20.0, 0.0000,
 48,   1,   7,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
13.0, 0.0254,
14.0, 0.0000,
21.0, 0.0254,
22.0, 0.0000,
23.0, 0.0508,
 49,   1,   6,1.000,
 0.0, 0.0254,
 1.0, 0.0000,
 2.0, 0.0254,
 3.0, 0.0000,
 4.0, 0.0254,
 5.0, 0.0000,
 50,   1,   2,1.000,
 7.0, 0.0254,
 8.0, 0.0000,
 53,   1,   2,1.000,
14.0, 0.0254,
15.0, 0.0000,
 55,   1,   4,1.000,
10.0, 0.0254,
11.0, 0.0762,
12.0, 0.0254,
13.0, 0.0000,
 56,   1,   4,1.000,
11.0, 0.1016,
12.0, 0.0000,
16.0, 0.0254,
17.0, 0.0000,
 57,   1,   5,1.000,
 6.0, 0.0254,
 7.0, 0.0000,
```

```
  9.0, 0.0254,
 10.0, 0.0508,
 11.0, 0.0000,
  59,   1,   2,1.000,
  8.0, 0.0254,
  9.0, 0.0000,
  61,   1,   2,1.000,
 10.0, 0.0254,
 11.0, 0.0000,
  62,   1,   6,1.000,
 11.0, 0.1270,
 12.0, 0.1270,
 13.0, 0.1270,
 14.0, 0.0508,
 15.0, 0.0254,
 16.0, 0.0000,
```

***CID, van Genuchten, 2009***

```
Spokane Valley Rathdrum Prairie CID Simulation:  VGCID2009.inp
0, 1,                          IPLANT, NGRAV
365, 1, 365,                   IFDEND, IDTBEG, IDTEND
2009, 1, 0, 0, 0,              IYS, NYEARS, ISTEAD, IFLIST, NFLIST
1, 24.0,                       NPRINT, STOPHR
0, 3, 1, 1.0E-4,               ISMETH, INMAX, ISWDIF, DMAXBA
1.0, 1.0E-5, 1.0,              DELMAX, DELMIN, OUTTIM
2.0, 1.0E-05, 0.0, 0.0, 0.0,   RFACT, RAINIF, DHTOL, DHMAX, DHFACT
4, 3, 0,                       KOPT, KEST, WTF
0, 1, 2, 2,                    ITOPBC, IEVOPT, NFHOUR, LOWER
0.0, 2.0E+04, 20.73, 0.0,      HIRRI, HDRY, HTOP, RHA
0, 0, 0,                       IETOPT, ICLOUD, ISHOPT
0, 0,                          IRAIN, HPR
0, 0, 0, 0, 0,                 IHYS, AIRTOL, HYSTOL, HYSMXH, HYFILE
0, 0, 0,                       IHEAT, ICONVH, DMAXHE
0, 0, 0, 0,                    UPPERH, TSMEAN, TSAMP, QHCTOP
0, 0.0, 0.0,                   LOWERH, QHLEAK, TGRAD
0, 0.66, 288.46, 0.24,         IVAPOR, TORT, TSOIL, VAPDIF
3, 126,                        MATN, NPT
1,    0.00,  1,    1.00,  1,    2.00,  1,    3.00,
1,    4.00,  1,    5.00,  1,    6.00,  1,    7.00,
1,    8.00,  1,    9.00,  1,   10.00,  1,   11.00,
1,   12.00,  1,   13.00,  1,   14.00,  1,   15.00,
1,   16.00,  1,   17.00,  1,   18.00,  1,   19.00,
1,   20.00,  2,   21.00,  2,   22.00,  2,   23.00,
2,   24.00,  2,   25.00,  2,   26.00,  2,   27.00,
2,   28.00,  2,   29.00,  2,   30.00,  2,   31.00,
2,   32.00,  2,   33.00,  2,   34.00,  2,   35.00,
2,   36.00,  2,   37.00,  2,   38.00,  2,   39.00,
2,   40.00,  2,   41.00,  2,   42.00,  2,   43.00,
2,   44.00,  2,   45.00,  2,   46.00,  2,   47.00,
2,   48.00,  2,   49.00,  2,   50.00,  2,   51.00,
2,   52.00,  2,   53.00,  2,   54.00,  2,   55.00,
2,   56.00,  2,   57.00,  2,   58.00,  2,   59.00,
```

```
2,   60.00,  2,   61.00,  2,   62.00,  2,   63.00,
2,   64.00,  2,   65.00,  3,   66.00,  3,   67.00
3,   68.00,  3,   69.00,  3,   70.00,  3,   71.00,
3,   72.00,  3,   73.00,  3,   74.00,  3,   75.00,
3,   76.00,  3,   77.00,  3,   78.00,  3,   79.00,
3,   80.00,  3,   81.00,  3,   82.00,  3,   83.00,
3,   84.00,  3,   85.00,  3,   86.00,  3,   87.00,
3,   88.00,  3,   89.00,  3,   90.00,  3,   91.00,
3,   92.00,  3,   93.00,  3,   94.00,  3,   95.00,
3,   96.00,  3,   97.00,  3,   98.00,  3,   99.00,
3,  100.00,  3,  101.00,  3,  102.00,  3,  103.00,
3,  104.00,  3,  105.00,  3,  106.00,  3,  107.00,
3,  108.00,  3,  109.00,  3,  110.00,  3,  111.00,
3,  112.00,  3,  113.00,  3,  114.00,  3,  115.00,
3,  116.00,  3,  117.00,  3,  118.00,  3,  119.00,
3,  120.00,  3,  121.00,  3,  122.00,  3,  123.00,
3,  124.00,  3,  125.00,
Sand Layer #1: 0-20 cm (van Genuchten et al.)   Retention
0.5, 0.02, 0.023, 1.71,                    THET, THTR, A, N
Sand Layer #1: 0-20 cm (van Genuchten et al.)   Hydraulic Conductivity
2.0, 39.2, 0.023, 1.71, 0.5,                    RKMODEL, SK, A, N, EPIT
Sand Layer #2: 21-65 cm (van Genuchten et al.)  Retention
0.57, 0.02, 0.037, 1.81,                        THET, THTR, A, N
Sand Layer #2: 21-65 cm (van Genuchten et al.)  Hydraulic Conductivity
2.0, 23.2, 0.037, 1.81, 0.5,                    RKMODEL, SK, A, N, EPIT
Sand Layer #3: 66-125 cm (van Genuchten et al.) Retention
0.2, 0.015, 0.055, 2.08,                        THET, THTR, A, N
Sand Layer #3: 66-125 cm (van Genuchten et al.) Hydraulic Conductivity
2.0, 23.2, 0.055, 2.08, 0.5,                    RKMODEL, SK, A, N, EPIT
0,    NDAY
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
10.0,10.0,10.0,10.0,
```

```
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,
0.0173, 0.0229, 0.0084, 0.0074, 0.0076, 0.0104, 0.0417, 0.0887,
0.0475, 0.0479, 0.0236, 0.0175, 0.0174, 0.0209, 0.0257, 0.0234,
0.0182, 0.0299, 0.0198, 0.0147, 0.0172, 0.0178, 0.0199, 0.0316,
0.0867, 0.0461, 0.0384, 0.0227, 0.0425, 0.0812, 0.0958, 0.0384,
0.0323, 0.0591, 0.0500, 0.0443, 0.0322, 0.0353, 0.0543, 0.0310,
0.0430, 0.0392, 0.0434, 0.0915, 0.0756, 0.0475, 0.0653, 0.0624,
0.0542, 0.0549, 0.0469, 0.0781, 0.0836, 0.0697, 0.0930, 0.0845,
0.0696, 0.0752, 0.0954, 0.1071, 0.0872, 0.1224, 0.1122, 0.0860,
0.1011, 0.1313, 0.0840, 0.0741, 0.0770, 0.0715, 0.0761, 0.0991,
0.1048, 0.1683, 0.1557, 0.1158, 0.1245, 0.1525, 0.1999, 0.1462,
0.1274, 0.1495, 0.1193, 0.1923, 0.1745, 0.1820, 0.1704, 0.1320,
0.1776, 0.1411, 0.1309, 0.1407, 0.1495, 0.1716, 0.2546, 0.2672,
0.2795, 0.3446, 0.2186, 0.2326, 0.1875, 0.1954, 0.2197, 0.1965,
0.2517, 0.2487, 0.2313, 0.2377, 0.2676, 0.3289, 0.3948, 0.3822,
0.2518, 0.2610, 0.2566, 0.2440, 0.2950, 0.3579, 0.3573, 0.3071,
0.3269, 0.4305, 0.2857, 0.2936, 0.3538, 0.2524, 0.2980, 0.3075,
0.3298, 0.3305, 0.3779, 0.3389, 0.3146, 0.3322, 0.3029, 0.3474,
0.3939, 0.4666, 0.4759, 0.3731, 0.3623, 0.4430, 0.4170, 0.4098,
0.4011, 0.4426, 0.4194, 0.4277, 0.5298, 0.8180, 0.4878, 0.6146,
0.6187, 0.5029, 0.5623, 0.4788, 0.4538, 0.4123, 0.3418, 0.3918,
0.4272, 0.4409, 0.4367, 0.4700, 0.4306, 0.4488, 0.4523, 0.4238,
0.4411, 0.3717, 0.4109, 0.3596, 0.3653, 0.3873, 0.5608, 0.5309,
0.4634, 0.4459, 0.5110, 0.4622, 0.4673, 0.4931, 0.5266, 0.5320,
0.5966, 0.5676, 0.5449, 0.4911, 0.4530, 0.4299, 0.4702, 0.5777,
0.6168, 0.3842, 0.4456, 0.5028, 0.5103, 0.5278, 0.5912, 0.5557,
0.4625, 0.5937, 0.6312, 0.5381, 0.4763, 0.4908, 0.4567, 0.5365,
0.6153, 0.5662, 0.5364, 0.5466, 0.5944, 0.4748, 0.5441, 0.5122,
0.5432, 0.4613, 0.3816, 0.3765, 0.3971, 0.4700, 0.4716, 0.3875,
0.3980, 0.3579, 0.3247, 0.3400, 0.3665, 0.3992, 0.3878, 0.5237,
0.5113, 0.4067, 0.3943, 0.3274, 0.3885, 0.3578, 0.4934, 0.6095,
0.3573, 0.3560, 0.3299, 0.3987, 0.3570, 0.4002, 0.2851, 0.4080,
0.3054, 0.2446, 0.2357, 0.3188, 0.2556, 0.3805, 0.4185, 0.3754,
0.3178, 0.2364, 0.3827, 0.2588, 0.2844, 0.2560, 0.2739, 0.1870,
0.2986, 0.4053, 0.2431, 0.2192, 0.3185, 0.1871, 0.3840, 0.2093,
0.1747, 0.1627, 0.1336, 0.1747, 0.3745, 0.1683, 0.1605, 0.1525,
0.1284, 0.1932, 0.1563, 0.1387, 0.1306, 0.1908, 0.0935, 0.1010,
0.1741, 0.1623, 0.0979, 0.0886, 0.0684, 0.0787, 0.0804, 0.0665,
0.1103, 0.0638, 0.0818, 0.0920, 0.0581, 0.0354, 0.0451, 0.1329,
0.0780, 0.0573, 0.0585, 0.1401, 0.0846, 0.1137, 0.1161, 0.0480,
0.0747, 0.0687, 0.0493, 0.0269, 0.0437, 0.0351, 0.0385, 0.2122,
0.2033, 0.1042, 0.0972, 0.1798, 0.0795, 0.0450, 0.0476, 0.0417,
0.0536, 0.0261, 0.0234, 0.0210, 0.0218, 0.0327, 0.0314, 0.0346,
0.0377, 0.0123, 0.0272, 0.1194, 0.0727, 0.0269, 0.0275, 0.0080,
0.0067, 0.0071, 0.0200, 0.0155, 0.0307, 0.0085, 0.0283, 0.1143,
0.0819, 0.0235, 0.0228, 0.0295, 0.0243, 0.0172, 0.0376, 0.0599,
0.0514, 0.0327, 0.0316, 0.0154, 0.0152,
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144,        NWATER  (Rain Data for 2009)
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  6.0, 0.0254,
  7.0, 0.0508,
  8.0, 0.0508,
  9.0, 0.1016,
 10.0, 0.1016,
 11.0, 0.0254,
 12.0, 0.0254,
 13.0, 0.0000,
 23.0, 0.0254,
   2,   1,  10,1.000,
  0.0, 0.1016,
  1.0, 0.1016,
  2.0, 0.0762,
  3.0, 0.1270,
  4.0, 0.2286,
  5.0, 0.1524,
  6.0, 0.0254,
  7.0, 0.0254,
  8.0, 0.0254,
  9.0, 0.0000,
   4,   1,   2,1.000,
 22.0, 0.1016,
 23.0, 0.1270,
   5,   1,   9,1.000,
  0.0, 0.1270,
  1.0, 0.1524,
  2.0, 0.0254,
  3.0, 0.1270,
  4.0, 0.0000,
  5.0, 0.1016,
  6.0, 0.1016,
  7.0, 0.0508,
  8.0, 0.0000,
   6,   1,   9,1.000,
  4.0, 0.0254,
  5.0, 0.0000,
  8.0, 0.0254,
  9.0, 0.0508,
 10.0, 0.1016,
 11.0, 0.1524,
 12.0, 0.1778,
 13.0, 0.0254,
 14.0, 0.0000,
   8,   1,   2,1.000,
  6.0, 0.0254,
  7.0, 0.0000,
  10,   1,   4,1.000,
 20.0, 0.0254,
 21.0, 0.0508,
 22.0, 0.0508,
 23.0, 0.0254,
```

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 11,   1,   2,1.000,
 0.0, 0.0508,
 1.0, 0.0000,
 16,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0000,
 17,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
 19,   1,   2,1.000,
15.0, 0.0254,
16.0, 0.0000,
 20,   1,   2,1.000,
19.0, 0.0254,
20.0, 0.0000,
 21,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0254,
 22,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0000,
 26,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0000,
 27,   1,   2,1.000,
 8.0, 0.0254,
 9.0, 0.0000,
 32,   1,   2,1.000,
18.0, 0.0254,
19.0, 0.0000,
 33,   1,   2,1.000,
 2.0, 0.0254,
 3.0, 0.0000,
 35,   1,   2,1.000,
 5.0, 0.0254,
 6.0, 0.0000,
 36,   1,   3,1.000,
21.0, 0.1016,
22.0, 0.1524,
23.0, 0.1524,
 37,   1,   9,1.000,
 0.0, 0.1270,
 1.0, 0.1016,
 2.0, 0.0762,
 3.0, 0.0000,
 7.0, 0.0508,
 8.0, 0.0508,
 9.0, 0.0508,
10.0, 0.0254,
11.0, 0.0000,
 41,   1,   2,1.000,
12.0, 0.0254,
13.0, 0.0000,
 42,   1,   2,1.000,
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11.0, 0.0254,
12.0, 0.0000,
 46,   1,   4,1.000,
11.0, 0.0254,
12.0, 0.0254,
13.0, 0.0254,
14.0, 0.0000,
 47,   1,   2,1.000,
 9.0, 0.0508,
10.0, 0.0000,
 53,   1,   6,1.000,
15.0, 0.0254,
16.0, 0.0254,
17.0, 0.0000,
19.0, 0.1016,
20.0, 0.0508,
21.0, 0.0000,
 54,   1,  12,1.000,
 3.0, 0.0254,
 4.0, 0.0254,
 5.0, 0.0000,
14.0, 0.0762,
15.0, 0.1270,
16.0, 0.0000,
17.0, 0.0508,
18.0, 0.0508,
19.0, 0.3048,
20.0, 0.2794,
21.0, 0.0508,
22.0, 0.0000,
 55,   1,   2,1.000,
11.0, 0.0762,
12.0, 0.0000,
 56,   1,   7,1.000,
12.0, 0.0762,
13.0, 0.0508,
14.0, 0.0254,
15.0, 0.0254,
16.0, 0.0000,
23.0, 0.0254,
24.0, 0.0000,
 57,   1,  13,1.000,
 0.0, 0.0508,
 1.0, 0.0762,
 2.0, 0.1016,
 3.0, 0.0254,
 4.0, 0.0000,
 8.0, 0.0254,
 9.0, 0.0508,
10.0, 0.0508,
11.0, 0.1270,
12.0, 0.0254,
13.0, 0.0000,
14.0, 0.0254,
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15.0, 0.0000,
 58,   1,   2,1.000,
 9.0, 0.0254,
10.0, 0.0000,
 60,   1,   9,1.000,
16.0, 0.0508,
17.0, 0.0254,
18.0, 0.1016,
19.0, 0.0762,
20.0, 0.0508,
21.0, 0.1016,
22.0, 0.0762,
23.0, 0.0508,
24.0, 0.0000,
 61,   1,  13,1.000,
10.0, 0.0254,
11.0, 0.0000,
12.0, 0.0762,
13.0, 0.0762,
14.0, 0.0762,
15.0, 0.0254,
16.0, 0.2286,
17.0, 0.1016,
18.0, 0.0000,
19.0, 0.0762,
20.0, 0.2286,
21.0, 0.0254,
22.0, 0.0000,
 62,   1,  12,1.000,
 0.0, 0.0508,
 1.0, 0.0508,
 2.0, 0.0508,
 3.0, 0.0254,
 4.0, 0.0000,
 5.0, 0.0508,
 6.0, 0.0254,
 7.0, 0.0254,
 8.0, 0.0000,
22.0, 0.0508,
23.0, 0.2032,
24.0, 0.0000,
 63,   1,  11,1.000,
 0.0, 0.0508,
 1.0, 0.0254,
 2.0, 0.0254,
 3.0, 0.0508,
 4.0, 0.0254,
 5.0, 0.0000,
 6.0, 0.0254,
 7.0, 0.0508,
 8.0, 0.1270,
 9.0, 0.0254,
10.0, 0.0000,
 64,   1,  10,1.000,
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 4.0, 0.0254,
 5.0, 0.0000,
 8.0, 0.0508,
 9.0, 0.0762,
10.0, 0.0000,
11.0, 0.0762,
12.0, 0.1524,
13.0, 0.1016,
14.0, 0.0508,
15.0, 0.0000,
 65,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
 67,   1,   3,1.000,
11.0, 0.0508,
12.0, 0.0254,
13.0, 0.0000,
 68,   1,   4,1.000,
14.0, 0.0254,
15.0, 0.0254,
16.0, 0.0254,
17.0, 0.0000,
 69,   1,   2,1.000,
12.0, 0.0254,
13.0, 0.0000,
 70,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0000,
 71,   1,   2,1.000,
13.0, 0.0254,
14.0, 0.0000,
 73,   1,   4,1.000,
21.0, 0.0508,
22.0, 0.1016,
23.0, 0.0762,
24.0, 0.0000,
 74,   1,   7,1.000,
 8.0, 0.0254,
 9.0, 0.0254,
10.0, 0.0254,
11.0, 0.0254,
12.0, 0.0000,
13.0, 0.0254,
14.0, 0.0000,
 75,   1,   3,1.000,
17.0, 0.0762,
18.0, 0.0508,
19.0, 0.0000,
 76,   1,   8,1.000,
 9.0, 0.0508,
10.0, 0.1016,
11.0, 0.0508,
12.0, 0.0000,
13.0, 0.0762,
```

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14.0, 0.0000,
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16.0, 0.0000,
 80,   1,  12,1.000,
 0.0, 0.1016,
 1.0, 0.1524,
 2.0, 0.0254,
 3.0, 0.0000,
 7.0, 0.0254,
 8.0, 0.0000,
12.0, 0.0762,
13.0, 0.0000,
21.0, 0.1524,
22.0, 0.3556,
23.0, 0.4064,
24.0, 0.0000,
 81,   1,  20,1.000,
 0.0, 0.0508,
 1.0, 0.0000,
 2.0, 0.0254,
 3.0, 0.0254,
 4.0, 0.0000,
 5.0, 0.0508,
 6.0, 0.0000,
10.0, 0.0508,
11.0, 0.0000,
13.0, 0.0762,
14.0, 0.1524,
15.0, 0.0762,
16.0, 0.0000,
18.0, 0.0254,
19.0, 0.0254,
20.0, 0.0000,
21.0, 0.1270,
22.0, 0.0508,
23.0, 0.0254,
24.0, 0.0000,
 82,   1,   2,1.000,
 2.0, 0.0508,
 3.0, 0.0000,
 83,   1,  11,1.000,
10.0, 0.1524,
11.0, 0.1016,
12.0, 0.1016,
13.0, 0.0000,
14.0, 0.0762,
15.0, 0.0254,
16.0, 0.0000,
19.0, 0.2286,
20.0, 0.0000,
21.0, 0.0254,
22.0, 0.0000,
 87,   1,  10,1.000,
15.0, 0.0508,
```

```
16.0, 0.1016,
17.0, 0.1016,
18.0, 0.0508,
19.0, 0.1016,
20.0, 0.0508,
21.0, 0.0254,
22.0, 0.0254,
23.0, 0.0254,
24.0, 0.0000,
 88,   1,  15,1.000,
 1.0, 0.0254,
 2.0, 0.0254,
 3.0, 0.0000,
 4.0, 0.0254,
 5.0, 0.0000,
 6.0, 0.0254,
 7.0, 0.0254,
 8.0, 0.0508,
 9.0, 0.0254,
10.0, 0.0000,
13.0, 0.0254,
14.0, 0.0000,
16.0, 0.1016,
17.0, 0.0508,
18.0, 0.0000,
 89,   1,   7,1.000,
 3.0, 0.0762,
 4.0, 0.0000,
 5.0, 0.0254,
 6.0, 0.0254,
 7.0, 0.0000,
 9.0, 0.0254,
10.0, 0.0000,
 90,   1,   9,1.000,
 7.0, 0.0508,
 8.0, 0.0000,
11.0, 0.1778,
12.0, 0.0000,
13.0, 0.0254,
14.0, 0.0508,
15.0, 0.0762,
16.0, 0.0254,
17.0, 0.0000,
 92,   1,  10,1.000,
10.0, 0.0762,
11.0, 0.1778,
12.0, 0.2286,
13.0, 0.0508,
14.0, 0.0000,
18.0, 0.1270,
19.0, 0.0254,
20.0, 0.0000,
23.0, 0.0254,
24.0, 0.0000,
```

```
 93,   1,   7,1.000,
 7.0, 0.0254,
 8.0, 0.0254,
 9.0, 0.0508,
10.0, 0.0508,
11.0, 0.0000,
18.0, 0.1778,
19.0, 0.0000,
 94,   1,   2,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
 99,   1,   2,1.000,
14.0, 0.0254,
15.0, 0.0000,
101,   1,   7,1.000,
 8.0, 0.2032,
 9.0, 0.1016,
10.0, 0.0000,
11.0, 0.0254,
12.0, 0.0000,
13.0, 0.0254,
14.0, 0.0000,
102,   1,   6,1.000,
16.0, 0.1270,
17.0, 0.1270,
18.0, 0.0508,
19.0, 0.0508,
20.0, 0.0508,
21.0, 0.0000,
103,   1,   5,1.000,
13.0, 0.0508,
14.0, 0.0000,
18.0, 0.0254,
19.0, 0.0762,
20.0, 0.0000,
113,   1,   4,1.000,
15.0, 0.0254,
16.0, 0.0000,
18.0, 0.0254,
19.0, 0.0000,
116,   1,   2,1.000,
15.0, 0.0254,
16.0, 0.0000,
122,   1,   4,1.000,
18.0, 0.0254,
19.0, 0.0508,
20.0, 0.0762,
21.0, 0.0000,
123,   1,   8,1.000,
 1.0, 0.1016,
 2.0, 0.0762,
 3.0, 0.0000,
 4.0, 0.0254,
 5.0, 0.0000,
```

```
14.0, 0.2032,
15.0, 0.0254,
16.0, 0.0000,
124,   1,   4,1.000,
21.0, 0.0508,
22.0, 0.0762,
23.0, 0.0762,
24.0, 0.0000,
125,   1,  10,1.000,
 0.0, 0.0508,
 1.0, 0.0000,
 2.0, 0.0254,
 3.0, 0.1016,
 4.0, 0.0254,
 5.0, 0.0000,
11.0, 0.0254,
12.0, 0.0000,
14.0, 0.0508,
15.0, 0.0000,
126,   1,   5,1.000,
16.0, 0.1524,
17.0, 0.1270,
18.0, 0.0000,
20.0, 0.0254,
21.0, 0.0000,
127,   1,   6,1.000,
12.0, 0.0254,
13.0, 0.0000,
15.0, 0.0254,
16.0, 0.0000,
18.0, 0.0254,
19.0, 0.0000,
131,   1,   7,1.000,
 3.0, 0.0254,
 4.0, 0.0762,
 5.0, 0.0762,
 6.0, 0.0000,
 8.0, 0.0254,
 9.0, 0.1016,
10.0, 0.0000,
132,   1,   5,1.000,
16.0, 0.0254,
17.0, 0.0000,
18.0, 0.0254,
19.0, 0.0254,
20.0, 0.0000,
133,   1,   4,1.000,
21.0, 0.0254,
22.0, 0.2032,
23.0, 0.1524,
24.0, 0.0000,
134,   1,  10,1.000,
 0.0, 0.1270,
 1.0, 0.1778,
```

```
 2.0, 0.2286,
 3.0, 0.1270,
 4.0, 0.0508,
 5.0, 0.0762,
 6.0, 0.1270,
 7.0, 0.0000,
 9.0, 0.0254,
10.0, 0.0000,
140,   1,   4,1.000,
 2.0, 0.0508,
 3.0, 0.0000,
 6.0, 0.0254,
 7.0, 0.0000,
159,   1,   6,1.000,
 8.0, 0.0254,
 9.0, 0.6096,
10.0, 0.1524,
11.0, 0.0000,
12.0, 0.1016,
13.0, 0.0000,
165,   1,   8,1.000,
 6.0, 0.4064,
 7.0, 0.1524,
 8.0, 0.1524,
 9.0, 0.0762,
10.0, 0.0254,
11.0, 0.0000,
19.0, 0.4572,
20.0, 0.0000,
166,   1,   2,1.000,
18.0, 0.0254,
19.0, 0.0000,
168,   1,   8,1.000,
11.0, 0.2286,
12.0, 0.0000,
16.0, 0.2286,
17.0, 0.0000,
21.0, 0.0254,
22.0, 0.0254,
23.0, 0.1778,
24.0, 0.0000,
170,   1,   7,1.000,
13.0, 0.0254,
14.0, 0.0254,
15.0, 0.0000,
21.0, 0.0508,
22.0, 0.2540,
23.0, 0.5842,
24.0, 0.0000,
171,   1,   4,1.000,
 0.0, 0.1270,
 1.0, 0.0000,
 4.0, 0.0254,
 5.0, 0.0000,
```

```
172,   1,   7,1.000,
16.0, 0.0508,
17.0, 0.1016,
18.0, 0.0762,
19.0, 0.0508,
20.0, 0.0000,
22.0, 0.0254,
23.0, 0.0000,
186,   1,   2,1.000,
 8.0, 0.0254,
 9.0, 0.0000,
187,   1,   7,1.000,
 3.0, 0.5080,
 4.0, 0.0000,
 6.0, 0.0508,
 7.0, 0.1270,
 8.0, 0.0508,
 9.0, 0.0254,
10.0, 0.0000,
193,   1,   3,1.000,
22.0, 0.0254,
23.0, 0.1270,
24.0, 0.0000,
194,   1,  19,1.000,
 0.0, 0.0254,
 1.0, 0.1778,
 2.0, 0.0508,
 3.0, 0.0000,
 4.0, 0.0254,
 5.0, 0.0000,
 9.0, 0.0508,
10.0, 0.0508,
11.0, 0.0762,
12.0, 0.0254,
13.0, 0.0508,
14.0, 0.3302,
15.0, 0.1016,
16.0, 0.2032,
17.0, 0.0000,
20.0, 0.0508,
21.0, 0.0000,
23.0, 0.0254,
24.0, 0.0000,
207,   1,   5,1.000,
 5.0, 0.0254,
 6.0, 0.0254,
 7.0, 0.0000,
 8.0, 0.0254,
 9.0, 0.0000,
209,   1,   7,1.000,
 2.0, 0.1270,
 3.0, 0.0508,
 4.0, 0.0000,
 5.0, 0.0254,
```

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 6.0, 0.0000,
21.0, 0.0762,
22.0, 0.0000,
212,   1,   4,1.000,
 3.0, 0.0254,
 4.0, 0.0000,
 5.0, 0.0254,
 6.0, 0.0000,
218,   1,   3,1.000,
20.0, 1.2446,
21.0, 0.0508,
22.0, 0.0000,
219,   1,   4,1.000,
 3.0, 0.1270,
 4.0, 0.0254,
 5.0, 0.0254,
 6.0, 0.0000,
224,   1,  11,1.000,
 6.0, 0.0254,
 7.0, 0.3810,
 8.0, 0.1016,
 9.0, 0.3810,
10.0, 0.0254,
11.0, 0.1016,
12.0, 0.0000,
20.0, 0.0508,
21.0, 0.8890,
22.0, 0.0508,
23.0, 0.0000,
225,   1,   2,1.000,
 5.0, 0.0254,
 6.0, 0.0000,
226,   1,   4,1.000,
14.0, 0.2032,
15.0, 0.0000,
19.0, 0.0254,
20.0, 0.0000,
227,   1,   7,1.000,
15.0, 0.1270,
16.0, 0.1270,
17.0, 0.0000,
20.0, 0.0762,
21.0, 0.0000,
22.0, 0.0254,
23.0, 0.0000,
228,   1,   2,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
229,   1,   2,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
233,   1,   4,1.000,
 1.0, 0.0254,
 2.0, 0.0000,
```

```
 3.0, 0.1778,
 4.0, 0.0000,
241,   1,   3,1.000,
 9.0, 0.0762,
10.0, 0.0254,
11.0, 0.0000,
249,   1,   4,1.000,
 5.0, 0.0254,
 6.0, 0.2540,
 7.0, 0.2286,
 8.0, 0.0000,
250,   1,   6,1.000,
12.0, 0.0254,
13.0, 0.0000,
15.0, 0.2540,
16.0, 0.1778,
17.0, 0.0254,
18.0, 0.0000,
251,   1,   2,1.000,
 3.0, 0.0254,
 4.0, 0.0000,
260,   1,   3,1.000,
 8.0, 0.2794,
 9.0, 0.1016,
10.0, 0.0000,
262,   1,   2,1.000,
15.0, 0.0254,
16.0, 0.0000,
275,   1,   9,1.000,
 7.0, 0.0254,
 8.0, 0.1270,
 9.0, 0.0508,
10.0, 0.0508,
11.0, 0.0254,
12.0, 0.0254,
13.0, 0.0000,
18.0, 0.1524,
19.0, 0.0000,
276,   1,   2,1.000,
11.0, 0.0508,
12.0, 0.0000,
280,   1,   2,1.000,
14.0, 0.1270,
15.0, 0.0254,
286,   1,   4,1.000,
17.0, 0.0254,
18.0, 0.0000,
19.0, 0.0254,
20.0, 0.0000,
287,   1,  17,1.000,
 0.0, 0.1016,
 1.0, 0.1270,
 2.0, 0.1524,
 3.0, 0.1270,
```

```
 4.0, 0.1270,
 5.0, 0.0000,
 8.0, 0.0508,
 9.0, 0.0508,
10.0, 0.0762,
11.0, 0.1016,
12.0, 0.1270,
13.0, 0.0508,
14.0, 0.0000,
16.0, 0.0254,
17.0, 0.0508,
18.0, 0.0254,
19.0, 0.0000,
290,   1,   4,1.000,
19.0, 0.2540,
20.0, 0.1778,
21.0, 0.1016,
22.0, 0.0000,
293,   1,   2,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
294,   1,   5,1.000,
17.0, 0.0254,
18.0, 0.0254,
19.0, 0.1524,
20.0, 0.0254,
21.0, 0.0000,
296,   1,  14,1.000,
 7.0, 0.0254,
 8.0, 0.0000,
 9.0, 0.0762,
10.0, 0.1270,
11.0, 0.1778,
12.0, 0.3302,
13.0, 0.2794,
14.0, 0.0762,
15.0, 0.2032,
16.0, 0.0762,
17.0, 0.0508,
18.0, 0.0254,
19.0, 0.0254,
20.0, 0.0000,
298,   1,   3,1.000,
 8.0, 0.0254,
 9.0, 0.0000,
23.0, 0.0762,
299,   1,  15,1.000,
 0.0, 0.1016,
 1.0, 0.0508,
 2.0, 0.0508,
 3.0, 0.0000,
 6.0, 0.2540,
 7.0, 0.1016,
 8.0, 0.2032,
```

```
 9.0, 0.1270,
10.0, 0.1270,
11.0, 0.0762,
12.0, 0.2032,
13.0, 0.5842,
14.0, 0.3048,
15.0, 0.0508,
16.0, 0.0000,
300,   1,   2,1.000,
 8.0, 0.0254,
 9.0, 0.0000,
302,   1,   8,1.000,
10.0, 0.0254,
11.0, 0.1016,
12.0, 0.0508,
13.0, 0.0000,
19.0, 0.0508,
20.0, 0.0000,
22.0, 0.0254,
23.0, 0.0000,
304,   1,   6,1.000,
 0.0, 0.0762,
 1.0, 0.0762,
 2.0, 0.0000,
 3.0, 0.0762,
 4.0, 0.0254,
 5.0, 0.0000,
306,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
309,   1,   6,1.000,
19.0, 0.0254,
20.0, 0.0254,
21.0, 0.0000,
22.0, 0.0508,
23.0, 0.0508,
24.0, 0.0000,
310,   1,   3,1.000,
 2.0, 0.0762,
 3.0, 0.0508,
 4.0, 0.0000,
312,   1,   5,1.000,
13.0, 0.0508,
14.0, 0.0762,
15.0, 0.0254,
16.0, 0.0508,
17.0, 0.0000,
313,   1,   6,1.000,
 2.0, 0.0254,
 3.0, 0.0000,
20.0, 0.0254,
21.0, 0.0000,
22.0, 0.0254,
23.0, 0.0000,
```

```
314,   1,   3,1.000,
 3.0, 0.0254,
 4.0, 0.0254,
 5.0, 0.0000,
315,   1,   2,1.000,
 5.0, 0.0254,
 6.0, 0.0000,
317,   1,   7,1.000,
14.0, 0.0254,
15.0, 0.0000,
17.0, 0.0254,
18.0, 0.0000,
19.0, 0.0254,
20.0, 0.0254,
21.0, 0.0000,
318,   1,   2,1.000,
10.0, 0.0508,
11.0, 0.0000,
321,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0000,
323,   1,   9,1.000,
 5.0, 0.0762,
 6.0, 0.0508,
 7.0, 0.0000,
 8.0, 0.0508,
 9.0, 0.1270,
10.0, 0.0762,
11.0, 0.0000,
12.0, 0.0254,
13.0, 0.0000,
324,   1,   3,1.000,
18.0, 0.0254,
19.0, 0.0254,
20.0, 0.0000,
326,   1,   9,1.000,
11.0, 0.1524,
12.0, 0.1016,
13.0, 0.0508,
14.0, 0.0254,
15.0, 0.0254,
16.0, 0.0254,
17.0, 0.0000,
18.0, 0.0508,
19.0, 0.0000,
328,   1,   2,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
330,   1,  11,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
15.0, 0.0762,
16.0, 0.1016,
17.0, 0.1016,
```

```
18.0, 0.0254,
19.0, 0.0000,
20.0, 0.0254,
21.0, 0.0000,
23.0, 0.0508,
24.0, 0.0000,
331,   1,   9,1.000,
 0.0, 0.0762,
 1.0, 0.0508,
 2.0, 0.0762,
 3.0, 0.2032,
 4.0, 0.1016,
 5.0, 0.1778,
 6.0, 0.1270,
 7.0, 0.0254,
 8.0, 0.0000,
332,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
334,   1,   2,1.000,
 9.0, 0.0254,
10.0, 0.0000,
339,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0000,
348,   1,   2,1.000,
11.0, 0.0254,
12.0, 0.0000,
349,   1,   4,1.000,
21.0, 0.1270,
22.0, 0.2286,
23.0, 0.1016,
24.0, 0.0000,
350,   1,  12,1.000,
 0.0, 0.1270,
 1.0, 0.1524,
 2.0, 0.1778,
 3.0, 0.0254,
 4.0, 0.0254,
 5.0, 0.0254,
 6.0, 0.0000,
17.0, 0.0254,
18.0, 0.0508,
19.0, 0.0000,
20.0, 0.0254,
21.0, 0.0000,
353,   1,  13,1.000,
 8.0, 0.0508,
 9.0, 0.0254,
10.0, 0.0254,
11.0, 0.0000,
12.0, 0.0508,
13.0, 0.0000,
17.0, 0.0254,
```

```
18.0, 0.0000,
20.0, 0.0508,
21.0, 0.0254,
22.0, 0.0508,
23.0, 0.1270,
24.0, 0.0000,
354,   1,  16,1.000,
 0.0, 0.1270,
 1.0, 0.0254,
 2.0, 0.0508,
 3.0, 0.0000,
11.0, 0.0254,
12.0, 0.0000,
14.0, 0.0254,
15.0, 0.0762,
16.0, 0.0762,
17.0, 0.0508,
18.0, 0.0254,
19.0, 0.1016,
20.0, 0.0000,
21.0, 0.0762,
22.0, 0.0254,
23.0, 0.0762,
355,   1,  20,1.000,
 0.0, 0.2032,
 1.0, 0.0000,
 2.0, 0.0762,
 3.0, 0.0508,
 4.0, 0.0000,
 9.0, 0.1524,
10.0, 0.2540,
11.0, 0.0508,
12.0, 0.0762,
13.0, 0.0508,
14.0, 0.0000,
16.0, 0.1270,
17.0, 0.1016,
18.0, 0.0254,
19.0, 0.1016,
20.0, 0.1016,
21.0, 0.0254,
22.0, 0.0508,
23.0, 0.0508,
24.0, 0.0000,
356,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
365,   1,   9,1.000,
10.0, 0.0254,
11.0, 0.0254,
12.0, 0.0000,
19.0, 0.0508,
20.0, 0.0508,
21.0, 0.0508,
```

```
 22.0, 0.0508,
 23.0, 0.0254,
 24.0, 0.0000,
```

***CID, van Genuchten, 2010***

```
Spokane Valley Rathdrum Prairie CID Simulation:  VGCID2010.inp
0, 1,                          IPLANT, NGRAV
62, 1, 62,                     IFDEND, IDTBEG, IDTEND
2010, 1, 0, 0, 0,              IYS, NYEARS, ISTEAD, IFLIST, NFLIST
1, 24.0,                       NPRINT, STOPHR
0, 3, 1, 1.0E-4,               ISMETH, INMAX, ISWDIF, DMAXBA
1.0, 1.0E-5, 1.0,              DELMAX, DELMIN, OUTTIM
2.0, 1.0E-05, 0.0, 0.0, 0.0,   RFACT, RAINIF, DHTOL, DHMAX, DHFACT
4, 3, 0,                       KOPT, KEST, WTF
0, 1, 2, 2,                    ITOPBC, IEVOPT, NFHOUR, LOWER
0.0, 2.0E+04, 20.73, 0.0,      HIRRI, HDRY, HTOP, RHA
0, 0, 0,                       IETOPT, ICLOUD, ISHOPT
0, 0,                          IRAIN, HPR
0, 0, 0, 0, 0,                 IHYS, AIRTOL, HYSTOL, HYSMXH, HYFILE
0, 0, 0,                       IHEAT, ICONVH, DMAXHE
0, 0, 0, 0,                    UPPERH, TSMEAN, TSAMP, QHCTOP
0, 0.0, 0.0,                   LOWERH, QHLEAK, TGRAD
0, 0.66, 288.46, 0.24,         IVAPOR, TORT, TSOIL, VAPDIF
3, 126,                        MATN, NPT
1,    0.00,  1,    1.00,  1,    2.00,  1,    3.00,
1,    4.00,  1,    5.00,  1,    6.00,  1,    7.00,
1,    8.00,  1,    9.00,  1,   10.00,  1,   11.00,
1,   12.00,  1,   13.00,  1,   14.00,  1,   15.00,
1,   16.00,  1,   17.00,  1,   18.00,  1,   19.00,
1,   20.00,  2,   21.00,  2,   22.00,  2,   23.00,
2,   24.00,  2,   25.00,  2,   26.00,  2,   27.00,
2,   28.00,  2,   29.00,  2,   30.00,  2,   31.00,
2,   32.00,  2,   33.00,  2,   34.00,  2,   35.00,
2,   36.00,  2,   37.00,  2,   38.00,  2,   39.00,
2,   40.00,  2,   41.00,  2,   42.00,  2,   43.00,
2,   44.00,  2,   45.00,  2,   46.00,  2,   47.00,
2,   48.00,  2,   49.00,  2,   50.00,  2,   51.00,
2,   52.00,  2,   53.00,  2,   54.00,  2,   55.00,
2,   56.00,  2,   57.00,  2,   58.00,  2,   59.00,
2,   60.00,  2,   61.00,  2,   62.00,  2,   63.00,
2,   64.00,  2,   65.00,  3,   66.00,  3,   67.00
3,   68.00,  3,   69.00,  3,   70.00,  3,   71.00,
3,   72.00,  3,   73.00,  3,   74.00,  3,   75.00,
3,   76.00,  3,   77.00,  3,   78.00,  3,   79.00,
3,   80.00,  3,   81.00,  3,   82.00,  3,   83.00,
3,   84.00,  3,   85.00,  3,   86.00,  3,   87.00,
3,   88.00,  3,   89.00,  3,   90.00,  3,   91.00,
3,   92.00,  3,   93.00,  3,   94.00,  3,   95.00,
3,   96.00,  3,   97.00,  3,   98.00,  3,   99.00,
3,  100.00,  3,  101.00,  3,  102.00,  3,  103.00,
3,  104.00,  3,  105.00,  3,  106.00,  3,  107.00,
3,  108.00,  3,  109.00,  3,  110.00,  3,  111.00,
```

```
3,  112.00,  3,  113.00,  3,  114.00,  3,  115.00,
3,  116.00,  3,  117.00,  3,  118.00,  3,  119.00,
3,  120.00,  3,  121.00,  3,  122.00,  3,  123.00,
3,  124.00,  3,  125.00,
Sand Layer #1: 0-20 cm (van Genuchten et al.)   Retention
0.5, 0.02, 0.023, 1.71,                    THET, THTR, A, N
Sand Layer #1: 0-20 cm (van Genuchten et al.)   Hydraulic Conductivity
2.0, 39.2, 0.023, 1.71, 0.5,                    RKMODEL, SK, A, N, EPIT
Sand Layer #2: 21-65 cm (van Genuchten et al.)  Retention
0.57, 0.02, 0.037, 1.81,                        THET, THTR, A, N
Sand Layer #2: 21-65 cm (van Genuchten et al.)  Hydraulic Conductivity
2.0, 23.2, 0.037, 1.81, 0.5,                    RKMODEL, SK, A, N, EPIT
Sand Layer #3: 66-125 cm (van Genuchten et al.) Retention
0.2, 0.015, 0.055, 2.08,                        THET, THTR, A, N
Sand Layer #3: 66-125 cm (van Genuchten et al.) Hydraulic Conductivity
2.0, 23.2, 0.055, 2.08, 0.5,                    RKMODEL, SK, A, N, EPIT
0,    NDAY
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,
0.0314, 0.0346, 0.0377, 0.0123, 0.0272, 0.1194, 0.0727, 0.0269,
0.0275, 0.0080, 0.0067, 0.0071, 0.0200, 0.0155, 0.0307, 0.0085,
0.0283, 0.1143, 0.0819, 0.0235, 0.0228, 0.0295, 0.0243, 0.0172,
0.0376, 0.0599, 0.0514, 0.0327, 0.0316, 0.0154, 0.0152, 0.0268,
0.0252, 0.0274, 0.0209, 0.0175, 0.0686, 0.0656, 0.0556, 0.0174,
```

```
0.0393, 0.0435, 0.0279, 0.0272, 0.0473, 0.1827, 0.0221, 0.0343,
0.1199, 0.0863, 0.1158, 0.1326, 0.1014, 0.0304, 0.0509, 0.0356,
0.0397, 0.0358, 0.0540, 0.0646, 0.0565, 0.0338,
24,         NWATER  (Rain Data for 2010)
   5,   1,   2,1.000,
 16.0, 0.0254,
 17.0, 0.0000,
  14,   1,   2,1.000,
 11.0, 0.0254,
 12.0, 0.0000,
  15,   1,   4,1.000,
 21.0, 0.1270,
 22.0, 0.2286,
 23.0, 0.1016,
 24.0, 0.0000,
  16,   1,  12,1.000,
  0.0, 0.1270,
  1.0, 0.1524,
  2.0, 0.1778,
  3.0, 0.0254,
  4.0, 0.0254,
  5.0, 0.0254,
  6.0, 0.0000,
 17.0, 0.0254,
 18.0, 0.0508,
 19.0, 0.0000,
 20.0, 0.0254,
 21.0, 0.0000,
  19,   1,  13,1.000,
  8.0, 0.0508,
  9.0, 0.0254,
 10.0, 0.0254,
 11.0, 0.0000,
 12.0, 0.0508,
 13.0, 0.0000,
 17.0, 0.0254,
 18.0, 0.0000,
 20.0, 0.0508,
 21.0, 0.0254,
 22.0, 0.0508,
 23.0, 0.1270,
 24.0, 0.0000,
  20,   1,  16,1.000,
  0.0, 0.1270,
  1.0, 0.0254,
  2.0, 0.0508,
  3.0, 0.0000,
 11.0, 0.0254,
 12.0, 0.0000,
 14.0, 0.0254,
 15.0, 0.0762,
 16.0, 0.0762,
 17.0, 0.0508,
 18.0, 0.0254,
```

```
19.0, 0.1016,
20.0, 0.0000,
21.0, 0.0762,
22.0, 0.0254,
23.0, 0.0762,
 21,   1,  20,1.000,
 0.0, 0.2032,
 1.0, 0.0000,
 2.0, 0.0762,
 3.0, 0.0508,
 4.0, 0.0000,
 9.0, 0.1524,
10.0, 0.2540,
11.0, 0.0508,
12.0, 0.0762,
13.0, 0.0508,
14.0, 0.0000,
16.0, 0.1270,
17.0, 0.1016,
18.0, 0.0254,
19.0, 0.1016,
20.0, 0.1016,
21.0, 0.0254,
22.0, 0.0508,
23.0, 0.0508,
24.0, 0.0000,
 22,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
 31,   1,   9,1.000,
10.0, 0.0254,
11.0, 0.0254,
12.0, 0.0000,
19.0, 0.0508,
20.0, 0.0508,
21.0, 0.0508,
22.0, 0.0508,
23.0, 0.0254,
24.0, 0.0000,
 32,   1,  15,1.000,
 0.0, 0.0254,
 1.0, 0.0254,
 2.0, 0.0508,
 3.0, 0.0508,
 4.0, 0.0254,
 5.0, 0.0000,
 7.0, 0.0254,
 8.0, 0.0254,
 9.0, 0.0000,
12.0, 0.1016,
13.0, 0.0000,
15.0, 0.0762,
16.0, 0.0000,
20.0, 0.0254,
```

```
21.0, 0.0000,
 33,   1,   2,1.000,
15.0, 0.0254,
16.0, 0.0000,
 35,   1,  17,1.000,
 4.0, 0.0254,
 5.0, 0.0254,
 6.0, 0.0000,
10.0, 0.0254,
11.0, 0.0254,
12.0, 0.1270,
13.0, 0.1778,
14.0, 0.2032,
15.0, 0.1524,
16.0, 0.0762,
17.0, 0.0254,
18.0, 0.0762,
19.0, 0.0508,
20.0, 0.0000,
21.0, 0.1016,
22.0, 0.2032,
23.0, 0.1524,
 36,   1,  13,1.000,
 0.0, 0.1524,
 1.0, 0.1016,
 2.0, 0.0254,
 3.0, 0.0508,
 4.0, 0.0508,
 5.0, 0.0508,
 6.0, 0.0000,
 7.0, 0.0254,
 8.0, 0.0000,
 9.0, 0.0254,
10.0, 0.0000,
12.0, 0.0254,
13.0, 0.0000,
 41,   1,   3,1.000,
 9.0, 0.0254,
10.0, 0.0254,
11.0, 0.0000,
 43,   1,   9,1.000,
 9.0, 0.0254,
10.0, 0.0000,
14.0, 0.0254,
15.0, 0.0000,
18.0, 0.0254,
19.0, 0.1016,
20.0, 0.4064,
21.0, 0.0254,
22.0, 0.0000,
 44,   1,   9,1.000,
 3.0, 0.0254,
 4.0, 0.0000,
14.0, 0.0508,
```

```
15.0, 0.1778,
16.0, 0.1778,
17.0, 0.0762,
18.0, 0.0000,
22.0, 0.0254,
23.0, 0.0254,
 45,   1,   4,1.000,
 0.0, 0.1778,
 1.0, 0.0508,
 2.0, 0.0254,
 3.0, 0.0000,
 46,   1,   2,1.000,
22.0, 0.0254,
23.0, 0.0000,
 47,   1,   9,1.000,
 1.0, 0.0508,
 2.0, 0.1016,
 3.0, 0.0762,
 4.0, 0.0508,
 5.0, 0.0254,
 6.0, 0.0762,
 7.0, 0.0508,
 8.0, 0.0508,
 9.0, 0.0000,
 48,   1,   9,1.000,
 3.0, 0.0508,
 4.0, 0.0254,
 5.0, 0.0000,
14.0, 0.0254,
15.0, 0.0000,
21.0, 0.0254,
22.0, 0.0762,
23.0, 0.0762,
24.0, 0.0000,
 50,   1,   3,1.000,
 4.0, 0.0254,
 5.0, 0.0254,
 6.0, 0.0000,
 56,   1,   8,1.000,
10.0, 0.0508,
11.0, 0.0762,
12.0, 0.0254,
13.0, 0.0254,
14.0, 0.0254,
15.0, 0.0000,
16.0, 0.0254,
17.0, 0.0000,
 61,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
 62,   1,  12,1.000,
 1.0, 0.0254,
 2.0, 0.0000,
 3.0, 0.0254,
```

```
  4.0, 0.0254,
  5.0, 0.0000,
  7.0, 0.0254,
  8.0, 0.0762,
  9.0, 0.0508,
 10.0, 0.0254,
 11.0, 0.0000,
 13.0, 0.0254,
 14.0, 0.0000,
```

***CID, Brooks-Corey, 2009***

```
Spokane Valley Rathdrum Prairie CID Simulation:  BCCID2009.inp
0, 1,                          IPLANT, NGRAV
365, 1, 365,                   IFDEND, IDTBEG, IDTEND
2009, 1, 0, 0, 0,              IYS, NYEARS, ISTEAD, IFLIST, NFLIST
1, 24.0,                       NPRINT, STOPHR
0, 3, 1, 1.0E-4,               ISMETH, INMAX, ISWDIF, DMAXBA
1.0, 1.0E-5, 1.0,              DELMAX, DELMIN, OUTTIM
2.0, 1.0E-05, 0.0, 0.0, 0.0,   RFACT, RAINIF, DHTOL, DHMAX, DHFACT
3, 3, 0,                       KOPT, KEST, WTF
0, 1, 2, 2,                    ITOPBC, IEVOPT, NFHOUR, LOWER
0.0, 2.0E+04, 20.73, 0.0,      HIRRI, HDRY, HTOP, RHA
0, 0, 0,                       IETOPT, ICLOUD, ISHOPT
0, 0,                          IRAIN, HPR
0, 0, 0, 0, 0,                 IHYS, AIRTOL, HYSTOL, HYSMXH, HYFILE
0, 0, 0,                       IHEAT, ICONVH, DMAXHE
0, 0, 0, 0,                    UPPERH, TSMEAN, TSAMP, QHCTOP
0, 0.0, 0.0,                   LOWERH, QHLEAK, TGRAD
0, 0.66, 288.46, 0.24,         IVAPOR, TORT, TSOIL, VAPDIF
3, 126,                        MATN, NPT
1,    0.00,  1,    1.00,  1,    2.00,  1,    3.00,
1,    4.00,  1,    5.00,  1,    6.00,  1,    7.00,
1,    8.00,  1,    9.00,  1,   10.00,  1,   11.00,
1,   12.00,  1,   13.00,  1,   14.00,  1,   15.00,
1,   16.00,  1,   17.00,  1,   18.00,  1,   19.00,
1,   20.00,  2,   21.00,  2,   22.00,  2,   23.00,
2,   24.00,  2,   25.00,  2,   26.00,  2,   27.00,
2,   28.00,  2,   29.00,  2,   30.00,  2,   31.00,
2,   32.00,  2,   33.00,  2,   34.00,  2,   35.00,
2,   36.00,  2,   37.00,  2,   38.00,  2,   39.00,
2,   40.00,  2,   41.00,  2,   42.00,  2,   43.00,
2,   44.00,  2,   45.00,  2,   46.00,  2,   47.00,
2,   48.00,  2,   49.00,  2,   50.00,  2,   51.00,
2,   52.00,  2,   53.00,  2,   54.00,  2,   55.00,
2,   56.00,  2,   57.00,  2,   58.00,  2,   59.00,
2,   60.00,  2,   61.00,  2,   62.00,  2,   63.00,
2,   64.00,  2,   65.00,  3,   66.00,  3,   67.00
3,   68.00,  3,   69.00,  3,   70.00,  3,   71.00,
3,   72.00,  3,   73.00,  3,   74.00,  3,   75.00,
3,   76.00,  3,   77.00,  3,   78.00,  3,   79.00,
3,   80.00,  3,   81.00,  3,   82.00,  3,   83.00,
```

```
3,   84.00,  3,   85.00,  3,   86.00,  3,   87.00,
3,   88.00,  3,   89.00,  3,   90.00,  3,   91.00,
3,   92.00,  3,   93.00,  3,   94.00,  3,   95.00,
3,   96.00,  3,   97.00,  3,   98.00,  3,   99.00,
3,  100.00,  3,  101.00,  3,  102.00,  3,  103.00,
3,  104.00,  3,  105.00,  3,  106.00,  3,  107.00,
3,  108.00,  3,  109.00,  3,  110.00,  3,  111.00,
3,  112.00,  3,  113.00,  3,  114.00,  3,  115.00,
3,  116.00,  3,  117.00,  3,  118.00,  3,  119.00,
3,  120.00,  3,  121.00,  3,  122.00,  3,  123.00,
3,  124.00,  3,  125.00,
Sand Layer #1: 0-20 cm (Brooks-Corey et al.)          Retention
0.5, 0.02, 30.21, 1.8476,                             THET, THTR,
AIRENT, B
Sand Layer #1: 0-20 cm (Brooks-Corey et al.)          Hydraulic
Conductivity
2.0, 39.2, 30.21, 1.8476, 0.5,                        RKMOD, SK,
AIRENK, B, EPIT
Sand Layer #2: 0-20 cm (Brooks-Corey et al.)          Retention
0.57, 0.02, 18.18, 1.6104,                            THET, THTR,
AIRENT, B
Sand Layer #2: 0-20 cm (Brooks-Corey et al.)          Hydraulic
Conductivity
2.0, 23.2, 18.18, 1.6104, 0.5,                        RKMOD, SK,
AIRENK, B, EPIT
Sand Layer #3: 0-20 cm (Brooks-Corey et al.)          Retention
0.2, 0.015, 18.18, 1.5172,                            THET, THTR,
AIRENT, B
Sand Layer #3: 0-20 cm (Brooks-Corey et al.)          Hydraulic
Conductivity
2.0, 23.2, 18.18, 1.5172, 0.5,                        RKMOD, SK,
AIRENK, B, EPIT
0,    NDAY
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
```

```
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,
0.0173, 0.0229, 0.0084, 0.0074, 0.0076, 0.0104, 0.0417, 0.0887,
0.0475, 0.0479, 0.0236, 0.0175, 0.0174, 0.0209, 0.0257, 0.0234,
0.0182, 0.0299, 0.0198, 0.0147, 0.0172, 0.0178, 0.0199, 0.0316,
0.0867, 0.0461, 0.0384, 0.0227, 0.0425, 0.0812, 0.0958, 0.0384,
0.0323, 0.0591, 0.0500, 0.0443, 0.0322, 0.0353, 0.0543, 0.0310,
0.0430, 0.0392, 0.0434, 0.0915, 0.0756, 0.0475, 0.0653, 0.0624,
0.0542, 0.0549, 0.0469, 0.0781, 0.0836, 0.0697, 0.0930, 0.0845,
0.0696, 0.0752, 0.0954, 0.1071, 0.0872, 0.1224, 0.1122, 0.0860,
0.1011, 0.1313, 0.0840, 0.0741, 0.0770, 0.0715, 0.0761, 0.0991,
0.1048, 0.1683, 0.1557, 0.1158, 0.1245, 0.1525, 0.1999, 0.1462,
0.1274, 0.1495, 0.1193, 0.1923, 0.1745, 0.1820, 0.1704, 0.1320,
0.1776, 0.1411, 0.1309, 0.1407, 0.1495, 0.1716, 0.2546, 0.2672,
0.2795, 0.3446, 0.2186, 0.2326, 0.1875, 0.1954, 0.2197, 0.1965,
0.2517, 0.2487, 0.2313, 0.2377, 0.2676, 0.3289, 0.3948, 0.3822,
0.2518, 0.2610, 0.2566, 0.2440, 0.2950, 0.3579, 0.3573, 0.3071,
0.3269, 0.4305, 0.2857, 0.2936, 0.3538, 0.2524, 0.2980, 0.3075,
0.3298, 0.3305, 0.3779, 0.3389, 0.3146, 0.3322, 0.3029, 0.3474,
0.3939, 0.4666, 0.4759, 0.3731, 0.3623, 0.4430, 0.4170, 0.4098,
0.4011, 0.4426, 0.4194, 0.4277, 0.5298, 0.8180, 0.4878, 0.6146,
0.6187, 0.5029, 0.5623, 0.4788, 0.4538, 0.4123, 0.3418, 0.3918,
0.4272, 0.4409, 0.4367, 0.4700, 0.4306, 0.4488, 0.4523, 0.4238,
0.4411, 0.3717, 0.4109, 0.3596, 0.3653, 0.3873, 0.5608, 0.5309,
0.4634, 0.4459, 0.5110, 0.4622, 0.4673, 0.4931, 0.5266, 0.5320,
0.5966, 0.5676, 0.5449, 0.4911, 0.4530, 0.4299, 0.4702, 0.5777,
0.6168, 0.3842, 0.4456, 0.5028, 0.5103, 0.5278, 0.5912, 0.5557,
0.4625, 0.5937, 0.6312, 0.5381, 0.4763, 0.4908, 0.4567, 0.5365,
0.6153, 0.5662, 0.5364, 0.5466, 0.5944, 0.4748, 0.5441, 0.5122,
0.5432, 0.4613, 0.3816, 0.3765, 0.3971, 0.4700, 0.4716, 0.3875,
0.3980, 0.3579, 0.3247, 0.3400, 0.3665, 0.3992, 0.3878, 0.5237,
0.5113, 0.4067, 0.3943, 0.3274, 0.3885, 0.3578, 0.4934, 0.6095,
0.3573, 0.3560, 0.3299, 0.3987, 0.3570, 0.4002, 0.2851, 0.4080,
0.3054, 0.2446, 0.2357, 0.3188, 0.2556, 0.3805, 0.4185, 0.3754,
0.3178, 0.2364, 0.3827, 0.2588, 0.2844, 0.2560, 0.2739, 0.1870,
0.2986, 0.4053, 0.2431, 0.2192, 0.3185, 0.1871, 0.3840, 0.2093,
0.1747, 0.1627, 0.1336, 0.1747, 0.3745, 0.1683, 0.1605, 0.1525,
0.1284, 0.1932, 0.1563, 0.1387, 0.1306, 0.1908, 0.0935, 0.1010,
0.1741, 0.1623, 0.0979, 0.0886, 0.0684, 0.0787, 0.0804, 0.0665,
0.1103, 0.0638, 0.0818, 0.0920, 0.0581, 0.0354, 0.0451, 0.1329,
0.0780, 0.0573, 0.0585, 0.1401, 0.0846, 0.1137, 0.1161, 0.0480,
0.0747, 0.0687, 0.0493, 0.0269, 0.0437, 0.0351, 0.0385, 0.2122,
0.2033, 0.1042, 0.0972, 0.1798, 0.0795, 0.0450, 0.0476, 0.0417,
0.0536, 0.0261, 0.0234, 0.0210, 0.0218, 0.0327, 0.0314, 0.0346,
0.0377, 0.0123, 0.0272, 0.1194, 0.0727, 0.0269, 0.0275, 0.0080,
```

```
0.0067, 0.0071, 0.0200, 0.0155, 0.0307, 0.0085, 0.0283, 0.1143,
0.0819, 0.0235, 0.0228, 0.0295, 0.0243, 0.0172, 0.0376, 0.0599,
0.0514, 0.0327, 0.0316, 0.0154, 0.0152,
144,        NWATER  (Rain Data for 2009)
   1,   1,  10,1.000,
  5.0, 0.0254,
  6.0, 0.0254,
  7.0, 0.0508,
  8.0, 0.0508,
  9.0, 0.1016,
 10.0, 0.1016,
 11.0, 0.0254,
 12.0, 0.0254,
 13.0, 0.0000,
 23.0, 0.0254,
   2,   1,  10,1.000,
  0.0, 0.1016,
  1.0, 0.1016,
  2.0, 0.0762,
  3.0, 0.1270,
  4.0, 0.2286,
  5.0, 0.1524,
  6.0, 0.0254,
  7.0, 0.0254,
  8.0, 0.0254,
  9.0, 0.0000,
   4,   1,   2,1.000,
 22.0, 0.1016,
 23.0, 0.1270,
   5,   1,   9,1.000,
  0.0, 0.1270,
  1.0, 0.1524,
  2.0, 0.0254,
  3.0, 0.1270,
  4.0, 0.0000,
  5.0, 0.1016,
  6.0, 0.1016,
  7.0, 0.0508,
  8.0, 0.0000,
   6,   1,   9,1.000,
  4.0, 0.0254,
  5.0, 0.0000,
  8.0, 0.0254,
  9.0, 0.0508,
 10.0, 0.1016,
 11.0, 0.1524,
 12.0, 0.1778,
 13.0, 0.0254,
 14.0, 0.0000,
   8,   1,   2,1.000,
  6.0, 0.0254,
  7.0, 0.0000,
  10,   1,   4,1.000,
 20.0, 0.0254,
```

```
21.0, 0.0508,
22.0, 0.0508,
23.0, 0.0254,
 11,   1,   2,1.000,
 0.0, 0.0508,
 1.0, 0.0000,
 16,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0000,
 17,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
 19,   1,   2,1.000,
15.0, 0.0254,
16.0, 0.0000,
 20,   1,   2,1.000,
19.0, 0.0254,
20.0, 0.0000,
 21,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0254,
 22,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0000,
 26,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0000,
 27,   1,   2,1.000,
 8.0, 0.0254,
 9.0, 0.0000,
 32,   1,   2,1.000,
18.0, 0.0254,
19.0, 0.0000,
 33,   1,   2,1.000,
 2.0, 0.0254,
 3.0, 0.0000,
 35,   1,   2,1.000,
 5.0, 0.0254,
 6.0, 0.0000,
 36,   1,   3,1.000,
21.0, 0.1016,
22.0, 0.1524,
23.0, 0.1524,
 37,   1,   9,1.000,
 0.0, 0.1270,
 1.0, 0.1016,
 2.0, 0.0762,
 3.0, 0.0000,
 7.0, 0.0508,
 8.0, 0.0508,
 9.0, 0.0508,
10.0, 0.0254,
11.0, 0.0000,
 41,   1,   2,1.000,
```

```
12.0, 0.0254,
13.0, 0.0000,
 42,   1,   2,1.000,
11.0, 0.0254,
12.0, 0.0000,
 46,   1,   4,1.000,
11.0, 0.0254,
12.0, 0.0254,
13.0, 0.0254,
14.0, 0.0000,
 47,   1,   2,1.000,
 9.0, 0.0508,
10.0, 0.0000,
 53,   1,   6,1.000,
15.0, 0.0254,
16.0, 0.0254,
17.0, 0.0000,
19.0, 0.1016,
20.0, 0.0508,
21.0, 0.0000,
 54,   1,  12,1.000,
 3.0, 0.0254,
 4.0, 0.0254,
 5.0, 0.0000,
14.0, 0.0762,
15.0, 0.1270,
16.0, 0.0000,
17.0, 0.0508,
18.0, 0.0508,
19.0, 0.3048,
20.0, 0.2794,
21.0, 0.0508,
22.0, 0.0000,
 55,   1,   2,1.000,
11.0, 0.0762,
12.0, 0.0000,
 56,   1,   7,1.000,
12.0, 0.0762,
13.0, 0.0508,
14.0, 0.0254,
15.0, 0.0254,
16.0, 0.0000,
23.0, 0.0254,
24.0, 0.0000,
 57,   1,  13,1.000,
 0.0, 0.0508,
 1.0, 0.0762,
 2.0, 0.1016,
 3.0, 0.0254,
 4.0, 0.0000,
 8.0, 0.0254,
 9.0, 0.0508,
10.0, 0.0508,
11.0, 0.1270,
```

```
12.0, 0.0254,
13.0, 0.0000,
14.0, 0.0254,
15.0, 0.0000,
 58,   1,   2,1.000,
 9.0, 0.0254,
10.0, 0.0000,
 60,   1,   9,1.000,
16.0, 0.0508,
17.0, 0.0254,
18.0, 0.1016,
19.0, 0.0762,
20.0, 0.0508,
21.0, 0.1016,
22.0, 0.0762,
23.0, 0.0508,
24.0, 0.0000,
 61,   1,  13,1.000,
10.0, 0.0254,
11.0, 0.0000,
12.0, 0.0762,
13.0, 0.0762,
14.0, 0.0762,
15.0, 0.0254,
16.0, 0.2286,
17.0, 0.1016,
18.0, 0.0000,
19.0, 0.0762,
20.0, 0.2286,
21.0, 0.0254,
22.0, 0.0000,
 62,   1,  12,1.000,
 0.0, 0.0508,
 1.0, 0.0508,
 2.0, 0.0508,
 3.0, 0.0254,
 4.0, 0.0000,
 5.0, 0.0508,
 6.0, 0.0254,
 7.0, 0.0254,
 8.0, 0.0000,
22.0, 0.0508,
23.0, 0.2032,
24.0, 0.0000,
 63,   1,  11,1.000,
 0.0, 0.0508,
 1.0, 0.0254,
 2.0, 0.0254,
 3.0, 0.0508,
 4.0, 0.0254,
 5.0, 0.0000,
 6.0, 0.0254,
 7.0, 0.0508,
 8.0, 0.1270,
```

```
 9.0, 0.0254,
10.0, 0.0000,
 64,   1,  10,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
 8.0, 0.0508,
 9.0, 0.0762,
10.0, 0.0000,
11.0, 0.0762,
12.0, 0.1524,
13.0, 0.1016,
14.0, 0.0508,
15.0, 0.0000,
 65,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
 67,   1,   3,1.000,
11.0, 0.0508,
12.0, 0.0254,
13.0, 0.0000,
 68,   1,   4,1.000,
14.0, 0.0254,
15.0, 0.0254,
16.0, 0.0254,
17.0, 0.0000,
 69,   1,   2,1.000,
12.0, 0.0254,
13.0, 0.0000,
 70,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0000,
 71,   1,   2,1.000,
13.0, 0.0254,
14.0, 0.0000,
 73,   1,   4,1.000,
21.0, 0.0508,
22.0, 0.1016,
23.0, 0.0762,
24.0, 0.0000,
 74,   1,   7,1.000,
 8.0, 0.0254,
 9.0, 0.0254,
10.0, 0.0254,
11.0, 0.0254,
12.0, 0.0000,
13.0, 0.0254,
14.0, 0.0000,
 75,   1,   3,1.000,
17.0, 0.0762,
18.0, 0.0508,
19.0, 0.0000,
 76,   1,   8,1.000,
 9.0, 0.0508,
10.0, 0.1016,
```

```
11.0, 0.0508,
12.0, 0.0000,
13.0, 0.0762,
14.0, 0.0000,
15.0, 0.0254,
16.0, 0.0000,
 80,   1,  12,1.000,
 0.0, 0.1016,
 1.0, 0.1524,
 2.0, 0.0254,
 3.0, 0.0000,
 7.0, 0.0254,
 8.0, 0.0000,
12.0, 0.0762,
13.0, 0.0000,
21.0, 0.1524,
22.0, 0.3556,
23.0, 0.4064,
24.0, 0.0000,
 81,   1,  20,1.000,
 0.0, 0.0508,
 1.0, 0.0000,
 2.0, 0.0254,
 3.0, 0.0254,
 4.0, 0.0000,
 5.0, 0.0508,
 6.0, 0.0000,
10.0, 0.0508,
11.0, 0.0000,
13.0, 0.0762,
14.0, 0.1524,
15.0, 0.0762,
16.0, 0.0000,
18.0, 0.0254,
19.0, 0.0254,
20.0, 0.0000,
21.0, 0.1270,
22.0, 0.0508,
23.0, 0.0254,
24.0, 0.0000,
 82,   1,   2,1.000,
 2.0, 0.0508,
 3.0, 0.0000,
 83,   1,  11,1.000,
10.0, 0.1524,
11.0, 0.1016,
12.0, 0.1016,
13.0, 0.0000,
14.0, 0.0762,
15.0, 0.0254,
16.0, 0.0000,
19.0, 0.2286,
20.0, 0.0000,
21.0, 0.0254,
```

```
22.0, 0.0000,
 87,   1,  10,1.000,
15.0, 0.0508,
16.0, 0.1016,
17.0, 0.1016,
18.0, 0.0508,
19.0, 0.1016,
20.0, 0.0508,
21.0, 0.0254,
22.0, 0.0254,
23.0, 0.0254,
24.0, 0.0000,
 88,   1,  15,1.000,
 1.0, 0.0254,
 2.0, 0.0254,
 3.0, 0.0000,
 4.0, 0.0254,
 5.0, 0.0000,
 6.0, 0.0254,
 7.0, 0.0254,
 8.0, 0.0508,
 9.0, 0.0254,
10.0, 0.0000,
13.0, 0.0254,
14.0, 0.0000,
16.0, 0.1016,
17.0, 0.0508,
18.0, 0.0000,
 89,   1,   7,1.000,
 3.0, 0.0762,
 4.0, 0.0000,
 5.0, 0.0254,
 6.0, 0.0254,
 7.0, 0.0000,
 9.0, 0.0254,
10.0, 0.0000,
 90,   1,   9,1.000,
 7.0, 0.0508,
 8.0, 0.0000,
11.0, 0.1778,
12.0, 0.0000,
13.0, 0.0254,
14.0, 0.0508,
15.0, 0.0762,
16.0, 0.0254,
17.0, 0.0000,
 92,   1,  10,1.000,
10.0, 0.0762,
11.0, 0.1778,
12.0, 0.2286,
13.0, 0.0508,
14.0, 0.0000,
18.0, 0.1270,
19.0, 0.0254,
```

```
20.0, 0.0000,
23.0, 0.0254,
24.0, 0.0000,
 93,   1,   7,1.000,
 7.0, 0.0254,
 8.0, 0.0254,
 9.0, 0.0508,
10.0, 0.0508,
11.0, 0.0000,
18.0, 0.1778,
19.0, 0.0000,
 94,   1,   2,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
 99,   1,   2,1.000,
14.0, 0.0254,
15.0, 0.0000,
101,   1,   7,1.000,
 8.0, 0.2032,
 9.0, 0.1016,
10.0, 0.0000,
11.0, 0.0254,
12.0, 0.0000,
13.0, 0.0254,
14.0, 0.0000,
102,   1,   6,1.000,
16.0, 0.1270,
17.0, 0.1270,
18.0, 0.0508,
19.0, 0.0508,
20.0, 0.0508,
21.0, 0.0000,
103,   1,   5,1.000,
13.0, 0.0508,
14.0, 0.0000,
18.0, 0.0254,
19.0, 0.0762,
20.0, 0.0000,
113,   1,   4,1.000,
15.0, 0.0254,
16.0, 0.0000,
18.0, 0.0254,
19.0, 0.0000,
116,   1,   2,1.000,
15.0, 0.0254,
16.0, 0.0000,
122,   1,   4,1.000,
18.0, 0.0254,
19.0, 0.0508,
20.0, 0.0762,
21.0, 0.0000,
123,   1,   8,1.000,
 1.0, 0.1016,
 2.0, 0.0762,
```

```
 3.0, 0.0000,
 4.0, 0.0254,
 5.0, 0.0000,
14.0, 0.2032,
15.0, 0.0254,
16.0, 0.0000,
124,   1,   4,1.000,
21.0, 0.0508,
22.0, 0.0762,
23.0, 0.0762,
24.0, 0.0000,
125,   1,  10,1.000,
 0.0, 0.0508,
 1.0, 0.0000,
 2.0, 0.0254,
 3.0, 0.1016,
 4.0, 0.0254,
 5.0, 0.0000,
11.0, 0.0254,
12.0, 0.0000,
14.0, 0.0508,
15.0, 0.0000,
126,   1,   5,1.000,
16.0, 0.1524,
17.0, 0.1270,
18.0, 0.0000,
20.0, 0.0254,
21.0, 0.0000,
127,   1,   6,1.000,
12.0, 0.0254,
13.0, 0.0000,
15.0, 0.0254,
16.0, 0.0000,
18.0, 0.0254,
19.0, 0.0000,
131,   1,   7,1.000,
 3.0, 0.0254,
 4.0, 0.0762,
 5.0, 0.0762,
 6.0, 0.0000,
 8.0, 0.0254,
 9.0, 0.1016,
10.0, 0.0000,
132,   1,   5,1.000,
16.0, 0.0254,
17.0, 0.0000,
18.0, 0.0254,
19.0, 0.0254,
20.0, 0.0000,
133,   1,   4,1.000,
21.0, 0.0254,
22.0, 0.2032,
23.0, 0.1524,
24.0, 0.0000,
```

```
134,   1,  10,1.000,
 0.0, 0.1270,
 1.0, 0.1778,
 2.0, 0.2286,
 3.0, 0.1270,
 4.0, 0.0508,
 5.0, 0.0762,
 6.0, 0.1270,
 7.0, 0.0000,
 9.0, 0.0254,
10.0, 0.0000,
140,   1,   4,1.000,
 2.0, 0.0508,
 3.0, 0.0000,
 6.0, 0.0254,
 7.0, 0.0000,
159,   1,   6,1.000,
 8.0, 0.0254,
 9.0, 0.6096,
10.0, 0.1524,
11.0, 0.0000,
12.0, 0.1016,
13.0, 0.0000,
165,   1,   8,1.000,
 6.0, 0.4064,
 7.0, 0.1524,
 8.0, 0.1524,
 9.0, 0.0762,
10.0, 0.0254,
11.0, 0.0000,
19.0, 0.4572,
20.0, 0.0000,
166,   1,   2,1.000,
18.0, 0.0254,
19.0, 0.0000,
168,   1,   8,1.000,
11.0, 0.2286,
12.0, 0.0000,
16.0, 0.2286,
17.0, 0.0000,
21.0, 0.0254,
22.0, 0.0254,
23.0, 0.1778,
24.0, 0.0000,
170,   1,   7,1.000,
13.0, 0.0254,
14.0, 0.0254,
15.0, 0.0000,
21.0, 0.0508,
22.0, 0.2540,
23.0, 0.5842,
24.0, 0.0000,
171,   1,   4,1.000,
 0.0, 0.1270,
```

```
 1.0, 0.0000,
 4.0, 0.0254,
 5.0, 0.0000,
172,   1,   7,1.000,
16.0, 0.0508,
17.0, 0.1016,
18.0, 0.0762,
19.0, 0.0508,
20.0, 0.0000,
22.0, 0.0254,
23.0, 0.0000,
186,   1,   2,1.000,
 8.0, 0.0254,
 9.0, 0.0000,
187,   1,   7,1.000,
 3.0, 0.5080,
 4.0, 0.0000,
 6.0, 0.0508,
 7.0, 0.1270,
 8.0, 0.0508,
 9.0, 0.0254,
10.0, 0.0000,
193,   1,   3,1.000,
22.0, 0.0254,
23.0, 0.1270,
24.0, 0.0000,
194,   1,  19,1.000,
 0.0, 0.0254,
 1.0, 0.1778,
 2.0, 0.0508,
 3.0, 0.0000,
 4.0, 0.0254,
 5.0, 0.0000,
 9.0, 0.0508,
10.0, 0.0508,
11.0, 0.0762,
12.0, 0.0254,
13.0, 0.0508,
14.0, 0.3302,
15.0, 0.1016,
16.0, 0.2032,
17.0, 0.0000,
20.0, 0.0508,
21.0, 0.0000,
23.0, 0.0254,
24.0, 0.0000,
207,   1,   5,1.000,
 5.0, 0.0254,
 6.0, 0.0254,
 7.0, 0.0000,
 8.0, 0.0254,
 9.0, 0.0000,
209,   1,   7,1.000,
 2.0, 0.1270,
```

```
 3.0, 0.0508,
 4.0, 0.0000,
 5.0, 0.0254,
 6.0, 0.0000,
21.0, 0.0762,
22.0, 0.0000,
212,   1,   4,1.000,
 3.0, 0.0254,
 4.0, 0.0000,
 5.0, 0.0254,
 6.0, 0.0000,
218,   1,   3,1.000,
20.0, 1.2446,
21.0, 0.0508,
22.0, 0.0000,
219,   1,   4,1.000,
 3.0, 0.1270,
 4.0, 0.0254,
 5.0, 0.0254,
 6.0, 0.0000,
224,   1,  11,1.000,
 6.0, 0.0254,
 7.0, 0.3810,
 8.0, 0.1016,
 9.0, 0.3810,
10.0, 0.0254,
11.0, 0.1016,
12.0, 0.0000,
20.0, 0.0508,
21.0, 0.8890,
22.0, 0.0508,
23.0, 0.0000,
225,   1,   2,1.000,
 5.0, 0.0254,
 6.0, 0.0000,
226,   1,   4,1.000,
14.0, 0.2032,
15.0, 0.0000,
19.0, 0.0254,
20.0, 0.0000,
227,   1,   7,1.000,
15.0, 0.1270,
16.0, 0.1270,
17.0, 0.0000,
20.0, 0.0762,
21.0, 0.0000,
22.0, 0.0254,
23.0, 0.0000,
228,   1,   2,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
229,   1,   2,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
```

```
233,   1,   4,1.000,
 1.0, 0.0254,
 2.0, 0.0000,
 3.0, 0.1778,
 4.0, 0.0000,
241,   1,   3,1.000,
 9.0, 0.0762,
10.0, 0.0254,
11.0, 0.0000,
249,   1,   4,1.000,
 5.0, 0.0254,
 6.0, 0.2540,
 7.0, 0.2286,
 8.0, 0.0000,
250,   1,   6,1.000,
12.0, 0.0254,
13.0, 0.0000,
15.0, 0.2540,
16.0, 0.1778,
17.0, 0.0254,
18.0, 0.0000,
251,   1,   2,1.000,
 3.0, 0.0254,
 4.0, 0.0000,
260,   1,   3,1.000,
 8.0, 0.2794,
 9.0, 0.1016,
10.0, 0.0000,
262,   1,   2,1.000,
15.0, 0.0254,
16.0, 0.0000,
275,   1,   9,1.000,
 7.0, 0.0254,
 8.0, 0.1270,
 9.0, 0.0508,
10.0, 0.0508,
11.0, 0.0254,
12.0, 0.0254,
13.0, 0.0000,
18.0, 0.1524,
19.0, 0.0000,
276,   1,   2,1.000,
11.0, 0.0508,
12.0, 0.0000,
280,   1,   2,1.000,
14.0, 0.1270,
15.0, 0.0254,
286,   1,   4,1.000,
17.0, 0.0254,
18.0, 0.0000,
19.0, 0.0254,
20.0, 0.0000,
287,   1,  17,1.000,
 0.0, 0.1016,
```

```
 1.0, 0.1270,
 2.0, 0.1524,
 3.0, 0.1270,
 4.0, 0.1270,
 5.0, 0.0000,
 8.0, 0.0508,
 9.0, 0.0508,
10.0, 0.0762,
11.0, 0.1016,
12.0, 0.1270,
13.0, 0.0508,
14.0, 0.0000,
16.0, 0.0254,
17.0, 0.0508,
18.0, 0.0254,
19.0, 0.0000,
290,   1,   4,1.000,
19.0, 0.2540,
20.0, 0.1778,
21.0, 0.1016,
22.0, 0.0000,
293,   1,   2,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
294,   1,   5,1.000,
17.0, 0.0254,
18.0, 0.0254,
19.0, 0.1524,
20.0, 0.0254,
21.0, 0.0000,
296,   1,  14,1.000,
 7.0, 0.0254,
 8.0, 0.0000,
 9.0, 0.0762,
10.0, 0.1270,
11.0, 0.1778,
12.0, 0.3302,
13.0, 0.2794,
14.0, 0.0762,
15.0, 0.2032,
16.0, 0.0762,
17.0, 0.0508,
18.0, 0.0254,
19.0, 0.0254,
20.0, 0.0000,
298,   1,   3,1.000,
 8.0, 0.0254,
 9.0, 0.0000,
23.0, 0.0762,
299,   1,  15,1.000,
 0.0, 0.1016,
 1.0, 0.0508,
 2.0, 0.0508,
 3.0, 0.0000,
```

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 6.0, 0.2540,
 7.0, 0.1016,
 8.0, 0.2032,
 9.0, 0.1270,
10.0, 0.1270,
11.0, 0.0762,
12.0, 0.2032,
13.0, 0.5842,
14.0, 0.3048,
15.0, 0.0508,
16.0, 0.0000,
300,   1,   2,1.000,
 8.0, 0.0254,
 9.0, 0.0000,
302,   1,   8,1.000,
10.0, 0.0254,
11.0, 0.1016,
12.0, 0.0508,
13.0, 0.0000,
19.0, 0.0508,
20.0, 0.0000,
22.0, 0.0254,
23.0, 0.0000,
304,   1,   6,1.000,
 0.0, 0.0762,
 1.0, 0.0762,
 2.0, 0.0000,
 3.0, 0.0762,
 4.0, 0.0254,
 5.0, 0.0000,
306,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
309,   1,   6,1.000,
19.0, 0.0254,
20.0, 0.0254,
21.0, 0.0000,
22.0, 0.0508,
23.0, 0.0508,
24.0, 0.0000,
310,   1,   3,1.000,
 2.0, 0.0762,
 3.0, 0.0508,
 4.0, 0.0000,
312,   1,   5,1.000,
13.0, 0.0508,
14.0, 0.0762,
15.0, 0.0254,
16.0, 0.0508,
17.0, 0.0000,
313,   1,   6,1.000,
 2.0, 0.0254,
 3.0, 0.0000,
20.0, 0.0254,
```

```
21.0, 0.0000,
22.0, 0.0254,
23.0, 0.0000,
314,   1,   3,1.000,
 3.0, 0.0254,
 4.0, 0.0254,
 5.0, 0.0000,
315,   1,   2,1.000,
 5.0, 0.0254,
 6.0, 0.0000,
317,   1,   7,1.000,
14.0, 0.0254,
15.0, 0.0000,
17.0, 0.0254,
18.0, 0.0000,
19.0, 0.0254,
20.0, 0.0254,
21.0, 0.0000,
318,   1,   2,1.000,
10.0, 0.0508,
11.0, 0.0000,
321,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0000,
323,   1,   9,1.000,
 5.0, 0.0762,
 6.0, 0.0508,
 7.0, 0.0000,
 8.0, 0.0508,
 9.0, 0.1270,
10.0, 0.0762,
11.0, 0.0000,
12.0, 0.0254,
13.0, 0.0000,
324,   1,   3,1.000,
18.0, 0.0254,
19.0, 0.0254,
20.0, 0.0000,
326,   1,   9,1.000,
11.0, 0.1524,
12.0, 0.1016,
13.0, 0.0508,
14.0, 0.0254,
15.0, 0.0254,
16.0, 0.0254,
17.0, 0.0000,
18.0, 0.0508,
19.0, 0.0000,
328,   1,   2,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
330,   1,  11,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
```

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15.0, 0.0762,
16.0, 0.1016,
17.0, 0.1016,
18.0, 0.0254,
19.0, 0.0000,
20.0, 0.0254,
21.0, 0.0000,
23.0, 0.0508,
24.0, 0.0000,
331,   1,   9,1.000,
 0.0, 0.0762,
 1.0, 0.0508,
 2.0, 0.0762,
 3.0, 0.2032,
 4.0, 0.1016,
 5.0, 0.1778,
 6.0, 0.1270,
 7.0, 0.0254,
 8.0, 0.0000,
332,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
334,   1,   2,1.000,
 9.0, 0.0254,
10.0, 0.0000,
339,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0000,
348,   1,   2,1.000,
11.0, 0.0254,
12.0, 0.0000,
349,   1,   4,1.000,
21.0, 0.1270,
22.0, 0.2286,
23.0, 0.1016,
24.0, 0.0000,
350,   1,  12,1.000,
 0.0, 0.1270,
 1.0, 0.1524,
 2.0, 0.1778,
 3.0, 0.0254,
 4.0, 0.0254,
 5.0, 0.0254,
 6.0, 0.0000,
17.0, 0.0254,
18.0, 0.0508,
19.0, 0.0000,
20.0, 0.0254,
21.0, 0.0000,
353,   1,  13,1.000,
 8.0, 0.0508,
 9.0, 0.0254,
10.0, 0.0254,
11.0, 0.0000,
```

```
12.0, 0.0508,
13.0, 0.0000,
17.0, 0.0254,
18.0, 0.0000,
20.0, 0.0508,
21.0, 0.0254,
22.0, 0.0508,
23.0, 0.1270,
24.0, 0.0000,
354,   1,  16,1.000,
 0.0, 0.1270,
 1.0, 0.0254,
 2.0, 0.0508,
 3.0, 0.0000,
11.0, 0.0254,
12.0, 0.0000,
14.0, 0.0254,
15.0, 0.0762,
16.0, 0.0762,
17.0, 0.0508,
18.0, 0.0254,
19.0, 0.1016,
20.0, 0.0000,
21.0, 0.0762,
22.0, 0.0254,
23.0, 0.0762,
355,   1,  20,1.000,
 0.0, 0.2032,
 1.0, 0.0000,
 2.0, 0.0762,
 3.0, 0.0508,
 4.0, 0.0000,
 9.0, 0.1524,
10.0, 0.2540,
11.0, 0.0508,
12.0, 0.0762,
13.0, 0.0508,
14.0, 0.0000,
16.0, 0.1270,
17.0, 0.1016,
18.0, 0.0254,
19.0, 0.1016,
20.0, 0.1016,
21.0, 0.0254,
22.0, 0.0508,
23.0, 0.0508,
24.0, 0.0000,
356,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
365,   1,   9,1.000,
10.0, 0.0254,
11.0, 0.0254,
12.0, 0.0000,
```

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 19.0, 0.0508,
 20.0, 0.0508,
 21.0, 0.0508,
 22.0, 0.0508,
 23.0, 0.0254,
 24.0, 0.0000,
```

***CID, Brooks-Corey, 2010***

```
Spokane Valley Rathdrum Prairie CID Simulation:  BCCID2010.inp
0, 1,                          IPLANT, NGRAV
62, 1, 62,                     IFDEND, IDTBEG, IDTEND
2010, 1, 0, 0, 0,              IYS, NYEARS, ISTEAD, IFLIST, NFLIST
1, 24.0,                       NPRINT, STOPHR
0, 3, 1, 1.0E-4,               ISMETH, INMAX, ISWDIF, DMAXBA
1.0, 1.0E-5, 1.0,              DELMAX, DELMIN, OUTTIM
2.0, 1.0E-05, 0.0, 0.0, 0.0,   RFACT, RAINIF, DHTOL, DHMAX, DHFACT
3, 3, 0,                       KOPT, KEST, WTF
0, 1, 2, 2,                    ITOPBC, IEVOPT, NFHOUR, LOWER
0.0, 2.0E+04, 20.73, 0.0,      HIRRI, HDRY, HTOP, RHA
0, 0, 0,                       IETOPT, ICLOUD, ISHOPT
0, 0,                          IRAIN, HPR
0, 0, 0, 0, 0,                 IHYS, AIRTOL, HYSTOL, HYSMXH, HYFILE
0, 0, 0,                       IHEAT, ICONVH, DMAXHE
0, 0, 0, 0,                    UPPERH, TSMEAN, TSAMP, QHCTOP
0, 0.0, 0.0,                   LOWERH, QHLEAK, TGRAD
0, 0.66, 288.46, 0.24,         IVAPOR, TORT, TSOIL, VAPDIF
3, 126,                        MATN, NPT
1,    0.00,  1,    1.00,  1,    2.00,  1,    3.00,
1,    4.00,  1,    5.00,  1,    6.00,  1,    7.00,
1,    8.00,  1,    9.00,  1,   10.00,  1,   11.00,
1,   12.00,  1,   13.00,  1,   14.00,  1,   15.00,
1,   16.00,  1,   17.00,  1,   18.00,  1,   19.00,
1,   20.00,  2,   21.00,  2,   22.00,  2,   23.00,
2,   24.00,  2,   25.00,  2,   26.00,  2,   27.00,
2,   28.00,  2,   29.00,  2,   30.00,  2,   31.00,
2,   32.00,  2,   33.00,  2,   34.00,  2,   35.00,
2,   36.00,  2,   37.00,  2,   38.00,  2,   39.00,
2,   40.00,  2,   41.00,  2,   42.00,  2,   43.00,
2,   44.00,  2,   45.00,  2,   46.00,  2,   47.00,
2,   48.00,  2,   49.00,  2,   50.00,  2,   51.00,
2,   52.00,  2,   53.00,  2,   54.00,  2,   55.00,
2,   56.00,  2,   57.00,  2,   58.00,  2,   59.00,
2,   60.00,  2,   61.00,  2,   62.00,  2,   63.00,
2,   64.00,  2,   65.00,  3,   66.00,  3,   67.00
3,   68.00,  3,   69.00,  3,   70.00,  3,   71.00,
3,   72.00,  3,   73.00,  3,   74.00,  3,   75.00,
3,   76.00,  3,   77.00,  3,   78.00,  3,   79.00,
3,   80.00,  3,   81.00,  3,   82.00,  3,   83.00,
3,   84.00,  3,   85.00,  3,   86.00,  3,   87.00,
3,   88.00,  3,   89.00,  3,   90.00,  3,   91.00,
3,   92.00,  3,   93.00,  3,   94.00,  3,   95.00,
3,   96.00,  3,   97.00,  3,   98.00,  3,   99.00,
```

```
3,  100.00,  3,  101.00,  3,  102.00,  3,  103.00,
3,  104.00,  3,  105.00,  3,  106.00,  3,  107.00,
3,  108.00,  3,  109.00,  3,  110.00,  3,  111.00,
3,  112.00,  3,  113.00,  3,  114.00,  3,  115.00,
3,  116.00,  3,  117.00,  3,  118.00,  3,  119.00,
3,  120.00,  3,  121.00,  3,  122.00,  3,  123.00,
3,  124.00,  3,  125.00,
Sand Layer #1: 0-20 cm (Brooks-Corey et al.)          Retention
0.5, 0.02, 30.21, 1.8476,                             THET, THTR,
AIRENT, B
Sand Layer #1: 0-20 cm (Brooks-Corey et al.)          Hydraulic
Conductivity
2.0, 39.2, 30.21, 1.8476, 0.5,                        RKMOD, SK,
AIRENK, B, EPIT
Sand Layer #2: 0-20 cm (Brooks-Corey et al.)          Retention
0.57, 0.02, 18.18, 1.6104,                            THET, THTR,
AIRENT, B
Sand Layer #2: 0-20 cm (Brooks-Corey et al.)          Hydraulic
Conductivity
2.0, 23.2, 18.18, 1.6104, 0.5,                        RKMOD, SK,
AIRENK, B, EPIT
Sand Layer #3: 0-20 cm (Brooks-Corey et al.)          Retention
0.2, 0.015, 18.18, 1.5172,                            THET, THTR,
AIRENT, B
Sand Layer #3: 0-20 cm (Brooks-Corey et al.)          Hydraulic
Conductivity
2.0, 23.2, 18.18, 1.5172, 0.5,                        RKMOD, SK,
AIRENK, B, EPIT
0,    NDAY
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
```

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50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,
0.0314, 0.0346, 0.0377, 0.0123, 0.0272, 0.1194, 0.0727, 0.0269,
0.0275, 0.0080, 0.0067, 0.0071, 0.0200, 0.0155, 0.0307, 0.0085,
0.0283, 0.1143, 0.0819, 0.0235, 0.0228, 0.0295, 0.0243, 0.0172,
0.0376, 0.0599, 0.0514, 0.0327, 0.0316, 0.0154, 0.0152, 0.0268,
0.0252, 0.0274, 0.0209, 0.0175, 0.0686, 0.0656, 0.0556, 0.0174,
0.0393, 0.0435, 0.0279, 0.0272, 0.0473, 0.1827, 0.0221, 0.0343,
0.1199, 0.0863, 0.1158, 0.1326, 0.1014, 0.0304, 0.0509, 0.0356,
0.0397, 0.0358, 0.0540, 0.0646, 0.0565, 0.0338,
24,         NWATER  (Rain Data for 2010)
   5,   1,   2,1.000,
 16.0, 0.0254,
 17.0, 0.0000,
  14,   1,   2,1.000,
 11.0, 0.0254,
 12.0, 0.0000,
  15,   1,   4,1.000,
 21.0, 0.1270,
 22.0, 0.2286,
 23.0, 0.1016,
 24.0, 0.0000,
  16,   1,  12,1.000,
  0.0, 0.1270,
  1.0, 0.1524,
  2.0, 0.1778,
  3.0, 0.0254,
  4.0, 0.0254,
  5.0, 0.0254,
  6.0, 0.0000,
 17.0, 0.0254,
 18.0, 0.0508,
 19.0, 0.0000,
 20.0, 0.0254,
 21.0, 0.0000,
  19,   1,  13,1.000,
  8.0, 0.0508,
  9.0, 0.0254,
 10.0, 0.0254,
 11.0, 0.0000,
 12.0, 0.0508,
 13.0, 0.0000,
 17.0, 0.0254,
 18.0, 0.0000,
 20.0, 0.0508,
 21.0, 0.0254,
 22.0, 0.0508,
 23.0, 0.1270,
 24.0, 0.0000,
```

```
 20,   1,  16,1.000,
 0.0, 0.1270,
 1.0, 0.0254,
 2.0, 0.0508,
 3.0, 0.0000,
11.0, 0.0254,
12.0, 0.0000,
14.0, 0.0254,
15.0, 0.0762,
16.0, 0.0762,
17.0, 0.0508,
18.0, 0.0254,
19.0, 0.1016,
20.0, 0.0000,
21.0, 0.0762,
22.0, 0.0254,
23.0, 0.0762,
 21,   1,  20,1.000,
 0.0, 0.2032,
 1.0, 0.0000,
 2.0, 0.0762,
 3.0, 0.0508,
 4.0, 0.0000,
 9.0, 0.1524,
10.0, 0.2540,
11.0, 0.0508,
12.0, 0.0762,
13.0, 0.0508,
14.0, 0.0000,
16.0, 0.1270,
17.0, 0.1016,
18.0, 0.0254,
19.0, 0.1016,
20.0, 0.1016,
21.0, 0.0254,
22.0, 0.0508,
23.0, 0.0508,
24.0, 0.0000,
 22,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
 31,   1,   9,1.000,
10.0, 0.0254,
11.0, 0.0254,
12.0, 0.0000,
19.0, 0.0508,
20.0, 0.0508,
21.0, 0.0508,
22.0, 0.0508,
23.0, 0.0254,
24.0, 0.0000,
 32,   1,  15,1.000,
 0.0, 0.0254,
 1.0, 0.0254,
```

```
 2.0, 0.0508,
 3.0, 0.0508,
 4.0, 0.0254,
 5.0, 0.0000,
 7.0, 0.0254,
 8.0, 0.0254,
 9.0, 0.0000,
12.0, 0.1016,
13.0, 0.0000,
15.0, 0.0762,
16.0, 0.0000,
20.0, 0.0254,
21.0, 0.0000,
 33,   1,   2,1.000,
15.0, 0.0254,
16.0, 0.0000,
 35,   1,  17,1.000,
 4.0, 0.0254,
 5.0, 0.0254,
 6.0, 0.0000,
10.0, 0.0254,
11.0, 0.0254,
12.0, 0.1270,
13.0, 0.1778,
14.0, 0.2032,
15.0, 0.1524,
16.0, 0.0762,
17.0, 0.0254,
18.0, 0.0762,
19.0, 0.0508,
20.0, 0.0000,
21.0, 0.1016,
22.0, 0.2032,
23.0, 0.1524,
 36,   1,  13,1.000,
 0.0, 0.1524,
 1.0, 0.1016,
 2.0, 0.0254,
 3.0, 0.0508,
 4.0, 0.0508,
 5.0, 0.0508,
 6.0, 0.0000,
 7.0, 0.0254,
 8.0, 0.0000,
 9.0, 0.0254,
10.0, 0.0000,
12.0, 0.0254,
13.0, 0.0000,
 41,   1,   3,1.000,
 9.0, 0.0254,
10.0, 0.0254,
11.0, 0.0000,
 43,   1,   9,1.000,
 9.0, 0.0254,
```

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10.0, 0.0000,
14.0, 0.0254,
15.0, 0.0000,
18.0, 0.0254,
19.0, 0.1016,
20.0, 0.4064,
21.0, 0.0254,
22.0, 0.0000,
 44,   1,   9,1.000,
 3.0, 0.0254,
 4.0, 0.0000,
14.0, 0.0508,
15.0, 0.1778,
16.0, 0.1778,
17.0, 0.0762,
18.0, 0.0000,
22.0, 0.0254,
23.0, 0.0254,
 45,   1,   4,1.000,
 0.0, 0.1778,
 1.0, 0.0508,
 2.0, 0.0254,
 3.0, 0.0000,
 46,   1,   2,1.000,
22.0, 0.0254,
23.0, 0.0000,
 47,   1,   9,1.000,
 1.0, 0.0508,
 2.0, 0.1016,
 3.0, 0.0762,
 4.0, 0.0508,
 5.0, 0.0254,
 6.0, 0.0762,
 7.0, 0.0508,
 8.0, 0.0508,
 9.0, 0.0000,
 48,   1,   9,1.000,
 3.0, 0.0508,
 4.0, 0.0254,
 5.0, 0.0000,
14.0, 0.0254,
15.0, 0.0000,
21.0, 0.0254,
22.0, 0.0762,
23.0, 0.0762,
24.0, 0.0000,
 50,   1,   3,1.000,
 4.0, 0.0254,
 5.0, 0.0254,
 6.0, 0.0000,
 56,   1,   8,1.000,
10.0, 0.0508,
11.0, 0.0762,
12.0, 0.0254,
```

```
 13.0, 0.0254,
 14.0, 0.0254,
 15.0, 0.0000,
 16.0, 0.0254,
 17.0, 0.0000,
  61,   1,   2,1.000,
 10.0, 0.0254,
 11.0, 0.0000,
  62,   1,  12,1.000,
  1.0, 0.0254,
  2.0, 0.0000,
  3.0, 0.0254,
  4.0, 0.0254,
  5.0, 0.0000,
  7.0, 0.0254,
  8.0, 0.0762,
  9.0, 0.0508,
 10.0, 0.0254,
 11.0, 0.0000,
 13.0, 0.0254,
 14.0, 0.0000,
```

***SVFD, van Genuchten, 2009***

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Spokane Valley Rathdrum Prairie SVFD Simulation:  VGSVFD2009.inp
0, 1,                          IPLANT, NGRAV
365, 1, 365,                   IFDEND, IDTBEG, IDTEND
2009, 1, 0, 0, 0,              IYS, NYEARS, ISTEAD, IFLIST, NFLIST
1, 24.0,                       NPRINT, STOPHR
0, 3, 1, 1.0E-4,               ISMETH, INMAX, ISWDIF, DMAXBA
1.0, 1.0E-5, 1.0,              DELMAX, DELMIN, OUTTIM
2.0, 1.0E-05, 0.0, 0.0, 0.0,   RFACT, RAINIF, DHTOL, DHMAX, DHFACT
4, 3, 0,                       KOPT, KEST, WTF
0, 1, 2, 2,                    ITOPBC, IEVOPT, NFHOUR, LOWER
0.0, 2.0E+04, 20.73, 0.0,      HIRRI, HDRY, HTOP, RHA
0, 0, 0,                       IETOPT, ICLOUD, ISHOPT
0, 0,                          IRAIN, HPR
0, 0, 0, 0, 0,                 IHYS, AIRTOL, HYSTOL, HYSMXH, HYFILE
0, 0, 0,                       IHEAT, ICONVH, DMAXHE
0, 0, 0, 0,                    UPPERH, TSMEAN, TSAMP, QHCTOP
0, 0.0, 0.0,                   LOWERH, QHLEAK, TGRAD
0, 0.66, 288.46, 0.24,         IVAPOR, TORT, TSOIL, VAPDIF
3, 126,                        MATN, NPT
1,    0.00,  1,    1.00,  1,    2.00,  1,    3.00,
1,    4.00,  1,    5.00,  1,    6.00,  1,    7.00,
1,    8.00,  1,    9.00,  1,   10.00,  1,   11.00,
1,   12.00,  1,   13.00,  1,   14.00,  1,   15.00,
1,   16.00,  1,   17.00,  1,   18.00,  1,   19.00,
1,   20.00,  2,   21.00,  2,   22.00,  2,   23.00,
2,   24.00,  2,   25.00,  2,   26.00,  2,   27.00,
2,   28.00,  2,   29.00,  2,   30.00,  2,   31.00,
2,   32.00,  2,   33.00,  2,   34.00,  2,   35.00,
2,   36.00,  2,   37.00,  2,   38.00,  2,   39.00,
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2,   40.00,  2,   41.00,  2,   42.00,  2,   43.00,
2,   44.00,  2,   45.00,  2,   46.00,  2,   47.00,
2,   48.00,  2,   49.00,  2,   50.00,  2,   51.00,
2,   52.00,  2,   53.00,  2,   54.00,  2,   55.00,
2,   56.00,  2,   57.00,  2,   58.00,  2,   59.00,
2,   60.00,  2,   61.00,  2,   62.00,  2,   63.00,
2,   64.00,  2,   65.00,  3,   66.00,  3,   67.00
3,   68.00,  3,   69.00,  3,   70.00,  3,   71.00,
3,   72.00,  3,   73.00,  3,   74.00,  3,   75.00,
3,   76.00,  3,   77.00,  3,   78.00,  3,   79.00,
3,   80.00,  3,   81.00,  3,   82.00,  3,   83.00,
3,   84.00,  3,   85.00,  3,   86.00,  3,   87.00,
3,   88.00,  3,   89.00,  3,   90.00,  3,   91.00,
3,   92.00,  3,   93.00,  3,   94.00,  3,   95.00,
3,   96.00,  3,   97.00,  3,   98.00,  3,   99.00,
3,  100.00,  3,  101.00,  3,  102.00,  3,  103.00,
3,  104.00,  3,  105.00,  3,  106.00,  3,  107.00,
3,  108.00,  3,  109.00,  3,  110.00,  3,  111.00,
3,  112.00,  3,  113.00,  3,  114.00,  3,  115.00,
3,  116.00,  3,  117.00,  3,  118.00,  3,  119.00,
3,  120.00,  3,  121.00,  3,  122.00,  3,  123.00,
3,  124.00,  3,  125.00,
Sand Layer #1: 0-20 cm (van Genuchten et al.)   Retention
0.3, 0.045, 0.025, 1.81,                        THET, THTR, A, N
Sand Layer #1: 0-20 cm (van Genuchten et al.)   Hydraulic Conductivity
2.0, 29.8, 0.025, 1.81, 0.5,                    RKMODEL, SK, A, N, EPIT
Sand Layer #2: 21-65 cm (van Genuchten et al.)  Retention
0.3, 0.045, 0.032, 1.81,                        THET, THTR, A, N
Sand Layer #2: 21-65 cm (van Genuchten et al.)  Hydraulic Conductivity
2.0, 29.8, 0.032, 1.81, 0.5,                    RKMODEL, SK, A, N, EPIT
Sand Layer #3: 66-125 cm (van Genuchten et al.) Retention
0.13, 0.01, 0.045, 1.89,                        THET, THTR, A, N
Sand Layer #3: 66-125 cm (van Genuchten et al.) Hydraulic Conductivity
2.0, 9.8, 0.045, 1.89, 0.5,                     RKMODEL, SK, A, N, EPIT
0,    NDAY
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
```

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20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,
0.0201, 0.0238, 0.0084, 0.0018, 0.0102, 0.0170, 0.0558, 0.0891,
0.0475, 0.0479, 0.0236, 0.0174, 0.0173, 0.0209, 0.0256, 0.0233,
0.0182, 0.0298, 0.0198, 0.0147, 0.0171, 0.0178, 0.0199, 0.0316,
0.0866, 0.0460, 0.0384, 0.0226, 0.0425, 0.0811, 0.0958, 0.0383,
0.0322, 0.0590, 0.0499, 0.0443, 0.0321, 0.0369, 0.0410, 0.0332,
0.0358, 0.0347, 0.0370, 0.0442, 0.0441, 0.0412, 0.0491, 0.0464,
0.0510, 0.0524, 0.0505, 0.0538, 0.0478, 0.0550, 0.1009, 0.0896,
0.0803, 0.0712, 0.0632, 0.0701, 0.0824, 0.0987, 0.1005, 0.1031,
0.0907, 0.1329, 0.0888, 0.0783, 0.0722, 0.0588, 0.0646, 0.0819,
0.0996, 0.1648, 0.1520, 0.1309, 0.1227, 0.1231, 0.1502, 0.1500,
0.1340, 0.1476, 0.1317, 0.1869, 0.1360, 0.1853, 0.1626, 0.1362,
0.1726, 0.1635, 0.1386, 0.1473, 0.1578, 0.1639, 0.1798, 0.2057,
0.2093, 0.2826, 0.2214, 0.2123, 0.2127, 0.2207, 0.2178, 0.1944,
0.2278, 0.2223, 0.2156, 0.2318, 0.2444, 0.2982, 0.3278, 0.3665,
0.2567, 0.2454, 0.2666, 0.2363, 0.2515, 0.2889, 0.2807, 0.2665,
0.2745, 0.3166, 0.3008, 0.3206, 0.3923, 0.2748, 0.3126, 0.3113,
0.3015, 0.3052, 0.3767, 0.3465, 0.3137, 0.3371, 0.3030, 0.3236,
0.3614, 0.4285, 0.4775, 0.3664, 0.3300, 0.3592, 0.3692, 0.3984,
0.4156, 0.4413, 0.4255, 0.4172, 0.4190, 0.8160, 0.4631, 0.4944,
0.4739, 0.4466, 0.4515, 0.4689, 0.4242, 0.3905, 0.3407, 0.3625,
0.3961, 0.4026, 0.4304, 0.4498, 0.4406, 0.4394, 0.4397, 0.4359,
0.4394, 0.3873, 0.4062, 0.3659, 0.3662, 0.3760, 0.4793, 0.4954,
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0.3906, 0.3530, 0.3223, 0.3339, 0.3310, 0.3851, 0.3566, 0.3711,
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0.3317, 0.3181, 0.3192, 0.3238, 0.3243, 0.3559, 0.2449, 0.2993,
0.2891, 0.2375, 0.2246, 0.2254, 0.2311, 0.2467, 0.2548, 0.2326,
0.2853, 0.2415, 0.2665, 0.2473, 0.2182, 0.2274, 0.2341, 0.1658,
0.1906, 0.2012, 0.2015, 0.1889, 0.2881, 0.1949, 0.1967, 0.1963,
0.1575, 0.1587, 0.1413, 0.1543, 0.2860, 0.1472, 0.1429, 0.1108,
0.1109, 0.1234, 0.0968, 0.0840, 0.0665, 0.0706, 0.0787, 0.0832,
0.0880, 0.1035, 0.0922, 0.0798, 0.0658, 0.0631, 0.0719, 0.0647,
0.1010, 0.0496, 0.0753, 0.0780, 0.0521, 0.0397, 0.0394, 0.1288,
0.1205, 0.0642, 0.0669, 0.1255, 0.1028, 0.1413, 0.1715, 0.0578,
0.0897, 0.1066, 0.0614, 0.0278, 0.0474, 0.0210, 0.0457, 0.2113,
0.2033, 0.1042, 0.0972, 0.1798, 0.0706, 0.0448, 0.0383, 0.0242,
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0.0213, 0.0189, 0.0253, 0.0195, 0.0214, 0.0206, 0.0368, 0.0222,
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0.0099, 0.0063, 0.0147, 0.0098, 0.0030, 0.0132, 0.0291, 0.1143,
0.0826, 0.0113, 0.0255, 0.0322, 0.0289, 0.0126, 0.0149, 0.0141,
0.0130, 0.0072, 0.0093, 0.0107, 0.0094,
128,        NWATER      (rain data 2009)
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  6.0, 0.0254,
  7.0, 0.0508,
  8.0, 0.0508,
  9.0, 0.1016,
 10.0, 0.1016,
 11.0, 0.0254,
 12.0, 0.0254,
 13.0, 0.0000,
 23.0, 0.0254,
   2,   1,  10,1.000,
  0.0, 0.1016,
  1.0, 0.1016,
  2.0, 0.0762,
  3.0, 0.1270,
  4.0, 0.2286,
  5.0, 0.1524,
  6.0, 0.0254,
  7.0, 0.0254,
  8.0, 0.0254,
  9.0, 0.0000,
   4,   1,   2,1.000,
 22.0, 0.1016,
 23.0, 0.1270,
   5,   1,   9,1.000,
  0.0, 0.1270,
  1.0, 0.1524,
  2.0, 0.0254,
  3.0, 0.1270,
  4.0, 0.0000,
  5.0, 0.1016,
  6.0, 0.1016,
  7.0, 0.0508,
  8.0, 0.0000,
   6,   1,   9,1.000,
  4.0, 0.0254,
  5.0, 0.0000,
  8.0, 0.0254,
  9.0, 0.0508,
 10.0, 0.1016,
 11.0, 0.1524,
 12.0, 0.1778,
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   8,   1,   2,1.000,
  6.0, 0.0254,
  7.0, 0.0000,
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21.0, 0.0508,
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23.0, 0.0254,
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16.0, 0.0254,
17.0, 0.0000,
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10.0, 0.0254,
11.0, 0.0000,
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15.0, 0.0254,
16.0, 0.0000,
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19.0, 0.0254,
20.0, 0.0000,
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16.0, 0.0254,
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16.0, 0.0254,
17.0, 0.0000,
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 9.0, 0.0000,
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18.0, 0.0254,
19.0, 0.0000,
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 3.0, 0.0000,
 35,   1,   2,1.000,
 5.0, 0.0254,
 6.0, 0.0000,
 36,   1,   3,1.000,
21.0, 0.1016,
22.0, 0.1524,
23.0, 0.1524,
 37,   1,   9,1.000,
 0.0, 0.1270,
 1.0, 0.1016,
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 8.0, 0.0508,
 9.0, 0.0508,
10.0, 0.0254,
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  9.0, 0.0508,
 10.0, 0.0508,
 11.0, 0.0000,
 50,   1,   2,1.000,
  8.0, 0.0254,
  9.0, 0.0000,
 53,   1,  10,1.000,
 14.0, 0.0254,
 15.0, 0.0508,
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 17.0, 0.0508,
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 21.0, 0.0000,
 22.0, 0.0254,
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  5.0, 0.0000,
 13.0, 0.0254,
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 16.0, 0.0000,
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 20.0, 0.3810,
 21.0, 0.0000,
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 11.0, 0.0508,
 12.0, 0.0000,
 56,   1,   2,1.000,
 13.0, 0.1016,
 14.0, 0.0000,
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  2.0, 0.0254,
  3.0, 0.0000,
  5.0, 0.0254,
  6.0, 0.0000,
 60,   1,   9,1.000,
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 16.0, 0.0508,
 17.0, 0.1016,
 18.0, 0.1270,
 19.0, 0.0508,
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 20.0, 0.0762,
 21.0, 0.1524,
 22.0, 0.0762,
 23.0, 0.0000,
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  0.0, 0.0254,
  1.0, 0.0000,
  9.0, 0.0254,
 10.0, 0.0254,
 11.0, 0.0000,
 14.0, 0.0254,
 15.0, 0.1524,
 16.0, 0.0508,
 17.0, 0.0254,
 18.0, 0.0000,
 19.0, 0.1270,
 20.0, 0.1270,
 21.0, 0.0000,
 23.0, 0.0508,
 24.0, 0.0000,
 62,   1,  10,1.000,
  0.0, 0.1016,
  1.0, 0.0762,
  2.0, 0.0000,
  5.0, 0.0254,
  6.0, 0.0762,
  7.0, 0.0254,
  8.0, 0.0000,
 22.0, 0.0762,
 23.0, 0.2286,
 24.0, 0.0000,
 63,   1,   9,1.000,
  0.0, 0.1016,
  1.0, 0.0254,
  2.0, 0.0508,
  3.0, 0.0254,
  4.0, 0.0254,
  5.0, 0.0254,
  6.0, 0.0254,
  7.0, 0.0254,
  8.0, 0.0000,
 64,   1,   6,1.000,
 8.0, 0.1016,
 9.0, 0.0254,
10.0, 0.0254,
11.0, 0.1270,
12.0, 0.0254,
13.0, 0.0000,
 67,   1,   2,1.000,
11.0, 0.0508,
12.0, 0.0000,
 68,   1,   7,1.000,
11.0, 0.0508,
12.0, 0.0000,
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13.0, 0.0508,
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15.0, 0.0508,
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17.0, 0.0000,
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10.0, 0.0000,
15.0, 0.0254,
16.0, 0.0000,
 70,   1,   4,1.000,
12.0, 0.0254,
13.0, 0.0000,
16.0, 0.0254,
17.0, 0.0000,
 71,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0000,
 73,   1,   3,1.000,
21.0, 0.0508,
22.0, 0.0508,
23.0, 0.0000,
 74,   1,  11,1.000,
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 3.0, 0.0000,
 7.0, 0.0254,
 8.0, 0.0254,
 9.0, 0.0254,
10.0, 0.0508,
11.0, 0.0254,
12.0, 0.0254,
13.0, 0.0254,
14.0, 0.0254,
15.0, 0.0000,
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10.0, 0.0762,
11.0, 0.0508,
12.0, 0.0254,
13.0, 0.0000,
14.0, 0.0254,
15.0, 0.0254,
16.0, 0.0000,
 79,   1,   4,1.000,
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 8.0, 0.0000,
22.0, 0.0762,
23.0, 0.0000,
 80,   1,   7,1.000,
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14.0, 0.0254,
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22.0, 0.2032,
23.0, 0.1524,
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12.0, 0.0508,
13.0, 0.1016,
14.0, 0.1524,
15.0, 0.1016,
16.0, 0.0000,
19.0, 0.0254,
20.0, 0.0508,
21.0, 0.0254,
22.0, 0.0254,
23.0, 0.0000,
 82,   1,   2,1.000,
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 2.0, 0.0000,
 83,   1,  14,1.000,
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 6.0, 0.0254,
 7.0, 0.0254,
 8.0, 0.0762,
 9.0, 0.0254,
10.0, 0.0254,
11.0, 0.0000,
12.0, 0.0254,
13.0, 0.0254,
14.0, 0.0000,
17.0, 0.0254,
18.0, 0.0000,
19.0, 0.0508,
20.0, 0.0000,
 84,   1,   2,1.000,
13.0, 0.0254,
14.0, 0.0000,
 87,   1,  10,1.000,
15.0, 0.0762,
16.0, 0.0762,
17.0, 0.0762,
18.0, 0.0762,
19.0, 0.1016,
20.0, 0.0254,
21.0, 0.0508,
22.0, 0.0254,
23.0, 0.0254,
24.0, 0.0000,
 88,   1,   9,1.000,
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 3.0, 0.0000,
 8.0, 0.0508,
 9.0, 0.0762,
10.0, 0.1016,
11.0, 0.1016,
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12.0, 0.0000,
17.0, 0.0508,
18.0, 0.0000,
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 3.0, 0.0254,
 4.0, 0.0000,
 90,   1,   6,1.000,
 8.0, 0.0254,
 9.0, 0.0000,
14.0, 0.0254,
15.0, 0.1524,
16.0, 0.1778,
17.0, 0.0000,
 92,   1,   6,1.000,
10.0, 0.1270,
11.0, 0.2794,
12.0, 0.2286,
13.0, 0.0762,
14.0, 0.0254,
15.0, 0.0000,
 93,   1,   6,1.000,
 7.0, 0.0254,
 8.0, 0.0508,
 9.0, 0.0508,
10.0, 0.0000,
11.0, 0.0254,
12.0, 0.0000,
 95,   1,   2,1.000,
 7.0, 0.0254,
 8.0, 0.0000,
101,   1,   3,1.000,
10.0, 0.1778,
11.0, 0.0508,
12.0, 0.0000,
102,   1,   8,1.000,
15.0, 0.0762,
16.0, 0.1524,
17.0, 0.1270,
18.0, 0.0762,
19.0, 0.0508,
20.0, 0.0508,
21.0, 0.0254,
22.0, 0.0000,
103,   1,   7,1.000,
13.0, 0.0254,
14.0, 0.0254,
15.0, 0.0000,
16.0, 0.0254,
17.0, 0.0000,
18.0, 0.0508,
19.0, 0.0000,
104,   1,   3,1.000,
10.0, 0.1778,
```

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11.0, 0.0254,
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113,   1,   2,1.000,
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18.0, 0.0000,
114,   1,   4,1.000,
14.0, 0.0508,
15.0, 0.0000,
23.0, 0.0254,
24.0, 0.0000,
115,   1,   4,1.000,
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 1.0, 0.0000,
12.0, 0.1016,
13.0, 0.0000,
122,   1,   3,1.000,
18.0, 0.0762,
19.0, 0.0762,
20.0, 0.0000,
123,   1,   3,1.000,
 1.0, 0.2794,
 2.0, 0.0254,
 3.0, 0.0000,
124,   1,   4,1.000,
21.0, 0.1270,
22.0, 0.0762,
23.0, 0.1016,
24.0, 0.0000,
125,   1,   4,1.000,
 0.0, 0.0254,
 1.0, 0.0000,
 4.0, 0.0508,
 5.0, 0.0000,
126,   1,   7,1.000,
14.0, 0.0508,
15.0, 0.0254,
16.0, 0.1778,
17.0, 0.1270,
18.0, 0.0000,
20.0, 0.1270,
21.0, 0.0000,
127,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
131,   1,   4,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
 9.0, 0.1270,
10.0, 0.0000,
133,   1,   4,1.000,
21.0, 0.0508,
22.0, 0.2032,
23.0, 0.0508,
24.0, 0.0000,
```

```
134,   1,   7,1.000,
 0.0, 0.0508,
 1.0, 0.1778,
 2.0, 0.1524,
 3.0, 0.0000,
 5.0, 0.0508,
 6.0, 0.0254,
 7.0, 0.0000,
156,   1,   2,1.000,
22.0, 0.0254,
23.0, 0.0000,
159,   1,   5,1.000,
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 9.0, 0.4064,
10.0, 0.0508,
11.0, 0.0508,
12.0, 0.0000,
163,   1,   2,1.000,
17.0, 0.0762,
18.0, 0.0000,
166,   1,   2,1.000,
17.0, 0.0762,
18.0, 0.0000,
168,   1,   8,1.000,
11.0, 0.0762,
12.0, 0.0000,
15.0, 0.0254,
16.0, 0.0254,
17.0, 0.0000,
22.0, 0.0254,
23.0, 0.0762,
24.0, 0.0000,
170,   1,  10,1.000,
 6.0, 0.0254,
 7.0, 0.0000,
10.0, 0.0254,
11.0, 0.0000,
12.0, 0.1778,
13.0, 0.0254,
14.0, 0.0000,
22.0, 0.6096,
23.0, 0.1270,
24.0, 0.0000,
172,   1,   7,1.000,
16.0, 0.0762,
17.0, 0.0762,
18.0, 0.1270,
19.0, 0.0508,
20.0, 0.0000,
22.0, 0.0254,
23.0, 0.0000,
187,   1,   7,1.000,
 3.0, 0.1524,
 4.0, 0.0508,
```

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 5.0, 0.0254,
 6.0, 0.0254,
 7.0, 0.0000,
11.0, 0.0254,
12.0, 0.0000,
193,   1,   2,1.000,
23.0, 0.0508,
24.0, 0.0000,
194,   1,  13,1.000,
 0.0, 0.1270,
 1.0, 0.1524,
 2.0, 0.0508,
 3.0, 0.0000,
 9.0, 0.0762,
10.0, 0.0254,
11.0, 0.0508,
12.0, 0.0000,
13.0, 0.1016,
14.0, 0.0762,
15.0, 0.0000,
17.0, 0.0254,
18.0, 0.0000,
204,   1,   2,1.000,
13.0, 0.0508,
14.0, 0.0000,
209,   1,   2,1.000,
 2.0, 0.0254,
 3.0, 0.0000,
218,   1,   3,1.000,
20.0, 0.0254,
21.0, 0.1270,
22.0, 0.0000,
224,   1,  14,1.000,
 3.0, 0.0254,
 4.0, 0.0000,
 5.0, 0.0508,
 6.0, 0.0508,
 7.0, 0.0762,
 8.0, 0.0508,
 9.0, 0.0000,
11.0, 0.0254,
12.0, 0.2032,
13.0, 0.0000,
16.0, 0.4826,
17.0, 0.0000,
22.0, 0.1270,
23.0, 0.0000,
225,   1,   2,1.000,
12.0, 0.0254,
13.0, 0.0000,
226,   1,   2,1.000,
14.0, 0.0254,
15.0, 0.0000,
227,   1,   2,1.000,
```

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 6.0, 0.0254,
 7.0, 0.0000,
233,   1,   4,1.000,
 1.0, 0.2540,
 2.0, 0.0254,
 3.0, 0.0254,
 4.0, 0.0000,
241,   1,   2,1.000,
 9.0, 0.0508,
10.0, 0.0000,
249,   1,   5,1.000,
 5.0, 0.1524,
 6.0, 0.2032,
 7.0, 0.0000,
17.0, 0.0508,
18.0, 0.0000,
250,   1,   4,1.000,
15.0, 0.1016,
16.0, 0.0000,
18.0, 0.0254,
19.0, 0.0000,
260,   1,   4,1.000,
 6.0, 0.2032,
 7.0, 0.6096,
 8.0, 0.1524,
 9.0, 0.0000,
274,   1,   2,1.000,
11.0, 0.0254,
12.0, 0.0000,
275,   1,   9,1.000,
 6.0, 0.0254,
 7.0, 0.0254,
 8.0, 0.2032,
 9.0, 0.1270,
10.0, 0.0254,
11.0, 0.0508,
12.0, 0.0000,
17.0, 0.1270,
18.0, 0.0000,
276,   1,   2,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
286,   1,   5,1.000,
18.0, 0.0254,
19.0, 0.0000,
20.0, 0.0254,
21.0, 0.0000,
23.0, 0.1016,
287,   1,  15,1.000,
 0.0, 0.1270,
 1.0, 0.1270,
 2.0, 0.2032,
 3.0, 0.2540,
 4.0, 0.0508,
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 8.0, 0.0254,
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12.0, 0.0508,
13.0, 0.0000,
16.0, 0.0508,
17.0, 0.0000,
290,   1,   4,1.000,
18.0, 0.0508,
19.0, 0.1778,
20.0, 0.1016,
21.0, 0.0000,
291,   1,   2,1.000,
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 8.0, 0.0000,
293,   1,   2,1.000,
23.0, 0.0254,
24.0, 0.0000,
294,   1,   5,1.000,
17.0, 0.0254,
18.0, 0.0508,
19.0, 0.0508,
20.0, 0.0254,
21.0, 0.0000,
296,   1,  12,1.000,
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 9.0, 0.1270,
10.0, 0.1778,
11.0, 0.3048,
12.0, 0.3302,
13.0, 0.2032,
14.0, 0.1270,
15.0, 0.1778,
16.0, 0.0254,
17.0, 0.0000,
18.0, 0.0254,
19.0, 0.0000,
298,   1,   1,1.000,
23.0, 0.0762,
299,   1,  14,1.000,
 0.0, 0.0508,
 1.0, 0.0254,
 2.0, 0.0000,
 6.0, 0.0508,
 7.0, 0.1524,
 8.0, 0.2540,
 9.0, 0.2032,
10.0, 0.1524,
11.0, 0.1524,
12.0, 0.2540,
13.0, 0.2540,
```

```
14.0, 0.1016,
15.0, 0.0254,
16.0, 0.0000,
302,   1,   9,1.000,
 9.0, 0.0508,
10.0, 0.0254,
11.0, 0.0508,
12.0, 0.0254,
13.0, 0.0000,
16.0, 0.0254,
17.0, 0.0000,
19.0, 0.0254,
20.0, 0.0000,
303,   1,   1,1.000,
23.0, 0.0254,
304,   1,   5,1.000,
 0.0, 0.0254,
 1.0, 0.0254,
 2.0, 0.0000,
 3.0, 0.0254,
 4.0, 0.0000,
309,   1,   5,1.000,
19.0, 0.0254,
20.0, 0.0762,
21.0, 0.0000,
23.0, 0.0762,
24.0, 0.0000,
310,   1,   4,1.000,
 2.0, 0.0508,
 3.0, 0.1778,
 4.0, 0.0254,
 5.0, 0.0000,
312,   1,   4,1.000,
13.0, 0.0254,
14.0, 0.0000,
15.0, 0.0508,
16.0, 0.0000,
313,   1,   3,1.000,
20.0, 0.0508,
21.0, 0.0254,
22.0, 0.0000,
314,   1,   2,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
317,   1,   5,1.000,
14.0, 0.0508,
15.0, 0.1016,
16.0, 0.0762,
17.0, 0.0254,
18.0, 0.0000,
321,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0000,
323,   1,   9,1.000,
```

```
 5.0, 0.0762,
 6.0, 0.0508,
 7.0, 0.0000,
 8.0, 0.0508,
 9.0, 0.1270,
10.0, 0.0762,
11.0, 0.0000,
12.0, 0.0254,
13.0, 0.0000,
324,   1,   3,1.000,
18.0, 0.0254,
19.0, 0.0254,
20.0, 0.0000,
326,   1,   8,1.000,
10.0, 0.2032,
11.0, 0.1778,
12.0, 0.1016,
13.0, 0.0254,
14.0, 0.0254,
15.0, 0.0000,
18.0, 0.0254,
19.0, 0.0000,
328,   1,   3,1.000,
 3.0, 0.0254,
 4.0, 0.0254,
 5.0, 0.0000,
330,   1,  11,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
15.0, 0.0254,
16.0, 0.0000,
17.0, 0.0508,
18.0, 0.0254,
19.0, 0.0254,
20.0, 0.0254,
21.0, 0.0000,
22.0, 0.0508,
23.0, 0.1270,
331,   1,   9,1.000,
 0.0, 0.1016,
 1.0, 0.0254,
 2.0, 0.1016,
 3.0, 0.2032,
 4.0, 0.0762,
 5.0, 0.0762,
 6.0, 0.1524,
 7.0, 0.0508,
 8.0, 0.0000,
332,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
349,   1,   7,1.000,
17.0, 0.0254,
18.0, 0.0000,
```

```
 19.0, 0.0762,
 20.0, 0.1270,
 21.0, 0.0508,
 22.0, 0.0508,
 23.0, 0.0508,
 350,   1,  20,1.000,
  0.0, 0.2032,
  1.0, 0.1524,
  2.0, 0.0762,
  3.0, 0.0762,
  4.0, 0.0762,
  5.0, 0.1270,
  6.0, 0.1270,
  7.0, 0.1016,
  8.0, 0.1016,
  9.0, 0.0508,
 10.0, 0.1778,
 11.0, 0.2286,
 12.0, 0.1270,
 13.0, 0.0762,
 14.0, 0.0254,
 15.0, 0.0000,
 18.0, 0.0254,
 19.0, 0.0000,
 20.0, 0.0254,
 21.0, 0.0000,
353,   1,  12,1.000,
  8.0, 0.0508,
  9.0, 0.0254,
 10.0, 0.0254,
 11.0, 0.0000,
 12.0, 0.0508,
 13.0, 0.0000,
 17.0, 0.0254,
 18.0, 0.0000,
 20.0, 0.0508,
 21.0, 0.0254,
 22.0, 0.0508,
 23.0, 0.1270,
354,   1,  16,1.000,
  0.0, 0.0508,
  1.0, 0.0254,
  2.0, 0.0508,
  3.0, 0.0254,
  4.0, 0.0000,
 11.0, 0.0254,
 12.0, 0.0000,
 15.0, 0.0254,
 16.0, 0.0000,
 17.0, 0.0762,
 18.0, 0.0508,
 19.0, 0.0508,
 20.0, 0.0000,
 21.0, 0.0762,
```

```
 22.0, 0.0000,
 23.0, 0.0508,
 355,   1,  19,1.000,
  0.0, 0.1778,
  1.0, 0.0000,
  4.0, 0.0254,
  5.0, 0.0000,
  9.0, 0.2286,
 10.0, 0.3048,
 11.0, 0.2286,
 12.0, 0.1270,
 13.0, 0.0000,
 14.0, 0.0254,
 15.0, 0.0000,
 16.0, 0.0762,
 17.0, 0.0762,
 18.0, 0.0000,
 19.0, 0.0508,
 20.0, 0.1778,
 21.0, 0.0762,
 22.0, 0.0508,
 23.0, 0.0000,
 365,   1,   2,1.000,
 12.0, 0.0254,
 13.0, 0.0000,
```

***SVFD, van Genuchten, 2010***

```
Spokane Valley Rathdrum Prairie SVFD Simulation:  VGSVFD2010.inp
0, 1,                          IPLANT, NGRAV
62, 1, 62,                     IFDEND, IDTBEG, IDTEND
2010, 1, 0, 0, 0,              IYS, NYEARS, ISTEAD, IFLIST, NFLIST
1, 24.0,                       NPRINT, STOPHR
0, 3, 1, 1.0E-4,               ISMETH, INMAX, ISWDIF, DMAXBA
1.0, 1.0E-5, 1.0,              DELMAX, DELMIN, OUTTIM
2.0, 1.0E-05, 0.0, 0.0, 0.0,   RFACT, RAINIF, DHTOL, DHMAX, DHFACT
4, 3, 0,                       KOPT, KEST, WTF
0, 1, 2, 2,                    ITOPBC, IEVOPT, NFHOUR, LOWER
0.0, 2.0E+04, 20.73, 0.0,      HIRRI, HDRY, HTOP, RHA
0, 0, 0,                       IETOPT, ICLOUD, ISHOPT
0, 0,                          IRAIN, HPR
0, 0, 0, 0, 0,                 IHYS, AIRTOL, HYSTOL, HYSMXH, HYFILE
0, 0, 0,                       IHEAT, ICONVH, DMAXHE
0, 0, 0, 0,                    UPPERH, TSMEAN, TSAMP, QHCTOP
0, 0.0, 0.0,                   LOWERH, QHLEAK, TGRAD
0, 0.66, 288.46, 0.24,         IVAPOR, TORT, TSOIL, VAPDIF
3, 126,                        MATN, NPT
1,    0.00,  1,    1.00,  1,    2.00,  1,    3.00,
1,    4.00,  1,    5.00,  1,    6.00,  1,    7.00,
1,    8.00,  1,    9.00,  1,   10.00,  1,   11.00,
1,   12.00,  1,   13.00,  1,   14.00,  1,   15.00,
1,   16.00,  1,   17.00,  1,   18.00,  1,   19.00,
1,   20.00,  2,   21.00,  2,   22.00,  2,   23.00,
```

```
2,   24.00,  2,   25.00,  2,   26.00,  2,   27.00,
2,   28.00,  2,   29.00,  2,   30.00,  2,   31.00,
2,   32.00,  2,   33.00,  2,   34.00,  2,   35.00,
2,   36.00,  2,   37.00,  2,   38.00,  2,   39.00,
2,   40.00,  2,   41.00,  2,   42.00,  2,   43.00,
2,   44.00,  2,   45.00,  2,   46.00,  2,   47.00,
2,   48.00,  2,   49.00,  2,   50.00,  2,   51.00,
2,   52.00,  2,   53.00,  2,   54.00,  2,   55.00,
2,   56.00,  2,   57.00,  2,   58.00,  2,   59.00,
2,   60.00,  2,   61.00,  2,   62.00,  2,   63.00,
2,   64.00,  2,   65.00,  3,   66.00,  3,   67.00
3,   68.00,  3,   69.00,  3,   70.00,  3,   71.00,
3,   72.00,  3,   73.00,  3,   74.00,  3,   75.00,
3,   76.00,  3,   77.00,  3,   78.00,  3,   79.00,
3,   80.00,  3,   81.00,  3,   82.00,  3,   83.00,
3,   84.00,  3,   85.00,  3,   86.00,  3,   87.00,
3,   88.00,  3,   89.00,  3,   90.00,  3,   91.00,
3,   92.00,  3,   93.00,  3,   94.00,  3,   95.00,
3,   96.00,  3,   97.00,  3,   98.00,  3,   99.00,
3,  100.00,  3,  101.00,  3,  102.00,  3,  103.00,
3,  104.00,  3,  105.00,  3,  106.00,  3,  107.00,
3,  108.00,  3,  109.00,  3,  110.00,  3,  111.00,
3,  112.00,  3,  113.00,  3,  114.00,  3,  115.00,
3,  116.00,  3,  117.00,  3,  118.00,  3,  119.00,
3,  120.00,  3,  121.00,  3,  122.00,  3,  123.00,
3,  124.00,  3,  125.00,
Sand Layer #1: 0-20 cm (van Genuchten et al.)   Retention
0.3, 0.045, 0.025, 1.81,                        THET, THTR, A, N
Sand Layer #1: 0-20 cm (van Genuchten et al.)   Hydraulic Conductivity
2.0, 29.8, 0.025, 1.81, 0.5,                    RKMODEL, SK, A, N, EPIT
Sand Layer #2: 21-65 cm (van Genuchten et al.)  Retention
0.3, 0.045, 0.032, 1.81,                        THET, THTR, A, N
Sand Layer #2: 21-65 cm (van Genuchten et al.)  Hydraulic Conductivity
2.0, 29.8, 0.032, 1.81, 0.5,                    RKMODEL, SK, A, N, EPIT
Sand Layer #3: 66-125 cm (van Genuchten et al.) Retention
0.13, 0.01, 0.045, 1.89,                        THET, THTR, A, N
Sand Layer #3: 66-125 cm (van Genuchten et al.) Hydraulic Conductivity
2.0, 9.8, 0.045, 1.89, 0.5,                     RKMODEL, SK, A, N, EPIT
0,    NDAY
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
50.0,50.0,50.0,50.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
```

```
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,
0.0368, 0.0222, 0.0131, 0.0104, 0.0203, 0.0840, 0.0372, 0.0127,
0.0195, 0.0090, 0.0099, 0.0063, 0.0147, 0.0098, 0.0030, 0.0132,
0.0291, 0.1143, 0.0826, 0.0113, 0.0255, 0.0322, 0.0289, 0.0126,
0.0149, 0.0141, 0.0130, 0.0072, 0.0093, 0.0107, 0.0094, 0.0147,
0.0182, 0.0136, 0.0121, 0.0171, 0.0280, 0.0157, 0.0113, 0.0067,
0.0100, 0.0127, 0.0185, 0.0178, 0.0307, 0.1826, 0.0220, 0.0342,
0.1198, 0.0863, 0.1157, 0.1344, 0.0328, 0.0227, 0.0264, 0.0261,
0.0267, 0.0241, 0.0270, 0.0249, 0.0281, 0.0329,
22,         NWATER      (rain data 2010)
 15,   1,   7,1.000,
 17.0, 0.0254,
 18.0, 0.0000,
 19.0, 0.0762,
 20.0, 0.1270,
 21.0, 0.0508,
 22.0, 0.0508,
 23.0, 0.0508,
 16,   1,  20,1.000,
  0.0, 0.2032,
  1.0, 0.1524,
  2.0, 0.0762,
  3.0, 0.0762,
  4.0, 0.0762,
  5.0, 0.1270,
  6.0, 0.1270,
  7.0, 0.1016,
  8.0, 0.1016,
  9.0, 0.0508,
 10.0, 0.1778,
 11.0, 0.2286,
 12.0, 0.1270,
 13.0, 0.0762,
 14.0, 0.0254,
 15.0, 0.0000,
 18.0, 0.0254,
 19.0, 0.0000,
 20.0, 0.0254,
```

```
 21.0, 0.0000,
19,   1,  12,1.000,
  8.0, 0.0508,
  9.0, 0.0254,
 10.0, 0.0254,
 11.0, 0.0000,
 12.0, 0.0508,
 13.0, 0.0000,
 17.0, 0.0254,
 18.0, 0.0000,
 20.0, 0.0508,
 21.0, 0.0254,
 22.0, 0.0508,
 23.0, 0.1270,
20,   1,  16,1.000,
  0.0, 0.0508,
  1.0, 0.0254,
  2.0, 0.0508,
  3.0, 0.0254,
  4.0, 0.0000,
 11.0, 0.0254,
 12.0, 0.0000,
 15.0, 0.0254,
 16.0, 0.0000,
 17.0, 0.0762,
 18.0, 0.0508,
 19.0, 0.0508,
 20.0, 0.0000,
 21.0, 0.0762,
 22.0, 0.0000,
 23.0, 0.0508,
 21,   1,  19,1.000,
  0.0, 0.1778,
  1.0, 0.0000,
  4.0, 0.0254,
  5.0, 0.0000,
  9.0, 0.2286,
 10.0, 0.3048,
 11.0, 0.2286,
 12.0, 0.1270,
 13.0, 0.0000,
 14.0, 0.0254,
 15.0, 0.0000,
 16.0, 0.0762,
 17.0, 0.0762,
 18.0, 0.0000,
 19.0, 0.0508,
 20.0, 0.1778,
 21.0, 0.0762,
 22.0, 0.0508,
 23.0, 0.0000,
 31,   1,   2,1.000,
 12.0, 0.0254,
 13.0, 0.0000,
```

```
32,   1,   8,1.000,
 9.0, 0.1778,
10.0, 0.1016,
11.0, 0.1016,
12.0, 0.2794,
13.0, 0.1016,
14.0, 0.0508,
15.0, 0.1270,
16.0, 0.0000,
34,   1,   2,1.000,
 9.0, 0.0254,
10.0, 0.0000,
35,   1,  17,1.000,
 3.0, 0.0254,
 4.0, 0.0000,
 5.0, 0.0254,
 6.0, 0.0000,
11.0, 0.0508,
12.0, 0.1524,
13.0, 0.1778,
14.0, 0.1270,
15.0, 0.0762,
16.0, 0.0508,
17.0, 0.0508,
18.0, 0.0762,
19.0, 0.0762,
20.0, 0.0254,
21.0, 0.0762,
22.0, 0.2032,
23.0, 0.1524,
36,   1,  13,1.000,
 0.0, 0.1524,
 1.0, 0.0762,
 2.0, 0.0254,
 3.0, 0.0508,
 4.0, 0.0000,
 5.0, 0.0254,
 6.0, 0.0000,
 7.0, 0.0254,
 8.0, 0.0254,
 9.0, 0.0254,
10.0, 0.0254,
11.0, 0.0254,
12.0, 0.0000,
41,   1,   4,1.000,
 9.0, 0.0254,
10.0, 0.0508,
11.0, 0.0254,
12.0, 0.0000,
42,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
43,   1,  11,1.000,
 0.0, 0.0254,
```

```
 1.0, 0.0000,
 9.0, 0.0254,
10.0, 0.0254,
11.0, 0.0000,
14.0, 0.0254,
15.0, 0.0000,
18.0, 0.0254,
19.0, 0.1270,
20.0, 0.2032,
21.0, 0.0000,
44,   1,   7,1.000,
 2.0, 0.0254,
 3.0, 0.0000,
14.0, 0.0508,
15.0, 0.2032,
16.0, 0.0762,
17.0, 0.0254,
18.0, 0.0000,
46,   1,   2,1.000,
22.0, 0.0254,
23.0, 0.0000,
47,   1,   9,1.000,
 1.0, 0.0508,
 2.0, 0.1016,
 3.0, 0.0762,
 4.0, 0.0508,
 5.0, 0.0254,
 6.0, 0.0762,
 7.0, 0.0508,
 8.0, 0.0508,
 9.0, 0.0000,
48,   1,   9,1.000,
 3.0, 0.0508,
 4.0, 0.0254,
 5.0, 0.0000,
14.0, 0.0254,
15.0, 0.0000,
21.0, 0.0254,
22.0, 0.0762,
23.0, 0.0762,
24.0, 0.0000,
50,   1,   3,1.000,
 4.0, 0.0254,
 5.0, 0.0254,
 6.0, 0.0000,
55,   1,   2,1.000,
 2.0, 0.1016,
 3.0, 0.0000,
56,   1,  10,1.000,
11.0, 0.1270,
12.0, 0.0762,
13.0, 0.0000,
14.0, 0.0254,
15.0, 0.0254,
```

```
 16.0, 0.0000,
 17.0, 0.0254,
 18.0, 0.0254,
 19.0, 0.0254,
 20.0, 0.0000,
 59,   1,   2,1.000,
  9.0, 0.0254,
 10.0, 0.0000,
 62,   1,   6,1.000,
  4.0, 0.0254,
  5.0, 0.0508,
  6.0, 0.0254,
  7.0, 0.0000,
 16.0, 0.0254,
 17.0, 0.0000,
```

***SVFD, Brooks-Corey, 2009***

```
Spokane Valley Rathdrum Prairie SVFD Simulation:  BCSVFD2009.inp
0, 1,                           IPLANT, NGRAV
365, 1, 365,                    IFDEND, IDTBEG, IDTEND
2009, 1, 0, 0, 0,               IYS, NYEARS, ISTEAD, IFLIST, NFLIST
1, 24.0,                        NPRINT, STOPHR
0, 3, 1, 1.0E-4,                ISMETH, INMAX, ISWDIF, DMAXBA
1.0, 1.0E-5, 1.0,               DELMAX, DELMIN, OUTTIM
2.0, 1.0E-05, 0.0, 0.0, 0.0,    RFACT, RAINIF, DHTOL, DHMAX, DHFACT
3, 3, 0,                        KOPT, KEST, WTF
0, 1, 2, 2,                     ITOPBC, IEVOPT, NFHOUR, LOWER
0.0, 2.0E+04, 20.73, 0.0,       HIRRI, HDRY, HTOP, RHA
0, 0, 0,                        IETOPT, ICLOUD, ISHOPT
0, 0,                           IRAIN, HPR
0, 0, 0, 0, 0,                  IHYS, AIRTOL, HYSTOL, HYSMXH, HYFILE
0, 0, 0,                        IHEAT, ICONVH, DMAXHE
0, 0, 0, 0,                     UPPERH, TSMEAN, TSAMP, QHCTOP
0, 0.0, 0.0,                    LOWERH, QHLEAK, TGRAD
0, 0.66, 288.46, 0.24,          IVAPOR, TORT, TSOIL, VAPDIF
3, 126,                         MATN, NPT
1,    0.00,  1,    1.00,  1,    2.00,  1,    3.00,
1,    4.00,  1,    5.00,  1,    6.00,  1,    7.00,
1,    8.00,  1,    9.00,  1,   10.00,  1,   11.00,
1,   12.00,  1,   13.00,  1,   14.00,  1,   15.00,
1,   16.00,  1,   17.00,  1,   18.00,  1,   19.00,
1,   20.00,  2,   21.00,  2,   22.00,  2,   23.00,
2,   24.00,  2,   25.00,  2,   26.00,  2,   27.00,
2,   28.00,  2,   29.00,  2,   30.00,  2,   31.00,
2,   32.00,  2,   33.00,  2,   34.00,  2,   35.00,
2,   36.00,  2,   37.00,  2,   38.00,  2,   39.00,
2,   40.00,  2,   41.00,  2,   42.00,  2,   43.00,
2,   44.00,  2,   45.00,  2,   46.00,  2,   47.00,
2,   48.00,  2,   49.00,  2,   50.00,  2,   51.00,
2,   52.00,  2,   53.00,  2,   54.00,  2,   55.00,
2,   56.00,  2,   57.00,  2,   58.00,  2,   59.00,
2,   60.00,  2,   61.00,  2,   62.00,  2,   63.00,
```

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2,   64.00,  2,   65.00,  3,   66.00,  3,   67.00
3,   68.00,  3,   69.00,  3,   70.00,  3,   71.00,
3,   72.00,  3,   73.00,  3,   74.00,  3,   75.00,
3,   76.00,  3,   77.00,  3,   78.00,  3,   79.00,
3,   80.00,  3,   81.00,  3,   82.00,  3,   83.00,
3,   84.00,  3,   85.00,  3,   86.00,  3,   87.00,
3,   88.00,  3,   89.00,  3,   90.00,  3,   91.00,
3,   92.00,  3,   93.00,  3,   94.00,  3,   95.00,
3,   96.00,  3,   97.00,  3,   98.00,  3,   99.00,
3,  100.00,  3,  101.00,  3,  102.00,  3,  103.00,
3,  104.00,  3,  105.00,  3,  106.00,  3,  107.00,
3,  108.00,  3,  109.00,  3,  110.00,  3,  111.00,
3,  112.00,  3,  113.00,  3,  114.00,  3,  115.00,
3,  116.00,  3,  117.00,  3,  118.00,  3,  119.00,
3,  120.00,  3,  121.00,  3,  122.00,  3,  123.00,
3,  124.00,  3,  125.00,
Sand Layer #1: 0-20 cm (Brooks-Corey et al.)          Retention
0.3, 0.045, 29.133, 1.9444,                           THET, THTR,
AIRENT, B
Sand Layer #1: 0-20 cm (Brooks-Corey et al.)          Hydraulic
Conductivity
2.0, 29.8, 29.133, 1.9444, 0.5,                       RKMOD, SK,
AIRENK, B, EPIT
Sand Layer #2: 0-20 cm (Brooks-Corey et al.)          Retention
0.3, 0.045, 29.602, 1.5476,                           THET, THTR,
AIRENT, B
Sand Layer #2: 0-20 cm (Brooks-Corey et al.)          Hydraulic
Conductivity
2.0, 29.8, 29.602, 1.5476, 0.5,                       RKMOD, SK,
AIRENK, B, EPIT
Sand Layer #3: 0-20 cm (Brooks-Corey et al.)          Retention
0.13, 0.045, 26.477, 1.4913,                          THET, THTR,
AIRENT, B
Sand Layer #3: 0-20 cm (Brooks-Corey et al.)          Hydraulic
Conductivity
2.0, 9.8, 26.477, 1.4913, 0.5,                        RKMOD, SK,
AIRENK, B, EPIT
0,    NDAY
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
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100.0,100.0,100.0,100.0,
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100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
```

```
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
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100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,
0.0201, 0.0238, 0.0084, 0.0018, 0.0102, 0.0170, 0.0558, 0.0891,
0.0475, 0.0479, 0.0236, 0.0174, 0.0173, 0.0209, 0.0256, 0.0233,
0.0182, 0.0298, 0.0198, 0.0147, 0.0171, 0.0178, 0.0199, 0.0316,
0.0866, 0.0460, 0.0384, 0.0226, 0.0425, 0.0811, 0.0958, 0.0383,
0.0322, 0.0590, 0.0499, 0.0443, 0.0321, 0.0369, 0.0410, 0.0332,
0.0358, 0.0347, 0.0370, 0.0442, 0.0441, 0.0412, 0.0491, 0.0464,
0.0510, 0.0524, 0.0505, 0.0538, 0.0478, 0.0550, 0.1009, 0.0896,
0.0803, 0.0712, 0.0632, 0.0701, 0.0824, 0.0987, 0.1005, 0.1031,
0.0907, 0.1329, 0.0888, 0.0783, 0.0722, 0.0588, 0.0646, 0.0819,
0.0996, 0.1648, 0.1520, 0.1309, 0.1227, 0.1231, 0.1502, 0.1500,
0.1340, 0.1476, 0.1317, 0.1869, 0.1360, 0.1853, 0.1626, 0.1362,
0.1726, 0.1635, 0.1386, 0.1473, 0.1578, 0.1639, 0.1798, 0.2057,
0.2093, 0.2826, 0.2214, 0.2123, 0.2127, 0.2207, 0.2178, 0.1944,
0.2278, 0.2223, 0.2156, 0.2318, 0.2444, 0.2982, 0.3278, 0.3665,
0.2567, 0.2454, 0.2666, 0.2363, 0.2515, 0.2889, 0.2807, 0.2665,
0.2745, 0.3166, 0.3008, 0.3206, 0.3923, 0.2748, 0.3126, 0.3113,
0.3015, 0.3052, 0.3767, 0.3465, 0.3137, 0.3371, 0.3030, 0.3236,
0.3614, 0.4285, 0.4775, 0.3664, 0.3300, 0.3592, 0.3692, 0.3984,
0.4156, 0.4413, 0.4255, 0.4172, 0.4190, 0.8160, 0.4631, 0.4944,
0.4739, 0.4466, 0.4515, 0.4689, 0.4242, 0.3905, 0.3407, 0.3625,
0.3961, 0.4026, 0.4304, 0.4498, 0.4406, 0.4394, 0.4397, 0.4359,
0.4394, 0.3873, 0.4062, 0.3659, 0.3662, 0.3760, 0.4793, 0.4954,
0.4577, 0.4350, 0.4860, 0.4543, 0.4442, 0.4572, 0.4734, 0.4722,
0.5181, 0.5418, 0.5244, 0.4677, 0.4368, 0.4175, 0.4414, 0.4823,
0.5123, 0.4018, 0.4391, 0.4440, 0.4666, 0.4683, 0.5336, 0.5081,
0.4327, 0.5952, 0.6299, 0.4952, 0.4637, 0.4593, 0.4473, 0.4721,
0.5096, 0.4844, 0.4408, 0.4481, 0.5085, 0.4326, 0.5129, 0.4964,
0.4423, 0.4637, 0.3830, 0.3721, 0.3865, 0.4325, 0.4536, 0.3802,
0.3906, 0.3530, 0.3223, 0.3339, 0.3310, 0.3851, 0.3566, 0.3711,
0.4634, 0.3648, 0.3725, 0.3107, 0.3485, 0.3306, 0.3264, 0.3834,
0.3317, 0.3181, 0.3192, 0.3238, 0.3243, 0.3559, 0.2449, 0.2993,
0.2891, 0.2375, 0.2246, 0.2254, 0.2311, 0.2467, 0.2548, 0.2326,
0.2853, 0.2415, 0.2665, 0.2473, 0.2182, 0.2274, 0.2341, 0.1658,
0.1906, 0.2012, 0.2015, 0.1889, 0.2881, 0.1949, 0.1967, 0.1963,
0.1575, 0.1587, 0.1413, 0.1543, 0.2860, 0.1472, 0.1429, 0.1108,
0.1109, 0.1234, 0.0968, 0.0840, 0.0665, 0.0706, 0.0787, 0.0832,
0.0880, 0.1035, 0.0922, 0.0798, 0.0658, 0.0631, 0.0719, 0.0647,
0.1010, 0.0496, 0.0753, 0.0780, 0.0521, 0.0397, 0.0394, 0.1288,
```

```
0.1205, 0.0642, 0.0669, 0.1255, 0.1028, 0.1413, 0.1715, 0.0578,
0.0897, 0.1066, 0.0614, 0.0278, 0.0474, 0.0210, 0.0457, 0.2113,
0.2033, 0.1042, 0.0972, 0.1798, 0.0706, 0.0448, 0.0383, 0.0242,
0.0213, 0.0189, 0.0253, 0.0195, 0.0214, 0.0206, 0.0368, 0.0222,
0.0131, 0.0104, 0.0203, 0.0840, 0.0372, 0.0127, 0.0195, 0.0090,
0.0099, 0.0063, 0.0147, 0.0098, 0.0030, 0.0132, 0.0291, 0.1143,
0.0826, 0.0113, 0.0255, 0.0322, 0.0289, 0.0126, 0.0149, 0.0141,
0.0130, 0.0072, 0.0093, 0.0107, 0.0094,
128,        NWATER      (rain data 2009)
   1,   1,  10,1.000,
  5.0, 0.0254,
  6.0, 0.0254,
  7.0, 0.0508,
  8.0, 0.0508,
  9.0, 0.1016,
 10.0, 0.1016,
 11.0, 0.0254,
 12.0, 0.0254,
 13.0, 0.0000,
 23.0, 0.0254,
   2,   1,  10,1.000,
  0.0, 0.1016,
  1.0, 0.1016,
  2.0, 0.0762,
  3.0, 0.1270,
  4.0, 0.2286,
  5.0, 0.1524,
  6.0, 0.0254,
  7.0, 0.0254,
  8.0, 0.0254,
  9.0, 0.0000,
   4,   1,   2,1.000,
 22.0, 0.1016,
 23.0, 0.1270,
   5,   1,   9,1.000,
  0.0, 0.1270,
  1.0, 0.1524,
  2.0, 0.0254,
  3.0, 0.1270,
  4.0, 0.0000,
  5.0, 0.1016,
  6.0, 0.1016,
  7.0, 0.0508,
  8.0, 0.0000,
   6,   1,   9,1.000,
  4.0, 0.0254,
  5.0, 0.0000,
  8.0, 0.0254,
  9.0, 0.0508,
 10.0, 0.1016,
 11.0, 0.1524,
 12.0, 0.1778,
 13.0, 0.0254,
 14.0, 0.0000,
```

```
  8,   1,   2,1.000,
 6.0, 0.0254,
 7.0, 0.0000,
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20.0, 0.0254,
21.0, 0.0508,
22.0, 0.0508,
23.0, 0.0254,
 11,   1,   2,1.000,
 0.0, 0.0508,
 1.0, 0.0000,
 16,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0000,
 17,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
 19,   1,   2,1.000,
15.0, 0.0254,
16.0, 0.0000,
 20,   1,   2,1.000,
19.0, 0.0254,
20.0, 0.0000,
 21,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0254,
 22,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0000,
 26,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0000,
 27,   1,   2,1.000,
 8.0, 0.0254,
 9.0, 0.0000,
 32,   1,   2,1.000,
18.0, 0.0254,
19.0, 0.0000,
 33,   1,   2,1.000,
 2.0, 0.0254,
 3.0, 0.0000,
 35,   1,   2,1.000,
 5.0, 0.0254,
 6.0, 0.0000,
 36,   1,   3,1.000,
21.0, 0.1016,
22.0, 0.1524,
23.0, 0.1524,
 37,   1,   9,1.000,
 0.0, 0.1270,
 1.0, 0.1016,
 2.0, 0.0762,
 3.0, 0.0000,
 7.0, 0.0508,
```

```
 8.0, 0.0508,
 9.0, 0.0508,
10.0, 0.0254,
11.0, 0.0000,
 42,   1,   2,1.000,
 11.0, 0.0508,
 12.0, 0.0000,
 47,   1,   3,1.000,
  9.0, 0.0508,
 10.0, 0.0508,
 11.0, 0.0000,
 50,   1,   2,1.000,
  8.0, 0.0254,
  9.0, 0.0000,
 53,   1,  10,1.000,
 14.0, 0.0254,
 15.0, 0.0508,
 16.0, 0.0762,
 17.0, 0.0508,
 18.0, 0.0000,
 19.0, 0.0762,
 20.0, 0.0254,
 21.0, 0.0000,
 22.0, 0.0254,
 23.0, 0.0000,
 54,   1,  11,1.000,
  4.0, 0.0254,
  5.0, 0.0000,
 13.0, 0.0254,
 14.0, 0.1270,
 15.0, 0.0508,
 16.0, 0.0000,
 17.0, 0.0508,
 18.0, 0.1270,
 19.0, 0.3810,
 20.0, 0.3810,
 21.0, 0.0000,
 55,   1,   3,1.000,
 10.0, 0.0254,
 11.0, 0.0508,
 12.0, 0.0000,
 56,   1,   2,1.000,
 13.0, 0.1016,
 14.0, 0.0000,
 57,   1,   6,1.000,
  0.0, 0.0254,
  1.0, 0.0254,
  2.0, 0.0254,
  3.0, 0.0000,
  5.0, 0.0254,
  6.0, 0.0000,
 60,   1,   9,1.000,
 15.0, 0.0254,
 16.0, 0.0508,
```

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 17.0, 0.1016,
 18.0, 0.1270,
 19.0, 0.0508,
 20.0, 0.0762,
 21.0, 0.1524,
 22.0, 0.0762,
 23.0, 0.0000,
 61,   1,  15,1.000,
  0.0, 0.0254,
  1.0, 0.0000,
  9.0, 0.0254,
 10.0, 0.0254,
 11.0, 0.0000,
 14.0, 0.0254,
 15.0, 0.1524,
 16.0, 0.0508,
 17.0, 0.0254,
 18.0, 0.0000,
 19.0, 0.1270,
 20.0, 0.1270,
 21.0, 0.0000,
 23.0, 0.0508,
 24.0, 0.0000,
 62,   1,  10,1.000,
  0.0, 0.1016,
  1.0, 0.0762,
  2.0, 0.0000,
  5.0, 0.0254,
  6.0, 0.0762,
  7.0, 0.0254,
  8.0, 0.0000,
 22.0, 0.0762,
 23.0, 0.2286,
 24.0, 0.0000,
 63,   1,   9,1.000,
  0.0, 0.1016,
  1.0, 0.0254,
  2.0, 0.0508,
  3.0, 0.0254,
  4.0, 0.0254,
  5.0, 0.0254,
  6.0, 0.0254,
  7.0, 0.0254,
  8.0, 0.0000,
 64,   1,   6,1.000,
 8.0, 0.1016,
 9.0, 0.0254,
10.0, 0.0254,
11.0, 0.1270,
12.0, 0.0254,
13.0, 0.0000,
 67,   1,   2,1.000,
11.0, 0.0508,
12.0, 0.0000,
```

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 68,   1,   7,1.000,
11.0, 0.0508,
12.0, 0.0000,
13.0, 0.0508,
14.0, 0.0000,
15.0, 0.0508,
16.0, 0.0254,
17.0, 0.0000,
 69,   1,   4,1.000,
 9.0, 0.0254,
10.0, 0.0000,
15.0, 0.0254,
16.0, 0.0000,
 70,   1,   4,1.000,
12.0, 0.0254,
13.0, 0.0000,
16.0, 0.0254,
17.0, 0.0000,
 71,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0000,
 73,   1,   3,1.000,
21.0, 0.0508,
22.0, 0.0508,
23.0, 0.0000,
 74,   1,  11,1.000,
 2.0, 0.0254,
 3.0, 0.0000,
 7.0, 0.0254,
 8.0, 0.0254,
 9.0, 0.0254,
10.0, 0.0508,
11.0, 0.0254,
12.0, 0.0254,
13.0, 0.0254,
14.0, 0.0254,
15.0, 0.0000,
 76,   1,   7,1.000,
10.0, 0.0762,
11.0, 0.0508,
12.0, 0.0254,
13.0, 0.0000,
14.0, 0.0254,
15.0, 0.0254,
16.0, 0.0000,
 79,   1,   4,1.000,
 7.0, 0.0254,
 8.0, 0.0000,
22.0, 0.0762,
23.0, 0.0000,
 80,   1,   7,1.000,
13.0, 0.0254,
14.0, 0.0254,
15.0, 0.0000,
```

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21.0, 0.1270,
22.0, 0.2032,
23.0, 0.1524,
24.0, 0.0000,
 81,   1,  13,1.000,
 2.0, 0.1270,
 3.0, 0.0254,
 4.0, 0.0000,
12.0, 0.0508,
13.0, 0.1016,
14.0, 0.1524,
15.0, 0.1016,
16.0, 0.0000,
19.0, 0.0254,
20.0, 0.0508,
21.0, 0.0254,
22.0, 0.0254,
23.0, 0.0000,
 82,   1,   2,1.000,
 1.0, 0.0254,
 2.0, 0.0000,
 83,   1,  14,1.000,
 5.0, 0.0254,
 6.0, 0.0254,
 7.0, 0.0254,
 8.0, 0.0762,
 9.0, 0.0254,
10.0, 0.0254,
11.0, 0.0000,
12.0, 0.0254,
13.0, 0.0254,
14.0, 0.0000,
17.0, 0.0254,
18.0, 0.0000,
19.0, 0.0508,
20.0, 0.0000,
 84,   1,   2,1.000,
13.0, 0.0254,
14.0, 0.0000,
 87,   1,  10,1.000,
15.0, 0.0762,
16.0, 0.0762,
17.0, 0.0762,
18.0, 0.0762,
19.0, 0.1016,
20.0, 0.0254,
21.0, 0.0508,
22.0, 0.0254,
23.0, 0.0254,
24.0, 0.0000,
 88,   1,   9,1.000,
 2.0, 0.0254,
 3.0, 0.0000,
 8.0, 0.0508,
```

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 9.0, 0.0762,
10.0, 0.1016,
11.0, 0.1016,
12.0, 0.0000,
17.0, 0.0508,
18.0, 0.0000,
 89,   1,   3,1.000,
 2.0, 0.0254,
 3.0, 0.0254,
 4.0, 0.0000,
 90,   1,   6,1.000,
 8.0, 0.0254,
 9.0, 0.0000,
14.0, 0.0254,
15.0, 0.1524,
16.0, 0.1778,
17.0, 0.0000,
 92,   1,   6,1.000,
10.0, 0.1270,
11.0, 0.2794,
12.0, 0.2286,
13.0, 0.0762,
14.0, 0.0254,
15.0, 0.0000,
 93,   1,   6,1.000,
 7.0, 0.0254,
 8.0, 0.0508,
 9.0, 0.0508,
10.0, 0.0000,
11.0, 0.0254,
12.0, 0.0000,
 95,   1,   2,1.000,
 7.0, 0.0254,
 8.0, 0.0000,
101,   1,   3,1.000,
10.0, 0.1778,
11.0, 0.0508,
12.0, 0.0000,
102,   1,   8,1.000,
15.0, 0.0762,
16.0, 0.1524,
17.0, 0.1270,
18.0, 0.0762,
19.0, 0.0508,
20.0, 0.0508,
21.0, 0.0254,
22.0, 0.0000,
103,   1,   7,1.000,
13.0, 0.0254,
14.0, 0.0254,
15.0, 0.0000,
16.0, 0.0254,
17.0, 0.0000,
18.0, 0.0508,
```

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19.0, 0.0000,
104,   1,   3,1.000,
10.0, 0.1778,
11.0, 0.0254,
12.0, 0.0000,
113,   1,   2,1.000,
17.0, 0.0508,
18.0, 0.0000,
114,   1,   4,1.000,
14.0, 0.0508,
15.0, 0.0000,
23.0, 0.0254,
24.0, 0.0000,
115,   1,   4,1.000,
 0.0, 0.0254,
 1.0, 0.0000,
12.0, 0.1016,
13.0, 0.0000,
122,   1,   3,1.000,
18.0, 0.0762,
19.0, 0.0762,
20.0, 0.0000,
123,   1,   3,1.000,
 1.0, 0.2794,
 2.0, 0.0254,
 3.0, 0.0000,
124,   1,   4,1.000,
21.0, 0.1270,
22.0, 0.0762,
23.0, 0.1016,
24.0, 0.0000,
125,   1,   4,1.000,
 0.0, 0.0254,
 1.0, 0.0000,
 4.0, 0.0508,
 5.0, 0.0000,
126,   1,   7,1.000,
14.0, 0.0508,
15.0, 0.0254,
16.0, 0.1778,
17.0, 0.1270,
18.0, 0.0000,
20.0, 0.1270,
21.0, 0.0000,
127,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
131,   1,   4,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
 9.0, 0.1270,
10.0, 0.0000,
133,   1,   4,1.000,
21.0, 0.0508,
```

```
22.0, 0.2032,
23.0, 0.0508,
24.0, 0.0000,
134,   1,   7,1.000,
 0.0, 0.0508,
 1.0, 0.1778,
 2.0, 0.1524,
 3.0, 0.0000,
 5.0, 0.0508,
 6.0, 0.0254,
 7.0, 0.0000,
156,   1,   2,1.000,
22.0, 0.0254,
23.0, 0.0000,
159,   1,   5,1.000,
 8.0, 0.0254,
 9.0, 0.4064,
10.0, 0.0508,
11.0, 0.0508,
12.0, 0.0000,
163,   1,   2,1.000,
17.0, 0.0762,
18.0, 0.0000,
166,   1,   2,1.000,
17.0, 0.0762,
18.0, 0.0000,
168,   1,   8,1.000,
11.0, 0.0762,
12.0, 0.0000,
15.0, 0.0254,
16.0, 0.0254,
17.0, 0.0000,
22.0, 0.0254,
23.0, 0.0762,
24.0, 0.0000,
170,   1,  10,1.000,
 6.0, 0.0254,
 7.0, 0.0000,
10.0, 0.0254,
11.0, 0.0000,
12.0, 0.1778,
13.0, 0.0254,
14.0, 0.0000,
22.0, 0.6096,
23.0, 0.1270,
24.0, 0.0000,
172,   1,   7,1.000,
16.0, 0.0762,
17.0, 0.0762,
18.0, 0.1270,
19.0, 0.0508,
20.0, 0.0000,
22.0, 0.0254,
23.0, 0.0000,
```

```
187,   1,   7,1.000,
 3.0, 0.1524,
 4.0, 0.0508,
 5.0, 0.0254,
 6.0, 0.0254,
 7.0, 0.0000,
11.0, 0.0254,
12.0, 0.0000,
193,   1,   2,1.000,
23.0, 0.0508,
24.0, 0.0000,
194,   1,  13,1.000,
 0.0, 0.1270,
 1.0, 0.1524,
 2.0, 0.0508,
 3.0, 0.0000,
 9.0, 0.0762,
10.0, 0.0254,
11.0, 0.0508,
12.0, 0.0000,
13.0, 0.1016,
14.0, 0.0762,
15.0, 0.0000,
17.0, 0.0254,
18.0, 0.0000,
204,   1,   2,1.000,
13.0, 0.0508,
14.0, 0.0000,
209,   1,   2,1.000,
 2.0, 0.0254,
 3.0, 0.0000,
218,   1,   3,1.000,
20.0, 0.0254,
21.0, 0.1270,
22.0, 0.0000,
224,   1,  14,1.000,
 3.0, 0.0254,
 4.0, 0.0000,
 5.0, 0.0508,
 6.0, 0.0508,
 7.0, 0.0762,
 8.0, 0.0508,
 9.0, 0.0000,
11.0, 0.0254,
12.0, 0.2032,
13.0, 0.0000,
16.0, 0.4826,
17.0, 0.0000,
22.0, 0.1270,
23.0, 0.0000,
225,   1,   2,1.000,
12.0, 0.0254,
13.0, 0.0000,
226,   1,   2,1.000,
```

```
14.0, 0.0254,
15.0, 0.0000,
227,   1,   2,1.000,
 6.0, 0.0254,
 7.0, 0.0000,
233,   1,   4,1.000,
 1.0, 0.2540,
 2.0, 0.0254,
 3.0, 0.0254,
 4.0, 0.0000,
241,   1,   2,1.000,
 9.0, 0.0508,
10.0, 0.0000,
249,   1,   5,1.000,
 5.0, 0.1524,
 6.0, 0.2032,
 7.0, 0.0000,
17.0, 0.0508,
18.0, 0.0000,
250,   1,   4,1.000,
15.0, 0.1016,
16.0, 0.0000,
18.0, 0.0254,
19.0, 0.0000,
260,   1,   4,1.000,
 6.0, 0.2032,
 7.0, 0.6096,
 8.0, 0.1524,
 9.0, 0.0000,
274,   1,   2,1.000,
11.0, 0.0254,
12.0, 0.0000,
275,   1,   9,1.000,
 6.0, 0.0254,
 7.0, 0.0254,
 8.0, 0.2032,
 9.0, 0.1270,
10.0, 0.0254,
11.0, 0.0508,
12.0, 0.0000,
17.0, 0.1270,
18.0, 0.0000,
276,   1,   2,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
286,   1,   5,1.000,
18.0, 0.0254,
19.0, 0.0000,
20.0, 0.0254,
21.0, 0.0000,
23.0, 0.1016,
287,   1,  15,1.000,
 0.0, 0.1270,
 1.0, 0.1270,
```

```
 2.0, 0.2032,
 3.0, 0.2540,
 4.0, 0.0508,
 5.0, 0.0000,
 7.0, 0.0762,
 8.0, 0.0254,
 9.0, 0.0508,
10.0, 0.2794,
11.0, 0.0508,
12.0, 0.0508,
13.0, 0.0000,
16.0, 0.0508,
17.0, 0.0000,
290,   1,   4,1.000,
18.0, 0.0508,
19.0, 0.1778,
20.0, 0.1016,
21.0, 0.0000,
291,   1,   2,1.000,
 7.0, 0.0254,
 8.0, 0.0000,
293,   1,   2,1.000,
23.0, 0.0254,
24.0, 0.0000,
294,   1,   5,1.000,
17.0, 0.0254,
18.0, 0.0508,
19.0, 0.0508,
20.0, 0.0254,
21.0, 0.0000,
296,   1,  12,1.000,
 8.0, 0.0254,
 9.0, 0.1270,
10.0, 0.1778,
11.0, 0.3048,
12.0, 0.3302,
13.0, 0.2032,
14.0, 0.1270,
15.0, 0.1778,
16.0, 0.0254,
17.0, 0.0000,
18.0, 0.0254,
19.0, 0.0000,
298,   1,   1,1.000,
23.0, 0.0762,
299,   1,  14,1.000,
 0.0, 0.0508,
 1.0, 0.0254,
 2.0, 0.0000,
 6.0, 0.0508,
 7.0, 0.1524,
 8.0, 0.2540,
 9.0, 0.2032,
10.0, 0.1524,
```

```
11.0, 0.1524,
12.0, 0.2540,
13.0, 0.2540,
14.0, 0.1016,
15.0, 0.0254,
16.0, 0.0000,
302,   1,   9,1.000,
 9.0, 0.0508,
10.0, 0.0254,
11.0, 0.0508,
12.0, 0.0254,
13.0, 0.0000,
16.0, 0.0254,
17.0, 0.0000,
19.0, 0.0254,
20.0, 0.0000,
303,   1,   1,1.000,
23.0, 0.0254,
304,   1,   5,1.000,
 0.0, 0.0254,
 1.0, 0.0254,
 2.0, 0.0000,
 3.0, 0.0254,
 4.0, 0.0000,
309,   1,   5,1.000,
19.0, 0.0254,
20.0, 0.0762,
21.0, 0.0000,
23.0, 0.0762,
24.0, 0.0000,
310,   1,   4,1.000,
 2.0, 0.0508,
 3.0, 0.1778,
 4.0, 0.0254,
 5.0, 0.0000,
312,   1,   4,1.000,
13.0, 0.0254,
14.0, 0.0000,
15.0, 0.0508,
16.0, 0.0000,
313,   1,   3,1.000,
20.0, 0.0508,
21.0, 0.0254,
22.0, 0.0000,
314,   1,   2,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
317,   1,   5,1.000,
14.0, 0.0508,
15.0, 0.1016,
16.0, 0.0762,
17.0, 0.0254,
18.0, 0.0000,
321,   1,   2,1.000,
```

```
16.0, 0.0254,
17.0, 0.0000,
323,   1,   9,1.000,
 5.0, 0.0762,
 6.0, 0.0508,
 7.0, 0.0000,
 8.0, 0.0508,
 9.0, 0.1270,
10.0, 0.0762,
11.0, 0.0000,
12.0, 0.0254,
13.0, 0.0000,
324,   1,   3,1.000,
18.0, 0.0254,
19.0, 0.0254,
20.0, 0.0000,
326,   1,   8,1.000,
10.0, 0.2032,
11.0, 0.1778,
12.0, 0.1016,
13.0, 0.0254,
14.0, 0.0254,
15.0, 0.0000,
18.0, 0.0254,
19.0, 0.0000,
328,   1,   3,1.000,
 3.0, 0.0254,
 4.0, 0.0254,
 5.0, 0.0000,
330,   1,  11,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
15.0, 0.0254,
16.0, 0.0000,
17.0, 0.0508,
18.0, 0.0254,
19.0, 0.0254,
20.0, 0.0254,
21.0, 0.0000,
22.0, 0.0508,
23.0, 0.1270,
331,   1,   9,1.000,
 0.0, 0.1016,
 1.0, 0.0254,
 2.0, 0.1016,
 3.0, 0.2032,
 4.0, 0.0762,
 5.0, 0.0762,
 6.0, 0.1524,
 7.0, 0.0508,
 8.0, 0.0000,
332,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
```

```
 349,   1,   7,1.000,
 17.0, 0.0254,
 18.0, 0.0000,
 19.0, 0.0762,
 20.0, 0.1270,
 21.0, 0.0508,
 22.0, 0.0508,
 23.0, 0.0508,
 350,   1,  20,1.000,
  0.0, 0.2032,
  1.0, 0.1524,
  2.0, 0.0762,
  3.0, 0.0762,
  4.0, 0.0762,
  5.0, 0.1270,
  6.0, 0.1270,
  7.0, 0.1016,
  8.0, 0.1016,
  9.0, 0.0508,
 10.0, 0.1778,
 11.0, 0.2286,
 12.0, 0.1270,
 13.0, 0.0762,
 14.0, 0.0254,
 15.0, 0.0000,
 18.0, 0.0254,
 19.0, 0.0000,
 20.0, 0.0254,
 21.0, 0.0000,
353,   1,  12,1.000,
  8.0, 0.0508,
  9.0, 0.0254,
 10.0, 0.0254,
 11.0, 0.0000,
 12.0, 0.0508,
 13.0, 0.0000,
 17.0, 0.0254,
 18.0, 0.0000,
 20.0, 0.0508,
 21.0, 0.0254,
 22.0, 0.0508,
 23.0, 0.1270,
354,   1,  16,1.000,
  0.0, 0.0508,
  1.0, 0.0254,
  2.0, 0.0508,
  3.0, 0.0254,
  4.0, 0.0000,
 11.0, 0.0254,
 12.0, 0.0000,
 15.0, 0.0254,
 16.0, 0.0000,
 17.0, 0.0762,
 18.0, 0.0508,
```

```
 19.0, 0.0508,
 20.0, 0.0000,
 21.0, 0.0762,
 22.0, 0.0000,
 23.0, 0.0508,
 355,   1,  19,1.000,
  0.0, 0.1778,
  1.0, 0.0000,
  4.0, 0.0254,
  5.0, 0.0000,
  9.0, 0.2286,
 10.0, 0.3048,
 11.0, 0.2286,
 12.0, 0.1270,
 13.0, 0.0000,
 14.0, 0.0254,
 15.0, 0.0000,
 16.0, 0.0762,
 17.0, 0.0762,
 18.0, 0.0000,
 19.0, 0.0508,
 20.0, 0.1778,
 21.0, 0.0762,
 22.0, 0.0508,
 23.0, 0.0000,
 365,   1,   2,1.000,
 12.0, 0.0254,
 13.0, 0.0000,
```

***SVFD, Brooks-Corey, 2010***

```
Spokane Valley Rathdrum Prairie SVFD Simulation:  BCSVFD2010.inp
0, 1,                          IPLANT, NGRAV
62, 1, 62,                     IFDEND, IDTBEG, IDTEND
2010, 1, 0, 0, 0,              IYS, NYEARS, ISTEAD, IFLIST, NFLIST
1, 24.0,                       NPRINT, STOPHR
0, 3, 1, 1.0E-4,               ISMETH, INMAX, ISWDIF, DMAXBA
1.0, 1.0E-5, 1.0,              DELMAX, DELMIN, OUTTIM
2.0, 1.0E-05, 0.0, 0.0, 0.0,   RFACT, RAINIF, DHTOL, DHMAX, DHFACT
3, 3, 0,                       KOPT, KEST, WTF
0, 1, 2, 2,                    ITOPBC, IEVOPT, NFHOUR, LOWER
0.0, 2.0E+04, 20.73, 0.0,      HIRRI, HDRY, HTOP, RHA
0, 0, 0,                       IETOPT, ICLOUD, ISHOPT
0, 0,                          IRAIN, HPR
0, 0, 0, 0, 0,                 IHYS, AIRTOL, HYSTOL, HYSMXH, HYFILE
0, 0, 0,                       IHEAT, ICONVH, DMAXHE
0, 0, 0, 0,                    UPPERH, TSMEAN, TSAMP, QHCTOP
0, 0.0, 0.0,                   LOWERH, QHLEAK, TGRAD
0, 0.66, 288.46, 0.24,         IVAPOR, TORT, TSOIL, VAPDIF
3, 126,                        MATN, NPT
1,    0.00,  1,    1.00,  1,    2.00,  1,    3.00,
1,    4.00,  1,    5.00,  1,    6.00,  1,    7.00,
1,    8.00,  1,    9.00,  1,   10.00,  1,   11.00,
```

```
1,   12.00,  1,   13.00,  1,   14.00,  1,   15.00,
1,   16.00,  1,   17.00,  1,   18.00,  1,   19.00,
1,   20.00,  2,   21.00,  2,   22.00,  2,   23.00,
2,   24.00,  2,   25.00,  2,   26.00,  2,   27.00,
2,   28.00,  2,   29.00,  2,   30.00,  2,   31.00,
2,   32.00,  2,   33.00,  2,   34.00,  2,   35.00,
2,   36.00,  2,   37.00,  2,   38.00,  2,   39.00,
2,   40.00,  2,   41.00,  2,   42.00,  2,   43.00,
2,   44.00,  2,   45.00,  2,   46.00,  2,   47.00,
2,   48.00,  2,   49.00,  2,   50.00,  2,   51.00,
2,   52.00,  2,   53.00,  2,   54.00,  2,   55.00,
2,   56.00,  2,   57.00,  2,   58.00,  2,   59.00,
2,   60.00,  2,   61.00,  2,   62.00,  2,   63.00,
2,   64.00,  2,   65.00,  3,   66.00,  3,   67.00
3,   68.00,  3,   69.00,  3,   70.00,  3,   71.00,
3,   72.00,  3,   73.00,  3,   74.00,  3,   75.00,
3,   76.00,  3,   77.00,  3,   78.00,  3,   79.00,
3,   80.00,  3,   81.00,  3,   82.00,  3,   83.00,
3,   84.00,  3,   85.00,  3,   86.00,  3,   87.00,
3,   88.00,  3,   89.00,  3,   90.00,  3,   91.00,
3,   92.00,  3,   93.00,  3,   94.00,  3,   95.00,
3,   96.00,  3,   97.00,  3,   98.00,  3,   99.00,
3,  100.00,  3,  101.00,  3,  102.00,  3,  103.00,
3,  104.00,  3,  105.00,  3,  106.00,  3,  107.00,
3,  108.00,  3,  109.00,  3,  110.00,  3,  111.00,
3,  112.00,  3,  113.00,  3,  114.00,  3,  115.00,
3,  116.00,  3,  117.00,  3,  118.00,  3,  119.00,
3,  120.00,  3,  121.00,  3,  122.00,  3,  123.00,
3,  124.00,  3,  125.00,
Sand Layer #1: 0-20 cm (Brooks-Corey et al.)          Retention
0.3, 0.045, 29.133, 1.9444,                           THET, THTR,
AIRENT, B
Sand Layer #1: 0-20 cm (Brooks-Corey et al.)          Hydraulic
Conductivity
2.0, 29.8, 29.133, 1.9444, 0.5,                       RKMOD, SK,
AIRENK, B, EPIT
Sand Layer #2: 0-20 cm (Brooks-Corey et al.)          Retention
0.3, 0.045, 29.602, 1.5476,                           THET, THTR,
AIRENT, B
Sand Layer #2: 0-20 cm (Brooks-Corey et al.)          Hydraulic
Conductivity
2.0, 29.8, 29.602, 1.5476, 0.5,                       RKMOD, SK,
AIRENK, B, EPIT
Sand Layer #3: 0-20 cm (Brooks-Corey et al.)          Retention
0.13, 0.045, 26.477, 1.4913,                          THET, THTR,
AIRENT, B
Sand Layer #3: 0-20 cm (Brooks-Corey et al.)          Hydraulic
Conductivity
2.0, 9.8, 26.477, 1.4913, 0.5,                        RKMOD, SK,
AIRENK, B, EPIT
0,    NDAY
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
```

```
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,100.0,100.0,
100.0,100.0,
0.0368, 0.0222, 0.0131, 0.0104, 0.0203, 0.0840, 0.0372, 0.0127,
0.0195, 0.0090, 0.0099, 0.0063, 0.0147, 0.0098, 0.0030, 0.0132,
0.0291, 0.1143, 0.0826, 0.0113, 0.0255, 0.0322, 0.0289, 0.0126,
0.0149, 0.0141, 0.0130, 0.0072, 0.0093, 0.0107, 0.0094, 0.0147,
0.0182, 0.0136, 0.0121, 0.0171, 0.0280, 0.0157, 0.0113, 0.0067,
0.0100, 0.0127, 0.0185, 0.0178, 0.0307, 0.1826, 0.0220, 0.0342,
0.1198, 0.0863, 0.1157, 0.1344, 0.0328, 0.0227, 0.0264, 0.0261,
0.0267, 0.0241, 0.0270, 0.0249, 0.0281, 0.0329,
22,         NWATER      (rain data 2010)
 15,   1,   7,1.000,
 17.0, 0.0254,
 18.0, 0.0000,
 19.0, 0.0762,
 20.0, 0.1270,
 21.0, 0.0508,
 22.0, 0.0508,
 23.0, 0.0508,
 16,   1,  20,1.000,
  0.0, 0.2032,
  1.0, 0.1524,
  2.0, 0.0762,
  3.0, 0.0762,
  4.0, 0.0762,
  5.0, 0.1270,
  6.0, 0.1270,
```

```
  7.0, 0.1016,
  8.0, 0.1016,
  9.0, 0.0508,
 10.0, 0.1778,
 11.0, 0.2286,
 12.0, 0.1270,
 13.0, 0.0762,
 14.0, 0.0254,
 15.0, 0.0000,
 18.0, 0.0254,
 19.0, 0.0000,
 20.0, 0.0254,
 21.0, 0.0000,
19,   1,  12,1.000,
  8.0, 0.0508,
  9.0, 0.0254,
 10.0, 0.0254,
 11.0, 0.0000,
 12.0, 0.0508,
 13.0, 0.0000,
 17.0, 0.0254,
 18.0, 0.0000,
 20.0, 0.0508,
 21.0, 0.0254,
 22.0, 0.0508,
 23.0, 0.1270,
20,   1,  16,1.000,
  0.0, 0.0508,
  1.0, 0.0254,
  2.0, 0.0508,
  3.0, 0.0254,
  4.0, 0.0000,
 11.0, 0.0254,
 12.0, 0.0000,
 15.0, 0.0254,
 16.0, 0.0000,
 17.0, 0.0762,
 18.0, 0.0508,
 19.0, 0.0508,
 20.0, 0.0000,
 21.0, 0.0762,
 22.0, 0.0000,
 23.0, 0.0508,
 21,   1,  19,1.000,
  0.0, 0.1778,
  1.0, 0.0000,
  4.0, 0.0254,
  5.0, 0.0000,
  9.0, 0.2286,
 10.0, 0.3048,
 11.0, 0.2286,
 12.0, 0.1270,
 13.0, 0.0000,
 14.0, 0.0254,
```

```
15.0, 0.0000,
16.0, 0.0762,
17.0, 0.0762,
18.0, 0.0000,
19.0, 0.0508,
20.0, 0.1778,
21.0, 0.0762,
22.0, 0.0508,
23.0, 0.0000,
31,   1,   2,1.000,
12.0, 0.0254,
13.0, 0.0000,
32,   1,   8,1.000,
 9.0, 0.1778,
10.0, 0.1016,
11.0, 0.1016,
12.0, 0.2794,
13.0, 0.1016,
14.0, 0.0508,
15.0, 0.1270,
16.0, 0.0000,
34,   1,   2,1.000,
 9.0, 0.0254,
10.0, 0.0000,
35,   1,  17,1.000,
 3.0, 0.0254,
 4.0, 0.0000,
 5.0, 0.0254,
 6.0, 0.0000,
11.0, 0.0508,
12.0, 0.1524,
13.0, 0.1778,
14.0, 0.1270,
15.0, 0.0762,
16.0, 0.0508,
17.0, 0.0508,
18.0, 0.0762,
19.0, 0.0762,
20.0, 0.0254,
21.0, 0.0762,
22.0, 0.2032,
23.0, 0.1524,
36,   1,  13,1.000,
 0.0, 0.1524,
 1.0, 0.0762,
 2.0, 0.0254,
 3.0, 0.0508,
 4.0, 0.0000,
 5.0, 0.0254,
 6.0, 0.0000,
 7.0, 0.0254,
 8.0, 0.0254,
 9.0, 0.0254,
10.0, 0.0254,
```

```
11.0, 0.0254,
12.0, 0.0000,
41,   1,   4,1.000,
 9.0, 0.0254,
10.0, 0.0508,
11.0, 0.0254,
12.0, 0.0000,
42,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
43,   1,  11,1.000,
 0.0, 0.0254,
 1.0, 0.0000,
 9.0, 0.0254,
10.0, 0.0254,
11.0, 0.0000,
14.0, 0.0254,
15.0, 0.0000,
18.0, 0.0254,
19.0, 0.1270,
20.0, 0.2032,
21.0, 0.0000,
44,   1,   7,1.000,
 2.0, 0.0254,
 3.0, 0.0000,
14.0, 0.0508,
15.0, 0.2032,
16.0, 0.0762,
17.0, 0.0254,
18.0, 0.0000,
46,   1,   2,1.000,
22.0, 0.0254,
23.0, 0.0000,
47,   1,   9,1.000,
 1.0, 0.0508,
 2.0, 0.1016,
 3.0, 0.0762,
 4.0, 0.0508,
 5.0, 0.0254,
 6.0, 0.0762,
 7.0, 0.0508,
 8.0, 0.0508,
 9.0, 0.0000,
48,   1,   9,1.000,
 3.0, 0.0508,
 4.0, 0.0254,
 5.0, 0.0000,
14.0, 0.0254,
15.0, 0.0000,
21.0, 0.0254,
22.0, 0.0762,
23.0, 0.0762,
24.0, 0.0000,
50,   1,   3,1.000,
```

```
  4.0, 0.0254,
  5.0, 0.0254,
  6.0, 0.0000,
 55,   1,   2,1.000,
  2.0, 0.1016,
  3.0, 0.0000,
 56,   1,  10,1.000,
 11.0, 0.1270,
 12.0, 0.0762,
 13.0, 0.0000,
 14.0, 0.0254,
 15.0, 0.0254,
 16.0, 0.0000,
 17.0, 0.0254,
 18.0, 0.0254,
 19.0, 0.0254,
 20.0, 0.0000,
 59,   1,   2,1.000,
  9.0, 0.0254,
 10.0, 0.0000,
 62,   1,   6,1.000,
  4.0, 0.0254,
  5.0, 0.0508,
  6.0, 0.0254,
  7.0, 0.0000,
 16.0, 0.0254,
 17.0, 0.0000,
```

***USFS, van Genuchten, 2009***

```
Spokane Valley Rathdrum Prairie USFS Simulation: VGUSFS2009.inp
0, 1,                          IPLANT, NGRAV
365, 1, 365,                   IFDEND, IDTBEG, IDTEND
2009, 1, 0, 0, 0,              IYS, NYEARS, ISTEAD, IFLIST, NFLIST
1, 24.0,                       NPRINT, STOPHR
0, 3, 1, 1.0E-4,               ISMETH, INMAX, ISWDIF, DMAXBA
1.0, 1.0E-5, 1.0,              DELMAX, DELMIN, OUTTIM
2.0, 1.0E-05, 0.0, 0.0, 0.0,   RFACT, RAINIF, DHTOL, DHMAX, DHFACT
4, 3, 0,                       KOPT, KEST, WTF
0, 1, 2, 2,                    ITOPBC, IEVOPT, NFHOUR, LOWER
0.0, 2.0E+04, 20.73, 0.0,      HIRRI, HDRY, HTOP, RHA
0, 0, 0,                       IETOPT, ICLOUD, ISHOPT
0, 0,                          IRAIN, HPR
0, 0, 0, 0, 0,                 IHYS, AIRTOL, HYSTOL, HYSMXH, HYFILE
0, 0, 0,                       IHEAT, ICONVH, DMAXHE
0, 0, 0, 0,                    UPPERH, TSMEAN, TSAMP, QHCTOP
0, 0.0, 0.0,                   LOWERH, QHLEAK, TGRAD
0, 0.66, 288.46, 0.24,         IVAPOR, TORT, TSOIL, VAPDIF
3, 126,                        MATN, NPT
1,    0.00,  1,    1.00,  1,    2.00,  1,    3.00,
1,    4.00,  1,    5.00,  1,    6.00,  1,    7.00,
1,    8.00,  1,    9.00,  1,   10.00,  1,   11.00,
1,   12.00,  1,   13.00,  1,   14.00,  1,   15.00,
```

```
1,   16.00,  1,   17.00,  1,   18.00,  1,   19.00,
1,   20.00,  2,   21.00,  2,   22.00,  2,   23.00,
2,   24.00,  2,   25.00,  2,   26.00,  2,   27.00,
2,   28.00,  2,   29.00,  2,   30.00,  2,   31.00,
2,   32.00,  2,   33.00,  2,   34.00,  2,   35.00,
2,   36.00,  2,   37.00,  2,   38.00,  2,   39.00,
2,   40.00,  2,   41.00,  2,   42.00,  2,   43.00,
2,   44.00,  2,   45.00,  2,   46.00,  2,   47.00,
2,   48.00,  2,   49.00,  2,   50.00,  2,   51.00,
2,   52.00,  2,   53.00,  2,   54.00,  2,   55.00,
2,   56.00,  2,   57.00,  2,   58.00,  2,   59.00,
2,   60.00,  2,   61.00,  2,   62.00,  2,   63.00,
2,   64.00,  2,   65.00,  3,   66.00,  3,   67.00
3,   68.00,  3,   69.00,  3,   70.00,  3,   71.00,
3,   72.00,  3,   73.00,  3,   74.00,  3,   75.00,
3,   76.00,  3,   77.00,  3,   78.00,  3,   79.00,
3,   80.00,  3,   81.00,  3,   82.00,  3,   83.00,
3,   84.00,  3,   85.00,  3,   86.00,  3,   87.00,
3,   88.00,  3,   89.00,  3,   90.00,  3,   91.00,
3,   92.00,  3,   93.00,  3,   94.00,  3,   95.00,
3,   96.00,  3,   97.00,  3,   98.00,  3,   99.00,
3,  100.00,  3,  101.00,  3,  102.00,  3,  103.00,
3,  104.00,  3,  105.00,  3,  106.00,  3,  107.00,
3,  108.00,  3,  109.00,  3,  110.00,  3,  111.00,
3,  112.00,  3,  113.00,  3,  114.00,  3,  115.00,
3,  116.00,  3,  117.00,  3,  118.00,  3,  119.00,
3,  120.00,  3,  121.00,  3,  122.00,  3,  123.00,
3,  124.00,  3,  125.00,
Loamy Sand Layer #1: 0-20 cm (van Genuchten et al.)   Retention
0.39, 0.048, 0.028, 1.51,                             THET, THTR, A, N
Loamy Sand Layer #1: 0-20 cm (van Genuchten et al.)   Hydraulic
Conductivity
2.0, 34.2, 0.028, 1.51, -0.5,                   RKMODEL, SK, A, N, EPIT
Sand Layer #2: 21-65 cm (van Genuchten et al.)        Retention
0.27, 0.025, 0.036, 1.46,                             THET, THTR, A, N
Sand Layer #2: 21-65 cm (van Genuchten et al.)        Hydraulic
Conductivity
2.0, 10.18, 0.036, 1.46, 0.5,                         RKMODEL, SK, A,
N, EPIT
Sand Layer #3: 66-125 cm (van Genuchten et al.)       Retention
0.13, 0.010, 0.045, 2.68,                             THET, THTR, A, N
Sand Layer #3: 66-125 cm (van Genuchten et al.)       Hydraulic
Conductivity
2.0, 16.18, 0.045, 2.68, 0.5,                   RKMODEL, SK, A, N, EPIT
0,    NDAY
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
```

```
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,
0.0301, 0.0221, 0.0073, 0.0114, 0.0116, 0.0167, 0.0497, 0.1163,
0.0438, 0.0535, 0.0393, 0.0311, 0.0290, 0.0212, 0.0188, 0.0196,
0.0345, 0.0381, 0.0426, 0.0665, 0.0514, 0.0354, 0.0196, 0.0257,
0.0337, 0.0222, 0.0216, 0.0393, 0.0432, 0.0220, 0.0306, 0.0137,
0.0363, 0.0455, 0.0488, 0.0301, 0.0410, 0.0486, 0.0371, 0.0322,
0.0442, 0.0356, 0.0443, 0.0832, 0.0542, 0.0420, 0.0522, 0.0492,
0.0517, 0.0575, 0.0483, 0.0609, 0.0534, 0.0628, 0.1077, 0.0850,
0.0701, 0.0709, 0.0647, 0.0804, 0.0793, 0.0972, 0.1076, 0.0822,
0.0977, 0.1148, 0.0881, 0.0767, 0.0892, 0.0656, 0.0722, 0.0981,
0.1047, 0.1445, 0.1505, 0.1235, 0.1177, 0.1216, 0.1678, 0.1478,
0.1237, 0.1419, 0.1206, 0.1592, 0.1450, 0.1914, 0.1634, 0.1269,
0.1582, 0.1339, 0.1297, 0.1396, 0.1408, 0.1763, 0.1967, 0.2513,
0.2976, 0.2457, 0.2315, 0.2360, 0.1778, 0.2027, 0.2011, 0.2036,
0.2537, 0.2443, 0.2394, 0.2579, 0.3033, 0.3720, 0.4356, 0.4090,
0.2592, 0.2580, 0.2724, 0.2406, 0.2539, 0.3034, 0.3151, 0.2864,
0.3066, 0.3611, 0.2573, 0.3131, 0.3497, 0.2671, 0.2782, 0.3035,
0.3104, 0.3130, 0.3607, 0.3244, 0.3012, 0.3181, 0.3290, 0.3535,
0.4200, 0.5139, 0.4697, 0.3669, 0.3541, 0.4123, 0.4048, 0.4435,
0.4737, 0.4966, 0.4593, 0.4773, 0.5808, 0.8175, 0.5402, 0.5866,
0.5484, 0.5044, 0.5108, 0.5118, 0.4237, 0.4191, 0.3461, 0.3542,
0.4416, 0.4536, 0.4905, 0.5157, 0.4672, 0.4687, 0.4745, 0.4428,
0.4407, 0.3740, 0.4266, 0.3652, 0.3766, 0.4341, 0.5353, 0.5375,
0.4841, 0.5057, 0.5843, 0.5331, 0.5310, 0.5103, 0.5388, 0.5256,
0.6379, 0.6406, 0.5514, 0.5164, 0.4504, 0.4543, 0.4911, 0.5411,
0.5679, 0.3944, 0.4581, 0.4782, 0.5558, 0.5524, 0.6380, 0.5681,
0.4788, 0.5956, 0.6306, 0.5585, 0.5192, 0.5420, 0.4990, 0.5243,
0.5364, 0.5127, 0.4783, 0.5182, 0.6292, 0.5284, 0.6425, 0.6290,
0.5264, 0.4745, 0.3839, 0.3619, 0.4363, 0.5551, 0.5405, 0.3907,
0.3917, 0.3409, 0.3266, 0.3463, 0.3694, 0.4752, 0.4493, 0.4066,
0.5114, 0.4323, 0.4428, 0.4019, 0.4333, 0.4236, 0.4234, 0.4503,
0.3438, 0.3695, 0.3948, 0.3837, 0.3972, 0.4120, 0.3146, 0.3452,
```

```
0.2985, 0.2683, 0.2721, 0.2499, 0.2938, 0.3249, 0.2971, 0.2735,
0.3530, 0.2856, 0.2800, 0.2600, 0.2477, 0.2879, 0.2839, 0.2273,
0.2089, 0.2158, 0.2674, 0.2905, 0.3800, 0.1935, 0.2555, 0.2298,
0.1805, 0.1799, 0.1301, 0.1508, 0.2998, 0.1690, 0.1957, 0.1522,
0.1234, 0.1634, 0.1119, 0.1157, 0.0935, 0.1463, 0.0867, 0.0956,
0.1093, 0.1092, 0.1000, 0.0943, 0.0736, 0.0719, 0.0779, 0.0788,
0.1059, 0.0670, 0.0760, 0.0734, 0.0574, 0.0414, 0.0562, 0.1269,
0.0801, 0.0525, 0.0469, 0.0596, 0.0463, 0.1149, 0.1234, 0.0480,
0.0445, 0.0749, 0.0456, 0.0302, 0.0423, 0.0310, 0.0271, 0.0830,
0.1340, 0.0700, 0.0264, 0.0402, 0.0645, 0.0284, 0.0449, 0.0220,
0.0322, 0.0248, 0.0209, 0.0254, 0.0307, 0.0431, 0.0400, 0.0352,
0.0205, 0.0113, 0.0333, 0.1071, 0.0462, 0.0235, 0.0216, 0.0209,
0.0209, 0.0121, 0.0142, 0.0120, 0.0051, 0.0088, 0.0331, 0.0166,
0.0100, 0.0133, 0.0150, 0.0263, 0.0291, 0.0150, 0.0345, 0.0422,
0.0335, 0.0160, 0.0146, 0.0098, 0.0105,
 153,       NWATER      (rain data 2009)
   1,   1,  17,1.000,
  3.0, 0.0254,
  4.0, 0.0000,
  5.0, 0.0254,
  6.0, 0.0254,
  7.0, 0.0762,
  8.0, 0.0762,
  9.0, 0.0762,
 10.0, 0.0762,
 11.0, 0.0254,
 12.0, 0.0508,
 13.0, 0.0508,
 14.0, 0.0508,
 15.0, 0.0508,
 16.0, 0.0254,
 17.0, 0.0000,
 18.0, 0.0254,
 19.0, 0.0000,
   2,   1,  11,1.000,
  0.0, 0.0508,
  1.0, 0.0762,
  2.0, 0.0762,
  3.0, 0.0000,
  4.0, 0.0762,
  5.0, 0.1270,
  6.0, 0.1016,
  7.0, 0.0508,
  8.0, 0.0000,
  9.0, 0.0254,
 10.0, 0.0000,
   4,   1,   5,1.000,
 11.0, 0.1524,
 12.0, 0.0000,
 14.0, 0.1270,
 15.0, 0.0254,
 16.0, 0.0000,
   5,   1,  18,1.000,
  1.0, 0.0508,
```

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 2.0, 0.0508,
 3.0, 0.0508,
 4.0, 0.0254,
 5.0, 0.0000,
 6.0, 0.0254,
 7.0, 0.0508,
 8.0, 0.1016,
 9.0, 0.1524,
10.0, 0.0762,
11.0, 0.0508,
12.0, 0.0762,
13.0, 0.0254,
14.0, 0.0000,
15.0, 0.0254,
16.0, 0.0000,
18.0, 0.0762,
19.0, 0.0000,
  6,   1,  20,1.000,
 3.0, 0.0254,
 4.0, 0.0000,
 6.0, 0.0254,
 7.0, 0.0508,
 8.0, 0.0254,
 9.0, 0.0508,
10.0, 0.0508,
11.0, 0.1778,
12.0, 0.1016,
13.0, 0.4064,
14.0, 0.0000,
15.0, 0.1016,
16.0, 0.1016,
17.0, 0.1778,
18.0, 0.1778,
19.0, 0.1270,
20.0, 0.0254,
21.0, 0.0254,
22.0, 0.0254,
23.0, 0.0000,
  7,   1,  14,1.000,
 1.0, 0.0254,
 2.0, 0.0000,
 8.0, 0.0508,
 9.0, 0.0254,
10.0, 0.0254,
11.0, 0.0254,
12.0, 0.1016,
13.0, 0.0000,
14.0, 0.0254,
15.0, 0.0000,
19.0, 0.0254,
20.0, 0.0762,
21.0, 0.0508,
22.0, 0.0000,
  8,   1,  12,1.000,
```

```
 1.0, 0.0254,
 2.0, 0.0000,
 8.0, 0.1016,
 9.0, 0.0254,
10.0, 0.0254,
11.0, 0.0254,
12.0, 0.1016,
13.0, 0.0254,
14.0, 0.0000,
21.0, 0.0254,
22.0, 0.0254,
23.0, 0.0000,
  9,   1,   4,1.000,
 2.0, 0.0254,
 3.0, 0.0000,
 6.0, 0.0254,
 7.0, 0.0000,
 10,   1,   9,1.000,
11.0, 0.0254,
12.0, 0.1016,
13.0, 0.0508,
14.0, 0.0000,
15.0, 0.0508,
16.0, 0.0254,
17.0, 0.0000,
22.0, 0.0508,
23.0, 0.0254,
 11,   1,   9,1.000,
 0.0, 0.0254,
 1.0, 0.0254,
 2.0, 0.0000,
 3.0, 0.0254,
 4.0, 0.0508,
 5.0, 0.0254,
 6.0, 0.0762,
 7.0, 0.0254,
 8.0, 0.0000,
 12,   1,   2,1.000,
18.0, 0.0254,
19.0, 0.0000,
 13,   1,   6,1.000,
14.0, 0.0254,
15.0, 0.0000,
18.0, 0.0254,
19.0, 0.0000,
22.0, 0.0254,
23.0, 0.0000,
 14,   1,   2,1.000,
 8.0, 0.0254,
 9.0, 0.0000,
 24,   1,   4,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
 8.0, 0.0254,
```

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 9.0, 0.0000,
 25,   1,   6,1.000,
12.0, 0.0254,
13.0, 0.0000,
14.0, 0.0254,
15.0, 0.0000,
20.0, 0.0254,
21.0, 0.0000,
 26,   1,   2,1.000,
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14.0, 0.0000,
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12.0, 0.0254,
13.0, 0.0000,
14.0, 0.0254,
15.0, 0.0000,
17.0, 0.0254,
18.0, 0.0000,
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15.0, 0.0254,
16.0, 0.0000,
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10.0, 0.0254,
11.0, 0.0000,
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13.0, 0.0000,
15.0, 0.0254,
16.0, 0.0000,
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10.0, 0.0000,
 41,   1,   2,1.000,
11.0, 0.0508,
12.0, 0.0000,
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10.0, 0.0508,
11.0, 0.0000,
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10.0, 0.0254,
11.0, 0.0000,
 47,   1,   4,1.000,
 7.0, 0.0254,
 8.0, 0.0000,
10.0, 0.0508,
11.0, 0.0000,
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 9.0, 0.0000,
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11.0, 0.0000,
 53,   1,   3,1.000,
19.0, 0.0254,
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 6.0, 0.0000,
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15.0, 0.0254,
16.0, 0.0000,
17.0, 0.0762,
18.0, 0.0508,
19.0, 0.3302,
20.0, 0.6350,
21.0, 0.0254,
22.0, 0.0254,
23.0, 0.0000,
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11.0, 0.0254,
12.0, 0.0000,
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13.0, 0.0762,
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15.0, 0.0508,
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17.0, 0.0000,
22.0, 0.0254,
23.0, 0.0000,
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 2.0, 0.0762,
 3.0, 0.0000,
 8.0, 0.0254,
 9.0, 0.0000,
11.0, 0.0508,
12.0, 0.0508,
13.0, 0.0508,
14.0, 0.0254,
15.0, 0.0254,
16.0, 0.0000,
17.0, 0.0254,
18.0, 0.0000,
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12.0, 0.0762,
13.0, 0.1016,
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15.0, 0.0254,
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 8.0, 0.0254,
 9.0, 0.0000,
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22.0, 0.1016,
23.0, 0.0508,
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15.0, 0.0254,
16.0, 0.1270,
17.0, 0.1524,
18.0, 0.3302,
19.0, 0.1270,
20.0, 0.3556,
21.0, 0.1778,
22.0, 0.0508,
23.0, 0.0000,
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 2.0, 0.0762,
 3.0, 0.0254,
 4.0, 0.0000,
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 7.0, 0.0000,
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22.0, 0.0508,
23.0, 0.2540,
24.0, 0.0000,
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 2.0, 0.1016,
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 5.0, 0.0254,
 6.0, 0.0508,
 7.0, 0.0254,
 8.0, 0.0000,
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 1.0, 0.0000,
 2.0, 0.0254,
 3.0, 0.0000,
 7.0, 0.0508,
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14.0, 0.0000,
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11.0, 0.0508,
12.0, 0.0762,
13.0, 0.0254,
14.0, 0.0254,
15.0, 0.0000,
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12.0, 0.0000,
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14.0, 0.0000,
 69,   1,   2,1.000,
15.0, 0.0254,
16.0, 0.0000,
 70,   1,   3,1.000,
12.0, 0.0762,
13.0, 0.0508,
14.0, 0.0000,
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14.0, 0.0000,
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21.0, 0.2032,
22.0, 0.2032,
23.0, 0.1016,
24.0, 0.0000,
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 1.0, 0.1016,
 2.0, 0.1270,
 3.0, 0.0762,
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 5.0, 0.0000,
 6.0, 0.0254,
 7.0, 0.0000,
 8.0, 0.0254,
 9.0, 0.0762,
10.0, 0.1270,
11.0, 0.1016,
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15.0, 0.1778,
16.0, 0.0508,
17.0, 0.0000,
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16.0, 0.0508,
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18.0, 0.0000,
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 5.0, 0.0000,
 80,   1,   9,1.000,
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 4.0, 0.0254,
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 3.0, 0.0254,
 4.0, 0.0508,
 5.0, 0.0254,
 6.0, 0.0000,
10.0, 0.0762,
11.0, 0.1270,
12.0, 0.0254,
13.0, 0.0000,
14.0, 0.0254,
15.0, 0.1524,
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17.0, 0.0000,
21.0, 0.0254,
22.0, 0.0508,
23.0, 0.0000,
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 4.0, 0.0000,
 83,   1,  13,1.000,
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10.0, 0.0254,
11.0, 0.0762,
12.0, 0.0762,
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18.0, 0.0254,
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16.0, 0.0254,
17.0, 0.0000,
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17.0, 0.1016,
18.0, 0.0508,
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21.0, 0.0508,
22.0, 0.0254,
23.0, 0.0000,
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 8.0, 0.0254,
 9.0, 0.0762,
10.0, 0.0000,
12.0, 0.0254,
13.0, 0.0508,
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 8.0, 0.0254,
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10.0, 0.1016,
11.0, 0.0254,
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 6.0, 0.0000,
 7.0, 0.0508,
 8.0, 0.1016,
 9.0, 0.0000,
10.0, 0.0508,
11.0, 0.1016,
12.0, 0.1524,
13.0, 0.1524,
14.0, 0.0762,
15.0, 0.0000,
 91,   1,   2,1.000,
18.0, 0.0254,
19.0, 0.0000,
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12.0, 0.3556,
13.0, 0.1016,
14.0, 0.0000,
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15.0, 0.0000,
17.0, 0.0254,
18.0, 0.0254,
19.0, 0.0000,
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 9.0, 0.0000,
101,   1,   7,1.000,
 9.0, 0.1524,
10.0, 0.0762,
11.0, 0.0254,
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13.0, 0.1016,
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15.0, 0.0000,
102,   1,   8,1.000,
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17.0, 0.1016,
18.0, 0.0508,
19.0, 0.1270,
20.0, 0.1270,
21.0, 0.1016,
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23.0, 0.0000,
103,   1,   7,1.000,
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13.0, 0.0000,
15.0, 0.0254,
16.0, 0.1016,
17.0, 0.0000,
19.0, 0.0254,
20.0, 0.0000,
107,   1,   2,1.000,
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19.0, 0.0000,
113,   1,   5,1.000,
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15.0, 0.0000,
21.0, 0.0254,
22.0, 0.0000,
114,   1,   2,1.000,
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115,   1,   2,1.000,
20.0, 0.0762,
21.0, 0.0000,
116,   1,   2,1.000,
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16.0, 0.1016,
17.0, 0.0000,
122,   1,   3,1.000,
19.0, 0.0508,
20.0, 0.1016,
21.0, 0.0000,
123,   1,   9,1.000,
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 3.0, 0.0000,
 4.0, 0.0254,
 5.0, 0.0000,
11.0, 0.0508,
12.0, 0.0508,
13.0, 0.0000,
15.0, 0.0254,
16.0, 0.0000,
124,   1,   4,1.000,
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22.0, 0.1778,
23.0, 0.2032,
24.0, 0.0000,
125,   1,  10,1.000,
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 1.0, 0.0000,
 3.0, 0.2794,
 4.0, 0.1016,
 5.0, 0.0762,
 6.0, 0.0000,
12.0, 0.0508,
13.0, 0.0508,
14.0, 0.3556,
15.0, 0.0000,
126,   1,   6,1.000,
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13.0, 0.0000,
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17.0, 0.1778,
18.0, 0.0508,
19.0, 0.0000,
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13.0, 0.0254,
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131,   1,   8,1.000,
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 3.0, 0.0254,
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11.0, 0.0000,
132,   1,   4,1.000,
15.0, 0.0254,
16.0, 0.0000,
20.0, 0.0508,
21.0, 0.0000,
133,   1,   3,1.000,
22.0, 0.1016,
23.0, 0.2032,
24.0, 0.0000,
134,   1,  15,1.000,
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 2.0, 0.2540,
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 4.0, 0.1524,
 5.0, 0.0508,
 6.0, 0.2032,
 7.0, 0.0508,
 8.0, 0.0000,
10.0, 0.0254,
11.0, 0.0254,
12.0, 0.0000,
15.0, 0.0254,
16.0, 0.0254,
17.0, 0.0000,
156,   1,   2,1.000,
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19.0, 0.0000,
159,   1,   5,1.000,
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10.0, 0.5334,
11.0, 0.0254,
12.0, 0.1016,
13.0, 0.0000,
160,   1,   2,1.000,
13.0, 0.0254,
14.0, 0.0000,
165,   1,   2,1.000,
 8.0, 0.0254,
 9.0, 0.0000,
166,   1,   4,1.000,
18.0, 0.1778,
19.0, 0.0000,
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13.0, 0.0000,
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16.0, 0.0000,
23.0, 0.0508,
24.0, 0.0000,
171,   1,   3,1.000,
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 2.0, 0.0000,
172,   1,   6,1.000,
17.0, 0.0254,
18.0, 0.0762,
19.0, 0.0254,
20.0, 0.0000,
22.0, 0.0254,
23.0, 0.0000,
173,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0000,
175,   1,   2,1.000,
23.0, 0.0508,
24.0, 0.0000,
186,   1,   2,1.000,
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22.0, 0.0000,
187,   1,   3,1.000,
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 8.0, 0.1016,
 9.0, 0.0000,
189,   1,   2,1.000,
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 6.0, 0.0000,
193,   1,   3,1.000,
22.0, 0.0254,
23.0, 0.0254,
24.0, 0.0000,
194,   1,  18,1.000,
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 3.0, 0.0508,
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 9.0, 0.0762,
10.0, 0.2032,
11.0, 0.1524,
12.0, 0.1016,
13.0, 0.0000,
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16.0, 0.0000,
19.0, 0.0762,
20.0, 0.1016,
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12.0, 0.0000,
207,   1,   5,1.000,
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 5.0, 0.0254,
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209,   1,   6,1.000,
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 4.0, 0.0508,
 5.0, 0.0000,
218,   1,   2,1.000,
22.0, 0.1016,
23.0, 0.0000,
219,   1,   5,1.000,
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 6.0, 0.0000,
10.0, 0.0254,
11.0, 0.0000,
224,   1,  11,1.000,
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 8.0, 0.3048,
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10.0, 0.1524,
11.0, 0.0000,
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13.0, 0.0000,
20.0, 0.0254,
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23.0, 0.0000,
225,   1,   4,1.000,
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16.0, 0.0508,
17.0, 0.0000,
226,   1,   7,1.000,
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15.0, 0.0000,
16.0, 0.0254,
17.0, 0.0508,
18.0, 0.1524,
19.0, 0.0762,
20.0, 0.0000,
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 4.0, 0.0000,
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17.0, 0.0000,
19.0, 0.0254,
20.0, 0.0762,
21.0, 0.0000,
23.0, 0.0254,
24.0, 0.0000,
228,   1,   6,1.000,
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 2.0, 0.0508,
 3.0, 0.1270,
 4.0, 0.0254,
 5.0, 0.0000,
233,   1,   2,1.000,
 3.0, 0.1016,
 4.0, 0.0000,
241,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
249,   1,   8,1.000,
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 7.0, 0.2032,
 8.0, 0.0762,
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15.0, 0.0000,
18.0, 0.0254,
19.0, 0.0000,
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17.0, 0.0762,
18.0, 0.0000,
260,   1,   4,1.000,
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 9.0, 0.0254,
10.0, 0.0254,
11.0, 0.0000,
262,   1,   2,1.000,
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22.0, 0.0000,
275,   1,  12,1.000,
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11.0, 0.1270,
12.0, 0.1270,
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19.0, 0.4064,
20.0, 0.0254,
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23.0, 0.0000,
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19.0, 0.0762,
20.0, 0.0508,
21.0, 0.0000,
22.0, 0.0254,
23.0, 0.0762,
287,   1,  17,1.000,
 0.0, 0.1016,
 1.0, 0.1524,
 2.0, 0.2286,
 3.0, 0.1778,
 4.0, 0.1778,
 5.0, 0.0000,
 7.0, 0.0254,
 8.0, 0.0508,
 9.0, 0.0508,
10.0, 0.1270,
11.0, 0.1524,
12.0, 0.1778,
13.0, 0.1778,
14.0, 0.0000,
17.0, 0.0508,
18.0, 0.0508,
19.0, 0.0000,
290,   1,   4,1.000,
19.0, 0.1270,
20.0, 0.1524,
21.0, 0.2286,
22.0, 0.0000,
292,   1,   2,1.000,
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 4.0, 0.0000,
293,   1,   2,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
294,   1,   7,1.000,
15.0, 0.0254,
16.0, 0.0000,
18.0, 0.0254,
19.0, 0.1524,
20.0, 0.0508,
21.0, 0.0254,
22.0, 0.0000,
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12.0, 0.3556,
13.0, 0.4064,
14.0, 0.2032,
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18.0, 0.0254,
19.0, 0.0000,
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297,   1,   2,1.000,
 0.0, 0.0254,
 1.0, 0.0000,
298,   1,   3,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
23.0, 0.0254,
299,   1,  17,1.000,
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 1.0, 0.1016,
 2.0, 0.1016,
 3.0, 0.0508,
 4.0, 0.0254,
 5.0, 0.0000,
 6.0, 0.2286,
 7.0, 0.1524,
 8.0, 0.2286,
 9.0, 0.1778,
10.0, 0.2032,
11.0, 0.1524,
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14.0, 0.4572,
15.0, 0.2286,
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302,   1,   9,1.000,
 9.0, 0.0254,
10.0, 0.1016,
11.0, 0.0254,
12.0, 0.0000,
19.0, 0.0762,
20.0, 0.0000,
22.0, 0.0508,
23.0, 0.0254,
24.0, 0.0000,
303,   1,   2,1.000,
 1.0, 0.0254,
 2.0, 0.0000,
304,   1,   6,1.000,
 0.0, 0.0508,
 1.0, 0.0000,
 2.0, 0.0254,
 3.0, 0.0508,
 4.0, 0.0254,
 5.0, 0.0000,
307,   1,   2,1.000,
 8.0, 0.0254,
 9.0, 0.0000,
```

```
309,   1,   4,1.000,
20.0, 0.0508,
21.0, 0.0254,
22.0, 0.0508,
23.0, 0.1270,
310,   1,   6,1.000,
 0.0, 0.0508,
 1.0, 0.0254,
 2.0, 0.0508,
 3.0, 0.2540,
 4.0, 0.0508,
 5.0, 0.0000,
311,   1,   5,1.000,
 5.0, 0.0254,
 6.0, 0.0254,
 7.0, 0.0000,
23.0, 0.0254,
24.0, 0.0000,
312,   1,   6,1.000,
13.0, 0.1270,
14.0, 0.0508,
15.0, 0.0254,
16.0, 0.0254,
17.0, 0.0254,
18.0, 0.0000,
313,   1,   3,1.000,
22.0, 0.0254,
23.0, 0.0254,
24.0, 0.0000,
314,   1,   4,1.000,
 3.0, 0.0762,
 4.0, 0.1778,
 5.0, 0.0254,
 6.0, 0.0000,
316,   1,   2,1.000,
 8.0, 0.0254,
 9.0, 0.0000,
318,   1,   6,1.000,
10.0, 0.0254,
11.0, 0.0762,
12.0, 0.0000,
13.0, 0.0254,
14.0, 0.0254,
15.0, 0.0000,
319,   1,   6,1.000,
 9.0, 0.0254,
10.0, 0.0000,
12.0, 0.0254,
13.0, 0.0000,
15.0, 0.0254,
16.0, 0.0000,
320,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0000,
```

```
321,   1,   3,1.000,
13.0, 0.0508,
14.0, 0.0508,
15.0, 0.0000,
323,   1,  10,1.000,
12.0, 0.0508,
13.0, 0.0508,
14.0, 0.0508,
15.0, 0.0508,
16.0, 0.0508,
17.0, 0.0508,
18.0, 0.0508,
19.0, 0.0508,
20.0, 0.0508,
21.0, 0.0000,
324,  1,   7,1.000,
 5.0, 0.0762,
 6.0, 0.0508,
 7.0, 0.0000,
 8.0, 0.0508,
 9.0, 0.0762,
10.0, 0.0254,
11.0, 0.0000,
326,  1,  13,1.000,
11.0, 0.1778,
12.0, 0.2794,
13.0, 0.2032,
14.0, 0.1270,
15.0, 0.0762,
16.0, 0.0254,
17.0, 0.0000,
18.0, 0.0508,
19.0, 0.0000,
21.0, 0.0254,
22.0, 0.0000,
23.0, 0.0254,
24.0, 0.0000,
327,  1,   2,1.000,
 9.0, 0.0254,
10.0, 0.0000,
328,  1,   4,1.000,
 3.0, 0.0254,
 4.0, 0.0508,
 5.0, 0.0508,
 6.0, 0.0000,
330,  1,   9,1.000,
 2.0, 0.0254,
 3.0, 0.0000,
15.0, 0.0254,
16.0, 0.1270,
17.0, 0.2286,
18.0, 0.0254,
19.0, 0.0254,
20.0, 0.0000,
```

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23.0, 0.0508,
331,   1,  11,1.000,
 0.0, 0.0508,
 1.0, 0.1270,
 2.0, 0.1270,
 3.0, 0.2286,
 4.0, 0.0762,
 5.0, 0.1016,
 6.0, 0.1524,
 7.0, 0.0508,
 8.0, 0.0000,
 9.0, 0.0254,
10.0, 0.0000,
334,   1,   2,1.000,
 3.0, 0.0254,
 4.0, 0.0000,
339,   1,   2,1.000,
19.0, 0.0254,
20.0, 0.0000,
348,   1,   4,1.000,
11.0, 0.0508,
12.0, 0.0254,
13.0, 0.0254,
14.0, 0.0000,
350,   1,  17,1.000,
 3.0, 0.0254,
 4.0, 0.7874,
 5.0, 0.2032,
 6.0, 0.2032,
 7.0, 0.1524,
 8.0, 0.1778,
 9.0, 0.2032,
10.0, 0.2794,
11.0, 0.1524,
12.0, 0.0254,
13.0, 0.0000,
18.0, 0.1016,
19.0, 0.0762,
20.0, 0.1016,
21.0, 0.0254,
22.0, 0.0254,
23.0, 0.0000,
351,   1,   9,1.000,
 0.0, 0.2286,
 1.0, 0.1778,
 2.0, 0.1270,
 3.0, 0.0762,
 4.0, 0.0508,
 5.0, 0.0508,
 6.0, 0.0000,
 7.0, 0.0254,
 8.0, 0.0000,
353,   1,  12,1.000,
 8.0, 0.0508,
```

```
 9.0, 0.0762,
10.0, 0.1270,
11.0, 0.1778,
12.0, 0.0254,
13.0, 0.0000,
14.0, 0.1270,
15.0, 0.0762,
16.0, 0.0508,
17.0, 0.0000,
18.0, 0.1778,
19.0, 0.0000,
354,   1,  14,1.000,
 0.0, 0.1778,
 1.0, 0.1016,
 2.0, 0.0508,
 3.0, 0.0254,
 4.0, 0.0000,
11.0, 0.0254,
12.0, 0.0000,
15.0, 0.0254,
16.0, 0.0762,
17.0, 0.0508,
18.0, 0.0254,
19.0, 0.0000,
22.0, 0.0762,
23.0, 0.0000,
355,   1,  22,1.000,
 0.0, 0.1524,
 1.0, 0.0254,
 2.0, 0.1016,
 3.0, 0.1270,
 4.0, 0.0000,
 7.0, 0.0254,
 8.0, 0.0000,
 9.0, 0.0762,
10.0, 0.0762,
11.0, 0.1270,
12.0, 0.1270,
13.0, 0.0254,
14.0, 0.0000,
15.0, 0.0508,
16.0, 0.2032,
17.0, 0.1016,
18.0, 0.0508,
19.0, 0.0000,
20.0, 0.1016,
21.0, 0.0508,
22.0, 0.0000,
23.0, 0.0254,
356,   1,   5,1.000,
 0.0, 0.0254,
 1.0, 0.0000,
11.0, 0.0762,
12.0, 0.0254,
```

```
 13.0, 0.0000,
 365,   1,   6,1.000,
 11.0, 0.1016,
 12.0, 0.1016,
 13.0, 0.0508,
 14.0, 0.0000,
 23.0, 0.0254,
 24.0, 0.0000,
```

***USFS, van Genuchten, 2010***

```
Spokane Valley Rathdrum Prairie USFS Simulation: VGUSFS2010.inp
0, 1,                          IPLANT, NGRAV
62, 1, 62,                     IFDEND, IDTBEG, IDTEND
2010, 1, 0, 0, 0,              IYS, NYEARS, ISTEAD, IFLIST, NFLIST
1, 24.0,                       NPRINT, STOPHR
0, 3, 1, 1.0E-4,               ISMETH, INMAX, ISWDIF, DMAXBA
1.0, 1.0E-5, 1.0,              DELMAX, DELMIN, OUTTIM
2.0, 1.0E-05, 0.0, 0.0, 0.0,   RFACT, RAINIF, DHTOL, DHMAX, DHFACT
4, 3, 0,                       KOPT, KEST, WTF
0, 1, 2, 2,                    ITOPBC, IEVOPT, NFHOUR, LOWER
0.0, 2.0E+04, 20.73, 0.0,      HIRRI, HDRY, HTOP, RHA
0, 0, 0,                       IETOPT, ICLOUD, ISHOPT
0, 0,                          IRAIN, HPR
0, 0, 0, 0, 0,                 IHYS, AIRTOL, HYSTOL, HYSMXH, HYFILE
0, 0, 0,                       IHEAT, ICONVH, DMAXHE
0, 0, 0, 0,                    UPPERH, TSMEAN, TSAMP, QHCTOP
0, 0.0, 0.0,                   LOWERH, QHLEAK, TGRAD
0, 0.66, 288.46, 0.24,         IVAPOR, TORT, TSOIL, VAPDIF
3, 126,                        MATN, NPT
1,    0.00,  1,    1.00,  1,    2.00,  1,    3.00,
1,    4.00,  1,    5.00,  1,    6.00,  1,    7.00,
1,    8.00,  1,    9.00,  1,   10.00,  1,   11.00,
1,   12.00,  1,   13.00,  1,   14.00,  1,   15.00,
1,   16.00,  1,   17.00,  1,   18.00,  1,   19.00,
1,   20.00,  2,   21.00,  2,   22.00,  2,   23.00,
2,   24.00,  2,   25.00,  2,   26.00,  2,   27.00,
2,   28.00,  2,   29.00,  2,   30.00,  2,   31.00,
2,   32.00,  2,   33.00,  2,   34.00,  2,   35.00,
2,   36.00,  2,   37.00,  2,   38.00,  2,   39.00,
2,   40.00,  2,   41.00,  2,   42.00,  2,   43.00,
2,   44.00,  2,   45.00,  2,   46.00,  2,   47.00,
2,   48.00,  2,   49.00,  2,   50.00,  2,   51.00,
2,   52.00,  2,   53.00,  2,   54.00,  2,   55.00,
2,   56.00,  2,   57.00,  2,   58.00,  2,   59.00,
2,   60.00,  2,   61.00,  2,   62.00,  2,   63.00,
2,   64.00,  2,   65.00,  3,   66.00,  3,   67.00
3,   68.00,  3,   69.00,  3,   70.00,  3,   71.00,
3,   72.00,  3,   73.00,  3,   74.00,  3,   75.00,
3,   76.00,  3,   77.00,  3,   78.00,  3,   79.00,
3,   80.00,  3,   81.00,  3,   82.00,  3,   83.00,
3,   84.00,  3,   85.00,  3,   86.00,  3,   87.00,
3,   88.00,  3,   89.00,  3,   90.00,  3,   91.00,
```

```
3,   92.00,  3,   93.00,  3,   94.00,  3,   95.00,
3,   96.00,  3,   97.00,  3,   98.00,  3,   99.00,
3,  100.00,  3,  101.00,  3,  102.00,  3,  103.00,
3,  104.00,  3,  105.00,  3,  106.00,  3,  107.00,
3,  108.00,  3,  109.00,  3,  110.00,  3,  111.00,
3,  112.00,  3,  113.00,  3,  114.00,  3,  115.00,
3,  116.00,  3,  117.00,  3,  118.00,  3,  119.00,
3,  120.00,  3,  121.00,  3,  122.00,  3,  123.00,
3,  124.00,  3,  125.00,
Loamy Sand Layer #1: 0-20 cm (van Genuchten et al.)   Retention
0.39, 0.048, 0.028, 1.51,                             THET, THTR, A, N
Loamy Sand Layer #1: 0-20 cm (van Genuchten et al.)   Hydraulic
Conductivity
2.0, 34.2, 0.028, 1.51, -0.5,                   RKMODEL, SK, A, N, EPIT
Sand Layer #2: 21-65 cm (van Genuchten et al.)        Retention
0.27, 0.025, 0.036, 1.46,                             THET, THTR, A, N
Sand Layer #2: 21-65 cm (van Genuchten et al.)        Hydraulic
Conductivity
2.0, 10.18, 0.036, 1.46, 0.5,                         RKMODEL, SK, A,
N, EPIT
Sand Layer #3: 66-125 cm (van Genuchten et al.)       Retention
0.13, 0.010, 0.045, 2.68,                             THET, THTR, A, N
Sand Layer #3: 66-125 cm (van Genuchten et al.)       Hydraulic
Conductivity
2.0, 16.18, 0.045, 2.68, 0.5,                   RKMODEL, SK, A, N, EPIT
0,    NDAY
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
20.0,20.0,20.0,20.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
```

```
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,10.0,10.0,
10.0,10.0,
0.0400, 0.0352, 0.0205, 0.0113, 0.0333, 0.1071, 0.0462, 0.0235,
0.0216, 0.0209, 0.0209, 0.0121, 0.0142, 0.0120, 0.0051, 0.0088,
0.0331, 0.0166, 0.0100, 0.0133, 0.0150, 0.0263, 0.0291, 0.0150,
0.0345, 0.0422, 0.0335, 0.0160, 0.0146, 0.0098, 0.0105, 0.0219
0.0260, 0.0242, 0.0163, 0.0202, 0.0605, 0.0433, 0.0361, 0.0096,
0.0171, 0.0201, 0.0215, 0.0210, 0.0398, 0.0705, 0.0273, 0.0352,
0.0832, 0.0573, 0.0975, 0.1213, 0.0734, 0.0313, 0.0381, 0.0267,
0.0342, 0.0294, 0.0294, 0.0362, 0.0364, 0.0325,
 27,        NWATER      (rain data 2010)
   5,   1,   2,1.000,
 19.0, 0.0254,
 20.0, 0.0000,
  14,   1,   4,1.000,
 11.0, 0.0508,
 12.0, 0.0254,
 13.0, 0.0254,
 14.0, 0.0000,
  16,   1,  17,1.000,
  3.0, 0.0254,
  4.0, 0.7874,
  5.0, 0.2032,
  6.0, 0.2032,
  7.0, 0.1524,
  8.0, 0.1778,
  9.0, 0.2032,
 10.0, 0.2794,
 11.0, 0.1524,
 12.0, 0.0254,
 13.0, 0.0000,
 18.0, 0.1016,
 19.0, 0.0762,
 20.0, 0.1016,
 21.0, 0.0254,
 22.0, 0.0254,
 23.0, 0.0000,
  17,   1,   9,1.000,
  0.0, 0.2286,
  1.0, 0.1778,
  2.0, 0.1270,
  3.0, 0.0762,
  4.0, 0.0508,
  5.0, 0.0508,
  6.0, 0.0000,
  7.0, 0.0254,
  8.0, 0.0000,
  19,   1,  12,1.000,
  8.0, 0.0508,
  9.0, 0.0762,
 10.0, 0.1270,
 11.0, 0.1778,
```

```
12.0, 0.0254,
13.0, 0.0000,
14.0, 0.1270,
15.0, 0.0762,
16.0, 0.0508,
17.0, 0.0000,
18.0, 0.1778,
19.0, 0.0000,
 20,   1,  14,1.000,
 0.0, 0.1778,
 1.0, 0.1016,
 2.0, 0.0508,
 3.0, 0.0254,
 4.0, 0.0000,
11.0, 0.0254,
12.0, 0.0000,
15.0, 0.0254,
16.0, 0.0762,
17.0, 0.0508,
18.0, 0.0254,
19.0, 0.0000,
22.0, 0.0762,
23.0, 0.0000,
 21,   1,  22,1.000,
 0.0, 0.1524,
 1.0, 0.0254,
 2.0, 0.1016,
 3.0, 0.1270,
 4.0, 0.0000,
 7.0, 0.0254,
 8.0, 0.0000,
 9.0, 0.0762,
10.0, 0.0762,
11.0, 0.1270,
12.0, 0.1270,
13.0, 0.0254,
14.0, 0.0000,
15.0, 0.0508,
16.0, 0.2032,
17.0, 0.1016,
18.0, 0.0508,
19.0, 0.0000,
20.0, 0.1016,
21.0, 0.0508,
22.0, 0.0000,
23.0, 0.0254,
 22,   1,   5,1.000,
 0.0, 0.0254,
 1.0, 0.0000,
11.0, 0.0762,
12.0, 0.0254,
13.0, 0.0000,
 31,   1,   6,1.000,
11.0, 0.1016,
```

```
12.0, 0.1016,
13.0, 0.0508,
14.0, 0.0000,
23.0, 0.0254,
24.0, 0.0000,
 32,   1,  19,1.000,
 0.0, 0.0254,
 1.0, 0.0762,
 2.0, 0.0508,
 3.0, 0.0762,
 4.0, 0.0254,
 5.0, 0.0508,
 6.0, 0.0254,
 7.0, 0.0254,
 8.0, 0.0508,
 9.0, 0.0000,
12.0, 0.1016,
13.0, 0.1016,
14.0, 0.0000,
15.0, 0.1270,
16.0, 0.0762,
17.0, 0.0000,
20.0, 0.1524,
21.0, 0.0508,
22.0, 0.0000,
 33,   1,   6,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
12.0, 0.0254,
13.0, 0.0254,
14.0, 0.0254,
15.0, 0.0000,
 35,   1,  18,1.000,
 4.0, 0.0254,
 5.0, 0.0254,
 6.0, 0.0254,
 7.0, 0.0000,
 8.0, 0.0254,
 9.0, 0.0000,
12.0, 0.1016,
13.0, 0.1016,
14.0, 0.1524,
15.0, 0.0762,
16.0, 0.0508,
17.0, 0.0254,
18.0, 0.1016,
19.0, 0.0508,
20.0, 0.0000,
21.0, 0.0508,
22.0, 0.1016,
23.0, 0.0762,
 36,   1,  15,1.000,
 0.0, 0.0762,
 1.0, 0.0762,
```

```
 2.0, 0.0254,
 3.0, 0.0508,
 4.0, 0.0508,
 5.0, 0.0508,
 6.0, 0.0508,
 7.0, 0.0000,
 8.0, 0.0508,
 9.0, 0.0508,
10.0, 0.0254,
11.0, 0.0254,
12.0, 0.0000,
13.0, 0.0254,
14.0, 0.0000,
 40,   1,   2,1.000,
13.0, 0.0254,
14.0, 0.0000,
 41,   1,   4,1.000,
10.0, 0.0508,
11.0, 0.0508,
12.0, 0.0254,
13.0, 0.0000,
 42,   1,   2,1.000,
 9.0, 0.0254,
10.0, 0.0000,
 43,   1,   9,1.000,
 8.0, 0.0254,
 9.0, 0.0000,
11.0, 0.0254,
12.0, 0.0000,
17.0, 0.0254,
18.0, 0.0000,
20.0, 0.2540,
21.0, 0.1016,
22.0, 0.0000,
 44,   1,   7,1.000,
 7.0, 0.0254,
 8.0, 0.0000,
15.0, 0.0254,
16.0, 0.1016,
17.0, 0.1016,
18.0, 0.0000,
23.0, 0.0254,
 45,   1,   5,1.000,
 0.0, 0.0254,
 1.0, 0.0508,
 2.0, 0.0254,
 3.0, 0.0254,
 4.0, 0.0000,
 46,   1,   5,1.000,
17.0, 0.0254,
18.0, 0.0000,
21.0, 0.0508,
22.0, 0.1016,
23.0, 0.2794,
```

```
 47,   1,  20,1.000,
 0.0, 0.1778,
 1.0, 0.1524,
 2.0, 0.2286,
 3.0, 0.1778,
 4.0, 0.1016,
 5.0, 0.0762,
 6.0, 0.1524,
 7.0, 0.1016,
 8.0, 0.1016,
 9.0, 0.0000,
10.0, 0.0254,
11.0, 0.0000,
12.0, 0.0254,
13.0, 0.0000,
14.0, 0.0254,
15.0, 0.0000,
17.0, 0.0254,
18.0, 0.0000,
19.0, 0.0254,
20.0, 0.0000,
 48,   1,   7,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
13.0, 0.0254,
14.0, 0.0000,
21.0, 0.0254,
22.0, 0.0000,
23.0, 0.0508,
 49,   1,   6,1.000,
 0.0, 0.0254,
 1.0, 0.0000,
 2.0, 0.0254,
 3.0, 0.0000,
 4.0, 0.0254,
 5.0, 0.0000,
 50,   1,   2,1.000,
 7.0, 0.0254,
 8.0, 0.0000,
 56,   1,   7,1.000,
10.0, 0.0508,
11.0, 0.0508,
12.0, 0.0508,
13.0, 0.0000,
14.0, 0.0254,
15.0, 0.0254,
16.0, 0.0000,
 58,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
 62,   1,  15,1.000,
 1.0, 0.0254,
 2.0, 0.0000,
 3.0, 0.0254,
```

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  4.0, 0.0000,
  7.0, 0.0254,
  8.0, 0.0254,
  9.0, 0.1778,
 10.0, 0.1016,
 11.0, 0.0762,
 12.0, 0.0508,
 13.0, 0.0508,
 14.0, 0.0254,
 15.0, 0.0000,
 16.0, 0.0254,
 17.0, 0.0000,
```

***USFS, Brooks-Corey, 2009***

```
Spokane Valley Rathdrum Prairie USFS Simulation: BCUSFS2009.inp
0, 1,                           IPLANT, NGRAV
365, 1, 365,                    IFDEND, IDTBEG, IDTEND
2009, 1, 0, 0, 0,               IYS, NYEARS, ISTEAD, IFLIST, NFLIST
1, 24.0,                        NPRINT, STOPHR
0, 3, 1, 1.0E-4,                ISMETH, INMAX, ISWDIF, DMAXBA
1.0, 1.0E-5, 1.0,               DELMAX, DELMIN, OUTTIM
2.0, 1.0E-05, 0.0, 0.0, 0.0,    RFACT, RAINIF, DHTOL, DHMAX, DHFACT
3, 3, 0,                        KOPT, KEST, WTF
0, 1, 2, 2,                     ITOPBC, IEVOPT, NFHOUR, LOWER
0.0, 2.0E+04, 20.73, 0.0,       HIRRI, HDRY, HTOP, RHA
0, 0, 0,                        IETOPT, ICLOUD, ISHOPT
0, 0,                           IRAIN, HPR
0, 0, 0, 0, 0,                  IHYS, AIRTOL, HYSTOL, HYSMXH, HYFILE
0, 0, 0,                        IHEAT, ICONVH, DMAXHE
0, 0, 0, 0,                     UPPERH, TSMEAN, TSAMP, QHCTOP
0, 0.0, 0.0,                    LOWERH, QHLEAK, TGRAD
0, 0.66, 288.46, 0.24,          IVAPOR, TORT, TSOIL, VAPDIF
3, 126,                         MATN, NPT
1,    0.00,  1,    1.00,  1,    2.00,  1,    3.00,
1,    4.00,  1,    5.00,  1,    6.00,  1,    7.00,
1,    8.00,  1,    9.00,  1,   10.00,  1,   11.00,
1,   12.00,  1,   13.00,  1,   14.00,  1,   15.00,
1,   16.00,  1,   17.00,  1,   18.00,  1,   19.00,
1,   20.00,  2,   21.00,  2,   22.00,  2,   23.00,
2,   24.00,  2,   25.00,  2,   26.00,  2,   27.00,
2,   28.00,  2,   29.00,  2,   30.00,  2,   31.00,
2,   32.00,  2,   33.00,  2,   34.00,  2,   35.00,
2,   36.00,  2,   37.00,  2,   38.00,  2,   39.00,
2,   40.00,  2,   41.00,  2,   42.00,  2,   43.00,
2,   44.00,  2,   45.00,  2,   46.00,  2,   47.00,
2,   48.00,  2,   49.00,  2,   50.00,  2,   51.00,
2,   52.00,  2,   53.00,  2,   54.00,  2,   55.00,
2,   56.00,  2,   57.00,  2,   58.00,  2,   59.00,
2,   60.00,  2,   61.00,  2,   62.00,  2,   63.00,
2,   64.00,  2,   65.00,  3,   66.00,  3,   67.00
3,   68.00,  3,   69.00,  3,   70.00,  3,   71.00,
3,   72.00,  3,   73.00,  3,   74.00,  3,   75.00,
```

```
3,   76.00,  3,   77.00,  3,   78.00,  3,   79.00,
3,   80.00,  3,   81.00,  3,   82.00,  3,   83.00,
3,   84.00,  3,   85.00,  3,   86.00,  3,   87.00,
3,   88.00,  3,   89.00,  3,   90.00,  3,   91.00,
3,   92.00,  3,   93.00,  3,   94.00,  3,   95.00,
3,   96.00,  3,   97.00,  3,   98.00,  3,   99.00,
3,  100.00,  3,  101.00,  3,  102.00,  3,  103.00,
3,  104.00,  3,  105.00,  3,  106.00,  3,  107.00,
3,  108.00,  3,  109.00,  3,  110.00,  3,  111.00,
3,  112.00,  3,  113.00,  3,  114.00,  3,  115.00,
3,  116.00,  3,  117.00,  3,  118.00,  3,  119.00,
3,  120.00,  3,  121.00,  3,  122.00,  3,  123.00,
3,  124.00,  3,  125.00,
Sand Layer #1: 0-20 cm (Brooks-Corey et al.)          Retention
0.39, 0.048, 27.114, 1.9933,                          THET, THTR,
AIRENT, B
Sand Layer #1: 0-20 cm (Brooks-Corey et al.)          Hydraulic
Conductivity
2.0, 34.2, 27.114, 1.9933, -0.5,                      RKMOD, SK,
AIRENK, B, EPIT
Sand Layer #2: 0-20 cm (Brooks-Corey et al.)          Retention
0.27, 0.025, 27.114, 1.7933,                          THET, THTR,
AIRENT, B
Sand Layer #2: 0-20 cm (Brooks-Corey et al.)          Hydraulic
Conductivity
2.0, 10.18, 27.114, 1.7933, 0.5,                            RKMOD, SK,
AIRENK, B, EPIT
Sand Layer #3: 0-20 cm (Brooks-Corey et al.)          Retention
0.13, 0.010, 17.105, 1.8113,                          THET, THTR,
AIRENT, B
Sand Layer #3: 0-20 cm (Brooks-Corey et al.)          Hydraulic
Conductivity
2.0, 16.18, 17.105, 1.8113, 0.5,                      RKMOD, SK,
AIRENK, B, EPIT
0,    NDAY
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
```

```
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0,
0.0301, 0.0221, 0.0073, 0.0114, 0.0116, 0.0167, 0.0497, 0.1163,
0.0438, 0.0535, 0.0393, 0.0311, 0.0290, 0.0212, 0.0188, 0.0196,
0.0345, 0.0381, 0.0426, 0.0665, 0.0514, 0.0354, 0.0196, 0.0257,
0.0337, 0.0222, 0.0216, 0.0393, 0.0432, 0.0220, 0.0306, 0.0137,
0.0363, 0.0455, 0.0488, 0.0301, 0.0410, 0.0486, 0.0371, 0.0322,
0.0442, 0.0356, 0.0443, 0.0832, 0.0542, 0.0420, 0.0522, 0.0492,
0.0517, 0.0575, 0.0483, 0.0609, 0.0534, 0.0628, 0.1077, 0.0850,
0.0701, 0.0709, 0.0647, 0.0804, 0.0793, 0.0972, 0.1076, 0.0822,
0.0977, 0.1148, 0.0881, 0.0767, 0.0892, 0.0656, 0.0722, 0.0981,
0.1047, 0.1445, 0.1505, 0.1235, 0.1177, 0.1216, 0.1678, 0.1478,
0.1237, 0.1419, 0.1206, 0.1592, 0.1450, 0.1914, 0.1634, 0.1269,
0.1582, 0.1339, 0.1297, 0.1396, 0.1408, 0.1763, 0.1967, 0.2513,
0.2976, 0.2457, 0.2315, 0.2360, 0.1778, 0.2027, 0.2011, 0.2036,
0.2537, 0.2443, 0.2394, 0.2579, 0.3033, 0.3720, 0.4356, 0.4090,
0.2592, 0.2580, 0.2724, 0.2406, 0.2539, 0.3034, 0.3151, 0.2864,
0.3066, 0.3611, 0.2573, 0.3131, 0.3497, 0.2671, 0.2782, 0.3035,
0.3104, 0.3130, 0.3607, 0.3244, 0.3012, 0.3181, 0.3290, 0.3535,
0.4200, 0.5139, 0.4697, 0.3669, 0.3541, 0.4123, 0.4048, 0.4435,
0.4737, 0.4966, 0.4593, 0.4773, 0.5808, 0.8175, 0.5402, 0.5866,
0.5484, 0.5044, 0.5108, 0.5118, 0.4237, 0.4191, 0.3461, 0.3542,
0.4416, 0.4536, 0.4905, 0.5157, 0.4672, 0.4687, 0.4745, 0.4428,
0.4407, 0.3740, 0.4266, 0.3652, 0.3766, 0.4341, 0.5353, 0.5375,
0.4841, 0.5057, 0.5843, 0.5331, 0.5310, 0.5103, 0.5388, 0.5256,
0.6379, 0.6406, 0.5514, 0.5164, 0.4504, 0.4543, 0.4911, 0.5411,
0.5679, 0.3944, 0.4581, 0.4782, 0.5558, 0.5524, 0.6380, 0.5681,
0.4788, 0.5956, 0.6306, 0.5585, 0.5192, 0.5420, 0.4990, 0.5243,
0.5364, 0.5127, 0.4783, 0.5182, 0.6292, 0.5284, 0.6425, 0.6290,
0.5264, 0.4745, 0.3839, 0.3619, 0.4363, 0.5551, 0.5405, 0.3907,
0.3917, 0.3409, 0.3266, 0.3463, 0.3694, 0.4752, 0.4493, 0.4066,
0.5114, 0.4323, 0.4428, 0.4019, 0.4333, 0.4236, 0.4234, 0.4503,
0.3438, 0.3695, 0.3948, 0.3837, 0.3972, 0.4120, 0.3146, 0.3452,
0.2985, 0.2683, 0.2721, 0.2499, 0.2938, 0.3249, 0.2971, 0.2735,
0.3530, 0.2856, 0.2800, 0.2600, 0.2477, 0.2879, 0.2839, 0.2273,
0.2089, 0.2158, 0.2674, 0.2905, 0.3800, 0.1935, 0.2555, 0.2298,
0.1805, 0.1799, 0.1301, 0.1508, 0.2998, 0.1690, 0.1957, 0.1522,
0.1234, 0.1634, 0.1119, 0.1157, 0.0935, 0.1463, 0.0867, 0.0956,
0.1093, 0.1092, 0.1000, 0.0943, 0.0736, 0.0719, 0.0779, 0.0788,
0.1059, 0.0670, 0.0760, 0.0734, 0.0574, 0.0414, 0.0562, 0.1269,
0.0801, 0.0525, 0.0469, 0.0596, 0.0463, 0.1149, 0.1234, 0.0480,
0.0445, 0.0749, 0.0456, 0.0302, 0.0423, 0.0310, 0.0271, 0.0830,
0.1340, 0.0700, 0.0264, 0.0402, 0.0645, 0.0284, 0.0449, 0.0220,
```

```
0.0322, 0.0248, 0.0209, 0.0254, 0.0307, 0.0431, 0.0400, 0.0352,
0.0205, 0.0113, 0.0333, 0.1071, 0.0462, 0.0235, 0.0216, 0.0209,
0.0209, 0.0121, 0.0142, 0.0120, 0.0051, 0.0088, 0.0331, 0.0166,
0.0100, 0.0133, 0.0150, 0.0263, 0.0291, 0.0150, 0.0345, 0.0422,
0.0335, 0.0160, 0.0146, 0.0098, 0.0105,
 153,       NWATER      (rain data 2009)
   1,   1,  17,1.000,
  3.0, 0.0254,
  4.0, 0.0000,
  5.0, 0.0254,
  6.0, 0.0254,
  7.0, 0.0762,
  8.0, 0.0762,
  9.0, 0.0762,
 10.0, 0.0762,
 11.0, 0.0254,
 12.0, 0.0508,
 13.0, 0.0508,
 14.0, 0.0508,
 15.0, 0.0508,
 16.0, 0.0254,
 17.0, 0.0000,
 18.0, 0.0254,
 19.0, 0.0000,
   2,   1,  11,1.000,
  0.0, 0.0508,
  1.0, 0.0762,
  2.0, 0.0762,
  3.0, 0.0000,
  4.0, 0.0762,
  5.0, 0.1270,
  6.0, 0.1016,
  7.0, 0.0508,
  8.0, 0.0000,
  9.0, 0.0254,
 10.0, 0.0000,
   4,   1,   5,1.000,
 11.0, 0.1524,
 12.0, 0.0000,
 14.0, 0.1270,
 15.0, 0.0254,
 16.0, 0.0000,
   5,   1,  18,1.000,
  1.0, 0.0508,
  2.0, 0.0508,
  3.0, 0.0508,
  4.0, 0.0254,
  5.0, 0.0000,
  6.0, 0.0254,
  7.0, 0.0508,
  8.0, 0.1016,
  9.0, 0.1524,
 10.0, 0.0762,
 11.0, 0.0508,
```

```
12.0, 0.0762,
13.0, 0.0254,
14.0, 0.0000,
15.0, 0.0254,
16.0, 0.0000,
18.0, 0.0762,
19.0, 0.0000,
  6,   1,  20,1.000,
 3.0, 0.0254,
 4.0, 0.0000,
 6.0, 0.0254,
 7.0, 0.0508,
 8.0, 0.0254,
 9.0, 0.0508,
10.0, 0.0508,
11.0, 0.1778,
12.0, 0.1016,
13.0, 0.4064,
14.0, 0.0000,
15.0, 0.1016,
16.0, 0.1016,
17.0, 0.1778,
18.0, 0.1778,
19.0, 0.1270,
20.0, 0.0254,
21.0, 0.0254,
22.0, 0.0254,
23.0, 0.0000,
  7,   1,  14,1.000,
 1.0, 0.0254,
 2.0, 0.0000,
 8.0, 0.0508,
 9.0, 0.0254,
10.0, 0.0254,
11.0, 0.0254,
12.0, 0.1016,
13.0, 0.0000,
14.0, 0.0254,
15.0, 0.0000,
19.0, 0.0254,
20.0, 0.0762,
21.0, 0.0508,
22.0, 0.0000,
  8,   1,  12,1.000,
 1.0, 0.0254,
 2.0, 0.0000,
 8.0, 0.1016,
 9.0, 0.0254,
10.0, 0.0254,
11.0, 0.0254,
12.0, 0.1016,
13.0, 0.0254,
14.0, 0.0000,
21.0, 0.0254,
```

```
22.0, 0.0254,
23.0, 0.0000,
  9,   1,   4,1.000,
 2.0, 0.0254,
 3.0, 0.0000,
 6.0, 0.0254,
 7.0, 0.0000,
 10,   1,   9,1.000,
11.0, 0.0254,
12.0, 0.1016,
13.0, 0.0508,
14.0, 0.0000,
15.0, 0.0508,
16.0, 0.0254,
17.0, 0.0000,
22.0, 0.0508,
23.0, 0.0254,
 11,   1,   9,1.000,
 0.0, 0.0254,
 1.0, 0.0254,
 2.0, 0.0000,
 3.0, 0.0254,
 4.0, 0.0508,
 5.0, 0.0254,
 6.0, 0.0762,
 7.0, 0.0254,
 8.0, 0.0000,
 12,   1,   2,1.000,
18.0, 0.0254,
19.0, 0.0000,
 13,   1,   6,1.000,
14.0, 0.0254,
15.0, 0.0000,
18.0, 0.0254,
19.0, 0.0000,
22.0, 0.0254,
23.0, 0.0000,
 14,   1,   2,1.000,
 8.0, 0.0254,
 9.0, 0.0000,
 24,   1,   4,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
 8.0, 0.0254,
 9.0, 0.0000,
 25,   1,   6,1.000,
12.0, 0.0254,
13.0, 0.0000,
14.0, 0.0254,
15.0, 0.0000,
20.0, 0.0254,
21.0, 0.0000,
 26,   1,   2,1.000,
13.0, 0.0254,
```

```
14.0, 0.0000,
 27,   1,   6,1.000,
12.0, 0.0254,
13.0, 0.0000,
14.0, 0.0254,
15.0, 0.0000,
17.0, 0.0254,
18.0, 0.0000,
 28,   1,   2,1.000,
15.0, 0.0254,
16.0, 0.0000,
 29,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
 30,   1,   4,1.000,
12.0, 0.0254,
13.0, 0.0000,
15.0, 0.0254,
16.0, 0.0000,
 38,   1,   2,1.000,
 9.0, 0.0254,
10.0, 0.0000,
 41,   1,   2,1.000,
11.0, 0.0508,
12.0, 0.0000,
 42,   1,   2,1.000,
10.0, 0.0508,
11.0, 0.0000,
 46,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
 47,   1,   4,1.000,
 7.0, 0.0254,
 8.0, 0.0000,
10.0, 0.0508,
11.0, 0.0000,
 48,   1,   2,1.000,
 8.0, 0.0254,
 9.0, 0.0000,
 51,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
 53,   1,   3,1.000,
19.0, 0.0254,
20.0, 0.0254,
21.0, 0.0000,
 54,   1,  13,1.000,
 4.0, 0.0254,
 5.0, 0.0254,
 6.0, 0.0000,
14.0, 0.0508,
15.0, 0.0254,
16.0, 0.0000,
17.0, 0.0762,
```

```
18.0, 0.0508,
19.0, 0.3302,
20.0, 0.6350,
21.0, 0.0254,
22.0, 0.0254,
23.0, 0.0000,
 55,   1,   2,1.000,
11.0, 0.0254,
12.0, 0.0000,
 56,   1,   8,1.000,
12.0, 0.0508,
13.0, 0.0762,
14.0, 0.0254,
15.0, 0.0508,
16.0, 0.0254,
17.0, 0.0000,
22.0, 0.0254,
23.0, 0.0000,
 57,   1,  13,1.000,
 1.0, 0.0254,
 2.0, 0.0762,
 3.0, 0.0000,
 8.0, 0.0254,
 9.0, 0.0000,
11.0, 0.0508,
12.0, 0.0508,
13.0, 0.0508,
14.0, 0.0254,
15.0, 0.0254,
16.0, 0.0000,
17.0, 0.0254,
18.0, 0.0000,
 58,   1,   8,1.000,
 9.0, 0.0508,
10.0, 0.0762,
11.0, 0.1016,
12.0, 0.0762,
13.0, 0.1016,
14.0, 0.0254,
15.0, 0.0254,
16.0, 0.0000,
 59,   1,   2,1.000,
 8.0, 0.0254,
 9.0, 0.0000,
 60,   1,   8,1.000,
17.0, 0.0762,
18.0, 0.0508,
19.0, 0.0762,
20.0, 0.0508,
21.0, 0.0762,
22.0, 0.1016,
23.0, 0.0508,
24.0, 0.0000,
 61,   1,  16,1.000,
```

```
 0.0, 0.0254,
 1.0, 0.0000,
 9.0, 0.0254,
10.0, 0.0000,
12.0, 0.0254,
13.0, 0.2032,
14.0, 0.0000,
15.0, 0.0254,
16.0, 0.1270,
17.0, 0.1524,
18.0, 0.3302,
19.0, 0.1270,
20.0, 0.3556,
21.0, 0.1778,
22.0, 0.0508,
23.0, 0.0000,
 62,   1,  11,1.000,
 1.0, 0.0254,
 2.0, 0.0762,
 3.0, 0.0254,
 4.0, 0.0000,
 6.0, 0.0508,
 7.0, 0.0000,
 8.0, 0.0254,
 9.0, 0.0000,
22.0, 0.0508,
23.0, 0.2540,
24.0, 0.0000,
 63,   1,   9,1.000,
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 1.0, 0.0254,
 2.0, 0.1016,
 3.0, 0.0762,
 4.0, 0.0254,
 5.0, 0.0254,
 6.0, 0.0508,
 7.0, 0.0254,
 8.0, 0.0000,
 64,   1,  12,1.000,
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 1.0, 0.0000,
 2.0, 0.0254,
 3.0, 0.0000,
 7.0, 0.0508,
 8.0, 0.0254,
 9.0, 0.0762,
10.0, 0.0000,
11.0, 0.0762,
12.0, 0.1524,
13.0, 0.0254,
14.0, 0.0000,
 67,   1,   5,1.000,
11.0, 0.0508,
12.0, 0.0762,
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14.0, 0.0254,
15.0, 0.0000,
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12.0, 0.0000,
13.0, 0.0254,
14.0, 0.0000,
 69,   1,   2,1.000,
15.0, 0.0254,
16.0, 0.0000,
 70,   1,   3,1.000,
12.0, 0.0762,
13.0, 0.0508,
14.0, 0.0000,
 71,   1,   2,1.000,
13.0, 0.0254,
14.0, 0.0000,
 73,   1,   6,1.000,
18.0, 0.0254,
19.0, 0.0000,
21.0, 0.2032,
22.0, 0.2032,
23.0, 0.1016,
24.0, 0.0000,
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 1.0, 0.1016,
 2.0, 0.1270,
 3.0, 0.0762,
 4.0, 0.0254,
 5.0, 0.0000,
 6.0, 0.0254,
 7.0, 0.0000,
 8.0, 0.0254,
 9.0, 0.0762,
10.0, 0.1270,
11.0, 0.1016,
12.0, 0.2794,
13.0, 0.0762,
14.0, 0.1524,
15.0, 0.1778,
16.0, 0.0508,
17.0, 0.0000,
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 9.0, 0.0508,
10.0, 0.0000,
14.0, 0.0762,
15.0, 0.2032,
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18.0, 0.0000,
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 4.0, 0.0254,
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 5.0, 0.0254,
 6.0, 0.0762,
 7.0, 0.0254,
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24.0, 0.0000,
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 3.0, 0.0254,
 4.0, 0.0508,
 5.0, 0.0254,
 6.0, 0.0000,
10.0, 0.0762,
11.0, 0.1270,
12.0, 0.0254,
13.0, 0.0000,
14.0, 0.0254,
15.0, 0.1524,
16.0, 0.0508,
17.0, 0.0000,
21.0, 0.0254,
22.0, 0.0508,
23.0, 0.0000,
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 3.0, 0.0254,
 4.0, 0.0000,
 83,   1,  13,1.000,
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10.0, 0.0254,
11.0, 0.0762,
12.0, 0.0762,
13.0, 0.0000,
14.0, 0.0508,
15.0, 0.0762,
16.0, 0.0000,
17.0, 0.0254,
18.0, 0.0254,
19.0, 0.1270,
20.0, 0.1270,
21.0, 0.0000,
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16.0, 0.0254,
17.0, 0.0000,
 87,   1,   8,1.000,
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21.0, 0.0508,
22.0, 0.0254,
23.0, 0.0000,
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 8.0, 0.0254,
 9.0, 0.0762,
10.0, 0.0000,
12.0, 0.0254,
13.0, 0.0508,
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 4.0, 0.0000,
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 8.0, 0.0254,
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10.0, 0.1016,
11.0, 0.0254,
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 6.0, 0.0000,
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 8.0, 0.1016,
 9.0, 0.0000,
10.0, 0.0508,
11.0, 0.1016,
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13.0, 0.1524,
14.0, 0.0762,
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19.0, 0.0000,
 92,   1,   6,1.000,
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13.0, 0.1016,
14.0, 0.0000,
19.0, 0.1016,
20.0, 0.0000,
 93,   1,   7,1.000,
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15.0, 0.0000,
17.0, 0.0254,
18.0, 0.0254,
19.0, 0.0000,
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 95,   1,   2,1.000,
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 9.0, 0.1524,
10.0, 0.0762,
11.0, 0.0254,
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13.0, 0.1016,
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15.0, 0.0000,
102,   1,   8,1.000,
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17.0, 0.1016,
18.0, 0.0508,
19.0, 0.1270,
20.0, 0.1270,
21.0, 0.1016,
22.0, 0.0254,
23.0, 0.0000,
103,   1,   7,1.000,
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13.0, 0.0000,
15.0, 0.0254,
16.0, 0.1016,
17.0, 0.0000,
19.0, 0.0254,
20.0, 0.0000,
107,   1,   2,1.000,
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19.0, 0.0000,
113,   1,   5,1.000,
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21.0, 0.0254,
22.0, 0.0000,
114,   1,   2,1.000,
 7.0, 0.0254,
 8.0, 0.0000,
115,   1,   2,1.000,
20.0, 0.0762,
21.0, 0.0000,
116,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0000,
117,   1,   4,1.000,
 3.0, 0.0254,
 4.0, 0.0000,
16.0, 0.1016,
17.0, 0.0000,
122,   1,   3,1.000,
19.0, 0.0508,
20.0, 0.1016,
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 3.0, 0.0000,
 4.0, 0.0254,
 5.0, 0.0000,
11.0, 0.0508,
12.0, 0.0508,
13.0, 0.0000,
15.0, 0.0254,
16.0, 0.0000,
124,   1,   4,1.000,
21.0, 0.1016,
22.0, 0.1778,
23.0, 0.2032,
24.0, 0.0000,
125,   1,  10,1.000,
 0.0, 0.1016,
 1.0, 0.0000,
 3.0, 0.2794,
 4.0, 0.1016,
 5.0, 0.0762,
 6.0, 0.0000,
12.0, 0.0508,
13.0, 0.0508,
14.0, 0.3556,
15.0, 0.0000,
126,   1,   6,1.000,
12.0, 0.0508,
13.0, 0.0000,
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17.0, 0.1778,
18.0, 0.0508,
19.0, 0.0000,
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13.0, 0.0254,
14.0, 0.0000,
15.0, 0.0762,
16.0, 0.0254,
17.0, 0.0000,
131,   1,   8,1.000,
 2.0, 0.0508,
 3.0, 0.0254,
 4.0, 0.1016,
 5.0, 0.1270,
 6.0, 0.0000,
 9.0, 0.1778,
10.0, 0.1270,
11.0, 0.0000,
132,   1,   4,1.000,
15.0, 0.0254,
16.0, 0.0000,
20.0, 0.0508,
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22.0, 0.1016,
23.0, 0.2032,
24.0, 0.0000,
134,   1,  15,1.000,
 0.0, 0.1016,
 1.0, 0.2540,
 2.0, 0.2540,
 3.0, 0.1524,
 4.0, 0.1524,
 5.0, 0.0508,
 6.0, 0.2032,
 7.0, 0.0508,
 8.0, 0.0000,
10.0, 0.0254,
11.0, 0.0254,
12.0, 0.0000,
15.0, 0.0254,
16.0, 0.0254,
17.0, 0.0000,
156,   1,   2,1.000,
18.0, 0.0254,
19.0, 0.0000,
159,   1,   5,1.000,
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10.0, 0.5334,
11.0, 0.0254,
12.0, 0.1016,
13.0, 0.0000,
160,   1,   2,1.000,
13.0, 0.0254,
14.0, 0.0000,
165,   1,   2,1.000,
 8.0, 0.0254,
 9.0, 0.0000,
166,   1,   4,1.000,
18.0, 0.1778,
19.0, 0.0000,
20.0, 0.0254,
21.0, 0.0000,
168,   1,   4,1.000,
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13.0, 0.0000,
17.0, 1.0160,
18.0, 0.0000,
170,   1,   5,1.000,
14.0, 0.0762,
15.0, 0.0762,
16.0, 0.0000,
23.0, 0.0508,
24.0, 0.0000,
171,   1,   3,1.000,
 0.0, 0.1524,
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172,   1,   6,1.000,
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18.0, 0.0762,
19.0, 0.0254,
20.0, 0.0000,
22.0, 0.0254,
23.0, 0.0000,
173,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0000,
175,   1,   2,1.000,
23.0, 0.0508,
24.0, 0.0000,
186,   1,   2,1.000,
21.0, 0.0762,
22.0, 0.0000,
187,   1,   3,1.000,
 7.0, 0.0762,
 8.0, 0.1016,
 9.0, 0.0000,
189,   1,   2,1.000,
 5.0, 0.0254,
 6.0, 0.0000,
193,   1,   3,1.000,
22.0, 0.0254,
23.0, 0.0254,
24.0, 0.0000,
194,   1,  18,1.000,
 1.0, 0.1016,
 2.0, 0.2286,
 3.0, 0.0508,
 4.0, 0.0000,
 9.0, 0.0762,
10.0, 0.2032,
11.0, 0.1524,
12.0, 0.1016,
13.0, 0.0000,
14.0, 0.3048,
15.0, 0.1524,
16.0, 0.0000,
19.0, 0.0762,
20.0, 0.1016,
21.0, 0.1016,
22.0, 0.0254,
23.0, 0.0508,
24.0, 0.0000,
204,   1,   2,1.000,
11.0, 0.0508,
12.0, 0.0000,
207,   1,   5,1.000,
 4.0, 0.0254,
 5.0, 0.0254,
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 7.0, 0.0508,
 8.0, 0.0000,
209,   1,   6,1.000,
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 1.0, 0.3810,
 2.0, 0.0000,
 3.0, 0.1270,
 4.0, 0.0508,
 5.0, 0.0000,
218,   1,   2,1.000,
22.0, 0.1016,
23.0, 0.0000,
219,   1,   5,1.000,
 4.0, 0.0508,
 5.0, 0.0508,
 6.0, 0.0000,
10.0, 0.0254,
11.0, 0.0000,
224,   1,  11,1.000,
 7.0, 0.6096,
 8.0, 0.3048,
 9.0, 0.0508,
10.0, 0.1524,
11.0, 0.0000,
12.0, 0.0254,
13.0, 0.0000,
20.0, 0.0254,
21.0, 0.2286,
22.0, 0.4572,
23.0, 0.0000,
225,   1,   4,1.000,
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 1.0, 0.0000,
16.0, 0.0508,
17.0, 0.0000,
226,   1,   7,1.000,
14.0, 0.0254,
15.0, 0.0000,
16.0, 0.0254,
17.0, 0.0508,
18.0, 0.1524,
19.0, 0.0762,
20.0, 0.0000,
227,   1,   9,1.000,
 3.0, 0.0254,
 4.0, 0.0000,
16.0, 0.0508,
17.0, 0.0000,
19.0, 0.0254,
20.0, 0.0762,
21.0, 0.0000,
23.0, 0.0254,
24.0, 0.0000,
```

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228,   1,   6,1.000,
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 1.0, 0.0254,
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 3.0, 0.1270,
 4.0, 0.0254,
 5.0, 0.0000,
233,   1,   2,1.000,
 3.0, 0.1016,
 4.0, 0.0000,
241,   1,   2,1.000,
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11.0, 0.0000,
249,   1,   8,1.000,
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 7.0, 0.2032,
 8.0, 0.0762,
 9.0, 0.0000,
14.0, 0.0254,
15.0, 0.0000,
18.0, 0.0254,
19.0, 0.0000,
250,   1,   3,1.000,
16.0, 0.2286,
17.0, 0.0762,
18.0, 0.0000,
260,   1,   4,1.000,
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 9.0, 0.0254,
10.0, 0.0254,
11.0, 0.0000,
262,   1,   2,1.000,
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22.0, 0.0000,
275,   1,  12,1.000,
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11.0, 0.1270,
12.0, 0.1270,
13.0, 0.0508,
14.0, 0.0254,
15.0, 0.0000,
19.0, 0.4064,
20.0, 0.0254,
21.0, 0.0254,
22.0, 0.0762,
23.0, 0.0000,
286,   1,   6,1.000,
18.0, 0.0254,
19.0, 0.0762,
20.0, 0.0508,
21.0, 0.0000,
22.0, 0.0254,
23.0, 0.0762,
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287,   1,  17,1.000,
 0.0, 0.1016,
 1.0, 0.1524,
 2.0, 0.2286,
 3.0, 0.1778,
 4.0, 0.1778,
 5.0, 0.0000,
 7.0, 0.0254,
 8.0, 0.0508,
 9.0, 0.0508,
10.0, 0.1270,
11.0, 0.1524,
12.0, 0.1778,
13.0, 0.1778,
14.0, 0.0000,
17.0, 0.0508,
18.0, 0.0508,
19.0, 0.0000,
290,   1,   4,1.000,
19.0, 0.1270,
20.0, 0.1524,
21.0, 0.2286,
22.0, 0.0000,
292,   1,   2,1.000,
 3.0, 0.0254,
 4.0, 0.0000,
293,   1,   2,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
294,   1,   7,1.000,
15.0, 0.0254,
16.0, 0.0000,
18.0, 0.0254,
19.0, 0.1524,
20.0, 0.0508,
21.0, 0.0254,
22.0, 0.0000,
296,   1,  12,1.000,
 9.0, 0.0254,
10.0, 0.2032,
11.0, 0.2286,
12.0, 0.3556,
13.0, 0.4064,
14.0, 0.2032,
15.0, 0.1778,
16.0, 0.1270,
17.0, 0.0254,
18.0, 0.0254,
19.0, 0.0000,
23.0, 0.0254,
297,   1,   2,1.000,
 0.0, 0.0254,
 1.0, 0.0000,
298,   1,   3,1.000,
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23.0, 0.0254,
299,   1,  17,1.000,
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 1.0, 0.1016,
 2.0, 0.1016,
 3.0, 0.0508,
 4.0, 0.0254,
 5.0, 0.0000,
 6.0, 0.2286,
 7.0, 0.1524,
 8.0, 0.2286,
 9.0, 0.1778,
10.0, 0.2032,
11.0, 0.1524,
12.0, 0.3048,
13.0, 0.4572,
14.0, 0.4572,
15.0, 0.2286,
16.0, 0.0000,
302,   1,   9,1.000,
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10.0, 0.1016,
11.0, 0.0254,
12.0, 0.0000,
19.0, 0.0762,
20.0, 0.0000,
22.0, 0.0508,
23.0, 0.0254,
24.0, 0.0000,
303,   1,   2,1.000,
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 2.0, 0.0000,
304,   1,   6,1.000,
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 1.0, 0.0000,
 2.0, 0.0254,
 3.0, 0.0508,
 4.0, 0.0254,
 5.0, 0.0000,
307,   1,   2,1.000,
 8.0, 0.0254,
 9.0, 0.0000,
309,   1,   4,1.000,
20.0, 0.0508,
21.0, 0.0254,
22.0, 0.0508,
23.0, 0.1270,
310,   1,   6,1.000,
 0.0, 0.0508,
 1.0, 0.0254,
 2.0, 0.0508,
 3.0, 0.2540,
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311,   1,   5,1.000,
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 7.0, 0.0000,
23.0, 0.0254,
24.0, 0.0000,
312,   1,   6,1.000,
13.0, 0.1270,
14.0, 0.0508,
15.0, 0.0254,
16.0, 0.0254,
17.0, 0.0254,
18.0, 0.0000,
313,   1,   3,1.000,
22.0, 0.0254,
23.0, 0.0254,
24.0, 0.0000,
314,   1,   4,1.000,
 3.0, 0.0762,
 4.0, 0.1778,
 5.0, 0.0254,
 6.0, 0.0000,
316,   1,   2,1.000,
 8.0, 0.0254,
 9.0, 0.0000,
318,   1,   6,1.000,
10.0, 0.0254,
11.0, 0.0762,
12.0, 0.0000,
13.0, 0.0254,
14.0, 0.0254,
15.0, 0.0000,
319,   1,   6,1.000,
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10.0, 0.0000,
12.0, 0.0254,
13.0, 0.0000,
15.0, 0.0254,
16.0, 0.0000,
320,   1,   2,1.000,
16.0, 0.0254,
17.0, 0.0000,
321,   1,   3,1.000,
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14.0, 0.0508,
15.0, 0.0000,
323,   1,  10,1.000,
12.0, 0.0508,
13.0, 0.0508,
14.0, 0.0508,
15.0, 0.0508,
16.0, 0.0508,
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17.0, 0.0508,
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19.0, 0.0508,
20.0, 0.0508,
21.0, 0.0000,
324,  1,   7,1.000,
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 6.0, 0.0508,
 7.0, 0.0000,
 8.0, 0.0508,
 9.0, 0.0762,
10.0, 0.0254,
11.0, 0.0000,
326,  1,  13,1.000,
11.0, 0.1778,
12.0, 0.2794,
13.0, 0.2032,
14.0, 0.1270,
15.0, 0.0762,
16.0, 0.0254,
17.0, 0.0000,
18.0, 0.0508,
19.0, 0.0000,
21.0, 0.0254,
22.0, 0.0000,
23.0, 0.0254,
24.0, 0.0000,
327,  1,   2,1.000,
 9.0, 0.0254,
10.0, 0.0000,
328,  1,   4,1.000,
 3.0, 0.0254,
 4.0, 0.0508,
 5.0, 0.0508,
 6.0, 0.0000,
330,  1,   9,1.000,
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 3.0, 0.0000,
15.0, 0.0254,
16.0, 0.1270,
17.0, 0.2286,
18.0, 0.0254,
19.0, 0.0254,
20.0, 0.0000,
23.0, 0.0508,
331,   1,  11,1.000,
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 1.0, 0.1270,
 2.0, 0.1270,
 3.0, 0.2286,
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 5.0, 0.1016,
 6.0, 0.1524,
 7.0, 0.0508,
```

```
 8.0, 0.0000,
 9.0, 0.0254,
10.0, 0.0000,
334,   1,   2,1.000,
 3.0, 0.0254,
 4.0, 0.0000,
339,   1,   2,1.000,
19.0, 0.0254,
20.0, 0.0000,
348,   1,   4,1.000,
11.0, 0.0508,
12.0, 0.0254,
13.0, 0.0254,
14.0, 0.0000,
350,   1,  17,1.000,
 3.0, 0.0254,
 4.0, 0.7874,
 5.0, 0.2032,
 6.0, 0.2032,
 7.0, 0.1524,
 8.0, 0.1778,
 9.0, 0.2032,
10.0, 0.2794,
11.0, 0.1524,
12.0, 0.0254,
13.0, 0.0000,
18.0, 0.1016,
19.0, 0.0762,
20.0, 0.1016,
21.0, 0.0254,
22.0, 0.0254,
23.0, 0.0000,
351,   1,   9,1.000,
 0.0, 0.2286,
 1.0, 0.1778,
 2.0, 0.1270,
 3.0, 0.0762,
 4.0, 0.0508,
 5.0, 0.0508,
 6.0, 0.0000,
 7.0, 0.0254,
 8.0, 0.0000,
353,   1,  12,1.000,
 8.0, 0.0508,
 9.0, 0.0762,
10.0, 0.1270,
11.0, 0.1778,
12.0, 0.0254,
13.0, 0.0000,
14.0, 0.1270,
15.0, 0.0762,
16.0, 0.0508,
17.0, 0.0000,
18.0, 0.1778,
```

```
19.0, 0.0000,
354,   1,  14,1.000,
 0.0, 0.1778,
 1.0, 0.1016,
 2.0, 0.0508,
 3.0, 0.0254,
 4.0, 0.0000,
11.0, 0.0254,
12.0, 0.0000,
15.0, 0.0254,
16.0, 0.0762,
17.0, 0.0508,
18.0, 0.0254,
19.0, 0.0000,
22.0, 0.0762,
23.0, 0.0000,
355,   1,  22,1.000,
 0.0, 0.1524,
 1.0, 0.0254,
 2.0, 0.1016,
 3.0, 0.1270,
 4.0, 0.0000,
 7.0, 0.0254,
 8.0, 0.0000,
 9.0, 0.0762,
10.0, 0.0762,
11.0, 0.1270,
12.0, 0.1270,
13.0, 0.0254,
14.0, 0.0000,
15.0, 0.0508,
16.0, 0.2032,
17.0, 0.1016,
18.0, 0.0508,
19.0, 0.0000,
20.0, 0.1016,
21.0, 0.0508,
22.0, 0.0000,
23.0, 0.0254,
356,   1,   5,1.000,
 0.0, 0.0254,
 1.0, 0.0000,
11.0, 0.0762,
12.0, 0.0254,
13.0, 0.0000,
365,   1,   6,1.000,
11.0, 0.1016,
12.0, 0.1016,
13.0, 0.0508,
14.0, 0.0000,
23.0, 0.0254,
24.0, 0.0000,
```

***USFS, Brooks-Corey, 2010***

```
Spokane Valley Rathdrum Prairie USFS Simulation: BCUSFS2010.inp
0, 1,                          IPLANT, NGRAV
62, 1, 62,                     IFDEND, IDTBEG, IDTEND
2010, 1, 0, 0, 0,              IYS, NYEARS, ISTEAD, IFLIST, NFLIST
1, 24.0,                       NPRINT, STOPHR
0, 3, 1, 1.0E-4,               ISMETH, INMAX, ISWDIF, DMAXBA
1.0, 1.0E-5, 1.0,              DELMAX, DELMIN, OUTTIM
2.0, 1.0E-05, 0.0, 0.0, 0.0,   RFACT, RAINIF, DHTOL, DHMAX, DHFACT
3, 3, 0,                       KOPT, KEST, WTF
0, 1, 2, 2,                    ITOPBC, IEVOPT, NFHOUR, LOWER
0.0, 2.0E+04, 20.73, 0.0,      HIRRI, HDRY, HTOP, RHA
0, 0, 0,                       IETOPT, ICLOUD, ISHOPT
0, 0,                          IRAIN, HPR
0, 0, 0, 0, 0,                 IHYS, AIRTOL, HYSTOL, HYSMXH, HYFILE
0, 0, 0,                       IHEAT, ICONVH, DMAXHE
0, 0, 0, 0,                    UPPERH, TSMEAN, TSAMP, QHCTOP
0, 0.0, 0.0,                   LOWERH, QHLEAK, TGRAD
0, 0.66, 288.46, 0.24,         IVAPOR, TORT, TSOIL, VAPDIF
3, 126,                        MATN, NPT
1,    0.00,  1,    1.00,  1,    2.00,  1,    3.00,
1,    4.00,  1,    5.00,  1,    6.00,  1,    7.00,
1,    8.00,  1,    9.00,  1,   10.00,  1,   11.00,
1,   12.00,  1,   13.00,  1,   14.00,  1,   15.00,
1,   16.00,  1,   17.00,  1,   18.00,  1,   19.00,
1,   20.00,  2,   21.00,  2,   22.00,  2,   23.00,
2,   24.00,  2,   25.00,  2,   26.00,  2,   27.00,
2,   28.00,  2,   29.00,  2,   30.00,  2,   31.00,
2,   32.00,  2,   33.00,  2,   34.00,  2,   35.00,
2,   36.00,  2,   37.00,  2,   38.00,  2,   39.00,
2,   40.00,  2,   41.00,  2,   42.00,  2,   43.00,
2,   44.00,  2,   45.00,  2,   46.00,  2,   47.00,
2,   48.00,  2,   49.00,  2,   50.00,  2,   51.00,
2,   52.00,  2,   53.00,  2,   54.00,  2,   55.00,
2,   56.00,  2,   57.00,  2,   58.00,  2,   59.00,
2,   60.00,  2,   61.00,  2,   62.00,  2,   63.00,
2,   64.00,  2,   65.00,  3,   66.00,  3,   67.00
3,   68.00,  3,   69.00,  3,   70.00,  3,   71.00,
3,   72.00,  3,   73.00,  3,   74.00,  3,   75.00,
3,   76.00,  3,   77.00,  3,   78.00,  3,   79.00,
3,   80.00,  3,   81.00,  3,   82.00,  3,   83.00,
3,   84.00,  3,   85.00,  3,   86.00,  3,   87.00,
3,   88.00,  3,   89.00,  3,   90.00,  3,   91.00,
3,   92.00,  3,   93.00,  3,   94.00,  3,   95.00,
3,   96.00,  3,   97.00,  3,   98.00,  3,   99.00,
3,  100.00,  3,  101.00,  3,  102.00,  3,  103.00,
3,  104.00,  3,  105.00,  3,  106.00,  3,  107.00,
3,  108.00,  3,  109.00,  3,  110.00,  3,  111.00,
3,  112.00,  3,  113.00,  3,  114.00,  3,  115.00,
3,  116.00,  3,  117.00,  3,  118.00,  3,  119.00,
3,  120.00,  3,  121.00,  3,  122.00,  3,  123.00,
3,  124.00,  3,  125.00,
```

```
Sand Layer #1: 0-20 cm (Brooks-Corey et al.)          Retention
0.39, 0.048, 27.114, 1.9933,                          THET, THTR,
AIRENT, B
Sand Layer #1: 0-20 cm (Brooks-Corey et al.)          Hydraulic
Conductivity
2.0, 34.2, 27.114, 1.9933, -0.5,                      RKMOD, SK,
AIRENK, B, EPIT
Sand Layer #2: 0-20 cm (Brooks-Corey et al.)          Retention
0.27, 0.025, 27.114, 1.7933,                          THET, THTR,
AIRENT, B
Sand Layer #2: 0-20 cm (Brooks-Corey et al.)          Hydraulic
Conductivity
2.0, 10.18, 27.114, 1.7933, 0.5,                            RKMOD, SK,
AIRENK, B, EPIT
Sand Layer #3: 0-20 cm (Brooks-Corey et al.)          Retention
0.13, 0.010, 17.105, 1.8113,                          THET, THTR,
AIRENT, B
Sand Layer #3: 0-20 cm (Brooks-Corey et al.)          Hydraulic
Conductivity
2.0, 16.18, 17.105, 1.8113, 0.5,                      RKMOD, SK,
AIRENK, B, EPIT
0,    NDAY
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0, 100.0, 100.0,
100.0, 100.0,
```

```
0.0400, 0.0352, 0.0205, 0.0113, 0.0333, 0.1071, 0.0462, 0.0235,
0.0216, 0.0209, 0.0209, 0.0121, 0.0142, 0.0120, 0.0051, 0.0088,
0.0331, 0.0166, 0.0100, 0.0133, 0.0150, 0.0263, 0.0291, 0.0150,
0.0345, 0.0422, 0.0335, 0.0160, 0.0146, 0.0098, 0.0105, 0.0219
0.0260, 0.0242, 0.0163, 0.0202, 0.0605, 0.0433, 0.0361, 0.0096,
0.0171, 0.0201, 0.0215, 0.0210, 0.0398, 0.0705, 0.0273, 0.0352,
0.0832, 0.0573, 0.0975, 0.1213, 0.0734, 0.0313, 0.0381, 0.0267,
0.0342, 0.0294, 0.0294, 0.0362, 0.0364, 0.0325,
 27,        NWATER      (rain data 2010)
   5,   1,   2,1.000,
 19.0, 0.0254,
 20.0, 0.0000,
  14,   1,   4,1.000,
 11.0, 0.0508,
 12.0, 0.0254,
 13.0, 0.0254,
 14.0, 0.0000,
  16,   1,  17,1.000,
  3.0, 0.0254,
  4.0, 0.7874,
  5.0, 0.2032,
  6.0, 0.2032,
  7.0, 0.1524,
  8.0, 0.1778,
  9.0, 0.2032,
 10.0, 0.2794,
 11.0, 0.1524,
 12.0, 0.0254,
 13.0, 0.0000,
 18.0, 0.1016,
 19.0, 0.0762,
 20.0, 0.1016,
 21.0, 0.0254,
 22.0, 0.0254,
 23.0, 0.0000,
  17,   1,   9,1.000,
  0.0, 0.2286,
  1.0, 0.1778,
  2.0, 0.1270,
  3.0, 0.0762,
  4.0, 0.0508,
  5.0, 0.0508,
  6.0, 0.0000,
  7.0, 0.0254,
  8.0, 0.0000,
  19,   1,  12,1.000,
  8.0, 0.0508,
  9.0, 0.0762,
 10.0, 0.1270,
 11.0, 0.1778,
 12.0, 0.0254,
 13.0, 0.0000,
 14.0, 0.1270,
 15.0, 0.0762,
```

```
16.0, 0.0508,
17.0, 0.0000,
18.0, 0.1778,
19.0, 0.0000,
 20,   1,  14,1.000,
 0.0, 0.1778,
 1.0, 0.1016,
 2.0, 0.0508,
 3.0, 0.0254,
 4.0, 0.0000,
11.0, 0.0254,
12.0, 0.0000,
15.0, 0.0254,
16.0, 0.0762,
17.0, 0.0508,
18.0, 0.0254,
19.0, 0.0000,
22.0, 0.0762,
23.0, 0.0000,
 21,   1,  22,1.000,
 0.0, 0.1524,
 1.0, 0.0254,
 2.0, 0.1016,
 3.0, 0.1270,
 4.0, 0.0000,
 7.0, 0.0254,
 8.0, 0.0000,
 9.0, 0.0762,
10.0, 0.0762,
11.0, 0.1270,
12.0, 0.1270,
13.0, 0.0254,
14.0, 0.0000,
15.0, 0.0508,
16.0, 0.2032,
17.0, 0.1016,
18.0, 0.0508,
19.0, 0.0000,
20.0, 0.1016,
21.0, 0.0508,
22.0, 0.0000,
23.0, 0.0254,
 22,   1,   5,1.000,
 0.0, 0.0254,
 1.0, 0.0000,
11.0, 0.0762,
12.0, 0.0254,
13.0, 0.0000,
 31,   1,   6,1.000,
11.0, 0.1016,
12.0, 0.1016,
13.0, 0.0508,
14.0, 0.0000,
23.0, 0.0254,
```

```
24.0, 0.0000,
 32,   1,  19,1.000,
 0.0, 0.0254,
 1.0, 0.0762,
 2.0, 0.0508,
 3.0, 0.0762,
 4.0, 0.0254,
 5.0, 0.0508,
 6.0, 0.0254,
 7.0, 0.0254,
 8.0, 0.0508,
 9.0, 0.0000,
12.0, 0.1016,
13.0, 0.1016,
14.0, 0.0000,
15.0, 0.1270,
16.0, 0.0762,
17.0, 0.0000,
20.0, 0.1524,
21.0, 0.0508,
22.0, 0.0000,
 33,   1,   6,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
12.0, 0.0254,
13.0, 0.0254,
14.0, 0.0254,
15.0, 0.0000,
 35,   1,  18,1.000,
 4.0, 0.0254,
 5.0, 0.0254,
 6.0, 0.0254,
 7.0, 0.0000,
 8.0, 0.0254,
 9.0, 0.0000,
12.0, 0.1016,
13.0, 0.1016,
14.0, 0.1524,
15.0, 0.0762,
16.0, 0.0508,
17.0, 0.0254,
18.0, 0.1016,
19.0, 0.0508,
20.0, 0.0000,
21.0, 0.0508,
22.0, 0.1016,
23.0, 0.0762,
 36,   1,  15,1.000,
 0.0, 0.0762,
 1.0, 0.0762,
 2.0, 0.0254,
 3.0, 0.0508,
 4.0, 0.0508,
 5.0, 0.0508,
```

```
 6.0, 0.0508,
 7.0, 0.0000,
 8.0, 0.0508,
 9.0, 0.0508,
10.0, 0.0254,
11.0, 0.0254,
12.0, 0.0000,
13.0, 0.0254,
14.0, 0.0000,
 40,   1,   2,1.000,
13.0, 0.0254,
14.0, 0.0000,
 41,   1,   4,1.000,
10.0, 0.0508,
11.0, 0.0508,
12.0, 0.0254,
13.0, 0.0000,
 42,   1,   2,1.000,
 9.0, 0.0254,
10.0, 0.0000,
 43,   1,   9,1.000,
 8.0, 0.0254,
 9.0, 0.0000,
11.0, 0.0254,
12.0, 0.0000,
17.0, 0.0254,
18.0, 0.0000,
20.0, 0.2540,
21.0, 0.1016,
22.0, 0.0000,
 44,   1,   7,1.000,
 7.0, 0.0254,
 8.0, 0.0000,
15.0, 0.0254,
16.0, 0.1016,
17.0, 0.1016,
18.0, 0.0000,
23.0, 0.0254,
 45,   1,   5,1.000,
 0.0, 0.0254,
 1.0, 0.0508,
 2.0, 0.0254,
 3.0, 0.0254,
 4.0, 0.0000,
 46,   1,   5,1.000,
17.0, 0.0254,
18.0, 0.0000,
21.0, 0.0508,
22.0, 0.1016,
23.0, 0.2794,
 47,   1,  20,1.000,
 0.0, 0.1778,
 1.0, 0.1524,
 2.0, 0.2286,
```

```
 3.0, 0.1778,
 4.0, 0.1016,
 5.0, 0.0762,
 6.0, 0.1524,
 7.0, 0.1016,
 8.0, 0.1016,
 9.0, 0.0000,
10.0, 0.0254,
11.0, 0.0000,
12.0, 0.0254,
13.0, 0.0000,
14.0, 0.0254,
15.0, 0.0000,
17.0, 0.0254,
18.0, 0.0000,
19.0, 0.0254,
20.0, 0.0000,
 48,   1,   7,1.000,
 4.0, 0.0254,
 5.0, 0.0000,
13.0, 0.0254,
14.0, 0.0000,
21.0, 0.0254,
22.0, 0.0000,
23.0, 0.0508,
 49,   1,   6,1.000,
 0.0, 0.0254,
 1.0, 0.0000,
 2.0, 0.0254,
 3.0, 0.0000,
 4.0, 0.0254,
 5.0, 0.0000,
 50,   1,   2,1.000,
 7.0, 0.0254,
 8.0, 0.0000,
 56,   1,   7,1.000,
10.0, 0.0508,
11.0, 0.0508,
12.0, 0.0508,
13.0, 0.0000,
14.0, 0.0254,
15.0, 0.0254,
16.0, 0.0000,
 58,   1,   2,1.000,
10.0, 0.0254,
11.0, 0.0000,
 62,   1,  15,1.000,
 1.0, 0.0254,
 2.0, 0.0000,
 3.0, 0.0254,
 4.0, 0.0000,
 7.0, 0.0254,
 8.0, 0.0254,
 9.0, 0.1778,
```

```
10.0, 0.1016,
11.0, 0.0762,
12.0, 0.0508,
13.0, 0.0508,
14.0, 0.0254,
15.0, 0.0000,
16.0, 0.0254,
17.0, 0.0000,
```